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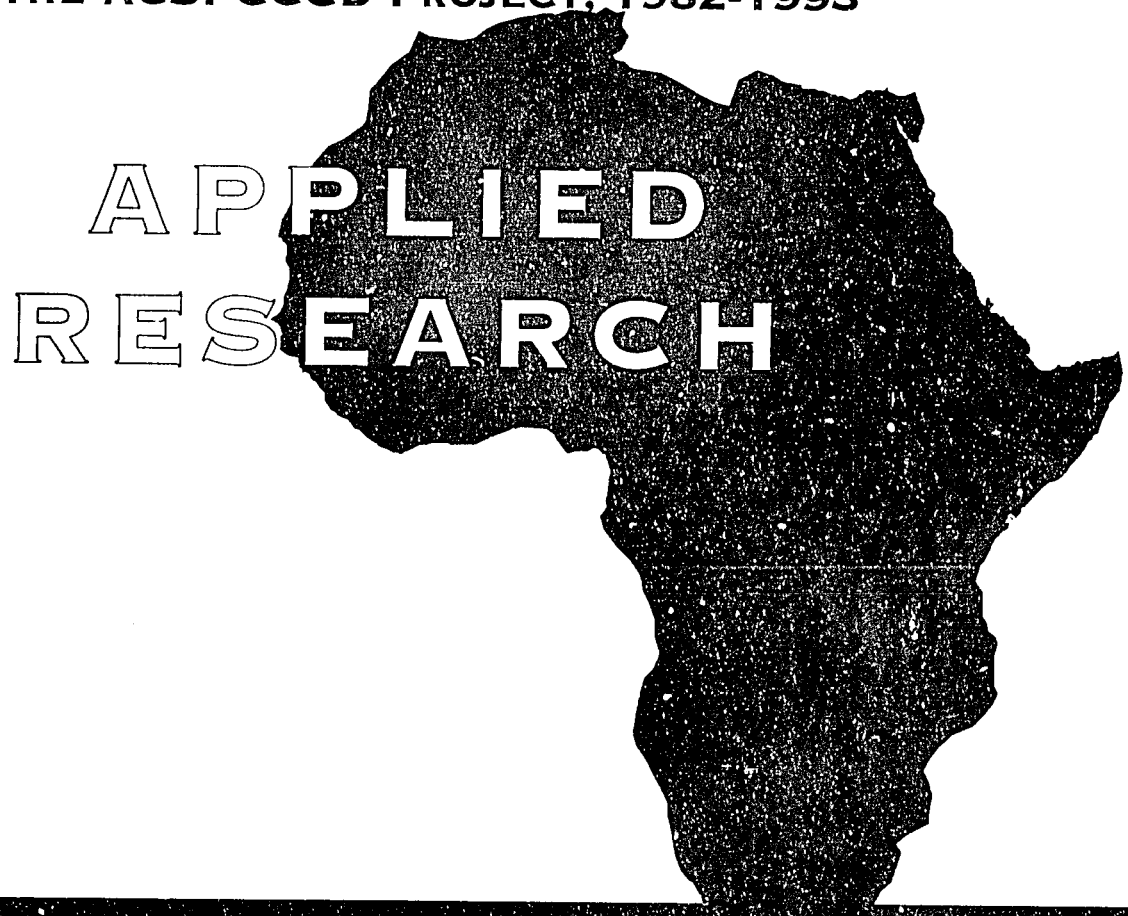
AFRICA CHILD SURVIVAL INITIATIVE
COMBATTING CHILDHOOD COMMUNICABLE DISEASES
(ACSI-CCCD)

APPLIED RESEARCH IN THE AFRICA CHILD SURVIVAL INITIATIVE

A COMPENDIUM OF USAID- SUPPORTED RESEARCH IN THE ACSI-CCCD PROJECT, 1982-1993



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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control
and Prevention
International Health Program Office

CDC
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This document was prepared by (staff of the ACSI-CCCD project) and does not represent the views or opinions of CDC or of the United States Agency for International Development. The views expressed are solely those of the authors.

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APPLIED RESEARCH IN THE AFRICA CHILD SURVIVAL INITIATIVE

A Compendium of USAID-Supported Research in the ACSI-CCCD Project, 1982-1993

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Introduction

This document is a compendium of research studies undertaken from 1982 to 1993 with the support of the Africa Child Survival Initiative Combatting Childhood Communicable Diseases (ACSI-CCCD), a multi-country project of the United States Agency for International Development (USAID). A more detailed assessment and evaluation of the research component of the ACSI-CCCD Project is provided by a companion document to this compendium — **Applied Research in the Africa Child Survival Initiative: Lessons Learned from the ACSI-CCCD Project, 1982 - 1993**. Additional aspects of the research activities are explored in several other end-of-project documents listed at the end of this section. Many of these publications describe ACSI-CCCD applied research within the context of individual project components —immunization, diarrheal disease control, malaria, and acute respiratory infections.

Although the chronology and experience of applied research in the ACSI-CCCD Project is described at length in other documents, a brief summary is warranted here. The account below is excerpted from the companion "Lessons Learned" document.

The ACSI-CCCD Project was initiated in 1981 as the Combatting Childhood Communicable Diseases Project (CCCD). From 1982 to 1993 the ACSI-CCCD Project directly supported a total of 13 country projects for variable periods. It also included a number of countries that were not bilateral signatories (e.g., Kenya, Zimbabwe, and The Gambia); these countries received assistance indirectly through activities of the regional epidemiologists or through individual research support. Thus, research projects were actually supported in 18 countries during the 12 years that the project was in operation.

From its inception, the three target interventions of CCCD were supplemented by a number of support strategies. These

"From 1982 to 1993 the ACSI-CCCD Project directly supported a total of 13 country projects for variable periods."

"Although the CDC played the main role in implementing the ACSI-CCCD Project, other collaborating institutions, non-governmental agencies and individual contractors were involved in research collaborations at various times."

changed slightly in emphasis over the duration of the project, but were primarily focused on the following activities:

- Training,
- Health education and health promotion,
- Health information systems,
- Operational research, and
- Sustainability and cost recovery

The main implementing agency for the ACSI-CCCD Project was the U.S. Centers for Disease Control and Prevention (CDC), an agency within the U.S. Public Health Service. Within the CDC, the International Health Program Office (IHPO) was the office with primary responsibility for the CCCD Project. Substantive inputs were also provided by CDC's Division of Immunization and the Malaria Branch of the Division of Parasitic Diseases.

Although the CDC played the main role in implementing the ACSI-CCCD Project, other collaborating institutions, non-governmental agencies and individual contractors were involved in research collaborations at various times. For example, the US Bureau of the Census collaborated on specific demographic projects. HEALTHCOM (the Communications for Child Survival Project) provided social marketing and formative research support in Malawi, Lesotho, Nigeria and Zaire. Three other USAID-funded projects cooperated with CCCD in various countries. These were

- PRITECH (Technologies for Primary Health Care Project)
- REACH (Resources for Child Health Project), and
- PRICOR (Primary Care Operations Research Project).

The ACSI-CCCD Project also cooperated at various levels with a number of international agencies. Through a variety of arrangements, coordination and collaboration with other international development agencies and research bodies was supported in several countries. These institutions included the British Overseas Development Agency in The Gambia; French Fonds d'Aide et Cooperation in the Congo; The United Nations Children's Fund (UNICEF); The World Health Organization Office for Africa (WHO/AFRO); and the Organisation de Coordination et de Coopération pour la

Lutte Contre les Grandes Endémies (OCCGE), sited in Burkina Faso.

As part of the program of technical assistance provided by the ACSI-CCCD Project, epidemiologists were assigned, on a regional or national basis to 6 countries — Malawi, Zaire, Côte d'Ivoire, Burundi, Burkina Faso (OCCGE), and Nigeria. These epidemiologists, in conjunction with counterparts in ministries of health, were responsible for initiating much of the research undertaken in the ACSI-CCCD Project.

In general, the functioning of the ACSI-CCCD Project in bilateral countries was closely tied to an active process of collaboration with the Ministry of Health and its program managers in the ACSI-CCCD focus areas (EPI, diarrheal disease and malaria). This working relationship played a significant role in defining two important aspects of ACSI-CCCD research — ensuring policy relevance, and encouraging the implementation of research findings.

The two primary objectives of ACSI-CCCD research, as summarized in the 1985 annual report, were as follows:

1. To identify and solve operational problems limiting the achievement of CCCD targets and objectives.

2. To develop African capability to conduct operational research.

The studies described in this document attempt to demonstrate the extent to which the ACSI-CCCD Project was able to achieve those ends. There were two main mechanisms by which applied research was accomplished in the ACSI-CCCD Project —first, a formal review mechanism that solicited research proposals initiated by African investigators, and secondly, research initiated by project personnel or the CDC, usually in collaboration with ministry personnel.

During the course of reviewing the applied research undertaken by the ACSI-CCCD Project, a great deal was learned about the scope of these activities, as well as the role that these studies played in framing national policies and programs. Over 250 studies in 18 countries were reviewed for this effort, ranging from small community surveys to large-scale national projects extending over several years and involving thousands of subjects (for example, the Mangochi Malaria Research Project in Malawi).

"In general, the functioning of the ACSI-CCCD Project in bilateral countries was closely tied to an active process of collaboration with the Ministry of Health and its program managers in the ACSI-CCCD focus areas."

"Over 250 studies in 18 countries were reviewed for this effort, ranging from small community surveys to large- scale national projects extending over several years and involving thousands of subjects (for example, the Mangochi Malaria Research Project in Malawi)."

This document does not attempt to document all 250 of these studies in detail. However, the authors have chosen to include a broad range of research activities, spanning several disciplines, and have attempted to include most of the studies with major policy or program implications. One notable exception is the omission of the Mangochi Malaria Research Project, which is the subject of a separate monograph in this series (STEKETEE R, BREMAN J, CAMPBELL C: Malaria prevention in pregnancy: The effect of treatment and chemoprophylaxis on placental malaria infection — The Mangochi Malaria Research Project).

The studies included in this document have not simply been abstracted. The authors' treatment of this body of research has differed, in an number of respects, from the usual process of summing research studies for publication. We have sought to include, wherever possible, an account of the policy and program implications involved in many of these studies. We have included a number of studies with negative findings, and have also attempted to document study limitations and methodological concerns in some detail. Such actions represent an attempt to portray the applied research activity of the ACSI-CCCD Project in a "real-world" context - in the real world, not all good research gets adopted and not all policy is based on perfect data. This document tries to reflect that reality.

A Note on Content

This document is offered with a few caveats:

The definition of "research" that this document has adopted is an intentionally broad one. The decision to be inclusive rather than exclusive in defining research was in the interest of demonstrating that a continuum exists between different methods applied to problem solving in the public health field, whether they are called surveillance, research, or evaluation.

In any attempt to catalogue an activity as extensive as the ACSI-CCCD Project, there will inevitably be omissions and perhaps, some errors. Although the authors have attempted to verify details of all the studies included here, there are sometimes unavoidable discrepancies in these accounts. The studies that were reviewed cover 18 countries and span a period of 12 years. Many of the principals originally involved with the early project were no longer with the project at the time of this review. In many cases, findings were culled

from unpublished reports; these included trip reports, preliminary and final research reports, telex messages, and project summaries. Many of these documents were also used to verify the program impact of studies. Although these methods were generally adequate for the intended purpose, there were a few problems with this approach:

First, it was not always possible to identify all collaborators or investigators on every project. Whereas published research usually follows a clearly defined hierarchy of authorship, the reports used for this review were often very informal in attributing authorship or naming collaborating researchers. Similar ambiguity also occurred in attempting to attribute support to the ACSI-CCCD Project. Because many individuals and activities had multiple sources of support, it was often difficult to specifically ascribe support of individual research projects to the ACSI- CCCD Project. In many cases, "CCCD-supported" research also received support from other sources. This document is not an attempt to claim sole ownership.

Secondly, the authors sometimes noted small discrepancies in different reports of the same research project, often because of the elimination of one or two questionable cases, or because of alternative methods of calculating results. Wherever possible, the original data were reviewed and discrepancies rectified.

Finally, in enumerating the studies, it was necessary to consolidate numerous lists and documents detailing ACSI-CCCD research into a single document. The actual process of identifying specific activities as "research projects" often required that certain activities be redefined, because ACSI-CCCD personnel often differed in what they classified as a research project. In general, this assessment did not include routine outbreak investigations or routine surveillance activities as research. Multiple activities that related to a single problem or research question were generally consolidated as a single "project" for the purpose of this review, although they were often listed as multiple activities in project documents. Despite this, there are some projects listed that could justifiably be classified as multiple activities, and others for which one might argue the opposite. With a few exceptions, studies which were abandoned at an early stage have not been included.

The authors offer apologies for any omissions or discrepancies that may be noted in this document. Although every ef-

"In the real world, not all good research gets adopted, and not all policy is based on perfect data. This document tries to reflect that reality."

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fort has been made to verify the accuracy of these accounts, there are limitations to what can be achieved in a retrospective review of a 12-year project . It was decided at an early stage, that the benefits of including important unpublished studies would outweigh the limitations and imperfections of the process.

A Note on Abbreviations and Conventions

At its outset, the ACSI-CCCD Project was known simply as the CCCD Project (Combatting Childhood Communicable Diseases). The prefix Africa Child Survival Initiative was added in 1986 and the project became known as ACSI-CCCD (although it was often still commonly called "the CCCD Project"). Both terms may be used interchangeably in this document.

In some instances the document may also use terms which are not currently the preferred ones — for example traditional birth attendants or TBAs. In general, we have not tried to change or update the terminology used in specific studies.

The use of French headings and titles: If the original source document for a study was written in French, the French title has been retained as the heading for the summary. This has been done in the interest of preserving the reader's ability to refer to the original document. Journal publications in French are also listed with the original French title. All short titles for studies are listed in English.

The use of trade names or commercial sources in this document is for identification only and does not constitute endorsement by the Public Health Service, the U.S. Department of Health and Human Services or the U.S. Agency for International Development.

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STEKETEE R, BREMAN J, CAMPBELL K et al.: Malaria prevention in pregnancy: the effect of treatment and chemoprophylaxis on placental malaria infection — low birth weight and fetal/infant/child survival. The Mangochi Malaria Research Project. ARTS document 099-4048.

WILSON RP,NXUMALO M, MAGONGA B ET AL.: Diagnosis and management of acute respiratory infections by Swazi child caretakers, healers, and health providers. ARTS document 099-4064.

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Errata

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PUBLICATIONS: DEMING MS, BISOFFI Z, WEIERBACH R et al: Tetanus antitoxin seroprevalence and measures of tetanus toxoid coverage in women at term in Burundi. Bull World Health Organ. In Press.

pg. 55

"Although CCCD research sometimes found evidence of harmful traditional practices, the harmful misuse of Western medicine appeared to be far more prevalent than harm engendered by traditional practices. In addition, many of the **usual concerns about** maternal practices during diarrhea (such as ceasing breastfeeding and withholding food) were not widely prevalent in the studies carried out under CCCD."
Should be replaced by:
"Although CCCD research sometimes found evidence of harmful traditional practices, the harmful misuse of Western medicine appeared to be far more prevalent than harm engendered by traditional practices. In addition, many of the **oft-cited, harmful** maternal practices during diarrhea (such as ceasing breastfeeding and withholding food) were not widely prevalent in the studies carried out under CCCD."

Pg. 84

PUBLICATIONS: Manuscript in preparation

Pg. 98

Addendum to NOTE: One deliberate omission from this section is the series of malaria studies by the Mangochi Malaria Research Project (MMRP). These studies are summarized in a separate document - STEKETEE R, BREMAN J, CAMPBELL C: Malaria prevention in pregnancy: The effect of treatment and chemoprophylaxis on placental malaria infection: The Mangochi Malaria Research Project (ARTS Document #099-4048)

Pg. 200

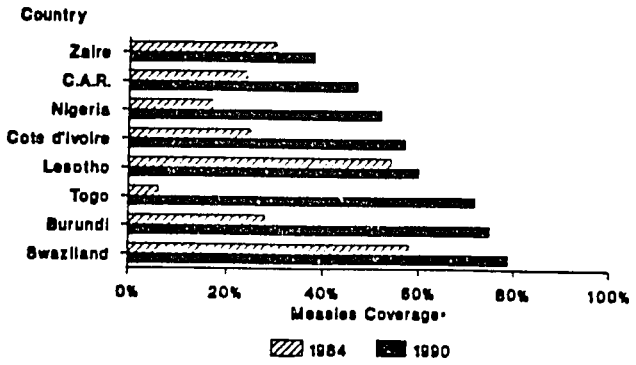
PUBLICATIONS: "Bull World Health Organ (1987)"
Should read:
"Bull World Health Organ 65:325-30 (1987)"

Research in Support of the Expanded Program of Immunization

Until recently, the success of immunization programs has often been almost synonymous with "coverage", at least in the minds and priorities of program managers and donors. With some justification, therefore, the main objective of African EPI programs has been to raise national coverage levels for immunization. Throughout the ACSI-CCCD project, this remained a strong priority, and much of the immunization-related activity in CCCD was in support of this objective — service delivery, training, cold-chain management, and technical support. Also in support of the objective of increasing coverage, a substantial investment was made in infrastructure support for the EPI —vehicles, cold-chain equipment, and (during the early years) vaccines. In many of these efforts, the ACSI-CCCD project cooperated with multilateral agencies such as UNICEF and with non-governmental organizations such as Rotary International.

The success of these efforts was considerable. Over the course of the 12 years that the ACSI-CCCD project operated in sub-Saharan Africa, momentous strides were made in increasing access to immunization services (usually defined as access to DPT-1) as well as in increasing the number of chil-

Measles Vaccine Coverage
8 African Countries, 1984 and 1990



* Measles vaccinations administered to children <1 yr divided by estimated number of surviving newborns

"Although the magnitude of the gains varied from country to country, there were proven gains in virtually every country. The role of CCCD applied research in support of this objective was substantial."

"At its most successful, CCCD research in support of EPI offered a vivid example . . . of 'the use of scientific methods to analyze health situations, identify problems and solve them,' providing for 'science-based, knowledge-based decision making at all levels.'"

dren "fully immunized" (usually defined as receipt of a full course of DPT, OPV and measles vaccination by one year of age).

Although the magnitude of the gains varied from country to country, there were proven gains in virtually every country. The role of CCCD applied research in support of this objective was substantial — for example, KAP studies to determine reasons for dropouts, interventions to reduce missed opportunities, and epidemiologic studies to identify pockets of low coverage or high disease prevalence. However, EPI-related research was not only directed at increasing coverage. Research was also initiated in response to a number of additional questions of local or global importance. In some cases (such as the large-scale trial of Edmonston- Zagreb vaccine in Kinshasa), the questions were critical to both local and global priorities.

At its most successful, (for example, in Burundi) CCCD research in support of EPI offers a vivid example of objectives which closely parallel what others have described as the objectives of Essential National Health Research — "the use of scientific methods to analyze health situations, identify problems and solve them," providing for "science-based, knowledge-based decision making at all levels of health services (LUCAS, 1993)."

On the other hand, there was also the negative experience of Liberia, where transient gains in improving immunization coverage and child survival were negated by the outbreak of civil war. ACSI-CCCD activities were finally abandoned there in 1990.

The scope of immunization-related research activities undertaken by the ACSI-CCCD project has covered a broad range of epidemiologic studies, health problem research, intervention research, and health services research. In sophistication they have ranged from small-scale KAP studies in a single Local Government Area (see ADIGUN) to evaluating the impact of a new vaccination policy among the 3 million inhabitants of Kinshasa (see CUTTS). Studies undertaken included:

Facility-based descriptive studies: These were either prospective or retrospective studies based in hospitals or community facilities (see NTAREME), and helped to provide a broad picture of disease epidemiology. Most were undertaken as discrete studies during the initiation of CCCD activities in various countries, and were generally superseded by

regular surveillance as health information systems were progressively strengthened.

Community-based surveys: These covered a wide range, from epidemiologic studies to establish the incidence rates of polio and neonatal tetanus (see MUTIE and BANANIYI), to multipurpose coverage surveys (see DABIS et al. in the section on Community Surveys). One innovation widely used was the inclusion of additional child survival questions in traditional EPI coverage surveys. Although frowned upon by some EPI purists (who feared that it might compromise the core EPI survey), this method was used extensively in CCCD to establish baselines and monitor health status indices throughout the project.

The "Hundred Household Survey": This method of local area monitoring was one adaptation of the community-based survey which looked only at the community immediately surrounding a local health center. In examining the immunization status and health care behavior of a population which had no barriers of distance, these surveys were able to identify non-access barriers to utilization of immunization services (e.g., stock ruptures, staff attitudes, cost). By using local health workers to conduct the simple survey (which generally took two workers just two days to complete), they also served to sensitize local health workers in a way that was far more convincing than a memorandum or a supervisory visit.

Seroprevalence surveys: These included studies of the decline of maternal measles antibodies in newborns (see REY and DABIS), and tetanus antitoxin seropositivity among women who had recently delivered (see DEMING). Combined with intervention trials, they included studies of seroconversion following immunization with alternative vaccines (see CUTTS), and seroconversion in ill children following measles immunization (see NDIKUYEZE). In some instances, these studies depended heavily on the laboratory support available at the CDC, Atlanta; in other instances they were able to use local resources.

Outbreak investigations: These studies, the traditional domain of epidemiologists, and one of the particular strengths of the CDC were initiated in response to a number of emerging issues and emergencies. These included polio in The Gambia, measles in Burundi and Pointe Noire, Congo, and yellow fever in Nigeria.

"In examining the immunization status and health care behavior of a population which had no barriers of distance, the hundred-household surveys were able to identify non-access barriers to utilization of immunization services. . . ."

"Studies of missed opportunities and inappropriately timed immunizations . . . were strongly linked to operational priorities, and virtually all were initiated in response to lagging progress in attaining full coverage."

Missed opportunities and inappropriately timed immunizations: These studies were classic examples of true "operational research." They were strongly linked to operational priorities, and virtually all were initiated in response to lagging progress in attaining full coverage. Facility based studies (see NDIHOKUBWAYO) and focus groups (see MACAULEY) helped to identify reasons for dropouts and missed opportunities (e.g., stock ruptures, and false contraindications), whereas community based studies (see KAHN) attempted to establish the actual community prevalence of missed opportunities and the potential gains of avoiding them.

Evaluation of vaccination campaigns: A number of these studies were done to assess the impact of vaccination campaigns either locally or nationally. Quantitative studies were able to assess the actual gains made and the potential for sustaining those gains (see SWISS and ROISIN). Qualitative evaluations were able to identify a number of shortcomings attributable to campaigns (e.g., improper sterilization practices, inappropriately timed immunizations, and decreased patient education). In individual cases, these either prompted EPI programs to decrease their emphasis on campaigns (e.g., Cote d'Ivoire) or to modify their campaign strategies (e.g., Nigeria and Liberia).

Economic analysis: In a number of countries, studies of various methods of auto-financing were undertaken by cooperating agencies, such as the Resources for Child Health (REACH) project. In addition, the ACSI-CCCD project itself supported a number of studies of the costs or cost- effectiveness of EPI programs (see BENNETT, ROBERTSON and McFARLAND in the section on Health Services Research). Several of these studies were able to demonstrate the costs of EPI relative to the number of cases of disease avoided or deaths prevented. Other studies highlighted the total program costs of EPI and the role of donor inputs, raising concerns about the heavy dependence of many programs on external donors and the need for more sustainable financing.

Facility-based assessment of training needs and impact: These studies (see separate section on Facility Based Assessments) were an integral part of the program of problem-based research initiated under CCCD and one of the activities most consistently valued by program managers. Implemented as cross-sectional studies of health worker practices either nationally or locally, these studies helped managers identify specific deficiencies in health worker prac-

tices (e.g,. improper sterilization practices or patient education), as well as logistical problems impeding the attainment of objectives (e.g., vaccine supply rupture). Implemented as a monitoring tool, they could be used to assess the effect of training on practices (e.g., Nigeria and Côte d'Ivoire). Used in abbreviated form as a supervisory instrument (e.g., in the Central African Republic) they enabled supervisors to take a more directed and quantitative approach to supervision and evaluation of health centers and health workers.

Another feature of equal interest is the mechanism by which many of the priorities for EPI-research were determined. Because CCCD involvement in EPI-related research has been primarily goal oriented, the importance and sophistication of research has progressively increased over the life of the CCCD project as more countries were able to establish basic infrastructure and training needs. One of the first tasks undertaken as part of a collaboration between the International Health Program Office (IHPO) and the CDC's Division of Immunization (DOI) in 1987 was to identify EPI-related operational research priorities within the CCCD project.

A list of 17 projects was compiled from preliminary discussions with colleagues working in the CCCD Project. The importance and design of each project were briefly described. The list was then distributed for review to colleagues with expertise in the EPI. Reviewers were asked to rate each proposal on a priority scale from 1 to 10, comment on the proposals, and suggest any high-priority proposals that were not on the list. Forty-one reviewers returned the list of proposed projects with ratings and comments. Twenty-two of these reviewers were on the CDC staff or worked for the CCCD Project. The remaining 19 worked for African ministries of health, World Health Organization, or universities.

By polling these experts, the EPI research program established a ranked priority list of 17 research questions, of which 6 were identified as specific priorities:

1. Identification and evaluation of the reasons for non- utilization and under-utilization of vaccination services and the demonstration of a strategy for increasing utilization (score of 8.1 out of a possible 10 points).

2. A study of the impact of using all health center contacts as opportunities to vaccinate children. (7.7)

"Used as a supervisory instrument, facility-based assessments enabled supervisors to take a more directed and quantitative approach to supervision and evaluation of health centers and health workers."

"The choice of six priority topics . . were all strongly linked to program objectives, and all had potential for immediate application. . . ."

3. Evaluation of the impact of a two-dose measles vaccine schedule. (7.5)

4. Measuring the impact of vaccination on the incidence of measles. (7.4)

5. Identification and evaluation of a strategy for vaccinating women of childbearing age with tetanus toxoid. (7.3)

6. A study of the impact of therapeutic vitamin A on case fatality rates of children hospitalized for measles. (7.1)

By comparison, the following were identified as the lowest priority research topics of those presented to the experts:

15. Assessment of the cost and effectiveness of using a vaccination strategy of special immunization days to raise coverage and reduce disease incidence. (5.3)

16. Comparison of the serologic efficacy of two and three doses of tetanus toxoid. (4.9)

17. Demonstration of the impact of giving measles vaccination at school entry. (4.7)

This method did not determine all the priorities for research under CCCD — in many instances individual country priorities warranted specific measures (for example high measles incidence in children younger than the recommended vaccination age). In other instances, changes in the status quo sometimes gave one topic increased importance or decreased the priority of another. For example, a deliberate decision was made in 1988 not to investigate the feasibility of a two-dose measles vaccine (the third rated priority) pending the outcome of E-Z vaccine trials. Following the 1992 reporting of adverse mortality with one formulation of E-Z vaccine (high-titre vaccine), the feasibility of a two- dose schedule has regained some of its importance.

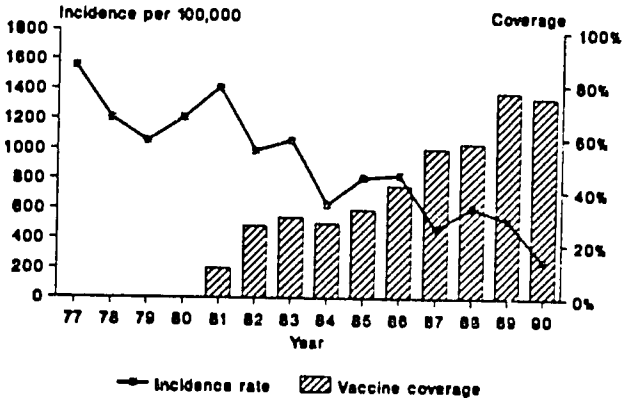
Although the above mechanism was not the only one used to establish research priorities for EPI, it did prove itself to be of considerable value. The distinct advantage that this method offered is readily seen in the choice of the six priority topics — they are all strongly linked to immediate program objectives of EPI and all had potential for immediate application of their findings to individual programs. More-

over, as negotiated priorities, they were readily acceptable to program managers and programs.

A second point worth noting is that the list of priorities is defined in terms of clear research questions — in the original exercise each topic was accompanied by a one-page description detailing a proposed research approach and allowing an assessment of its feasibility as well as its importance. This is often not done in agenda setting, a shortcoming which often leads to a list of topics which are of acknowledged importance, but which may not be amenable to an immediate research solution.

Finally, there is the question of impact. Has there been any measureable effect of these interventions on the targets which the ACSI-CCCD project established at its outset? That question has been a recurrent one throughout the 12 years of the project's existence. Impressive gains in EPI coverage have been documented. However, impact objectives

Measles Incidence and Vaccine Coverage
Burundi, 1977 - 1990



such as decreases in mortality and morbidity have sometimes been more elusive to document. Fortunately, the strengthening of surveillance systems has allowed many countries supported by CCCD activities to convincingly demonstrate the gains achieved through immunization. Declining measles and polio incidence have been convincingly demonstrated in several countries; changes in the age distribution of measles have also occurred, consistent with the benefits of improved immunization coverage; declines in mortality due to neonatal tetanus have been similarly demonstrated. In other countries, research and surveillance have helped identify shortcomings in meeting these goals. In both instances, sur-

"A second point worth noting is that the list of priorities is defined in terms of clear research questions."

"This is often not done in agenda setting, a shortcoming which often leads to a list of topics which are of acknowledged importance, but which may not be amenable to an immediate research solution."

"The strengthening of surveillance systems has allowed many countries supported by CCCD activities to convincingly demonstrate the gains achieved through immunization."

veillance and research have been closely linked together to enable the progress of the EPI to be monitored, to identify evolving problems and obstacles, and to generate feasible solutions. These achievements have been, perhaps, the greatest strength of this component.

MEASLES CONTROL EFFORTS IN URBAN AFRICA COMPLICATED BY HIGH INCIDENCE OF MEASLES IN THE FIRST YEAR OF LIFE

STUDY LOCATION: ZAIRE

SHORT TITLE: **EPIDEMIOLOGY OF MEASLES, KINSHASA, 1980 - 1985**

PRINCIPAL INVESTIGATOR: TAYLOR, Dr. William R
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CO-INVESTIGATORS: Ruti-Kalisa, Ma-Disu M, Weinman JM

STUDY DESIGN

Multiple methods were used to define the epidemiology of measles in Kinshasa: (1) Vaccine coverage by routine administrative reporting and annual vaccine coverage surveys; (2) sentinel surveillance at 4 of 5 major hospitals and 10 of the largest health centers; (3) review of pediatric registers at Mama Yemo Hospital (HMY) for secular trends; (4) a community cluster survey in December 1983 of all children under 5 years of age; and (5) estimation of projected numbers of measles cases in the absence of vaccination by the method of FINE and CLARKSON (1982).

"Coverage varied greatly throughout Kinshasa, and ranged from 16% to 73% in various clusters."

"The sentinel system reported approximately 9.7% of estimated cases."

RESULTS

- Vaccine coverage among children 12 to 23 months of age increased from 37% in 1977 to 62% in 1983, but remained roughly static from 1983 to 1986.
- Coverage varied greatly throughout Kinshasa, and ranged from 16% to 73% in various clusters.
- Measles epidemics occurred in alternating years from 1980 to 1985 despite coverage levels.
- Of the reported measles cases, 27% occurred in children before the recommended age of immunization (9 months).
- From the community survey, 18% of cases occurred in children under 9 months of age.
- Of children hospitalized with measles at HMY, the proportion who were younger than 12 months of age and older than 23 months both increased from 1976 to 1983. Rates of hospitalization varied according to zone of residence.
- Authors estimated that 175,200 measles cases occurred in Kinshasa in 1983 and 1984 (87,600 per year) and 111,700 additional cases would have occurred in the absence of any vaccination. The sentinel system reported approximately 9.7% of estimated cases.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Two results expected from herd immunity — a reduction in measles incidence greater than the coverage level, and a shift in the age distribution to older children — did not occur.

2. Factors which may counter the protective effect of high coverage include measles cases in children younger than 9 months of age, nonuniform vaccination coverage, and urban crowding and social patterns.

3. Measles control in Kinshasa will require coverage higher than 60%.

STUDY LIMITATIONS

None cited.

PROGRAM AND POLICY IMPACT

The problems identified by this study played an important role in the comprehensive strategy for measles control developed by the EPI program in Kinshasa. This included a policy of vaccination at all contacts, identification and targeting of low coverage zones, and (starting in 1989) universal vaccination of 6-month old infants with medium-titre Edmonston-Zagreb measles vaccine (4.45 log10 infectious units per dose). Documented measles coverage was increased to 68% by 1990 (89% based on verbal history), and measles incidence decreased from 37.5 cases per in 1980 to 1.6 in 1991.

A major role in formulating this policy was played by a consultative group of leading pediatricians and donor representatives, meeting in Kinshasa in December 1988. Intensified training and supervision activities were aided by the reassignment of a number of Ministry staff to the activity, as well as the provision of a vehicle full time to the project.

PUBLICATIONS

TAYLOR WR, RUTI-KALISA, MA-DISU M, WEINMAN JM: Measles control efforts in urban Africa complicated by high incidence of measles in the first year of life. Am J Epidemiol 127:788- 94 (1988)

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RELATED STUDIES

CUTTS FT, OTHEPA O, VERNON AA et al.: The impact on measles morbidity and mortality of administering medium-titre E-Z vaccine at 6 months of age and measures to increase vaccine coverage. Manuscript in preparation.

This study documented the serological response to medium- titre E-Z vaccine in children immunized at 6 months of age, as well as the population trends in measles incidence after the introduction of the policy of uniform immunization with E-Z vaccine at 6 months of age in Kinshasa, Zaire. Absolute rates decreased in all age groups, but the proportion of measles in older age groups (over 23 months of age) increased from 28% in 1986-87 to 42% in 1990-91 (with a corresponding decrease in the proportion of cases below 9 months of age). It was not possible to directly attribute the decreased measles rate to the use of E-Z vaccine because other program changes were made concurrently to improve the EPI program.

DABIS F, SOW A, WALDMAN RJ et al.: The epidemiology of measles in a partially vaccinated population in an African city: implications for immunization programs. Am J Epidemiol 127:171-8 (1988)

Multiple methods (including surveillance reports, clinic and hospital record reviews and a community survey) were used to identify the epidemiology of measles in Pointe-Noire, Congo, following a 1984-85 measles outbreak. This outbreak occurred despite estimated coverage of 54%. Between October 1984 and March 1985, 1,942 measles cases were reported, of which 16% died. Vaccine efficacy was calculated to be between 78% and 87%. There was a 49% decrease in the attack rate for children 9 to 23 months of age between 1983 and 1985, and a 20% increase in children of age five years or older. Among children less than 9 months of age the proportion of cases increased from 13% to 17%. The highest incidence rate of measles was in children 12 to 23 months of age. The study concludes that coverage levels of 50% are inadequate to ensure acceptable measles control in this setting.

ASPECTS EPIDEMIOLOGIQUES, CLINIQUES ET EVOLUTIFS DE LA ROUGEOLE EN MILIEU HOSPITALIER ET COMMUNAUTAIRE DE BUJUMBURA

STUDY LOCATION: BURUNDI

SHORT TITLE: **EPIDEMIOLOGY OF MEASLES, BUJUMBURA.**

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Burundi

CO-INVESTIGATORS: Gakima P, Marimbu J, Kanziza R, Ndikuyeze A, Gayle H

STUDY DESIGN

This study involved the descriptive epidemiology of 154 hospitalized cases of measles at the Prince Regent Charles Hospital in Bujumbura, Burundi. A simple univariate comparison was performed, with controls (matched for age and sex) selected from the "consultation des nourissons". A clinical case-definition was used, with at least three of the following signs present for diagnosis of measles: fever confirmed by a physician, rhinitis, conjunctivitis, and stomatitis (with or without Koplik spots), rash or desquamation, and laryngitis. One year longitudinal follow-up of survivors (cases and controls) was carried out after discharge from hospital (this was done by means of monthly home visits).

RESULTS

A total of 154 cases were selected from 526 hospitalized children with measles over a 17-month period; there were 116 controls which were not strictly matched for age and sex. Mean age was 14.7 months (cases) and 13.2 months (controls).

- Sex distribution was 57% male, 43% female for children with measles and 58% male and 42% female for children without measles.
- Distribution of measles cases by age group was as follows:

3-8 months	23%
9-11 months	25%
Over 12 months	52%

- The average period between onset of symptoms and hospitalization was 6.7 days for children with measles.
- Of children admitted with measles, 55% were malnourished on admission, compared with 15.5% of children without measles.
- A history of prior measles vaccination was given by 4% of children with measles, compared with 38% of children without measles; 83% of vaccinated cases and 91% of vaccinated controls were vaccinated between 9 and 11 months.

"Ninety-two percent of all measles-related mortality occurred in-hospital or within the first month after discharge."

- Complications arising during hospitalization were dehydration (25%), laryngitis (15%), pneumonia (12%), and malnutrition (8%).

- The in-hospital case fatality rate for measles was 38%.

- Of the 154 children admitted with measles, there were 59 hospital deaths, and 95 discharged alive. Of these, there were 17 deaths (18%), 28 survivors, and 50 (52%) lost to follow-up.

- Of the 116 children without measles, there were no hospital deaths, and 116 discharged alive. Of these, there were 5 deaths (4%), 72 survivors, and 39 (34%) lost to follow-up.

- Morbidity for cases and controls over the 12-month follow- up period was not systematically evaluated.

- Ninety-two percent of all measles-related mortality occurred in-hospital or within the first month after discharge. The relative risk for mortality in the first month after discharge was 16.2 times higher in cases than in controls.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Significant measles incidence below the age of 12 months supports the policy of vaccination at 9 months.

2. The 35% of hospital cases occurring in infants younger than 9 months (if confirmed) suggests a significant at-risk population not covered by current immunization practices.

3. Nutritional status is an important risk factor for measles requiring hospitalization.

4. High risk of mortality persists after discharge (at least during the first month), in hospitalized children with measles.

STUDY LIMITATIONS

The major limitation for the longitudinal study was the loss to follow-up of 52% of cases and 34% of controls. This precludes conclusive statements about this phase of the study, vis-a-vis morbidity or mortality. Additional limitations were:

- Matched controls were not possible for all cases. The analysis, therefore, does not consider methods for matched controls. Controls and cases are not strictly comparable in age (14.7 months vs. 13.2 months), and differences in socioeconomic status between cases and controls could not be excluded.

- This hospital-based study is probably not representative of community incidence, rates, or natural history with regard to measles. Biases of service access and utilization may exist.

PROGRAM AND POLICY IMPACT

This study formed part of a continuing process of policy and program development in EPI in Burundi. During the period that the ACSI-CCCD project operated in Burundi, measles control was one of the ongoing issues in EPI. The evolution of EPI-related research demonstrates this. In the context of improving overall immunization coverage a number of coverage surveys were carried out. Concerns about dropout rates and missed opportunities prompted a UNICEF and CCCD-supported study of missed opportunities (see report by NDIHOKUBWAYO). Anxiety about the persistence of epidemic measles in the presence of apparently high coverage provoked a study of the epidemiology of measles in the outbreak community, and an evaluation of vaccine efficacy (see report by CHEN).

Concurrent to these activities, efforts were made to strengthen routine disease reporting — the government's epidemiology and statistical unit (EPISTAT) developed a simplified reporting form, improved data handling capabilities, and initiated production of a regular epidemiologic bulletin (Bulletin Epidemiologique du Burundi or "BEB"), of which approximately 3,000 copies are distributed nationally. The evolution of these research efforts and the increasingly sophisticated approach demonstrated in response to measles as a priority health problem also provide a good example of how appropriate applied research can work in support of country programs.

PUBLICATIONS

None documented.

TRANSMISSION DES ANTICORPS MATERNELS ANTIROUGEOLEUX AU NOUVEAU-NE IVORIEN

STUDY LOCATION: COTE D'IVOIRE

SHORT TITLE: **NEONATAL TRANSMISSION OF MEASLES ANTIBODIES, ADZOPE**

PRINCIPAL INVESTIGATOR: REY, Dr. J.L.
Medecin en Chef, Epidemiologiste
I.N.S.P., BP V47
Abidjan, Côte d'Ivoire

CO-INVESTIGATORS: Lhuillier M, Dem M, Soro B, Saki Z, Davis CE

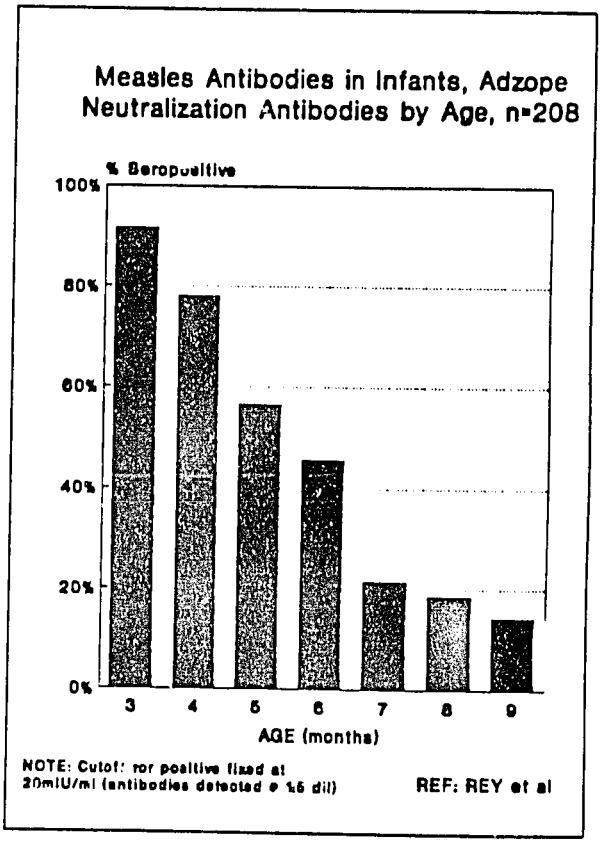
STUDY DESIGN

This study used measles serology by Hemagglutination Inhibition (HAI), and neutralization antibodies by simplified plaque assay (MANN & ZUCKERMAN, 1980). Study subjects were infants, 3 to 9 months of age from the ***Centre de Protection Maternelle et Infantile*** *(CPMI) de Adzope (n = 208) and the CPMI, Marcory (n = 36). Subjects were excluded if they gave a history of measles or vaccination. The cutoff for positivity was established at 20 mIU/ml (presence of antibodies at 1:5 dilution).*

RESULTS

- The study of antibodies by HAI showed a higher prevalence of maternal antibodies for infants 4 months of age in Abidjan than in Adzope. Hemagglutination Inhibition was less sensitive than serum neutralization in detecting measles antibodies.

- A regular rate of antibody decline was noted up to the age of 6 months, after which levels stabilized between 40 and 20 mIU/mL. From the regression equation it was estimated that 60% of infants would have no maternal antibodies by 6 months of age.



- In comparison with the findings of MANN and ZUCKERMAN in Brazzaville, the geometric mean titre of antibody was lower in Adzope at all ages. However, the onset of seronegativity occurred at a later age in Adzope, largely because of a lower cutoff for seropositivity in Adzope (20 mIU/mL vs. 40 mIU/mL in Brazzaville).

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. The study confirms the usefulness of the simplified plaque assay method of MANN & ZUCKERMAN. The method offers greater sensitivity than HAI in detecting measles antibodies.

2. Although the findings are supportive of the practice of measles immunization at 9 months (because there is very little maternal antibody persistence at this age), the absence of antibodies in 60% of infants at 6 months of age leaves a large number of infants susceptible to infection.

3. The findings support consideration of an earlier recommended immunization age with alternative immunization strategies (e.g. E-Z vaccine at 6 months).

4. An alternative strategy to immunization at 6 months with an increased potency vaccine was a 2-dose schedule using a second dose at 1 year, following an initial dose (of the current vaccine) at 6 months of age.

STUDY LIMITATIONS

None were identified. However, because the study was based in a peri- urban and urban facility, there is always a possibility that patterns might differ in a rural setting. This is not unrealistic, since rates of maternal antibody decline have been found to vary in different populations (BLACK, 1986).

PROGRAM AND POLICY IMPACT

The WHO-recommended age for measles immunization at the time of this study was 9 months. The authors note that this study was initiated in response to the concerns of some physicians that the recommended age of immunization was "too late to immunize against measles" because a significant number of measles cases were seen before the age of 9 months. The study findings do support those anecdotal reports since there was significant loss of maternal antibodies at 6 months of age, a finding consistent with the early onset of clinical measles in a population.

It is significant that the 9-month minimum age for measles immunization became uniform national policy only in July 1980. Prior to that date, immunization at 6 to 8 months of age was both policy and practice (SOKAL & ATAYI 1981). Under this strategy, a second dose was supposed to be given at a later age (usually 12 months), but was frequently omitted. Because the protection conferred by vaccination with regular Schwarz vaccine at 6 months was generally poor, this strategy left many children unprotected.

Among the reasons for the 1980 change in policy was the finding that few infants vaccinated before 9 months received a recommended second dose before or at 12 months (35% in one study in Abidjan). A 1990 WHO review revealed similar findings in other countries (MARKOWITZ 1990).

It should be noted that these two sets of results present decision-makers with opposing and somewhat contradictory alternatives. In actuality, WHO recommendations do allow for vaccination before 9 months of age (with revaccination at 9 months) when significant levels of measles cases occur before the age of 9 months. However this recommendation is tempered with the knowledge that where overall coverage is already low, the likelihood of achieving high compliance with the 2-dose measles schedule is low (as demonstrated by the previous survey in Abidjan). Thus the WHO recommendation that "achieving high coverage with existing vaccines remains the first priority in all countries" (EPI/WHO, 1988). For a single-dose strategy, the "optimal" age of 9 months for Schwarz vaccine was based on seroconversion studies and age- specific incidence data — balancing the vaccine's lower efficacy at younger ages with the risk of acquiring measles at various ages. These models predicted 9 months as the age at which the maximal number of cases would be prevented (MARKOWITZ 1990).

The two-dose strategy has not been readopted in Côte d'Ivoire. The alternative proposed strategy of using a higher potency vaccine at 6 months was also set back following reports of adverse mortality in three clinical trials of Edmonston-Zagreb high-titre vaccine and its subsequent withdrawal from production and public use (EPI/WHO 1992). Medium titre E-Z vaccine has not been affected by these recommendations.

PUBLICATIONS

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MARKOWITZ L: Measles control in the 1990s: Immunization before 9 months of age. Geneva, WHO. WHO/EPI/GEN/90.3.

MSPP: Rapport d'Une Evaluation du Programme Elargi de Vaccination, Côte d'Ivoire Oct-Nov 1981.

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DABIS F, WALDMAN RJ, MANN GF et al.: Loss of maternal measles antibody during infancy in an African city. Int J Epidemiol 18:264-8 (1989).

Measles antibody in infants 2 to 9 months of age (in Pointe Noire, Congo) was measured from capillary blood with the plaque inhibition test, using a titre of 40 mIU/ml as the threshold level. Among 252 infants studied at eight MCH clinics in 1986, the proportion with detectable antibody dropped from 96% at 2 months of age to 49% at 4 months and 8% in the 7-8 month age group. Between the ages of 8 and 28 weeks there was an almost steady decline of 4.7% per week in the proportion of infants who were seropositive. By the end of the seventh month only 10% of infants would be expected to have measurable antibodies against measles.

IMMUNOGENICITY AND SAFETY OF MEASLES VACCINE IN ILL AFRICAN CHILDREN

STUDY LOCATION: RWANDA

SHORT TITLE: **MEASLES VACCINE IN ILL CHILDREN**

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CO-INVESTIGATORS: Munoz A, Stewart J, Modlin J, Heymann D, Polk BF

STUDY DESIGN

*This was a prospective study at two health centers – **Rango**, and **University Center at Butare**. A total of 518 children aged 8 to 19 months were enrolled — 267 ill children and 251 well controls. An "ill child" was defined as having fever, diarrhea or vomiting. Clinical diagnosis of complicating conditions (e.g., pharyngitis, otitis, malaria) was confirmed by "simple laboratory tests". Nutritional status was determined based on clinical judgement and weight for age, and compared to Gomez classification. All children received measles immunization following mother's informed consent. Blood samples for measles serology were taken prior to immunization (1st visit) and on day 40. Serology was by **enzyme immunosorbent assay (EIA)** on finger-stick samples, stored at -30 degC and analyzed by CDC/Atlanta. Over 100 samples were tested by both EIA and **hemagglutination inhibition (HAI)** as a quality check. Vaccine potency was verified at the start and end of study. Routine clinical follow-up of ill and well children was done at day 10 and day 40. Analysis was by t-test, Chi-square, and multiple logistic regression.*

RESULTS

Of 518 children surveyed, one died at 30 days. Only 5 children (1%) were lost to follow-up. Of the 512 remaining children paired sera samples were available for 505 children.

Of these, 423 were seronegative at the time of immunization and did not have equivocal results at baseline or follow-up.

- Ill children and control group differed significantly in percentage of females (58% in ill vs. 39% in well children, $p<0.001$), and weight by age (reflecting the high rates of malnutrition in ill group).
- **There was no significant difference between ill and well children in incidence of adverse reactions.** Reactions reported were rash, fever, and Koplik spots. A "few" mothers reported transient diarrhea or cough. In total, 15% of the 518 children had minor reactions.
- For the **208 ill children and 215 well children with unequivocal responses, there was no significant difference in seroconversion rates** (81% in ill children vs. 80% in well children).

"There was no significant difference between ill and well children in incidence of adverse reactions."

- There was no significant difference between mean antibody titres for ill children and well children.

- **Seroconversion rates at age 8 months were significantly lower than conversion rates at older ages for both groups** ($p = 0.001$).

- There was no significant effect on seroconversion of any disease variable when measured by logistic regression (except for moderate malnutrition, which was of borderline significance). Malaria and other infections appeared to negatively influence outcome, but differences were not significant ($p = 0.13$). Numbers were small however.

- Power to detect an odds ratio of 2.0 for seroconversion of ill children versus well children was calculated at 86%.

STUDY CONCLUSIONS AND RECOMMENDATIONS

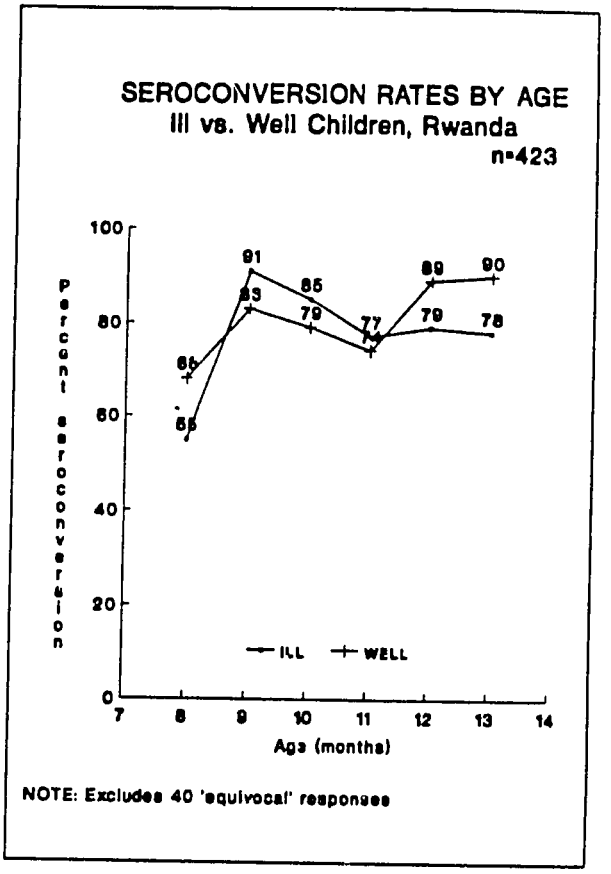
1. **Immunogenicity and safety of measles vaccine was comparable in both ill and well children.**

2. **There is a significant decrease in seroconversion if measles vaccine is given before 9 months of age.**

3. The study is supportive of WHO recommendations promoting the immunization of ill children as providing significant benefit without increased risk.

4. **For unclear reasons, overall seroconversion rates and age- specific rates were low compared to previous studies** (serologic responses of more than 90% above age 12 months).

5. Absence of maternal measles antibodies might account for absence of passive immunity in some infants and early "acquired" measles infection. Further study of serology in pregnant Rwandan women was recommended.



STUDY LIMITATIONS

- Forty subjects with "equivocal" antibody responses following immunization were excluded from analysis. However these were equally distributed between "ill" and "well" groups and would not have influenced group comparisons.

- Authors suggest that uncharacteristically low seroconversion rates might suggest technical problems in sample handling between collection in the field and analysis at CDC in Atlanta. Authors also noted that they had actually expected seroconversion rates to be higher than prior studies because of the greater sensitivity of the EIA method (compared to HAI).

- Recruitment of older children was limited because most had already been immunized against measles. Matched pairs analysis was also impractical because many matched controls enrolled had later to be excluded because of positive serology indicating prior exposure.

PROGRAM AND POLICY IMPACT

This study provided supportive evidence for existing WHO immunization policy. As noted in the study, at the time of this research it was not the policy in Rwanda to vaccinate ill children, and "fever and several illnesses" were contraindications to measles immunization. In response to this research and other initiatives, policies were changed to promote the immunization of all children, and to severely restrict the number of true contraindications to immunization.

Although these policies have been adopted widely in CCCD countries, the degree to which they have been implemented has varied. Facility based assessments have often revealed that actual practices at the facility level have generally been slower to change than have national policies.

PUBLICATIONS

NDIKUYEZE A, MUNOZ A, STEWART J et al.: Immunogenicity and safety of measles vaccine in ill African children. Intl J Epidemiol 17(2):448 (1988).

REPORT ON EPIDEMIOLOGIC FOLLOW-UP OF THE 1988-89 MEASLES OUTBREAK, MUYINGA HEALTH SECTOR, BURUNDI

STUDY LOCATION: BURUNDI

SHORT TITLE: **MEASLES OUTBREAK INVESTIGATION, BURUNDI**

PRINCIPAL INVESTIGATOR: CHEN, Dr. Robert T.
Division of Immunization
Centers for Disease Control and Prevention
Atlanta, GA 30333

CO-INVESTIGATORS: Weierbach R, Bisoffi Z, Cutts F, Rhodes P, Ramaroson S, Ntembagara C, Bizimana F

STUDY DESIGN

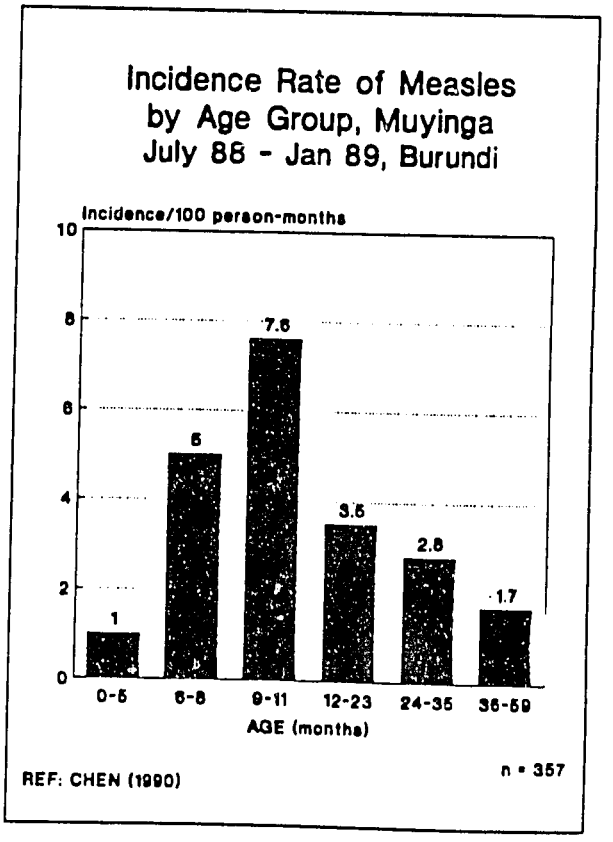
This study was carried out in January 1989 to investigate the circumstances surrounding a 1988 rural outbreak of measles (in the Muyinga health sector of Burundi) in an apparently well-vaccinated population. The study included a review of existing surveillance data for Burundi and Muyinga, a census of children younger than 5 years of age in Muyinga to evaluate vaccine efficacy and short-term mortality (one month after the epidemic peak), a case-control study in health centers to assess nosocomial transmission, and a study of school-aged children to assess the role of school-based transmission. In September 1989, a repeat census was conducted in Muyinga to evaluate longer-term mortality. Maternal diagnosis of measles was taken to indicate positive history of measles. Children without vaccination cards were considered to be unvaccinated.

RESULTS

Census study

Information was obtained on 1,899 children in the census, of whom 357 (19%) had measles during the outbreak, according to the history of mothers or caretakers.

- Measles incidence rate for the entire cohort, irrespective of vaccination status was highest for the age group 9-11 months (7.6 per 100 person-months at risk).
- Children younger than 9 months constituted 18% of cases, and children older than 23 months accounted for 44%.
- Surveillance data, available since 1985 showed that children 24 months and older constituted an increasing proportion of total measles cases, reaching 57% in 1988.



Mortality

- Fifty-five percent of measles deaths (12/22) occurred in the first month after illness.

- The rate ratio/relative risk of death in children with measles was 2.2 for all ages (relative to children without measles). The rate ratio was 3.6 in the age group 0-8 months, 2.9 at 9-23 months, and 2.0 at 24-59 months. The case fatality ratio for children identified by their caretakers as having had measles during the epidemic was 6.2%.

- By logistic regression, the excess mortality due to measles was confined to the first month after onset, and increased risk of death by 2.5 fold.

Immunization Coverage

- **Immunization coverage was generally high** - 86% in children 9-23 months, and 80% in children 25-59 months. **However, only 59% of those receiving measles vaccine received it at the target age of 9-11 months** — 15% were vaccinated at a younger age and 26% were vaccinated after 11 months of age.

- Measles vaccine efficacy was estimated at 73% in an analysis that controlled for potential bias by excluding children without vaccination cards, children not meeting the clinical case definition, and children younger than 9 months of age.

Health Centers and Schools

- A facility-based study of 75 cases and 211 controls failed to reveal any evidence of transmission mediated by attendance at health facilities. This was supported by census findings — only 1% of cases reported a health center visit in the month prior to illness.

- Among 299 students in the primary school visited, 28 (9%) were reported to have had measles; among these, 25 (89%) were the first case in their household; and in these households 31 subsequent cases occurred in younger siblings.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Study results were consistent with the pattern of a maturing EPI — a shift in the age-distribution of cases to older age groups, an increased inter-epidemic interval, and vaccine efficacy within expected limits.

2. The estimated vaccine efficacy of 73% was slightly lower than 85-93% observed in seroconversion studies, but was considered to be consistent because the study was unable to control for previous measles disease.

3. Nosocomial spread was not a likely means of transmission in this setting.

4. School-based transmission did appear to be a significant factor in this setting.

5. The authors recommended that the primary focus of immunization efforts should remain on the 9 to 11-month target age group. However, in view of significant excess mortality in older children, the study recommended "catch- up" immunization of older children, resources permitting.

6. The study recommended that future outbreak measures be limited to investigating possible program failures rather than outbreak control, which is generally ineffective.

STUDY LIMITATIONS

The authors note the probable underestimate of vaccine efficacy resulting from the inability to exclude persons with previous measles. Other limitations:

- Over half of children were unable to provide an exact month and year of birth.

"Immunization coverage was generally high . . . However, only 59% of those receiving measles vaccine received it at the target age of 9-11 months."

- Use of card confirmation of vaccination status to calculate coverage probably underestimates true vaccination coverage.

PROGRAM AND POLICY IMPACT

The study results were useful in reassuring the country's EPI program that the measles outbreak was not evidence of program failure. The national EPI program did institute a "catch-up" campaign for unvaccinated children in March and November 1989. In 1990 efforts were focused on more sustainable mobilization efforts using a "channeling strategy" in areas of low coverage (ACSI-CCCD Quarterly Report July-Sep 1990).

PUBLICATIONS

CHEN RT, WEIERBACH R, BISOFFI Z et al.: A "Post-Honeymoon Period" Measles Outbreak in Muyinga Sector, Burundi. Int J Epidemiol (in press).

BISOFFI Z, CHEN RT, WEIERBACH R et al.: A case-control study of nosocomial measles transmission, Muyinga Sector, Burundi. Manuscript in preparation.

MORTALITY FROM NEONATAL TETANUS IN KENYA: A COMPARISON OF TWO DIFFERENT SURVEY METHODS

STUDY LOCATION: KENYA

SHORT TITLE: **NEONATAL TETANUS MORTALITY, KENYA**

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CO-INVESTIGATORS: Melgaard B

STUDY DESIGN

Three districts were surveyed: Tana (S. Tana division), Meru (Igembe), and Kisii (Irianyi). Two alternate methods for evaluating mortality were used: (1) a two-stage cluster survey of each community, yielding 30 clusters randomly selected with probability proportionate to size; and (2) interviews of pregnant women attending antenatal clinics. The study included all live neonates delivered during the 12-month period ending one month prior to the survey; there were approximately 70 births per cluster (2,100 in each division). Interviews were conducted by one experienced interviewer, a local translator, and local guide — an assistant chief or elder. The survey used 12-month recall of births and deaths, except in the Tana region (24-month recall). The case definition of a neonatal tetanus death was determined by response to 7 clinical criteria (mother's self- report). The clinic survey involved a structured interview of patients at antenatal clinics; details were obtained of all live infant births and deaths over the preceding 5 years.

RESULTS

Cluster Survey

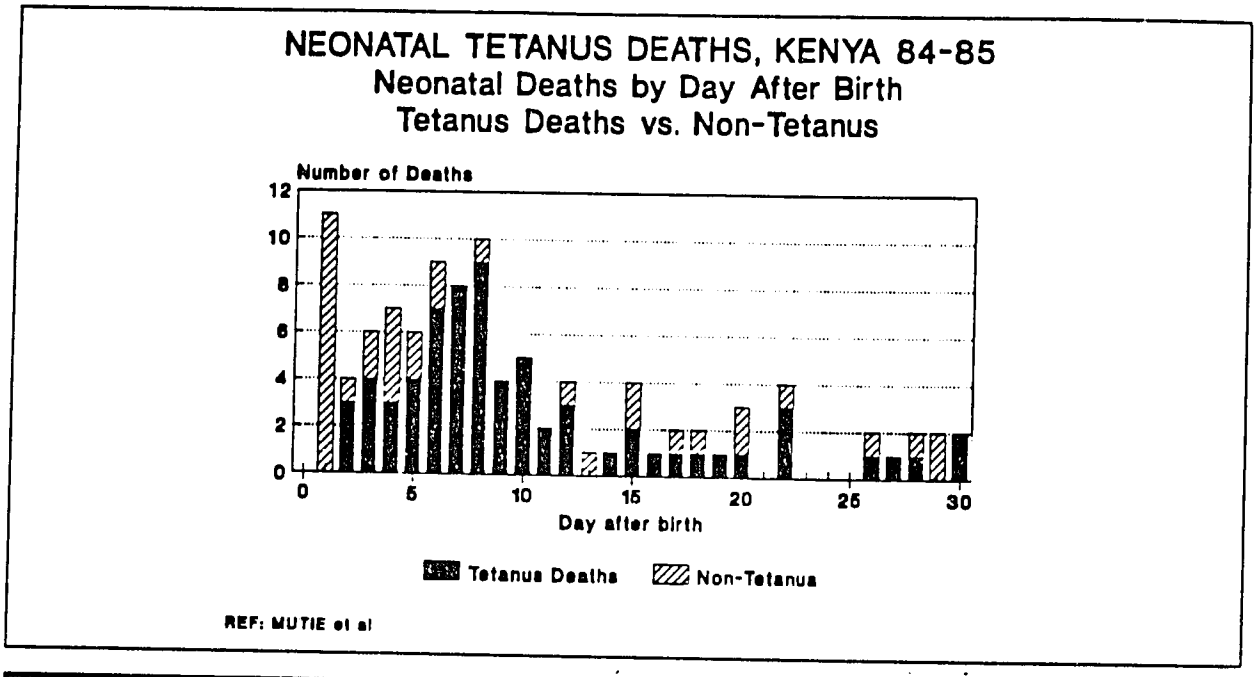
A total of 6,566 live births were enumerated.

- Neonatal mortality ranged from 10 to 23 per 1000 live births (13/1000 weighted average).
- Death rates from neonatal tetanus ranged from 6 to 15 per 1000 live births (8/1000 weighted average).
- The percentage of neonatal tetanus deaths born at home ranged from 81% (Tana) to 100% (Kisii). **The odds ratio of neonatal death for children born at home was 3.3 compared to institutional delivery.**
- The majority of neonatal tetanus deaths took place between days 6 and 12, whereas the majority of non tetanus deaths occurred on the first day of life.

Antenatal Clinic Survey

A total of 1,433 pregnant women were interviewed, accounting for 2,654 deliveries.

- The neonatal death rate obtained by the clinic survey ranged from 7 to 17 per 1000 live births. The death rate from neonatal tetanus by this method ranged from 0 to 5.6 per 1000 live births (weighted averages not given).
- **Estimated death rates were so low for the clinic survey that the method was regarded as unreliable and therefore abandoned.**



Neonatal Death Rates, All Causes Cluster Survey vs. Antenatal Clinic Interviews Deaths per 1000 Live Births: All Causes		
	Cluster Survey	ANC Survey
Igembe	16	12
S. Tana	23	17
Irianyi	10	7
Total (weighted)	13	n.a.

Neonatal Tetanus Death Rates Cluster Survey vs. Antenatal Clinic Interviews Deaths per 1000 Live Births: Neonatal Tetanus		
	Cluster Survey	ANC Survey
Igembe	11	0
S. Tana	15	6
Irianyi	6	1
Total (weighted)	8	n.a.

"Death rates estimated from ANC recall were consistently lower than community survey estimates."

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Death rates estimated from ANC recall interviews were consistently lower than community survey estimates, **and were considered an inadequate method for estimating neonatal deaths.**

2. Lower estimates may have resulted from the reticence of pregnant mothers to discuss previous unsuccessful outcomes, or from the ANC population being unrepresentative of the population in general.

3. Neonatal death rates and neonatal tetanus death rates were appreciably lower than reported rates from Côte d'Ivoire (34/1000 for neonatal deaths and 18/1000 for neonatal tetanus deaths) and Malawi (29/1000 for neonatal deaths and 12/1000 for neonatal tetanus deaths).

4. By comparing the study findings to a 1978 Kenya Fertility Survey, **it was estimated that 30-50% of neonatal deaths remain unreported.**

5. The discrepancy in rates between mothers using health services and those who do not cannot be resolved by the present study.

STUDY LIMITATIONS

- The authors note that the prenatal population was biased by the fact that women must pay for prenatal care.
- The case definition used for neonatal tetanus deaths differs in some respects from the WHO recommended criteria which excludes deaths (or onset of symptoms) occurring before the third day of life.
- Inadequate staffing generally limited clinic interviews, and at Tana River site proved a major obstacle (Only 480 interviews were done there).
- Training of interviewers was sometimes inadequate.
- The discrepancy between the two methods for overall rates of neonatal death (all causes) was not actually as divergent as claimed; the major discrepancy occurred in specifically attributing deaths to a particular cause — cause-specific mortality.

PROGRAM AND POLICY IMPACT

One obvious policy implication of the study was the decision to discard the possibility of using (less expensive) clinic interviews instead of community surveys for accurate mortality determinations. Other recommendations were somewhat self-evident: increased immunization of women of child bearing age and educating traditional birth attendants (TBAs) about hygienic practices.

PUBLICATIONS

MELGAARD B, MUTIE DM, KIMANI G: A cluster survey of mortality due to neonatal tetanus in Kenya. Int J Epidemiol 17:174-77 (1988)

MELGAARD B, KIMANI G, MUTIE DM: A community study of neonatal tetanus in Kenya. East Afr Med J 64:458-63 (1987)

MELGAARD B, KIMANI G, MUTIE D: Neonatal tetanus i Kenya. Ugeskr Laeger 148:1504-5 (1986)

COMBINED SURVEY FOR POLIOMYELITIS AND NEONATAL TETANUS IN ILORIN LGA, KWARA STATE, NIGERIA 1988.

STUDY LOCATION:	NIGERIA
SHORT TITLE:	INCIDENCE OF POLIO/ NEONATAL TETANUS, ILORIN
PRINCIPAL INVESTIGATOR:	BABANIYI, Dr. Olusegun Ministry of Health, PMB 1386, Ilorin Kwara State, Nigeria
CO-INVESTIGATOR:	Parakoyi B

STUDY DESIGN

This was a 40-cluster retrospective survey of deaths from neonatal tetanus (NT) and lameness from poliomyelitis, conducted in March and April 1988. Neonatal tetanus was defined by WHO criteria — (1) onset during the 3rd to 28th day of life; (2) normal sucking and crying during the first two days of life; (3) a history of inability to suck followed by stiffness and/or convulsions; and (4) death within the first month of life. Questionnaires also included questions to identify the place and manner of delivery, and the mother's immunization status. Polio was defined by flaccid paralysis, intact sensation and atrophy, in a syndrome of acute onset with no progression. Polio incidence was estimated from the observed rates of lower-limb paralysis by correcting for upper-limb paralysis, years at risk, age distribution, and mortality, using the method of **LAFORCE et al. (1980).** *The study was conducted in* ***Ilorin Local Government Area (LGA),*** *with an estimated 1988 population of 503,300.*

RESULTS

- The study identified 19 neonatal tetanus deaths among 1,601 live births, yielding a neonatal tetanus mortality of 11.9 per 1000 live births, and incidence of 14.9 per 1000 live births.
- Average age at onset was 7.5 days, and average age at death was 10.4 days.
- The effectiveness of maternal immunization in preventing neonatal tetanus was assessed by calculating the efficacy of two doses of tetanus toxoid compared to hospital delivery, or birth assisted by a trained traditional birth attendant (TBA). Calculated efficacy for antenatal tetanus toxoid coverage was 93%, compared with 88% for hospital delivery, and 47% for home delivery by a trained TBA.
- The prevalence of residual paralytic polio was 6.8 per 1000 children aged 5-9 years; corresponding to an annual incidence rate of 38.3 per 100,000 general population.

"Calculated efficacy for antenatal tetanus toxoid coverage was 93%, compared with 88% for hospital delivery and 47% for home delivery by a trained TBA."

- Almost 95% of paralytic polio cases had an onset before the age of 5 years.

- Approximately one-third of paralytic polio cases (32%) received injections within one month prior to the onset of paralysis.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Prevalence rates of paralytic polio are consistent with published reports for other sub-Saharan countries (0.7 - 13.2; median 5.6).

2. Annual incidence rate for paralytic polio was also consistent with the published range (28-53/100,000).

3. The mortality rate for Neonatal Tetanus (11.9) was consistent with reported rates for Sub-Saharan Africa (1-18/1000 live births; median 8).

4. **The high NNT rate occurred despite estimated 60% coverage for 2-dose antenatal tetanus toxoid during the period.**

5. Trained TBAs were less effective an intervention than was tetanus toxoid immunization in preventing neonatal tetanus.

6. Two doses of antenatal tetanus toxoid coverage provides imperfect protection against neonatal tetanus.

7. Based on the community rates, it was estimated that a minimum of 375 neonatal tetanus cases occurred in the Ilorin LGA for the 12-month period ending March 1988. During this period only 25 cases were seen at the University Hospital, accounting for **only 7% of estimated cases.**

8. The study concludes that NNT and polio still represent important causes of childhood mortality and morbidity in Ilorin, and it recommends extending tetanus toxoid immunization to **all women of childbearing age.**

STUDY LIMITATIONS

Authors note limitations in the assumption that paralytic polio is the only cause of cases of flaccid paralysis identified. Similar limitations exist in retrospective identification of NNT deaths using the specified definition.

PROGRAM AND POLICY IMPACT

The study provided support for extending tetanus toxoid coverage to all women of childbearing age, as well as evidence in favor of a 5-dose schedule for tetanus toxoid. The findings were also the basis of subsequent studies to further define trends in neonatal tetanus and poliomyelitis (see below), and to assess the effect of the EPI program on the incidence of EPI diseases.

PUBLICATIONS

BABANIYI O, PARAKOYI B: Mortality from neonatal tetanus in Ilorin: results of a community-based survey. J Trop Pediatr 35:137-8 (1989).

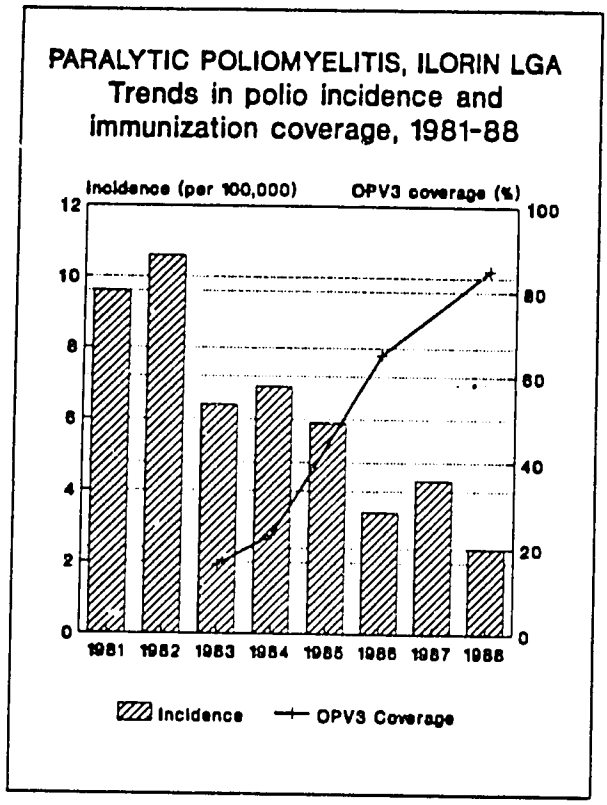
BABANIYI O, PARAKOYI B: Cluster survey for poliomyelitis and neonatal tetanus in Ilorin, Nigeria. Int J Epidemiol 20:515-520 (1991).

RELATED STUDIES

BABANIYI OA, YEYA-AGBA B, PARAKOYI DB: Monitoring impact of oral poliovirus vaccine on poliomyelitis trends from physiotherapy records, Ilorin, Nigeria, 1981 - 1988.

This study developed the conclusions of the above study further by using a retrospective examination of records from the physiotherapy department of the University of Ilorin Teaching Hospital. Paralytic poliomyelitis incidence over an eight year period was compared with immunization coverage derived from periodic coverage surveys. A 59% decrease in the annual incidence of paralytic poliomyelitis was seen during the first four years of the polio control program. The conclusion suggested by these studies was that increased OPV coverage was important in decreasing the number of paralytic polio cases, but that OPV-3 coverage by itself might not be sufficient to achieve complete control of endemic disease. This suggests a

possible role for a fourth dose of OPV or use of enhanced potency inactivated polio vaccine (IPV) at the time of measles immunization.



BINCHAN RK, DICKIN KL et al.: Community-based research to increase tetanus toxoid immunization coverage in Kaduna, Nigeria.

A qualitative study sponsored by the ACSI-CCCD project under the Research Review Committee mechanism. Twelve focus group discussions were held with mothers, traditional birth attendants, and clinic staff in the city of Kaduna in northern Nigeria. Mothers' responses indicated that home delivery and traditional beliefs about childbirth still predominated in this population, including the use of hot compresses and herbal mixtures on the umbilical stump. Mothers' knowledge about the symptoms and causes of neonatal tetanus was low. The purpose of antenatal tetanus toxoid immunization was not generally known. Mothers commonly associated injections with family planning or sterilization. Health services barriers, including fees, vaccine shortages and staff attitudes were also cited as reasons for non-use of services. Clinic staff and TBAs both expressed willingness to work together to improve birthing practices, and both reported favorable opinions of previous experiences working together.

REFERENCES

LAFORCE FM, LICHNEVSKI MS, KEJA J, HENDERSON RH: Clinical survey techniques to estimate prevalence and annual incidence of poliomyelitis in developing countries. Bull World Health Organ 58:609-20 (1980)

SURVEILLANCE ACTIVE DE LA POLIOMYELITE PARALYTIQUE DANS LA VILLE DE KINSHASA, ZAIRE

STUDY LOCATION: ZAIRE

SHORT TITLE: **ACTIVE SURVEILLANCE FOR POLIO, KINSHASA**

PRINCIPAL INVESTIGATOR: VERNON, Dr. Andrew A
TSD-IHPO, Mailstop F-03
Centers for Disease Control and Prevention
Atlanta, GA 30333

CO-INVESTIGATORS: Okwo B, Lubamba.N

STUDY DESIGN

This was a study to compare the effectiveness of an alternative system of polio surveillance (using active surveillance at multiple sites) with the existing system based on one sentinel site at the main rehabilitation hospital. From October 1988 to September 1989, active surveillance at 26 additional sites (including pediatric hospitals and other rehabilitation centers) was carried out. Weekly reports of new cases of flaccid paralysis (or non-occurrence of cases) were requested. Reports were collected every 7-14 days by a visiting nurse. Investigation of suspected cases, classified as confirmed or non-cases (discarded). WHO case-definitions were used to define suspect, probable and confirmed cases. Virus isolation was carried out at the Institut National de Recherche Biomedicale (INRB), Kinshasa and at CDC, Atlanta.

RESULTS

During the 12-month period, 154 suspected cases were reported. After further investigation, 22 cases (14%) were discarded.

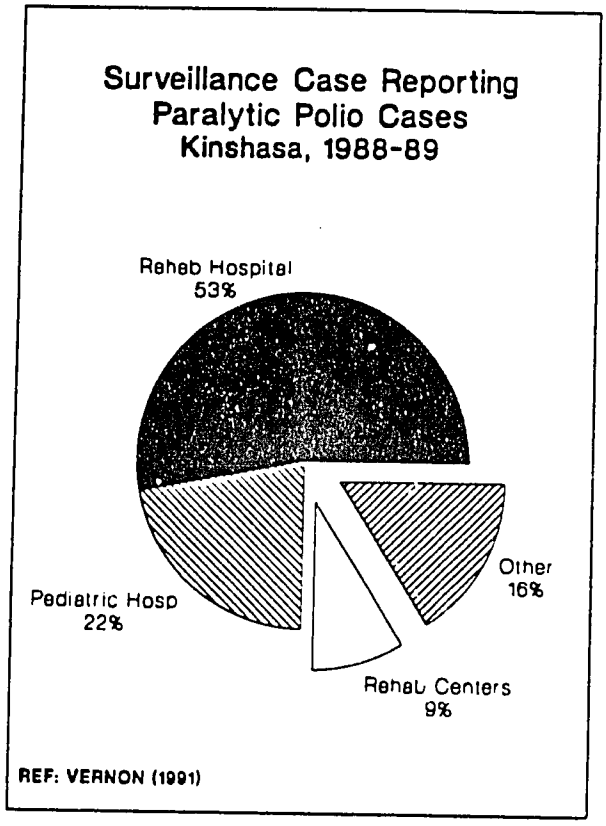
- Virus isolation from fecal specimens was attempted for 56 cases. **Type 1 wild poliovirus** was isolated from 13 specimens, 4 were non-polio enterovirus, and 10 were negative.
- Fifty-three percent of cases were reported by the main rehabilitation center, 22% by the largest pediatric hospital, and 9% by NGO-operated rehabilitation centers.
- Three zones with 22% of the population accounted for 45% of all confirmed cases. These were all areas of low immunization coverage.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. An active surveillance system is feasible.
2. Active surveillance based on just two sites could capture 75% of cases.
3. Surveillance was able to identify areas of low immunization coverage.
4. For polio eradication, more intensive surveillance will be necessary than that achieved by just two centers. As the number of cases diminishes, the importance of identifying every case will increase.

STUDY LIMITATIONS

None identified.



PROGRAM AND POLICY IMPACT

The authors note the usefulness of this surveillance program in alerting program managers to pockets of high-risk. These denote areas where immunization activities need to be strengthened or outbreak control conducted. This polio surveillance project was conducted with Rotary International support, as well as support of Rotary Zaire and UNICEF.

A second point should be made about the interpretation of findings: A reader of this study might feel that the ability of 2 sites to account for 75% of cases would allow fairly acceptable and cost-effective surveillance to be set up using only those 2 sites (avoiding the need for active surveillance at more than 20 other sites). This, however, was not the conclusion of the published report, mainly because of the context in which these findings were interpreted. As was noted, the goal of polio eradication would require that every case be identified, not just the majority of cases. As occurs in most such instances, the less common an event becomes, the more it generally costs to identify a single case. As cases of paralytic polio become more rare it should be expected that it may require more resources, not less, to identify the remaining cases.

PUBLICATIONS

Expanded Programme on Immunization: Poliomyelitis surveillance, Zaire. Wkly Epidemiol Rec 66:81-83 (1991)

This study was also published in the Zaire epidemiological bulletin, Sauvons nos Enfants No. 11, 1990.

ELEMENTS D'EPIDEMIOLOGIE DES MENINGITES DANS LE NORD DE LA COTE D'IVOIRE

STUDY LOCATION: COTE D'IVOIRE

SHORT TITLE: **MENINGOCOCCAL MENINGITIS SURVEILLANCE**

PRINCIPAL INVESTIGATOR: SORO, Dr Benoit N
Medecin-Epidemiologiste Institut
National de Santé Publique
BP V47, Abidjan

CO-INVESTIGATORS: Rey JL, Davis CE, Coulibaly A, Diomande I

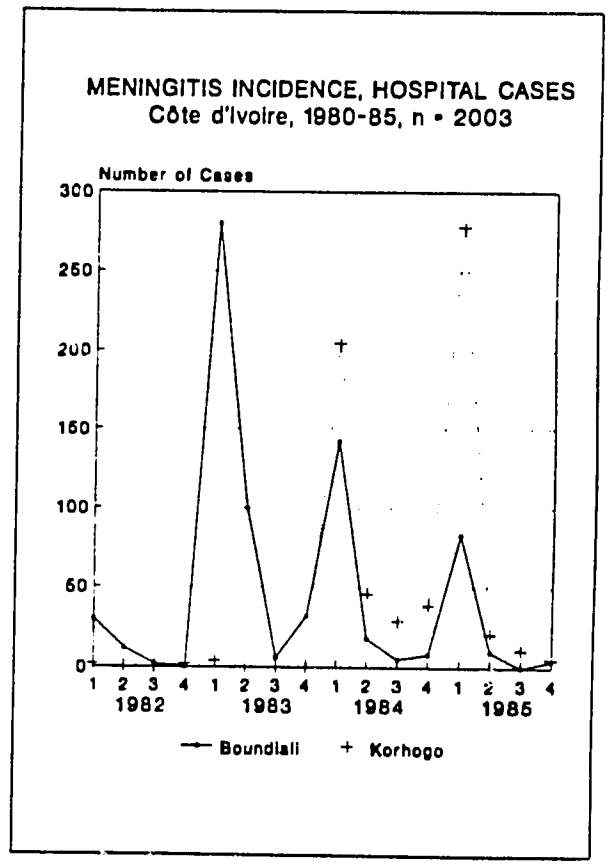
STUDY DESIGN

*This study used a retrospective review of records (1980-85) from five central hospitals in three Northern sectors of Côte d'Ivoire — **Korhogo, Boundiali,** and **Ferkessedougou**. All reported diagnoses of meningitis were considered cases, and were sub-grouped as suspect (clinical) cases or confirmed (laboratory) cases.*

RESULTS

A total of 2,243 cases were reviewed for the period 1980-85. This was allocated (by the authors) into two groups — 240 cases for the period 1980-82 and 2,003 cases for the period 1983-85.

- Distribution of cases over time indicated epidemic peaks during the months of February and March.
- **Age specific attack rates were highest for the age group 5 to 14 years** of age. There was no significant difference in attack rates between males and females (Korhogo only).
- The estimated case fatality rate for meningitis was 8.5% in 1985 (Korhogo and Ferkessedougou) and 8.5% in 1984 (Ferkessedougou only).



- Of 346 CSF samples examined during the 1985 outbreak, 136 (39%) were positive for gram-negative diplococci; 96 CSF samples were Serogroup A, 7 were Serogroup B.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. The 1984-85 epidemics of meningitis in Northern Côte d'Ivoire can be considered to be the tail of 1981-82 epidemics in Mali and Burkina Faso.

2. The epidemiological features are typical — with peaks in March, extension of cases into rural zones, and peak incidence among children 5 to 14 years of age.

3. The lack of a convenient, simple diagnostic test was noted.

4. **The strategy of routinely immunizing children against meningitis at 12 months during epidemics is not justified by the disease's epidemiology, since the greatest risk is among children 7 to 10 years of age.**

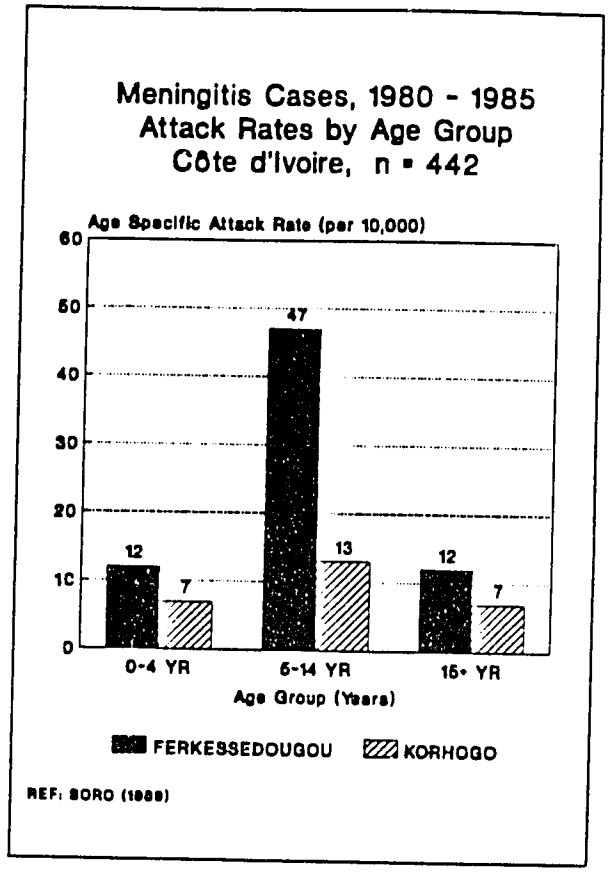
5. The spread of meningitis South from the traditional "meningitis belt" is expected to accompany the increasing southward encroachment of the Sahel and inter-country migration.

6. A sentinel surveillance system for meningitis in Côte d'Ivoire is needed to improve case detection and allow timely and effective vaccination strategies where indicated.

STUDY LIMITATIONS

All the limitations of retrospective studies in this setting must be considered - they are dependent on the accuracy of medical records, subjective diagnoses, reporter bias, etc. The actual epidemic is self-evident, but age data, and case- fatality rates may not be as reliable.

- Only a small proportion of cases had laboratory confirmation (136 of 2,003).



- There was a significant percentage of cases with missing ages in the 1985 data used to calculate age specific attack rates (27% in Korhogo, 10% in Ferkessedougou). This could substantially change age-specific rates since the probability of missing age data is unlikely to be the same for all age-groups.

PROGRAM AND POLICY IMPACT

Funding for implementation of a meningococcal surveillance system at four Northern hospitals was apparently approved by CCCD, with all cases to have lumbar puncture, and determination of infective agent by rapid latex fixation kit (Field Epidemiologist's report, UNICOI 1987).

PUBLICATIONS

SORO BN, REY JL, DAVIS CE et al.: Elements d'Epidemiologie des Meningites dans le Nord de la Côte d'Ivoire. Med Trop 48:145-8 (1988).

NATIONAL STUDY ON LEVELS OF TETANUS ANTITOXIN SEROPOSITIVITY AMONG RECENTLY DELIVERED WOMEN IN BURUNDI

STUDY LOCATION: BURUNDI

SHORT TITLE:: **TET-TOX SEROPREVALENCE STUDY, BURUNDI**

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Centers for Disease Control and Prevention
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CO-INVESTIGATORS: Bisoffi Z, Weierbach R, Ibsen P, Mokdad A, Ciotti M, Bizimana F

STUDY DESIGN

The study compared three estimates of tetanus toxoid (TT) coverage in pregnant women at term with tetanus antitoxin seroprevalence. Two of the estimates were from a nationwide, stratified, cluster-sample survey of women who had given birth during the previous 10 months. This was done as part of a national vaccination coverage survey conducted in February and March 1989. One estimate of TT coverage was based only on documents kept at home. The second was based on mother's verbal histories of tetanus toxoid injections received during their last three pregnancies. Filter paper blood specimens were also obtained from mothers in the survey, and a competition ELISA developed at the State Serum Institute in Denmark (SIMONSEN 1987) was used to determine tetanus antitoxin seroprevalence. Finally, TT coverage was calculated for the same 10 month period using the usual "administrative" method (doses of TT2+ administered to pregnant women during this period divided by the estimated number of live births during the period). Sampling for the coverage survey was a stratified probability sample in two strata —Bujumbura (urban) and the rest of the country (rural).

RESULTS

There were 212 mothers in the rural sample and 206 in the Bujumbura sample.

- Coverage estimates yielded by each method are summarized below:

	Rural Strata	Bujumbura	National Weighted
Survey coverage estimates:			
Based on home documents	17%	49%	18%
Based on history	72%	95%	73%
Administrative coverage:	n.a.	n.a.	57%
Antitoxin seroprevalence:	67%	84%	67%

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. The prevalence of serological protection against neonatal tetanus achieved in Burundi (67%) was impressive. It was higher than expected based on previous estimates of TT coverage (the "administrative" estimate for TT2+ coverage in 1987 was 49%). Also it showed that progress in preventing neonatal tetanus by vaccinating mothers did not lag behind efforts to prevent measles or polio by vaccinating children. Card-documented measles vaccine coverage in children 12-23 months of age from a vaccination coverage survey of children conducted simultaneously was 46%, while OPV-3 coverage was 51%.

2. TT coverage and tetanus antitoxin seroprevalence in Bujumbura was appreciably greater than in the rest of the country.

3. The estimate of TT coverage based on mothers' verbal histories correlated best with seroprevalence. The "administrative" estimate of coverage underestimated what the immunization program had achieved, and the estimate based on documents kept at home greatly underestimated it.

4. Mothers' verbal histories may not be as accurate when eligible women of childbearing age are vaccinated at all health facility contacts, since histories cannot be confined to recent pregnancies, and mothers must distinguish TT toxoid injections from injections given to treat illnesses.

STUDY LIMITATIONS

None cited.

PROGRAM AND POLICY IMPACT

The rationale for this study was based on limitations of the existing methods for determining maternal tetanus toxoid coverage. One factor limiting a study such as this (prior to this period), was the lack of a practical laboratory method for determining antibody seroprevalence accurately. Although there were a number of methods previously used, the ELISA test used in this study was at the time the only in vitro test which reliably correlated with the "gold standard" mouse neutralization test.

The underestimation of coverage which occurs with both the administrative and survey methods was particularly important to Burundi, which had seen relatively modest improvement in tetanus toxoid coverage despite an EPI program in effect since 1980, and despite significant gains in EPI coverage of children. This anomalous "lack of success" in raising maternal coverage was therefore important to the setting of objectives by the program, as well as its future priorities (i.e., did the program need a specific plan to address "low" maternal coverage?).

Burundi had initiated a policy of immunization of all women of child-bearing age in 1986, making the conventional means of determining coverage increasingly impractical. Although not all facilities were actively implementing this policy, a number of them were. In preliminary studies, six of 11 health centers surveyed in 1988 had already instituted the policy of vaccinating all women of childbearing age.

Preliminary investigations for this study also revealed limitations of the health information system — one of the most important of these was that neonatal tetanus was not reported separately from adult tetanus in routine reporting (the two have been reported separately beginning in 1988). Thus, at the time of this study the most reliable indication of decreased susceptibility to neonatal tetanus was a decrease in hospital cases at the largest referral hospital from 1983 to 1988.

"In a preliminary study, mothers' accounts of coverage suggested that 95% of children were protected, whereas documents suggested that only 42% were covered."

During the same preliminary phase a number of reasons were demonstrated to justify a seroprevalence study: in small non- random samples (1) mothers reported an average of 4.1 previous injections during ANC visits; (2) clinic-kept records were generally better than patient's records with respect to previous pregnancy history, but were still deficient or missing in many cases; and (3) mothers' accounts of coverage suggested 95% of children protected, whereas documents suggested that only 42% were covered.

From these preliminary findings it was immediately apparent that a seroprevalence survey could rectify serious discrepancies between different methods and resolve important program questions for the Burundi EPI program.

One immediate result of this study was a decision by the EPI program to abandon plans for a national study of neonatal tetanus mortality, in view of the high seroprevalence levels found.

Also on the basis of this study and the problems identified with the existing methods, a working paper was written for the WHO recommending a new administrative method for monitoring tetanus toxoid coverage, based on the percentage of infants protected at birth (determined at time of their first DPT immunization visit), rather than mothers' documented coverage levels.

PUBLICATIONS

REFERENCES

SIMONSEN O, SCHOU C, HERON I: Modification of the ELISA for the estimation of tetanus antitoxin in human sera. J Biol Standard 15:1[illegible]7 (1987)

DEMING M: Monitoring tetanus toxoid immunization coverage. World Health Organization, Geneva, 1990. EPI/NNT/90/WP.3/REV1.

APPLICATION OF MULTIPLE METHODS TO STUDY THE IMMUNIZATION PROGRAMME IN AN URBAN AREA OF GUINEA

STUDY LOCATION: GUINEA

SHORT TITLE: **EPI PROGRAM EVALUATION IN GUINEA, 1988-89**

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CO-INVESTIGATORS: Glik DC, Gordon A, Parker K, Diallo S, Haba F, Stone R

STUDY DESIGN

This study utilized four methods to define problems related to the Expanded Program of Immunization in Conakry, Guinea after the initiation of CCCD support activities there in 1986: (1) a facility-based assessment (FBA) similar to those undertaken in other CCCD countries; (2) key informant interviews at health centers; (3) focus groups; and (4) a two-staged 40-cluster household survey (modified EPI cluster survey) to determine vaccination coverage and treatment histories. These studies were undertaken from November 1988 to March 1989.

RESULTS

Health Facility Study

- All children attending for preventive services received the vaccines for which they were eligible, but only 30% of children seeking treatment services were screened for vaccination status.
- A sterile needle and syringe were used for less than half of all injections.
- Only 5% of mothers had their vaccination status checked.
- Only half of mothers received information about vaccine reactions or the diseases for which children were being immunized; 97% of mothers received information on when to return.

Key Informant Interviews

Health workers in each of Conakry's 13 health centers were interviewed. According to respondents, supplies and support from the Ministry was generally adequate, and communication between the Ministry and staff was sufficient. Although communication links between the health workers and the surrounding communities were "minimal" this was not a perceived problem. The main problems identified were lack of materials and drugs for curative care.

Focus Groups

A total of 24 focus groups were conducted. Knowledge of vaccination practices was high; perceptions of vaccine effectiveness were high; attitudes towards vaccination services varied.

- Respondents generally did not know the exact number of attendances required for vaccination, and did not know that sick children could be vaccinated.
- The most frequent complaints about services were long waiting times, lack of rapport with health workers and high cost.
- Radio and television were the most commonly cited sources of information about vaccinations; health workers played only a minor role.

Household Survey

A total of 377 mothers of children 12 to 23 months of age were included in the survey; 204 children had vaccination cards.

- Altogether, 19% of children had documented evidence of being fully and correctly immunized (doses given prematurely or at invalid intervals excluded).
- Of the 204 children with vaccination cards, 39 children (19%) had sufficient health services contacts to have been completely vaccinated, but had missed opportunities for vaccination.
- By logistic regression, factors associated with receipt of DPT-1 and OPV-1 included mother's ability to speak French, hospital birth of a child, mothers younger than 35 years of age, possession of a television, perception of affordability, and a number of interaction terms.
- Factors associated with receipt of DPT-3/OPV-3 included mother's ability to speak French, maternal employment (for French speakers only), and positive experience with vaccination services (including short waiting times, not having been turned away from vaccination, and not knowing a child with a postvaccination "abscess").

"Of the 204 children with vaccination cards, 39 children (19%) had sufficient health services contacts to have been completely vaccinated, but had missed opportunities for vaccination."

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Missed opportunities and inappropriately timed immunizations reduced vaccine coverage almost 30% among children with vaccination cards.
2. Deficiencies in health worker practices were demonstrated by both the facility survey and household survey (missed opportunities).
3. There were minimal lines of communication between health workers and the community. Moreover, health workers did not perceive this to be a problem.
4. Poor sterilization techniques were reflected in focus groups and mothers' complaints of postvaccination abscesses.
5. The methods used were complementary, and provided a grounded approach that was rapid and timely and directly linked to program objectives.
6. The household KAP survey required the most resources, and entailed a complex analysis by outside consultants.

STUDY LIMITATIONS

- Authors note that none of the methods was able to determine whether a mother's knowledge about vaccination had any influence on her child's vaccination status.

PROGRAM AND POLICY IMPLICATIONS

The direct benefit of these studies to the Guinea EPI program was much enhanced by the ability of the investigators to involve local personnel in the execution and analysis of the studies and the ability to provide interactive, participatory involvement in developing conclusions and recommendations from the data.

The analysis of health facility surveys and key informant interviews were done on site by national program personnel and consultants, as were preliminary analyses of focus groups and the KAP survey. The authors

note that the final report of the KAP household survey was distributed to participating health centers within 3 months of survey completion.

In response to the issues identified in the key informant interviews, a one-day workshop and on site training was held in July 1989, involving health center personnel, EPI personnel, medical officers of health, and CCCD project supervisors. The workshop was able to identify two strategies to increase coverage: (1) avoiding missed vaccination opportunities, and (2) home visits to identify and refer defaulters. Charges for vaccination cards were also standardized, and it was agreed that there would be no charge for vaccination.

The methods used in this study were also further refined and used other CCCD project countries.

PUBLICATIONS

CUTTS FT, GLIK DC, GORDON A et al.: Application of multiple methods to study the immunization programme in an urban area of Guinea. Bull World Health Organ 68:769-76 (1990)

CUTTS FT, DIALLO S, ZELL ER, RHODES P: Determinants of vaccination in an urban population in Conakry, Guinea. Int J Epidemiol 20:1099-1106 (1991)

RELATED PUBLICATIONS

CUTTS FT, ZELL ER, SOARES AC, DIALLO S: Obstacles to achieving immunization for all 2000: missed immunization opportunities and inappropriately timed immunization. J Trop Ped 37:153-158 (1991)

This publication includes studies in Mozambique as well as in Guinea. In the Mozambique study 53% of children were fully and correctly vaccinated; missed opportunities were 8% and inappropriately timed immunizations were 11%. Authors recommend including all health center visits on home-based immunization records, and routine assessment of missed opportunities and inappropriately timed immunizations during vaccine coverage surveys.

FORMATIVE RESEARCH ON KNOWLEDGE, ATTITUDES, PRACTICES AND MEDIA HABITS RELATED TO E.P.I. IN OYO STATE, NIGERIA

STUDY LOCATION: NIGERIA

SHORT TITLE: **KAP STUDY FOR EPI PROMOTION, OYO STATE**

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STUDY DESIGN

Nine wards from three Local Government Areas (LGAs) in Oyo State were surveyed in 1989 using in-depth interviews, focus groups, and small-scale surveys. Respondents were chosen from mothers and fathers of children 0-2 years, traditional leaders, community leaders and health workers. Questionnaires were administered to 90 mothers in each ward for the small-scale survey.

RESULTS

- Eighty-five percent of respondents could recognize signs or symptoms of EPI diseases; 77% of respondents knew that the best way to prevent EPI diseases is immunization.
- Virtually all respondents had heard of EPI; 93% of respondents had immunized their children; 73% had fully immunized their children (self-reported).
- Of all respondents, 99% had access to a radio.
- The preferred source of information for respondents was health staff (50%), followed by radio (39%), and traditional leaders (11%).
- Focus groups showed that mothers were generally satisfied with treatment received at health centers, but there were complaints of many repeat visits being necessary before children were immunized. Another common complaint volunteered was the long waiting time at clinics (3 to 5 hours).
- Focus groups also confirmed that clinic staff usually did attempt to trace mothers who defaulted from immunization days.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Factors which promote EPI success are positive health-seeking behavior of mothers, friendly attitudes of health staff, a high level of publicity, incentives for fully immunized children, and home visits to trace defaulters.
2. Factors inhibiting EPI participation include lack of readily available transportation, waiting time at clinics, and repeat visits to clinics before being able to complete the immunization of children.
3. Recommendations included strengthening levels of community knowledge through mass media, strengthening the health system, training, and improved health services aimed at reducing mothers' waiting time and repeat visits.

STUDY LIMITATIONS

- Self-reported levels of compliance with immunization are probably overestimates, because respondents generally tend to overstate "desirable" behavior in a setting such as this. The corresponding documented levels of immunization ob-

tained from coverage surveys (enumerated in the study report), give lower coverage than reported by this study — 73% for DPT-3, 67% for measles, and 45% fully immunized, using card and history combined.

- Whereas significant feedback was obtained from focus groups on the utilization of health services and attendant constraints, little information was reported on possible ethnic, religious or cultural differences of relevance to either "media practices" or other aspects of program goals. (At least one area surveyed has a heterogeneous population including Hausa and Fulani tribesmen, Ibos, Bendelites and other West-African immigrants in addition to the majority Yoruba population).

■ PROGRAM AND POLICY IMPACT

This was one of several KAP studies with HEALTHCOM input, intended to provide information for formulation of mass- communication campaigns and appropriate social-marketing strategies. As such, it was part of a continuing effort by HEALTHCOM Nigeria to promote formative research methodology and stimulate collaborative work by health staff, university faculty, and media representatives.

■ PUBLICATIONS

None documented.

IMMUNIZATION DROP-OUTS AND MATERNAL BEHAVIOR: EVALUATION OF REASONS GIVEN AND STRATEGIES FOR MAINTAINING GAINS MADE IN THE NATIONAL VACCINATION CAMPAIGN IN LIBERIA

STUDY LOCATION: LIBERIA

SHORT TITLE: **EPI REASONS FOR DROPOUT**

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CO-INVESTIGATORS: Bender D

STUDY DESIGN

This study was sited in Bomi and Cape Mount counties, two counties with high initial EPI coverage (88% and 93% respectively), but low rates for completed series (29% in Bomi and 33% in Cape Mount). Data was collected by conducting focus group interviews with mothers of children younger than 5 years of age, "front-line" health workers, and county level administrators. Mothers of both vaccinated and unvaccinated children were included in common groups. County health workers were interviewed in separate groups. Responses were grouped and analyzed according to the major themes identified.

RESULTS

A total of 242 women were interviewed, 132 in Bomi and 110 in Cape Mount. A total of 37 health workers were interviewed (15 in Bomi, 22 in Cape Mount).

- Of eligible children, 22% in Bomi and 24% in Cape Mount had a completed series of immunizations.
- The number of children receiving vaccinations solely during the National Vaccination Campaign was 6% in Bomi county and 4% in Cape Mount.
- At least 80% of children in Bomi and 76% in Cape Mount had more than one visit to the health center.
- The most frequently cited health problems of children (in order of frequency) were measles, "running stomach" (diarrhea), malaria, fever, scabies, whooping cough, pneumonia, polio, and vomiting. Health priorities cited by health workers mirrored the priorities of the immunization program.
- There was a lack of congruence between the priorities identified by mothers and health workers, (which the authors attributed to "a lack of recognition of susceptibility to and seriousness of other illnesses" by mothers).
- The most commonly cited reasons for dropout given by mothers were those relating to vaccine side effects (42% of mentions), whereas reasons given by health workers most commonly related to service delivery.
- Sores or "abscess" was cited as a deterrent by 65% of mothers' groups, and 55% identified fever after vaccination as a deterrent.
- The cost of the Road-to-Health Card ($ .25) was cited as a deterrent by 35% of respondents. Other reasons cited included:
    - Not told to return
    - Health worker absent
    - Lack motivation
    - Session cancelled
    - Long wait or travel time

- The reasons for nonreturn most commonly cited by health workers included "lack of knowledge (of mothers)", service delivery failures, vaccine side effects and lack of health education.

- The most common recommendations made by mothers' groups for improving follow-up compliance included the following:

Inform chiefs	24%
Announce date in advance	20%
Education	14%
More frequent sessions	10%
Give aspirin for fever	7%
No charge for vaccination card	7%

- The most commonly cited recommendations by health workers included:

Stronger education program	22%
Additional use of media	17%
Work with chiefs	13%
Mini-campaigns	9%

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. EPI diseases which are of primary concern to EPI/CCCD personnel are not primary concerns of mothers. Programs should build dialogue on mothers' felt needs.

2. Vaccination side effects were a significant deterrent to completion of a vaccination series.

3. Health education about vaccine side effects, care of the BCG wound, and provision of aspirin for fever were recommended.

4. A review to identify and correct service delivery problems should be conducted.

5. Two community-based strategies identified involve working more closely with chiefs and traditional midwives to address priority health concerns.

STUDY LIMITATIONS

- The categories of health problems identified by mothers' in focus groups are so distinctly classified in 'Western' medical categories, that they must be viewed with some suspicion. The latitude for "interpretation" by reporters or interviewers makes the open interview format often vulnerable to subjective interpretation.

- Although the initial study design proposed to select mothers "randomly" it is not certain that this was done. Hence the "representativeness" of the sample may not be assured.

PROGRAM AND POLICY IMPACT

Two community-based strategies for intervention identified by the study were proposed and approved as a second phase study in the same districts.

PUBLICATIONS

BENDER D, MACAULEY RJ: Immunization dropouts and maternal behavior: Evaluation of reasons given and strategies for maintaining gains made in the national vaccination campaign in Liberia. Intl Quarterly of Community Health Education 9(4):283-98 (1988-89).

RELATED STUDIES

ENG E, NAIMOLI J, NAIMOLI G et al.: The acceptability of childhood immunization to Togolese mothers: A sociobehavioral perspective. Hlth Ed Q 18:97-110 (1991)

Focus group interviews were conducted in 1987 with 110 mothers or caretakers of young children, from 9 pilot villages. Failure to complete an immunization series was explained in terms of mothers' lack of knowledge of when to return, or forgetfulness, rather than inadequate knowledge about the importance of returning. Other barriers included the requirement to keep and present a vaccination card, waiting time at the clinic, lack of information about available services, and laziness. Knowledge of the benefits of childhood immunization were generally accurate, whereas knowledge of benefits from prenatal antitetanus immunization of mothers were inaccurate. Vaccine side effects such as fever and sores were also cited as a deterrent to completing immunization. Methods suggested by mothers to increase compliance included increasing the level of social control exerted by decision makers in their community and increasing the level of social support regarding vaccinations.

IMPROVING VACCINATION COVERAGE: POTENTIAL IMPACT OF AVOIDING MISSED OPPORTUNITIES IN THE CENTRAL AFRICAN REPUBLIC

STUDY LOCATION: CENTRAL AFRICAN REPUBLIC

SHORT TITLE: **MISSED OPPORTUNITIES STUDY, C.A.R., 1990**

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STUDY DESIGN

An expanded national coverage survey in 1990 was conducted to estimate the maximum gain in coverage possible through avoidance of missed opportunities. A cluster survey was carried out in three strata — (1) the capital, Bangui, (2) other urban areas, and (3) rural areas. Missed opportunities were evaluated by recording dates and purpose of all clinic visits, including dates of all vaccines administered. Missed opportunities were defined as a health center visit at which a child did not receive a vaccination for which he or she was eligible. Visits were classified as vaccination visits or non-vaccination visits. Missed opportunities for measles were calculated first by including opportunities for revaccinating children whose initial dose was invalid (given before 9 months), and also by excluding these opportunities for revaccination. "Valid coverage" was calculated using only vaccinations administered at the appropriate age and intervals. Missed opportunities for DPT and OPV considered only opportunities for supplying missing doses, not opportunities for readministering invalid doses. Regional totals were weighted to provide national totals.

RESULTS

Of 642 children, 567 had a health card. Children had an average of 4.1 visits to the health center for vaccinations and 8.8 visits for other reasons.

- Nationwide, for each valid measles vaccination there were 2.3 missed opportunities. Of these 28% were vaccination visits at which at least one antigen was given; 72% were other visits.
- If the analysis excludes the opportunity for revaccinating children improperly vaccinated for measles, there were 1.7 missed opportunities for each valid vaccination.
- If there were no opportunities missed, measles coverage would have increased from 54% to 76%. If only vaccination visits were considered, coverage would have increased to 70%.
- If all missed opportunities were avoided, DPT-3 coverage would have increased from 53% to 70%, and if only vaccination visits are considered, from 53% to 67%. For DPT-3, only 9% of missed opportunities were at vaccination visits, whereas 91% were at non-vaccination visits.

"If all missed opportunities were avoided, DPT-3 coverage would have increased from 53% to 70%."

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. There were many missed opportunities for measles vaccination, which suggest that vaccination at all contacts was not being widely implemented.

2. Avoiding missed opportunities for simultaneous vaccination during vaccination contacts alone could provide most of the potential benefit in increased coverage, particularly in rural areas.

3. Achieving the maximum gains in coverage by avoiding missed opportunities requires that health workers be able to recognize that a previous dose was given before the valid age (e.g., 9 months for measles). This may be difficult to assure.

STUDY LIMITATIONS

Authors note that the study did not attempt to identify the reasons why opportunities were missed; therefore, of necessity, the recommendations are limited in scope. They recommend that community based assessments be used to better define the nature and extent of missed opportunities.

PROGRAM AND POLICY IMPACT

The study emphasized that the stated policy of vaccination at all contacts (or "all visits") needs to be actively promoted and monitored if there is to be actual benefit from a change in policy.

Two additional questions were raised by this study — (1) What are the "actual" gains achievable in practice by a policy of vaccination at all contacts; and (2) what amount of vaccine wastage is likely to result from a fully implemented policy of vaccination at all contacts?

Both questions were being addressed by a demonstration trial conducted in Togo, with CCCD support. As part of this trial, an effort was made to fully implement a policy of avoiding missed opportunities in one prefecture, and to evaluate a number of measures, including coverage and vaccine wastage.

One recommendation arising out of this and other studies was the need for specific guidelines to clearly define the policy operationally. These would address specific scenarios (e.g., missing vaccination cards) with explicit recommendations and would also outline steps and procedures for clinic assessments (e.g., with respect to the adult accompanying a sick child).

PUBLICATIONS

Cited in: HUTCHINS S et al.: Missed Opportunities for Immunization WHO/EPI/GEN/92.9

Manuscript in preparation.

RELATED STUDIES

GINDLER J, ADEWUSI M, FAGBULE D et al.: Missed Opportunities at Urban Health Facilities, Lagos.

A clinic-based study at 70 urban health centers in Lagos, Nigeria, using observation of health worker practices, exit interviews, a supply and equipment checklist, and health care worker interviews. This study was jointly undertaken by CCCD, the Lagos State Ministry of Health and the Resources for Child Health (REACH) project. For 1,841 children with a vaccination card, there were 532 missed opportunities for vaccination — 433 of these were during vaccination visits. Only 11% of mothers were screened for their immunization status (with respect to tetanus toxoid). At 97% of centers, immunizations were given only once a week. Provider misconceptions about indications and contraindications for vaccination were common.

IMPACT DE LA POLITIQUE DE VACCINER LES ENFANTS A TOUT CONTACT SUR LA COUVERTURE VACCINALE, LE COUT, ET L'AMPLEUR DES OCCASIONS MANQUEES DE VACCINATIONS

STUDY LOCATION: BURUNDI

SHORT TITLE: **MISSED OPPORTUNITIES STUDY, BURUNDI**

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Bujumbura, Burundi

CO-INVESTIGATORS: Ntareme F, Weierbach M

STUDY DESIGN

This study was conducted in 12 health centers in two health zones - Muramvya and Muyinga. Centers comprised three groups of four centers each: Group I - centers vaccinating at all contacts; Group II - centers vaccinating daily, but not at all contacts; and - centers vaccinating less than 4 days per week. Group III centers were studied on a non- vaccination day; Group II and I centers on a day of "less intensive" vaccination activity. All children from birth to 23 months of age attending clinics for any reason were included in the survey (including children accompanying a sick mother or a mother attending antenatal clinic). The study used exit interviews and verified vaccination status from vaccination cards, if available. Records for centers in Groups I and II were also reviewed for a period of 6 months before the implementation date of the policy change and 12 months subsequent to implementation. For Group III, records were reviewed for calendar year 1988.

RESULTS

There were 282 children of age 0 to 23 months in the study. Of these, 56% brought their immunization card to the clinic visit.

Missed Opportunities

- Of the total, 77% were completely vaccinated or vaccinated at a level appropriate to age.
- There were 64 missed occasions for vaccination out of 282 encounters (23%).
- Of these 64 children, 25 had vaccination cards (39%), and 87% of mothers said they would have accepted vaccination if it had been offered. Almost all who refused were from Group III.
- Six major causes of missed opportunities were revealed by this study:

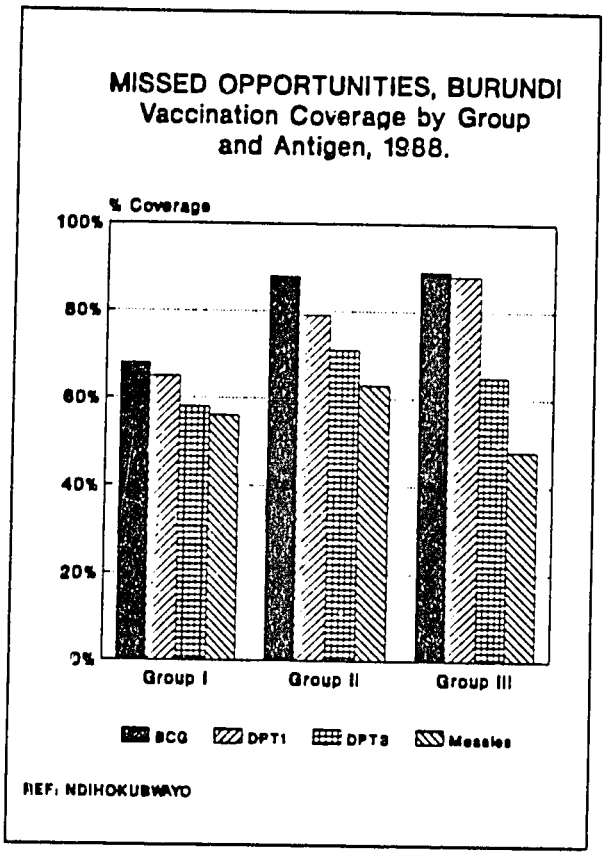
  1. Health workers did not verify the immunization status of children who did not come expressly for vaccination visits. This was most common in Groups II and III.
  2. Misinterpretation of vaccination cards; giving one vaccination dose where more than one was required.
  3. "Insufficient personnel" to vaccinate every day (Group III).
  4. Fear of wasting vaccines.
  5. Stock ruptures (BCG and measles).
  6. Failure of mothers to bring immunization cards, and reluctance of personnel to immunize children without cards.

- "False contra-indications" were not a significant cause of missed opportunities in this setting.

- The rate of missed opportunities was 15% for Group I, 21% for Group II, and 30% for Group III.

Coverage

- Indicators of access (DPT-1 and BCG) were higher in Groups II and III than in Group I; however, the dropout rate from DPT-1 to DPT-3 was highest in Group III. The dropout rate was 11% for Group I, 10% for Group II, and 26% for Group III.



- The number of measles doses administered after the implementation of the "all contacts" policy increased by 6% for clinics in Group I (vaccination at all contacts), and by 17% in Group II (vaccination every day).

Cost

- The average number of doses of measles vaccine utilized per child immunized in the target age group (9 to 11 months) was:
  - 3.2 doses in Group I,
  - 2.7 doses in Group II,
  - 2.9 doses in Group III.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. This study did not demonstrate an increase in total coverage with a policy of vaccination at all contacts, but it did find that centers with a policy of vaccinating every day or at all contacts had a lower dropout rate (DPT-1 to DPT-3) than centers which did not.

2. Centers which had a policy of vaccination at all contacts did not show a substantial advantage over centers which vaccinated daily. This may have been because of a lack of sensitization of the population.

3. Vaccination at all contacts did not substantially increase the amount of vaccine wasted.

4. False indications were not a prominent cause of missed opportunities.

5. Vaccination at all contacts did reduce the proportion of missed opportunities in children attending clinic.

6. The authors conclude that the policy of vaccination at all contacts, where it has been implemented, has not been accompanied by appropriate mobilization and sensitization of the community, which may account for the failure to substantially increase coverage rates. Stock ruptures may also contribute to this.

STUDY LIMITATIONS

None cited. However, the study evaluated health centers in only two health zones, and results may not be representative of the country as a whole. The study also accepted mothers' history of immunization for children who did not have a vaccination card.

PROGRAM AND POLICY IMPACT

The results of this study were made available to the local Ministry of Health as well as local UNICEF representatives. Specific recommendations were that Burundi should adopt a single "health card" for immunization and curative visits for all children to age 5. This would facilitate accounting for missed opportunities.

EVALUATION OF THE 1987 MASS VACCINATION CAMPAIGN IN TWO NORTHEASTERN SECTORS OF COTE D'IVOIRE - BOUNA AND BONDOUKOU

STUDY LOCATION: COTE D'IVOIRE

SHORT TITLE: **EVALUATION OF '87 CAMPAIGN, N.E. COTE D'IVOIRE**

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CO-INVESTIGATORS: Assaole N'Dri D, Able E, Davis C, Weierbach R, Soro B, Coulibaly A, Niangue J

STUDY DESIGN

*This was an evaluation in two Northeastern sectors done as part of an assessment of a national vaccine campaign (**Journees Nationales de Vaccination**). The vaccination campaign was carried out in two phases beginning with the capital Abidjan from April to June 1987, and continuing with the rest of the country from September to November 1987. This survey was executed within a few weeks of completion of the third and final round of immunizations. WHO cluster methods were used to select approximately 210 children aged 12-23 months divided among 30 random clusters (approximately 50 households). Study design and supervisor training was done by the Institut National de Santé Publique (INSP), Abidjan. Population denominators were derived from the 1985 census. The coverage survey considered only "card documented" vaccinations. The target populations for the campaign were (1) children under 5 years of age; and (2) pregnant women (for tetanus toxoid). The main objective of the campaign was to achieve 80% coverage of children for diphtheria, pertussis, tetanus, poliomyelitis, measles and yellow fever. BCG was not given during the campaign, and yellow fever vaccine was not given consistently throughout the campaign because of stock ruptures. The campaign in rural health sectors was held during 18 consecutive days each month for three consecutive months —September, October and November, 1987. (Note: In an earlier evaluation of the campaign in Abidjan, children were assessed in three age groups, 2-11 months, 12-23 months and 24-59 months. In the 25 rural sectors only the 12 to 23 month age group was assessed "due to logistical problems and time constraints.")*

RESULTS

Because of difficulties in locating sufficient numbers of pregnant women for the survey, results presented here are for children alone.

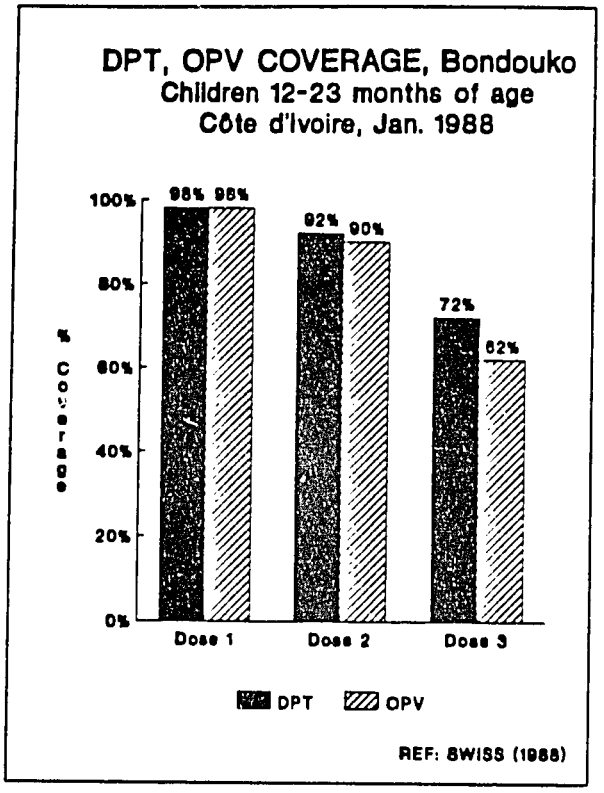
BONDOUKOU SECTOR (pop. 294,000)

Problems identified during the campaign included the following:

- Ruptures in the supply of polio and yellow fever vaccines.
- A number of villages were inaccessible because the campaign was carried out during the rainy season.
- Some children received duplicate vaccinations because of non-uniform recording of vaccinations given.

Results of the Coverage survey for Bondoukou:

- Coverage levels were 98% for DPT-1 and OPV-1, dropping to 72% for DPT-3 and 62% for OPV-3 (the lower polio rate being due to stock ruptures).



- Of all children 12 to 23 months of age, 54% were completely vaccinated, (excluding yellow fever and BCG from the totals because they were not given throughout the campaign).

- Measles coverage was 91%; yellow fever was 78%.

BOUNA SECTOR (pop. 122,000)

This sector suffered a fire which destroyed much of the vaccine stock and cold chain equipment just before the campaign. Other problems which were identified included:

- Nineteen villages (5%) could not be reached during the rainy season.

- Supplying the campaign from Abidjan resulted in "enormous" vehicle and gasoline costs.

- Regularly scheduled health activities virtually ceased for the duration of the campaign, despite six additional vaccinators brought from Abidjan for the campaign.

- One hundred and forty-two Lobi villages (29%) listed on the 1985 census could not be located during the campaign, due to the transitory and widely dispersed nature of these villages.

- Children who were vaccinated before the campaign but did not have cards (because of a shortage of health cards) were vaccinated again.

Coverage estimates were as follows:

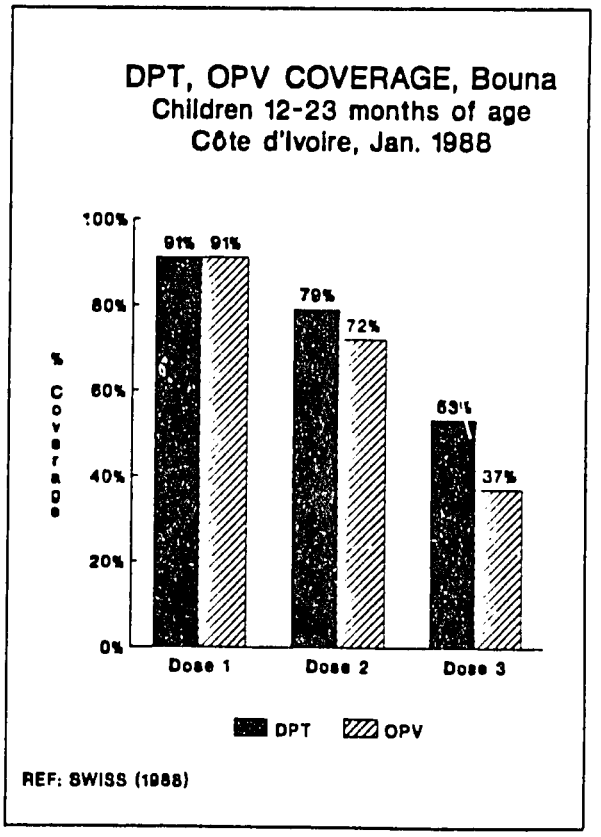
- DPT-1 and OPV-1 were 91%, dropping to 53% for DPT-3 and 37% for OPV-3 (dropout rates of 38% for DPT and 54% for OPV).

- Measles coverage was 88% and yellow fever 78%.

- Of children 12-23 months of age, 35% were completely vaccinated (excluding yellow fever and BCG).

Other survey findings:

- Estimated cost of the campaign in Bouna (pop. 122,000) was $55,700. An estimate for maintenance of 80% coverage for 80% of the target population was $15,000, or 27% of campaign cost (estimates based on INSP calculations).



STUDY CONCLUSIONS AND RECOMMENDATIONS

1. The campaign did establish a broad base of vaccination coverage for children 0-4 years old.

2. Coverage levels of 54% and 35% (for children "completely" vaccinated) did not achieve the specified goal of 80%, although coverage was high for some individual antigens (eg., measles).

3. In Bouna, the impact of the campaign, relative to routine vaccination services, was high — of children in the survey who had ever received DPT-1, 79% were vaccinated during the campaign.

4. The high dropout rate for OPV relative to DPT was attributed to stock ruptures of OPV.

5. There was a significant disruption in regular health sector activities due to the campaign.

6. The study recommended strengthening fixed centers, with increased mobilization and outreach, and also identified the need for research to identify reasons for immunization dropouts.

STUDY LIMITATIONS

The author notes that many of the accessibility problems present during the campaign were also present for the evaluation survey — 10 of 30 villages could not be located initially, although all were eventually identified. Sufficient numbers of pregnant women were difficult to locate in the selected clusters. Lobi villagers presented problems for interpreters, since most did not speak a second language.

Additional limitations noted:

- Coverage estimates may be subject to biases of access because villages which could not be reached during the evaluation were also more likely to have lower coverage because of their inaccessibility. Results would tend to overestimate coverage.

- Children who had been vaccinated but had no card were counted as unvaccinated for the evaluation. Results would tend to underestimate true coverage.

- Administrative estimates of coverage based on doses administered during the campaign sometimes totalled more than 100% of population - possibly due to an underestimate of the population denominator.

- Interviewers frequently had to use indirect methods (milestones) to estimate birth dates.

- A coverage survey that evaluates immunization levels in children 12-23 months of age gives, at best, an incomplete picture of the effectiveness of a campaign targeting children younger than age 5. For example, because the survey was done just one month after the end of the campaign, children vaccinated at the earliest recommended age during the campaign (i.e., 8 to 16 weeks for DPT, and 9 months for measles) would not be included in the survey, (since they would not yet be 12 months old).

- Similarly, the high coverage attained during a campaign often distorts coverage data for the subsequent year: Because the number of incompletely vaccinated children is lowered by the campaign, the amount of catch-up vaccination done by routine immunization services in the subsequent year is usually lower, causing a real drop in vaccines administered, and an apparent drop in coverage as measured by the "administrative" method.

PROGRAM AND POLICY IMPACT

In contrast to a number of other CCCD countries, the Ivoirian experience with its 1987 campaign led to a general policy discouraging time-limited vaccine campaigns in favor of a strategy of strengthening existing facility based services and outreach. In large measure this was due to a fairly comprehensive evaluation of the costs and benefits of the 1987 Journees Nationales de Vaccination (JNV).

The above study was just one of a number of evaluations aimed at assessing the cost and impact of the 1987 immunization campaign in Côte d'Ivoire. This study, with others, identified several shortcomings of the vaccination campaign as a strategy for achieving sustainable coverage in populations. Although some of these limitations were consequences of inadequate planning or resources for the campaign, others appear to be limitations of the campaign strategy itself.

Whereas coverage for DPT-1, OPV-1 and measles was high, indicating good access to the population during the campaign, the dropout rates from DPT-1 to DPT-3

and from OPV-1 to OPV-3 were high. This is partly accounted for by the fact that children had three chances to get immunized for DPT-1 (during each of the three passes), but had to be reached by all three passes to be fully immunized (DPT-3 and OPV-3). However, the low levels were also due to accessibility problems during the rainy season, and (for OPV-3) inadequate supply of the vaccine. The earlier urban campaign in Abidjan (April-June, 1987) also identified significant (although lower) levels of dropouts (12% for DPT and OPV). On the other hand, for the country as a whole, the dropout rate from DPT-1 to DPT-3 ranged from 25% to 40%, depending on age group.

The comprehensive national assessment done by the government of Côte d'Ivoire also revealed additional benefits and limitations of the 1987 campaign, which was envisioned as a "first step" towards long term strengthening of EPI services. Among the benefits: (1) increasing the number of operational fixed centers, through supplies and equipment provided; (2) decreasing the at-risk population through increased coverage; (3) sensitization, training and mobilization of personnel; and (4) social mobilization. One particularly encouraging sign of success which the program was able to attribute to the vaccination campaign was a marked diminution in measles and neonatal tetanus cases seen at sentinel hospitals following the JNV '87.

Among the limitations identified: (1) the number of fixed sites remained insufficient — by 1988, 42% of potential vaccination sites were reported to be inoperative; (2) management deficiencies, including inadequate supervision, inadequate coordination of surveillance activities and donor resources, and lack of clear allocation of responsibilities among principal government agencies; (3) inadequate maintenance of cold chain and inappropriate sterilization practices by some technical personnel; (4) failure to respect appropriate vaccination intervals; and (5) inadequate understanding by the population of the necessity for "complete" immunization, resulting in high dropout rates.

In addition to extensive recommendations for equipping fixed centers, training of personnel and reorganization of the operational management of the immunization program, the government also based much of the thrust of subsequent efforts on maintaining the gains achieved by the vaccination campaign. Policy measures included avoidance of missed opportunities through vaccination at all contacts, and minor changes to the vaccination schedule to bring it line with WHO recommendations (e.g., OPV at birth).

PUBLICATIONS

None documented.

RELATED STUDIES

ROISIN AJ: Evaluation des Journees de Vaccination de Conakry, Novembre 1986 - Fevrier 1987. Epidemiologiste Regional du Projet ACSI-CCCD, Secretariat Genéral de l'OCCGE, Bobo Dioulasso, Burkina Faso. Mars 1987.

Three vaccine coverage surveys were carried out simultaneously for three age groups (less than 1 year of age, 12 to 23 months of age, and 2 to 3 years of age) following a vaccination campaign in Conakry, Guinea. The campaign used three passes, each of one week duration, in November 1986, and January and February 1987. The survey was conducted in March 1987. Three measures of impact were used: (1) coverage based on doses administered and estimated live births; (2) difference in coverage from June 1986 to March 1987; and (3) assessment of the proportion of vaccinations received by children under the age of 1 year which were received during the campaign. For children younger than one year of age, the denominator for coverage was recalculated for each cycle of the campaign by adjusting for children entering or leaving the age cohort eligible for vaccination. Estimated coverage by the administrative method was 84% for DPT-1, 46% for DPT- 3, and 102% for measles. From the coverage survey, coverage was 87% for DPT-1, 51% for DPT-3, and 55% for measles. Overestimation of measles coverage by the administrative method was attributed to vaccination of children younger than 9 months of age (67% of vaccines administered to children under age 1 year). About 10% of this age group also received DPT-1 before the recommended age. Vaccination at inappropriate intervals was not a problem. From June 1986 to March 1987, immunization coverage among children 12 to 23 months of age increased by 71% for DPT-1 (from 23% to 94%), 56% for DPT-3 (from 8% to 64%), and 65% for measles (from 16% to 81%). Of vaccinations received by children younger than one year of age, 66% of DPT-1, 46% of DPT-3, and 48% of measles vaccinations were received during the campaign. The author concluded that the campaign was extraordinarily successful at increasing coverage, but that special precautions need to be made to prevent the vaccination of children younger than the recommended age. The administrative method of calculating coverage is useful if strict account is taken of the age of children who are vaccinated.

MASS IMMUNIZATION CAMPAIGNS AND THE QUALITY OF IMMUNIZATION SERVICES

STUDY LOCATION: NIGERIA

SHORT TITLE: **ASSESSMENT OF NIGER STATE IMMUNIZATION CAMPAIGN**

PRINCIPAL INVESTIGATOR: BRYCE, Dr. Jennifer
SBSB/TSD-IHPO, Mailstop F-03
Centers for Disease Control and Prevention
Atlanta, GA 30333

CO-INVESTIGATORS: Cutts FT, Saba S

STUDY DESIGN

During the course of an evaluation of health worker practices in Niger State (in October 1989), a one-day mass immunization campaign, "Mass Immunization Day" was being conducted. The opportunity was taken to compare practices at 3 facilities implementing the mass campaign with 8 providing routine services. Assessment included observations of health worker performance and exit interviews with mothers or other caretakers of children attending clinic.

RESULTS

Fifty-nine immunization encounters were observed and scored according to a standardized checklist (20 encounters during the mass immunization day, and 39 routine service encounters).

- Mass immunization day centers performed significantly less well on several indicators of quality of care.
- Performance was lower for Immunization Day encounters on two critical aspects —adequate maintenance of the cold chain, and use of a sterile needle and syringe for each injection.
- Performance was also lower on educational activities, such as informing the mother of when she should return with the child.

	IMMUNIZN DAYS	ROUTINE SERVICE
Health worker practices:		
Checked immunization record	70%	95%
Assessed child's general health	5%	50%
Informed mother of return date	35%	62%
Used sterile needle/syring	50%	90%
Maintained adequate cold chai	45%	70%
Exit survey:		
Child has immunization record	20%	100%
Mother knows when she should return with child	25%	83%

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Problems of service quality could offset some of the advantage of serving larger numbers which is a primary goal of mass immunization campaigns.

2. The increased intensity of service delivery during campaigns may be at the cost of quality, maternal knowledge, and compliance with vaccination schedules.

3. Particular attention to performance standards during intensified EPI activities is warranted.

STUDY LIMITATIONS

The authors acknowledge that the sample (n = 59) was too small and unrepresentative to make general statements about campaign effectiveness, but propose that the findings suggest a need for further studies, including more qualitative assessment of services during intensified activities. They make this recommendation (they note), despite the argument that there is often "little time and few resources" to evaluate activities in this setting.

PROGRAM AND POLICY IMPACT

This study was a relatively small scale study but one of several evaluative efforts assessing Nigeria's immunization days activities. In 1988 a nationally focused campaign - National Immunization Days was conducted, and in 1989 State Immunization Days and Local Immunization Days were held instead.

Administrative accounting for immunizations given showed a decrease in total immunizations for 1989 compared to 1988 (14-27% for various antigens). While acknowledging that different districts varied considerably in leadership and effectiveness, the 1989 CCCD Annual Report also noted that in some instances, routine immunizations actually decreased in months preceding and following campaign activities. Although some of this may have been due to an effective campaign (reducing the amount of "catch-up" vaccination carried out during routine immunization activities), there were other concerns that it might represent "burn-out" by either staff or parents in the wake of an intensive burst of campaign activity.

As a result of these concerns about campaign effectiveness, the Federal Ministry of Health proposed (and a 1989 program review team endorsed) specific guidelines for mass campaigns and acceleration strategies. These stressed the need for strengthening existing services, while establishing the following criteria to be met by states planning state immunization days: (1) submission of a plan of action to the Federal Ministry of Health two months prior to the expected dates, (including post-campaign efforts to ensure sustainability); (2) a clear strategy for providing transportation, training, supervision, publicity and personnel for effective implementation; and (3) ability to provide specified minimum levels of equipment, (e.g., steam sterilizers, ice-packs, cold-boxes and vehicles).

PUBLICATIONS

BRYCE JW, CUTTS FT and SABA S: Mass immunization campaigns and quality of immunization services (Letter). **Lancet** 335:739-40 (1990).

REFERENCES

ODUNSI PY: Criteria for conducting State Immunization Days. Federal Ministry of Health. 59/EPI/CDD/1/1. 17 January, 1989.

SAUL S: A report on State Immunization Days of May 16, 17 and 18 for Dustin-Ma LGA of Katsina State. May 25, 1989.

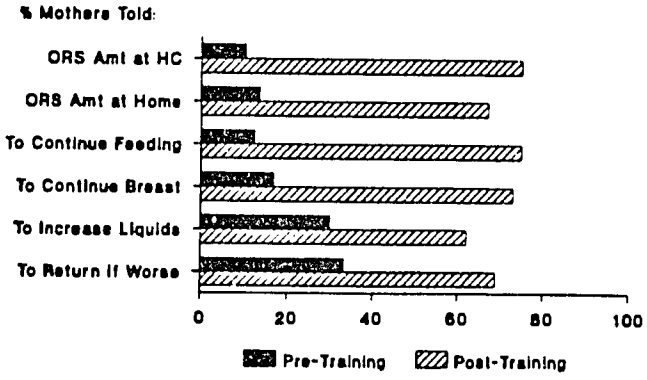
Federal Government of Nigeria and UNICEF: Mid-Term Review of Country Programme of Cooperation 1986-1990. Final report. Lagos 4 - 7 July, 1988.

Diarrheal Disease Research

Applied research in diarrheal disease has been used in various roles over the life of the ACSI-CCCD Project. As illustrated by this series of studies, many of the investigations that were initiated in support of diarrheal disease programs were focused on oral rehydration therapy (ORT) and the treatment of diarrhea. A few studies examined other aspects of diarrheal disease — risk factors for mortality, traditional purging practices, or the community epidemiology of diarrheal disease.

Many of the ORT studies were straightforward knowledge, attitude and practice surveys or formative research carried out using small nonrandom samples. Even so, the collective weight of evidence provided by the number and variety of these studies was a catalyst for individual country programs to reexamine the relative roles of oral rehydration solution (ORS) and sugar and salt solution (SSS) in their national policies.

Health Worker Patient Education Practice
Pre- and Post-Training Facility Surveys
Central African Republic, 1990



Facility-based surveys of treatment practices raised similar concerns about the role and practices of health workers with respect to the misuse of antibiotics and antidiarrheal agents. Fortunately, these facility surveys also showed that such

"Many of the ORT studies were straightforward KAP surveys or formative research . . . Even so, the collective evidence was a catalyst for programs to reexamine the roles of ORS and SSS in their national policies."

"Even when properly prepared, ORS was often given in inadequate quantities to properly rehydrate children with diarrhea."

practices could be changed (at least in the short term) by appropriate training.

A number of common themes were identified during the course of the CCCD Project's experience in diarrheal disease research. Although these findings were not found in every CCCD country, they recurred with enough frequency to cause concern to CCCD program managers. Some of the findings of greatest importance included the following:

- Oral rehydration therapy (ORT) was not as "simple" a strategy as originally conceived. In particular, the promotion of SSS was accompanied by numerous problems.

- Households frequently did not have utensils or materials appropriate for making SSS.

- Many mothers and care-givers who claimed to be familiar with SSS or ORS could not prepare the solutions properly.

- Even when properly prepared, ORS was often given in inadequate quantities to properly rehydrate children with diarrhea. This practice was common to both mothers and health workers. On the other hand, later intervention studies did demonstrate that these practices could be changed by appropriate teaching (see section on Facility-Based Assessments).

- The misuse of antidiarrheals, antibiotics, and other medications was generally widespread. Not only mothers and care-givers but also government health workers often inappropriately used these medications for uncomplicated diarrhea.

- Use of ORT did not necessarily lead to any lesser use of alternative (often harmful) therapies, such as antibiotics or antidiarrheal drugs.

- In a surprising number of instances, mass media such as radio and print had relatively little effect on mothers' familiarity with ORT. Levels of access to radio varied considerably among the sites surveyed, but a consistently high proportion of

respondents reported health workers as their principal source of knowledge about ORT.

- Levels of knowledge about the causes and effects of diarrhea varied widely. However, the proportion of respondents reporting use of "traditional" treatments (such as bush teas or enemas) was generally low, and acceptance of "Western" medicine was generally high, even when respondents also held traditional beliefs.

- Although CCCD research sometimes found evidence of harmful traditional practices, the harmful misuse of Western medicine appeared to be far more prevalent than the harm engendered by traditional practices. In addition, many of the usual concerns about maternal practices during diarrhea (such as ceasing breastfeeding and withholding food) were not widely prevalent in the studies carried out under CCCD.

- Effectively functioning ORT units can be cost effective in reducing diarrhea-related hospital admissions. Such units can also improve treatment practices among health workers (see section on Health Services Research).

Three main points can be made regarding diarrheal disease research and the impact of CDD-related research conducted within the CCCD Project:

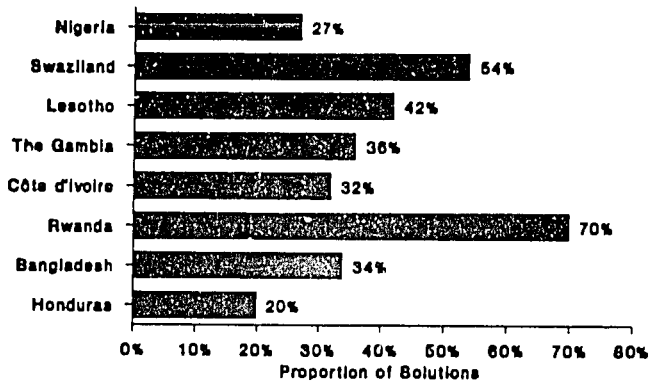
First, the effect was cumulative. Although individual studies were often convincing demonstrations in their own right (see, for example, studies by SHAW, MALENGA and JI-NADU), the overall strategy of the CCCD Project was very much influenced by the accumulated evidence of many studies in many different settings, all tending to identify the same problems or themes. This consistency of findings across national boundaries and across rural-urban divisions greatly influenced the acceptance of these findings. Moreover, these findings were generally consistent with research being published by other investigators.

Secondly, it was often important to have locally available data. The fact that KAP studies in one country identified major problems with diarrhea treatment practices or ORT promotion seldom had much influence on decision makers in

"In a surprising number of instances, mass media such as radio and print had relatively little effect on mothers' familiarity with ORT."

"This consistency of findings across national boundaries and across rural-urban divisions greatly influenced the acceptance of these findings."

Proportion of Prepared SSS Samples with Sodium Concentration > 100 mEq/liter



another country. On the other hand, locally generated data from facility-based assessments or community studies often had considerable influence on decision makers, and such examples were often cited by program managers during assessments of CCCD applied research.

Third, because many of the interventions related to diarrheal disease were behavioral interventions (and often involved the alteration of deep-rooted behaviors or cultural practices), the policy development and implementation phase that normally follows research was particularly important. In this respect, the "selling" of findings and recommendations to decision makers was of paramount importance. In the CCCD experience, the response to diarrheal disease research and the impact of such research have been mixed. In general, both the initial strategy of ORT promotion and the subsequent changes in strategy by governments in response to research findings have often been inadequate to ensure the maximum effectiveness of this strategy. With respect to prevention of diarrhea through behavioral change, the results have also been mixed. Although national programs to control diarrhea have often expended considerable resources on ORT promotion through health education programs and provision of ORS packets, the programs have infrequently monitored the actual effect of these efforts on practices. Where programs have done so, the results have often been discouraging and the programs' response (in terms of corrective action) has often been inadequate. For example, several programs decided to reduce or discontinue program emphasis on SSS after research revealed that mothers frequently prepared it improperly. This action was relatively easy for a program manager to accept, since it did not involve expending additional resources but simply involved discontinuing

an existing (but ineffective) strategy. On the other hand, there has been less success with efforts to interest programs in health education intended to actively discourage health workers and mothers from using antibiotics and antidiarrheals in diarrhea treatment. When such practices have been periodically evaluated, the results have often been discouraging. It is apparent that the sociobehavioral research undertaken by CCCD has been very effective at problem identification; such research now needs to be equally convincing in demonstrating the effectiveness of behavioral interventions.

"It is apparent that the sociobehavioral research undertaken by CCCD has been very effective at problem identification . . . Such research now needs to be equally convincing in demonstrating the effectiveness of behavioral interventions."

Note: Although this section presents a range of diarrheal disease research projects undertaken by the ACSI-CCCD Project, it does not include the entire spectrum of diarrhea-related studies. The multipurpose facility-based studies and community-based KAP surveys that are described in other sections also contain important diarrheal disease components. These studies also contributed greatly to the evolution of diarrheal disease policy and strategies.

EVALUATION DE L'UTILISATION A DOMICILE DES SOLUTIONS FAMILIALES DE REHYDRATION ORALE DANS LES DIARRHEES AIGUES BENIGNES

STUDY LOCATION: COTE D'IVOIRE

SHORT TITLE: **EVALUATION OF HOME ORS**

PRINCIPAL INVESTIGATOR: SHAW, Dr. Estelle
Ex Sous-Directrice des Protection Maternelle et Infantile de Côte d'Ivoire,
Ministere de la Sante Publique et de la Population

CO-INVESTIGATORS: Darracq R, Kogbo W, Roy C, Anouma J, Anderson C, Klein Zabban ML, Davis CE, Rey JL.

STUDY DESIGN

This was a prospective study of 300 mothers of children younger than 5 years of age treated for acute watery diarrhea. Mothers were recruited at three Protection Maternelle et Infantile centers in Abidjan and were taught to prepare one of three recommended formulas for home-based oral rehydration solution (ORS): salt-sugar solution, rice-water solution, or guava leaf formula. Each formula included addition of eight cubes of sugar, and one level teaspoon of salt (cuillere a cafe) to 1 liter of liquid (plain water, guava leaf "tea," or "rice water"). Teaching was conducted in groups of 10 to 20 persons, each group receiving 10 to 30 minutes of instruction followed by demonstration of ORS preparation and distribution of appropriate printed materials.

Children were followed at home during the first week and one month later (Day 1, Day 3, Day 7 and Day 30). A sample (150 to 200 ml) of solution prepared by each mother at home was collected one day after the mothers had received instruction. Samples were analyzed at the nutrition laboratory of the Institut National de Santé Publique for sodium, potassium, osmolarity, and reducing sugars.

RESULTS

A total of 300 mothers were interviewed; 301 children were registered and 299 samples of solutions were analyzed for content. ORS therapy was abandoned on Day 1 for 7 cases because of continued severe diarrhea. In two cases, mothers used other, traditional remedies in addition to prescribed ORS therapy. One 6-month old infant died following the recurrence of diarrhea between Day 3 and Day 7. Forty-one children (13.6%) were lost to follow-up at Day 30. Other findings were:

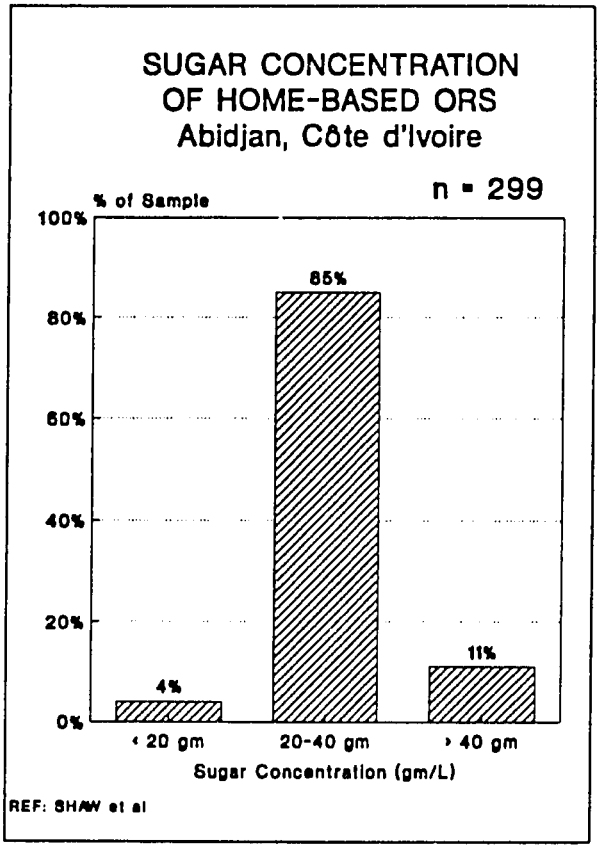
- Of 300 mothers interviewed, 64% were illiterate.
- In all, 91% of mothers reported using a liter container for measuring solution; 78% used sugar cubes measured at 4 g, 17% used cubes weighing 4.5 - 5.0 g, and 2% of mothers used granular sugar (*sucre en poudre*).
- Sodium concentration: There was no significant difference among the three solutions with respect to sodium concentration. Only 63% had acceptable concentrations (40 - 100 meq/L), whereas 32% had dangerously high sodium concentrations (over 100 meq/L), including 17% that were more than 120 meq/L.

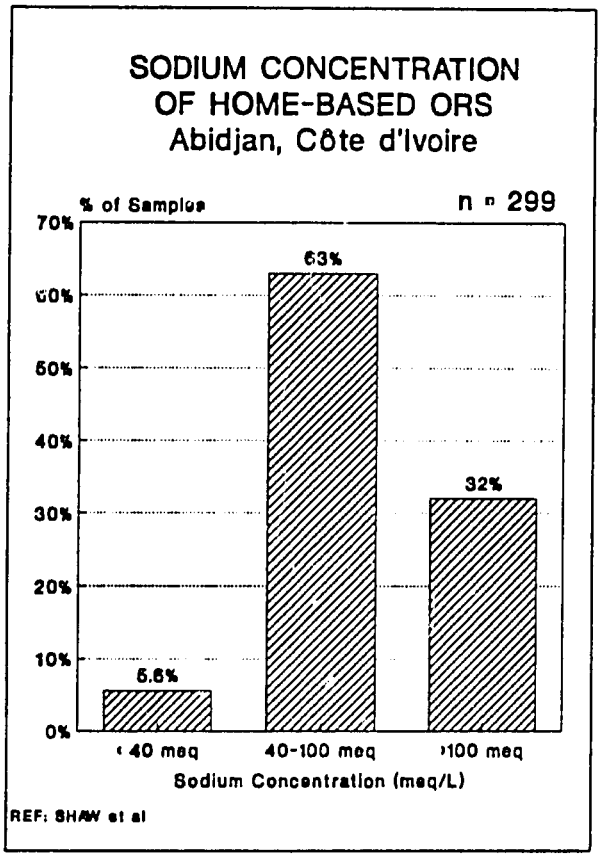
- Sugar concentration: 85% of solutions were within acceptable levels (20 - 40 g/L), whereas 4% were below and 11% were above acceptable levels.

- Potassium concentration: Only the formulation made from guava leaves had potassium in any measurable concentration, with a mean concentration of 2.9 meq/L (compared with the WHO recommended formula that has 20 meq/L Potassium).

- Osmolarity: 69% of solutions had osmolarity between 200 and 350 mOsm/L (compared with the WHO formula that has an osmolarity of 330 mOsm/L); 13% of solutions had an osmolarity less than 200 mOsm/L and 17% were greater than 350 mOsm/L.

- Effect on weight gain: 20% of 194 children (at two centers) lost weight by Day 3; the remainder had weight gain (68%) or no change in weight (12%). Only 7% of children had measurable weight loss at Day 30.





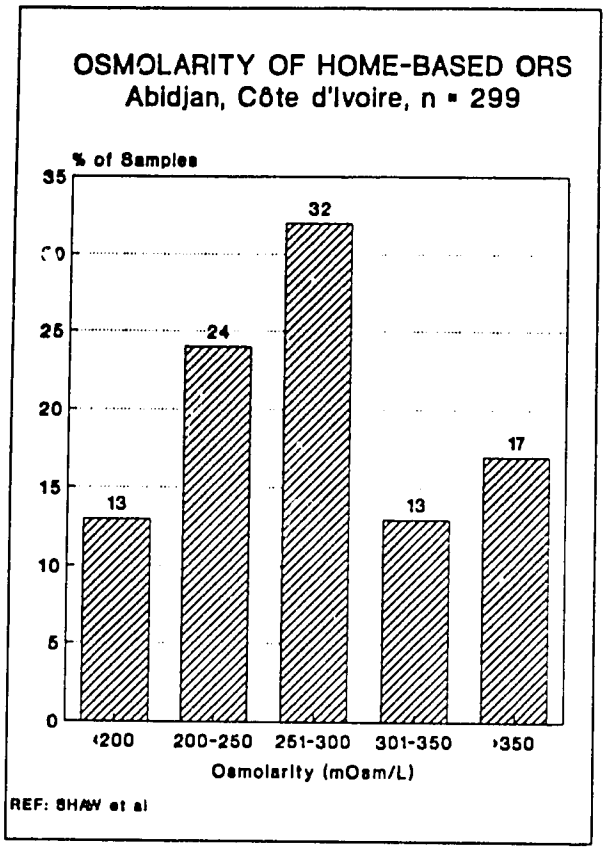
STUDY CONCLUSIONS AND RECOMMENDATIONS

1. The study concluded that procuring utensils and materials for home preparation of ORS was not a major problem. However, a great diversity of implements and materials was noted.

2. The measured weight of sugar cubes found in homes was usually 4 g or 4.5 g rather than the 5 g assumed by the recommended formula.

3. Nearly one in three mothers prepared a solution with too high a sodium concentration despite specific training just one day before the sampling.

4. Reexamination of the role of home-based ORS solutions was recommended in view of the risks of uncontrolled use and varying composition.



STUDY LIMITATIONS

Considerable precautions were taken to ensure accurate laboratory analysis. Some difficulties common to these measurements generally were glycolysis and breakdown of sugars in samples, or hydrolysis of starch in rice-water formulas. Consistency of the results among three different sites and with respect to sodium concentration (which is usually measurable with fewer methodological problems) support the conclusion that variability in preparation, rather than measuring errors, was the cause of the measured differences.

POLICY IMPACT

This study's findings were of considerable importance in the reevaluation of country policy with respect to the promotion of home-based ORS. A 1986 UNICEF evaluation recommended that "the policy of using both ORS packets and home solutions be retained, but that considerably more emphasis be placed on packet use in facilities" (HOGAN, 1986). Subsequent external evaluations by the University Research Corporation in May 1987 (PLOPPER et al., 1987) and by the PRAGMA corporation in May 1988 (BROWN and REINGOLD, 1988) further endorsed the need for policy reevaluation, using Dr. Shaw's findings in support.

The study's findings were also consistent with other country studies.

PUBLICATIONS

None documented.

REFERENCES

HOGAN RC: Travel report: August 13, 1986.

PLOPPER S, GUYON A, SATURNIN MA: Evaluation of the ACSI-CCCD Project, Ivory Coast, May 4 - 29, 1987.

BROWN VW, REINGOLD A: Evaluation of ACSI-CCCD Project, Côte d'Ivoire, May 18 - June 3, 1988.

ETUDE DES RAISONS PROFONDES DES LAVEMENTS TRADITIONNELS CHEZ LES ENFANTS EN CôTE D'IVOIRE

STUDY LOCATION: COTE D'IVOIRE

SHORT TITLE: **PURGING PRACTICES IN CHILDREN**

PRINCIPAL INVESTIGATOR: KOUAME, Kale
Sociologue Medicale
Institut National de Santé Publique BP V47 - Abidjan

CO-INVESTIGATORS: Guessan, Mah-Bi

STUDY DESIGN

The principal focus of this study was an examination of traditional purging practices. Such practices generally involved administration of enemas (lavements) among different ethnic groups in Côte d'Ivoire. Three "formative research" methods were used to develop data: focus groups; direct observation; and individual interviews. The study used six female interviewers; study subjects were chosen from three prevalent ethnic groups: Bete, Gouro and Baoule. Study villages were stratified by their "level of development". Subjects, stratified by sex and age (10% random sample), were selected following enumeration of villages. Focus groups (nominally) consisted of 6 to 12 individuals. Groups were segregated by sex.

RESULTS

Direct Observation

The administration of enemas in a traditional setting was directly observed in 18 instances. Results were as follows:

- Of 18 episodes of treatment observed, 10 (55%) were infants or children less than 5 years of age; 17% were pregnant women or women in labor.
- Parents or grandparents had recommended the enema in 55% of cases.
- Parents administered the enema in 61% of cases. Individuals administered it to themselves in 39% of episodes.
- In 14 (78%) of 18 subjects, no significant adverse reaction to the enema was noted. Agitation or "panic" occurred in 4 cases (22%).
- No fundamental differences were seen by ethnic group or locality. Composition of the enema fluid included leaves or herbs in 72% of cases, and tree bark in 33%; irritant ingredients were used in 78% of cases.

Focus Group Interviews

These interviews examined eight areas of interest, including the degree of participation in traditional practices, indications for the use of enemas, composition of the fluids, and treatment outcomes.

- The composition of the enema fluid depended on the nature of the illness and the age and sex of the individual. Enemas were administered with traditional or modern instruments, or by mouth in the case of infants.
- Indications for treatment included the following:
  - *Djekoidjo* used by all groups to describe symptoms consistent with malaria or jaundice.
  - Hernia
  - Back pain/ lumbago
  - Constipation
  - Pelvic pain or *boboduman* in females

- Hemorrhoids, gonorrhea and sterility in adults
- Fever, constipation, measles and dysentery in infants and children.

None of the groups surveyed used traditional enemas for any cases of diarrhea in children except dysentery.

- Composition of fluids: Respondents used the following herbs or leaves — *nime* (used for djekoidjo), *quinqueliba* (used for fever), and pepper (two varieties).

- Perceived benefits were different for children, women in pregnancy and during labor, and the elderly. Among children, the principal benefits were promoting improved growth and posture and preventing constipation (strongest in the Baoule). In Baoule, enemas were traditionally administered to infants regularly every morning and evening after bathing the child (generally without pepper). This practice was less entrenched amongst the Bete and Gouro. Enemas were administered to neonates to promote passage of meconium and to prevent the mother's milk from "hardening" in the infant's stomach.

- Among the Baoule, recommendation for enema administration was generally made by males. Among the Bete and Gouro the recommendation was generally made by women or herbalists.

- Perceived dangers and complications of enema practices included profuse sweating, violent colic, palpitations and vertigo, loss of consciousness, and (infrequently) death.

- Treatment of adverse complications included administering a cold bath (for sweating), a cold water enema (colic), drinking palm oil or kaolin in cold water (colic or vomiting), and smearing the anus with oil (for burning in the rectum).

- The Baoule were particularly antagonistic about any consideration of foregoing traditional practices. Other groups also expressed little eagerness for "abandoning one beneficial practice in favor of another."

Individual Interviews

Individual interviews were conducted in 96 households — In all, 49.5% of respondents were male, 50.5% were female; 31% were Bete, 33% Gouro, and 35% Baoule. By religion, 28% were Catholic, 6% Protestant, 15% were of other Christian faiths, and 47% were of traditional "animiste" religions.

- The prevalence of enema practices among the three groups was greatest in the Baoule, followed by the Gouro and the Bete. The difference was statistically significant. Only 3% of women had never administered traditional enemas for a child. Most (99%) began their practice of enemas between birth and 2 months of age; 79% stopped the practice when the children were older than 25 months.

- Illness was the most frequent reason for administering traditional enemas to adults. In men, the reasons given included waist or back pain (48% of men), malaria (36%), and "colic" or gastrointestinal disorders (35%). Among women, the reasons given were abdominal pain (58%) and malaria (40%).

- Thirty-two percent of respondents cited cultural traditions as an underlying reason for administering enemas. Other causes were less frequently cited.

- Improved digestion and prevention of constipation were the most common indications for administering enemas to children (53% of respondents), followed by improved growth and posture (25%).

- Seventy-six percent of respondents among the Baoule and Gouro, and 67% of Bete, cited no complications resulting from traditional practices. Complications and treatment of complications were similar to those identified by focus groups.

- Although 19% of respondents knew of some infant or child who had suffered adverse consequences from traditional enemas, only 25% said they would not consider administering enemas again. Christians and younger women were somewhat more likely to consider abandoning traditional practices.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Traditional enemas represented a cultural tradition in this area, whose underlying basis was treatment of illness or maintenance of good health.

2. Adverse complications sometimes resulted from difficulty in appreciating the temperature of heated enema solutions, incorrectly estimating the "dosage" of pepper or irritants needed, and trauma from the instruments in administration.

3. These complications were rare in neonates because the enema was usually administered by mouth and because irritants were seldom used.

4. The practice of administering traditional enemas was based on secular reasoning, not religious practice.

5. Various nontraditional ingredients were increasingly used because of the influence of herbalists, drug-sellers, and others. This in turn caused problems in identifying the products used and controlling their use.

6. The authors recommended intensifying mini-campaigns in weaning practices, diarrheal disease control, malaria control, and immunization. Also recommended were instruction of health personnel in traditional health practices and terminology, use of culturally appropriate messages in mass communication, and the use of traditional communication channels — for example, chiefs, political and religious leaders, and singers.

STUDY LIMITATIONS

Two significant modifications to focus group methods were necessary in the African field setting. First, traditional family and community groupings often necessitated focus groups that exceeded the recommended size of 6-12 participants. Secondly, the stipulation that "participants should not know each other" was considered culturally inappropriate, since it is generally unacceptable in this rural African setting to discuss sensitive personal subjects among strangers.

Additional study limitations included the following:

- Inquiry into the "dangers" of traditional enemas was met with strong objections particularly in male focus groups, who interpreted the inquiry as a condemnation of the practices and an attempt to prohibit them. Respondents' perceptions of the interviewers' motivation may have significantly biased the veracity of responses (for example, by minimizing ill effects).

- Conclusions and recommendations appear preconceived, rather than derivative, because the findings of this particular study provide only marginal evidence of adverse effects from traditional practices. The comment that "enemas in infants and small children remain always dangerous" may be true, but was not proven conclusively by this study.

- The recommendations that were made were very general and only indirectly related to the study findings. Whereas the promotion of immunization, local language broadcasts, and other measures are admirable, the specific factors that the study identified as favoring abandonment of traditional practices were Christian faith and younger age of females.

- Formative research of a predominantly qualitative nature (such as this study) may be better suited to identifying areas for future inquiry of a more specific, focused nature than for generating concrete recommendations.

- Study findings on the use of enemas in children with diarrhea seem to contradict prior findings of DAVIS et al that 24% of diarrhea cases received traditional enemas before arriving at one ORT clinic.

PROGRAM AND POLICY IMPACT

None documented. This study addresses basic knowledge deficits with respect to traditional practices rather than a specific operational problem.

PUBLICATIONS

None documented.

References

DAVIS CE: ORT in Côte d'Ivoire: A review of the first 6 months of a demonstration unit at Port-Bouet. Unpublished report, 1986.

INVESTIGATION INTO THE FACTORS CONTRIBUTING TO CHILDHOOD MORTALITY CAUSED BY DIARRHOEAL DISEASES IN HOSPITALS, LESOTHO 1983 AND 1984

STUDY LOCATION: LESOTHO

SHORT TITLE: **FACTORS IN CHILDHOOD DIARRHEA MORTALITY**

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CO-INVESTIGATORS: Nyaphisi M, Ryan C, Ramatlapeng T, Hargrett-Bean N, Waldman RJ, Blake P

STUDY DESIGN

*This was a retrospective review of diarrhea deaths over a 2- year period (1983 - 1984) at six regional hospitals that had a range of case-fatality rates (CFR): High CFR (CFR greater than 16) — **Maluti, Butha Buthe**; medium CFR (8 to 16) — **QE II, Roma**; and low CFR (less than 8) — **Morija and Mafeteng**. Health information system reports were compared with hospital logs and medical records. Two separate case-control studies at two hospitals were carried out; cases were defined as deaths of children from birth to 24 months of age with a diagnosis of non-bloody diarrhea from November 1983 to May 1984. Controls were children who met the same clinical criteria as case-patients, but they survived. Twice as many controls as cases were chosen; controls were not matched. Diagnostic information was abstracted from existing medical records. The dehydration level was transcribed as recorded by the admitting physician. Weights on admission (adjusted for the degree of dehydration) were used to evaluate malnutrition, using National Center for Health Statistics/Centers for Disease Control normalized curves for the international growth reference. Analysis was carried out using univariate methods (Wilcoxon Rank Sum, Fisher's exact test) and multivariate methods (logistic regression).*

RESULTS

The health information system reported deaths in 112 of 1,191 children (CFR = 9.5%). A total of 104 fatal diarrhea cases were reviewed in the final case-control study.

- The median age of children who died was 7 months, and 94% of children who died were 24 months or younger.
- In the two case-control studies, children who died were ill for a median of 5 days in one hospital and 8 days in the other before seeking treatment, compared with 3 days for children who did not die ($p = 0.02$ and $p = 0.04$).
- Antibiotics or antimicrobials were given to 94% of children who died compared with 73% of controls at hospital 1, and 73% of cases and 74% of controls at hospital 2.
- Using univariate analysis, eight factors were associated with death at one or both hospitals:
  - Diagnosis of major infection
  - Age younger than 6 months
  - Illness for longer than 7 days before admission
  - Thrush or stomatitis on admission

- Severe dehydration
- History of vomiting
- Dehydration that had not improved within 12 hours
- Fever or subnormal temperature.

- By multivariate analysis, three risk factors remained significant:

  - Major infection (p less than 0.001)
  - Age younger than 6 months (p = 0.01)
  - Illness for longer than 7 days (p = 0.05).

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Many children who died were hospitalized late in their illness and might not have received adequate hydration in the initial critical phase after admission.

2. Although thrush and stomatitis were not statistically significant as predictors of death they may be clinically useful.

3. There was no demonstrated association between diarrheal deaths and first or second degree malnutrition.

4. Data on a small number of patients in study 2 suggested an association between the use of traditional remedies and death (data not shown), but the risk was not statistically significant.

STUDY LIMITATIONS

- The prevalence of factors such as breastfeeding, use of oral rehydration therapy and fluid therapy in hospital could not be adequately assessed.

- No pathological studies for stool pathogens were done.

- The quality of data in records often varies and may be questionable with respect to diagnostic accuracy or severity of dehydration.

- Recorder bias may influence the recording of traditional remedies in children who died when compared with survivors.

PROGRAM AND POLICY IMPACT

None documented. The potential impact of this study relates to improving early access to health care for mothers with ill children and to improving in-hospital intervention, where possible.

PUBLICATIONS

GRIFFIN PM, RYAN CA, NYAPHISI M et al.: Risk factors for fatal diarrhea: A case-control study of African children. Am J Epidemiol 128:1322-9 (1988).

A STUDY OF KNOWLEDGE, ATTITUDES AND PRACTICES CONCERNING CHILDHOOD DIARRHOEA AND DEHYDRATION IN MULANJE DISTRICT, MALAWI

STUDY LOCATION: MALAWI

SHORT TITLE: **KAP IN CHILDHOOD DIARRHEA, MULANJE**

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Mulanje, Malawi

CO-INVESTIGATORS: Nyasulu YMZ

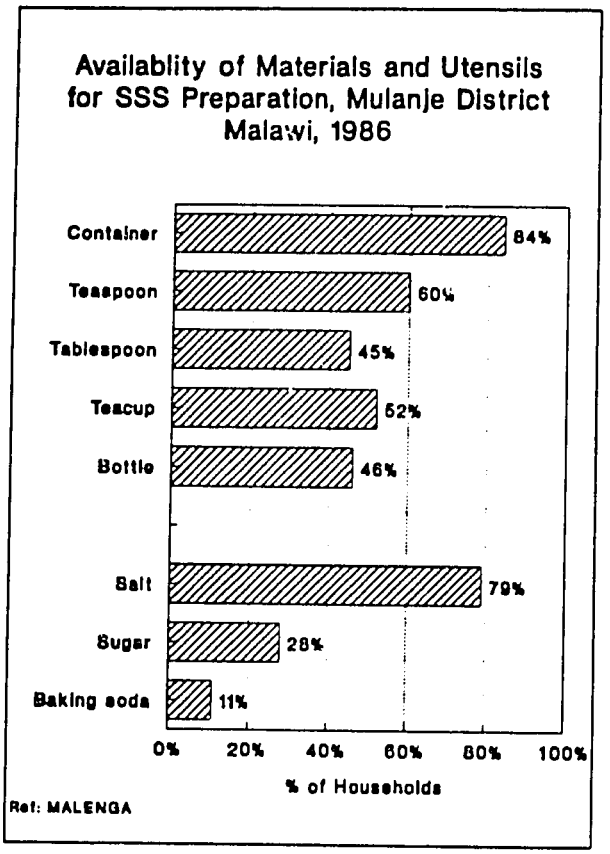
STUDY DESIGN:

*This was a questionnaire survey of mothers or caregivers of children younger than 5 years of age in **Mulanje district** (population 557,600), an area underdevelopment by the **Rural Piped Water Project**. A total of 90 villages were selected randomly from a listing of 800 villages. Of these 90 selected villages, 44 had access to a community health program, the **Health Education and Sanitation Promotion Project (HESP)**, part of the above-mentioned water project. These 44 villages were designated as HESP target villages. "About 10 households" were chosen from each village. All of the enumerators used to administer the questionnaire were men, including five members of the health department staff from the district.*

RESULTS

A total of 896 women were interviewed (44% from HESP target villages, 56% from nontarget villages).

- In all, 24% of respondents related an episode of childhood diarrhea within the preceding 2 weeks.
- Only 3% of respondents did not know any signs or symptoms of diarrhea; 78% knew of frequent watery stools, but only 19% associated it with signs of dehydration.
- Although 95% of mothers had heard of sugar salt solution (SSS), only 14% could recall the formula correctly. For prepackaged oral rehydration solution (ORS), 9% of mothers knew the appropriate amount of water used. Only 0.1% of mothers learned of SSS from the radio, whereas 93% of mothers had heard of it from the hospital or health center.
- The most frequent action reportedly taken for diarrhea was to give SSS or ORS at home (52% of respondents). The proportion of mothers who reported use of herbal teas was very small (1.5%).
- Sixty-six percent of mothers reported no change in feeding patterns during diarrhea; the other third changed their child's diet during diarrhea, but only 1% stopped feeding. Only 3% of mothers stopped breastfeeding during diarrhea episodes.
- The availability of materials and utensils for SSS preparation is shown in the accompanying figure.
- There was no significant difference in knowledge or practices between HESP target villages and non-target villages, but there was some difference in the type of water supply reported and in the proportion of respondents with "satisfactory drinking water storage."
- Only 23% of respondents owned a radio, but 59% had access to one.



STUDY CONCLUSIONS AND RECOMMENDATIONS

1. The study revealed that knowledge about causes and symptoms of diarrhea was widespread. Often, both conventional and supernatural causes were accepted.

2. Radio messages had surprisingly little effect on knowledge about diarrheal diseases. Very few mothers or caregivers knew the correct preparation of SSS or ORS.

3. The investigators of this study concluded that greater promotion of ORT is necessary to improve low "coverage."

STUDY LIMITATIONS

- The use of health personnel as enumerators may have biased responses toward "desired" behavior (for example, underestimating the use of herbal teas and overestimating SSS use).

- The range of responses in the structured questionnaire may also have been too limiting to elicit an accurate range of behavior.

- Although the sampling method did not produce a sample proportional to population size (pps sample), heterogeneity of the sample throughout different districts does appear to have been achieved. However, the sample was not appropriate for determining overall prevalence rates.

- Interviews were conducted in the dry season (during a period of relatively low diarrhea incidence), and might not have accurately represented the situation during the rainy season, when the major health impact of diarrheal disease generally occurs.

- A different design may have better exploited the potential for identifying differences between HESP villages and non-target villages. However, that was not the primary objective of this study.

PROGRAM AND POLICY IMPACT

This study's findings were presented to the Ministry of Health in November 1986 and figured prominently in the development of the country's diarrheal disease policy and national diarrheal disease control program. The findings were also the basis for later investigations under the auspices of CCCD and HEALTHCOM activities in Malawi (targeted at developing appropriate messages for diarrheal disease control and the means for their dissemination).

Although the 1985 - 1989 National Plan does emphasize promotion of SSS, later evidence suggests the acceptance of a lesser priority for SSS in accordance with this study's findings and recommendations (see KENDALL, 1987 and FOSTER, 1988).

REFERENCES

KENDALL C: Malawi HEALTHCOM Project Formative Research — Diarrheal Disease Component, Project Report, January 29, 1987.

FOSTER SO: Malawi ACSI-CCCD Supervisory Review. Feb 8-12, 1988.

RELATED STUDIES

HELITZER-ALLEN DL: Formative Research on Diarrhoea, Malawi. Health Education Unit, Ministry of Health, Malawi, 1987.

This study relates the findings of research conducted in February 1987 in three districts of Malawi. Focus groups and a questionnaire survey showed that mothers had a low opinion of SSS, believing it was just water (*madzi*) as opposed to medicine (*mankhwala*). Most mothers wanted treatment to stop the diarrhea and had little appreciation of the role of dehydration in the illness. Although many mothers reported having no sugar in their households for SSS, many had used sugar with phala on the morning of the interview. Mothers identified 12 "types" of diarrhea, and numerous causes spanning the range from traditional beliefs to the conventional disease model. Knowledge and use of SSS were generally low. This study recommended the formulation of alternative health messages as well as measures to involve other family decision makers (grandmother, grandfather, neighbors).

KALILANI, JA and HEYMANN D: Sodium Concentration of SSS Mixed in Outpatient Facilities. Ministry of Health, Malawi: 1986.

This study evaluated practices in a sample of 271 women in outpatient facilities in three regions of Malawi. Women were asked to mix SSS while being directly observed. Of the total, 51% claimed that they had used SSS at home previously. Only 20% of solutions tested had an acceptable concentration of sodium (80 to 110 meq/L Na), whereas 50% of solutions had a concentration greater than 110 meq/L.

ASSESSMENT OF KNOWLEDGE, ATTITUDES AND PRACTICES IN THE MANAGEMENT AND PREVENTION OF DIARRHOEA IN ZIMBABWE (JULY 1984)

STUDY LOCATION: ZIMBAMBWE

SHORT TITLE: **KAP IN DIARRHEA PREVENTION AND TREATMENT**

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CO-INVESTIGATORS: Dube N, Gwebu ET, Ramji S

STUDY DESIGN

Multistage sampling was used to select eight clusters of 60 households each, one from each province. Questionnaires were administered to mothers or the principal care-giver of a target child younger than 5 years of age with a history of a diarrheal episode during the preceding 6 months. Interviewers were trained university students, fluent in each local language. Questionnaires were pretested. A similar questionnaire was administered to provincial health workers including health assistants, medical assistants, community health sisters, and village health workers (VHWs). A concurrent observational survey of the household and environs was conducted by the interviewers administering the questionnaire.

RESULTS

Household Survey

A total of 808 households were visited. Some 480 mothers or care-givers were interviewed; 80% of respondents were the natural mothers of the target child.

- The perceived cause of diarrhea was most commonly cited as poor diet (30%) or teething (25%). Perceived consequences of diarrhea included dehydration (58%), infection (4%), and death (43%).
- Seventy-three percent of all respondents believed that diarrhea was not preventable, and 63% believed it was not infectious.
- The most frequently cited action taken by mothers was to take the child to the health center (46%); only 11% used traditional medicines.
- Only 5.8% of mothers said they contacted the VHW for an episode of diarrhea.
- Only 12% of mothers stopped breastfeeding because of diarrhea.
- In all, 72% of mothers said they had been taught to prepare sugar and salt solution (SSS); however, only 21% of these (15.2% of total respondents) could describe its preparation correctly.
- Only 25% of mothers knew that SSS would correct dehydration, while 37% believed that SSS would stop or cure the diarrhea. One-quarter of respondents did not know the function of SSS.
- Necessary household items for making SSS were available in over 88% of homes.

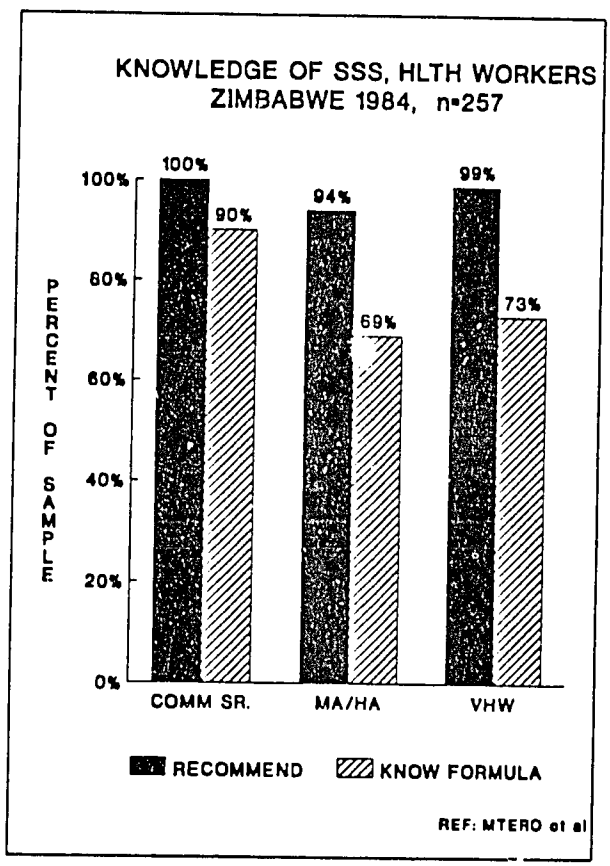
Health Worker Survey

A total of 38 community sisters (senior health cadres), 78 medical and health assistants, and 138 village health workers were interviewed.

- The majority of VHWs (70%) believed that they were the first ones contacted for a diarrheal episode. This view was also held by 37% of community sisters and 26% of M/H assistants.

- Over 94% of health workers would advise mothers to continue breastfeeding. However, 37% of M/H Assistants, and 18% of community sisters said they would postpone vaccination if a child had diarrhea.

- Over 94% of health workers said they recommended home-based SSS to mothers for diarrhea treatment. However, only 90% of community sisters, 69% of M/H Assistants, and 73% of VHWs could state the correct formula.



STUDY CONCLUSIONS AND RECOMMENDATIONS

1. There was general awareness of the seriousness of diarrhea in the community.

2. There was a lack of knowledge about the causes, infectiousness and prevention of diarrhea, as well as about breast feeding and SSS.

3. Although 72% of mothers were taught about SSS, a large proportion of them could not prepare SSS correctly.

4. ORS packets were not available in most health centers, consequently, their use was not promoted.

5. Ingredients for SSS were readily available.

6. There was a positive attitude amongst health workers regarding SSS, but many could not prepare it correctly.

7. Although VHWs believed they were commonly consulted for diarrhea, mothers seldom sought their help.

8. The study's recommendations included promoting appropriate messages on the preventability of diarrhea, and on the continued breastfeeding used together with SSS; and consolidating health workers' messages to avoid incorrect instructions. Emphasizing and promoting the role of VHWs were also recommended. Reaffirmation of the policy on vaccination was also stressed.

"The majority of VHWs (70%) believed that they were the first ones contacted for a diarrheal episode. This view was also held by 37% of community sisters and 26% of M/H assistants."

STUDY LIMITATIONS

- Some of the questionnaire options were not mutually exclusive, resulting in some confusing answers - for example both "poor diet" and "malnutrition" were listed as possible causes of diarrhea.

- Questionnaire options were sometimes so limited as to be obviously "leading" to the respondents — thus the options for "consequences of diarrhea" were limited to dehydration, infection, death, and other.

PROGRAM AND POLICY IMPACT

This study's likely impact was in identifying priority areas for focusing diarrheal disease program efforts. The findings demonstrating underuse of VHWs and low levels of maternal knowledge with respect to ORS preparation were particularly important.

PUBLICATIONS

None documented.

STUDIES ON THE ROLE OF WEANING FOODS AND DRINKING WATER IN THE TRANSMISSION OF DIARRHOEA IN CHILDREN OF FARM LABORERS IN A COMMERCIAL FARMING AREA

STUDY LOCATION:	ZIMBAMBWE
SHORT TITLE:	**WEANING FOODS AND DIARRHEA, ZIMBABWE**
PRINCIPAL INVESTIGATOR:	SIMANGO, Clifford Blair Research Laboratory Ministry of Health, Box 8105 Causeway, Harare, Zimbabwe
CO-INVESTIGATORS:	None documented.

STUDY DESIGN

This was a case-control study. Cases comprised children who were seen at health centers with diarrhea (more than three stools within 24 hours). An equal number of controls were selected, matched for sex and age. Samples of weaning food and drinking water were collected from households of all cases and controls. Samples from the local water source were also collected. Stool samples were collected from all children with diarrhea and were transported in ***Cary-Blair transport medium*** *for bacterial culture, or stored at -20 deg C for rotavirus examination. Rotavirus detection was carried out by enzyme-linked immunoasorbent assay. Stools were also screened by microscopy for* ***Giardia lamblia*** *and* ***Entamoeba histolytica****. Water samples were evaluated for* ***Escherichia coli*** *and fecal* ***streptococci*** *(counts /100 ml), and other* ***pathogens****. Questionnaires were administered to all cases and controls to determine food and water storage practices. Data were analyzed using simple univariate methods (Chi square and 2x2 tables).*

RESULTS

A total of 222 weaning food samples were collected from the homes of children with diarrhea and age-matched controls. Weaning foods included *sadza* (a thick porridge), *mahewu* (a fermented, non-alcoholic sour cereal gruel) and vegetables (e.g., cabbage and rape).

- Levels of contamination with E. coli for the most common foods were as follows:
  - "Green mealies" 67% (2/3)
  - Milk 57% (4/7)
  - Pumpkins 21% (3/14)
  - Vegetables 21% (9/43)
  - Mahewu 18% (7/38)
  - Sadza 14% (3/21)
  - SSS 36% (5/14)
- Most foods were stored for periods of 13 to 24 hours. Few were stored more than 24 hours. No relationship was found between storage time and E. coli contamination.

"Few foods were stored more than 24 hours. No relationship was found between storage time and E.coli contamination."

- There was no appreciable difference in E. coli contamination with different types of storage container. E. coli was present in 17% of "left-over" foods, and 15% of foods that were not left-overs.

- Most porridge given to infants was stored for less than 12 hours. The cooking pot was the most commonly used storage utensil. There was a greater tendency to store vegetables for longer than 12 hours (24/43 samples), and this roughly corresponded to greater contamination levels (33% in vegetables stored more than 12 hours compared with 5% in vegetables stored less than 12 hours (p value not given).

- Overall, 3% of food samples (7/222) had bacterial contamination with enteric pathogens — Enteropathogenic E. coli was the most common pathogen isolated.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Although some contamination of weaning foods was noted, the study did not document a clear relationship between storage time and contamination.

2. Foods most likely to be contaminated were green mealies and milk.

STUDY LIMITATIONS

None cited. Detailed evaluation of study limitations or operational difficulties that may have affected results was not possible from the limited documentation available.

PROGRAM AND POLICY IMPACT

None documented.

PUBLICATIONS

SIMANGO C: Fecal contamination of weaning foods in Zimbabwe. In: ALNWICK D, Improving young child feeding in eastern and southern Africa, 1987. IDRC-265e, pp 240 -44.

"Most porridge given to infants was stored for less than 12 hours. The cooking pot was the most commonly used storage utensil."

KNOWLEDGE, ATTITUDE AND PRACTICE STUDY FOR ORT PROMOTION IN BENDEL STATE, NIGERIA

STUDY LOCATION: NIGERIA

SHORT TITLE: **KAP STUDY FOR ORT PROMOTION, BENDEL STATE**

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Benin City, Bendel State, Nigeria

CO-INVESTIGATORS: Ijebor FB, Igbeyi B, Adewale K, Urnah F, Okogbe JE, Omijie REU, Osata DE

STUDY DESIGN

This study employed a survey in nine rural communities within three local government areas (LGAs) in Bendel State, using focus groups and small-scale survey methods during the period of October to December 1989. Focus groups were selected to include mothers, fathers, elderly females, community leaders and health workers. A total of 400 mothers were interviewed for the small-scale survey.

RESULTS

- The prevalence of diarrhea averaged 61% (range 54% to 68%). The most commonly reported signs of diarrhea were general weakness, sunken eyes, and weight loss. Watery stool was recognized as the most common sign of diarrhea by 56% of mothers.
- Of all respondents, 42% continued regular feeding of children with diarrhea.
- Of all mothers interviewed, 39% knew about sugar and salt solution (SSS) or oral rehydration therapy (ORT). Of this number, 40% could prepare and administer it properly (16% of the total).
- The most common source of information on ORT was the health service. Neighbors and traditional leaders were the most common sources for general information.
- Only 7% of respondents cited radio or television as an information source. However, 57% of all respondents stated a preference for news or broadcasts in a local language.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Diarrhea was recognized as a significant health problem in the area surveyed.
2. Knowledge of SSS and ORT was very limited in this population. Those who did know about ORT generally received such information from health workers, not from mass media sources.
3. Media programs addressing this population should use local language broadcasts.
4. Traditional rulers should be used to help disseminate knowledge on ORT.

STUDY LIMITATIONS

- The "prevalence" of diarrhea cited in this study is ambiguously defined and did not seem to refer to recall over any specified period (e.g., 2 weeks); it is therefore difficult to evaluate its significance.

- Other qualifying adjectives used in survey questions appear to be similarly ambiguous (e.g., "had diarrhea recently" and "had diarrhea not too long").

- A clear advantage of the chosen methodology (focus groups) was not demonstrated by the findings of this study. A traditional questionnaire survey would seem to be more suited to the information sought by this study.

- The report notes that the area surveyed includes at least 12 distinct linguistic/ethnic groups. The implications of this in relation to a media campaign or program are not really addressed (with the exception of noting the preference for "broadcasts in local language").

PROGRAM AND POLICY IMPACT

This study provides some baseline information on media preferences in this population and provides evidence supporting the need for more widespread promotion of ORT. This study was one of several studies developed with HEALTHCOM's (the Communication for Child Survival Project's) assistance and supported by the Nigeria CCCD Project through the Operational Research Review Committee mechanism (see studies, below).

PUBLICATIONS

None documented.

RELATED STUDIES

AKINFELEYE RA, MOSANYA ME, OSUNKOYA TI et al.: Community knowledge, attitude and practices (KAP) study on ORT/SSS and media habits and practices in Lagos State. Final report, December 1989. Unpublished.

Focus group discussions and a small-scale survey were used in four randomly selected local government area of Lagos State. Of the total of 1,000 respondents, 83% knew some signs of diarrhea and 92% knew the danger of diarrhea. However, 50% of respondents believed diarrhea was caused by teething problems in children. The proportion of respondents who knew of SSS or ORT was 88%; of these, 89% had heard about SSS or ORT from the hospital, whereas only 3% heard of it by means of radio. Of all respondents, 88% had "ever used" SSS, but only 35% of these (or 31% of the total) could prepare it properly. Of 835 respondents whose children had "ever had" diarrhea, only 20% had used SSS to treat that episode; 60% took the child to the hospital and 9% used traditional medicine. Of the respondents who had used SSS, 52% said they used it to stop diarrhea; 46% said they used it to prevent dehydration. Radio was accessible to 50% of respondents and television was accessible to 46%; printed materials were available to only a small proportion (less than 2%) of respondents.

JINADU MK, OJOFEITIMI EO, ABAYOMI IO et al.: Evaluation of home capacity to make salt and sugar solution in a rural area of Nigeria. Final Report, 1990. Unpublished.

Mothers of children seen at a health center for diarrhea were interviewed and taught how to prepare SSS. A total of 224 mothers were seen and followed up at home the next day, when a sample of SSS was taken for analysis. Virtually all respondents (98%) knew of SSS, and 95% cited primary health care workers as their source of knowledge. Of the total, 66% said they had been taught how to prepare SSS previously. Of these, only 45% (or 30% overall) could describe its ingredients correctly; 30% said they used medicinal drugs to treat a child with diarrhea. About 44% of mothers had stopped using SSS by the time they were followed up at home, just one day after being seen at the health center. The main reasons given were "lack of time to prepare it" and "the child refused to drink it." Of 109 solutions sampled, 44% had a sodium concentration between 30 and 80 mmol/L; 50% had a concentration of 81 to 120 mmol/L; and 6% had a concentration higher than 120 mmol/L. A variety of teaspoons of various capacity were noted in homes, and sugar cubes were more commonly found than granulated sugar. Attempts by the investigators to locate and purchase a 3-ml capacity spoon in the local markets were unsuccessful.

IMPACT DE L'EDUCATION POUR LA SANTE SUR LES CONNAISSANCES ET PRATIQUES DES MERES DANS LA REHYDRATION PAR VOIE ORALE A DOMICILE DANS LE MOYEN MONO (TOGO)

STUDY LOCATION: TOGO

SHORT TITLE: **IMPACT OF HEALTH EDUCATION ON ORT USE, TOGO**

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Assistant Médical
Division de la Santé Familiale
Responsable du Programme de Lutte
Contre les Maladies Diarrhéiques, Togo

CO-INVESTIGATORS: Aplogan A, Wilkins K, Karsa T

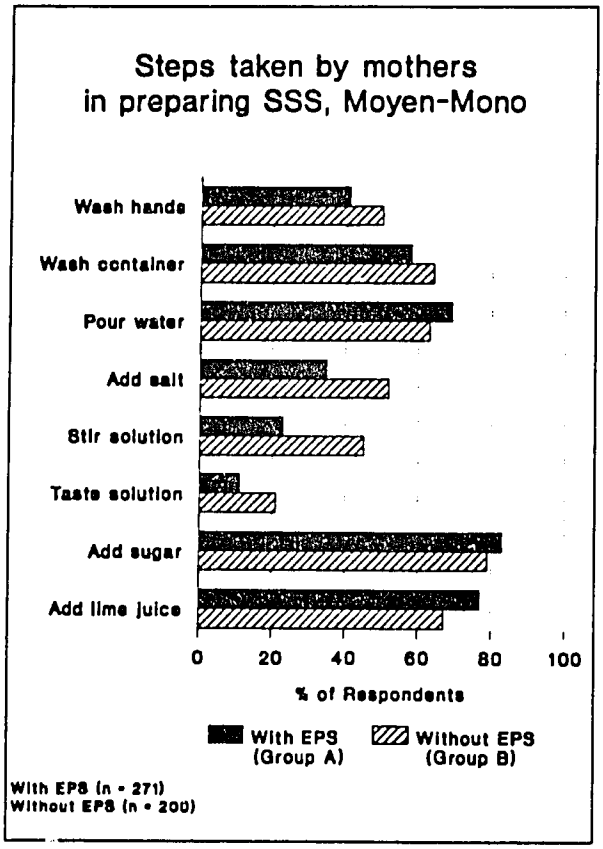
STUDY DESIGN

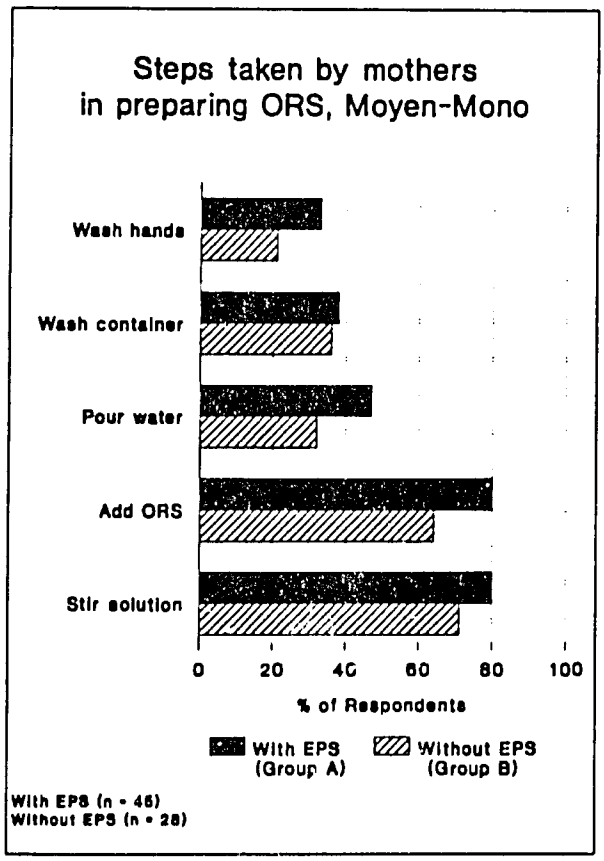
Multi-stage sampling was used to select 1599 mothers from two groups of villages in Moyen-Mono Prefecture, Togo, a pilot area for a health education intervention — "Programme d'Education Pour la Santé" (EPS), introduced in the area since 1989. Group A consisted of 54 villages in which the intervention was more than 75% implemented. Group B consisted of 26 villages where the intervention was less than 25% implemented. A total of 15 villages in group A and 25 villages in group B were included in the sampling frame. The number of mothers interviewed in each village was selected proportionate to population size (pps sample). Univariate methods were used to compare EPS villages with nonintervention villages.

RESULTS

A total of 1,599 mothers of children younger than 5 years of age were interviewed (799 from group A, 800 from group B).

- Of the total, 67% of mothers knew that children with diarrhea should be treated with fluids; however, 46% of mothers believed that sugar and salt solution (SSS) or oral rehydration solution (ORS) would stop diarrhea.
- The treatment most often used by mothers for the treatment of diarrhea were medicinal drugs (36%); SSS (31%); or traditional home fluids (21%). Most mothers reported being taught to use either SSS (47%) or traditional home fluids (27%); only 6% reported being taught to use packaged ORS for diarrhea treatment. Of those, 60% were instructed by a nurse, 21% by a community health worker or *agent de santé communautaire.*
- Only 29% of mothers reported using SSS/ORS at least once. Of those who had not used it, 80% said it was because their child had not had diarrhea.
- Of the total sample, 29% of mothers could prepare SSS, 24% traditional home fluids, and 5% ORS.
- When the group of mothers exposed to health education (group A) was compared with mothers from non-EPS villages (group B), a *greater* proportion of mothers in group A believed that oral rehydration therapy stops diarrhea (60% in group A compared with 33% in group B). Mothers in group A were also more likely to use SSS (61% in group A compared with 33% in group B, $p = 0.0001$), or ORS (8% in group A compared with 4% in group B, $p = 0.01$).





- Mothers in group A were more likely to use SSS or ORS for every diarrheal episode. They were also less likely to use traditional home fluids or medications. However, in the preparation of SSS, the proportion of mothers who added salt to SSS, stirred the solution, and tasted the solution was higher in villages without health education (group B) than in EPS villages.

- In the preparation of ORS, mothers exposed to health education (group A) performed better in all five steps — washing hands, washing the container, pouring water, adding ORS, and tasting the solution.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Although two-thirds of mothers knew that children with diarrhea should receive oral rehydration, only 6% knew the reason for administering oral rehydration therapy (ORS or SSS).

2. Traditional home fluids and SSS/ORS were the liquids most often used for the treatment of diarrhea.

3. Approximately 36% of mothers used medicinal drugs for the treatment of diarrhea in children.

4. Overall, health education was found to have a positive effect on the knowledge and practices of mothers. However, some mothers apparently learned erroneous information from health educators (e.g., that ORS stops diarrhea).

5. The authors recommended that methods should be explored to implement more extensive health education strategies in additional areas.

6. The authors also recommended that health education should stress the reasons for ORS treatment, washing of hands before preparation of SSS/ORS, and recognition of the signs of dehydration. Such education should also emphasize the dangers of using antibiotics and antidiarrheals in diarrhea treatment.

7. The study also recommended retraining of agents de santé.

STUDY LIMITATIONS

- The use of univariate methods for multiple comparisons, as done in this study may not be sufficiently discriminating to exclude the occurrence of differences between the two groups that occur by chance. Moreover, the results that compare the performance of the groups in the preparation of SSS do not actually show a consistent advantage of health education. Of the eight measures, the group *without* health education actually performed better in five. For ORS preparation the findings were more consistent, with the group exposed to health education (group A) performing better than group B in all five measures.

- Because the magnitude of the differences was not great (even where group A mothers outperformed group B mothers), a recommendation to endorse the health education intervention should probably include an assessment of the cost of such an intervention relative to the gains achieved.

PROGRAM AND POLICY IMPACT

This study was one of several undertaken with CCCD support under the research review committee mechanism. The impact of these studies was compromised by the occurrence of political instability and unrest in Togo in 1992. Plans for a national research meeting to disseminate the results of these studies were curtailed by events, and normal functioning of the health services was also precluded.

PUBLICATIONS

None documented.

THE EFFECTIVE CASE MANAGEMENT OF CHILDHOOD DIARRHOEA WITH ORAL REHYDRATION THERAPY IN THE KINGDOM OF LESOTHO

STUDY LOCATION: LESOTHO

SHORT TITLE: **IMPACT OF QEII ORT UNIT ON DIARRHEAL DISEASE**

PRINCIPAL INVESTIGATOR: HATCH, Dr. Douglas L.
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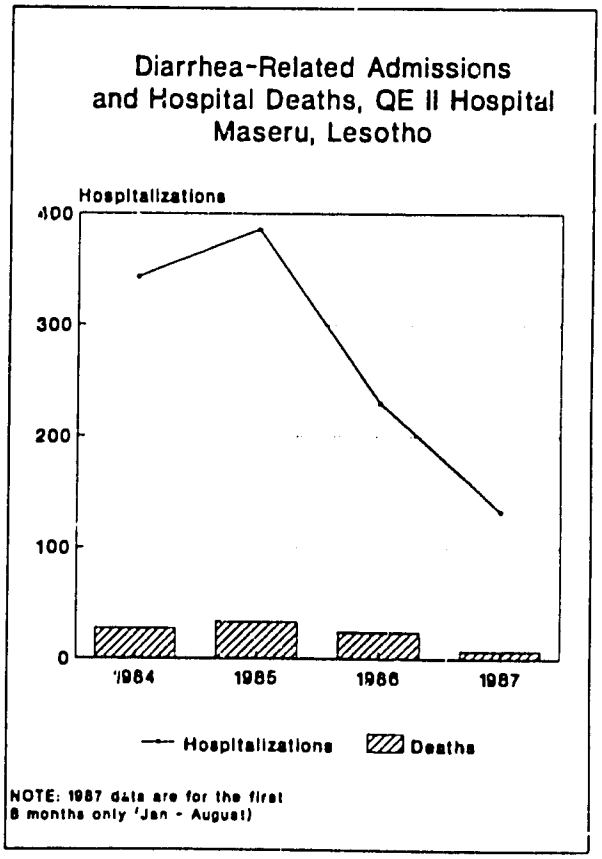
CO-INVESTIGATORS: Vreuls RC, Toole MJ, Moteetee MM, Monoang I, Ngatane CM, Gittelman DM, Waldman RJ

STUDY DESIGN

This study examined the impact of the opening of an oral rehydration therapy unit (ORTU) at ***Queen Elizabeth II Hospital****, Lesotho, in February 1986. Various measures were used for evaluation — the proportion and absolute number of diarrhea-related admissions, case-fatality ratios, and in- hospital mortality. (A study of the economic impact is reported separately — see MCFARLAND et al. in the section on Health Services Research). A case-control study of children younger then 5 years of age was used to evaluate risk factors associated with failing ORTU treatment (i.e., children requiring hospital admission). Information was abstracted from standardized medical forms used in the ORTU and from medical records on the pediatric ward. This study was carried out retrospectively in September 1987.*

RESULTS

- The absolute number of pediatric admissions for diarrheal disease decreased from 388 in 1985 (the year prior to the ORTU opening) to 230 in 1986.
- Of the 322 children admitted after the opening of the ORTU, only 24% were admitted from the ORTU; the others were admitted from the outpatient casualty department during the times that the ORTU was closed.
- More than 97% of children treated in the ORTU were successfully treated and sent home.
- The case-fatality ratio of children treated in the ORTU declined from 1.4% (7/490) in the first quarter of 1986 to 0% (0/554) in the second and third quarters of 1987.



- By univariate analysis, factors significantly associated with failed ORTU treatment included male gender, a history of 6 or more days of diarrhea, fever, undernutrition and moderate or severe dehydration. The only protective factor (i.e., associated with a decreased risk of hospitalization) was breastfeeding in children younger than 2 years of age.

- By multivariate analysis, the following remained significantly associated with increased risk of admission:

	odds ratio
male gender	4.9
fever	2.0
undernutrition	3.2
moderate dehydration	2.3
severe dehydration	12.1

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Effective case management of diarrhea in the ORTU resulted in fewer hospitalizations and deaths in children.

2. Children treated in the outpatient casualty unit (who did not have access to ORT) accounted for 76% of hospital admissions. Data were not available on the total number of children treated in the casualty unit.

3. The efficiency of the ORTU, as measured by the ORTU case- fatality ratio, improved markedly over time.

4. Children who are brought late to the ORTU were at increased risk for hospitalization. Thus, these investigators recommended that parents be encouraged to seek treatment early for children with diarrhea.

STUDY LIMITATIONS

- The authors noted that factors other than effective ORTU management might have been responsible for the decline in case-fatality ratio over time. This possibility could not be excluded by this study.

- The authors also observed that the study did not evaluate out-of-hospital mortality or morbidity for patients discharged from the ORTU. It is possible, they note, that some children may have been discharged prematurely and suffered adverse consequences. Follow-up studies of discharged patients could be used to exclude this possibility.

PROGRAM AND POLICY IMPACT

This was one of several studies assessing the effectiveness of ORT units that were established with CCCD support. The rationale for these studies was mainly to provide concrete evidence that these facilities were useful in reducing hospital admissions and improving patient outcome. During this period, many countries were not entirely convinced of the effectiveness of ORT or ORT units as feasible strategies (as can be seen from the fact that ORT was not being used by the outpatient casualty department at this time). The success of these studies contributed appreciably to the acceptance of ORT units as a useful (and cost-effective) adjunct to other hospital services. In the case of the QE II ORTU, the assessment also included an analysis of the cost- effectiveness of the intervention (see section on Health Care Financing).

PUBLICATIONS

HATCH DL, VREULS RC, TOOLE MJ et al.: The effective case management of childhood diarrhoea with oral rehydration therapy in the Kingdom of Lesotho. Intl J Epidemiol 19:1066- 71 (1990).

RELATED STUDIES

ROISIN AJ: Rapport sur les activites menees au Centre de Rehydration de l'Hopital de Donka, Septembre 1986 - Juillet 1987, Conakry, Guinee.

Between September 1986 and July 1987, a total of 8,051 children were seen at the ORT pavilion at the Donka hospital. Only 1.5% were Plan C (severe dehydration). The total case- fatality ratio was 0.5%. Of 218 cases selected from children visiting the center, 48% occurred in children younger than 1 year of age. The median time period before treatment at the center was 3 days; 71% of mothers waited 3 days or more before seeking treatment. Vomiting was present in 71% of cases and 55% of children had a least 5 stools per day. Intravenous infusions were used for rehydration in 19% of cases; 18% of children without other complications received antibiotics; 17% of children received antidiarrheal agents.

A POPULATION-BASED SURVEY OF DYSENTERY IN KIBUYE HEALTH SECTOR, BURUNDI, FEBRUARY 1992

STUDY LOCATION: BURUNDI

SHORT TITLE: RISK FACTOR STUDY OF DYSENTERY IN BURUNDI

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CO-INVESTIGATORS: Lee L, Deming M, Ntakibirora M, Bizimana F

STUDY DESIGN

This study consisted of a population-based two-staged cluster survey conducted in February 1992 in ***Kibuye Health Sector****, an area with a high reported incidence of dysentery. The field work was scheduled to follow the seasonal peak of an annual outbreak of dysentery occurring in Burundi since the 1980s. Three case-control studies were carried out, comparing risk factors at three levels of analysis: (1) individuals with and without dysentery living within the same household, (2) households with and without dysentery within the same rugo (circular enclosure) and (3) households with and without dysentery, situated in adjacent rugos. (Note: Rugos generally contain one to three households and may be enclosed by a circular fence). Case definition was by self-report of bloody diarrhea occurring during the epidemic period. Univariate methods for cluster survey analysis and stepwise conditional logistic regression were used for analysis of results. Annualized rates were calculated from the 7-month recall period based on the relative proportion of cases seen at heath centers during the recall period of the study.*

RESULTS

Information was collected on 2,054 households and 9319 persons. There were 127 cases and 4 deaths over the 7-month recall period.

- The incidence rate of dysentery in the area surveyed was 13.6 cases per 1,000 population. The annualized incidence rate was 20.9/1000; the case fatality-ratio was 3.2%.
- The mortality rate attributable to dysentery was estimated at 0.4 per 1000 (0.7/1000 annualized) and the crude mortality rate was 4.7/1000 (7.2/1000 annualized). The proportional mortality (the proportion of all deaths that were due to dysentery) was 9.1%.
- Age-specific incidence rates showed an increasing risk of dysentery with age; the incidence rate in females (16/1000) was significantly greater than the rate in males (11/1000, $p = 0.03$).
- Among 339 household contacts of persons with dysentery, there were 14 cases of dysentery. When compared to an expected 5 cases in the absence of secondary transmission, this yielded an estimated maximum of 9 cases attributable to possible secondary transmission (7% of all cases).
- Of the 127 persons with dysentery, 76% sought health care, and 65% of these made more than one visit to the health center. There was no difference between those who did and did not seek health care in terms of age, sex, occupation, level of education or reported severity of clinical signs.
- Comparison of households within the same rugo showed that residents of households with dysentery were more likely than other households to transport water in a bucket than in other containers. No other differences were significant.

- Comparison of households in adjacent rugos suggested that households with dysentery were more likely not to have soap in the house (odds ratio [OR] = 1.8, p = 0.07), and not to wash hands before preparing food (OR = 1.8, p = 0.09). These associations approached statistical significance, and the variable "did not wash hands before preparing food" was significant in the multiple regression model.

- At the individual level, factors that were significant in univariate and multivariate models were weight loss during the 3 months before dysentery was acquired (OR = 1.8, p = 0.02), and use of a rag for anal cleansing after defecation (OR = 12.3, p = 0.003).

- Median household water use (amount transported daily) was only 5 liters per person; 89% of households reported using a capped water source for drinking water; 77% had soap in the household, and 85% had a latrine.

- Only 16-18% of households reported owning a functioning radio.

"Possible risk behaviors associated with dysentery include transporting water in an open-mouthed bucket, not washing hands . . . not having soap available, and using a rag for anal cleansing."

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Dysentery is a disease of high morbidity in Burundi — severe enough to cause most people to seek health care.

2. Women and older people are at higher risk, although the reasons for this are unclear.

3. Dysentery accounts for a large proportion (9%) of all mortality.

4. Household transmission accounts for only a small proportion of dysentery cases in this study.

5. The health facility use rates derived from this study can be used to transform facility-based surveillance data into population rates, assuming that facility use rates are similar throughout the country.

6. The annual crude mortality rate and dysentery mortality rates derived from this study were lower than expected.

7. Possible risk behaviors associated with dysentery include transporting water in an open-mouthed bucket, not washing hands before preparing foods, not washing hands before eating, not having soap available in the house, and using a rag for anal cleansing.

STUDY LIMITATIONS

- The most important limitation of this study identified by the authors was the uncharacteristically low rate obtained for crude mortality and dysentery-related mortality, and for the case-fatality ratio for dysentery. These were all attributed to a single probable cause — a strong cultural reluctance to acknowledge deaths in Burundi. The annualized crude mortality rate of 7/1000 obtained by this study was only one third the rate obtained by the 1987 Demographic and Health Survey, and that survey result was considered to be an underestimate.

PROGRAM AND POLICY IMPACT

This study forms part of a continuing effort of the diarrheal disease program to deal with the problem of epidemic dysentery in Burundi. Prior investigations initiated by the CCCD Project in 1990 helped identify and characterize the epidemic from a facility-based perspective. That 1990 investigation helped identify *Shigella* (rather than *Entamoeba histolytica*) as the causative agent of the overwhelming majority of cases of bloody diarrhea and identified drug resistance patterns of the organism. The 1992 study extended the focus of that investigation by revealing the community epidemiology of the disease. The intent of this exercise was twofold — to estimate the population-based incidence and mortality burden, and to identify possible risk factors.

In meeting these two objectives, the study was partly successful. It was able to identify several risk factors, some of which are potentially amenable to behavioral intervention. On the other hand, although the incidence rates derived from this study were tremendously useful in determining the importance of dysentery as a public health problem, the mortality findings were considered to be very questionable. Those doubts caused the Burundi diarrheal disease control program and the CCCD Project to initiate a subsequent community study in 1993 that was specifically focused on mortality (see following study by MURRAY et al.). The findings of this study thus formed part of a concerted effort to define the problem of dysentery in Burundi, with the use of multiple methods.

In terms of concrete recommendations, the impact of this study has been mixed. There has not yet been a concerted attempt to influence dysentery incidence through behavioral intervention. This has been attributed to several reasons. The main one cited is a probable lack of confidence in the effectiveness of preventive measures (i.e., some decision makers remain unconvinced that behavioral interventions are effective or that epidemic dysentery in this setting is preventable). On the other hand, this study and the subsequent 1993 study have helped highlight the problem of dysentery and focus more attention and resources on the problem. Moreover, the marked increase in cases that has occurred since 1993 may cause the Burundi diarrheal disease program to take renewed interest in behavioral interventions. Should this occur, the findings of this study will be increasingly important.

The authors recommended that additional research (including formative and behavioral research) be undertaken to further characterize the risk behaviors identified by this study. This would include investigating economic, logistical, or cultural barriers to the use of soap in handwashing, factors affecting water use, and other similar factors.

PUBLICATIONS

DYSENTERY MORTALITY IN AFRICA; A FOLLOW-UP STUDY IN BURUNDI

STUDY LOCATION: BURUNDI

SHORT TITLE: **MORTALITY FROM DYSENTERY IN BURUNDI**

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EIS Officer
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CO-INVESTIGATORS: Manirankunda L, Ntakibirora M, Lee L, Deming M

STUDY DESIGN

This study had three objectives: (1) to estimate the-case fatality ratio among patients with dysentery in Burundi; (2) to identify risk-factors for death from dysentery; and (3) to determine the antibiotic resistance pattern of Shigella dysenteriae type 1 isolates in Burundi during the 1993 epidemic.

In October, 1992, at the beginning of the dysentery season in Burundi, dysentery registers were placed in nine government health centers in the province of Muramvya. All individuals coming to the health centers with dysentery were entered into the registers. For the purposes of this study, dysentery was defined as "bloody diarrhea," which is described by the local word, ***amacinya****. For each person, information on the place of residence was recorded in a way that would permit location of the individual in the community at the time of follow-up. In addition, information was recorded on the date of onset of dysentery and the medication that the individual had been given at the time of this visit.*

In February 1993, the registers were collected from the health centers. All children younger than 5 years of age (N = 425) were selected. An equal probability sample of all individuals 5 years of age or older (N = 440) was selected by systematically sampling every fourth person over 4 years of age to generate a final sample size of 865 persons.

Follow-up of registered patients occurred in the period March 4 - April 10, 1993. A questionnaire was designed to determine whether the case-patient was alive or dead, what the risk factors for death were, and what treatment was taken. The case-patients themselves were questioned if they were alive and capable of answering questions. When the case-patient had died, or if the case-patient was an infant or very small child, the next-nearest relative was questioned.

From March 4 through April 10, 1993, stool specimens were obtained from all new cases of dysentery at health centers in the study province. Specimens were placed in Carey-Blair transport medium, refrigerated and then transported daily to the national laboratory in Bujumbura, where culture and antibiotic sensitivity testing were performed. A sample of isolates were frozen and returned to the Centers for Disease Control for confirmatory culture and sensitivity testing.

Overall frequency distributions were weighted for age. Kaplan-Meier survival analysis was performed for each age stratum to estimate survival after the onset of dysentery. Univariate analysis of the survival curves was performed using the log rank test.

RESULTS

Of the 865 registered case-patients included in the study, 74 individuals (8.6%) were lost to follow-up. Of 791 case- patients for whom the vital status was determined, 734 (92.8%) were alive at the time of follow-up and 57 (7.2%) were dead.

- Sixty-one percent of all deaths occurred at home; 83% of all persons who died were described as having dysentery at the time of death. These proportions did not differ by age.

Treatment

All persons with dysentery received medication. Eighty three percent of persons with dysentery received trimethoprim- sulfamethoxazole, the antibiotic recommended as the first- line treatment for dysentery in Burundi.

Complete treatment was defined as taking 4 capsules daily for a total of 5 days. Persons younger than 5 years of age were less likely to take a complete treatment course than persons older than 5 years. Seventy-seven percent of persons less than 5 years of age took an incomplete course compared with 30% in the oldest age-group.

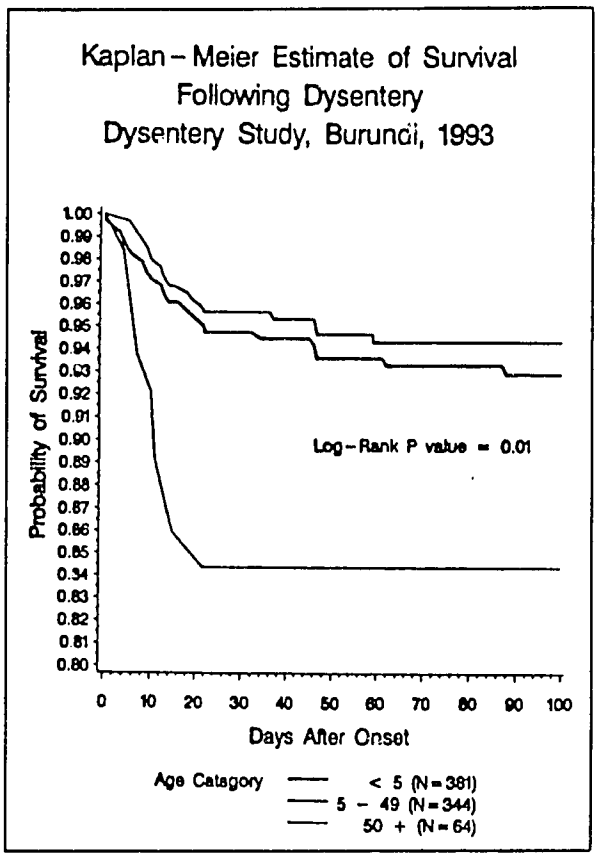
Taking a complete course of therapy was associated in univariate analysis with being given a full course of treatment at the time of the first clinic visit (odds ratio [OR] = 3.04, p 0.001), with being female (OR = 1.47, p<0.01) and with being hospitalized (OR = 2.71, p<0.00 1).

Case-fatality

The overall case-fatality ratio (CFR) was 7.2%. Case-fatality ratios were calculated separately for three age-groups (0-4, 5-49, and 50 and greater). The CFR for the youngest age-group was 7.3%. The CFR for persons aged 5-49 years was 5.8%. The CFR for persons 50 years and older was 18.5%. The dysentery incidence rate was estimated to be 20.9/1000 per year in 1991, based on the previous community study. Using this rate, the estimated dysentery mortality rate in Burundi was 1.53/1000/yr in 1991. If the crude mortality rate were assumed to be 17/1000/yr (based on 1988 census data), the proportional mortality caused by dysentery is 9.0%.

Survival analysis

Survival after the onset of dysentery differed significantly by age. Persons aged 50 years or older were less likely to survive than persons in the younger age-groups. The majority of deaths occurred in the first 10 days after the onset o f dysentery for all ages.



The completeness of antibiotic treatment and survival following the onset of dysentery were not associated. Reduced survival following the onset of dysentery was associated with waiting longer than 1 day before going to a health center and with being hospitalized for at least one night.

Laboratory Study

Stool specimens were taken from a total of 133 individuals presenting to health centers with dysentery; 60 of these specimens were positive for *Shigella spp.* Of the total positive specimens, 46 (76.7%) were *S.dysenteriae* type 1 and 14 (23. 3%) were S. flexneri. Of the *S. dysenteriae* type 1 isolates, 43 (93.5%) were resistant to both trimethoprim- sulfamethoxazole and ampicillin. All *S. dysenteriae* type 1 isolates were sensitive to nalidixic acid, ceftriaxone, amdinocillin, and ciprofloxacin. Of *S. flexneri* isolates, 12 (83.7%) were resistant to trimethoprim-sulfamethoxazole and ampicillin and sensitive to all other antibiotics. When compared with the results of the previous (1990) laboratory study, the sensitivity pattern of *S. dysenteriae* type 1 was changed, becoming sensitive to nalidixic acid. In addition, a considerably higher proportion of *S. flexneri* isolates were resistant to trimethoprim-sulfamethoxazole and ampicillin.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Dysentery is a major cause of mortality in Burundi.

2. Persons 50 years of age and older are at highest risk of dying. Mortality was also associated with delaying going to a health center more than one day, and with spending at least one night in hospital. Most deaths occurred within 10 days after the onset of dysentery.

3. Incomplete treatment is associated with the prescribing practices of health workers.

4. Persons who were given less than a full treatment course of antibiotics at the time of the first clinic visit were less likely to take a full treatment course. Completeness of treatment was also associated with being hospitalized, with being female and with age (older persons were more likely to take a full treatment course of antibiotics). There was no difference in the survival of persons who took a complete course of treatment and persons who took an incomplete course of treatment.

5. *S. dysenteriae* type 1 remains resistant to trimethoprim- sulfamethoxazole, the first-line therapy for dysentery in Burundi. The organism is however sensitive to nalidixic acid.

6. The resistance patterns of *S. dysenteriae* type 1 and *S. flexneri* were the same.

7. The study recommended that antibiotic resistance be monitored with a network of sentinel laboratories. It also advised changing the national treatment policy to nalidixic acid for all cases of dysentery, and dispensing a full course of antibiotics at the initial visit to increase the likelihood of taking a complete course.

8. The authors also recommended conducting a prevention trial targeting behavioral risk-factors for the acquisition of dysentery.

STUDY LIMITATIONS

The representativeness of this study was its major limitation. The authors assumed that persons coming to health centers are representative of all persons with dysentery and also assumed that the mortality experience of persons lost to follow-up did not differ from persons who were not lost to follow-up. When calculating national mortality estimates, it was assumed that persons in the study province were representative of persons with dysentery in the country.

PROGRAM AND POLICY IMPACT

This study documented for the first time that dysentery is a significant cause of mortality in Burundi. In addition, it demonstrated that the first-line antibiotic therapy (trimethoprim-sulfamethoxazole) was ineffective in preventing death from dysentery. It demonstrated that many people receiving antibiotics for dysentery do not take a complete course, which may contribute to the development of antibiotic resistance. In addition, it demonstrated that the resistance pattern of S. dysenteriae type 1 can change dramatically with time, and emphasized the need to monitor resistance patterns in epidemic are as.

This information prompted the Ministry of Health in Burundi to change the first-line drug for dysentery in Burundi to nalidixic acid at the end of 1993. The approximate cost of a full treatment course of trimethoprim-sulfamethoxazole in 1993 was eighteen cents for a pediatric course and fifty-six cents for an adult course. The estimated cost of a full treatment course of nalidixic acid is estimated to be sixty cents for a pediatric course and $1.20 for an adult course. Clearly, nalidixic acid is two to three times more expensive. Nalidixic acid must also be imported, whereas ampicillin is produced locally. Although a formal cost-effectiveness analysis has not yet been performed, outside funding will be required in the short term to allow the country to purchase stocks of nalidixic acid for the current season. The Ministry of Health is also considering a sentinel system for monitoring resistance patterns in areas with epidemic dysentery.

It is hoped that these data also will encourage the Ministry of Health to conduct a health intervention trial designed to modify behavioral risk factors for the acquisition of dysentery, and to consider re-educating health care workers to improve their antibiotic prescribing practices.

PUBLICATIONS

None citied. Manuscript in preparation...

NEW PARAMETERS FOR EVALUATING ORAL REHYDRATION THERAPY: ONE YEAR'S EXPERIENCE IN A MAJOR URBAN HOSPITAL IN ZAIRE

STUDY LOCATION: ZAIRE

SHORT TITLE: **ORT EXPERIENCE AT MAMA YEMO HOSPITAL, 1984-85**

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STUDY DESIGN

The study reviewed pediatric outpatient records for 52 weeks following the opening of an Oral Rehydration Therapy Unit (ORTU) at Mama Yemo Hospital (in August 1984), as well as a sample of 100 records for each month of the preceding 3 years. Records were reviewed for selected monitoring indicators, including (1) quantity of fluid prescribed, (2) quantity of fluid given, (3) weight gain, (4) time spent at the center, and (5) clinical outcome (at the facility). Feedback of ongoing monitoring was provided to clinicians at a clinical conference scheduled approximately quarterly. The rate and number of diarrhea case admissions for the 3-year period were extrapolated from the sample.

RESULTS

Data were available for 3,700 children seen in the ORTU and 1,830 children seen in the dispensary ORT service during the same period. Of the patients seen at the ORTU, 16% were classified as Plan C by WHO criteria (i.e., severe dehydration). Patients seen in the ORTU tended to be more dehydrated than those seen in the dispensary.

- On average, 16% of mothers used SSS at home before coming to the hospital.
- During each of the four quarters after the opening of the ORTU, quality of treatment indicators progressively improved for all categories of severity (Plans A, B, and C), "with some drop off in the fourth quarter."
- Clinical outcome also improved over time; in general more children were rehydrated and sent home, and fewer children were hospitalized or died.
- Factors that were significantly associated with adverse outcomes included measles (in all three treatment categories), duration of diarrhea, fever, and "other" complaints.
- Between the first and fourth quarters diarrhea admissions dropped from 30% to 12% for nonsevere diarrhea (a 60% reduction), but for severe cases (Plan C) diarrhea, it was reduced only 8% (from 39% to 36%).
- The case fatality rate decreased from 6.9% to 1.2% during the four quarters (an 83% reduction).

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. The treatment population in this study is comparable to other reported studies.

2. Measurable improvements in treatment quality indicators as well as outcome indicators suggest that the ORTU has been successful in its first year.

3. The systematic use of operational indicators that reflect quality of ORT treatment is valuable for the evaluation of ORTU effectiveness.

4. The drop off in performance indicators during the fourth quarter may have been related to the lack of a review conference and feedback after the third quarter.

STUDY LIMITATIONS

- Incomplete records were a frequent problem in this review, particularly for the first months of operation of the ORTU and the years preceding its opening. It was thus impossible to obtain exact admission rates for all these periods.

- Discharge status was omitted from a large proportion of records, particularly during the early months of ORTU operation. In addition, outcome status for patients hospitalized from the ORTU was not determined. Thus, the CFR data probably underrepresents true case fatality since the data denotes only deaths from the emergency ward.

PROGRAM AND POLICY IMPLICATIONS

This was one of several effectiveness studies looking at the operation of ORT units during the early experience of the CCCD project with the strategy of ORT units. Apart from Zaire, assessments were also done in Malawi and Côte d'Ivoire. The object of these assessments was essentially to confirm (or challenge, if necessary) the strategy of ORT units as a useful one for (1) reducing hospital admissions, (2) improving the quality of diarrheal treatment practices, and (3) aiding the diffusion of the technology by functioning as training units for clinicians. Although this last objective was not evaluated by this or the other two assessments cited, training (and sensitization) was a major rationale in the establishment of a number of these ORT units. Besides functioning as service delivery points, they were often intended to counter the innate resistance of physicians (and other clinicians) to this decidedly "low- tech" therapy. The confidence to promote these ORT training units was to a significant degree because ofdue to the success demonstrated in these assessments.

In Kinshasa, the ORT unit described here continued to operate, but as case management became increasingly common at the peripheral level (in peripheral health centers, etc.) the ORT unit's caseload and importance declined somewhat over time. In actuality, the program viewed this as a positive step, since earlier treatment at the peripheral level generally improves treatment outcome.

PUBLICATIONS

MOORE M, DAVACHI F, BONGO L et al.: New parameters for evaluating oral rehydration therapy: one year's experience in a major urban hospital in Zaire. J Trop Pediatrics 35:179-184 (1989).

RELATED STUDIES

HEYMANN DL, MBVUNDULA M, MACHESO A et al.: Oral rehydration therapy in Malawi: impact on the severity of disease and on hospital admissions, treatment practices, and recurrent costs. Bull World Health Organ 68:193-7 (1990).

Records for pediatric inpatients from 1981 to 1986 were reviewed retrospectively to assess the impact of an outpatient ORTU opened at Kamuzu Central Hospital, Lilongwe, in 1984. The review showed a 50% decrease in the number of children admitted with a diagnosis of diarrheal disease, a 56% decrease in the use of intravenous fluids, and a threefold increase in the exclusive use of ORS for such patients. A 32% decrease in hospital recurrent costs attributable to pediatric diarrheal disease was also noted. The proportion of children admitted with dehydration and severe dehydration increased during this period, indicating more selective use of hospital admission. The inpatient case fatality rate also increased by 39% (probably due to elimination of less severe cases from the denominator).

Malaria-Related Research

This series of studies illustrates, to a fair degree, the scope of malaria-related activities that were undertaken by the ACSI-CCCD project during its project life. As noted elsewhere, malaria was introduced into the CCCD project largely in response to host country requests. Indeed, malaria was believed by many governments to be the most important health problem facing child survival at that time (comprising, for example, 40% to 50% of pediatric admissions in Togo and 30% of pediatric hospital deaths in Malawi).

Among the issues identified as research priorities at the inception of the CCCD project were

(1) Reduced susceptibility to chloroquine because of spreading chloroquine resistance.

(2) The relative effectiveness of single-dose rather than multi-day treatment regimens of chloroquine for treatment of malaria.

(3) The case definition of malaria and the clinical significance of fever as an indicator.

(4) The measurement of the burden of malarial illness in terms of morbidity, mortality, and economic cost.

(5) The effectiveness of existing treatment practices, in both public and private sectors, including commercial sources of antimalarials and alternative sources of malaria treatment.

(Update on CCCD Malaria Program. First Consultative Meeting, Lome, Togo. March 1984)

"Among the greatest disappointments of the malaria activity has been the continued increase in mortality and morbidity due to malaria in virtually every African country . . . ."

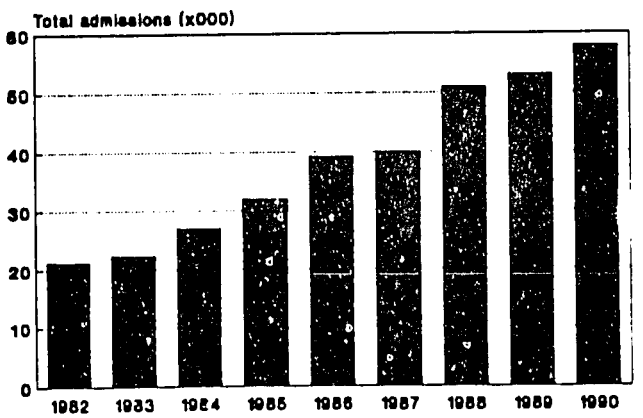
". . . the program's achievements in epidemilogic surveillance and rational treatment practices have come a long way since inception, as have the technical skills of counterpart researchers."

The program's record in addressing that first agenda and the evolution of its research priorities since have been a mixed picture of success and failure. For two of the most important factors influencing the program — political instability and the spread of chloroquine resistant malaria — the circumstances were mostly beyond the program's control. For other factors, such as the case definition of malaria, the project has achieved some progress in understanding the overlapping syndromes of pneumonia and malaria, anemia, HIV disease and even diarrhea; however the influence on actual diagnostic practices and treatment at the peripheral level has often been slower.

On the other hand, the program's achievements in epidemiologic surveillance and rational treatment practices have come a long way since inception, as have the technical skills of counterpart researchers. Therefore, the irony (and a demonstration of the magnitude of the challenge) is that this component, which has had so much concerted effort addressed to its research and service needs, has been the least able to demonstrate the positive effect which the CCCD project hoped to achieve at its start.

Among the greatest disappointments of the malaria activity has been the continued increase in mortality and morbidity due to malaria in virtually every African country during the project. Initial impact objectives of a 50% decrease in hospital mortality now seem naively optimistic. Although (in the best of circumstances) the program has witnessed stable case fatality rates, large increases in total malaria cases have overwhelmed most of the gains made in improved case management.

Hospital Admissions Due to Malaria
1982 - 1990, Malawi



Source: MOH, Malawi

The scope of research activities addressed here covers much of the spectrum of applied research, from basic biomedical studies to health services research, cost-effectiveness and economic impact studies, and evaluation research. Some of the areas covered by malaria-related activities were:

- **Community studies:** were initiated early in the course of CCCD activities, often to identify baseline levels of community practices, local attitudes, or levels of health care access. Findings were sometimes radically different from the "prevailing wisdom" — for example, Togo studies showed that mothers actually do not prefer injectable drugs more than tablets, despite health workers' claims to the contrary.

- **Facility-based assessments:** when combined with community surveys, allowed programs to target deficiencies in malaria treatment practices, such as incorrect dosage.

- **Facility-based record review:** used either as a discrete research activity at one point or as ongoing sentinel surveillance. Where most successful, these reviews, albeit at the facility level, allowed for fairly accurate monitoring of morbidity and mortality trends, despite often deficient health information systems.

- **Ethnographic and qualitative studies:** were most successful when they enabled programs to identify cultural barriers or enabling factors that could be used to influence targeted behavior (e.g., chloroquine noncompliance in pregnancy). Studies were also used on occasion to develop information, education and communication (IEC) strategies and to field test appropriate communication messages.

- **Intervention studies and in vivo sensitivity tests:** Although these occupied a major position in the research agenda, they were just one aspect of research activities. Their importance was magnified by the need to document the spread of chloroquine-resistant malaria in Africa and by the search for suitable alternative drugs.

"Ethnographic and qualitative studies were most successful when they enabled programs to identify cultural barriers or enabling factors that could be used to influence targeted behavior. . . ."

"A second strength readily identified by program managers was the 'demystification' of research."

"A third benefit was the contribution to consolidating information needs into a meaningful agenda."

- **Biomedical research:** included studies investigating placental pathology in malaria and the role of Tumor Necrosis Factor in malaria. As an adjunct to intervention studies these often yielded crucial information — for example entomological studies suggesting a possible reduction in permethrin susceptibility with the use of treated bed nets.

- **Epidemiologic research:** was facility-based or community-based, and helped to define the relationship between anemia and malaria, malaria and low birthweight, and malaria and HIV disease. This research also showed the unreliability of fever as a diagnostic sign and documented cause-specific mortality in a birth cohort. In Malawi, the Mangochi Malaria Research Project (MMRP) incorporated elements of epidemiologic research and of large scale intervention.

- **Development of laboratory methods:** was mainly focused on developing improved field methods for the detection of chloroquine and its metabolites. Methods were not only developed to serve immediate program needs, but to provide more reliable or simple methods for other malaria researchers.

- **Economic impact and cost-effectiveness studies:** were used either as an analysis incorporated into the existing study design, or as a discrete activity (e.g., study of the economic impact of malaria or the feasibility of a revolving drug fund), these studies enabled some governments to develop data-based economic decisions.

The malaria program's research activities had several strengths. Prominent among them was the program's success in developing and fostering a cadre of skilled African and CDC-affiliated researchers and technicians. Although considerable time and effort was spent on training in technical skills (e.g., in vivo susceptibility testing, detection methods for urinary amino- quinolones), a number of researchers were also beneficiaries of long-term collaborations with the ACSI-CCCD project. In general these relationships (whether "mentoring" of less experienced researchers or collaborations among equals) considerably increased the experience, skills, and "track record" of the researchers.

In this respect, the malaria-related activities were able to achieve two complementary objectives — training a relatively large number of persons in basic applied research skills (including laboratory training and technical skills) and concurrently developing a smaller number of relatively skilled researchers in more advanced research skills (including proposal development, project execution and management, and writing for publication).

A second strength (readily identified by program managers in focus groups) was the "demystification" of research. By involving program managers to a substantive degree in the formulation of research protocols, execution of studies, and their analysis, this component of the ACSI-CCCD program was easily able to make its study findings immediately accessible to policy makers and decision makers.

A third benefit to bilateral countries was the program's contribution to consolidating information needs into a meaningful agenda. In this respect, the impact of the CCCD program was not due to the introduction of a radically new technology — indeed, several countries had already carried out and published in vivo studies by the time the CCCD program was fully underway. To many countries, the greatest benefit of CCCD was the project's role in combining these disparate sources of data (including research, surveillance, and routine reporting) into information suitable for making national policy.

It was **not** true then, that countries had no experience in malaria research — for example, there were at least 92 journal articles published about malaria in Nigeria from 1982 to 1990. However, much of this research was generated by academic institutions, often with only indirect or tenuous links to concrete programs or policy objectives of the Ministry of Health. In fashioning the CCCD research agenda in close collaboration with national program managers, the the ACSI-CCCD project, in general, was able to avoid that pitfall. Because malaria research was a project component specifically requested by countries, African counterparts often had a clear idea of priorities they wished to address, questions they needed answered, and the rationale for the objectives they hoped to achieve.

As happened with other program interventions in the ACSI-CCCD project, CCCD efforts in malaria control generally sought to increase capabilities for routine surveillance and reporting and to engage in periodic surveys or research activi-

"To many countries, the greatest benefit of CCCD was the project's role in combining these disparate sources of data (including research, surveillance, and routine reporting) into information suitable for making national policy."

". . . CCD efforts in malaria control generally sought to increase capabilities for routine surveillance and to engage in periodic surveys or research activities at the same time."

ties at the same time. In Togo, for example, these objectives were achieved to a substantial degree by 1989, when a comprehensive hospital inpatient data base was established to allow comprehensive and timely reporting of malaria and other morbidity data. In 1993, despite significant political instability, CDC personnel who were asked to reevaluate the health information system found that peripheral levels continued to function, albeit at reduced levels, with interruptions occurring mainly at the central level. In Malawi, a comprehensive review of existing data was an early priority of CCCD, a step which was immediately succeeded by establishment of sentinel surveillance to monitor drug sensitivity and to report morbidity.

On the other hand, there have also been gaps in the effectiveness of malaria-related research, as well as a number of unresolved questions.

One such question is in the application of research findings. Although Malawi is one country that has clearly developed a rational policy from research data, implementing policy has not been uniformly successful, even in Malawi. For example, although policy development has been clear, the implementation of policy at the peripheral level has often not occurred. Health education programs still gravitate towards a fixed set of standard messages and a standard means of delivery, often despite behavioral research findings. Facility-based treatment practices have often shown only minimal changes over time in several significant measures. Supervisory assessments often begin with the phrase: "Despite the widespread availability of treatment guidelines..."

Results from studies of alternative sources of care also raise several interesting issues. In Togo, a 1985 survey showed that as many as 80% of febrile episodes were treated in the home and that pharmacies and drug sellers generally provided most of the medications used. In general, however, governments and programs have simply ignored or been unable to capitalize on these resources, often despite clear research findings.

One justification often cited is the improper treatment practices of these "unofficial" health agents. Ironically, although a number of studies *have* demonstrated significant dosing problems (principally underdosing) when treatment was dispensed by lay workers, results of other studies, such as facility surveys, often showed equal levels of improper prescribing practices among "official" health personnel in

the absence of specific training. Results of this and other reseach also showed that improved practices could be obtained in both groups with proper training (see for example, OSHINAME 1992).

Other weaknesses identified in the program include a relatively low priority for socio-behavioral and operational research, compared with the emphasis on epidemiologic research and drug efficacy studies. For example, a 1990 report from Togo raises the question of whether health centers should dispense to patients an entire 3-day course of chloroquine treatment at one visit or should require patients to return on the second day. This question had also been raised in 1985. If this question was ever answered in the CCCD program (and there is no indication that it was), then the answer was not apparent to that program manager in 1990.

In other respects, the socio-behavioral research that *was* done sometimes appeared to have preconceived outcomes rather than allowing the findings to shape the recommendations. In one case, for example, the objective of the study was "to increase chloroquine chemoprophylaxis and treatment of malaria in pregnant women," whereas the study showed clearly that women were plainly *not* inclined to use chloroquine because of its bitter taste and reputation as an abortifacient. It did not perceive any options for changing the system, the drug or the program priorities. Apparently, investigators were only willing to consider changes to one component in the interaction between the patient and health services — that being the patient. WARD (1985) described this conundrum by noting: "Health educators are as interested in ways to change the system as they are in changes in individual behaviors. However, they have limited control over the system."

Within any program limited by resources there are only a finite number of programmatic options available to managers. However, the role of the researcher to advise those decisions should include the ability to consider options beyond the obvious ones. One would consider this particularly apropos for formative and socio-behavioral research.

What then has been the overall impact of the ACSI-CCCD program of malaria-related research? At its outset, the process hoped to achieve two main objectives — (1) supplying the program with good quality information for policy development, program monitoring and evaluation of progress; and (2) training of local and national malariologists. The pro-

"The role of the researcher to advise programmatic options should include the ability to consider options beyond the obvious ones."

gram succeeded in both. A critical process of self-analysis should not detract from that achievement.

NOTE: The studies included in this section are intended to be representative of malaria-related activities supported by the ACSI-CCCD project. They do not include all the studies carried out by the malaria support activity. They are presented by country and in roughly chronological order, in an attempt to give some continuity to the reading.

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IN VIVO ASSESSMENT OF EFFICIACY OF CHLOROQUINE TREATMENT FOR P. PALCIPARUM IN MALAWIAN CHILDREN UNDER FIVE YEARS OF AGE

STUDY LOCATION: MALAWI

SHORT TITLE: **DRUG THERAPY OF CQ RESISTANT MALARIA, MALAWI**

PRINCIPAL INVESTIGATOR: KHOROMANA, Dr. Charles O
Senior Lab Technician
Central Pathological Laboratory
Blantyre, Malawi

CO-INVESTIGATORS: Campbell CC, Wirima JJ, Heymann D

STUDY DESIGN

In 1984 the government of Malawi instituted a program to reduce malaria mortality and morbidity in children less than 5 years of age as a part of the Combatting Childhood Communicable Diseases (CCCD) program. To define the appropriate malaria therapy regimen, investigators used a quality assurance design in a simplified 7-day in vivo drug response study with follow-up observations on day 2 (D2), D3, and D7 after the initial day of the study (D0). The efficacy of oral chloroquine was assessed in 224 children who were enrolled at 6 sites, 2 in each of the 3 administrative regions of Malawi.

RESULTS

- Parasitological failure (defined as failure of parasitemia to decrease by 75% of the value by D3 or presence of any detectable parasitemia on D7) ranged from 41% to 65% following administration of chloroquine 25 mg (base)/kg.
- Only 8% of children who were parasitemic on D7 were febrile or judged to be ill.

STUDY CONCLUSIONS AND RECOMMENDATIONS

- Considering these therapeutic results and the higher cost and limited availability of alternative therapies, chloroquine 25 mg/kg therapy was recommended as the primary therapy for malaria.

STUDY LIMITATIONS

- As noted by authors, a modified test does not detect (RI) failures with late recrudescence at D28.
- The cutoff level of 2,000 parasites per mm3 used in this study was later revised downward in other country studies to 1,000/mm3.

PROGRAM AND POLICY IMPACT

This was the first of a series of joint collaborative studies between country investigators and CDC Malaria Branch, CCCD. Essential information for Malawi's malaria policy development was provided, and the model also provided a format for later studies in Zaire and Cote d'Ivoire (where the training and field study components were replicated). Combining the joint ob-

jectives of training, research, and field experience seems to have been profitable in all three instances and favorably viewed by all parties.

Interim evaluation of this study in 1985 noted: "This was a highly successful OR study in that it provided for the training of many Malawian health workers, especially the principal investigator, and resulted in the collection of important malaria treatment data" (POLK, 1985 evaluation).

The evolution of malaria policy over the next 8 years depended substantially on this and subsequent studies using the same methodology, and also on the cadre of investigators developed during these activities.

■ PUBLICATIONS

KHOROMANA CO, CAMPBELL CC, WIRIMA JJ, HEYMANN D: In vivo efficacy of chloroquine treatment for *Plasmodium falciparum* in Malawian children under 5 years of age. Am J Trop Med Hyg 35:465-71 (1986).

COMPARATIVE EFFICACY OF ALTERNATIVE PRIMARY THERAPIES FOR CHLOROQUINE RESISTANT PLASMODIUM FALCIPARUM MALARIA IN MALAWI

STUDY LOCATION: MALAWI

SHORT TITLE: **ANTIMALARIAL DRUGS EVALUATION, MALAWI, 1985**

PRINCIPAL INVESTIGATOR: WIRIMA Dr. Jack J.
Chairman, National Malaria Control Committee
Malaria Control Programme
Ministry of Health, PO Box 30377
Lilongwe 3, Malawi

CO-INVESTIGATORS: Heymann DL, Khoromana CO, Campbell CC

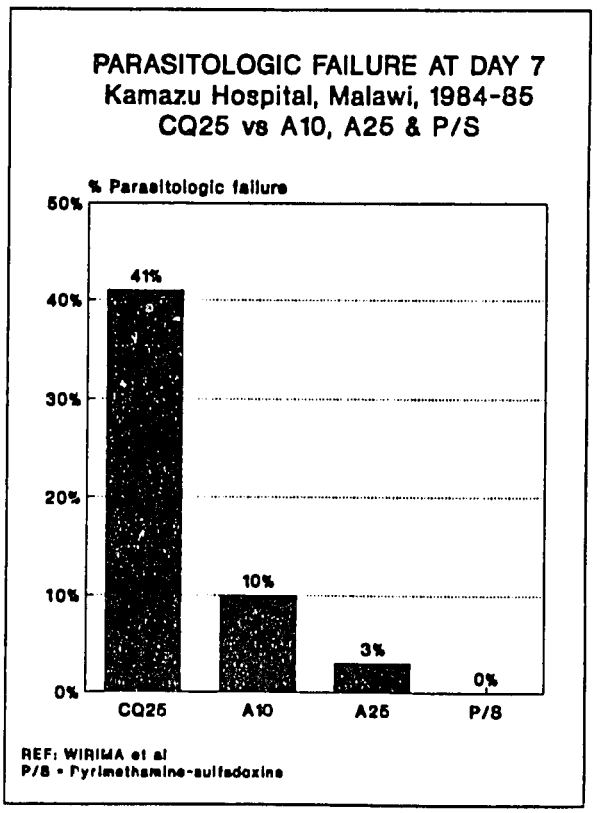
STUDY DESIGN

In Malawi, where high levels of chloroquine resistance were shown using a modified 7-day in vivo test, amodiaquine and pyrimethamine-sulfadoxine were evaluated as alternative initial therapies for Plasmodium falciparum infections in children less than 5 years of age.

RESULTS

- Therapy success rates, judged by parasite clearance by day 7 after initiation of therapy, were significantly greater among 39 children treated with amodiaquine at 10 mg/kg (90%), 37 receiving amodiaquine at 25 mg/kg (97%), and 34 receiving pyrimethamine-sulfadoxine (100%) at a dose of 25 mg sulfadoxine/kg, than among those treated with chloroquine at a dose of 25 mg/kg (59%) (p = 0.01).

- Extension of the follow-up period to 21 days for those receiving amodiaquine (25 mg/kg) and pyrimethamine- sulfadoxine revealed a progressively increasing rate of parasite recrudescence in the amodiaquine group (34%) but no recrudescence in the pyrimethamine-sulfadoxine group.



STUDY CONCLUSIONS AND RECOMMENDATIONS

- These results suggest that, in Malawi, amodiaquine and pyrimethamine-sulfadoxine are superior to chloroquine in producing prompt clearance of *P. falciparum* parasites among young children, and that pyrimethamine-sulfadoxine alone is superior to the 4-aminoquinolines in sustaining *P. falciparum* clearance.

STUDY LIMITATIONS

None cited.

PROGRAM AND POLICY IMPACT

The study constituted part of ongoing surveillance and monitoring of drug efficacy in treatment of malaria in Malawi. Used in the formulation of National Malaria Policy in 1985 and the subsequent evolution of policy. In 1991 Malawi decided to change its recommended treatment for uncomplicated malaria from chloroquine to pyrimethamine-sulfadoxine, in view of decreasing parasitologic and clinical efficacy of chloroquine, and proven effectiveness of pyrimethamine-sulfadoxine.

PUBLICATIONS

HEYMANN DL, KHOROMANA CO, WIRIMA JJ, CAMPBELL CC: Comparative efficacy of alternative primary therapies for *Plasmodium falciparum* infections in Malawi. Trans R Soc Trop Med Hyg 81:722-4 (1987).

RELATED STUDIES

WIRIMA JJ, HEYMANN DL, KHOROMANA CO, et al.: In vivo efficacy of quinine treatment for *Plasmodium falciparum* malaria in Malawian children. Ann Trop Med Parasitol 84(3):223-7 (1990).

Twenty-five Malwaian children with *Plasmodium falciparum* infection were studied for response to quinine in an 8-hourly dosage of 10 mg/kg. Mean parasite clearance time was 67 hours. The mean fever clearance time was 36 hours. All children cleared their parasitaemia within 108 hours.

MEFLOQUINE THERAPY FOR PLASMODIUM FALCIPARUM MALARIA IN CHILDREN LESS THAN 5 YEARS OF AGE IN MALAWI: IN VIVO AND IN VITRO EFFICACY AND CORRELATION WITH PARASITOLOGICAL OUTCOME

STUDY LOCATION: MALAWI

SHORT TITLE: **MEFLOQUINE THERAPY FOR P FALCIPARUM, MALAWI**

PRINCIPAL INVESTIGATOR: SLUTSKER, Dr. L.M.
Malaria Branch, MS F-12
Division of Parasitic Diseases,
Centers for Disease Control and Prevention
Atlanta, GA 30333

CO-INVESTIGATORS: Khoromana, CO, Payne D, Allen CR, WirimA JJ, Heymann DL, Patchen L, Steketee RW

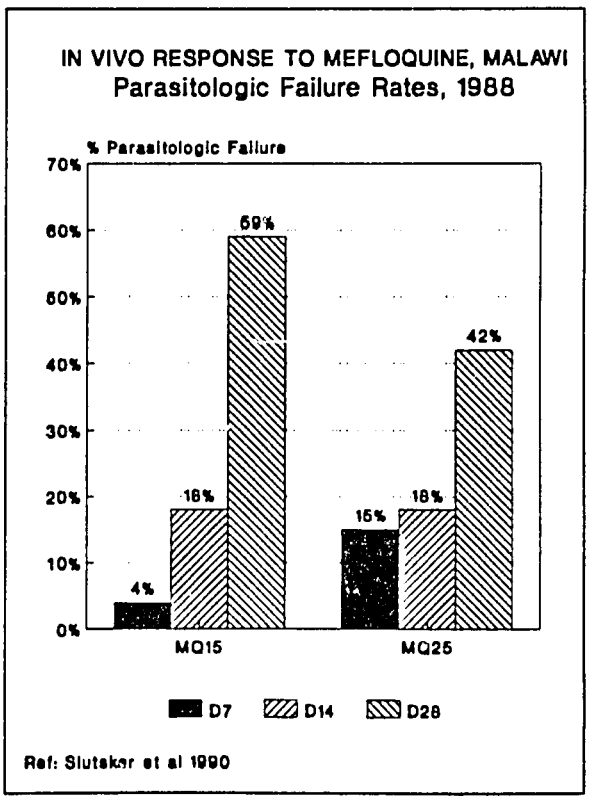
STUDY DESIGN

The in vivo and in vitro response of Plasmodium falciparum to a single oral dose of mefloquine (25 mg/kg body weight [M25] or 15 mg/kg [M15]) was studied in children less than 5 years of age in Malawi.

RESULTS

Of the children who received mefloquine, 35% vomited at least once, and 10% did not tolerate the drug because of vomiting.

- The therapy failure rates for the M25 group on day 7 were 15%, day 14 18%, and day 28 42%, and these rates did not differ significantly from those for the M15 group (4%, 18%, and 59%).
- In contrast, 34 in vitro microtests (17 per group) showed schizont inhibition at less than or equal to 32 pmol mefloquine per test well.
- On day 7, the concentration of mefloquine in samples of blood from children who were parasitemic was significantly lower in both the M25 and M15 groups than was concentration in samples from those who were aparasitemic. A positive blood smear on day 7 was strongly associated with a mefloquine concentration of less than 500 (ng)/mL blood on day 2 or day 7 (p).
- Vomiting was associated with a low mefloquine concentration on day 2 but not on day 7.



STUDY CONCLUSIONS AND RECOMMENDATIONS

- These results suggest that mefloquine is effective against *P. falciparum* in Malawi but that for young children the therapy appears to be complicated by frequent vomiting.

STUDY LIMITATIONS

- Because the children were in a hyperendemic region for malaria transmission, reinfection as well as recrudescence could have been responsible for some of the parasitemia found after D7.

- Authors caution that study results should not be interpreted as evidence of in vivo or in vitro resistance to mefloquine.

PROGRAM AND POLICY IMPACT

One of a number of CCCD supported studies to evaluate alternative therapies for malaria in the face of high levels of chloroquine resistance in Malawi. Study contributed to formulation of current Malaria Policy Guidelines.

PUBLICATIONS

SLUTSKER LM, KHOROMANA CO, PAYNE D, et al.: Mefloquine therapy for *Plasmodium falciparum* malaria in children under 5 years of age in Malawi: in vivo/in vitro efficacy and correlation of drug concentration with parasitological outcome. Bull World Health Organ 68:53-9 (1990).

EFFICACY OF CHEMOPROPHYLAXIS IN PREVENTING PLASMODIUM FALCIPARUM PARASITEMIA AND PLACENTAL INFECTION IN PREGNANT WOMEN IN MALAWI

STUDY LOCATION: MALAWI

SHORT TITLE: **EFFICACY OF CQ PROPHYLAXIS IN PREGNANCY, MALAWI**

PRINCIPAL INVESTIGATOR: McDERMOTT, Dr. Jeanne M.
Malaria Branch, MS F-12
Division of Parasitic Diseases,
Centers for Disease Control and Prevention, (CDC)
Atlanta, GA 30333

CO-INVESTIGATORS: Heymann DL, WirimA JJ, Macheso AP, Wahl RD, Steketee RW, Campbell CC

STUDY DESIGN

In Malawi 73 pregnant women in Malawi were given weekly antimalarial chemoprophylaxis under observation and were monitored for Plasmodium falciparum parasitaemia and placental infection.

RESULTS

Three of 19 women (16%) who were parasitemic at the time they began chemoprophylaxis were infected with chloroquine-resistant *P. falciparum*. After clearance of initial infections, 25% of the 73 women became parasitemic while taking prophylaxis and 56% had evidence of active or past placental infection at the time of delivery.

- None of the women who were parasitemic at the time of enrollment, and only 11% of those who had breakthrough parasitemias while taking prophylaxis, had a history of fever and signs or symptoms that they recognized as malaria.

STUDY CONCLUSIONS AND RECOMMENDATIONS

- Although the density of *P. falciparum* infection and rates of placental infection appeared to be lower among women taking regular chloroquine prophylaxis, this drug did not prevent *P. falciparum* infection among pregnant women.

STUDY LIMITATIONS

- Authors note that the study does not answer the question of whether a program of chloroquine chemoprophylaxis that clears or reduces parasitemia in some women actually leads to an increase in birthweight or influences pregnancy outcome.

PROGRAM & POLICY IMPACT

Precursor study to Mangochi Malaria Research Project (MMRP). Helped shape design of the Mangochi pregnancy study.

Findings also provide support for WHO policy of initial treatment of all pregnant women at (ANC) enrollment with a curative dose of antimalarial drug. Combined with similar findings from Zaire (1987-88) and Kenya studies (1988), these findings raised concerns about adequacy of existing prophylaxis recommendations, that resulted in eventual change of Malawi national policy in 1992 (after results of Mangochi project).

PUBLICATIONS

McDERMOTT JM, HEYMANN DL, WIRIMA JJ et al.: Efficacy of chemoprophylaxis in preventing *Plasmodium falciparum* parasitemia and placental infection in pregnant women in Malawi. Trans Soc Trop Med Hyg 82:520-3 (1988).

ANTENATAL CHLOROQUINE CHEMOPROPHYLAXIS IN MALAWI: CHLOROQUINE RESISTANCE, COMPLIANCE, PROTECTIVE EFFICACY AND COST

STUDY LOCATION:	MALAWI
SHORT TITLE:	**ANTENATAL CQ PROPHYLAXIS IN MALAWI**
PRINCIPAL INVESTIGATOR:	HEYMANN, Dr. David L. Combatting Childhood Communicable Diseases Program, Ministry of Health, Malawi (currently with the Global Program on AIDS, WHO, Geneva)
CO-INVESTIGATORS:	Steketee RW, Wirima JJ, McFarland DA, Khoromana CO, Campbell CC

STUDY DESIGN

The roles of Plasmodium falciparum resistance to chloroquine and of compliance in the protective efficacy of the antenatal chloroquine chemoprophylaxis program in Malawi were evaluated by interviewing pregnant women attending antenatal clinics, examining them for P. falciparum parasites in thick smears, and checking chloroquine metabolites in their urine.

RESULTS

- Of 642 women, 36% had urine chloroquine metabolite levels compatible with regular compliance with the weekly chloroquine dosage schedule.
- Among a subgroup of 288 pregnant women who were provided weekly prophylaxis under supervision for 4 consecutive weeks, *P. falciparum* infection rates were 37%, representing the failure of chloroquine to eliminate *P. falciparum* in Malawi.
- Among pregnant women not taking prophylaxis, the *P. falciparum* infection rate was 48%.
- The cost of preventing one *P. falciparum* infection among pregnant women in the Malawi program is estimated at US$ 10.87.
- On the basis of the *P. falciparum* infection rates among these women taking prophylaxis and women not taking prophylaxis, the protective efficacy of CQ chloroquine was estimated as 23%.
- If 36% for regular compliance is an accurate estimate for the proportion of women who comply with the prophylaxis program in Malawi, the actual protective efficacy of the program would be 8%.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. The cost of preventing one *P. falciparum* infection among pregnant women in the Malawi program (US$ 10.87) is an unacceptably high cost in much of Africa.
2. Research is required to define more cost-effective interventions (including more effective drugs and health education programs) that will improve compliance among pregnant women.

STUDY LIMITATIONS

None cited.

PROGRAM AND POLICY IMPACT

This study confirms a finding common to several prior and concurrent CCCD studies: without specific interventions, levels of compliance with chloroquine chemoprophylaxis in routine antenatal programs were invariably low (generally less than 50%).

In Malawi, these findings led to a series of in-depth studies in collaboration with the HEALTHCOM resident advisor. The studies used both qualitative and quantitative methods to identify reasons for poor compliance. The effort also included a subsequent pilot intervention of an alternative health education approach and an alternative chloroquine formulation (see HELITZER-ALLEN, 1992).

PUBLICATIONS

HEYMANN DL, STEKETEE RW, WIRIMA JJ, et al.: Antenatal chloroquine chemoprophylaxis in Malawi: chloroquine resistance, compliance, protective efficacy and cost. Trans R Soc Trop Med Hyg 84:496-8 (1990).

RELATED STUDIES

GLIK DC, WARD WB, GORDON A, HABA F.: Malaria treatment practices among mothers in Guinea. J Health Soc Behav 30:421-35 (1989).

Of 243 mothers interviewed from urban and rural areas of two provinces (Kindia and Telimele), 33% of rural mothers and 69% of urban mothers sought health center care for children with fever. Access and availability factors were more important than knowledge or beliefs in seeking care. Of rural mothers 22% reported taking chloroquine during their last pregnancy as did 39% of urban mothers. Beliefs *were* more strongly associated with chloroquine use during pregnancy than with use for treating children with malaria.

See also (summarized in this volume):

HELITZER-ALLEN DL, KENDALL C: Explaining differences between qualitative and quantitative data: A study of chemoprophylaxis during pregnancy. Health Educ Q 19:41-54 (1992).

HELITZER-ALLEN DL, McFARLAND DA, WIRIMA JJ, MACHESO AP: Malaria chemoprophylaxis in pregnant women: A cost-effectiveness analysis of alternative interventions. Soc Sci Med 36:403-7 (1993).

EXPLAINING DIFFERENCES BETWEEN QUALITATIVE AND QUANTITATIVE DATA: A STUDY OF CHEMOPROPHYLAXIS DURING PREGNANCY

STUDY LOCATION: MALAWI

SHORT TITLE: **CHEMOPROPHYLAXIS DURING PREGNANCY, MALAWI**

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CO-INVESTIGATORS: Kendall C

STUDY DESIGN

Two contemporaneous studies to investigate chloroquine compliance in pregnancy and social and cultural factors related to malaria and pharmaceutical use in pregnancy. Background clinic study to determine extent of non-compliance: 265 pregnant females attending antenatal clinic administered a questionnaire. Thick blood smear taken for malaria parasites, and urine for chloroquine metabolites (modified SAKER-SOLOMONS). Parasite density greater than 200/mm^3 considered positive. Community-based ethnographic study, using focus groups and in-depth interviews among various target groups within a village of 1,500 (160 interviews and 24 focus groups). Women and men were questioned about their knowledge and beliefs regarding malaria and the local illness classification of febrile illness (malungo).

RESULTS

Background Clinic Study

- Of 265 clinic patients on chemoprophylaxis, 49% claimed to have taken chloroquine, and 31% were confirmed by urine testing.
- When asked whether there were "any medicines which are bad for pregnant women?" most women (99%) did not mention chloroquine.
- Only 26% knew chloroquine was used to prevent malaria; 24% said chloroquine was used to treat malaria.
- Twenty percent of all women were parasitemic. Of these, 83% were asymptomatic. Of women without parasitemia, 11% claimed to be experiencing symptoms of "malungo"; of those with parasitemia 17% had symptoms. Self-reported symptoms were *not* a reliable predictor of parasitemia in this population (sensitivity = 0.17, specificity = 0.89).
- Of 74 women on their first clinic visit, 23% had positive urine screens for chloroquine metabolites, indicating recent chloroquine use (presumably to treat malungo).

Ethnographic Study

- *Malungo* comprised a total of seven categories with different symptoms and etiologies.
- Community members were "unanimous" in noting that bitter medications (specifically chloroquine) and capsules were not good for pregnant women. Bitter tablets were associated with abortificants, and capsules were prohibited because "one can never tell" what kind of medicine is inside.

- Informants generally did *not* believe traditional medicines were effective against malungo caused by mosquitoes.

- The ethnographic study showed knowledge of chloroquine (both preventive and treatment uses) was extensive.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Chemoprophylactic use of chloroquine in pregnancy is quite low, and actual levels are significantly less than self-reported levels.

2. Lack of use is undoubtedly due (at least in part) to reluctance to ingest bitter medications during pregnancy.

3. There is a "background rate" of chloroquine use in the community, unrelated to the antenatal chemoprophylaxis program. In this setting, the rate was about 23%.

4. The discrepancy between clinic findings and the ethnographic study is probably due to the interview setting.

5. The discrepancy between symptoms and prevalence of parasitemia may be due to (1) imperfect congruence between infection and symptoms (2) cultural reinterpretation or (3) nosological fusion.

6. Ethnographic studies are a useful (and sometimes indispensable) complement to quantitative surveys.

STUDY LIMITATIONS

None cited.

PROGRAM AND POLICY IMPACT

The author notes the particular value of this study in identifying a "clear conflict" between health worker practices and traditional beliefs with respect to chloroquine prophylaxis in pregnancy. This finding and others were incorporated into a subsequent intervention study that evaluated alternatives to increase compliance (see following study).

To some degree, this study's findings with respect to chloroquine may become less policy relevant as increased chloroquine resistance causes the country to revise its recommended drugs for prophylaxis. However, the findings retain some importance because many of the alternatives to chloroquine being considered (e.g. mefloquine) also share the bitter taste characteristic of chloroquine.

Ongoing reassessment of the regimen for use in preganancy has continued.

PUBLICATIONS

HELITZER-ALLEN DL and KENDALL C: Explaining differences between qualitative and quantitative data: A study of chemoprophylaxis during pregnancy. Health Educ Q 19:41-54 (1992).

"Of 74 women on their first clinic visit, 23% had positive urine screens for chloroquine metabolites, indicating recent chloroquine use . . ."

MALARIA CHEMOPROPHYLAXIS COMPLIANCE IN PREGNANT WOMEN: EXAMINATION OF THE FACTORS INFLUENCING UTILIZATION, AND A COST-EFFECTIVENESS ANALYSIS OF ALTERNATIVE INTERVENTIONS

STUDY LOCATION: MALAWI

SHORT TITLE: **MALARIA PROPHYLAXIS IN PREGNANCY: INTERVENTION STUDY**

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CO-INVESTIGATORS: McFarland D, Wirima J, Macheso A

STUDY DESIGN

Intervention study to address barriers to compliance with chloroquine chemoprophylaxis documented by prior formative research study. Three population interventions were tested: (1) coated "non-bitter" chloroquine tablets, (2) revised health education message differentiating between several types of "malaria" identified by villagers, and (3) combination of a new health education message and coated chloroquine tablets. Chloroquine use as a proxy measure for program compliance was determined by urinary detection of chloroquine using modified SAKER-SOLOMONS test (STEKETEE: Bull World Health Organization 66:485-90 1988). Effectiveness determined by detection of urinary chloroquine metabolites on a return visit to antenatal clinic (ANC). Costs were estimated for the supply of drugs at the local wholesale price and for incremental costs for materials and training for new health education message.

"Women described the coated chloroquine as 'sweet, then bitter.'"

RESULTS

There were no significant differences between clinic populations except for tribal affiliation, education attainment, and complaints about side effects. These were not found to be significantly related to baseline urinary chloroquine. However complaints about side effects were not independent of medication use and did not deter women from taking the medication. Parity, gravidity, and rate of return were not significantly different.

- There was a significant difference in the baseline percentage of women testing positive for urinary chloroquine by week of enrollment at all clinics. Baseline rates increased for all groups.
- The introduction of a new health education message and the introduction of a new chloroquine formulation both had a positive impact on the percentage of clinic women taking chloroquine. The combination of both interventions did NOT appear to be additive.
- Exit interviews with patients showed women to be generally familiar with the health education messages. Numerous women described the coated chloroquine as "sweet, then bitter," and a number of them were aware that the coated tablets were "just like chloroquine, only sweetened especially for pregnant women."

- "Compliance" levels (as determined by a positive urine screen on return ANC visit) were as follows:

Current program	25%
New Health Ed message only	57%
Coated chloroquine only	87%
Coated chloroquine + new message	91%

- Total estimated cost for Malawi of interventions was as follows:

Current program	$149,844
New Health Ed message only	259,844
Coated chloroquine only	374,611
Coated chloroquine + new message	484,611

- From this, the calculated cost per compliant woman was as follows:

Current program	$1.67
New Health Ed message only	1.27
Coated chloroquine only	1.20
Coated chloroquine + new message	1.48

"The introduction of a new health education message and the introduction of a new chloroquine formulation both had a positive impact . . ."

"The effects did not appear to be additive however."

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Both interventions (improved health education and coated tablets) had a positive effect on the percentage of clinic women taking chloroquine. The effects did NOT appear to be additive, however.

2. There was a significant increase in the baseline percentage of women taking chloroquine during the intervention period. This may have been due to "study effect" or diffusion of information in the community following introduction of the intervention.

3. Knowing the purpose of the medication is neither a necessary nor sufficient condition for compliance since "women who knew the purpose of chloroquine did not necessarily take it, and women who did NOT know the purpose of the coated chloroquine took it anyway."

4. Either a strategy of different medication or a new health education message would be more cost-effective than the combined strategy. The existing strategy was the least cost-effective of the four options.

5. Changing the medication to a coated product would raise the total pharmaceutical costs of the program to more than twice current levels.

6. Although the introduction of a new health education message and the introduction of coated chloroquine tablets have similar cost effectiveness, the second intervention had a clear advantage in increased "compliance". Despite this advantage, coated chloroquine tablets might not be favored by decision-makers because of high initial cost and the requirement for scarce foreign exchange.

STUDY LIMITATIONS

Authors stress that cost-effectiveness analysis is not intended to be the sole criterion for decision-making in this context and note that results should NOT be simply interpreted as an endorsement of the intervention with the lowest cost-effectiveness value. Other limitations:

- Detection of urinary chloroquine and its metabolites is taken as a proxy measure for compliance with the program of prenatal prophylaxis. However, as the study has shown, there is a significant baseline level of chloroquine use in the community, and the single confirmatory urine test may reflect use of chloroquine for treatment or other uses as well as actual "compliance" with the prophylaxis program.

- For the purpose of the economic analysis, compliance is treated as a dichotomous variable (and women are considered as either compliant or not). It is more likely however, that incomplete levels or "partial compliance" with medical regimens will also occur, and in terms of outcome (e.g. malaria deaths prevented) partial compliance probably offers "partial protection" from adverse consequences.

- Drug "costs" calculated do not specifically take into account the probable diversion of coated chloroquine to other populations besides the target one (i.e., pregnant women). However, as demonstrated in a later study with traditional birth attendants (also in Malawi), providers in a resource-poor setting are often expected by the community to provide treatment for other community members as well as for the target group. The calculated incremental cost might therefore underestimate the actual amount (i.e., the cost of "a program treating pregnant women" may not be identical to "the cost of treating pregnant women").

PROGRAM AND POLICY IMPACT

No direct impact documented. However, provision is made in the 1990-94 National Plan for "providing additional health education to pregnant women regarding the importance of malaria prevention during pregnancy." The results of this chloroquine intervention study have also had to be reevaluated following the revision of national recommendations for chemoprophylaxis and ongoing reevaluation of recommendations (see Malawi Guidelines for the Management of Malaria, Oct. 1991).

PUBLICATIONS

HELITZER-ALLEN DL, McFARLAND DA, WIRIMA JJ, MACHESO AP: Malaria chemoprophylaxis in pregnant women: A cost-effectiveness analysis of alternative interventions. Soc. Sci. Med. 36:403-7 (1993).

RELATED STUDIES

HELITZER-ALLEN DL: Examination of the factors influencing utilization of the antenatal chemoprophylaxis program: Malawi, Central Africa. Doctoral Dissertation. Dept. of International Health, Johns Hopkins University School of Hygiene and Public Health, Baltimore, Maryland, 1989.

INTERVENTION STUDY ON MALARIA – FEASIBILITY, ACCEPTABILITY AND COST OF PROVIDING CHLOROQUINE THROUGH TRADITIONAL HEALTH WORKERS IN MALAWI

STUDY LOCATION: MALAWI

SHORT TITLE: **COMMUNITY INTERVENTION IN MALARIA, MALAWI**

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CO-INVESTIGATORS: Kapachika L, Heyman D, McFarland D

STUDY DESIGN

An intervention study to evaluate the feasibility of using traditional birth attendants (TBAs) for the diagnosis and presumptive treatment of fever at the village level. Study utilized 38 TBAs, trained to presumptively treat clinical malaria with chloroquine (2-day training session). Post-intervention evaluation to assess the correctness of TBA prescribing practices and acceptability to communities. Study sited in 47 villages in the Salima District – 18 intervention villages and 29 control villages (offering routine health services). Post-intervention assessments were carried out after 4 months using (1) practice surveys, (2) review of TBA records, and (3) review of health facility records. Chloroquine was provided to TBAs at no cost. TBAs did not charge for services. Refresher courses in presumptive treatment of malaria were held in health facilities in both intervention and control areas at the outset of the study. Monthly supervisory visits to TBAs were made during the intervention.

RESULTS

There were no significant baseline differences between intervention and control areas. Malaria parasite prevalence was 39% in December 1986 at the start of the intervention, and 78% in April 1987, post-intervention. Home treatment of fever/malaria was 3-5% for the period.

- There was a significant decrease in the number of mothers who used health facilities for treatment of fevers during the intervention period (from 100% to 29%).
- There was a corresponding increase in mothers using TBAs (from 0% to 56%).
- By mothers' accounts, 24% of treatment by trained TBAs was the correct (3-day) dosage; while correct dosage was given by health workers in 13% of cases in the intervention area ($p = 0.17$, ns) and 7% of cases in control area.
- Undertreatment was the most common cause of incorrect dosage (59-84% for health workers, and 51-100% for TBAs).
- According to treatment records, 92% of 691 children treated by TBAs received the correct dosage, versus 18% of 300 episodes treated by health workers ($p < 0.00001$).
- Children under five constitute 42% of patients seen by TBAs, and received 21% of chloroquine distributed.

- The 1987 cost of training one TBA was estimated at 38.63 Malawi kwacha (US $17.25), and the cost of providing chloroquine to a child younger than 5 years old with fever was MK 0.60 ($0.28). On a national basis, estimated cost ranged from MK 1.04 million to MK 9.8 million in the fifth year of a proposed phase-in (US $0.5 million to $5.4 million). Costs do *not* include training costs.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. TBAs are an acceptable and possibly preferred source of treatment and advice to mothers of children with fever.

2. TBAs are reported by mothers to be "as accurate as health workers" in prescribing chloroquine, but performance of both was "less than ideal."

3. Recurrent costs to provide treatment to children through TBAs are considerable. Savings in health facility costs are difficult to estimate.

STUDY LIMITATIONS

Author notes that cost estimates are "crude at best" and based on the estimated annual incidence of fevers in children under five. Estimates would also vary considerably depending on whether study assumes all episodes are treated, and whether adjustments are made for treatment provided to persons outside the target group (58% of treatments in this case). Other considerations:

- The use of TBAs may not remain at documented levels for an indefinite period. It is not unusual for newly introduced programs to record high initial use followed by stabilization at somewhat lower levels as the "newness" or novelty of the innovation decreases (ROGERS E.M: Diffusion of Innovations, 3rd Ed. New York: Free Press. 1983).

- Much of the mothers' willingness to use TBAs during the intervention period may have been attributable to two very significant factors: (1) reliable chloroquine supply and (2) availability at no cost. Author notes that the program as conceived would probably need to include small user fees to be sustainable, but "even small fees may alter the acceptability of TBAs as a source of advice and medication." This hypothesis was not tested, however.

- The intervention does not address the issue of logistics and supply, which facility surveys showed previously to be a significant problem at peripheral levels. Unless a parallel distribution system were established for TBAs (with its attendant cost), the frequent stock ruptures and drug shortages that exist in health facilities might also occur with TBAs as providers.

PROGRAM AND POLICY IMPACT

The recommendations of this study for incorporating TBAs in treatment has not been widely adopted in practice, although both the 1985-89 and the 1990-94 Five-Year Plans have included village level health workers (including TBAs) in their strategy for extending service delivery into the community. The 1990-94 National Plan for Malaria Control for example, notes that although "efforts have been made in certain districts to provide malaria treatment at the community level, this has not been widely employed across the country." A 1989 joint review of CDD and Malaria control programs noted that lack of sufficient experience and resources had hampered previous efforts. In general, all of these proposed community-based interventions included some partial cost-recovery through a minimal fee (a question raised in this study).

Evidence suggests, therefore, that the mandate for involvement of community-based interventions apparently persists, although constrained by limited resources.

PUBLICATIONS

HELITZER-ALLEN DL: Collecting information in the field: An experience designing record forms for traditional birth attendants in Malawi, in: SEIDEL, RE: Notes from the Field. In Communication For Child Surival. Washington, DC: Academy for Educational Development, April 1993.

This article describes the evolution of the TBA program over 10 months (6 months beyond this initial study). A detailed description of the development of the recording form used by TBAs to record treatment is included. The longer follow-up confirmed findings of the short-term study; recording practices improved significantly with improved design of forms, but many reports of undocumented use of chloroquine were also noted.

PARASITOLOGICAL AND CLINICAL EFFICACY OF 25 AND 50 MG/KG OF CHLOROQUINE FOR TREATMENT OF PLASMODIUM FALCIPARUM MALARIA IN RWANDAN CHILDREN

STUDY LOCATION:	RWANDA
SHORT TITLE:	**EFFICACY OF CQ25 AND CQ50 IN RWANDAN CHILDREN**
PRINCIPAL INVESTIGATOR:	SEXTON, Dr. John D. Malaria Branch, MS F-12 Division of Parasitic Diseases, Centers for Disease Control and Prevention, Atlanta, GA 30333
CO-INVESTIGATORS:	Deloron P, Buglimfura L, Ntilivamunda A, Neill M.

STUDY DESIGN

The standard chloroquine treatment for Plasmodium falciparum malaria is 25 mg (base)/kg (C25) given over 3 days. In Rwanda, 50 mg/kg (C50) administered over 6 days has been recommended by the Faculty of Medicine, Ministry of Health. The present study compared clinical and parasitological efficacy and side effects of C25 and C50 in children less than or equal to 5 years of age. In vitro studies with chloroquine, mefloquine, pyrimethamine, and quinine were also performed. A 3-day treatment of C25 was given to 90 children and a 5-day treatment of C50 was given to 48. Patients were followed for a total of 15 days (D0 to D14).

RESULTS

- At day 14, 73% of the C25 and 67% of the C50 children were still parasitemic, but the mean geometric parasite density had decreased by at least 96% in both groups.
- Clinically, 44 C25 and 12 C50 children had fever on day 0; by day 14 only 4 (9%) C25 and 4 (33%) C50 children still had fever. Side effects were found to be minimal.
- The chloroquine in vitro tests corroborated the in vivo findings.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. For malaria therapy of Rwandan children under 5 years of age, the WHO recommended dosage of 25 mg/kg given over 3 days produced benefits similar to a dosage of 50 mg/kg of chloroquine given over 5 days.
2. *P. falciparum* was found to be quite sensitive to mefloquine and quinine but showed a high (59%) resistance to pyrimethamine.

PROGRAM AND POLICY IMPACT

As a result of this study the Ministry of Health recommended CQ25 as standard treatment of uncomplicated malaria in children.

■ PUBLICATIONS

SEXTON JD, DELORON P, BUGLIMFURA L, et al.: Parasitologic and clinical efficacy of 25 and 50 mg/kg of chloroquine for treatment of *Plasmodium falciparum* malaria in Rwandan children. Am J Trop Med Hyg 38:237-43 (1988).

■ RELATED STUDIES

DELORON P, SEXTON JD, BUGLIMFURA L, et al.: Amodiaquine and sulfadoxine-pyrimethamine as treatment for chloroquine resistant *Plasmodium falciparum* in Rwanda. Am J Trop Med Hyg 38:244-8 (1988).

Chloroquine treatment failures from the above study were treated with Amodiaquine 25 mg/kg or Sulfadoxine-Pyrimethamine in recommended dose. Of 68 children, 50 on Amodiaquine (78%) cleared parasites by D7. All of 34 children on sulfadoxine-pyrimethamine cleared parasites by D7. No major side effects requiring cessation of treatment were detected. Presence of RI type resistance (delayed recrudescence) could not be excluded.

SINGLE-DOSE CHLOROQUINE THERAPY FOR PLASMODIUM FALCIPARUM INCHILDREN IN TOGO, WEST AFRICA

STUDY LOCATION: TOGO

SHORT TITLE: **SINGLE-DOSE CQ THERAPY, TOGO**

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CO-INVESTIGATORS: Gayibor A, Roberts JM, Sexton JD, Agbo K, Miller KD, Karsa T, Murphy K

STUDY DESIGN

Chloroquine, in a single dose of 10 mg of base/kg, was given orally to Togolese children less than 5 years of age as primary therapy for Plasmodium falciparum malaria. A simplified World Health Organization in vivo method was used, as was a sequential analysis procedure, for determining if the drug trial was a success or failure. This study was carried out in 1984.

RESULTS

- In three regions 178 children were treated; 174 (98%) responded successfully, which required a greater than or equal to 75% reduction in parasites by day 2 and elimination of parasites by day 7.
- All four failures had low blood levels of chloroquine and desethylchloroquine at day 7.

STUDY CONCLUSIONS AND RECOMMENDATIONS:

- A single dose of chloroquine for treating malaria can be considered for those areas of Africa where the efficacy of such therapy is documented and where an antimalarial drug sensitivity monitoring system is operating.

STUDY LIMITATIONS

- Limitation of test to 7-day follow-up cannot exclude late recrudescences of RI type. This was acknowledged by the authors, but they also note the difficulties inherent in follow-up at D14 and D28.

"At the time of this study a mixed picture existed in Togo regarding malaria treatment practices — although 10mg/kg was officially recommended, the 25mg/kg regimen was frequently used. . . ."

PROGRAM AND POLICY IMPACT

This study's recommendation was for continued use of CQ10 in Togo on the basis of the effectiveness of this regimen in areas of low chloroquine resistance. The authors disputed then existing recommendations for the use of CQ25 in areas where resistance does not exist. At the time of this study a mixed picture existed in Togo regarding malaria treatment practices — although 10 mg/kg was officially recommended, the 25 mg/kg regimen was frequently used in response to WHO published recommendations. The recommended dose of chloroquine for the treatment of fever and malaria was 10 mg/kg until the summer of 1988 (following a national conference in March 1988), when the dose was changed to 25 mg/kg. (Resistance was first documented in Togo in 1987.) Regular surveillance of *P. falciparum* sensitivity to chloroquine and other antimalarials was subsequently established (see below).

The field and laboratory work for this series of studies was coordinated and supervised by the Service National du Paludisme. The exercise contributed to the training and experience of 13 local health professionals.

PUBLICATIONS

BREMAN JG, GAYIBOR A, ROBERTS JM, et al.: Single-dose chloroquine therapy for *Plasmodium falciparum* in children in Togo, West-Africa. Am J Trop Med Hyg 36:469-73 (1987).

RELATED STUDIES

GNAMEY K, KESSIE K, BREMAN JG, et al.: Efficacité des antipaludiques sur le *Plasmodium falciparum* au Togo. Résultats d'une série d'enquêtes en 1988 et en 1989. Bull Soc Pathol Exot Filiales 84:1005 (1991).

In vivo testing in 1988 showed average CQ resistance of 32% (range 27% to 39%) at four sites in Togo, with 2.2% prevalence of RIII type resistance. Amodiaquine resistance of 18.5% was shown at two sites (16% at Tone, 21% at Kloto), with 0.8% prevalence of RIII type resistance. Subsequent hospital surveillance at the University Hospital Center (CHU), Lome, revealed 44% CQ resistance and 8.3% amodiaquine resistance, but no resistance to quinine in 86 patients tested.

HOME TREATMENT OF FEBRILE CHILDREN WITH ANTIMALARIAL DRUGS IN TOGO

STUDY LOCATION:	TOGO
SHORT TITLE:	HOME TREATMENT OF FEVER, TOGO
PRINCIPAL INVESTIGATOR:	DEMING, Dr. Michael S. Technical Support Division International Health Program Office, MS F-03 Centers for Disease Control and Prevention, Atlanta, GA 30333
CO-INVESTIGATORS:	Gayibor A, Murphy K, Jones TS, Karsa T

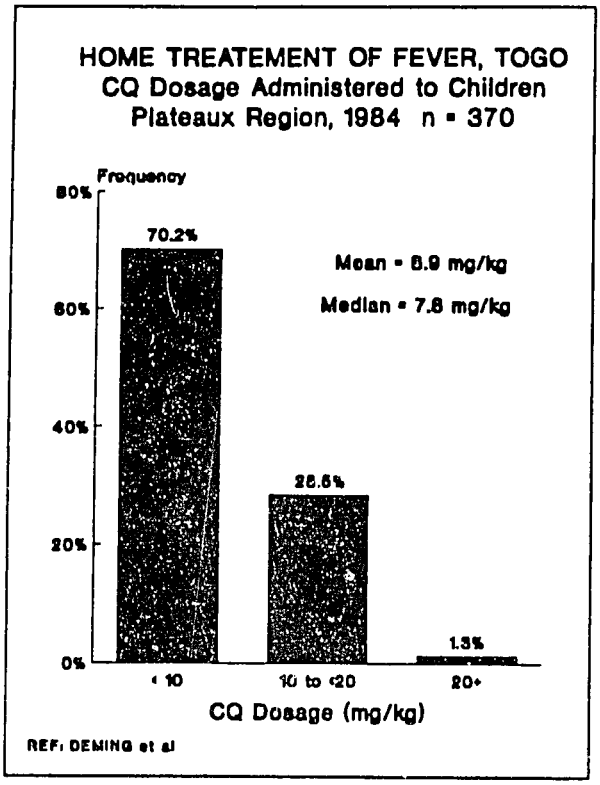
STUDY DESIGN

A follow-up survey was conducted of mothers interviewed in the 1984 Mortality and Utilization of Health Services (MUHS) survey in the Plateaux region of Togo (see summary for WALDMAN et al.: Togo MUHS study). In the MUHS survey, women of children younger than 6 years of age were asked if their children had had fever or malaria in the preceding two weeks. In the follow-up survey, conducted in the three of the Region's five prefectures (18 of the 30 original clusters). Mothers who had answered "yes" to this question were questioned in detail about the care their child received during the fever or malaria illness, including the identity and amount of any antimalarial drug received, and the children were weighed. When necessary, samples of drugs and their packaging were shown to mothers to assist them in identifying the drug their child received. "Home treatment" was defined as treatment with an antimalarial drug received before visiting a health facility or in the absence of a visit to a health facility. A concurrent survey was undertaken of the fever treatment practices of health facility staff at a convenience sample of 10 health facilities in the prefectures of the follow-up survey.

RESULTS

The analysis of treatment practices was limited to 507 children with a completed episode of fever.

- Altogether, 20% of children with fever were taken to a health center, and 83% were treated at home with an antimalarial drug (11% received both home and health center treatment); 8% of children were not treated at home or at the health center.
- Of children treated at home 97% were treated on the first day of fever. In contrast, only 17% of those treated at health centers were treated on the first day of illness.
- Chloroquine was the drug used for 94% of children treated at home. A single commercial preparation — Nivaquine was used for 91% of children and was well known by name.
- At the time of the survey, recommended treatment for malaria was 10 mg/kg of chloroquine, given as a single dose. This dosage was known to be effective from recent in vivo testing. In the survey "acceptable" chloroquine treatment was defined as 10-20 mg/kg received during the first 24 hours of treatment. In all, 29% of home chloroquine treatments dosages were in this range. Seventy percent of treatments were below the range and 1% were above.



- Street vendors or market sellers supplied 64% of the chloroquine used for home treatment, and pharmacies supplied 35%.

- All 586 mothers in the survey were asked how they would prefer their children to be treated at a health center — with pills, syrup, or by injection. Fifty-seven percent preferred pills or syrup, 33% said they did not know, and only 10% said they preferred injections. The main reason cited (by 70% of respondents) was fear of paralysis from injections. However, 69% of clinicians surveyed (9/13) believed that mothers preferred injections over oral medications.

- A review of health center records during the same period showed that 66% of children treated for malaria received an injection.

- In 13 villages in Wawa and Kloto Prefectures, where the follow-up survey was conducted, there were 34 vendors (revendeures) who sold "Nivaquine" tablets (the most popular brand of chloroquine), along with other commonly used household supplies. Only one of these villages had a health worker able to dispense chloroquine. Cost per tablet was 0.5 to 0.8 cents more from village vendors (1.8 to 2.1 cents) than from state pharmacy outlets (1.3 cents).

- Nivaquine was available from all village vendors in quantities of one or more tablets. However a minimum purchase of 20 tablets was usually required at state pharmacy outlets.

- Only 9% of respondents in the follow-up survey recognized the role of mosquitoes in causing malaria.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Home treatment of febrile children with an antimalarial drug is extremely common in south-central Togo.

2. The use of alternative health care resources (village vendors) in this setting was more common than the use of health centers or pharmacies.

3. Early home treatment offers advantages of promptness, availability (even to children without ready access to health centers), and sustainability (since home treatment is self-financing and self-managing).

4. The main problem identified in home treatment was underdosing. Overdosing was uncommon.

5. A pictorial display showing appropriate treatment dosages and displayed at pharmacies and by village vendors might reduce underdosing.

6. The use of injectable antimalarials by health workers was quite excessive. Health workers' misconceptions about mothers' preferences may have contributed to this.

7. The authors raise the question of whether or not countries should actively encourage involvement of parents in home treatment of febrile illness in the interests of child survival.

STUDY LIMITATIONS

None cited, but the study surveyed only one region of Togo, and within that region surveyed only 18 clusters instead of all 30 assessed originally. The results may not be representative of the entire country. The authors of this study also acknowledge that use of home treat-

ment varies considerably from region to region and country to country.

PROGRAM AND POLICY IMPACT

This study is an instructive example of country-specific research that is extremely relevant to this country but whose specific findings cannot be readily applied to the policy or programmatic needs of another country.

By most accounts, the implications of this study's findings have not been fully exploited. Probably the most significant finding was that the use of alternative sources of medical care is a significant factor in the health-related behavior of populations. In general, however, official government health services seldom take account of alternative providers, despite the fact that these providers may account for a significant proportion of all health care services available.

Although WHO recommendations for the prompt treatment of febrile illness (presumptive treatment of malaria) was a CCCD priority, ministries of health (and the CCCD project) did not generally embrace home treatment or self treatment as part of that strategy. This is not unique to the ACSI-CCCD project or to project countries. In general, early community treatment has focused mainly on the use of first-line community health workers (CHWs) or village health workers (VHWs), or other resources operating from community health centers. Even this strategy has not been widely espoused or adopted, although it has been applied to varying degrees, usually on a local level.

In a wider sense, this situation also reflects a more fundamental issue — that is, the recognition (or non- recognition) by the health system of the status quo. It should be noted that this study does not propose a strategy of using parents as treatment providers but simply acknowledges that parents are already functioning as treatment providers. It also demonstrated that this occurs to a considerable degree, and that parents treat promptly and with the correct drug.

Although the malaria program in Togo has acknowledged the home treatment of malaria to be very widespread, home treatment is not a part of national policy. In part, such decision-making is complicated because the retail sale of chloroquine (and other drugs) by non-pharmacists is technically illegal (although widely practiced) in Togo. This situation is not uncommon in sub-Saharan Africa.

PUBLICATIONS

DEMING MS, GAYIBOR A, MURPHY K et al.: Home treatment of febrile children with antimalarial drugs in Togo. Bull World Health Organ 67:695-700 (1989)

RELATED STUDIES

GAYIBOR A, D'ALMEIDA AE, BAYOR M: A propos de l'utilisation des antipaludiques: Resultats d'enquete dans les pharmacies de la commune de Lomé, du 12 au 16 Mars 1990.

A 1990 questionnaire survey of pharmacists, sellers, and clients at 45 pharmacies in Lomé: approximately 78% of antimalarials were sold as tablets or suspension and 22% as injections. Only 25% of sellers gave correct dosages of chloroquine and pyrimethamine-sulphadoxine, 32% did not answer, and 43% gave a wrong response. Of the clients, 32% knew correct dosages, 18% gave a wrong response, and 50% said they did not know. Only 12% of clients preferred injectable antimalarials for the treatment of children.

GLIK DC, WARD WB, GORDON A, HABA F.: Malaria treatment practices among mothers in Guinea. J Health Soc Behav 30:421-35 (1989).

A total of 243 mothers were interviewed from urban and rural areas of two provinces (Kindia and Telimele). Of these, 33% of rural mothers and 69% of urban mothers sought health center care for children with fever. Access and availability factors were more important than knowledge or beliefs in seeking care. Of rural mothers 22% reported taking chloroquine as did 39% of urban mothers. Beliefs were more strongly associated with chloroquine use during pregnancy than with use for treating children with malaria.

GLIK D, GORDON A, WARD W, et al.: Focus group methods for formative research in child survival: an Ivorian example. Intl Q Commun Health Education 8:297-316 (1987-88).

In all, 24 focus groups were used (representing 6 language or ethnic groups in 3 geographic zones of Cote d'Ivoire) to identify treatment preferences, local classifications of malaria and febrile illness, and access and availability of treatment. (Methodology is described but results are not reported in detail in this article).

MISSION EFFECTUEE DANS LE CADRE DU COURS INTERNATIONAL SUR LA CHEMOSENSIBILITE PALUSTRE ORGANISE PAR L'USAID ET LE CDC ATLANTA A ABIDJAN DU 3 AU 25 SEPTEMBRE 1986

STUDY LOCATION:	COTE D'IVOIRE
SHORT TITLE:	**IN VIVO EFFICACY OF CHLOROQUINE, COTE D'IVOIRE**
PRINCIPAL INVESTIGATOR:	SORO, Dr. Benoit N Medecin-Epidemiologiste Institut National de Santé Publique BP V47, Abidjan
CO-INVESTIGATORS:	Davis CE, Peyron FM, Yao F, Saki ZM, Nguyen-dinh P, Breman JG

STUDY DESIGN

In order to develop a malaria treatment policy for children with Plasmodium falciparum, an in vivo and in vitro chloroquine (CQ) sensitivity study was conducted in Cote d'Ivoire in September 1986. The efficacy of a single dose of CQ 10 mg base/kg (C10) was tested with assessment of subjects on days 2 and 7 after treatment.

RESULTS

- A total of 108 (99%) of 109 children were aparasitemic on day 7.
- Of 33 isolates of *P. falciparum* tested in vitro, 2 (6%) were resistant to CQ.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Although C10 appeared effective clinically and parasitologically in Cote d'Ivoire, a treatment dose of 25 mg of CQ base/kg (C25) over 3 days was recommended as first-line therapy for malaria.
2. The higher dose was recommended in view of the predicted spread of in vivo CQ resistance into West African countries, including Cote d'Ivoire.
3. The C25 dose still retains clinical effectiveness in most partially-immune persons living in areas with low-level chloroquine resistance and alternate drugs are more expensive.

"As a result of this seminar, a national strategy for the treatment of malaria was elaborated, using chloroquine at a dose of 25mg/kg over a three-day period"

STUDY LIMITATIONS

The study's scope was limited by site selection. Selected areas do not necessarily constitute a representative sample of possible surveillance sites, but the study acknowledged this. The need for a more systematic (and comprehensive) surveillance system was recognized in the recommendations.

PROGRAM AND POLICY IMPACT

"As a result of this seminar, a national strategy for the treatment of malaria was elaborated, using chloroquine at a dose of 25mg/kg over a three-day period" (1987 external evaluation). It is noteworthy that the final policy adopted is more stringent than warranted by the study's own findings and recommendations. This policy was developed by a technical committee on the basis of study findings, but was not limited to this study.

The study's recommendation for sentinel surveillance of chloroquine resistance was also endorsed and implemented in 1990-91.

The seminar provided significant practical experience for 17 participants from Cote d'Ivoire, Burundi, and Guinea. Competencies were gained in monitoring chloroquine resistance, reviewing current knowledge, and using study data to elaborate policy or strategies.

Participants were not appreciably involved with generating proposals, study design, or any other aspects except implementation. On the other hand, utilizing two OCCGE staffers as resource persons provided mutual benefits to that body and to seminar organizers.

PUBLICATIONS

SORO B, DAVIS CE, PEYRON FM, et al.: Formulation of a malaria treatment policy for children in Cote d'Ivoire as chloroquine resistant *P. falciparum* spreads into West Africa. Ann Trop Med Parasitol 83(2):101-6 (1989).

PREVALENCE DU PALUDISME DANS LES CAS DE FIEVRE OBSERVES CHEZ LES ENFANTS DE 0-4 ANS AU CENTRE DE PROTECTION MATERNELLE ET INFANTILE (PMI) D'AGBOVILLE.

STUDY LOCATION: COTE D'IVOIRE

SHORT TITLE: **MALARIA IN CHILDREN 0-4YO, AGBOVILLE**

PRINCIPAL INVESTIGATOR: IMBOUA-BOGUI, Dr. Guy
Medecin Epidemiologiste et de Santé Communautaire
Institut National de Santé Publique
BP V47, Abidjan

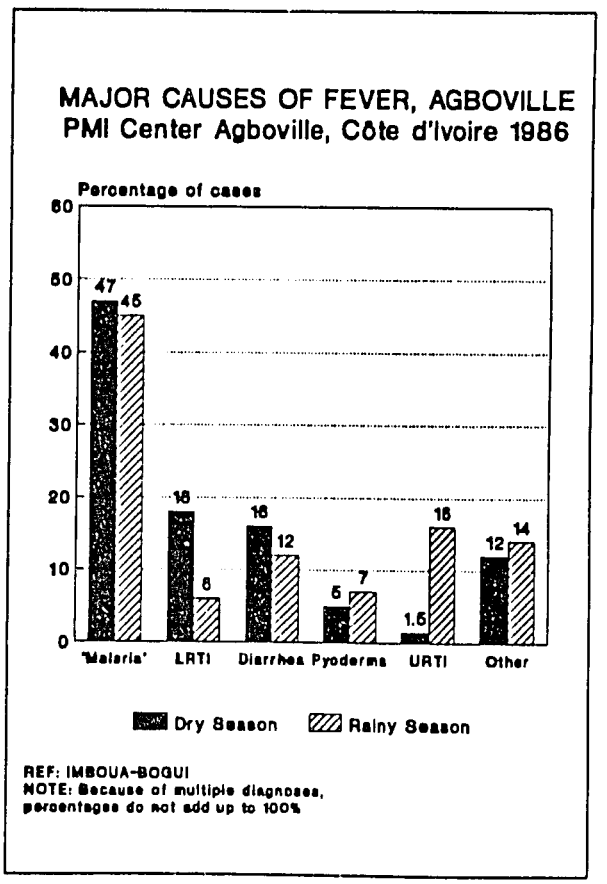
CO-INVESTIGATORS: Diawara I

STUDY DESIGN

*Prospective review of all patients with fever seeking treatment at the **PMI Center, Ag boville**, from March through May 1986 (dry season) and July through August 1986 (wet season). Prior records show children aged 0 to 4 years comprise 46% of patient population. Fever defined as temperature greater than or equal to 38°C deg, (or 37.5°C deg for all premature infants). All patients had clinical exam, thick smears for blood parasites, white cell count, and treatment with chloroquine at 10mg/kg. Initial plans to evaluate urinary chloroquine by DILL-GLAZKO method was abandoned during study because of difficulties in obtaining urine, inconvenience to mothers, etc. Follow-up blood smears at D3 and D7 also proved impractical because of remoteness of patients' living quarters and transportation difficulties.*

RESULTS

- Prevalence of malaria parasitemia was 22% in the dry season, and 39% in the rainy season.
- Mean parasite densities were 5,500/mm^3 for dry season cases of malaria, and 6,200/mm^3 for rainy season cases. The difference was not statistically significant.
- *P. falciparum* alone was responsible for all 42 dry season cases of malaria and for 91% of rainy season cases.



- Of cases of clinical malaria, during the rainy season 60% were confirmed by positive slides, but during the dry season only 28% of cases were confirmed by positive slides. The difference was statistically significant.

- Principal causes of fever by season are shown in the accompanying figure.

- Of 183 febrile patients NOT diagnosed as malaria, 19% were positive for parasites on thick smear (false negatives). Parasite prevalence rates were 17% for the dry season and 22% for the wet season.

- In 67% of patients with positive parasitemia during the dry season, leucocyte counts were less than 10,000. Mean leucocyte count was 8,700. During the rainy season, only one parasite positive patient (1/59) had a leucocyte count below 10,000, and mean count was over 19,000.

- Of 59 parasite positive patients during the rainy season, 13 (22%) had parasite counts less than 1,000/mm^3, indicative of malaria "infection" without "disease". None of the 42 patients in the dry season had parasite densities below 1,000.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Malaria disease (defined as parasitemia greater than 1,000/mm3) occurred in only 22% to 30% of children 0 to 4 years of age with fever.

2. Forty percent (40%) of febrile patients in the rainy season have parasitemia.

3. A clinical diagnosis of malaria was more reliable in the rainy season.

4. A significant number of children with parasitemia will be overlooked unless all febrile children are treated presumptively for malaria.

5. In absence of laboratory facilities it is recommended to ensure antimalarial coverage in cases of fever in children 0 to 4 years of age, particularly in the rainy season. In areas of high malaria endemicity, malaria treatment should be added to antibiotic treatment of other childhood febrile illness.

STUDY LIMITATIONS

The study population is probably not appropriate for generalizing results to the country's population at large, because physical conditions vary greatly throughout Cote d'Ivoire, (e.g., both savanne and forest geographies). Moreover, Agboville is relatively close to Abidjan (90k). Additional limitations were

- Plans to hold children pending results of testing before providing treatment proved difficult in the field, as did prospects for collecting urine samples from febrile children (to evaluate or confirm prior home treatment). Urine analysis was therefore aborted, and presumptive treatment of all febrile children with chloroquine was eventually decided upon.

- Planned home follow-up at D3 and D7 proved unfeasible and was also abandoned.

PROGRAM AND POLICY IMPACT

Not documented. Results of the study show somewhat lower levels of infection than do two prior studies by Imboua-Bogui. Results of one study showed levels of infection in a forest area of 54% in the rainy season and 12% in the dry season. The second study found 77% of febrile children and 35% of non-febrile children to have parasites. This is not entirely inconsistent, however, with the variability of parasitemia in different locations and at different seasonal periods.

In fact, the present study did provide a small contribution to several 1986 studies evaluating malaria prevalence and treatment. These in turn were used in 1987 to formulate a national malaria policy that included provision for presumptive treatment of children with fever using antimalarials. This policy was eventually approved by the Ministry of Health in January 1988.

PUBLICATIONS

None documented.

". . . During the dry season only 28% of cases were confirmed by positive slides."

STUDIES ON CHLOROQUINE EFFICACY IN SWAZILAND, 1986

STUDY LOCATION:	SWAZILAND
SHORT TITLE:	**CQ EFFICACY IN SWAZILAND**
PRINCIPAL INVESTIGATOR:	TSHABALALA, Dr. Ruth Ministry of Health Swaziland
CO-INVESTIGATOR:	Khoromana C

STUDY DESIGN

*The study used 7-day in vivo testing of a C10 (single dose) chloroquine regime. Study was undertaken in May-June 1986 concurrently with a training course on vivo testing techniques. Two test sites were used — **Big Bend, and St. Phillips Mission**, both in the lowveld region of Swaziland. Initial recruitment of children 0 to 5 years of age was targeted. Additional children from a Mozambican refugee camp at Ndzevana and children older than 5 years of age were subsequently included because of low infection rates and low numbers at original sites. Inclusion criteria: pure P. falciparum infection, no prior CQ treatment, and condition not so severe as to require hospitalization.*

RESULTS

A total of 2,766 children were screened.

- Of all children, 200 (7%) had malaria parasites on thick smear.
- Of the positive cases, 12 of 35 completing the 7-day follow-up (34%) continued to have low-grade parasitemia.
- Only 6 parasite positive children were reported febrile at onset of treatment. All of these became afebrile by D7.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. C10 regime was not recommended for parasitologic cure.
2. Further testing using C25 regimen should be pursued.
3. Policy of routine chemoprophylaxis of children younger than 5 years of age five should be reevaluated in view of emerging chloroquine resistance.

STUDY LIMITATIONS

- Positivity rates for parasites are hardly representative of the country as a whole, since many may have been imported cases from the refugee camp.
- Similar implications apply for CQ resistance — 43% of failures were recorded in the sample that included the refugee camp, and 21% in the sample from the alternate site.

PROGRAM AND POLICY IMPACT

The recommended follow-up study testing C25 chloroquine regimen was carried out in March 1987 and recorded parasitological failure in 79% of 29 children tested. Although recognizing this, the 1988-90 national plan retained chloroquine as the first line treatment for malaria (in a dose of 25 mg/kg) in view of chloroquine's wide availability and clinical efficacy.

The recommended phasing out of routine prophylaxis in groups other than pregnant women was also adopted as policy.

PUBLICATIONS

Results included in BREMAN JG, CAMPBELL CC: Combatting severe malaria in African children. Bull World Health Organ 66:611-20 (1988).

RESPONSE OF CHILDREN WITH PLASMODIUM FALCIPARUM TO CHLOROQUINE, AND DEVELOPMENT OF A NATIONAL MALARIA TREATMENT POLICY IN ZAIRE, 1985

STUDY LOCATION: ZAIRE

SHORT TITLE: **CQ RESPONSE IN CHILDREN AND NATIONAL TX POLICY**

PRINCIPAL INVESTIGATOR: PALUKU, Dr. Kalenga-Mbudi
Malaria Coordinator
Medecin, PEV/CCCD BP 9638
Kinshasa, Zaire

CO-INVESTIGATORS: Breman JG, Moore M, Ngimbi NP, SEXTON JD, Roy J, Steketee RW, Weinman JM, Kalisa-Ruti, Mambu Ma-Disu

STUDY DESIGN

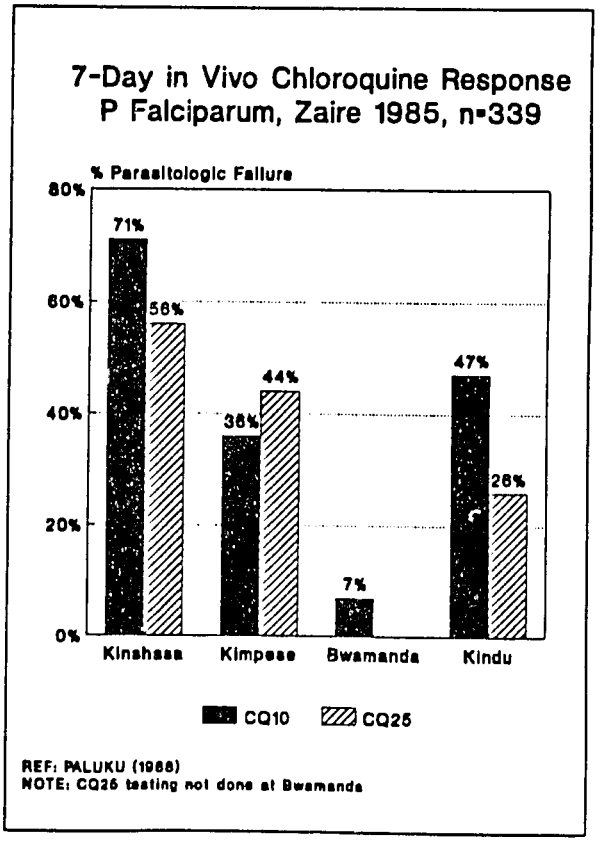
Study was executed during 3 weeks in September and October 1985, concurrent with a CCCD regional workshop on in vivo drug surveillance. Four of nine regions were selected: ***Kindu*** *(Kivu region -- previously known to have chloroquine resistant P. falciparum — CRPF),* ***Bwamanda*** *(Equateur — no known resistance),* ***Kimpese*** *(Bas-Zaire — CRPF reported recently), and* ***Kinshasa*** *(CRPF suspected).*

A CDC modification of the standard WHO in vivo test was used to evaluate response to C10 and C25 in children 0 to 5 years of age. Inclusion criteria: pure infection with *P. falciparum* (mixed infections excluded), parasites greater than 1,000/mm^3, no prior antimalarial treatment, and negative DILL-GLAZKO urine test for CQ metabolites. Re-evaluation at D2, D3, and D7. Therapy failure indicated by greater than 25% of original parasite count present at D3, or any parasites at D7 (and confirmed urine test for CQ).

RESULTS

Of 2,502 children screened, 33% were parasitemic. Of these, 339 were recruited for study. Fifty-two (15%) of study children were febrile on D0.

- In Bwamanda, 92% of children were aparasitemic 7 days after chloroquine (10 mg/kg) but in Kinshasa only 44% were free of parasites after 25 mg/kg chloroquine.



- The mean drop in parasite density among those who did not clear parasites by day 7 was greater than 98% of the initial value.

- Only 1 child of 51 who were initially febrile remained febrile, although 14 (28%) of these had resistant parasites.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Although the parasite density decreased markedly, the failure of most subjects to become aparasitemic indicated a marked decrease in parasite sensitivity since 1983.

2. Despite parasitologic failures, both dosages continued to produce clinical improvement.

3. Recommendations were made for the use of 25 mg/kg chloroquine as first line treatment for fever and malaria in children 0 to 5 years of age.

4. Alternative second-line drugs should be available for chloroquine treatment failures.

STUDY LIMITATIONS

- Only 4 of 9 regions in Zaire were evaluated. Despite this, findings were of sufficient significance in those regions to warrant policy changes.

- Prevalence rates should be interpreted cautiously, since parasite prevalence is generally seasonal.

PROGRAM AND POLICY IMPACT

This study had a major effect on the formulation of national malaria policy for Zaire. The decrease in parasitaemia and temperature, even among children with resistant strains, led the Ministry of Health to recommend 25 mg/kg chloroquine as first line treatment for fever and malaria in their national malaria control plan.

The plan also included drug sensitivity surveillance and a referral system for patients who do not respond to chloroquine treatment. Since 1985, the drug sensitivity surveillance network was extended to Kisangam, Lubumbashi, Tshikala and Katana. The operation of the widely dispersed surveillance network has been severely affected by economic constraints and political instability over the intervening years, however.

In the national malaria plan, initial recommendations advising the use of C10 in areas of low resistance were subsequently revised to recommend C25 for all areas of Zaire.

Investigation of response to alternative drugs (e.g. amodiaquine, pyrimethamine-sulphadoxine, quinine) was also initiated — see DELACOLLETTE: Acta Leiden 55:159-62 (1987) and PALUKU: Ann Soc Belg Med Trop 69:25-33 (1989).

This study was an integral part of a training workshop and exercise that involved 45 participants from 4 countries (Zaire Congo, Central African Republic, and Rwanda). There were two complementary objectives of the workshop, and benefits of the training program were focused on both: (1) improving competency in the methodology and labwork involved in the in vivo tests, and (2) developing experience in the field investigations and concept of in vivo sensitivity studies. The named principal investigator was only one participant in the planning and sponsorship of the entire program and investigation. CDC/CCCD input in all aspects

"Although the parasite density decreased markedly, the failure of most subjects to become aparasitemic indicated a marked decrease in parasite sensitivity since 1983."

(particularly planning, concept, and methodology) was major.

The study is not strictly comparable with individually conceived and executed studies but has considerably benefited the principal investigator as well as other participants.

PUBLICATIONS

PALUKU KM, BREMAN JG, MOORE M, et al.: Response of children with *Plasmodium falciparum* to chloroquine and development of a national malaria treatment policy in Zaire. Trans R Soc Trop Med Hyg 82:353-7 (1988).

RELATED STUDIES

PALUKU KM, NGIMBI NP, MUSHIYA WK, MAMBU MD: Efficacité comparative des traitements alternatifs dans les infections a *P. falciparum* au Zaire. Ann Soc Belg Med Trop 69:25-33 (1989).

At 3 of 14 sentinel sites (Kisangani, Tshela and Bandundu), in vivo studies of 3 alternative regimens versus standard CQ25 treatment. Studies carried out during 1986 and 1987. Failure rates at D7 were 44% to 81% for CQ25, 2% to 9% for Q140 (140 mg/kg quininine over 7 days) and 2% to 4% for pyrimethamine-sulphadoxine (Fansidar). At one site (Tshela) parasitologic failure with Q140 increased to 26% by D14. All the antimalarials retained clinical effectiveness (determined by remission of fever). This was a CCCD-supported study.

ETUDE IN VIVO CHLOROQUINE: FEMMES ENCIENTES ET ENFANTS A KINGASANI

STUDY LOCATION: ZAIRE

SHORT TITLE: **CQ EFFICACY IN PREGNANCY, KINSHASHA**

PRINCIPAL INVESTIGATOR: PALUKU, Dr. Kalenga-Mbudi
Malaria Coordinator
Medecin, PEV/CCCD BP 9638
Kinshasa, Zaire

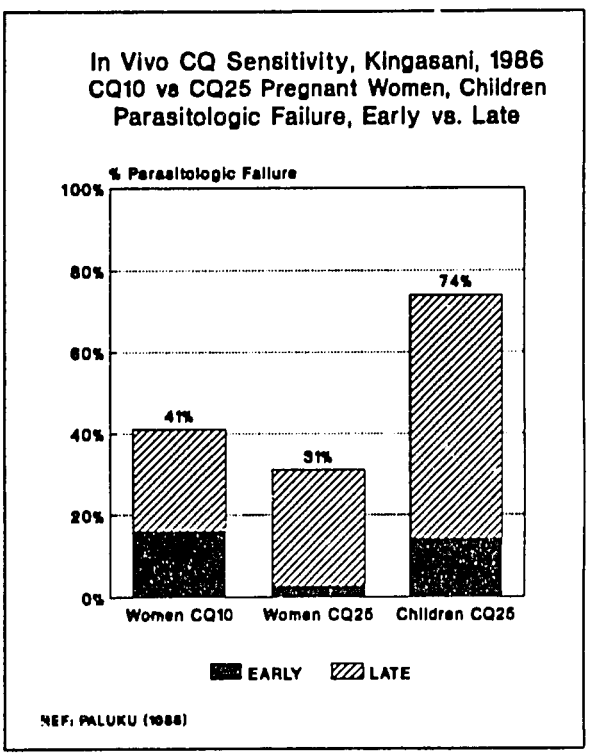
CO-INVESTIGATORS: Gemiers M, Ngimbi NM, Kisi M, Moore M

STUDY DESIGN

A total of 71 pregnant women (parity 1 or 2) and 38 children (aged 0 to 5 years) with P. falciparum parasitemia were tested in the Kingasani district, Kinshasa. Women were treated with C10 (chloroquine 10mg/kg single dose) or C25 (C5mg/kg) dosages over 3 days. Children received only C25 regimen.

RESULTS

- Forty one percent (41%) of pregnant women, were parasitologic failures with C10 regimen; 31% were failures with C25 (p = ns).
- Of women with initial counts less than 5000/mm^3, 23% were failures; 43% of women with counts above 5000/mm^3 were failures (p = ns).
- Thirty-eight percent (38%) of the C10 failures, 38% were early parasitologic failures (D3); only 8% of C25 failures were early failures (1/12).
- A total of 74% of children treated with C25 were parasitologic failures (28/38); 18% of these (5/28) were early failures.
- There were no clinical failures. However, only 6 of 71 parasite positive mothers were initially febrile.



STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Fever is a poor predictor of malaria parasitemia in pregnant women.
2. Significant levels of chloroquine resistance were confirmed and were comparable to other concurrent studies in the region.

STUDY LIMITATIONS

- Small sample size limits stratification of data by parity or other risk factors. Fifteen mothers were primipara, 56 were parity 2.

PROGRAM AND POLICY IMPACT

One of a number of precursor (baseline) studies used in planning the subsequent 1987-88 chemoprophylaxis study.

This study, and similar findings in Kenya (1986), confirmed that fever is a poor predictor of parasitemia in pregnant women and reinforced WHO recommendations for initial treatment of all pregnant women with a curative dose of antimalarials before chemoprophylaxis.

PUBLICATIONS

None documented. Presented by CDC epidemiologist at 1987 ACSI-CCCD UNICOI conference.

MALARIA INFECTION IN PREGNANT WOMEN IN ZAIRE: THE EFFECTS AND THE POTENTIAL FOR INTERVENTION.

STUDY LOCATION:	ZAIRE
SHORT TITLE:	**MALARIA AND PREGNANCY IN ZAIRE, 1985**
PRINCIPAL INVESTIGATOR:	STEKETEE, Dr. Richard W Malaria Branch, MS F-12 Division of Parasitic Diseases, Centers for Disease Control and Prevention, Atlanta, GA 30333
CO-INVESTIGATORS:	Breman JG, Paluku KM, Moore M, Roy J, Ma-disu M

STUDY DESIGN

Study carried out concurrently with the 1985 workshops on in vivo drug sensitivity surveillance. In five maternity centres in urban and rural Zaire, patients were evaluated for maternal prevalence of Plasmodium falciparum parasitaemia and recorded fever, frequency of abortions and stillbirths, newborn birth weights, and the feasibility of delivering antimalarial chemoprophylaxis. Methods included record reviews, parasitology, and a questionnaire survey.

RESULTS

- Women in their first or second pregnancy, when compared with women in their third or higher pregnancy, had a higher frequency of parasitaemia (38% and 15%); ($p < 0.001$), higher parasite densities (geometric mean densities 927 and 277 per mm3 ($p = 0.01$), and higher rates of stillborn and low-birth-weight infants (24% and 6.4%); ($p<0.001$).
- On average, pregnant women first attended prenatal clinics in the sixth to seventh month of gestation and made three to four visits before delivery.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. In these areas of Zaire, antimalarial interventions during pregnancy would have the greatest effect if they were targeted to women in their first or second pregnancies.
2. Maternal attitudes and prenatal care-seeking behaviors did not appear to be barriers to providing an antimalarial intervention.

STUDY LIMITATIONS

None cited.

PROGRAM AND POLICY IMPACT

This study was one of several CCCD-supported studies intended to define a rational policy for malaria prophylaxis and treatment in pregnant women. As examples of "health problem research" they were meant to define the extent of the problem and to identify sub-populations at greatest risk.

By linking this study to the drug sensitivity surveillance studies done in five regions, the CCCD project was able to minimize project costs for this component, yet generate useful baseline information about the extent of parasitemia and its sequelae in pregnant women. Results of the study confirmed that women in their first or second pregnancies were generally at greatest risk from malaria during pregnancy. In a setting of limited resources, therefore, it has been recommended that only women in their first, second, or third pregnancies should be priorities for chemoprophylaxis. This latter recommendation raises significant programmatic (and operational) questions however, since (in the African context), treating only a specific subcategory of antenatal clinic patients might prove difficult.

Current recommendations in both Malawi and Zaire recognize a theoretical (and justifiable) priority for treating women in their first or second pregnancies but do not propose specific programmatic limitations. The Malawi policy, for example, notes that although chemoprophylaxis might not be routinely offered to women in their fourth or higher pregnancy, Chemoprophylaxis should not be withheld "if requested or clinically indicated" (e.g., women with anemia).

Although subsequent CCCD research activities investigating malaria in pregnancy have dealt primarily with questions of biological susceptibility or treatment effectiveness, some effort has been paid (particularly in Malawi) to investigating malaria's cultural context through formative and socio-behavioral research (see studies of HELITZER-ALLEN et al).

PUBLICATIONS

STEKETTEE RW, BREMAN JG, PALUKU KM, et al.: Malaria infection in pregnant women in Zaire: the effects and the potential for intervention. Ann Trop Med Parasitol 82:113-20 (1988).

FAISABILITE/EFFICACITE DE LA CHEM OPROPHYLAXIE, TRAITEMENT CHEZ LES FEMMES ENCEINTES

STUDY LOCATION: ZAIRE

SHORT TITLE: **MALARIA PROPHYLAXIS IN PREGNANCY, KINSHASA**

PRINCIPAL INVESTIGATOR: PALUKU, Dr. Kalenga-Mbudi
Malaria Coordinator
Medecin, PEV/CCCD BP 9638,
Kinshasa, Zaire

CO-INVESTIGATORS: Moore MN, Gemier M, Kisi M, Nelson A, Vernon A, et al.

STUDY DESIGN

*Study site at **Kingasani Hospital Center, Kinshasa**; study period 1987-88. Mothers of parity 1 or 2 were randomized to one of four treatment groups: **Group 1** — 1,200mg chloroquine (CQ) monthly over 2 days; **Group 2** — 1,200mg LQ at initial visit, return for treatment of fever as necessary; **Group 3** — initial treatment and home supply of CQ in case of fever; **Group 4** — recruited in the third trimester and received initial treatment but no further treatment. Infant birthweights were recorded at delivery; a subset of 10% of deliveries was evaluated for placental parasites locally and confirmed by the Armed Forces Institute of Pathology (AFIP), Washington, DC. Chloroquine compliance verified (on a subset of Group 1 patients only) by CDC modification of Haskins test or Saker-Solomon. Birth weight outcome analyzed by univariate methods and stepwise linear regression; logistic regression was done using birth weight greater or less than 2,500gm as a dichotomous outcome variable. Concurrent in vivo CQ sensitivity studies were done on a separate sample using CQ 1200mg vs. CQ 25mg/kg.*

RESULTS

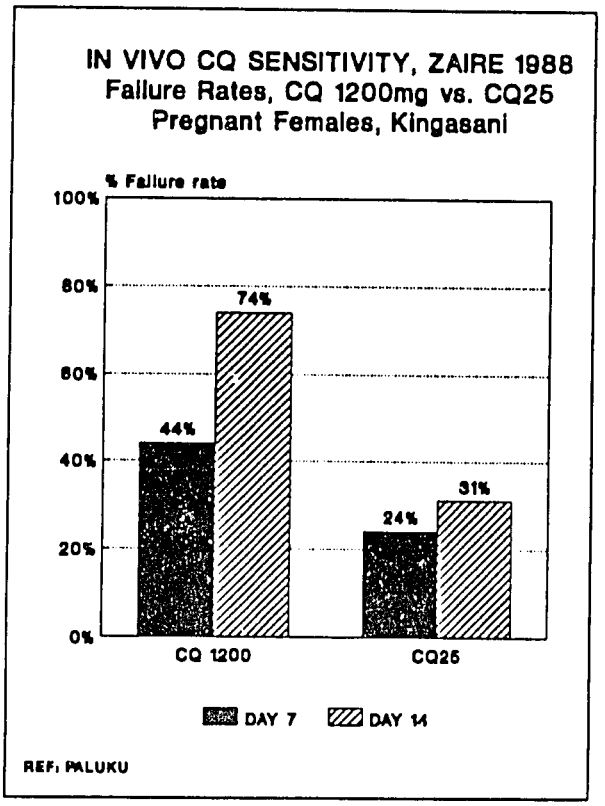
There were 3,116 mothers initially recruited (June 1987 to May 1988); the completed study comprises 1,885 mothers. Of the initial recruits, 913 patients (29%) did not deliver at the Center, and an additional 318 patients were excluded after a change in procedures (digital scale introduced) and an error in patient instructions (Group 3).

- There was no significant difference in major patient variables among groups 1, 2, or 3; group 4 was slightly older but differed significantly only in parity (56% primipara); groups 1 and 2 had 75%, and group 3 had 70%.
- A major determinant of birth weight was parity — primiparas having significantly lower birth weights across all groups.
- No significant difference in birth weight or percentage of low-birth-weight (LBW) deliveries was detected among groups 1, 2, or 3. Membership in group 4 was significant by univariate analysis, linear regression, and logistic regression. Mean birth weight was higher in group 4.

Group	Mean	Modian	%LBW
1.	2859	2878	17.3
2.	2885	2918	18.3
3.	2865	2903	16.7
4.	2980	2983	11.4

- Other significant variables by logistic regression (birthweight 2,500gm) were "days in study", maternal weight, parity, and sex of infant. Significant variables by linear regression were maternal weight, parity, sex of infant, and maternal height; these factors accounted for only 14% of variability in birth weight.

- In vivo CQ sensitivity showed no significant change in failure rates among mothers from 1986 (28% for CQ25) to 1988 (28%).



- There was however, a significantly increased failure rate in CQ 1200mg (approx 20mg/kg) (44% at D7, 74% at D14) compared with CQ25 (24% at D7, 31% at D14).

- Placental parasitization rates varied from 0% to 43% by month (p = ns). No significant difference in placental parasite rates among groups was noted (range 24% to 26%).

- Presence of any placental parasites was associated with a mean decrease in birth weight of 170gm (p = 0.06); presence of malarial pigment was associated with a smaller decrease of 121gm (p = 0.07).

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. None of the three proposed regimes of chemoprophylaxis examined by this study confers significant benefit on birth weight.

2. Chemoprophylaxis may confer some other benefit (in terms of other adverse outcomes), but results of this study show none.

3. The main determinants of birth weight (subject to intervention) that are shown by results of this study were parity, maternal weight, and time of enrollment. Maternal height and sex of infant also influenced birth weight, but are less subject to intervention.

4. Identified variables accounted for only a small percentage of variability in birth weight.

5. Placental studies suggest an association between smaller babies and placental malaria infection.

6. Data suggests that mothers are able and willing to comply with a regimen of monthly prenatal visits and medication.

STUDY LIMITATIONS

In retrospect, the study combines two separate investigations that could conceivably be better addressed individually — first, the biologic research issue of chloroquine prophylaxis and its effect on birth weight and pregnancy outcome, and second the operational issue of how best to administer chloroquine prophylaxis during pregnancy.

- Ethically, it was not possible to establish a control group which received no treatment or prophylaxis. The control group that was established (group 4) differed significantly at outset, since they sought treatment later in pregnancy and were less likely to be "eventful" pregnancies. In fact, this group had heavier babies than the other three, which (on first examination) would seem to suggest negative effects of chemoprophylaxis.

- Compliance was inadequately verified. For patients who were directly supervised, this was unimportant; for patients taking treatment at home, a urine test was unable to distinguish between a 600mg and a 1200mg dose of chloroquine.

- Initial confusion about instructions given to one group (3) and a change in the weighing scales caused a number of subjects to be eliminated, but there was no demonstrated difference between subjects eliminated and those retained in the study.

PROGRAM AND POLICY IMPACT

This was one of several concurrent studies with CDC involvement investigating chloroquine prophylaxis in pregnancy (others were in Malawi and Burkina Faso). Findings were presented at the 1988 CCCD Consultative Meeting in Yamoussoukro, and at the 1989 UNICOI meeting, but the substantive policy impact of this and the other studies is yet to be defined.

The existing policy defined in the 1985 malaria plan provides only for weekly chloroquine prophylaxis (with 300mg CQ) for pregnant women, initiated "as early in pregnancy as possible, and continued until 2 months after delivery." Results from this study have called into question the effectiveness of that strategy but do not disprove it unequivocally.

In addition to the practical and logistical problems presented by this study (e.g., inability to assign an appropriate control group), the study's findings may have suffered because of the decreased effectiveness of chloroquine (because of chloroquine resistance) as an antimalarial during this period. The objective of clearing placental parasites was only partially met by the regimens available. In this respect, this study's findings helped fashion the design of the larger scale Mangochi Malaria Research Project in Malawi, a longitudinal study of chemoprophylaxis in pregnancy that used mefloquine in addition to chloroquine.

PUBLICATIONS

No final document. Preliminary findings were presented at the 1988 ACSI-CCCD Consultative meeting in Yamoussoukro and at the 1989 UNICOI meeting.

PLASMODIUM FALCIPARUM ASSOCIATED ANEMIA IN CHILDREN AT A LARGE URBAN HOSPITAL, KINSHASA, ZAIRE

STUDY LOCATION: ZAIRE

SHORT TITLE: **ANEMIA AND MALARIA IN CHILDREN, KINSHASA**

PRINCIPAL INVESTIGATOR: HEDBERG, K.
Malaria Branch, MS F-12
Centers for Disease Control and Prevention,
Atlanta, GA 30333

CO-INVESTIGATORS: Shaffer N, Davachi F, Hightower A, Lyamba B, Paluku KM, Nguyen-Dinh P, Breman JG

STUDY DESIGN

Authors conducted a study of children brought to the emergency ward of a large urban hospital in Kinshasa, Zaire, from November 1-15, 1988. Study was part of a larger epidemiologic study of urban illness reflected at a large city referral hospital.

RESULTS

During the study period 748 children aged 6 through 59 months were enrolled.

- A total of 318 children (43%) were anemic (hematocrit [hct]<33%), including 74 (10%) who were severely anemic (hct<20 %).
- *Plasmodium falciparum* parasites were detected in 166 children (22%); hematocrits for these children (mean = 25.8%) were lower than for aparasitemic children (mean = 33.7%; p<.000001).
- Parasitemic children were 2.4 times more likely to be mildly anemic and 8.0 times more likely to be severely anemic than were aparasitemic children.
- On univariate analysis other risk factors for anemia included lower socio-economic status, malnutrition, a previous blood transfusion, recent fever, splenomegaly, and HIV seropositivity.
- On multivariate analysis, lower SES, malnutrition, fever, splenomgaly, and parasitemia were associated with anemia.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. In this population the high prevalence of anemia and its strong association with *P. falciparum* anemia underscore the need to develop more effective malaria treatment and control strategies.
2. New strategies are needed to prevent severe anemia and to limit the use of blood transfusions.

STUDY LIMITATIONS

- Authors note that establishing a causal relationship between associated risk factors and anemia depends on the time sequence of events, "which is difficult to determine in a cross-sectional study."

PROGRAM AND POLICY IMPACT

This study is one of several reflecting renewed interest in anemia as a major consequence of chronic malaria infection — see also CAMPBELL: J Infec Dis 163:1207-11 (1991). In this review, CAMPBELL notes that low-density chronic parasitemia, because it contributes to the development of immunity, has often been accepted as innocuous or even beneficial as long as it remained at low-density. This and other studies have recently caused such assumptions to be reassessed.

Findings of this study, along with others supported by CCCD have also contributed to an increased investigative focus on defining the morbidity and mortality burden caused not only by acute complications of malaria or febrile illness, but by chronic sequelae as well. Most prominent among the priorities is the contribution of anemia.

In terms of program effect assessments and reporting of malaria-related morbidity and mortality have now begun to routinely include anemia-associated mortality along with malaria-specific causes. Although this inclusion is not meant to imply that all anemia-associated death and illness is malaria-related, a better picture of the burden of malaria is given by ensuring that malaria-associated anemia is not ignored. Other research initiatives have identified the need to assess the recovery from anemia of children treated with chloroquine and pyrimethamine-sulpahadoxine, with the objective of detecting whether "chloroqine-resistant malaria, treated with chloroquine, might not perpetuate anemia while giving a false impression of clinical recovery" (Nguyen-Dinh 1990).

PUBLICATIONS

HEDBERG K, SHAFFER N, DAVACHI F et al.: Plasmodium falciparium associated anemia in children at a large urban hospital in Zaire. Am J Trop Med Hyg 48:365-71 (1993).

RELATED STUDIES

SLUTSKER L, TAYLOR T, WIRIMA J, STEKETEE R: In-hospital morbidity and mortality due to malaria-associated severe anemia in two areas of Malawi with different malaria transmission patterns (Malawi study with CCCD support; manuscript in preparation).

CAMPBELL CC: Challenges facing Antimalarial therapy in Africa. J Infec Dis 163: 1207-11 (1991).

THE ASSOCIATION BETWEEN MALARIA, BLOOD TRANSFUSIONS, AND HIV SEROPOSITIVITY IN A PEDIATRIC POPULATION IN KINSHASA, ZAIRE

STUDY LOCATION: ZAIRE

SHORT TITLE: **BLOOD TRANSFUSION AND HIV SEROPOSITIVITY, ZAIRE**

PRINCIPAL INVESTIGATOR: GREENBERG, Dr. Alan E
NCID/HIV
Centers for Disease Control and Prevention,
Atlanta, GA 30333

CO-INVESTIGATORS: Nguyen-Dinh P, Mann JM, Kabote N, Colebunders RL, Francis H, Quinn TC, Baudoux P, Lyamba B, Davachi F, et al.

STUDY DESIGN

The relationships between malaria, transfusions, and HIV seropositivity were investigated in a pediatric population in Kinshasa, Zaire.

RESULTS

- Of 167 hospitalized children, 112 (67%) had malaria. 78 (47%) had received transfusions during the current hospitalization, and 21 (13%) were HIV seropositive.
- Of the 11 seropositive malaria patients, 10 had received transfusions during the current hospitalization.
- Pretransfusion specimens were available for four of the seropositive children and were seronegative.
- Of all blood transfusions, 87% were administered to malaria patients, and a strong dose-response association between transfusions and HIV seropositivity was noted.
- Review of 1,000 emergency ward records showed that 69% of transfusions were administered to malaria patients, and that 97% of children who received transfusions had pretransfusion hematocrits of 25% or less.

STUDY CONCLUSIONS AND RECOMMENDATIONS

- In Kinshasa, the treatment of malaria with blood transfusions is an important factor in the exposure of children to HIV infection.

PROGRAM AND POLICY IMPACT

This study provided concrete supportive evidence for efforts to institute widespread pretransfusion screening of blood in all situations where technologically feasible. Limited screening was implemented in Kinshasa in 1987.

The study also provided strong supportive evidence of a causal link between malaria-related anemia, transfusions and HIV infection in children. This was supported by the findings of a retrospective study by SHAFFER et al. in 1988, which identified a clearly significant association between malaria, transfusion of unscreened blood, and HIV seropositivity.

The programmatic implications of this study were twofold: results of the study showed the need for blood screening and identified the need for a rational approach to transfusions. This latter priority has since been the subject of research by Project RETRO-CI in Côte d'Ivoire.

■ PUBLICATIONS

GREENBERG AE, NGUYEN-DINH P, MANN JM, et al.: The association between malaria, blood transfusions, and HIV seropositivity in a pediatric population in Kinshasa, Zaire. JAMA 259:545-9 (1988).

■ RELATED STUDIES

SHAFFER N, HEDBERG K, DAVACHI F, et al.: Trends and risk factors for HIV-1 seropositivity among outpatient children, Kinshasa, Zaire. AIDS 4:1231-6 (1990).

This study evaluated 1,110 children seen consecutively in the pediatric emergency ward of Mama Yemo Hospital, Kinshasa, 1 year after the introduction of HIV screening. A previous blood transfusion was associated with HIV-1 seropositivity only among children older than or equal to 1 year of age (odds ratio [OR] = 5.4, $p < 0.0005$). The association with seropositivity was higher for those children who had received a transfusion before 1987 than for those who had received a transfusion since 1987 (OR = 4.8, $p <= 0.01$).

SENSITIVITY OF PLASMODIUM FALCIPARUM TO CHLOROQUINE AND SULFADOXINE-PYRIMETHAMINE IN NIGERIAN CHILDREN

STUDY LOCATION: NIGERIA

SHORT TITLE: **IN-VIVO SENSITIVITY TO CQ AND S/P, NIGERIA**

PRINCIPAL INVESTIGATOR: EKANEM, Dr. O.J.
Chief Consultant Malariologist National Malaria and Vector Control Div.
Federal Ministry of Health,
Yaba Lagos, Nigeria

CO-INVESTIGATORS: Weisfeld JS, Salako LA, Nahlen BL, Ezedinachi ENU, Walker O, Breman JG, Laoye OJ, Hedberg K

STUDY DESIGN

The in vivo sensitivity of Plasmodium falciparum to chloroquine and sulfadoxine-pyrimethamine was evaluated in children younger than 5 years of age in two areas of southern Nigeria in 1987. A modification of the WHO Standard Field and Extended Tests (in vivo) was used (with follow-up on days, 2, 3, 7, and 14) after treatment with 25 mg chloroquine per kg body weight (given over 3 days) or with standard doses of sulfadoxine- pyrimethamine. Clinical and parasitological evaluations were performed. [NOTE: Similar studies were done at 22 additional sites between 1987 and 1990].

RESULTS

- At Igbo Ora, in Oyo State, where, by day 7, chloroquine was clinically successful in 94.4% of 36 children and sulfadoxine-pyrimethamine in 91.7% of 36 children, there were no parasitological failures in either treatment group. Fever regressed significantly more rapidly with chloroquine than with sulfadoxine-pyrimethamine.

- At Oban, in Cross River State, initial parasite densities decreased markedly with the chloroquine regimen, but 63.6% of 44 children were parasitological failures on days 3, 7, or 14; and all of the 26 children who failed parasitologically and completed follow-up were successfully treated with sulfadoxine-pyrimethamine. By day 7, clinical success was shown for 77.3% of the children treated with chloroquine.

- The in vitro sensitivity to chloroquine, quinine, and mefloquine at Igbo Ora indicated that isolates of *P. falciparum* were sensitive to chloroquine and quinine but had reduced sensitivity to mefloquine.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Because of its continued clinical efficacy, chloroquine remains the recommended treatment for children with uncomplicated malaria in Nigeria.

2. Health providers were, however, encouraged to maintain supplies of sulfadoxine-pyrimethamine as an alternative and to refer patients promptly if necessary.

STUDY LIMITATIONS

- A significant number of patients were lost to follow-up at D7 for Igbo Ora site (18% of chloroquine-treated, 27% of sulphadoxine-pyrimethamine-treated).

PROGRAM AND POLICY IMPACT

These studies were the basis for numerous subsequent in vivo studies at different sites from 1987 to 1990. This surveillance network established throughout Nigeria is coordinated by the National Malaria and Vector Control Division of the Federal Ministry of Health with ACSI-CCCD support. Systematic documentation of the extent of chloroquine resistance in Nigeria has contributed to the determination of national malaria policy and to National Guidelines for Malaria Control issued in 1989.

The initial study was held as part of a field training exercise for a training workshop on in vivo sensitivity sponsored by ACSI-CCCD. Of the 27 participants taking part, 18 were from Nigeria, 4 were from Liberia and 3 were from CDC. Between 1987 and 1990, similar studies were held at 22 additional sites. Several of these studies have been published.

Since its inauguration, the surveillance system has involved collaborations of five surveillance centers with State ministries of health and with universities.

PUBLICATIONS

EKANEM OJ, WEISFELD JS, SALAKO LA, et al.: Sensitivity of *Plasmodium falciparum* to chloroquine and sulfadoxine-pyrimethamine in Nigerian children. Bull World Health Organ 68:45-52, (1990).

MOUNT DL, NAHLEN BL, PATCHEN LC, CHURCHILL FC: Adaptations of the Saker-Solomons test: simple, reliable colorimetric field assays for chloroquine and its metabolites in urine. Bull World Health Organ 67:295-300 (1989).

Two field-adapted colorimetric methods for measuring chloroquine in urine were adapted from the method of Saker and Solomons for screening urine for phencyclidine and other drugs of abuse, using the colour reagent tetrabromo-phenolphthalein ethyl ester. The first method was validated in the field during the 1987 field study using a published quantitative colorimetric method. The second method was validated in the laboratory against high-performance liquid chromatographic results on paired samples from the same study.

RELATED STUDIES

Additional publications were generated by subsequent studies at other sites:

1. **DANIEL HI, MOLTA NB: Efficacy of chloroquine in the treatment of malaria in children under five years in Balssa (Gongola State, Nigeria). Ann Trop Med Parasitol 83:331-8 (1989).**

   Forty-seven percent of all children screened were parasite positive. Parasitological failure occurred in 25% of treated children. There was a 98% decrease in GMPD by D7.

2. **LEGE-OGUNTOYE L, ABUA JU, WERBLINSKA B, OGALA WN, SLOTBOOM AB, and OLURINOLA PF: Chloroquine resistance of *Plasmodium falciparum* in semi-immune children in Zaria, northern Nigeria. Trans Trop Med Hyg 83:599-601 (1989).**

   Of 59 children, 6 (10%) were resistant to CQ25 at RI-RII level. For in vitro testing, 37% of 36 isolates underwent schizogony at CQ concentration of 1.6 umoL/L.

3. **USANGA EA, EZEDINACHI EN, GEMADE EI, IKPATT NW, ALARIBE AA: Efficacies of chloroquine and pyrimethamine-sulphadoxine in a Nigerian population with chloroquine resistant *P. falciparum* malaria. East Afr Med J 67:295-301 (1990).**

   Of children screened in Jato-Aka, Benue State, 59% were parasitemic. Parasitologic failure rates were 9.5% at D2 and 50% at D7 with CQ25. Rates for pyrimethamine-sulfadoxine (Fansidar) were 0% at D2 and 8.9% at D7 and D14.

4. **EZEDINACHI EN, EJEZIE GC, USANGA EA, GEMADE EI, IKPATT NW, ALARIBE AA: New trends in chloroquine efficacy in the treatment of malaria: chloroquine-resistant Plasmodium falciparum in Anambra and Benue States of Nigeria. Cent Afr J Med 37:180-6 (1991).**

   Parasitological failure rates of 52% and 60% at two sites with CQ25 (Agbani and Jato-Aka). Clinical success was 69% and 94% at the two sites.

5. **UMOTONG AB, EZEDINACHI EN, OKERENGWO AA, USANGA EA, UDO JJ, WILLIAMS AI: Correlation between in vivo and in vitro response of chloroquine-resistant *Plasmodium falciparum* in Calabar, south-eastern Nigeria. Acta Trop 49:119-25 (1991).**

   Of 28 children, 15 were parasitemic on D7 after CQ25 treatment (54%). Isolates from 14 of these children showed in vitro resistance to CQ concentrations of 5.7 pmoL/well.

6. **MOLTA NB, DANIEL HI, WATILA IM, OGUCHE SO, OTU TI, AMEH JO, GADZAMA NM: Efficacies of chloroquine, pyrimethamine-sulphadoxine and pyrimethamine-sulphalene against *P. falciparum* in northeastern Nigeria. J Trop Med Hyg 95(4):253-9 (1992).**

   P. falciparum parasitemia was detected in 58% to 72% of children. Varying degrees of parasitologic failure, ranging from delayed clearance through recrudescence to asymptomatic Type-II resistance, were encountered with oral chloroquine. Clinically, the drug showed high performance in clearing symptoms of infection. For tests with pyrimethamine-sulphadoxine and pyrimethamine-sulphalene, both drugs were highly effective, both clinically and parasitologically.

ASSESSMENT OF THE RELIABILITY OF MOTHERS' HISTORY OF ANTI-MALARIAL DRUG USE — IGBO ORA, OYO STATE, NIGERIA.

STUDY LOCATION:	NIGERIA
SHORT TITLE:	**MOTHERS' HISTORY OF ANTIMALARIAL DRUG USE**
PRINCIPAL INVESTIGATORS:	HEDBERG K, BREMAN J Malaria Branch, MS F-12 Centers for Disease Control and Prevention (CDC), Atlanta, GA 30333
CO-INVESTIGATORS:	None cited.

STUDY DESIGN

Study was carried out concurrently with 1987 training on vivo sensitivity testing and with field study at Igbo Ora. A questionnaire was administered in Yoruba to all mothers arriving at Igbo Ora Health Center whose children were screened for parasites. Antimalarial drug use over the preceding 7 days was ascertained; a display of 25 different antimalarials commercially available was used to elicit a more precise response. Urine samples of children were collected and correlated with mothers' responses. Urinary amino-quinolones were tested by DILL-GLAZKO and MOUNT modification of HASKINS Test.

RESULTS

Of 128 children in the study, 85% had a history of fever.

Recent chloroquine use by 38 (21%) of mothers; was reported by (35%) reported use of antipyretics. A positive Dill-Glazko test was noted for 13 children (7/13 had positive history and 6/13 had no history of CQ ingestion).

- Sensitivity of mother's history was 0.54 and specificity 0.83 with respect to Dill-Glazko confirmation. Predictive value of a negative history was 0.94 (predictive value positive was 0.25).
- Compared with Dill-Glazko, Modified Haskins (II) yielded 27 positive urine tests (9/27 with positive history of CQ ingestion). Specificity of mother's history with respect to Modified Haskins was 0.82, with negative predictive value of 0.82. (Sensitivity was 0.33 and positive predictive value 0.35.)

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Findings suggest that maternal history is a reliable way to exclude recent chloroquine ingestion, and maternal history is as useful as Dill-Glazko in determining the absence of recent antimalarial use.
2. Ability of either test to confirm a negative history was much more reliable than the tests' ability to verify a positive history of ingestion.
3. Results question the need for urine testing as a criterion for enrollment in future in vivo studies.

STUDY LIMITATIONS

- Dill-Glazko method is known to be a relatively insensitive test for detection of urinary chloroquine and its metabolites.

- Although the use of visual aids probably helped drug identification, chloroquine in generic form is often an indistinguishable plain white tablet and (despite its bitter taste) might conceivably be misidentified or confused with other drugs (35% of mothers reported use of antipyretics such as aspirin or paracetomol).

"The ability of either test to confirm a negative history was much more reliable than the tests' ability to verify a positive history of ingestion."

- The apparently widespread prevalence of fake and adulterated drugs in Nigeria might also imply that mothers may reliably report (and believe) they had given children chloroquine when they had not.

- Reliance on Predictive Value of a Negative test (PVN) is somewhat misleading since this varies in different populations. In other words, PVN is high in this population because comparatively few mothers used chloroquine (21%). If the percentage of mothers using chloroquine were greater, the PVN would be reduced accordingly.

■ PROGRAM AND POLICY IMPACT

None noted. Subsequent in vivo studies have continued to use urinary confirmation of mothers' history.

■ PUBLICATIONS

None documented.

SOCIAL AND BEHAVIORAL ASPECTS OF IMPLEMENTING A STRATEGY OF IMPREGNATED BED NETS AND CURTAINS FOR MALARIA CONTROL

STUDY LOCATION:	NIGERIA
SHORT TITLE:	**BEHAVIORAL ASPECTS OF BED NET USE, NIGERIA**
PRINCIPAL INVESTIGATOR:	BRIEGER, William R., DrPH African Regional Health Education Center University of Ibadan, Ibadan, Nigeria
CO-INVESTIGATORS:	Nwanko E, Robinson T, Ekanem OJ, Ezike VI, Sexton JD

STUDY DESIGN

*Study area in four villages of **Nsukka LGA** of **Enugu State**. Initial informal group interviews using open-ended questions and direct observation; subsequent inquiry using survey questionnaires and observation checklist. Random sample of 100 households in each community. Interviewers recruited from communities. Interviewed 405 people in the second phase of the study.*

RESULTS

None of the respondents used mosquito nets for protection at the time of initial interviews. However, a few respondents did use small nets to protect infants.

- Respondents noted common use of a local herb—*nsigbu anwu* for repelling mosquitoes.
- Nets were generally acknowledged to be effective, but cost was seen as the main barrier to their use.
- Several factors were cited as "causes" of malaria including excessive sun exposure. Mosquitoes were generally believed to be an unavoidable nuisance.

In the second phase of the study, 405 people were interviewed.

- Of all households, 37% reported an attack of malaria during in the prior month.
- Symptoms cited included tiredness or weakness (57%), headache (40%), yellow eyes and yellow urine (36%), and loss of appetite (36%). Only 18% of respondents cited fever as a symptom.
- Advantages of bed nets included protection against mosquito and other insect bites. Disadvantages included heat, lack of durability, and cost.
- Of all households, 61% had a working radio.
- Educational level was correlated with mention of mosquitoes as a cause of malaria and with the presence of curtains and a radio in the home.

"Authors note that persons may hold both Western and indigenous beliefs simultaneously. . ."

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Malaria was defined as "iba" or "eya" and is believed to have three modes of presentation: fever and joint pains, a fatigue syndrome, or a syndrome with yellow eyes and urine.

2. "Western" interventions such as bed nets are believed to be effective (in stopping bites) but are seldom used because of high cost.

3. No clear cultural barriers to bed net use were identified. The main limitations to use would appear to be discomfort from heat or high cost.

4. There is not a clear etiological link between mosquitoes and malaria in the minds of most people.

STUDY LIMITATIONS

- In asking about symptoms or manifestations of malaria, questions did not distinguish between symptoms in adults and children. Thus, relatively low priority was given by respondents to fever as a symptom despite its prevalence as a common manifestation of childhood malaria.

- Authors note that persons may hold both Western and indigenous beliefs simultaneously and interpretation of responses about the "cause" of malaria must be seen in this light.

PROGRAM AND POLICY IMPACT

Study findings are intended to provide baseline data for a CCCD- sponsored intervention study on the use of impregnated bed nets in the four communities. Subsequent assessments will evaluate the influence of intervention on attitudes and behaviors of population.

PUBLICATIONS

None documented.

QUALITY ASSURANCE TESTING OF CHLOROQUINE SYRUPS IN EASTERN NIGERIA

STUDY LOCATION:	NIGERIA
SHORT TITLE:	**QUALITY ASSURANCE TESTING OF CQ SYRUPS**
PRINCIPAL INVESTIGATOR:	OGBUOKIRI, Dr. Justina E. Dept of Pharmacology Therapeutics College of Medicine Enugu, Nigeria
CO-INVESTIGATOR:	None cited.

STUDY DESIGN

Prospective study: 1,473 samples of chloroquine syrups were collected from Anambra State (1,366 samples), Imo, Cross River, and Rivers States. Randomly selected 10% for analysis. Samples were collected from patent medicine stores, licensed chemists, open markets, clinics, and hospitals. Samples were analyzed by Thin Layer Chromatography (TLC) and (BPC) method for CQ assay. Syrups were adjudged to be substandard if they differed by greater than 15% from stated label content.

RESULTS

Analysis of samples for each State revealed the following:

- For Anambra State, 53/133 samples (40%) were below acceptable concentration, 8% were unacceptably higher (range 24% to 118%, mean = 62% by BPC method). For patent medicine stores in Anambra, 52% of samples were unacceptably low.
- In Imo State, 3/6 samples (50%) were below acceptable concentration of chloroquine; one sample (17%) was above acceptable concentration.
- Cross River State: 4 samples, all within acceptable range.
- Rivers State: One of 4 samples outside acceptable range.
- Analysis by BPC method did not differ appreciably from TLC assays.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. BPC method of chloroquine assay was easier and more reliable when using colorless preparations.
2. Results support published findings of widespread adulteration of chloroquine samples available on the Nigerian market.
3. Author recommends re-education of patent medicine dealers and establishment of standards for persons involved in compounding medicines.
4. Continued monitoring of drug use and quality control were also recommended.

STUDY LIMITATIONS

- Report notes some difficulty experienced in technical aspects of BPC method but found good agreement between both methods with some modification.

- Number of samples analyzed from Imo, Cross River, and Rivers States were too few to allow definitive conclusions to be made from the results obtained.

- Study evaluated only syrups; analysis of tablets and injectables was not attempted.

PROGRAM AND POLICY IMPACT

Provides supportive documentation consistent with a previous Lancet report (Anarchy in the Drug Market. Lancet 1988 i;109) Ongoing efforts to establish monitoring of drug quality and to enforce standards relating to sale of adulterated drugs are part of Nigerian Federal government priorities, also supported by CCCD. Subsequent studies were expected to evaluate tablets and injectables; quality assurance study of CQ tablets was approved in February 1990 for northern Nigeria.

This study also initiated a series of government and private sector actions to address these and related issues. Representatives of patent medicine dealers have met with National Malaria and Vector Control Division staff and discussed product quality, drug options, distributon, cost, and other common issues.

PUBLICATIONS

None documented.

IN VIVO AND IN VITRO SENSITIVITY OF PLASMODIUM FALCIPARUM TO PYRIMETHAMINE IN PREGNANT WOMEN IN ILORIN

STUDY LOCATION: NIGERIA

SHORT TITLE: **PYRIMETHAMINE PROPLYLAXIS IN PREGNANCY**

PRINCIPAL INVESTIGATOR: OGUNBODE, Dr. O.
University of Ilorin
Ilorin, Nigeria

CO-INVESTIGATOR: Nahlen BL, Akintunde A, Alakija T, Nguyen-Dinh P, Edungbola LD, Adetoro O, Breman JG.

STUDY DESIGN

To evaluate the efficacy of pyrimethamine on the blood stage (suppressive prophylaxis) and liver stage (causal prophylaxis) of Plasmodium falciparum in pregnant women, in vivo and in vitro field studies were conducted in Ilorin, Nigeria, from January 1 to June 30, 1988. In vivo and in vitro parasite sensitivity was evaluated in women receiving 25 mg of pyrimethamine weekly for suppressive prophylaxis. A second group of parasitemic and parasite-free pregnant women was enrolled to evaluate the efficacy of pyrimethamine as a primary tissue schizonticide; after receiving a curative dose of chloroquine (25 mg/kg), half the women were given 25 mg of pyrimethamine weekly and half received no prophylaxis.

RESULTS

- For pregnant women with *P. falciparum* infections who received 25 mg of pyrimethamine weekly for suppressive prophylaxis, 67% (59/88) of in vivo and 60% (6/10) of in vitro tests showed pyrimethamine resistance.
- For the second group of women, parasitologic failure rates did not differ between the pyrimethamine-treated (8/34) and the control (11/37) groups during the 16-week follow-up.

STUDY CONCLUSIONS AND RECOMMENDATIONS

- Pyrimethamine is not effective for suppressive or causal prophylaxis in pregnant women in Ilorin.

STUDY LIMITATIONS

None cited. However, because this study was limited to one urban site, the question has been raised as to whether the results can be generalized to the whole of Nigeria.

PROGRAM AND POLICY IMPACT

This study vividly illustrates three important factors related to the conduct of research in the ACSI-CCCD project.

The first factor relates to the justification for research. This study protocol was generated in response to the widespread use in Nigeria of pyrimethamine as a prophylactic agent in pregnancy. Although CCCD principals generally believed that the case against pyrimethamine was already well documented, sufficient question existed about the applicability of those results to Nigeria to justify the study.

The second factor relates to representativeness. At what point does a research finding become sufficiently "general" to be applied without further site-specific research? One justification for this study (and a number of others) was that results from another country or site were sufficiently disputable to warrant an additional study. Yet because the results of this study were also site-specific, the question of the study's validity in other areas of Nigeria has also been raised.

The third factor relates to what might be called the "implementation gap." Although many principals involved considered the study sufficiently strong evidence against the use of pyrimethamine as a prophylactic agent, the practice has continued. Amongst practitioners at the peripheral level the practice remains prevalent, and at the central level recommendations for chemoprophylaxis in pregnancy have included a clause allowing that "current chemoprophylaxis practices for pregnant women may be continued until authoritative recommendations are available."

This shows clearly that although research findings are one factor in the formulation of policy (and the institution of policy), they are only one of several factors that go into the decision-making process. In the CCCD experience, a large decentralized process for decision-making such as exists in Nigeria often involved much broader compromises than were necessary in a highly centralized beauracracy (such as exists in Togo).

PUBLICATIONS

NAHLEN BL, AKINTUNDE A, ALAKIJA T, et al.: Lack of efficacy of pyrimethamine prophylaxis in pregnant Nigerian women. Lancet 2:830-4 (1989).

RELATED STUDIES

ILOBACHIE GC: In vivo study of *Plasmodium falciparum* to pyrimethamine in pregnant women in Enugu (CCCD-supported study funded through the Operational Research Review Committee).

LEGE-OGUNTOYE L: Effect of malaria chemoprophylaxis on the outcome of pregnancy in Zaria (also supported through the Research Review Committee mechanism).

PERMETHRIN-IMPREGNATED CURTAINS AND BED NETS FOR MALARIA PREVENTION IN WESTERN KENYA

STUDY LOCATION: KENYA

SHORT TITLE: **MALARIA BED NET STUDY, KENYA**

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STUDY DESIGN

The effectiveness of permethrin-impregnated (0.5 g/m2) bed nets and curtains as malaria control measures was evaluated in Uriri, Kenya, in 1988. One hundred five families were randomly assigned to 1 of 3 study groups (control, bed net, or curtain). All participants were cured of parasitemia with pyrimethamine-sulfadoxine. Selective epidemiologic and entomologic parameters were measured weekly, whereas knowledge, attitude, and practices surveys were conducted at the beginning and end of the 15-week study.

RESULTS

- *Plasmodium falciparum* infections per person week at risk were significantly higher in the control group (5.42 cases/100 person weeks risk) than in the curtain group (2.35) or the bed net group (3.77).
- The curtain group had fewer infections (2.35) per person week at risk than the bed net group (3.77).
- A difference was found in clinical malaria among the groups: 45% of persons in the bed net and curtain groups and 30% of those in the control group reported no episodes of fever and chills (chi = 2, $p<0.05$).
- Indoor resting *Anopheles gambiae* or *An. funestus* were found on 94 occasions in the control houses but only twice in the treated houses during weekly visits to each house during the study period (chi = 2, $p<0.001$). The pyrethrum knockdown method produced similar results with a total of 195 (control), 23 (bed net), and 3 (curtain) *An. gambiae* and *An. funestus* collected in the houses during the same period.
- Bed nets and curtains were readily accepted, although 30% of the bed net group were not using their bed nets when visited late in the evening.

STUDY CONCLUSIONS AND RECOMMENDATIONS

- **Widespread community use of bed nets and curtains is considered achievable.**

STUDY LIMITATIONS

- Authors note that the study was limited in both time and coverage to a small segment of the community.

- Because evaluations were done in the dry season (with lower mosquito populations), use of bed nets and malaria transmission were probably affected. Compliance with bed net use would be expected to be greater in the rainy season.

PROGRAM AND POLICY IMPACT

Monitoring of this intervention has continued with CCCD support. However, a clear link between transition from a pilot intervention to implementation as a population measure has not been clearly defined. Cost estimates for bed nets were approximately US $5.00 each, with treatment costing approximately $0.50 each (or $1.00 a year). This is probably a conservative (wholesale) cost estimate, however, and does not include intermediate mark-ups, for example, duty and taxes. Although this appears to be a "reasonable" cost, a clear willingness (and ability) to pay has not been demonstrated in the African setting at this time.

A second concern is a later Kenya study (see VULULE et al. below) suggesting a possible increase in permethrin resistance with the use of impregnated bed nets. This may have serious implications for long term feasibility of this intervention. Both concerns suggest that caution is warranted in attempting to extrapolate the findings of a limited intervention to a national scale.

PUBLICATIONS

SEXTON JD, RUEBUSH TK, BRANDLING-BENNETT AD et al.: Permethrin- impregnated curtains and bed-nets prevent malaria in Western Kenya. Am J Trop Med Hyg 43:11-8 (1990).

RELATED STUDIES

BEACH RF, RUEBUSH TK SEXTON JD et al.: Effectiveness of permethrin-impregnated bed nets and curtains for malaria control in a holoendemic area of western Kenya. Am J Trop Med Hyg. In press.

A 1990-91 follow-up to the 1989 study, but staged during two successive high transmission seasons. *P. falciparum* prevalence was lower in bed net and curtain groups than in controls. Bed net and curtain groups were also lower in (1) incidence of *P. falciparum* infections in children, (2) parasitemia greater than 2,500 parasites per mm^3, (3) documented fevers, and (4) entomologial inoculation rates. During high the transmission season, these measures reduced the frequency of infection but did not prevent it entirely.

VULULE JM, BEACH RF, ATIELI FK et al.: Reduced susceptibility of Anopheles gambiae to permethrin associated with the use of permethrin-impregnated bed nets and curtains in Kenya.

Entomologic studies carried out concurrent to the 1990-91 intervention. Reduced susceptibility of *An. gambiae* s.l. as measured by exposure time to 50% mortality (LT50) was seen in intervention villages when compared to controls. LT50 was increased 2.5 times at one year. No futher decrease in susceptibility was seen during the next 12 months.

Acute Respiratory Infection

Acute Respiratory Infection was added to the focus areas of the ACSI-CCCD Project at a much later stage than the original three interventions — EPI, diarrheal disease and malaria. Because of this, the volume of research done in the field of acute respiratory infections (ARI), including acute lower respiratory infection (ALRI) was generally much less than that undertaken with respect to the other diseases. Much of the ARI research conducted in ACSI-CCCD Project was therefore initiated after 1988. Despite this, the role which the project played was quite critical to a few countries' efforts. Among them were the series of studies undertaken in Lesotho, and described in this section.

Where the priorities of an individual ministry of health were already focused on the problem of ARI, the role of ACSI-CCCD technical assistance was primarily in aiding the government to better define the problem and shape its strategy for public health measures to address the problem. In Lesotho, this was obviously a viable option because the problem of ARI was one which accounted for approximately one quarter of hospital deaths in children, and was the leading cause of seeking medical care (MOTEETEE, 1990).

As in several other areas, the focus of ACSI-CCCD research in ARI was generally tied closely to operational issues, and to the specific program assistance sought by policy makers or program managers. As a result, much ACSI-CCCD research had a very deliberate bias in favor of practical issues of local or national importance. For example, the specific findings regarding perceptions of illness among the Basotho in Lesotho are obviously not findings which can simply be translated or imposed upon the Yoruba of Nigeria. This example reinforces the fact that global research, no matter how well executed, cannot always substitute for national research. At the same time, there were often a number of common themes and common problems reported across different settings. Many of these lessons could be transferred across cultures — for example the role of co-morbidities in the misclassification of ARI illness. These findings do offer a coun-

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"Global research, no matter how well executed, cannot always substitute for national research."

tervailing argument for the usefulness of regional and global research.

Many of these and other research questions relating to ARI are explored in the published proceedings of a 1989 USAID-sponsored workshop on ALRI (GADOMSKI, 1990). Among the research issues raised at that forum were the following:

- Standardization in epidemiologic research,
- Case ascertainment techniques,
- The role of prior antibiotic use,
- Seasonality of transmission,
- Rapidity of death,
- The role of malnutrition, anemia and other comorbidities,
- Radiologic classification,
- The focus on community or facility level case management,
- Determinants of health service utilization,
- Antibiotic supply and the rational use of medicines,
- The usefulness and suitability of cough mixtures for treatment,
- Private sector treatment resources,
- Antimicrobial resistance,
- Cultural diversity in explanatory models of disease,
- Gaps in behavioral science as it pertains to ALRI,
- Determinants of health-seeking behavior,
- Interaction between mothers and health providers, and
- The role of behavioral science as a problem-solving tool

Although the ACSI-CCCD Project managed to address only a small fraction of these issues facing ARI programs, the project did suceed in focusing on specific areas of importance to individual governments and programs. This was its principal strength.

REFERENCES

GADOMSKI A, ed. Acute lower respiratory infection and child survival in developing countries: Understanding the current status and directions for the 1990s. Proceedings of a workshop held August 2-3, 1989. Washington DC: Johns Hopkins University, 1990.

DIAGNOSIS AND MANAGEMENT OF ACUTE RESPIRATORY INFECTIONS IN LESOTHO

STUDY LOCATION: LESOTHO

SHORT TITLE: **DIAGNOSIS AND MANAGEMENT OF ARI, LESOTHO**

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STUDY DESIGN

This was a questionnaire survey of medical personnel from selected government hospitals, health centers, and private hospitals in Lesotho. Responses of physicians and nurse- clinicians (specially trained nurses who had undergone 18 months of additional training) were compared using Fisher's exact test. Questions were focused on the diagnosis and treatment of acute respiratory infection (ARI) and acute lower respiratory tract infection (ALRI). Moderate ALRI was characterized, for th purpose of this study, as cough with a respiratory rate greater than 50 per minute; children with chest indrawing were defined as having severe ALRI.

RESULTS

Completed questionnaires were received from 11 physicians, 12 nurses, and 44 nurse-clinicians, as well as 2 respondents who did not indicate their training.

- Antimicrobials were recommended by 6% of respondents for mild ARI, by 17% for moderate ALRI, and by 68% for severe ALRI.
- Physicians were more likely than nurse -clinicians to treat with an antimicrobial in all three instances. The difference was not statistically significant in the case of severe ALRI.

Percentage of Group Treating with an Antimicrobial for Three Degrees of Severity of ARI/ALRI, Lesotho

	Physicians (11)	Nurse-Clinicians (44)	p Value
Mild ARI	27%	2%	0.02
Moderate ALRI	55%	10%	0.004
Severe ALRI	100%	76%	ns

- Penicillin was the preferred drug for the treatment of mild ARI and moderate ALRI. Ampicillin was the leading choice for severe ALRI.
- Cotrimoxazole was recommended 6% of the time for children with mild ARI and 14% for children with moderate ALRI.
- The signs and symptoms which respondents associated most with pneumonia were rapid breathing, cough, being too sick to eat or drink, fever, chest indrawing, and crepitations on auscultation of the chest. Whereas 77% of nurse- clinicians listed fever as a required sign for diagnosis, only 18% of physicians cited fever as a required sign.
- For asthma, the signs associated with diagnosis were wheezing, chest indrawing, rapid breathing, and cough.

- For "common cold" the signs associated were runny nose, cough, rapid breathing, blocked nose, and too sick to eat or drink.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Clinicians recommendations were consistent with WHO recommendations for mild ARI, but for moderate ALRI, only 17% recommended antimicrobials although WHO recommends that treatment.

2. Referral of patients with severe ALRI might not be widely practiced in Lesotho because of difficult terrain. Moreover, the benefit of referral may be questionable in this specific setting.

3. Clinicians generally agree on the clinical findings found in pneumonia, asthma, and common cold.

4. The use of cotrimoxazole is preferable to penicillin for routine ALRI treatment, because oral penicillin is ineffective for treatment of Hemophilus influenzae, and because injectable penicillin is more expensive but no more effective than oral cotrimoxazole.

STUDY LIMITATIONS

Non-response rate is not reported for this questionnaire survey (although it is reported that respondents represent 15% of physicians and 25% of nurse clinicians in Lesotho). It is possible that the results for these respondents may not be fully representative of treatment practices for the nation in general.

"Whereas 77% of nurse — clinicians listed fever as a required sign, only 18% of physicians did so."

PROGRAM AND POLICY IMPACT

This study was one of several undertaken the initiation of Lesotho's ARI program. This national control program was begun in 1989, with the aim of improving case management of routine cases and providing prompt referral for severely ill children (MOTEETEE, 1990). One of the data needs identified by the ministry was the need to determine "how respiratory infections are managed in the clinic and at home," enabling the program to identify differences between ideal and actual practices. This study contributed to policy development by identifying specific training needs of medical personnel. Among these was the need for refining the case-management strategy and developing appropriate referral guidelines. It also highlighted "crucial areas where the scientific basis for ARI case-management is less than adequate." One recommendation for supplemental research which this report generated was for an anthropological study to determine appropriate educational messages for mothers, to encourage the appropriate use of health services. This study was carried out with CCCD support and also contributed to program development (see WILSON, 1990).

The full development of ARI policy and program strategies for the Lesotho ARI program was therefore based on multiple inputs. The final policies were developed at a national workshop involving district physicians, training personnel, and ministry of health personnel. One direct consequence of this and other studies was the decision of the national program to place training emphasis on the health center and specially trained nurses, at least in the initial phase. This was based on the determination that an emphasis on community health workers would be inappropriate because of difficulties providing adequate supervision, training and drug supplies.

PUBLICATIONS

REDD S, MOTEETEE M, WALDMAN R: Diagnosis and management of acute respiratory infections in Lesotho. Health Policy & Planning 5:255-60 (1990).

MOTEETEE M, REDD SC, METSING M: The development of the national ARI control program in Lesotho. Bull Intl Union Tuberc Lung Dis 65:29-30 (1990).

USEFULNESS OF CLINICAL CASE-DEFINITIONS IN GUIDING THERAPY FOR AFRICAN CHILDREN WITH MALARIA OR PNEUMONIA

STUDY LOCATION: MALAWI

SHORT TITLE: **MALARIA AND ALRI, MALAWI**

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STUDY DESIGN

The study sample was drawn from children attending the outpatient department of ***Kamuzu Central Hospital in Lilongwe****, during February and March 1990. Every fifth child brought to the clinic for fever or cough was enrolled, if maternal consent was given. Physical signs and symptoms were recorded, and blood taken for thick smears for malaria parasites. The clinical definition of malaria was fever or a history of fever. Radiography was done for children with parasitemia and children with cough and high respiratory rates. (Rapid respiratory rate was defined as rates >60 for children younger than 2 months of age, >50 for children 2-11 months, and >40 for children older than 12 months). Clinical definition of pneumonia was history of cough or difficulty breathing and rapid respiratory rate. Comparisons were by univariate and multivariate methods.*

RESULTS

Of 1,699 children eligible for enrollment, blood smears and questionnaires were obtained for 1,599 (96%). Prevalence of fever and cough in the sample was as follows:

Fever only	31%
Cough only	15%
Fever and cough	54%

If mothers were not prompted, 54% reported fever and cough present. If directly asked, 14% more reported both fever and cough to be present (68%).

- The median duration of illness was 3 days before the clinic visit.
- The percentage of children meeting a laboratory definition of malaria or pneumonia differed from those meeting a clinical definition. Whereas only 9% of those enrolled had neither malaria nor pneumonia clinically, 60% of those undergoing confirmatory tests had neither pneumonia nor malaria (parasitemia or radiographic evidence).
- Whereas 89% of those enrolled had a clinical diagnosis of malaria (with or without pneumonia), only 35% had laboratory confirmation of parasitemia.
- There was no association between parasitemia and radiographic change.
- There was little difference in mean axillary temperature and median duration of fever between children with radiologic evidence of pneumonia and those without.
- For children with radiographic evidence of pneumonia, the malaria clinical case-definition had a sensitivity of 93% and a specificity of 5%. For children without radiographic evidence, the sensitivity was 96% and the specificity 17%.

- For children with parasitemia, the clinical definition of pneumonia had a sensitivity of 63% (compared to the presence of radiologic changes), and a specificity of 68%. In the absence of parasitemia, the clinical definition had a sensitivity of 78% and a specificity of 84%.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. There was substantial overlap between clinical definitions and laboratory findings.

2. Because children who met the pneumonia case-definition were more likely to have *P falciparum* parasitemia than those who did not, treatment for malaria should be included in treatment for presumed malaria in malarious areas, unless parasitemia can be excluded.

3. The 5-day regimen of cotrimoxazole recommended for pneumonia is also effective for *P. falciparum* malaria and can provide adequate treatment for both malaria and pneumonia in Africa.

4. Because the clinical definition of malaria is imprecise, treatment for malaria will inevitably be given to some children without parasitemia.

STUDY LIMITATIONS

- The acceptance of radiologic evidence as the "gold standard" for definition of pneumonia (against which clinical diagnosis is measured for sensitivity and specificity) is arguable. In general, many authors dispute the sensitivity of radiography to detect acute lower respiratory infection at an early stage, in the presence of dehydration, or in the presence of malnutrition (see for example, DOHERTY, 1991 and MULHOLLAND, 1991)

- The authors themselves note the doubtful significance of some of this study's findings, commenting that although associations were found between splenomegaly and parasitemia, and between crepitations and pneumonia, these findings would be difficult to incorporate into a treatment algorithm. Moreover, the findings were too uncommon to be very useful.

PROGRAM AND POLICY IMPACT

The immediate impact of this study on national policy was modest. In this context it was primarily useful in identifying problems with existing or proposed policy, rather than uncovering a practical alternative. The study was not able to provide substantial recommendations for an alternative diagnostic approach because of a several reasons: First was the complexity of overlapping symptoms and signs malaria and ARI. Second was the fact that neither of the alternative methods of diagnosis —radiologic diagnosis of pneumonia, and microscopic diagnosis of malaria — have proven practical at the peripheral level. The third consideration is that early treatment at the peripheral level is desirable as a matter of policy, if treatment is to be most effective. The requirement for a diagnostic method sufficiently accurate to differentiate between ARI and malaria, yet sufficiently simple to be used at the peripheral level, remains a problem.

In Malawi and other sub-Saharan African countries this imperative led the ACSI-CCCD Project to pay increasing attention to the differential diagnosis of other diseases (particularly anemia and ARI), when considering the "appropriate" case management of "presumed malaria". In the short term, this led to the investigation of cotrimoxazole as a possible alternative to chloroquine in malaria treatment in children, under the presumption that it possesses effectiveness against both malaria and ARI (see BLOLAND, 1992). In the longer term, it has contributed to the involvement of the CDC in a program of research focused on evaluating the effectiveness of diagnostic methods and treatment algorithms for the integrated management of the sick child, a recent WHO initiative (WHO/UNICEF, 1993).

PUBLICATIONS

REDD SC, BLOLAND PB, KAZEMBE PN et al.: Usefulness of clinical case-definitions in guiding therapy for African children with malaria or pneumonia. Lancet 340:1140-43 (1992).

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DOHERTY JF, DIJKHUIZEN MA, WIERINGA FT et al: WHO guidelines on detecting pneumonia in children (letter). Lancet 338:1454 (1991).

MULHOLLAND EK, SIMOES EAF: WHO guidelines on detecting pneumonia in children (letter). Lancet 338:1454 (1991).

WHO/UNICEF: Integrated management of the sick child: a new WHO/UNICEF effort to improve child survival. WHO document. February, 1993.

RELATED PUBLICATIONS

BLOLAND PB, REDD SC, KAZEMBE P et al: Cotrimoxazole for childhood febrile illness in malaria-endemic regions. Lancet 337:518-20 (1991).

Of 46 children with pure *P falciparum* parasitemia (2,000 asexual parasites/ml) seen in the outpatient department of the Kamuzu Central Hospital, Lilongwe, 37% also met the clinical diagnosis of ALRI. Of 1,605 children originally screened, 61% met the case definition of malaria alone, 2% were ALRI alone, and 28% met both definitions (ALRI and malaria). The 46 enrolled children were treated with cotrimoxazole 20 mg/kg (based on sulphamethoxazole) twice daily for 5 days. Two children were lost to follow-up. Parasitemia was abolished in all 44 children followed for 14 days, with a mean parasite clearance time of 2.7 days. One child had parasite recurrence by day 14. Of the 17 children with ALRI, 14 (82%) had clinical cure by day 14. The authors acknowledge the limitations of cotrimoxazole as a first-line drug for malaria treatment because of its lengthy dosage regimen, but recommend its use where *P falciparum* is sensitive and where ALRI cannot be excluded in the presence of clinical malaria.

DIAGNOSIS OF PNEUMONIA IN UNDER-5's ATTENDING A HOSPITAL IN LESOTHO

STUDY LOCATION: LESOTHO

SHORT TITLE: **PREDICTORS OF PNEUMONIA IN CHILDREN, LESOTHO**

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STUDY DESIGN

Diagnosis of pneumonia in children was compared for three categories of clinicians (a nurse, general practitioner and pediatrician) at the Queen Elizabeth II Hospital, Maseru, Lesotho. Children aged 3 months to 5 years were enrolled from those attending the hospital outpatient department. Children were adjudged to be at high risk of pneumonia if they had a history of rapid breathing, a history of difficulty in drinking, wheezing, nasal faring or chest indrawing, or an elevated respiratory rate (40/min or greater for children 12 months and older, and 50/min for children 3-12 months of age). Children without these signs were defined as low risk. Pneumonia was defined as parenchymal pulmonary density on chest radiograph. Interobserver agreement was evaluated using the kappa statistic.

RESULTS

Of 393 children with chest radiographs, 17% had radiographic findings of pneumonia, 76% did not show pneumonia; 4% of films were uninterpretable, and 3% were unreadable because of poor quality.

- The most common symptoms and signs of radiologically confirmed pneumonia were respiratory rate elevation, history of rapid breathing, and temperature above 37.9 deg Centigrade. Other findings were present in less than half of patients with pneumonia.
- Malnutrition was associated with radiographic evidence of pneumonia (risk ratio = 1.88, 95% confidence interval = 1.04 - 3.40); however the actual number of children with malnutrition was small.
- There was good agreement between the three examiners for respiratory rate cutoffs and nasal flaring, but the nurse clinician's assessment of chest indrawing correlated poorly with both physicians' assessments.
- Elevated respiratory rate was the most sensitive indicator for radiographic evidence of pneumonia; however sensitivity varied with age.
- For children younger than 12 months of age, the sensitivity of a respiratory rate cutoff of 50/min ranged from 59% to 79% for the three examiners.
- For children older than 12 months, a cutoff of 40/min was more sensitive; however neither cutoff was more than 30% sensitive for children older than 24 months.
- Addition of clinical findings to respiratory rate added only slightly to the sensitivity of respiratory rate for diagnosis.
- The sensitivity of respiratory rate as a predictor of pneumonia was 34% if a cutoff of 50/min was used for all ages, but if 40/min was used for children older than 12 months (age-adjusted respiratory rate), the sensitivity of respiratory rate across all ages was 60%.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. The findings agree with previous studies showing that an adjusted cutoff rate for older children improves the sensitivity of respiratory rate as an indication of children with pneumonia.

2. The clinical definition of pneumonia works as well for a nurse as for a pediatrician, at least in this setting.

3. The influence of training on the reproducibility of clinical findings was most evident for the interpretation of chest indrawing.

4. The sensitivities found by this study were somewhat less than those found by previous studies which used a clinical standard rather than radiographic findings to define pneumonia (range of 71% to 75% for respiratory cutoff rate of 50/min). Other studies also found higher specificity for the measure (81% to 98%).

"Elevated respiratory rate was the most sensitive indicator for radiographic evidence of pneumonia."

STUDY LIMITATIONS

Concerns regarding the usefulness of radiographic evidence as the "gold standard" for diagnosis of pneumonia have been previously identified (see Malawi study by REDD et al.). In this study the authors concede that "some children with pneumonia may not have had radiographic evidence of pneumonia", but conclude that the number is probably small, and that the radiograph is a more objective measure of disease than clinical diagnosis. The validity of this conclusion is obviously dependent on the question of whether the number of children *with* pneumonia but *without* evidence of radiographic findings is small or large. In the absence of a clear consensus, this question will continue to influence clinicians' opinions.

PROGRAM AND POLICY IMPACT

The main policy implication of this study, as identified by the authors, was the demonstration that respiratory rate could be used by nurses as well as physicians to identify pneumonia. The other important finding was the confirmation of respiratory rate as the most useful clinical sign to determine the presence of pneumonia.

This study, with others, contributed appreciably to the formulation of ARI policy in Lesotho.

PUBLICATIONS

Cited in GOVE S, PIO A, CAMPBELL H, CATTANEO A: WHO guidelines on detecting pneumonia in children (letter). Lancet 338:1453 (1991).

ACUTE RESPIRATORY INFECTIONS IN LESOTHO: THE KNOWLEDGE, BELIEFS AND BEHAVIORS AMONG CARETAKERS OF CHILDREN UNDER THE AGE OF FIVE

STUDY LOCATION: LESOTHO

SHORT TITLE: **MOTHERS' PERCEPTION OF ALRI, LESOTHO**

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CO-INVESTIGATORS: Kimane, I

STUDY DESIGN

A two-phased study undertaken in 1989 and 1990 in Lesotho. Phase I used rapid anthropological research methods to assess the local perception of ALRI. The Phase I qualitative data were used to develop a quantitative survey instrument used in Phase II. Cluster sampling was used to select a sample of child care providers for children younger than 5 years of age. (A Phase III plan to use participant observation to determine the relationship between providers' self-reported behavior and their actual behavior was not carried out). Results are given for Phases I and II.

RESULTS

Phase I

A total of 39 in-depth open-ended group interviews and individual interviews were conducted among Basotho mothers, grandmothers, fathers and village health workers (the people of Lesotho are called Basotho). The data from Phase I led to three major insights:

- There are specific Basotho terms used to define acute respiratory infection (ARI) and acute lower respiratory infection (ALRI). *Sefuba* is the term used in Basotho to refer to the chest; it also refers to general illness (being sick), and in children refers specifically to the common cold.
- Of the different types of sefuba, the one specifically associated with breathing difficulty is called *letsoejana*, which literally translated means "little breast" and refers to seeing "the heart jumping" in the child's breast.
- The Basotho have specific beliefs and practices associated with treating children with ALRI.
- Questions about "breathing difficulty" were most likely to elicit responses related to ALRI. Illnesses causing breathing difficulty were *letsoejana* (66%), *letsollo* (11%), *lefuba* (9%), *kokoana* (6%), *phuana* (6%), and *feberu* (3%).

Phase II

A total of 660 individuals were surveyed, with a response rate of 92% (603/660).

- Of 60 possible terms for common childhood illness, sefuba, letsollo (diarrhea), and letsoejana were the three most frequently cited common childhood illnesses in rural and urban strata. Within the category of sefuba, some illnesses were regarded as a normal part of the child's growing up process; respondents indicated that these illnesses "usually come and go" and generally resolve without any specific treatment.
- Letsoejana was more likely to be cited as a serious illness than was sefuba. Diarrhea and vomiting were also cited as serious illnesses in a minority of cases.

- Of illnesses that cause death, letsoejana was more frequently cited than sefuba.

- Of illnesses associated with breathing difficulty, letsoejana and sefuba were the most frequently cited by both urban and rural respondents.

- Crude odds ratios were used to determine the likelihood of a symptom being used to diagnose letsoejana, compared with its likelihood of describing another childhood illness. The respiratory symptoms most specifically associated with letsoejana were ranked as follows:

  - Nasal flaring
  - Runny nose
  - Rapid breathing
  - Noisy breathing
  - Difficulty breathing
  - Cough
  - Fever

Thus, fever was not as closely and specifically associated with letsoejana as were other symptoms.

- Health behaviors associated with letsoejana included taking the child to the hospital; consulting with the mother-in- law, father, chief, or village health worker; increasing or decreasing the child's clothing; or binding the child's chest with cloth (to stop the fast heart beating or heart jumping).

- Of mothers who reported recently treating a child with letsoejana, the most common behaviors were taking the child to the clinic, to a physician, or to the hospital. Urban mothers were more likely to have used health services than were rural mothers.

- In approximately half of the cases, the child was treated with over-the-counter medications, and in a small minority of cases they were were treated with herbal medicines.

- In a majority of cases, caretakers increased or decreased the child's clothing and/or wrapped or bound the child's chest with strips of cloth.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Results showed widespread acceptance and use of the health care system and its resources for the treatment of ARI-related illnesses, including letsoejana and sefuba.

2. Data showed little evidence of widespread use of Sesotho traditional healers, herbalists or religious healers for treatment of ARI, including letsoejana.

3. Chest binding was associated with Basotho beliefs about the causes of letsoejana. However, this practice may restrict the lungs adversely and may be harmful to the child with letsoejana.

4. Early recognition of the most commonly recognized symptoms of letsoejana should be the basis of a health education message aimed at encouraging mothers to seek early treatment of children with ALRI.

5. Basotho beliefs in the efficacy of Western medicines should be reinforced by health education messages which underscore the importance of specificity (specific medicines for specific illnesses), and the need for continuing therapy even after the child "appears better."

STUDY LIMITATIONS

None cited. However, the prevalence of self-reported health behaviors in the survey do not necessarily reflect population prevalences, although they do indicate the general rank of these behaviors in the population.

PROGRAM AND POLICY IMPACT

This study provided an important dimension to prior studies which evaluated the medical aspects of ALRI treatment from the perspective of the country's health services. As noted by the authors, the initiative for Lesotho's attention to ALRI was initially generated by the high incidence of acute respiratory infections reported by routine monitoring. The series of studies which were initiated, after technical assistance was requested from the CDC, were intended to assist in the development of "a culturally appropriate and medically effective" policy.

The principal objectives of the research initiated by the ACSI-CCCD Project were to determine how respiratory infections are diagnosed and managed in the clinic and at home, and to identify differences between actual and ideal treatment practices (MOTEETEE, 1990). These in turn, would allow plans to be made for training clinical staff and educating the community. This sequence of studies proved very effective at providing such information.

Other factors which were identified as contributing to the effectiveness of the national strategy were a comparatively well organized medical infrastructure, relatively high immunization coverage, and a fairly effective essential drug program, in which shortages at the peripheral level were "extremely unusual."

PUBLICATIONS

WILSON RP, KIMANE I: Mothers' perception of ALRI: a case study from Lesotho. In Gadomski A, ed. Acute lower respiratory infection and child survival in developing countries. Proceedings of a workshop held August 2-3, 1989. Washington DC: Johns Hopkins University, 1990.

WILSON RP, SHALE MM, PARKER KA: Rapid anthropological procedures in the early planning for control of paediatric acute respiratory infections: Lesotho, 1989. In Scrimshaw NS and Gleason GR, eds. Rapid assessment procedures: qualitative methodologies for planning and evaluation of health related programmes. Boston: International Nutrition Foundation for Developing Countries (INFDC).

WILSON RP, KIMANE I, MOKDAD A et al.: Anthropologic methods for policy and program development: pediatric acute respiratory infections in Lesotho, 1989. ARTS document 099-4070.

REFERENCES

MOTEETEE M, REDD SC, METSING M: The development of the national ARI control program in Lesotho. Bull Intl Union Tuberc Lung Dis 65:29-30 (1990).

"Results showed widespread acceptance and use of the health care system . . ."

RELATED STUDIES

WILSON RP, AJABENG-ASEM S, ADETORO B et al.: The use of **ethnographic research in ARI program development: results from a focused ethnographic study in Ile-Ife, Nigeria. November, 1991.** ARTS document 099-4068.

Data from seven key informants was verified through semi- structured home-based interviews of mothers using health facilities, facility-based interviews of mothers seeking care for children with ARI, structured interviews with drug- sellers, and 13 structured interviews with practitioners (physicians, herbalists and nurses). Fast breathing was rarely regarded as a danger signal by mothers interviewed. Symptoms of ARI were generally regarded as a common and "normal" part of children's development. Treatment of ARI was sometimes initiated with herbal teas (agbo), home concoctions for cough, or hot fomentation or balm applied to the child's chest. Antipyretics or antibiotics were obtainable from drug sellers without a prescription and were generally dispensed without adequate instructions on proper use. With minimal changes, the WHO Focused Ethnographic Study protocol and manual were determined to be suitable for use in the field with few difficulties.

WILSON RP, NXUMALO M, MAGONGA B et al.: Diagnosis and management of acute respiratory infections by Swazi child caretakers, healers, and health providers, 1990 - 1991. ARTS document 099-4064

Individual structured and unstructured interviews, focus group discussions, and participant observation were used by MOH staff to obtain baseline community data on the diagnosis and treatment of ARI in children by mothers, healers and health providers. A broad range of ARI-related illness terms were used in the siSwati language. Of these, the signs and symptoms of *yimbo, umkhuhlane,* and *lishashati* reflected mild ARI, whereas *emahalba* and *lucabangu* reflected a more serious condition, consistent with ALRI. Respondents cited fever, cough, rapid breathing, and groaning as indicative of emahalba and lucabangu. Mothers and focus group participants both preferred first-line treatment at the health center to treatment at home, even for mild ARI. Reported practices that might compromise a child's recovery from ARI included use of detergent or disinfectant enemas to treat ARI, inhalation of smoke from burning herbs (a form of treatment administered by healers), and health workers' misdiagnosis of ALRI.

Facility-Based Assessment of Child Survival Services

This section deals with a number of facility-based research activities that were used over the life of the Africa Childhood Survival Initiative – Combating Childhood Communicable Diseases (ACSI-CCCD) project to assess the quality of service delivery. These evaluation activities (facility-based assessments or FBAs) were not only used to evaluate health care worker (HCW) performance (compared with predetermined performance standards), but also to assess the effectiveness of the encounter from the perspective of mothers or caretakers (through exit interviews). A convenient overview and description of these studies is included in **BRYCE et al.: Assessing the quality of facility-based child survival services. Health Policy and Planning 7:155-163 (1992).** A partial chronology is provided in the accompanying table.

Chronological List of Facility-Based Assessments Conducted in Collaboration with the ACSI-CCCD Program

Country	Year	# Facilities	Assessment Components				
			Observation	Exit Interview	HW/Sup Interview	Record Review	Equipment Inventory
Malawi	1986	23	X	X	X		
Burundi	1987	8	X	X	X		X
Burundi (Ngozi Region)	1987	22	X				X
Nigeria	1988	30	X	X	X	X	X
Togo	1988	25	X	X		X	X
Guinea	1988	11	X	X			X
Swaziland	1989	15	X	X	X		X
Central African Republic	1988	79	X	X		X	X
Nigeria	1990	30	X	X	X		X
Zaire	1989	12	X	X			

"Because these assessments were intended to provide information locally . . . a deliberate decision was made to develop the instrument so that it could be tallied by hand . . ."

The essential features of these assessments were developed and progressively refined over the life of the ACSI-CCCD project. Although not all features of the methodology were used in all countries, the basic components included five discrete activities:

1. Observations of HCW performance (using a standardized checklist).

2. Exit interviews with mothers or caretakers (to assess effectiveness of patient education by HCWs).

3. Interviews with HCWs and supervisors.

4. Record reviews.

5. Inventories of essential equipment and supplies.

Data collection was generally performed by three- or four-person teams, the number of teams determined by the number of facilities to be surveyed. A specific assessment exercise usually utilized 3 or 4 such teams. Performance standards were developed on the basis of each country's official policy (e.g., Nigeria included salt and sugar solution (SSS) promotion and teaching in its protocol for clinic visits; other countries that do not promote SSS did not have that included in their protocol).

Observer variability in monitoring health care worker practices was generally minimized by carefully training observers and interviewers and by standardizing a checklist that reduced assessment to dichotomous outcomes (e.g. did health care worker weigh the child . . . yes or no).

Because inter-interviewer reliability was a concern, bias was minimized by having two members of the research team independently conduct a subsample of observations (8% in Niger State, 14% in Cote d'Ivoire). The same procedure was used to provide reliability estimates during exit interviews. Concurrence on these subsamples was over 95%, suggesting only minimal levels of inter-observer variability.

Because these assessments were intended to provide information locally to local administrators (and to provide program information to mid-level and program managers), a deliberate decision was made to develop the instrument so that it could be tallied by hand at the local level; thus preliminary

frequencies and descriptive data could be used to provide immediate feedback. Further analyses using a microcomputer were generally done at the central or regional level using EPIINFO, a data entry and analysis program developed by the Centers for Disease Control.

The two main applications of the facility-based assessment in ACSI-CCCD were:

1. Cross-sectional studies of "current" health care worker practices and logistical problems constraining program objectives. In this respect the application provides a "snaphot of health care worker performance" and functions as a needs-assessment tool.

2. Longitudinal studies providing pre- and post-intervention assessments, allowing the program to evaluate the effectiveness of health care worker training.

Although initially conducted using random samples of facilities, purposive sampling using a "best-case" scenario has also been proposed as an applicable strategy for using the facility-based assessment (see BRYCE, 1992). Under this strategy, the evaluation would target the facilities where service delivery is assumed to be "best." Deficiencies identified in such a setting could be assumed to be equally or more prevalent in less favorable settings. In this aspect, the instrument would mirror the strategy used extensively in Zaire in the "100-Foyers" activities and developed earlier in Uganda (see MALISON et al.: Bulletin WHO 65:325 1987).

In many instances the facility-based assessment, when combined with community-based knowledge, attitude, and practices (KAP) studies of maternal practices (see DABIS et al: Bulletin WHO 67:675 1989), has provided considerable baseline information, which is necessary for allocating program resources. In many countries these sources were often the only reliable indicators of training needs, resource needs or logistical problems.

Note: This review of facility-based assessments in ACSI-CCCD owes much to BRYCE'S 1992 published review, as well as a 1989 unpublished document: "Report on Facility-Based Needs Assessments in Five CCCD Countries" by Kathleen Singleton.

"In many countries these sources were often the only reliable indicators of training, resource needs or logistical problems."

REPORT OF JOB PERFORMANCE AT SELECTED HEALTH UNITS: THE TREATMENT AND MANAGEMENT OF PRIORITY DISEASES – DIARRHEA, MALARIA, MALNUTRITION IN MALAWI, 1986

STUDY LOCATION:	MALAWI
SHORT TITLE:	**NATIONAL JOB PERFORMANCE SURVEY, MALAWI**
PRINCIPAL INVESTIGATOR:	VOIGT, Ann CNM MPH SBSB-TSD/IHPO, Mailstop F-03 Centers for Disease Control and Prevention, Atlanta, GA 30333
CO-INVESTIGATORS:	None cited.

STUDY DESIGN

This study design used observation of health care worker practices in selected health facilities (nonrandom sample). Very limited exit interview of mothers (in later studies this component was expanded considerably). This study followed a program of health care worker training based on a series of World Health Organization (WHO) modules that were largely didactic.

RESULTS

Childhood Diarrheal Disease

For treatment of childhood diarrheal disease 128 encounters were observed. Key findings were as follows:

- In 45% of cases the frequency of stools was not asked, and in 55% skin turgor was not examined for dehydration.
- Only 25% of children were weighed.
- Of all cases 70%) were given oral rehydration salts (ORS) at the clinic, but in only 4.2% of cases were the correct amounts given.
- In 16% of cases mothers were told how to feed their children at home, 20% were told to increase fluids, and only 8.3% were told the signs to look for that would warrant bringing the children back to the clinic.

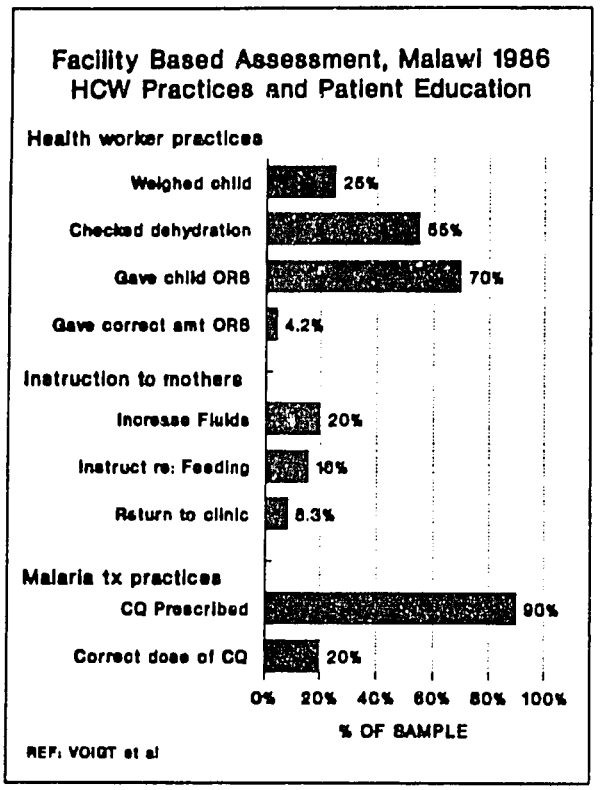
Fever and Malaria Practices

For treatment of fever or malaria 204 cases were observed.

- The age of the child was asked 45% of the time; 9% of the children were weighed.
- Chloroquine was prescribed for 90% of cases, but only in 20% was dosage correct; 44% received the first dose at the clinic.
- Less than 20% of cases received instruction on how to reduce fever, and only 14% were told to return if fever persisted.

Malnutrition

- Of children who had not gained weight over the previous month, 75% were not given nutrition counselling.
- Ten health workers (19%) could not plot the correct weight of the child on the growth chart. Five of 49 (10%) did not get the weight of the child correct.



STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Health care worker practices were weak in many critical areas. Informing mothers was a particular weakness.

2. The existing approach to health training (3-day workshops consisting primarily of reading modules and facilitator-led discussions) was not effective.

3. Study authors recommended a change in the teaching approach to one emphasizing practice and skills building.

STUDY LIMITATIONS

None identified by authors.

PROGRAM AND POLICY IMPACT

This study highlighted a number of deficiencies in health care worker practices common to several country studies. Among these deficiencies was the frequent finding that ORS and SSS knowledge was not as widespread as thought, and that oral rehydration therapy (ORT), even when properly prepared, was often given in insufficient quantities. Another finding was that the education of mother or caregivers was often inadequate.

One example of specific program impact evolving from these study results was the problem of appropriate chloroquine dosage for children. This significant problem for peripheral health workers was identified at an early stage, confirmed by related community studies and formative research, and was subsequently addressed with some considerable success by developing a pictorial chart showing correct dosages for five age ranges. This job aid, developed by the Communication for Child Survival Project (HEALTHCOM) in Malawi (with the cooperation and support of a local drug company) was eventually adopted by a number of other CCCD countries.

With respect to both controlling diarrheal disease (CDD) and malaria activities, these performance evaluation studies helped identify specific areas of emphasis for health care worker training – an approach that contrasted with "less targeted" training efforts that often preceded the CCCD project in individual countries.

Because Malawi was one of the early CCCD project countries, many of the early lessons learned there about facility-based and community-based practices were also instrumental in developing later instruments and training materials.

"Because Malawi was one of the early CCCD project countries, many of the early lessons learned there were also instrumental in developing later instruments and training materials."

■ PUBLICATIONS

Included in: BRYCE JW, TOOLE MJ, WALDMAN RJ and VOIGT A: Assessing the quality of facility-based child survival services. Health Policy & Planning 7:155-63 (1992).

■ RELATED STUDIES

MALENGA GJ and NYASULU YMZ: A Study of Knowledge, Attitudes, and Practices Concerning Childhood Diarrhoea and Dehydration in Mulanje District, Malawi.

This complementary community study examined practices among mothers and caregivers in Mulanje district of Malawi. In conjunction with the facility surveys, thus study provided documentation of existing maternal practices, availability of ORT materials in the home, and sources of health information. Both the study and the surveys were used in the formulation of national CDD policy.

TRAINING AND SUPERVISION NEEDS ASSESSMENT STUDY, NIGER STATE HEALTH FACILITIES: 27 JAN-22 FEB 1988

STUDY LOCATION:	NIGERIA
SHORT TITLE:	**FACILITY-BASED NEEDS ASSESSMENT, NIGER STATE**
PRINCIPAL INVESTIGATOR:	TOOLE, Dr. Michael TSD/iHPO, MS F-03 Centers for Disease Control and Prevention Atlanta, GA 30333
CO-INVESTIGATORS:	Voigt A, Puckett D, Saba S

STUDY DESIGN

This study utilized a standardized assessment protocol using all five FBA components (including on-site observations, exit interviews, record reviews, and equipment and supply inventories). Sampling was of "a large sample of different categories of health facilities." Probability proportional to size (PPS) methods were used to select 30 facilities in two strata from 62 facilities.

RESULTS

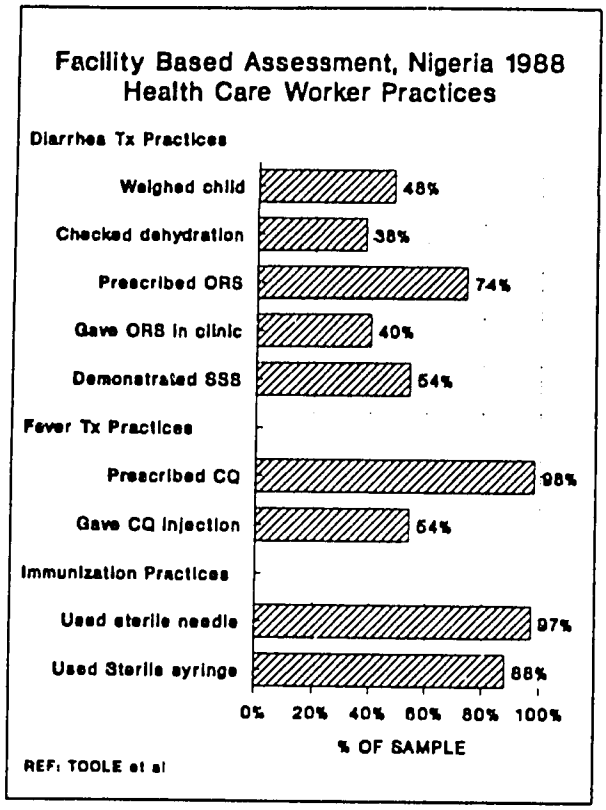
EPI and Immunization Practices

- A total of 117 observations in 19 facilities was recorded.
- In 85% of cases the child's age was checked, and in 99% the immunization card was checked.
- In 97% of cases a sterile needle was used; 88% used a sterile syringe.
- Proper vaccine storage was observed in 73% of cases.
- In 59% of Material and Child Health (MCH) clinic contacts, mothers were told of the diseases immunization would prevent, but were told in only 14% of Basic Health Center contacts.
- Of 130 respondents in exit interviews, 65% of children had received appropriate vaccines for their ages.

Childhood Diarrheal Disease

Fifty observations were made in 20 facilities.

- In 48% of cases children were weighed; of the 15 facilities where children were not weighed, only 4% did not have scales. In 38%, dehydration status was checked. Only 24% checked skin turgor.
- In 74% of cases ORS or SSS was prescribed, but in only 40% of cases was fluid given in the clinic. SSS was demonstrated in the clinic in 54% of cases.
- Only 30% of the time was the mother told to return if the child got worse.
- Immunization status was checked in 84% of cases.
- Although 73% of mothers said they knew how to make SSS, only 35% could correctly show how (i.e., 26% of total sample).



Fever and Malaria Practices

There were 56 observations of treatment encounters in 19 facilities.

- In 77% of cases weight or age was checked.
- In 98% of cases chloroquine was given. Of all patients, 54% received injections; 43% received medication both orally and through injections.

Supervisory Practices

Interviews with 32 health care workers disclosed that supervisory visits were often reported but frequently these were only vaccine drop-offs, and actual regular supervision was rare.

"Of all patients with fever 54% received injections"

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Health worker practices in EPI were generally adequate. Problems remain in educating mothers.
2. Supply and equipment availability often limits the ability of health care workers to carry out tasks appropriately.
3. Supplies of ORS and equipment were lacking in one third of facilities, and many aspects of diarrhea case management were not adequate.
4. Presumptive treatment of malaria was often inadequate since dosages of chloroquine were often inaccurate. Injections of chloroquine were routinely given for all degrees of severity.
5. Training programs need to be tailored to the particular needs of health care workers.
6. Supervisor training is needed to institutionalize effective supervisory practices.

STUDY LIMITATIONS

- Although visits were planned for scheduled immunization days, several venues had to be changed because there were no children present for immunization or diarrheal disease treatment at the scheduled facility.
- Review of treatment records provided incomplete information on management of malaria in clinics (usually because of inadequate data recorded).

PROGRAM AND POLICY IMPACT

BRYCE et al. (1992) notes the function of this study in providing "a snapshot of health care worker performance" which, in the case of Niger State, allowed the ministry to identify (and document) inadequate treatment pactices as well as to distinguish between professed levels of knowledge and actual practices. For example, mothers' actual ability to prepare SSS, when directly observed, was much lower than their self-reported capability (46% vs. 68%).

This study was the first of a number of assessments done in Niger State with CCCD support. Findings were instrumental in formulation of a supervisory training program for mid-level managers that was instituted in 1989-90. In Niger State this took the form of a Continuing Education Unit (CEU) established within the Niger State Ministry of Health (MOH) and a training curriculum involving not only didactic teaching but field visits, discussions, role plays, and practice teaching.

This latter program was itself the subject of extensive evaluation through repeated facility-based assessments and a case-control comparison of post-training practices with non-intervention areas and pre-intervention historical controls. (The training evaluation is described in an accompanying summary.)

Similar baseline assessments have been done in five of nine CCCD-supported states at time of writing, and plans for replication in the remaining states are underway. CEUs were also established in other CCCD-supported states, with plans by the MOH for instituting them in nonfocus states as well.

PUBLICATIONS

Included in: BRYCE JW, TOOLE MJ, WALDMAN RJ and VOIGT A: Assessing the Quality of Facility-Based Child Survival Services. Health Policy & Planning 7:155-63 (1992).

See also: Proceedings of Fourth Consultative Meeting, ACSI-CCCD, Yamoussoukro 1988, p27.

RELATED STUDIES

BRYCE J et al.: Niger State Facility Assessment Survey, 1989.

This was a 1989 restaging of the 1988 survey, "using every effort to replicate the samples and procedures in the 1988 survey." The 1989 study was used as a pre-intervention baseline for evaluating the effect of the state-wide training program. Findings were comparable to 1988 results. However, they showed a somewhat higher proportion of ORT prescribed, and some improvement in mothers' knowledge of SSS preparation. Patient education by health care workers remained at low levels. Other results are highlighted in the ensuing summary (BRYCE et al. 1990), which uses the 1989 results as a historical control.

Similar baseline assessments done at the Local Government Area (LGA) level in Barkin-Ladi and Nsukka are outlined briefly after the next summary.

"The findings were instrumental in formulation of a supervisory training program for mid-level managers that was instituted in 1989-90."

SKILLS ASSESSMENT IN PRIMARY HEALTH CARE TRAINING – THE IMPACT OF CONTINUING EDUCATION ON THE BEHAVIOR OF HEALTH PERSONNEL IN NIGER STATE

STUDY LOCATION: NIGERIA

SHORT TITLE: **COMPARATIVE ASSESSMENT OF TRAINING METHODS, NIGERIA 1990**

PRINCIPAL INVESTIGATOR: BRYCE, Jennifer PhD
SBSB-TSD/IHPO, MS F-03
Centers for Disease Control and Prevention
Atlanta, GA 30333

CO-INVESTIGATORS: Voigt A, Adegoroye A, Zakari B, Oyebolu D, Rodman A, Saba S.

STUDY DESIGN

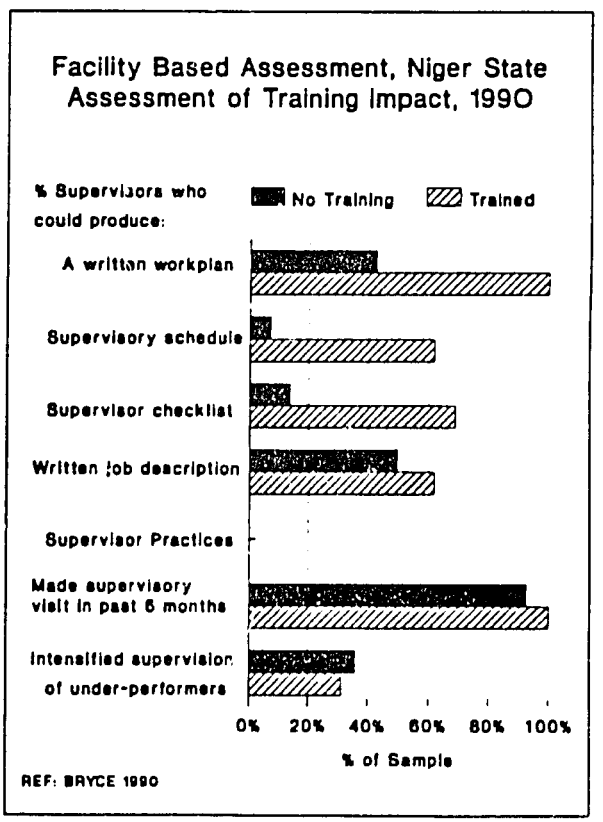
This was a study designed to evaluate the effectiveness of a supervisory skills training program instituted in 1989-1990 in Niger State. Two components: (1) Skills assessment of participants (pre- and post-training) measured by performance on a series of interactive tasks at time of training, and (2) on-site assessment of application of skills in the field. Field assessments of training impact included evaluation of supervisors' and health care workers' practices. Quasi-experimental design used purposive sample of 10 facilities supervised by trainees and 10 control facilities in nonintervention LGAs (matched for type and urban or rural status). Historical controls from 1989 baseline study were also used. Instruments and procedures for assessment were identical to 1989 study.

RESULTS

Assessment of Supervisory Practices

A total of 31 observations were made (18 trained supervisors, 13 not trained).

- Supervisors in the intervention group performed significantly better than their counterparts in non-intervention LGAs on a number of measures related to training objectives (e.g., target populations for immunization, producing a written work plan, supervisory schedule, performance checklists, etc.).



- A number of additional performance measures were also higher for trained supervisors but not at statistically significant levels (production of written job descriptions, supervisory visits, on-site performance monitoring).

- There was no evidence that training increased self-reported practices involving (1) increased supervisory visits to under-performing centers, (2) knowledge of villages without access to health services, or (3) availability of written job descriptions.

- Both intervention and control groups reported a significant problem with availability of transportation which caused cancellation of supervisory visits.

Effect on Health Care Worker Practices

There were only 20 observations of health care worker practices for diarrhea case management and 23 for vaccination practices.

- There was a noticeable improvement in health care worker practices in both groups (trainee-supervised LGAs and controls) compared with groups in the 1989 health practices survey. This improvement occurred over a relatively wide range of measures.

- There was a trend towards better performance of health care workers supervised by trained supervisors, but this trend did not reach statistical significance.

- Availability of equipment and supplies actually dropped from 1989 to 1990 for several measures (adequate stocks of needles and syringes, availability of ORS).

- There was no discernible change (either overall or by training status) in a number of key indices: (1) mothers' ability to correctly mix SSS, (2) health care worker vaccination of sick children, and (3) maintenance of cold chain during the immunization session.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Training has a measurable effect on supervisors' managerial performances.

2. A trend toward improved health care worker practices when supervisors are trained is suggested but did not reach statistical significance (possibly because of small numbers).

3. Availability of equipment and supplies is as important as training to supervisors' and health care workers' ability to perform duties adequately.

STUDY LIMITATIONS

The limitations identified below demonstrate one difficulty of quasi-experimental designs such as this – the inability to completely isolate and insulate the intervention or control communities from other influences.

- Vaccination campaigns were being held in some LGAs during the 1989 and 1990 assessments. This may confound to some degree the ability to attribute changes in practices solely to the training intervention (see BRYCE et al.: Lancet 335:739 1990 for a discussion of these results).

- A HEALTHCOM training program in 1990 included some personnel from four of the facilities in this assessment (three intervention facilities and, one control). The authors conclude that it probably did not confound the study results to any significant degree, but this is unproven.

- Between 1989 and 1990, the policy regarding vaccination changed significantly, emphasizing vaccination at all contacts rather than set-aside days for vaccination at health centers. This change affected the ability to monitor significant numbers of vaccination encounters during the 1990 assessment.

"Supervisors in the intervention group performed significantly better than their counterparts on a number of measures . . ."

PROGRAM AND POLICY IMPACT

BRYCE et al. (1992) outlines the use made of this study as a "rapid impact evaluation" in response to a funding need.

The immediate effects of the study were: (1) heightened attention to logistical constraints on health care worker performance, (2) adjustments to the training curriculum, and (3) adoption by other CCCD focus states of the broad-based continuing education approach piloted in Niger State. A subsequent review of the Niger State Training Program by national MOH personnel verified these results.

As the authors note, "One of the first results of the FBA was increased recognition by MOHs of the interdependence of health worker training and broader health system issues such as commodity distribution and supervision." In terms of Niger State, the report notes that immediately after the field assessment, the Ministry undertook a special exercise to deliver materials for SSS preparation and to provide instructions on their use to all health facilities. Although such responses do not necessarily guarantee sustainable supply logistics, the responses at least demonstrate that the medium was an effective one in causing the appropriate decision makers to recognize the problem.

This study also shows what BRYCE et al. have proposed as a second application of the FBA – to assess changes in service delivery over time. In this study, the changes in supervisory practices were easily shown; however, the "end-point" effects on health care worker practices were not as easy to demonstrate.

Two important comments should be made about the use of the FBA in this capacity. First, the survey in its complete form requires a significant diversion of personnel and resources from their "usual" activities. Second, differences in practices are easiest to demonstrate when overall levels are initially low and training causes significant improvement. If initial levels of performance are high (e.g., 80% correct preparation of SSS), then a much larger sample will be required to show small incremental improvements in health care worker practices. Thus, the instrument loses much of its attractiveness as a monitoring tool as performance levels improve.

In the particular context of Niger State (as well as in the Central African Republic and Rwanda), an additional role to which the FBA has been applied is routine supervision – supervisors have developed a shortened supervisory checklist from that originally developed for the FBA. In this respect, the process allows supervisors (through on-going supervision) to provide feedback at the facility level without disrupting routine services.

PUBLICATIONS

Included in: BRYCE JW, TOOLE MJ, WALDMAN RJ and VOIGT A: Assessing the Quality of Facility-Based Child Survival Services. Health Policy & Planning 7:155-63 (1992).

RELATED PUBLICATIONS

BRYCE J, et al: Skills Assessment in Primary Health Care Training. USAID/PHS/CDC ARTS Project Series.

Pre- and post-training assessment of supervisory skills. Evaluation of the same training experience as above study, but held at the time of training. Mean scores increased from 27.6 to 43.1 (maximum of 100) in a series of standardized interactive tasks.

BRYCE JW, CUTTS FT and SABA S: Mass Immunization Campaigns and Quality of Immunization Services (Letter). Lancet 335:739-40 (1990).

Comparison of FBA results for facilities during participation in Mass Immunization Days campaign, with noncampaign facilities. (Results are included in EPI section.)

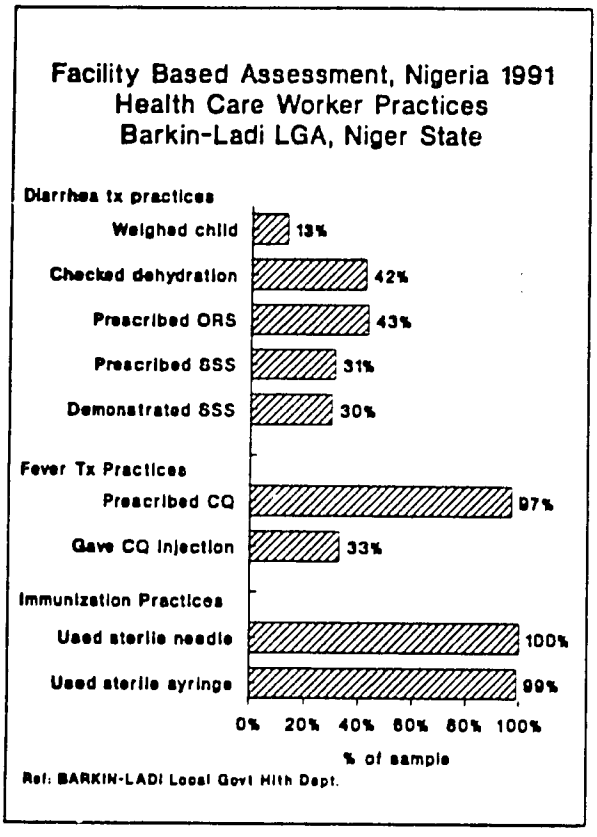
RELATED STUDIES

BARKIN-LADI LOCAL GOVT. HEALTH DEPT.: Facility Assessment Survey – Barkin-Ladi, 1991.

NSUKKA LOCAL GOVT. HEALTH DEPT.: Facility Assessment Survey, Nsukka, 1991.

The first of a number of studies done in Nigeria at the LGA level, in which the FBA methodology was adopted and implemented by the local government as a routine needs assessment tool. Although financially supported by CCCD, implementation (including interviewer training, data collection, analysis and report production) was essentially managed and executed at the local level. One small but significant change in methodology was that *all* LGA facilities were surveyed (13 in Barkin-Ladi, 11 in Nsukka) rather than taking samples.

Also significant was the inclusion of items to assess missed immunization opportunities. In Barkin-Ladi the findings revealed that only half of the sick children needing referral for immunization were referred and only a third of the sick children presented to the clinic with their immunization cards (although health care workers did check immunization status for 80% of those with cards). Other findings are summarized in the accompanying figure.



"One of the first results of the FBA was increased recognition by MOHs of the interdependence of health worker training and broader health system issues such as commodity distribution and supervision."

HEALTH FACILITY NEEDS ASSESSMENT STUDY, TOGO – 1988

STUDY LOCATION:	TOGO
SHORT TITLE:	**FACILITY-BASED ASSESSMENT, TOGO 1988**
PRINCIPAL INVESTIGATOR:	LENT, Drew Training Consultant
CO-INVESTIGATORS:	Karsa A., Gayibor A., et al.

STUDY DESIGN

This study used a standardized instrument for facility-based assessment, adapted for use in Togo – 88 questions in 6 modules, comprising (1) on-site observations of HCWs and (2) exit interviews, covering each of the three target interventions (EPI, CDD, and malaria). In addition an equipment and supply inventory and a review of clinic registers were required. Teams consisted of four evaluators. Of 340 facilities, 25 were surveyed – initial "random" sample of facilities from each region. Alternate centers were substituted if inadequate numbers encountered, or if there was low percentage use. Study was conducted in May-June 1988.

RESULTS

EPI and Immunization Practices

For EPI and immunization practices, 98 immunization encounters were observed and 107 exit interviews conducted.

- A sterile needle was used in 96% of cases, but a sterile syringe was used in only 21%. All centers had cold boxes and ice packs, but some of the larger centers did not have enough syringes and needles to cover a full day of vaccination.
- Seventy-two percent of mothers knew of fever as a reaction to vaccination, and 50% knew to give aspirin as a remedy.
- In 91% of cases, mothers knew to return to clinic for further immunizations, but only half knew how many times.

Childhood Diarrheal Diseases

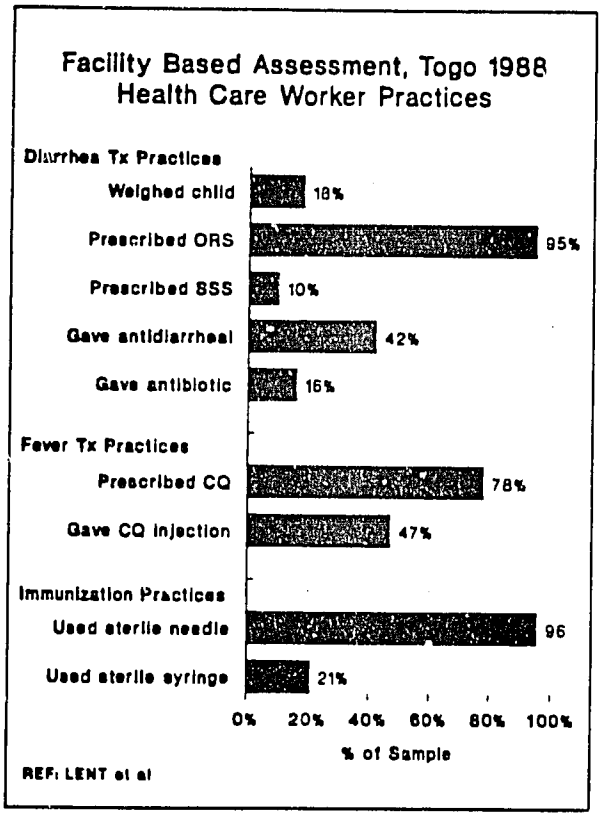
For childhood diarrheal disease, 67 encounters were evaluated.

- In 85% of cases, child's age was verified; in 18% the infant was weighed. Number of stools was verified in 99%, and duration of diarrhea asked in 85%.
- ORS were prescribed for 95% of cases; only 10% were prescribed SSS. Antidiarrheals were prescribed for 42% of cases and antibiotics for 16%.
- Mothers were instructed in the preparation of ORS in 82% of cases, but only 19% were asked to repeat the directions; in only 4.5% of cases was ORS administered in the clinic. Actual demonstration of ORS/SSS preparation was "nonexistent."
- Seventy-nine percent of mothers claimed they could prepare ORS (versus 36% for SSS). Only 6% actually demonstrated correct preparation of SSS.
- All but one center had a supply of ORS. Four centers had more than 10,000 packets in stock. No centers had materials for preparing SSS.

Fever and Malaria Practices

For fever and malaria, 81 encounters were evaluated.

- All centers had some chloroquine in stock. Chloroquine treatment was given on site for 78% of cases; 47% of cases received injectable chloroquine.
- "Correct" treatment (single-dose treatment, 10 mg/kg per existing protocol) was given in 57% of cases. (However, this recommendation was under review and a new policy was under active consideration at the time.)



STUDY CONCLUSIONS AND RECOMMENDATIONS

1. The administration of ORT on site was "basically nonexistent," as was the demonstration or use of SSS.
2. Mothers were generally more familiar with ORS than with SSS and did not demonstrate a high level of ability in preparing SSS properly. Study recommended targeting ORS rather than SSS as the preferred fluid for diarrhea treatment.
3. Many centers used antidiarrheals or antibiotics for diarrhea treatment and used a high percentage of injectable chloroquine for presumptive treatment of malaria.
4. The low acceptance of the single-dose protocol for malaria treatment was not surprising, given the knowledge that the recommended dosage was being reconsidered.
5. Health education practices were generally weak.
6. Report recommends decentralizing training of health care workers and adapting training to address specific deficiencies of health care worker practices.
7. Attention to nontraining issues should include establishment of ORT corners to promote ORS, improved supply logistics, and "methods to improve the quality and quantity of field supervision."

"Mothers were instructed in the preparation of ORS in 82% of cases, but only 19% were asked to repeat the directions; in only 4.5% of cases was ORS administered in the clinic."

STUDY LIMITATIONS

The survey was conducted at the same time as a national vaccination campaign was in progress in Togo. Observation of vaccination practices during this period may not be a valid measure of practices under routine circumstances. Other concerns identified by the author:

- Timing of the survey was not optimal for observing treatment of diarrheal cases since it was held outside the season of peak incidence.
- Although the survey provides information useful for planning training needs and identifying probable deficiencies. This information should not be viewed as national "prevalence" data.

PROGRAM AND POLICY IMPACT

Authors suggest that the findings of this study were essential to the formulation of a national strategy for continuing education training. The Health Sector Support for Child Survival (HSSCS) Project was proposed as the vehicle most appropriate for developing decentralized training of health workers. The authors note the study's use (1) to determine overall training needs, and (2) to provide sufficient information for planning nationwide continuing education.

PUBLICATIONS

Included in: BRYCE JW, TOOLE MJ, WALDMAN RJ and VOIGT A: Assessing the Quality of Facility-Based Child Survival Services. Health Policy & Planning 7:155-63 (1992).

RELATED STUDIES

ERICKSON, S: Facility Assessment, Togo, 1985.

A smaller, informal assessment done in 1985 identified initial levels of health worker practices and supply problems in health facilities in Togo.

EVALUATION OF TRAINING IMPACT ON HEALTH WORKER PERFORMANCE, COTE D'IVOIRE – MARCH 1990

STUDY LOCATION: COTE D'IVOIRE

SHORT TITLE: **TRAINING FIELD ASSESSMENT, COTE D'IVOIRE 1990**

PRINCIPAL INVESTIGATOR: BRYCE, Jennifer PhD
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CO-INVESTIGATORS: Traore M, Lindsey D

STUDY DESIGN

A study to evaluate at baseline the effect of CCCD training. Survey sample was designed to include all base facilities and a random sample of 16 health centers and dispensaries within each of two sector subsamples: (1) 4 sectors in which supervisors participated in a 1989 training course and which were funded for peripheral training activities; and (2) 4 sectors in which supervisors participated in a 1990 training course, who had not yet had an opportunity to apply training skills at the peripheral level. Of 40 closed or inactive facilities, 8 were replaced with "the nearest facility of the same type." Four FBA components were used: (1) observation checklists, (2) exit interviews, (3) supervisor, manager, and health care worker interviews, and (4) equipment and supply inventories. An integrated checklist was used allowing specific analysis of symptom overlap for children presenting with multiple symptoms and/or diagnoses. Inter-interviewer reliability was evaluated by independent duplicate observations on a subsample of 44 instruments.

RESULTS

The subsample of 44 duplicate observations yielded an inter-interviewer reliability of 98% (60 nonmatches from 2,584 items). A total of 320 encounters were evaluated – 178 were for vaccination. Of the sick children, 18% had both fever and diarrhea. Significant findings:

- Surprisingly low utilization rates were noted in many facilities.
- Health care workers checked immunization status for 96% of sick children seen (fever or diarrhea).

EPI and Immunization Practices

- A sterile needle was used in 86% of cases but a sterile syringe in only 71%. Health centers were somewhat less likely than base centers to use a sterile syringe (66% vs 88%).
- Three of four mothers were told when to return to clinic. Other information was rarely provided.

Childhood Diarrheal Disease

- Dehydration status was assessed for 53% of children with diarrhea and for 46% with both fever and diarrhea.
- Of 64 children with diarrhea, 66% received a prescription for ORS; 60% of those with diarrhea only (no fever) received an antidiarrheal, and 32% received an antimalarial. Antibiotics were received by 10%.
- An average of 1.8 prescriptions per encounter were recorded for infants with diarrhea only, 2.5 for children with diarrhea and fever, and 2.0 for children with fever only.

- Although ORS preparation was explained to 72% of others only one (1.6%) was given a demonstration.

- In 61% of cases, mothers were familiar with ORS; 82% of them claimed they knew how to prepare it, and 84% of these could indeed demonstrate its preparation correctly.

- Only 44% of facilities had ORS packets in stock.

Fever and Malaria Practices

- Approximately 33% of children with fever (with or without diarrhea) were prescribed antibiotics.

- Two-thirds of children with fever and diarrhea (67%) received antimalarials as did 90% with fever only. Of children with diarrhea and no fever, 32% also received antimalarials.

- Only 44% of mothers were told to return if the child got worse.

- Only 42% of facilities had oral chloroquine (syrup or tablets) in stock (75% of base facilities but only 39% of peripheral health centers).

Comparison of Supervisory Skills

Interviews were conducted with 69 health personnel. Comparison of a subsample of those trained in 1989 with those trained in 1990 and 1987 suggested that training participation improved performance in managerial skills, but overall performance was relatively low.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. The Ministry of Health should address urgently the low utilization of peripheral facilities. Lack of basic supplies may contribute to nonuse.

2. Targeted peripheral level training activities should be supported.

3. Misuse of antidiarrheals needs to be addressed and other specific deficiencies at peripheral levels should be addressed in specific training activities (e.g., use of sterile syringe and needle, assessment of dehydration, or providing information to mothers, etc.).

STUDY LIMITATIONS

Because centers with very low levels of use were replaced in the survey, selection was not truly random. Since the excluded facilities were probably more likely to have had deficiencies in supplies, staffing, and so forth, the final study sample probably yielded conservative estimates for deficiencies in supplies and worker practices.

- Authors note that observations of health care workers did not include an assessment of whether or not the worker specified the recommended 3-day treatment course of antimalarials. This limitation precluded a direct comparison with exit interview responses.

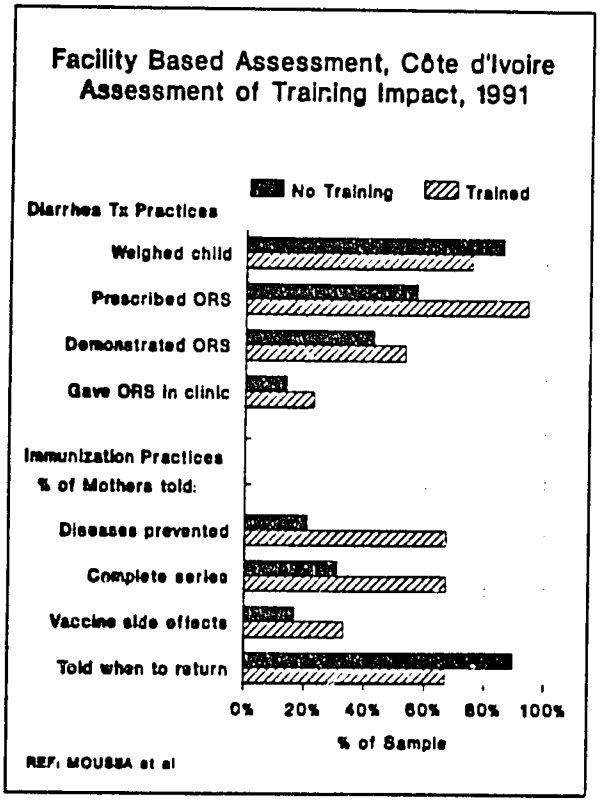
- As with prior studies, results are not intended to provide national estimates or direct comparisons with other countries.

"In 61% of cases, mothers were familiar with ORS; 82% of them claimed they knew how to prepare it, and 84% of these could indeed demonstrate its preparation correctly."

■ PROGRAM AND POLICY IMPACT

This study was designed as a baseline study of health care worker practices prior to starting a training activity for peripheral level health care workers. In this respect, the decision to institute the training program was not a consequence of the study findings but had evolved from prior assessments (see KHANTAWAY 1986, DAVIS 1987 & 1988, and TRAORE 1990). This study was followed in 1991 by a follow-up survey (TRAORE et al. 1991) subsequent to the final round of mid-level manager training and after initiation of peripheral level health care worker training.

The specific training program entailed four mid-level manager courses (*cours moyen*) in all 26 health sectors, and peripheral level training (*cours relais*) for health center personnel. At the time of the follow-up survey of training impact (Feb 1991), sixteen health sectors had instituted *cours relais* activities. For results, see below.



■ PUBLICATIONS

Included in: BRYCE JW, TOOLE MJ, WALDMAN RJ and VOIGT A: Assessing the Quality of Facility-Based Child Survival Services. Health Policy & Planning 7:155-63 (1992).

■ RELATED STUDIES

TRAORE, M et Collaborateurs: Evaluation de L'Impact des Formations et des Besoins en Formation des Personnels de Sant, Rapport Final, Aout, 1991. Programme de Lutte Contre les Maladies Transmissibles de L'Enfance/CCCD, Republique de Cote d'Ivoire.

The post-training resurvey of the facilities showed improved health care worker practices after training in: (1) giving information to mothers about immunization and malaria treatment, (2) prescribing ORS for diarrhea, and (3) treating fever. Significantly more facilities with trained personnel had ORT materials available (a finding also noted in Nigeria).

The study showed minimal improvement after training but still showed low levels of performance in (1) physically examining infants (2) giving information to mothers about diarrhea, and (3) administering of ORS on site.

"Two-thirds of children with fever and diarrhea received antimalarials, as did 90% with fever only."

FACILITY BASED ASSESSMENTS: POSTSCRIPT

COMMENTS AND CONCLUSIONS

The experience of the ACSI-CCCD project in developing and implementing the facility-based assessment as an evaluation method has raised a number of method and program issues worthy of consideration. Among them:

1. **Validation and Reliability:** Although considerable attention was paid to confirming the reliability of the instrument in its development and piloting, subsequent uses as a routine assessment tool have generally not used subsamples or other methods to verify reliability.

2. **Representativeness:** A variety of sampling methods (ranging from random and purposive sampling to selection of all facilities within an LGA) have often been used to select facilities. Although these methods have generally been adequate when the objective of assessment is a cross-sectional "snapshot" of knowledge and practices at a single point, the need for methodological rigor becomes much greater if the objective is to monitor longitudinal changes over time. Can or should the instrument be used then to monitor changes, and at what point do small incremental changes become irrelevant to information needs (e.g., would policy makers care if ORS use changed from 85% to 88% during one year)? In fact, although statistical methods are available to determine with relative accuracy the significance levels of such a change, the question remains: "At what point does the process become too complex to be useful, or too expensive to be practical?"

3. **Diagnostic Classification:** Initial facility assessments that evaluated practices for treatment of diarrhea or fever seldom considered multiple or secondary diagnoses in determing appropriateness of therapy, despite considerable symptom overlap known to exist, for example, between acute respiratory infection and malaria. Later assessments have seen a need to attempt a differentiation of symptoms (e.g., diarrhea with fever, diarrhea without fever, and fever with cough). This need for differentiation has introduced an apparently unavoidable level of complexity to the interpretation of findings however, and it remains to be seen whether the relative simplicity of the instrument can be maintained.

4. **Resource Requirements:** In terms of personnel time and expense, resources are not insignificant for this method. The average assessment exercise, involving approximately 30 facilities, generally requires as many as 90 person-days of interviewer time (two teams of three persons each x 15 facilities), plus equivalent time for two supervisors or coordinators, and approximately 5 days of interviewer training. Data-entry and analysis also contribute significantly. Because of these resource demands, several authors have raised the following questions: At what administrative level is the exercise an effective use of resources? Is there significant benefit to be gained from implementation at the local level despite the cost? Is the exercise, in fact, effective in stimulating awareness at the peripheral or facility level?

In the CCCD experience, the development of performance-based standards and observational assessments of service quality have generally laid a foundation for future improvements in quality assessments through supervision or other mechanisms.

Although each country or program will probably decide for itself how it wishes to use the FBA, the experience of Niger State suggests one option, and the Central African Republic (CAR) illustrates another. In CAR, program managers have generally foregone the formal survey approach to facility-based assessment and have instead incorporated supervisory checklists derived from the FBA into routine supervision. Thus, emphasis is continuously being placed on developing less resource-intensive methods (much like the CAR model) for assessing the quality of services.

Community Surveys

Community surveys undertaken by the ACSI-CCCD Project encompassed a wide range of data gathering and research activities. These extended from small-scale, single site surveys using qualitative methods to national surveys using representative population samples. Although this section illustrates a number of these community based methods, other examples are included in individual sections related to specific interventions (EPI, diarrheal diseases, malaria and ARI) and in the section covering the Mortality and Use of Health Services (MUHS) Surveys.

Although the studies represented here are few in number, population-based community surveys actually played a critical role within the ACSI-CCCD Project. One of the major reasons for this was the dearth of reliable community level data in virtually all of the African countries in which the CCCD Project operated. In contrast to existing morbidity and mortality data, which were generally institution-based, and often incomplete, the ACSI-CCCD Project made deliberate attempts to provide decision makers with reliable population-based data, with the objective of enabling decision makers to more accurately define the magnitude and extent of health problems that the programs sought to address. At the macro level, these efforts included several multipurpose national surveys, using representative population samples to derive national prevalence estimates or weighted area estimates (for example, by rural and urban strata). At the local level, community surveys were equally important, and were often undertaken to provide local personnel with a more "objective" view of health problems from the community perspective, without biases introduced by variables of access or utilization, such as cost, travel distance, or waiting time. In many instances these results could be directly compared with contemporaneous facility-based data.

Over the life of the CCCD project, there was also a corresponding evolution in the routine use of surveys to monitor programs, particularly with respect to EPI monitoring through the use of WHO cluster surveys, as well as malaria prevalence and sensitivity surveillance through sentinel sites or community surveys. Many of these activities were also

"In contrast to existing morbidity and mortality data, which were generally institution-based, and often incomplete, the ACSI-CCCD project made deliberate attempts to provide decision makers with reliable population data."

"Community surveys were invariably undertaken as part of integrated approach to data gathering."

supported by CCCD technical assistance. In many cases, the technical skills gained from these "routine" activities could also be applied to special surveys or community-based research.

Several specific characteristics are worth mentioning with respect to the community surveys undertaken under CCCD:

First, community surveys within CCCD were invariably undertaken as part of an integrated approach to data gathering. Concurrent review of hospital or facility records was usually undertaken to allow comparison of community data with facility data. This was seen in the neonatal tetanus studies of BABANIYI and MUTIE, as well as other EPI studies (see, for example, Guinea study by CUTTS in EPI section and Rwanda study by DEMING in this section).

Second, the process of determining health priorities or health problems through community surveys is iterative. The establishment of baseline data was a necessary part of this process, but the project also revealed a need to use focal or periodic surveys to determine whether interventions had any effect on actual outcomes, and to monitor changing priorities or the emergence of new diseases or health problems. This was most important where surveillance systems or routine data systems were inadequate. Where it was possible to strengthen routine surveillance, such systems could often obviate the need for repeated expensive surveys.

A third point is that CCCD surveys were often concerned, not solely with determining the magnitude of health problems (i.e. incidence and prevalence) but often with identifying determinants as well. This is particularly well demonstrated by Deming's studies on the home treatment of fever in Togo (see DEMING in the section on Malaria-Related Research). This approach greatly increased the value of these studies to decision makers.

Finally, a major strength of the CCCD experience with community surveys was the ability to fashion the instrument and methods in response to specific program needs, and to tailor the results to the intended audience. PROST and JANCLOES (1993) note that one major failing of epidemiologists' approach to data is that "too many epidemiologists perceive their function as that of collecting the greatest possible amount of information in order to combine all possible variables." Thus, they note, critical data are often missing or impossible to retrieve. Moreover, systems are often not con-

ceived in relation the needs of users and potential users. With few exceptions, the CCCD Project placed particular emphasis on establishing clearly focused areas of inquiry, timeliness in data availability, flexibility and responsiveness to policy issues, manageability, and close collaborative involvement of counterparts. All of these strengths generally increased the relevance and utility of the project's survey results. They also correlate with factors that other authors have previously identified as contributing to the successful use of community surveys for policy change (see for example, GROSH, 1991).

REFERENCES

PROST A, JANCLOES M: Rationales for choice in public health: the role of epidemiology. In Jamison DT, Mosley WH, eds. Disease Control Priorities in Developing Countries. New York: World Bank, Oxford University Press, 1993.

GROSH ME: The Household Survey as a Tool for Policy Change: Lessons from the Jamaican Survey of Living Conditions. LSMS Working Paper Number 80. Washington, DC: World Bank, 1991.

ESTIMATING HEALTH SERVICE UTILIZATION, IMMUNIZATION COVERAGE, AND CHILDHOOD MORTALITY: A NEW APPROACH IN UGANDA

STUDY LOCATION: UGANDA

SHORT TITLE: **A NEW APPROACH TO LOCAL AREA MONITORING, UGANDA**

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Centers for Disease Control and Prevention
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CO-INVESTIGATORS: Sekeito P, Henderson PL, Hawkins RV, Okware SI, Jones TS

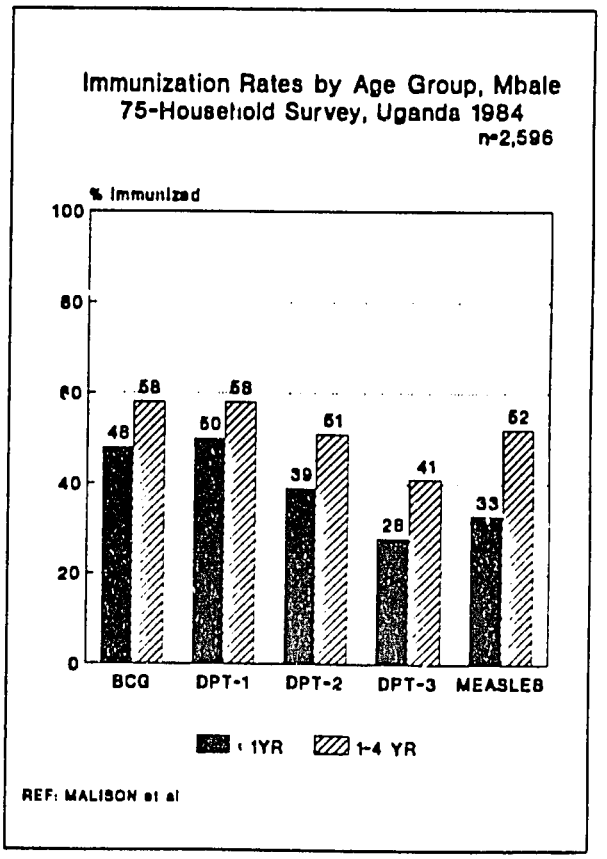
STUDY DESIGN

This was the prototype of the "Hundred Household Survey" used extensively in Uganda, Zaire, Nigeria and Liberia. Seventy-five households nearest to each of 36 rural health centers in the Mbale district were surveyed with a single- page questionnaire. The study utilized recall of births for the prior five years and deaths of children younger than five years of age within the prior year. A simplified verbal autopsy was used to determine deaths from neonatal tetanus, as well as diarrhea-associated and measles-associated deaths. Measles and diarrhea were not considered mutually exclusive. Immunization rates were determined using card-documented confirmation only. Data collection, analysis and interpretation were done at each health facility in one day. Supervisors and local health center staff were responsible for all interviews and analysis. Data were hand-tallied on- site.

RESULTS

Interviews were completed in 91% of households visited (n = 2,450). Data for 2,596 children younger than 5 years of age were obtained.

- The estimated infant mortality rate (IMR) was 95/1000 live births. The 1 to 4 mortality rate was 25/1000 live births.
- The estimated neonatal tetanus death rate was 15/1000 live births. Approximately one-third (34%) of infant deaths and two-thirds of deaths in children 1- to 4-years-old were diarrhea-associated.



- An estimated 18% of infant deaths and 41% of deaths in children 1- to 4-years-old were measles-associated.

- Only 21% of infants and 38% of children 1 to 4 years of age were fully immunized.

- There were 3.2 episodes of diarrhea per child per year. Only 12% of episodes were treated with oral rehydration salts or salt and sugar solution (ORS/SSS), whereas 62% of children with diarrhea received drugs of some sort (antidiarrheals, antibiotics, etc.).

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. The study documented high rates of mortality and under-utilization of preventive health services despite close physical access to health services.

2. The survey demonstrates "a substantial need to improve the utilization of health services among populations who already have easy access to health facilities."

3. The method used is a valid means to augment routine reporting and population surveys. It also facilitates program implementation by involving direct providers in assessing their community's health needs.

STUDY LIMITATIONS

As noted in the study, the sample was not intended to be a population random sample, and results should not be interpreted as population prevalences. Other cautions:

- The very limited verbal autopsy performed offers only a rough estimate of cause-specific mortality. Moreover, although valid for neonatal tetanus deaths, the reliability of verbal autopsy in other causes of death is less assured.

- The brief birth history taken, without in-depth probing has been shown in Zaire to omit a significant proportion of births and deaths (see TAYLOR, 1993).

Although the sampling frame used in this study assumes that coverage levels obtained for households nearest health facilities exceed those in more distant households, the study does not actually prove the assumption.

PROGRAM AND POLICY IMPACT

One immediate consequence arising from this study was that the results surprised local health workers who had assumed that local needs were being better met by existing health services. The authors also noted that the findings were of immediate utility in providing the district medical officer with valuable baseline information on EPI and ORT programs.

In the CCCD context, the survey method (**local area monitoring**) proved particularly useful in providing local assessments at the facility level to program managers. In particular, the methodology was extensively adopted in Zaire (where it was modified to include a slightly larger number of households and children — the 100 Household or **"Cent-Foyers"** survey). The advantages of the method were several: (1) ease of use (allowing it to be used even where existing health services were rudimentary), (2) timeliness, and (3) low cost.

It has also been used in CCCD projects in Liberia and Nigeria.

PUBLICATIONS

MALISON MD, SEKEITO P, HENDERSON PL et al.: Estimating health service utilization, immunization coverage, and childhood mortality: a new approach in Uganda. Bull World Health Organ (1987)

"The results surprised local health workers who had assumed that local needs were being better met by existing health services."

MONITORING SELECTIVE PRIMARY HEALTH CARE: METHODOLOGY AND COMMUNITY ASSESSMENT OF VACCINATION, DIARRHEA, AND MALARIA PRACTICES IN CONAKRY, GUINEA

STUDY LOCATION: GUINEA

SHORT TITLE: **MONITORING SELECTIVE PRIMARY CARE, GUINEA**

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Université de Bourdeaux II
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CO-INVESTIGATORS: Sow A, Breman JG, Roisin AJ, Haba F, and the ACSI-CCCD team

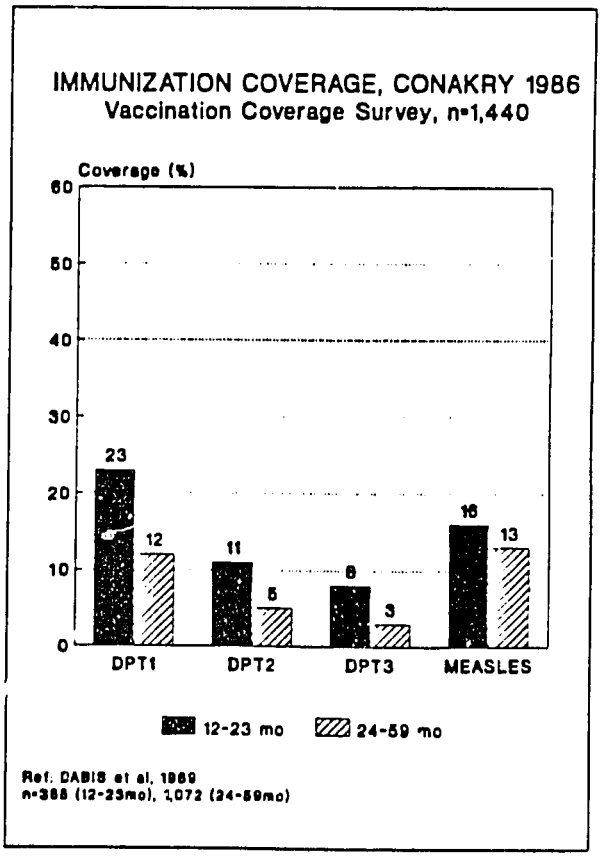
STUDY DESIGN

This was a 30-cluster sample of 76 "quartiers" in Conakry, Guinea based on a probability proportionate to size (PPS) sample and an estimated sample size of 2,040 children younger than 5 years of age. A questionnaire was developed in English and translated to Soussou, Malinke and Fula. Vaccination status was based on card-confirmed immunizations only. Two-week recall for was used for diarrhea and febrile illness.

RESULTS

Interviews were completed for 1,415 women caring for 2,046 children. Of the total, 15% of children had a history of diarrhea and 24% had a history of fever in the prior 2-week period. Eight percent or 156 children had both fever and diarrhea. Fifty-six percent of respondents were within one hour of a health facility.

- Maternal tetanus toxoid immunization (2 or more doses) was 49%, and 60% of mothers had at least one dose.
- Coverage for children was less than 25% for all individual antigens.
- Of the children who received measles immunization, only 28% had received it at the appropriate age (9-35 months).



Diarrheal Disease

- Only 13% of mothers discontinued breast-feeding during diarrheal episodes.
- Sixty-four percent of diarrheal episodes were treated at home. Thirty-one percent of episodes were not treated.
- **Only 10% of children were treated with SSS or ORS** (16% of those treated at home and 17% of those treated at clinic).
- **Almost 51% of all children with diarrhea received antibiotics or antidiarrheal drugs, including 80% of those receiving home treatment.**
- Only 4% of children with diarrhea received ORT treatment of correct composition and in adequate quantities to correct dehydration.

Febrile Illness

- Of 482 children with fever, 79% were treated at home and 43% by a health worker. Thirty-nine percent of children treated at home also went to a health center.
- Forty-seven percent of febrile children received an antimalarial drug, and 36% received an antipyretic.
- Fourteen percent of all febrile children received an injection during their febrile episode. Most of these were given at the health center.

"Almost 51% of all children with diarrhea received antibiotics or antidiarrheal drugs, including 80% of those receiving home treatment."

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. The method used in this multi-purpose survey is adequate to yield usable statistical comparisons for two different incidence figures (diarrhea and fever) and two summary indicators (utilization of health services and home treatment).
2. To measure changes over time, larger sample sizes are needed than for a point prevalence vaccine coverage survey.
3. The cost of the survey (estimated at $3,800 in 1986) was reasonable.
4. Low immunization coverage was documented, with poor targeting of vaccination efforts.
5. Despite a relatively high rate of contact with the health system there was very little use of ORT.
6. Even when used, ORT use was often inadequately prepared or given in insufficient quantities.
7. There was excessive use of injections for fever and anti- diarrheals and antibiotics for diarrhea. Chloroquine treatment regimens were also frequently in error.

STUDY LIMITATIONS

- Reliance on documented immunizations probably underestimates actual coverage. However, the authors noted that over-reporting or under-reporting biases would probably result if sole reliance was placed on respondents' histories.
- Authors also noted that responses with respect to practices may have been influenced by perceptions of desired behavior or a quest for additional services. This is a predictable qualification of self-report measures in general.

- The ease of execution of the survey in an urban setting probably underestimates the effort needed to apply the method in a rural context. Costs for the survey in a rural setting were also expected to be higher, and the probability of non-response may be greater.

PROGRAM AND POLICY IMPACT

The survey findings identified several problems needing to be addressed by program components. These included poor targeting of immunizations as well as low overall coverage. Additional findings addressed elements relevant to diarrheal disease control and treatment of the febrile child which were inappropriate or inadequate.

The expanded survey format for measuring health indices other than immunization coverage was subsequently used widely throughout CCCD participant countries. The advantages of low cost and comparative simplicity were obvious benefits of the method, which allowed relatively quick determination of a number of essential baseline measures. This proved particularly appropriate following initiation of CCCD programs in new countries, especially where health information system reporting was deficient.

PUBLICATIONS

DABIS F, BREMAN J, ROISIN AJ. et al: Monitoring Selective Components of Primary Health Care: Methodology and Community Assessment of Vaccination, Diarrhoea and Malaria Practices in Conakry, Guinea. Bull World Health Organ 67:675-84 (1989).

DABIS F, ROISIN A, BREMAN J. et al: Improper Practices for Diarrhoea Treatment in Africa. Trans Roy Soc Trop Med & Hygiene 82:935-6 (1988).

This study also reports the results of a facility survey in 10 clinics: Only 2 of 10 clinics were supplied with ORS; only 39% of outpatient records reported ORT use for diarrhea treatment. Antibiotics were prescribed in 62% of cases and other chemotherapeutic agents in 52%.

ENQUETES NATIONALES SUR LE TRAITEMENT DE LA FIEVRE ET DE LA DIARHEE CHEZ LES ENFANTS DE MOINS DE 5 ANS A DOMICILE ET DANS LES FORMATIONS SANITAIRE

STUDY LOCATION: RWANDA

SHORT TITLE: **TREATMENT OF DIARRHEA AND FEVER IN CHILDREN 0- 5YO**

PRINCIPAL INVESTIGATOR: DEMING, Dr. Michael S.
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CO-INVESTIGATORS: Neill M, Ntilivamunda A

STUDY DESIGN

This was a national population-based survey of children younger than five years of age to determine fever and diarrhea treatment practices. Children were included in the survey if, according to the mother, they had fever or diarrhea during the preceding month. Mothers were asked if children were seen at a health facility, and, if yes, on what day of their illness. Children who received an antimalarial at home were weighed. Mothers of children who had diarrhea were asked if the child had received sugar-salt solution (SSS) or oral rehydration therapy solution (from a packet) at home. If so, they were asked to prepare the solution in the same way, and a sample was taken for analysis. Samples were analyzed at the CDC, Atlanta for sodium and glucose concentration. A survey of fever and diarrhea treatment practices was conducted concurrently at health facilities. This study was conducted in November 1985.

RESULTS

Results of Community Survey

Information was obtained on 860 children. Of these, 503 had fever and 469 had diarrhea during the recall period (children with both were questioned separately about the treatment of fever and diarrhea).

Fever

- Forty-one percent of children with fever were taken to a health facility; 74% of these children were seen within 2 days of onset of fever.

- Only 8% of children with fever received an antimalarial drug as part of home treatment (defined as treatment received before a visit to a health facility or in the absence of a visit to a health facility). Ninety-five percent of home antimalarial treatments were with chloroquine. However only 31% of children treated at home with chloroquine received between 20 and 30 mg/kg during the first three days of treatment (the nationally recommended treatment was 10, 10, and 5 mg/kg over the first three days respectively).

- According to mothers, children with fever seen at health facilities were treated as follows (categories are not mutually exclusive):

  - Injections 42%
  - Tablets or Syrup 67%
  - Tabs/syrup to take home 43%
  - Other 4%

- Fifty-two percent of children with fever received neither treatment at home nor at the health center.

Diarrhea

- Of 469 children who had diarrhea, 42% were seen at a health facility; 77% of health center visits were within 2 days of the onset of diarrhea.

- Twenty-eight percent of children with diarrhea received home treatment with an oral rehydration solution — salt- sugar solution (SSS), or oral rehydration salts (ORS); 31% also used or received "traditional" remedies (not specified).

- Only 21% of home-prepared salt-sugar solution (SSS) had Sodium concentrations between 50 and 100 mmol/L (a range considered safe and effective). The median concentration was 155 mmol/L, and 75% of samples had a concentration higher than 90 mmol/L.

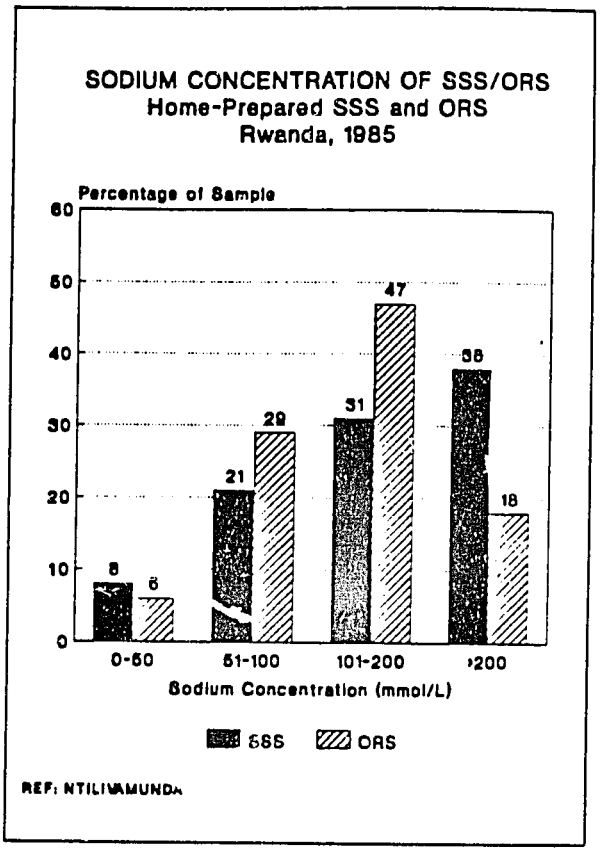
- In preparing sugar-salt solution at home, mothers used 20 different receptacles for measuring the volume of water, 16 quantities of salt and 16 different quantities of sugar.

- Only 29% of solutions prepared from prepackaged ORS salts had Sodium levels of 50-100 mmol/L. The median concentration of sodium in samples was 103 mmol/L; 76% of samples had a sodium concentration greater than 90 mmol/L. Potassium levels ranged from 11 to 69 mmol/L (normal = 20); median was 26 mmol/L.

- Infants receiving SSS were given an average of 53 ml/kg of fluid in the first 24 hours (median = 50 ml), while those receiving ORS received 31 ml/kg (median = 26 ml). There was no significant correlation between number of stools per day and amount of fluid given ($r = 0.03$, $p = 0.78$).

- Eighty-five percent of mothers who were breastfeeding during the onset of diarrhea continued breastfeeding during the diarrheal episode.

- Although 92% of households had salt in the household or access to salt (e.g., in a nearby shop), only 47% had access to sugar.



Results Of Health Facility Survey

Ten facilities were surveyed and 10 health workers were interviewed. Frequent stock ruptures of both antimalarials and ORS packets were reported.

- All ten respondents recommended oral chloroquine for treatment of uncomplicated malaria. However, only 4 of 10 recommended doses within 20-35 mg/kg.; 6 of 10 recommended doses of 50 mg/kg or higher.

- Seven of nine respondents (78%) recommended mothers return daily for subsequent doses of chloroquine. Only 2 of 9 provided chloroquine for mothers to administer at home.

- Nine of ten respondents (90%) recommended ORS for moderate dehydration (Category B) but only 20% for severe dehydration (Category C).

"Although 92% of households had salt in the household or access to salt (e.g., in a nearby shop), only 47% had access to sugar."

- Eight health workers were asked for the recipe taught to mothers for preparing sugar-salt solution, and gave 8 different recipes.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Children with fever in Rwanda were twice as likely to be seen at a health facility as children with fever in Togo (41% compared to 20%, see summary for Togo). However, they were much less likely to be treated with an antimalarial drug at home (8% compared to 83%). As a result, over half of children with fever in Rwanda (52%) were neither treated with an antimalarial drug at home nor taken to a health facility.

2. Three options were proposed for decreasing the proportion of children who are neither seen at a health facility nor treated at home: increasing the use of existing health facilities, establishing additional health facilities, and promoting more home treatment. Forty-eight percent of the sample received treatment either at home or at the health center (compared with 19% in Guinea, 93% in Togo, 84% in Zaire).

3. There was little standardization in the prescribed dosage of antimalarials.

4. The study showed that health workers commonly require mothers to return to health facilities each day of fever treatment to obtain the treatment for that day, and suggests that this practice may be an unnecessary cause of failure to complete treatment.

5. In all, only 28% of children with diarrhea received oral rehydration therapy (at home or at a health facility, with sugar-salt solution or with oral rehydration solution from packets).

6. The range of sodium concentrations in sugar-salt solution prepared at home varied widely, and was usually too high: 75% of solutions had concentrations greater than 90 mmol/L the recommended upper limit, and the median value was 155 mmol/L.

7. Mothers generally gave inadequate amounts of fluid and did not correlate fluid intake with stool losses.

STUDY LIMITATIONS

- The one-month recall used for case identification exceeds generally reliable limit (two weeks), and may cast some doubt on the accuracy of recall by mothers, particularly of events requiring detailed knowledge (e.g., number of stools, amount of fluid, etc.)

- Self-report of behavior may be biased by "social acceptability;" such self-report generally requires confirmation by direct or participant observation.

- Study findings that relate to appropriateness of prescribed therapy are potentially confounded by dual (or multiple) diagnoses in a significant number of these cases. "Injections" prescribed for diarrhea may have been for that condition, or perhaps for a concurrent fever or other condition.

- The study conclusion that injectable antimalarials are appropriately used is arguable — the community survey findings that injections were used in 42% of cases seems high. Although all ten health workers in the facility survey recommended oral chloroquine to the interviewer, actual practice was not confirmed by direct observation, and these responses may have been simply a reflection of "socially desirable" behavior.

PROGRAM AND POLICY IMPACT

This was one of several country-specific community surveys in which a broad range of questions was asked to obtain baseline data on community knowledge and practices with respect to CCCD target interventions (EPI, diarrheal diseases, and malaria). It also demonstrates well the integration of information derived from a concurrent survey of health worker practices. Although in many countries these assessments were reported separately, in this case they form a single baseline assessment.

The study's principal use was to guide CCCD interventions in community health education and health worker training and supervision by measuring "current" levels of behaviors and practices and identifying particular areas requiring priority intervention.

In this country survey, as in several others, deficiencies in the preparation and use of oral rehydration therapy were a prominent finding.

PUBLICATIONS

None documented.

RELATED STUDIES

GLIK DC, PARKER K, MULIGANDE G, HATEGIKAMANA B: Integrating qualitative and quantitative survey techniques. Intl Q Commun Hlth Educ 7:181-99 (1986-87).

A two-part investigation using (1) in-depth quantitative methods with a 10% subsample (n = 67) of the original 30- cluster survey to explore "extensive attitudinal, knowledge and practice indicators", and (2) concurrent qualitative study with fifteen focus-groups in study areas, using mothers who had not participated in the national survey. Reliability of responses compared to the initial survey was fair, with estimates of duration, quantity and distance the least reliable. Mothers' knowledge of causation for diarrheal illness and malaria was limited, but use of health facilities for treatment was widely embraced. A major obstacle to health center use was the lack of regularly available medications.

OTHER COUNTRY STUDIES

MALAWI: HEYMANN et al. surveyed 84 health workers treating 204 children. Ninety-three percent (93%) received chloroquine, but only 24% received a correct dose. (Ref: Proceedings of 4th CCCD Consultative Meeting, Yamoussoukro, 1988).

COTE D'IVOIRE: See SHAW et al.: 'Evaluation of Home ORS'.

Sixty-two percent (62%) of ORS solutions were within the acceptable range of sodium concentration.

HOUSEHOLD DIARRHEA AND MALARIA SURVEY IN TWO TOWNS OF BOMI COUNTY

STUDY LOCATION:	LIBERIA
SHORT TITLE:	**HOUSEHOLD SURVEY, BOMI COUNTY**
PRINCIPAL INVESTIGATOR:	MOMOLU, Mary RN CCCD Supervisor, Bomi County Liberia
CO-INVESTIGATORS:	Ackerman L

STUDY DESIGN

*The study used a non-random (convenience) sample and was conducted in two towns — **Beh Salee** (on the main highway of Bomi county) and **Gbaigbon** (1.5 hrs drive away form the main road). A health center was located in Beh Salee. In each town, 25 households were visited and mothers or guardians of children younger than 5 years of age were interviewed using a structured interview. Child health cards were also reviewed.*

RESULTS

A total of 78 mothers in 50 households were interviewed (42 in Beh Salee, 36 in Gbaigbon), accounting for 106 children (50 in Beh Salee, 56 in Gbaigbon).

Diarrheal disease

- Of all the children, 33% had had a reported case of diarrhea in the previous month.
- In 52% of such cases no external help was sought in managing the diarrhea — In the clinic town of Beh Salee, 71% of children were taken to the clinic or hospital for care, but only 33% of children in the "remote" town sought external care (10% were taken to a health facility, 20% to a "black bagger").
- Only 9% of all cases of diarrhea were treated with oral rehydration solution (ORS). In contrast, 65% of children received tablets of some kind.
- For home treatment of diarrhea, 29% of children were given some type of fluid (usually "bush" teas).
- The majority (77%) of mothers who reported an episode of diarrhea in their children did not know its cause.

Malaria

- Of all children, 55% had had a reported episode of fever in the preceding 2 weeks.
- Most febrile children (62%) were not taken anywhere for treatment.
- Of all febrile children, 48% were given some amount of chloroquine (63% in Beh Salee, 32% in Gbaigbon).
- Only 7% of children were treated with chloroquine at home before consultation with some health worker.

"Only 9% of all cases of diarrhea were treated with oral rehydration solution (ORS). In contrast, 65% of children received tablets of some kind."

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. The frequent use of **black baggers** by villagers in remote locations suggested that the health system might profitably make use of "those who are providing services currently."

2. Use of ORS for treatment of diarrhea was low, even in the "clinic town" which had access to health services. The manner in which ORS is taught (scales, weighing and precise measurement) may preclude its use where equipment is unavailable.

3. Home fluids need evaluation as possible rehydrating fluids.

4. Health education of mothers with respect to cause, prevention and treatment is needed for both diarrhea and malaria.

5. It was not possible from this study, to determine whether the correct amounts of chloroquine were used in treatment.

STUDY LIMITATIONS

- The authors reported that mothers appeared embarrassed when asked the cause of diarrhea, and may have felt they were being "tested." Therefore, the responses might have reflected their perception of the "desired" answers rather than their true beliefs.

- Other possible ambiguities in the questions were also identified by the authors.

- The sample was not random and was not intended for generalization. However, the study *was* useful in generating hypotheses for possible investigation in greater depth using more rigidly designed protocols.

- The authors recommended that subsequent studies use a larger sample (at least 50 households) to improve validity, since some response groups were very small.

PROGRAM AND POLICY IMPACT

None were described. This study's value lies primarily in generating hypotheses for more detailed examination, and in identifying possible pitfalls for similar future studies. In the remote town, the survey was combined with a vaccination session. The authors recommend the model as an inexpensive exercise of some value in identifying several priority issues.

This was an unpretentious survey with modest ambitions, but an equally modest cost. The undertaking offered some experience in questionnaire design and testing, and its authors note several significant modifications that could make a subsequent investigation more precise and fruitful. The model bears considerable resemblance to the "100 Foyers" exercises used in Zaire and Uganda (see MALISON, 1987). The main value of these exercises was not in the accumulation of national statistics but in the sensitization of local health workers.

PUBLICATIONS

None documented.

Economics, Cost and Health Care Financing

Economic studies initiated during the course of the ACSI-CCCD Project generally concerned the costs or cost-effectiveness of programs and interventions with which the CCCD project was directly concerned — i.e., immunization, diarrheal disease control and malaria. Although the studies enumerated here generally fall within the rubric of discrete research activities, the CCCD Project also engaged in a number of program evaluations, feasibility studies and costing exercises related to specific country programs. These latter activities are not included here as research. They include, for example, an evaluation of the revolving drug fund in Liberia, and the feasibility of cost recovery in the malaria program in Burundi.

During the 12-year existence of the ACSI-CCCD Project, a limited number of economic studies were initiated by project staff themselves; an equal number were undertaken by other contractors or collaborating institutions. In addition, economic analyses were included in a number of other studies — for example, in the impact studies of ORT units.

Many of these studies were initiated in response to direct concerns of host governments; others addressed considerations of importance to donors. One of the paramount concerns for both donors and host countries was the question of sustainability, an issue that gained increasing importance as the ACSI-CCCD Project approached its completion. (Although a number of specific sustainability evaluations were carried out near the end of the CCCD project, these studies are not included here as research activities, although they did employ some innovations with respect to the measures of sustainability used. References for these studies are cited at the end of this section.)

The importance of cost studies to sustainability is perhaps best demonstrated by the cost analysis studies of the EPI and CDD programs done in Lesotho and Swaziland, and summarized in this section (BENNETT, 1989 and McFARLAND, 1991). By simply defining more clearly the actual costs

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"By simply defining more clearly the actual costs within the diarrheal disease and immunization programs, these studies demonstrated the considerable role that foreign-donor funds played in sustaining these programs."

within the diarrheal disease and immunization programs, these studies demonstrated the considerable role that foreign-donor funds played in sustaining these programs (52% of EPI costs and 56% of CDD program costs in Lesotho, and 35% and 13% for the same programs in Swaziland). Although this information is often known to program managers in a general sense — most managers are usually aware of donor inputs — the specific magnitude of donor funding is often unknown because of separate budgeting procedures, shared resources among programs, and other limitations. Such analyses help managers to more accurately assess the actual program costs which must be replaced if programs are to continue after the withdrawal of donor aid.

On the other hand, donors may also need to be reminded of the contributions which resource-poor countries have to make to support programs. Often, donor agencies assume that "donor-funded" programs come at no cost to aid recipients, ministries of health, or local communities. In reality, each parcel of "assistance" inevitably requires some allocation of local resources, however small, whether of personnel or material. In an environment of limited cash resources (and even more limited foreign exchange capacity), this is often a significant domestic burden. Where skilled personnel are limited, they too are resources whose time must be allocated and apportioned with caution. Thus, even the most cost- effective and admirable of interventions may not be "affordable" to some countries or communities.

In general, the economic studies undertaken by the CCCD program have attempted to deal with some of the most immediate policy questions facing individual countries. They have also constituted a small part of a much larger debate regarding two important policy issues: (1) the cost, burden or impact of illness, and (2) the search for sustainable ways to pay for treating or preventing it.

The arguments regarding the rationale for economic analysis of health and disease are too broad in scope to be examined in a document such as this. There are, however, a few issues of relevance to the scope of ACSI-CCCD research activities. Three are particularly worthy of comment:

First is the economic impact of disease (or burden of illness). In one respect, the ever-increasing concern with quantifying the economic impact of disease has been motivated by donor needs to justify support of disease control programs in the developing world. The foundation for such analysis is the as-

sumption that there is a definable burden of illness attributable to a disease or disability, and that the removal of that burden represents the potential benefit to be gained by eliminating or attenuating that disease. Among the burden of illness studies undertaken by the ACSI-CCCD project has been the recent series of studies in Malawi evaluating the economic cost of malaria at the household level as well as the direct and indirect costs to the health care system and the national economy (see ETTLING, 1992). Similar interest has also been directed at AIDS in recent years. The limitations of such analyses are several — some of them relate to the methods used to place an economic or dollar value on good health and to value the labor or productivity lost to illness, as well as the need to attribute some relative weighting to the value of productivity across generations — children, working adults, and the non-working elderly. Other complicating factors arise in attempting to compare the impact of different diseases on a common scale. ARON and DAVIS (1993) identify a number of these limitations and review some of the alternative methods in a review which also stresses the need for such analyses at both the macroeconomic (national) level and the household level. This is particularly relevant because the burden of illness is seldom shared equally across populations. As demonstrated by the household study of Ettling et al., "average" expenditure means very little when virtually the same dollar amount represents 2% to 3% of one household's annual income, and 28% of another household's income.

A second consideration regarding economic analysis is the role of value judgements in placing an economic value on the effects of disease. Is the value of a coffee farmer's health the value of his coffee? Is his illness devalued if the world market price of his coffee declines? As noted by PROST and JANCLOES (1993): "A single measure of health status has never been unequivocally accepted." Conventional measures of valuing health, such as the human capital approach, have well recognized flaws. More recent methods have also been subject to critique as well. Some of these, such as the **disability adjusted life-year measure**, and **"healthy days of life lost"** each attempt to provide a common measure for comparing the impact of illness across diseases, and to correct the tendency of the human capital approach to link health to the formal labor market. These arguments are summarized in reviews by ARON and DAVIS (1993), JAMISON (1993), and MOONEY and CREESE (1993). Mooney and Creese, for example, note that regardless of the method chosen, attaching weights to different morbidity states in relation to death in-

"'Average' expenditure means very little when virtually the same dollar amount represents 2% to 3% of one household's annual income, and 28% of another household's income."

"Mooney and Creese, for example, note that regardless of the method chosen, attaching weights to different morbidity states in relation to death intrinsically involves value judgements."

trinsically involves value judgements. Such valuations are difficult enough in developed countries; when the analysis involves researchers collaborating across different cultures, there is need for even greater caution (see for example, GREEN and PARKER, 1988).

The third consideration relates to the practical usefulness of economic analyses such as those undertaken by the CCCD Project. Mooney and Creese take particular issue with the value of studies which attempt solely to quantify burden of illness, noting that "burden of illness, however measured, is not a particularly useful concept if it is assessed separately from the question of the policies and resources associated with addressing that burden." Cost-effectiveness analysis, cost-utility analysis, and cost-benefit analysis help to define and evaluate those options, either in relation to alternative interventions, or to the burden of the disease itself.

To be useful to policy makers, research must also address all the aspects of importance to the political process — it is not sufficient to address overall impact if one ignores particularly vulnerable populations. As Mooney and Creese note: "It is important to recognize that equity and efficiency goals can sometimes conflict." Therefore, economic analyses and research must often go beyond macroeconomic analysis. The emphasis on household analysis stressed by Aron and Davis is one such concern. As they note: "It is clearly recognized that the examination of ill-health in the developing world involves more than reduced productivity of the ill adult and the medical cost of treatment." (See also DUBOIS, 1992). A related concern is that the methods of economic analysis must be sufficiently rigorous to represent good science, but that the language and representation of such analysis must be phrased in terms and concepts understandable to administrators and policy makers if its findings are to be appreciated and its recommendations adopted.

Finally, researchers must understand that good science does not necessarily guarantee good outcome. Since the initiation of the ACSI-CCCD Project in 1982, a constant reality with which the project has had to cope has been the stagnant or diminishing resources allocated to the health sector by the African countries in which it has operated. Although authors have often assigned great importance to methods of allocating resources *within* the health sector, an equal (if not greater) concern must be the loss of resources *from* the health sector to other sectors (notably military spending and interest on foreign debt). Although cost-benefit analysis may

demonstrate whether a particular intervention is worth doing, and cost- effectiveness analysis may determine which intervention can achieve an objective at the lowest cost, neither can substitute for the political will to effect such changes. In this respect, research methods are valuable tools in the hands of a skillful administrator, but tools alone cannot substitute for political will.

"Since the initiation of the ACSI-CCCD Project in 1982, a constant reality with which the project has had to cope has been the stagnant or diminishing resources allocated to the health sector by the African countries in which it has operated."

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TREATMENT OF CHLOROQUINE-RESISTANT MALARIA IN AFRICAN CHILDREN: A COST-EFFECTIVENESS ANALYSIS

SHORT TITLE: **COST-EFFECTIVENESS OF CQ-RESISTANT MALARIA Tx**

PRINCIPAL INVESTIGATOR: SUDRE, Dr. Philippe
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STUDY DESIGN

A decision-analysis model was used to compare the cost and effectiveness of chloroquine 25 mg/kg (CQ), amodiaquine (AQ), and pyrimethamine-sulfadoxine (PS), in the treatment of malaria at varying levels of drug resistance. The variables considered were the probability of P. falciparum infection, drug compliance, minor and lethal side effects of the drug, the level of drug resistance in the community, and case-fatality rates associated with treatment. The measures of effectiveness were the number of malaria-related fever episodes cured parasitologically with each treatment and the number of malaria deaths prevented in children 6-59 months of age. Cost-effectiveness comparisons were made for cases cured and deaths prevented. The model used data from a fever survey conducted in The Gambia (GREENWOOD: Trans R Soc Trop Med Hyg 81:478-86 1987) and unpublished surveillance data from Togo to give an estimate of 40% of fevers occurring in children aged 6-23 months and 60% occurring in children aged 24-50 months. Compliance was assumed at 80% for CQ and 95% for AQ and PS; minor side effects were set at 10% for CQ and 5% for AQ and PS; lethal side effects were assumed at 0% for CQ and 0.01% for AQ and PS. Prevalence of parasitemia was estimated at 60%. Three scenarios of drug resistance were assessed: (1) No resistance; (2) low CQ resistance with minimal AQ resistance and no PS resistance; and (3) high CQ resistance with moderate AQ resistance and no PS resistance. Probability of death for each outcome was estimated by a Delphi survey of 19 experts.

RESULTS

Of 100,000 episodes, it was estimated that there would be 1,920 malaria-related deaths in the absence of any treatment.

For treating 100,000 febrile episodes, CQ cost US $1,812, PS $2,622 and AQ $3,044. Cost of the drug, compliance, and the level of chloroquine resistance had the greatest effect on the cost-effectiveness ratio.

Treatment effectiveness of each drug according to varying levels of drug resistance (and taking into account the effects of noncompliance and side-effects) is shown in the accompanying figure as the number of children (from a population of 100,000) "not cured parasitologically" following treatment. Because the model assumes no resistance to pyrimethamine-sulfadoxine in any of the three scenarios, the treatment failure rate for that drug is the same for all scenarios.

- In a scenario with high-level chloroquine-resistant *P. falciparum*, treatment with CQ costs US$0.47 to cure one patient and $2.29 to prevent one death compared with $0.05 and $1.52 for treatment with PS.

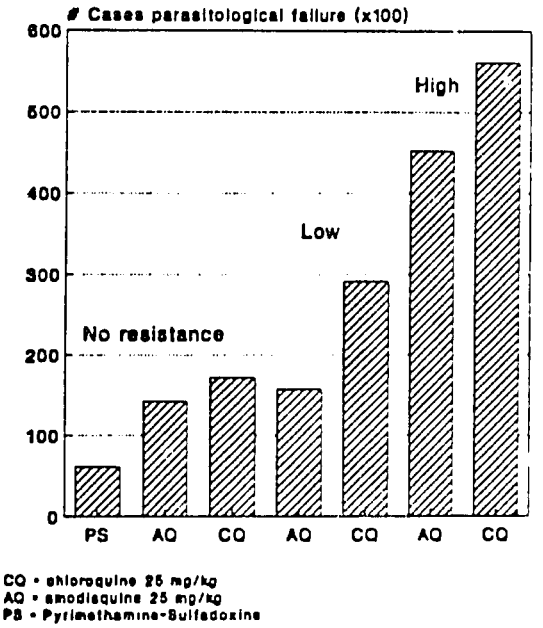
"The prevalence of high-level drug resistance (RIII) was the most important determinant of cost-effectiveness."

Cost Effectiveness per Case Cured (Parasitological Cure) for Chloroquine, Amodiaquine, and Pyrimethamine-Sulfadoxine			
	CQ	AQ	PS
No Resistance:	0.04	0.07	0.05
Low Resistance:	0.06	0.07	0.05
High Resistance:	0.47	0.20	0.05

Cost Effectiveness per Death Averted for Chloroquine, Amodiaquine, and Pyrimethamine-Sulfadoxine			
	CQ	AQ	PS
No Resistance:	1.31	2.10	1.52
Low Resistance:	1.33	2.10	1.52
High Resistance:	2.29	2.58	1.52

- When the prevalence of RIII-level CRPF is greater than 14% to 31% (depending on the level of compliance), the most cost-effective treatment is PS, despite its 45% greater cost.

Malaria-Related Fever Episodes Not Cured
100,000 Episodes Treated: Chloroquine vs Amodiaquine vs Pyrimethamine-Sulfadoxine



STUDY CONCLUSIONS AND RECOMMENDATIONS

1. The prevalence of high-level drug resistance (RIII) was the most important determinant of cost-effectiveness.

2. In absence of resistance, chloroquine was the most cost- effective treatment. However, PS cured the greatest number of episodes and prevented the largest number of deaths and was more cost-effective at levels of RIII resistance above 14%.

3. Improved compliance would have the greatest effect on mortality regardless of the drug and model chosen.

4. Decision analysis models will be useful for malaria control planners as strategies are reconsidered in the 1990s.

STUDY LIMITATIONS

- Authors caution that cost-effectiveness is probably not the only criteria for choosing an antimalarial drug.

- The model is limited to the assessment of the short- term outcome of a single malaria episode.

- The prospect that a certain proportion of children with fever unrelated to malaria may die was not considered.

- Authors also note that the model is useful as a guideline in formulating treatment regimens but is not intended to address specific clinical decisions.

PROGRAM AND POLICY IMPACT

This study was proposed in response to an operational question raised by several malaria programs during the course of the CCCD project — that is, at what point is it worthwhile to change national policy regarding first-line treatment of malaria, and what should be the criteria for that decision?

This study offers one approach to the problem and was of value in several respects: (1) It helped expand the debate regarding alternative treatments — instead of simply considering effectiveness of alternative drugs, it presents an analysis that considered cost as well as effectiveness; (2) it identified a method of using decision analysis and probability to arrive at a rational decision among several feasible alternatives; and (3) in practical terms it demonstrated some specific advantages of pyrimethamine- sulfadoxine as a first-line drug, despite its higher cost. Although this study was based on a hypothetical population and used estimates for mortality at different levels of drug resistance, it showed that such analysis was possible even without specific national data and that such a process can guide decision-making. In a related study of chloroquine prophylaxis in pregnancy, a similar analysis used empirical data to arrive at cost-effectiveness measures (see summary for HELITZER-ALLEN, 1993), an equally valid approach.

Although the specific findings of this study (e.g., the threshold of 14% RIII resistance) were not necessarily applied to individual countries in CCCD, the relative merits of pyrimethamine-sulfadoxine as a first-line drug in the presence of high chloroquine resistance did contribute to the arguments supporting the change from chloroquine to pyrimethamine-sulfadoxine in Malawi.

PUBLICATIONS

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ECONOMIC IMPACT OF MALARIA: FOCUS ON THE HOUSEHOLD

STUDY LOCATION:	MALAWI
SHORT TITLE:	**ECONOMIC IMPACT OF MALARIA — HOUSEHOLD STUDY, 1992**
PRINCIPAL INVESTIGATOR:	ETTLING, Dr. Mary Vector Biology and Control Project USAID, Washington DC
CO-INVESTIGATORS:	McFarland DA, Schultz LJ, Chitsulo L

STUDY DESIGN

This analysis of the economic impact of malaria on the household is one part of a larger, more comprehensive study of the economic cost of malaria, consisting of three components: (1) estimatation of direct cost to households, (2) direct cost to the health care system, and (3) indirect cost to the national economy in terms of lost productivity. Household data were derived from a KAP survey of 1,531 households during April-May 1992 by using a structured interview. Household income was estimated for all sources including informal market sales, farm production, livestock sales, and salary and wage income.

RESULTS

Estimated incidence of malaria in children less than 10 years of age was 7.5 episodes per child per year (versus 6.1 adult episodes per year).

- Whereas the average household income for all households was 1470 MK (US $1.00 = 3 MK), 52% of households earned less than 500 MK per annum (classified as "very low income" in the analysis). The median household income was 465 MK.
- Farm production accounted for 92% of income for very low income households, and 81% for other households. Much of this was subsistence farming consumed within the household and although counted as "income," is not equivalent to discretionary income available for spending.
- The average annual expenditure for preventive measures of all types was 7.68 MK (US $2.56), but only 10% of households reported any spending on preventive measures.
- Direct costs for malaria treatment were mainly due to the cost of drugs, and were approximately 1.50 MK ($0.51) per child episode, and 2.25 MK ($0.75) per adult episode. Total estimated household expenditure on malaria treatment and prevention was 59 MK ($19.83) per year. Treatment costs did not vary much by income, being approximately 57 MK ($19.13) for very low income households (representing 28% of annual income) and 60 MK ($19.94) for all other households (or 2% of annual income).
- Indirect costs of malaria illness due to lost work or reduced work were approximately 2.40 MK ($0.80) per child episode, and 4 MK ($1.33) per adult episode, or approximately 38 MK ($12.75) per household per year (6.36 MK or $2.12 in very low income households and 62 MK or $20.68 in other households). This represented 2 to 3% of disposable income.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Malaria represents a disproportionate economic burden for those in the very low income category.

2. Whereas other households spend approximately 5% of average income on malaria, very low income household spend 32% of their income.

3. Households spend very little on prevention compared with treatment, at all income levels.

4. Although expenditures represent significant "willingness to pay" for malaria-related services, they should not be taken as an absolute surrogate for the level of user fees that might be charged for such services (at government facilities, for example).

STUDY LIMITATIONS

Authors note that during the course of this study and in subsequent months, there was a significant devaluation of the Malawi kwacha (MK) followed by several readjustments. The authors particularly note that during this time the market price of many items, including malaria drugs and preventive measures, changed.

- Authors also note that this analysis does not attempt to assess the economic impact of such measures as the loss of children's schooling on future productivity or the effect of malaria on childhood mortality rates.

PROGRAM AND POLICY IMPACT

This study was designed as part of a much larger effort to evaluate the economic burden of malaria to Malawi. In addition, the household KAP Survey used here to estimate the household costs of malaria also looked at other aspects of malaria-related practices (for example, treatment practices, malaria episodes). The larger economic impact study includes evaluation of the direct costs to the health care system of malaria and the indirect costs to the national economy of illness time loss, care of sick children, etc. The methods for this larger study include: (1) health facilities reviews of medical and administrative records, (2) structured interviews with hospital inpatients and outpatients and health center patients, and (3) analysis of private sector providers.

The object of these studies has been to make available information for the benefit of decision makers on the extent and toll of malaria on the population and thus aid in the rational allocation of "limited or declining resources." The scope of these studies clearly falls within what Feachem (1989) has described as "health problem research" although it uses the economic analysis and methods commonly associated with "health services research."

What direct usefulness do these studies provide? In a limited sense, policy makers might be most interested in the economic effect of malaria on national productivity, whereas program managers may well be most interested in the direct costs to the health care system (i.e., the proportion of health resources consumed by malaria-related illness). In general, health systems often estimate this burden by looking at proxy indicators, such as the proportion of all hospitalizations that malaria-illness comprises or the number of annual outpatient visits. Although both are valid indicators that a program may need to monitor, there is additional usefulness in an attempt to attribute the total costs of malaria illness, at least on a one-time basis, in order to assess what "hidden costs" of illness are also present and who bears the burden of these costs (individual patients, the health care system, or the economy at large).

The specific findings of this study that may prove useful include the finding of a significant level of "willingness to pay" for treatment of illness (with far less willingness demonstrated for prevention, perhaps because of doubtful effectiveness). The other finding was that very-low-income households generally spend as much as other households on malaria treatment but this expenditure represents a much larger bite out of their household income than it does for less poor families.

PUBLICATIONS

Manuscripts of this and other related economic impact studies from Malawi are in development for publication as a journal supplement.

COST EFFECTIVENESS OF IMMUNIZATION IN THE GAMBIA

STUDY LOCATION: THE GAMBIA

SHORT TITLE: **COST-EFFECTIVENESS OF EPI**

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CO-INVESTIGATORS: Foster SO, Hull HF, Williams PJ

STUDY DESIGN

Using published and unpublished local data, the authors estimated the number of deaths averted for each antigen by combining expected cases and case fatality in the absence of immunization and comparing it with cases and deaths occurring at specified coverage levels and given levels of vaccine efficacy. Costs were allocated by antigen for shared resources (such as personnel costs) by distributing the shared costs to each antigen in proportion to its number of patient contacts (visits). Where multiple antigens were given at one visit, the cost per visit was distributed equally for each antigen. For the eight required contacts, costs were allocated as follows: measles and yellow fever: 1 visit (12.5%, or 6.25% each antigen); DPT and polio: 3 visits (37.5%); neonatal tetanus: 3 visits (37.5%); and tuberculosis (BCG): 1 visit (12.5%).

RESULTS

- Of a total annual cost of US $374,764 for The Gambia EPI program (for the period July 1, 1980 to June 30, 1981), 30% were fixed costs, and 70% were variable costs.

The major components of variable costs were:

Personnel (local)	38%
Vaccines	12%
Transportation (local)	11%
Supplies	9.4%

- For fixed costs:

Personnel (national)	6.9%
Transportation (national)	4.0%
Equipment	14%
Training	2.8%

- Cost-effectiveness calculations were possible for five antigens for which there was sufficient mortality and morbidity data available:

	Cost per case prevented (US$) (1980 - 81)	Cost per death prevented (US$) (1980 - 81)
Neonatal tetanus	136.36	151.53
Measles	1.96	40.83
Diphtheria	890.64	11,133.00
Pertussis	1.30	99.85
Poliomyelitis	655.54	6,555.40

"The authors note a critical point of relevance to problem - oriented research - that 'decisions to allocate health resources will be made in any case'"

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Whereas neonatal tetanus, measles, and pertussis immunization appear to be cost-effective, poliomyelitis and diphtheria appear to be "considerably less so."

2. Unit costs for measles prevention in The Gambia are comparable with earlier reports for Cameroon ($3.30) and the Central African Republic ($2.20) and show a substantial cost advantage over Côte d'Ivoire ($14.00).

3. For neonatal tetanus, the figures compare with Dakar, Senegal ($4.81), and Haiti ($112.50).

STUDY LIMITATIONS

- Because of inadequate data, cost-effectiveness calculations were not done for yellow fever and tuberculosis.

- Authors note that the method chosen for allocation of shared resources and costs is only one of several possible approaches.

- The analysis does not attempt to place any value on "medical treatments averted" as a cost saving.

PROGRAM AND POLICY IMPACT

The authors are careful to note that analyses such as thoses done in the above study are always subject to debates over "the validity of some comparative reviews and certain fine points of research methodology." However, they also note a critical point of relevance to problem-oriented research — that "decisions to allocate resources within the health field will be made in any case." Thus, they argue, such decisions "can be more knowledgeable if based on results like these."

That in essence is the rationale for problem-based or problem-oriented research — not necessarily to devise the perfect methodology, but to enable decision-makers to make "reasonably informed decisions" rather than having to depend on "educated guesses", intuition, or analogy.

This was the first of several cost-effectiveness studies in the CCCD project that looked at EPI or CDD programs in African countries. Most used variations or adaptations of the methods used in this study, although each differed in significant ways (for example, this was the only study looking at individual antigens). Although the others were done in bilateral countries, The Gambia was a useful place to start, because, as noted by the authors "The Gambia is a small country with a well developed national MCH program. . . the accessibility of immunizations is greater than in many other countries. . . and therefore offers a norm or target for achievement as well as a reference point for many forms of comparisons to obtain cost-effectiveness results."

PUBLICATIONS

ROBERTSON RL, FOSTER SO, HULL HF, WILLIAMS PJ: Cost- effectiveness of immunization in The Gambia. J Trop Med Hyg 88:343-51 (1985).

COST EFFECTIVENESS ANALYSIS OF ORAL REHYDRATION THERAPY AT QUEEN ELIZABETH II HOSPITAL, MASERU, LESOTHO

STUDY LOCATION:	LESOTHO
SHORT TITLE:	**COST ANALYSIS OF DIARRHEA Tx, QE II HOSPITAL**
PRINCIPAL INVESTIGATORS:	McFARLAND, Dr. Deborah A. TSD-IHPO, Mailstop F-03 Centers for Disease Control and Prevention Atlanta, GA 30333
CO-INVESTIGATORS:	None cited

STUDY DESIGN

The study examined the case management of children seeking treatment for diarrheal illness at the QE II Hospital in Maseru before and after the opening of an Oral Rehydration Therapy Unit (ORTU) in February 1986, and the cost- effectiveness of the ORTU. (At that time, the facility operated five days a week during normal working hours.) Both recurrent and capital costs were estimated.

RESULTS

Approximately 67% of all children with diarrhea were treated in the ORTU. In 1987, after the establishment of the ORTU, only 6.2% of children with diarrhea were treated as inpatients, compared with 12.4% in 1985 (before the ORTU was opened).

- The cost per outpatient case treated dropped from 14.26 Maloti in 1985 to 11.21 Maloti in 1987 (US $1.00 = 2.5 Maloti). This drop was largely due to a decrease in the cost of drugs and supplies.

"Cost per complicated admission increased from 1985 to 1987, mainly because of the more severe cases then being admitted."

- During the time the ORTU was closed, children treated in the casualty department were more likely to get antibiotics than those treated in the ORTU.

- Admissions to the pediatric ward decreased from 376 in 1985 to 218 in 1987. Costs per uncomplicated admission (diarrhea as the only diagnosis) decreased from M 183 to M 112, mainly because of a decrease in the average stay from 5.7 days to 3.4 days and a corresponding decrease in drug costs.

- Costs per complicated admission increased from M 273 in 1985 to M 508 in 1987, mainly because of the more severe cases then being admitted (since fewer total cases were admitted, those who were admitted were selectively more ill).

- The cost savings to the hospital from decreased admissions was estimated at M 36,166 (US $14,466). If the ORTU was operated 7 days a week during the season of highest diarrhea incidence, it was calculated that admissions would be further reduced to 127, for an additional cost saving of M 10,486, (US $4,194). This was largely because the admission rate for patients seen in the ORTU was 2% whereas the admission rate for patients seen in casualty was 12%. Other staffing options examined were not as advantageous.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. The case management of diarrhea through the establishment of an ORTU in Lesotho was convincingly cost-effective, resulting in considerable savings from decreased hospital admissions and decreased use of unneeded drugs.

2. The advantages would be increased by operating the unit on weekends during the peak diarrhea season, using reassigned staff to operate it.

STUDY LIMITATIONS

- Authors note that the costs of operating the ORTU do not include training although additional training would add to the cost of establishing the ORTU "but not significantly."

- The study also does not include costs of additional staffing since it was assumed that personnel would be reassigned to the unit. If added staffing were needed the costs "would not be negligible."

PROGRAM AND POLICY IMPACT

This is an excellent example of country-specific research with broader implications for the global community. As noted by the authors, "although the public health community generally views diarrheal disease control as overwhelmingly cost effective, there is limited documentation of the cost- effectiveness of case management approaches to diarrheal disease."

This study's principal audience was the Ministry of Health and CDD program in Lesotho, as well as the CCCD project. The study was an attempt to determine whether the establishment of ORT units in hospitals could be justified on an economic basis, a reasonable objective for a program that was supporting the establishment of ORT units in numerous facilities throughout CCCD bilateral countries. The Ministry was able to demonstrate the effectiveness (in terms of reduced admissions) and the cost implications involved, to evaluate three alternative scenarios for operating the ORTU, and to provide guidance to the ministry on an alternative that could increase the effectiveness of the unit (in decreasing admissions) without increasing operating costs — thus increasing effective savings.

Apart from the local implications of this study, the supportive evidence it provides for the usefulness of ORT units in general can assist other countries and programs debating the usefulness of ORT units as a strategy. Within the CCCD project, this study and a number of others (see MOORE 1989 and HEYMANN 1990) helped confirm the usefulness of the strategy to CCCD.

Within the wider (global) community, the value of these studies are largely a function of how widely and well they are distributed or disseminated. All three studies cited were published in international journals.

PUBLICATIONS

Diarrhoeal Disease Control Programme: Cost-effectiveness analysis of oral rehydration therapy. Wkly Epidemiol Rec 36:275-279 (1990)

UNIT COST STUDY OF THE EXPANDED PROGRAMME ON IMMUNISATION AND THE CONTROL OF DIARRHOEAL DISEASES IN LESOTHO

STUDY LOCATION: LESOTHO

SHORT TITLE: **UNIT COST STUDY, LESOTHO**

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CO-INVESTIGATORS: Adu-Boehene, McFarland DA

STUDY DESIGN

A sample of 20 health centers in four Health Service Areas (HSAs) was used, selection based on achieving a representation of three factors likely to affect cost — accessibility, ownership and workload (number of cases treated, etc.) The study was carried out from September 1988 to January 1989 as a follow-up to a 1987 health financing study. Costing methods were adapted from WHO recommendations (EPI/GEN/79/5 and PHILLIPS 1988). Donor contributions to meeting program costs were identified wherever possible. Costs were grouped in six categories: (1) personnel, (2) drugs and dressings, (3) travel and transport, (4) operating costs, (5) training, and (6) capital expenditure. Because of inadequate record-keeping, vaccine consumption was based on new stock supplied. The official government discount rate of 10% was used to annualize capital expenditures. Personnel costs were allocated by subtracting time spent on defined non-EPI, non-CDD activities and assigning the remaining time according to the proportion of children seen for each activity (vaccination contacts or diarrheal treatment) and the estimated time per contact. (It was estimated that the average vaccination contact took approximately 0.42 of the time of an outpatient contact).

RESULTS

Results are based on 18 centers for EPI and 19 centers for CDD services. Three centers were removed from one or the other analysis due to inadequate data.

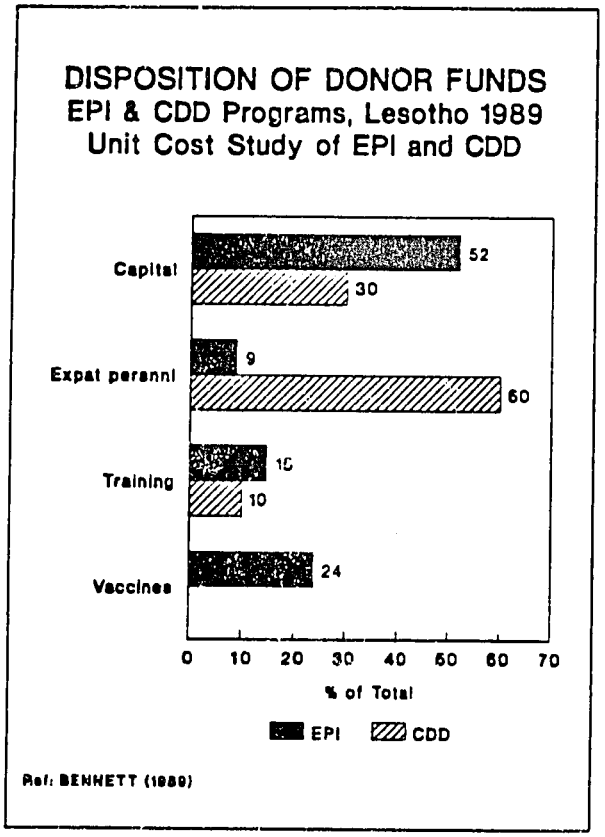
- Although nurses mentioned only ORS for the treatment of diarrhoea, a wide range of drugs was found to be used for diarrhea treatment, including cotrimoxazole, ampicillin, metronidazole, multivitamins, chloramphenicol, and sulphadimidine.

- Unit costs were as follows:

	Average	Range
Cost per administered dose (2.2 Maloti = US $1):	M 3.47 ($1.58)	1.55 - 6.29
Cost per fully immunized child:	M 38.78 ($7.63)	20.07 - 85.90
Cost per child with diarrhea treated:	M 12.58 ($5.72)	2.87 - 24.97

- If expatriate personnel costs are added to these measures, EPI costs increase by 5 to 6%, but CDD unit costs increase by 60% (to 20.8 Maloti or US $8.37).

- Donor contributions accounted for 52% of the program costs of EPI and 56% of costs of the CDD program (exclusive of expatriate technical assistance). The disposition of these funds is shown in the accompanying figure.



- Personnel costs accounted for the majority of expenditure in both EPI and CDD programs (40% and 38% respectively). Other costs were as follows:

	EPI	CDD
Personnel	40%	38%
Capital expenditure	30%	30%
Vaccines or drugs	14%	13%
Training	9%	10%
Transport	3%	2%
Overheads	4%	7%

- The unit costs by facility showed a significant decline as the number of persons served in the facilities increased. For the CDD program, this tended to be true up to a maximum of 300 cases per year. Above the level of 300 cases per year there was minimal decline in the unit cost per case treated.

- Unit costs tended to be higher in less accessible facilities in mountainous areas. Other variables which tended to increase unit cost were inappropriate drug use and lower levels of training. Level of supervision and degree of integration of services did not appear to influence unit cost.

- Practically all facilities surpassed the Ministry of Finance's goal of 15% cost recovery for services rendered.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. For the CDD program, optimal output levels (and minimum unit cost per child treated) are attained across a range of higher outputs (approximately 300 or more children treated per year).

2. For the EPI program, there appears to be excess capacity even at higher levels of output since average costs continue to decline throughout the whole range.

3. Unit cost at all facilities could probably be reduced by increasing the number of attendances for both CDD and EPI.

4. Increased attention in training and supervision should be paid to decreasing inappropriate drug use.

STUDY LIMITATIONS

- Cost estimates exclude all expatriate personnel costs.

- Training estimates were based on staff recall of training they had undergone "in the past year." The author notes that incomplete recall was a problem.

PROGRAM AND POLICY IMPACT

"The results of this study should complement previous financial studies undertaken in the health sector by providing micro-economic data on the costs of PHC services provided at the health center level." The author uses the preceding statement to explain the

program implications of this study. A series of policy recommendations were also derived from this study, concerning training and the use of drugs and vaccines. Cost findings were also expected to influence the government policy on cost recovery and alternative financing for health services.

PUBLICATIONS

None cited. Published locally in the Lesotho epidemiologic bulletin.

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COST OF THE EXPANDED PROGRAM OF IMMUNIZATION AND THE CONTROL OF DIARRHEAL DISEASES PROGRAM IN SWAZILAND

STUDY LOCATION: SWAZILAND

SHORT TITLE: **COST ANALYSIS OF EPI AND CDD, SWAZILAND**

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CO-INVESTIGATORS: Kraushaar D, Hlope E

STUDY DESIGN

This study used a sampling of facilities at central, regional and peripheral levels, including donor agencies, ministry central facilities, and community level health clinics. EPICOST software, developed by WHO was modified for data collection in both EPI and CDD programs. Cost allocation was based on the estimates (given by health service personnel at each level) of the percentage of time spent on each program component (EPI and CDD). Training costs were allocated according to the purpose of the training activity. Capital costs were annualized at a 7% discount rate (the difference between the rate of inflation and the market rate of interest in Swaziland). This study was undertaken in July 1989.

RESULTS

The total cost of the EPI program was estimated at 2,509,941 Emalangeni (US $929,608). The cost of the CDD program was E 699,216 ($258,969).

- Recurrent costs were 81% of total costs for EPI and capital costs were 19%. For the CDD program, the total cost of the program was about 25% of the EPI program's cost. Capital costs were 23% of the total.

- Training costs that the study was able to attribute were very low at 1.6%, mainly because of difficulties in accounting for costs and types of training sponsored by donors.

- The largest components of total costs for EPI and CDD programs were:

	EPI	CDD
Labor (salaries and personnel)	38%	44%
Recurrent transportation costs	22%	13%
Vaccines or drugs	16%	16%

- Donors provided 35% of total program costs for EPI; 46% of this went to vaccines and supplies and 24% for recurrent transportation costs. Donors provided only 13% of CDD program costs.

- Other program indices were as follows:

Cost per immunization administered	$3.58
Cost per child fully immunized	$54.89
Cost per child treated for diarrhea	$3.83

- The more children who were served in health centers, the more the unit cost for EPI and CDD tended to decrease, evidence of expected economies of scale.

- Vaccine wastage for specific antigens (total doses used divided by doses actually administered) was as follows:

BCG	5.7
DPT	2.6
OPV	2.8
Measles	3.7

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Donor contributions cover a significant proportion of costs of EPI and CDD programs. This reliance on donor funding has serious implications for future recurrent obligations for the Ministry of Health.

2. Drug costs related to treatment of diarrhea constitute a significant expenditure of doubtful value, because of the doubtful efficacy of these drugs in diarrhea treatment. The inappropriate use of drugs uncovered by this cost- effectiveness analysis represent an important training need.

3. The EPICOST software appears to be an effective means for monitoring program costs.

4. The empirical data for vaccine wastage was higher than the estimated factor of two used by WHO in its estimates of vaccine requirements.

5. The cost per immunization dose administered is comparable to findings in Lesotho ($3.58 vs. $1.68). The cost per immunized child was higher ($54.89 vs. $18.63) and may represent "diseconomies of scale" associated with reaching harder to reach children in a setting of high coverage levels (71% at the time of the study).

6. The cost per child treated for diarrhea was appreciably lower than in Lesotho ($3.83 vs. $9.13); the reasons were not readily apparent.

PROGRAM AND POLICY IMPACT

The objective of this study was to "serve as a first step in determining the costs of primary health care in Swaziland." This in turn was expected to contribute to the sustainability of programs by helping to identify (1) true costs of programs, (2) the distribution of costs between the MOH and donors, (3) the costs across each level of the system, and (4) possible areas for economy.

The study did help to identify the widespread use of drugs in diarrheal treatment as one possible area of economy. It also provided a more accurate estimate of vaccine wastage to the EPI program manager. In addition it greatly helped the Ministry of Health better understand the components of cost in each program and the donor role which would have to be supplanted by MOH funding if the programs were to become sustainable. These findings have, in turn, provided a rational basis for the country to examine a number of alternatives for cost recovery and financing in programs.

NOTE: The comparison figures given in this report for the Lesotho Unit Cost study are slightly different from those in the summary of that study (included elsewhere in this volume), which uses an exchange rate of 2.2 Maloti = US $1.00. That is one hazard of using currency conversions in the presence of varying exchange rates. A second comment is that, the value given for cost per child with diarrhea treated in Lesotho may be considerably greater than that for Swaziland because Lesotho's costs includes expatriate personnel costs. A significantly lower unit cost was obtained by excluding expatriate costs ($5.72), which is still larger than the unit cost in Swaziland, but less so than before.

PUBLICATIONS

None cited. Manuscript in preparation.

Mortality and Use of Health Services Surveys

This group of five studies (two each in Zaire and Liberia, and one in Togo) was initiated primarily in response to a donor concern which identified "a need to better measure mortality and identify changes in mortality rates in order to demonstrate program effectiveness." This need was identified in the 1983 external evaluation of the CCCD project, then operating in the three countries.

For that specific purpose the Mortality and Use of Health Services (MUHS) surveys were of limited success. The chronology of the studies and some of the successes they were able to demonstrate are summarized in FOSTER (1993) and EWBANK (1993).

As field tests of the methods of measuring mortality, the MUHS surveys in the three countries were of considerable value. This section presents summaries of the 1984 surveys in Liberia and Zaire, and the follow-up surveys done in each of the two countries 4 years later. It also includes an account of the 1984 MUHS study from the Plateaux Region of Togo, and the reliability survey done in the same region. These surveys were intended to measure the effect of the CCCD interventions on mortality and morbidity, as specified in the original project goals, as well as the effect on intermediate indicators such as coverage, treatment practices, etc.

Several methods were used. Only a brief description of the main one is offered here:

- Direct Method: Uses full birth histories over a specified period, requiring knowledge of year of birth, age of surviving children, age at death of non-surviving children, etc. Age-specific death rates can be derived for a particular period, and infant mortality rate (IMR) or 0-5 mortality directly calculated (per 1000 live births). This method, as can be expected, requires some accuracy in determining age not only of mothers

"These surveys were intended to measure the effect of the CCCD interventions on mortality and morbidity, as specified in the original project goals, as well as the effect on intermediate indicators."

"There were also problems with attempting to attribute a decline in mortality to a specific intervention (in this case the CCCD project)."

but of all children, alive and dead. In the CCCD experience some ages had to be imputed from historical milestones, since exact dates were sometimes unknown.

The references listed below offer more detail on methods used in the field estimation of mortality.

In the CCCD experience, there were 3 principal limitations of the MUHS surveys:

(1) Limitations in the accuracy and applicability of the method,

(2) Problems or limitations in the conduct of the fieldwork,

(3) The ability to specifically attribute changes in mortality to the intervention.

In brief, the main design limitation was that the Direct Method is not optimal for measuring mortality change over a period as short as 4-5 years. A second limitation, noted by MURRAY et al (1993) is that childhood mortality itself is highly variable from year to year and season to season. The periodicity of measles epidemics is a particular concern. This is one justification for attempting to identify cause- specific mortality in studies such as this.

The problems identified in the conduct of fieldwork are also instructive. Incomplete recall (and more importantly, differential recall of births and deaths) were clearly demonstrated by the 1984-85 resurveys in Liberia and Zaire. The impact of level of training and level of supervision of interviewers was also noted.

There were also problems with attempting to attribute a decline in mortality to a specific intervention (in this case the CCCD project). The most difficult challenge has been to separate the influence of the intervention from the overall decline in mortality that has been occurring over time in virtually every developing country. This decline has been noted by MURRAY et al (1993), and described in detail by HILL (1991), who notes that the only African countries that have not shown this decline are those embroiled in civil war or socio-political instability; (she gives the examples of Ethiopia, Mozambique, Rwanda and Sudan).

In general therefore, the combination of all these limitations and approximations makes demonstrating mortality changes over a short time frame exceedingly difficult, unless the changes in mortality are very large. Attributing changes to a specific intervention or program with confidence is even more difficult.

Since the implementation of the MUHS studies, the ACSI-CCCD project has continued to struggle with the methodological problem of measuring mortality or morbidity as outcome indicators of program success. One means used has been the facility-based or population-based use of the Preceding-Birth Technique (PBT) in Burundi, Center African Republic (CAR), and Swaziland. A second approach, taken in Malawi has prospectively followed a cohort of children enrolled at birth in the Mangochi Malaria Research Project (BLOLAND et al, 1992). Although too expensive to institute widely, it has offered insights into mortality at the community level which are not addressed by facility-based studies or retrospective studies.

A more sustainable approach has also been taken in CCCD activities — that of strengthening existing health information systems, with particular success experienced in improving morbidity reporting (for example, by reducing the numbers of reportable diseases, automating reporting mechanisms, and establishing sentinel surveillance for diseases of importance). It should also be noted that several ACSI-CCCD countries (notably Nigeria and Togo) have since had Demographic Health Surveys (DHS) done at a national level; these surveys satisfy the demand for relatively reliable mortality data but are still of only limited use in measuring short-term trends.

In summary, the experience of the ACSI-CCCD project with the MUHS and other mortality methods has been mixed. Although several reviewers and evaluators of the CCCD project have concurred on the need to reliably measure the "impact" of the program, the MUHS study's ability to provide concrete "proof" of impact is debatable. This has reinforced the need for continuing to develop reliable and practicable methods.

"Since the implementation of the MUHS studies, the ACSI-CCCD project has continued to struggle with the methodological problem of measuring mortality or morbidity as indicators of program success."

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MORTALITY AND USE OF HEALTH SERVICES SURVEYS IN RURAL ZAIRE, 1984-85

STUDY LOCATION:	ZAIRE
SHORT TITLE:	**MUHS BASELINE SURVEY 1984, ZAIRE**
PRINCIPAL INVESTIGATOR:	TAYLOR, Dr. William R. Office of Program Planning and Evaluation Centers for Disease Control and Prevention, D-24 Atlanta, GA 30333
CO-INVESTIGATORS:	Chahnazarian A, Weinman J, Wernette M, Roy J, Pebley AR, Okwo Bele , Ma-disu M

STUDY DESIGN

*Study carried out in 1984 in two health zones of rural Zaire: **Kingandu** and **Pai-Kongila**. Five-part baseline questionnaire developed by CDC and modified in four rounds of field testing. Administered in local language **Kikongo** to two-stage cluster sample of thirty clusters (197 houses per cluster in Kingandu and 158 per cluster in Pai-Kongila). Indirect estimates of child mortality from mortality tables using womens' reported ages, number of children ever born and number of children who died (Brass Indirect Method). Direct estimation by complete birth history for children born in the last 6 years, using 1982-84 interval and 1978-84 interval preceding the survey. Initial survey was followed by a reinterview survey of a 20% subsample, 8 months after baseline survey. Reinterviews were carried out by women interviewers and allowed for more systematic probing of birth history. Supervision for the reinterview was also more intensive. Indirect estimates were derived using the Trussell Variant, West family of Coale Demeny Model Life Tables for women 20 to 34 years old.*

RESULTS

The study interviewed 4,172 women in Kingandu and 3,685 in Pai-Kongila, with a 96-97% response rate. Sample accounted for 4,218 births in Kingandu and 4,182 births in Pai-Kongila.

Mortality Estimates

Both areas were comparable and results were combined.

- Of all pregnancies (ever born), 15% resulted in fetal death. There were 317 reported deaths in Kingandu and 346 in Pai-Kongila for the period 1978-84. Fetal death rate increased with maternal age.
- The estimated IMR was similar for both areas – 43 deaths per 1,000 live births in Kingandu and 42 per 1,000 in Pai-Kongila (direct method).
- Probability of dying before the fifth birthday was 117 for Kingandu and 111 for Pai-Kongila. Indirect estimates yielded 119 and 135 respectively.

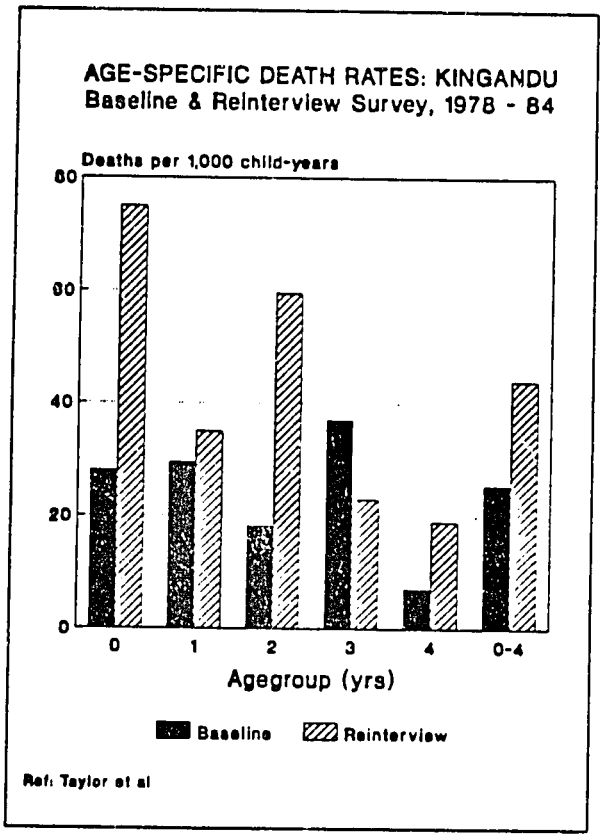
Reinterview Survey

In the reinterview survey, of 871 women reinterviewed in Kingandu, 840 were eligible respondents.

- There were 14% more births reported in the reinterview survey than in the original questioning of the same women.
- Of these additional reported births, 64% resulted in deaths. Thus, reported deaths were increased 116% by inclusion of the reinterview survey results.

- Direct estimate of IMR in the reinterview survey was 74 per 1,000 live births compared to 43 per 1,000 in the original survey.

- Probability of dying before the fifth birthday (direct estimates) was 191 per 1,000 live births in the reinterview survey compared with 117 in the original survey (Kingandu). Indirect estimates (using the West family of Coale-Demeny model life tables, Trussel variant) were 130 for IMR and 193 for childhood mortality.



"Knowledge of ORT was low in both sites. Only 36% knew of ORT/SSS in Kingandu and only 13% reported having used it. No one could correctly describe its composition or preparation."

Mortality Estimates, Kingandu 1978-84 MUHS Baseline & Reinterview Surveys 1984, 1985		
	Baseline Oct 1984	Reinterview July 1985
IMR (Direct)	43	74
Child Mortality 0-4 (Direct, age <5 yo)	117	191
IMR (Indirect)	N.A.	130
Child Mortality 0-4 (Indirect, age <5 yo)	119	193

Use of Health Services

Coverage levels were generally low for all antigens.

- Vaccination coverage levels at baseline were 22% for DPT-1 in Kingandu and 6% in Pai-Kongila, with levels diminishing to 10% and 2% respectively for DPT-3. Similar results were obtained for OPV-1 (22% and 6%) and OPV-3 (10% and 3%).

- Measles coverage was 20% and 19% respectively at the two sites.

- Coverage BCG was higher for BCG than for other antigens at both sites – 45% in Kingandu and 40% in Pai-Kongila.

Reported use of health services was similar in both sites, although services were generally more accessible in Kingandu.

- Knowledge of ORT was low in both sites. Only 36% knew of ORT/SSS in Kingandu and only 13% reported having used it. No one could correctly describe its composition or preparation.

- In Pai-Kongila, 13% knew of SSS and only 3% had used it.

- Of children with fever, 47% were treated with an anti-malarial.

- For 85% of mothers, some prenatal care was received in their last pregnancy. Two doses of tetanus toxoid were received by 14% of mothers in Kingali and 9% in Pai-Kongila. None received malaria chemoprophylaxis.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Kingandu, with a fixed facility vaccine strategy was able to achieve higher coverage than Pai-Kongili, with a mobile-team strategy.

2. Treatment of diarrhea with ORT/SSS was uncommon in both areas.

3. Estimates of mortality were similar in both zones. Recall bias was felt unlikely because average mortality was similar for both 2-year and 6-year intervals (results not shown).

4. Age-specific mortality in the first year of life was appreciably under- estimated in the initial survey.

5. Authors estimate that the reinterview survey probably missed 1% of birth events whereas the baseline survey missed as much as 12% of live births.

6. Results are not inconsistent with earlier published census and survey estimates reporting IMR rates of 73-139 and child mortality of 195-235 per 1000 live births.

7. Strategies to increase reliability of birth event reporting should include restricting the focus and length of questionnaires, limiting the sample to a manageable size, increasing training and supervision of interviewers, and more careful selection of interviewers.

"Authors estimate that the reinterview survey probably missed 1% of birth events, whereas the baseline survey missed 12%."

STUDY LIMITATIONS

- Estimates of malaria treatment of children were considered underestimates since many mothers may have had children treated with antimalarials at health centers without knowing the specific drug(s) given.

- The actual reasons for discrepancies between initial and reinterview surveys were not known. Misclassification of stillbirths, length of the initial questionnaire, and denial or suspicion on the part of respondents in the initial survey were all possible causes identified by the authors. Interviewer variability was also a possible cause.

- The study notes that the mortality estimates cannot be reliably validated because of the absence of a reliable external standard (e.g. prospective cohort study).

- The authors noted that, given the variability of the derived estimates, changes noted at the 4-year followup survey may be difficult to interpret unless reliably reproducible methods are used.

POLICY IMPACT

This was one of three initial MUHS surveys intended to allow subsequent evaluation of program impact by looking at outcome variables as well as process indicators. Of the three sites (Liberia, Togo and Zaire), only two had follow-up surveys (Liberia and Zaire).

PUBLICATIONS

TAYLOR WR, WEINMAN J, WERNETTE M et al: Difficultes se Posant pour Determiner la Mortalite du Jeune Enfant Afin d'Evaluer les Interventions Selectives de Soins de Sante Primaire. Seminaire CIE-INSERM-ORSTOM-INED. Seminaires INSERM 145:491-8 (1986).

TAYLOR WR, CHAHNAZARIAN A, WEINMAN J, et al.: Mortality and use of health services in rural Zaire. Int J Epidemiol. In press (1993).

- Treatment of febrile children with antimalarials was 47% in 1984 and 44% in 1989. It changed very little over the intervening period.

Authors also provide data on cost for the two MUHS surveys ($142,000 and $98,000) and the standard coverage surveys (approximately $5,000).

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Significant gains in process variables were documented in both districts. This was highest for EPI activities and appreciably less for treatment of febrile illness or malaria.

2. Much of the coverage data provided by the MUHS survey could have been obtained at lower cost by "a well-designed local surveillance system using health centers and the mission hospital," although this would not necessarily provide the mortality data sought.

"Much of the coverage data provided could have been obtained at lower cost by a well-designed local surveillance system."

STUDY LIMITATIONS

- Target age groups of children for the initial and follow-up surveys were not identical in all instances (e.g. the 1984 survey reports coverage in the 12-23 month age group and the 1988-89 survey in children 12-35 months of age).

- It was not possible to attribute all changes in health status to CCCD intervention alone since other concurrent activities also occurred in health zones.

- Area chosen as a "control" area in the original design was not a valid control at resurvey because it had been administratively merged with the study area in the interim.

- Deterioration in economic and social conditions during the intervening years (e.g., 1,000% devaluation of local currency) was noted by the authors, but quantifying its negative impact on the intervention was not practicable.

POLICY IMPACT

Although the study demonstrated improvement in both process and outcome indicators, the question of whether this improvement was caused solely by the CCCD intervention was not resolved by the study. In this respect, the study demonstrates the most common drawback of efforts to evaluate population interventions – the inability to isolate populations from other influences.

PUBLICATIONS

VERNON AA, TAYLOR WR, BIEY A et al.: Changes in use of health services in a rural health zone in Zaire. Int J Epidemiol. In press.

IMPACT OF SELECTIVE PRIMARY CARE ON CHILDHOOD MORTALITY IN A RURAL HEALTH ZONE OF ZAIRE

STUDY LOCATION: ZAIRE

SHORT TITLE: **MUHS FOLLOW-UP MORTALITY STUDY, ZAIRE 1988-89**

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STUDY DESIGN:

This was a 1989 survey using 6 clusters in the coverage area of the 1985 MUHS reinterview survey (Kingandu only). Design was contrived to detect a 20% decline in mortality with a power of 80% at 5% significance level (with provision for adequate design effect). More stringent methods for recording date of birth and age at death (direct or estimated/ imputed) were used in the 1989 survey.

RESULTS

A total of 1,947 mothers were interviewed in the followup MUHS survey.

Review of the 1985 age profile of women showed inordinately low numbers in older age groups, consistent with age misreporting by respondents. Selection bias, excluding many women under age 20, was also noted in the 1985 survey. The 1989 profile was more consistent with the expected demographic pattern for a developing country.

- Mortality above age 1 year was up to two times higher than normally found in populations with similar levels of infant mortality.
- Period mortality rates for the 1985 survey showed greater fluctuation than for the 1989 survey (possibly because of smaller sample size).
- Using 1989 survey data, under-five mortality declined from 41 to 33 per 1000 person-years. The proportion of children dying by age 5 declined from 178 to 147 (per 1000 live births), a 17% decline.

Change In Childhood Mortality Indicators, Kingandu

	1980-84	1985-89	Decline
Infant Mortality Rate	75.9	77.4	-2%
Mortality, age 1-4 yrs	29.7	19.9	33% **
Mortality, age 0-5 yrs	41.0	33.4	19%
Proportion of children dying by age 5	178	147	17%

** Note: Only 1-4 mortality was significant at 0.05 level (p=0.02 one-tailed).

- The decline in under-five mortality was virtually all attributable to a decline in the 1-4 yr old range, since the IMR (0-1 yr) was virtually unchanged between the two periods.

- Regression analysis suggested that the mortality change between the two periods was not simply due to a continuous long-term decline in mortality.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Findings are consistent with a decline in 0-5 mortality due to program impact but do not prove program impact.

2. No decline in mortality was observed under age 1. This may be explained by the conspicuous absence of neonatal tetanus cases both before and after the introduction of the program. In the absence of neonatal tetanus, immunization would not change under-1 mortality markedly.

3. Measles epidemics prior to the intervention occurred in approximate 2-year cycles. After the CCCD program was initiated, 4 years intervened before the next epidemic cycle. The immunization program most probably was responsible for delaying the recurrence.

STUDY LIMITATIONS

- The study used only the 1989 survey data since they contained less random fluctuation than the 1985 survey data. However, the mortality levels obtained by the 1989 survey were generally lower than the 1985 survey data for the same period and therefore provide a more conservative measure of program impact than would have resulted from using the 1985 survey data.

- A major limitation in interpreting mortality trends was the considerable year-to-year fluctuation in mortality prior to program introduction, largely due to periodic measles epidemics. Mortality after program introduction also experienced fluctuations, including a 1988 increase probably due to a hospital-associated measles outbreak.Because of this fluctuation, measuring mortality trends was not simply a matter of comparing relatively constant pre- and post-intervention rates.

- The authors note: "Although the trends in child mortality are consistent with positive program impact, it is also possible that some or all of these changes were a result of a long-term consistent decline in mortality".

POLICY IMPACT

The original project objectives for CCCD included five specific targets for reducing mortality. These included an overall reduction in under-5 mortality of 25%. They also included additional targets for cause-specific mortality from neonatal tetanus, measles, diarrheal disease and febrile illness. The MUHS studies were initiated to address difficulties which the CCCD project had in demonstrating a measurable decline in mortality. In this respect, the studies were of some success. However a clear and convincing demonstration of impact was not demonstrated by the Zaire studies. To an appreciable degree this was because of limitations of the method itself. The Zaire study therefore had only limited impact on actual program activities. However, the experience did identify a need for additional efforts and methods to measure mortality in populations with inadequate vital event recording. The focus on usable, practical, community based methods to assess mortality has continued to be a priority concern of the ACSI- CCCD project.

PUBLICATIONS

CHAHNAZARIAN A, EWBANK D, MAKANI B, EKOUEVI K: Impact of selective primary care on childhood mortality in a rural health zone of Zaire. Intl J Epidemiol. In press.

INFANT AND CHILD MORTALITY ESTIMATES IN BOMI AND CAPE MOUNT COUNTIES, LIBERIA: MORTALITY AND USE OF HEALTH SERVICES (MUHS) SURVEYS,1984 & 1988

STUDY LOCATION: LIBERIA

SHORT TITLE: **MUHS BASELINE AND FOLLOW-UP SURVEY, LIBERIA**

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CO-INVESTIGATORS: Thornton JN (1984, 1988), Holder W (1984)
Diop F (1988)

STUDY DESIGN

The sampling frame was 379 enumeration areas in two counties (Bomi and Cape Mount) in Liberia. Forty clusters of approximately 65 households each. The questionnaire used a 7-year truncated pregnancy history and probes for timing of births and deaths. Birth dates were estimated when necessary by their occurrence relative to rainy and dry seasons. Period mortality for the 2-year period preceding the survey were calculated for children under 5 years of age (0-4 mortality) per 1000 child-years lived. Conventional and cohort IMR were also calculated by life tables and standard procedures. A reinterview survey of a subsample of clusters was done using only questions pertaining to pregnancy history and excluding cause of death questions. Matching of births with the initial survey using ranked criteria: name, pregnancy order, date of birth, pregnancy outcome, living/dead status and sex. If the child was deceased, the date of death and age at death was recorded. Estimation of missed events in both surveys was done using the CHANDRA SEKAR-DEMING technique.

The follow-up survey in 1988 was modeled after the 1984 survey with the addition of verbal autopsy questions. The 1988 survey was done using the same 40 clusters as the 1984 survey. Reinterview of a subsample of the 1988 survey respondents was also conducted, using a simplified questionnaire. Missed events were again estimated by the CHANDRA SAKAR-DEMING method.

RESULTS

1984 Survey

A total of 3,337 women were interviewed in the 1984 survey; 636 women were interviewed for the reinterview (reliability survey) in 1984.

- Estimates of survival to age 5 are derived from the Lexis diagram and were as follows:

Completed Age (x)	Probability of Surviving Beyond Age x
1	.81
2	.76
3	.73
4	.72
5	.71

- About 20% of infants born alive die in their first year of life and only 70% of live born babies survive to age 5. The estimate for under-5 mortality for the two year period before the survey was 84 per 1,000.

- Women in the reinterview (reliability) survey had a somewhat lower child mortality experience than the original survey.

- Matching of pregnancies for the survey and reinterview indicated that 28% of deaths were missed in the main survey and 9% in the reinterviews. By comparison, 5% of living children were missed in the main survey and 2% by the resurvey (Chandra Sakar-Deming estimates). The rate of omission was about five times greater for dead children than for living children.

- The unadjusted IMR was 193 and 0-4 mortality 84 per 1000 live births; the adjusted IMR using the 5% underestimation in the reinterviews yielded an IMR of 240 and 0-4 mortality of 100 per 1000 live births.

- The sex of interviewer did not have a measurable effect on the quality of data.

1988 Follow-up Survey

In the 1988 follow-up survey, 2,385 women with 5,309 live births were interviewed in the initial interviews and 867 in the reinterviews.

- Comparison of the 1984 and 1988 adjusted mortality rates indicate a significant decline since 1984:

	1984 Adjusted	1988 Adjusted	% Change
IMR	240	181	-25%
0-4 Mortality	100	79	-21%

- The differences between unadjusted rates were appreciably less and did not show a clear decline, largely because of the omission of deaths in the 1984 survey.

- From the results of verbal autopsies, tetanus deaths were 50% lower and fever-associated deaths declined by 29%.

- There was no correlation between change in measles coverage and 0-4 mortality by cluster.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. From the 1984 survey, 20% of children were estimated to die in the first year of life and only 70% survived past their fifth birthday.

2. There was greater under-reporting of deaths than of births in the 1984 initial interviews and reinterviews.

3. Even though mortality did decrease about 20%, infant mortality even after the decline was still very high (above 170 per 1000 live births).

4. Because there was no "control" area it is not possible to specifically attribute the decline in mortality to CCCD activities.

5. The decline in neonatal tetanus can probably be attributed to immunization of pregnant women with tetanus toxoid; reductions in fever deaths may have been due to increased availability of antimalarial drugs in the home.

6. Measles immunization probably had no measurable effect on overall mortality because coverage was low even after the intervention. However, the four clusters with greatest measles coverage all experienced declines in mortality (data not shown).

STUDY LIMITATIONS

- Authors note that the 1984 survey showed slightly lower numbers of children born to women aged 35-39 and 40-44. This is unlikely and probably due to under-reporting (recall bias).

- The completion rate for the 1984 reinterview was relatively low (59%) because of logistical difficulties in locating women. Responders did differ slightly from nonresponders (age, fertility, and mortality).

- The Chandra Sakar-Deming technique assumes that the chance of an event being missed is independent in the two surveys. Because this assump-

tion is not entirely true in this instance, missing events were probably underestimates.

- Many women did not know their age; only 35% of women in the 1988 survey reported an age.

- The use of "card-documented" immunization coverage probably underestimated actual coverage rates.

POLICY IMPACT

The MUHS surveys as a group were designed principally in response to a programmatic need to demonstrate a change in outcome variables of importance as well as a change in the obvious process variables usually measured in national scale interventions such as the CCCD project.

The benefit of intervention programs such as EPI and CDD programs on a national scale, are often extrapolated from demonstrations of effectiveness of these interventions at the individual or local level. EWBANK notes that such imputations are not necessarily defensible in all cases. He notes three "implicit assumptions" which planners use to support conclusions that an intervention which works at the local level will be effective on a larger scale. He also cautions that the effectiveness of the intervention on a large scale is not always predictably and demonstrably of the same nature as occurs at the individual level or on a local scale.

The impact of the Liberia surveys in demonstrating program impact was limited for several reasons:

- Despite the CCCD program, gains were modest in many areas (e.g. ORS use and measles immunization).

- Because certain diseases such as measles are naturally cyclical (and contribute a variable but undefined proportion to annual mortality), lower rates of child mortality or measles morbidity over a period as short as two years are difficult to interpret with certainty. Low rates may simply be occurring in an inter-epidemic period. The MUHS surveys attempted to address this by assessing mortality in the 6 to 35 month age group (an atypical demographic interval but one that corresponds to the principal at-risk ages for measles-related mortality).

Although planned as a widely applicable tool for use in all CCCD countries, the surveys have not proved useful for widespread or routine use, principally because of their greater than expected complexity, relatively high cost, and personnel demands. There was also an important design limitation: the authors note that unless initial mortality rates are high and unless the program has substantial impact on mortality, the sample size required to demonstrate a significant decline in mortality becomes unmanageable. Thus the follow-up survey for Togo was dropped because of doubts that it would be able to demonstrate significant declines in mortality.

PUBLICATIONS

BECKER S, THORNTON JN, HOLDER W: Infant and child mortality estimates in two counties of Liberia: 1984. Int J Epidemiol. In press.

BECKER S, DIOP F, THORNTON JN: Infant and child mortality in two counties of Liberia: Results of a survey in 1988 and trends since 1984. Int J Epidemiol. In press.

EWBANK DC: Impact of health programs on child mortality in Africa: Evidence from Zaire and Liberia. Int J Epidemiol. In press.

IMMUNIZATION, ORAL REHYDRATION THERAPY AND MALARIA CHEMOTHERAPY IN UNDER-FIVE CHILDREN IN BOMI AND GRAND CAPE MOUNT COUNTIES, LIBERIA, 1984 AND 1988

STUDY LOCATION: LIBERIA

SHORT TITLE: **MUHS FOLLOW-UP SURVEY IN LIBERIA, 1988**

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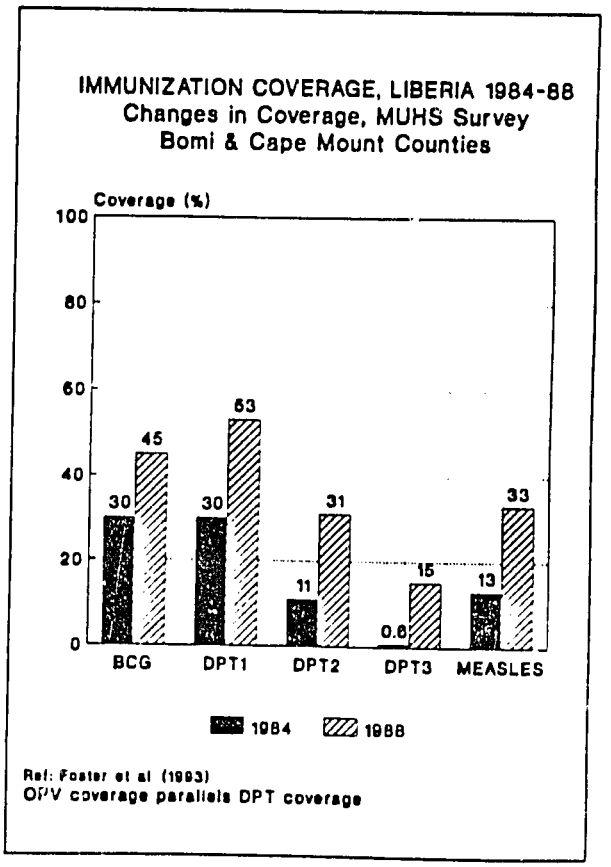
STUDY DESIGN

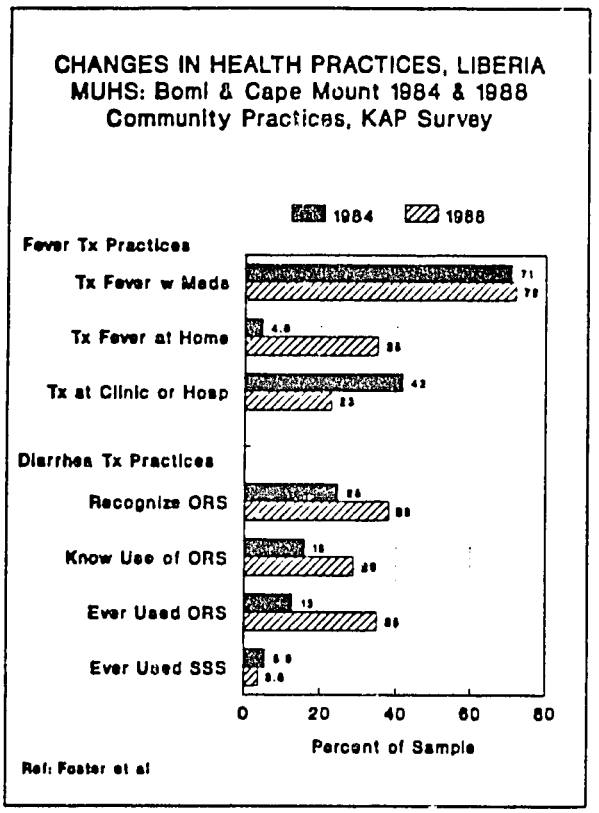
1988 follow-up to the 1984 Liberia MUHS survey, following CCCD program introduction in 1985 and initiation of a national vaccination days campaign in 1986. Immunization coverage was estimated by verified (Road-to-Health card) documentation only. Administrative estimates of TT coverage in child-bearing women were obtained; direct estimates were not.

RESULTS

A total of 3,337 women were interviewed in 1984, and 3,222 in 1988. Immunization rates increased for all antigens; however, no antigen exceeded 60% coverage. Coverage levels for OPV-1 to OPV-3 roughly corresponded to DPT-1 to DPT-3 levels.

- Immunization days accounted for 31% of DPT-1, 27% of DPT-3 and 36% of all measles vaccine administered in 1988.
- The major difference in treatment practices was increased use of antimalarials at home for treatment of fever (5% to 35%), with a corresponding decrease in health facility use (42% to 23%).
- ORS and SSS use was low in both surveys. In 1988 thirty-five percent (35%) of mothers ever used ORS, while only 3.8% ever used SSS.





STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Annual campaigns accounted for about one third of all vaccinations and may be appropriate "where resources are inadequate to sustain regular outreach activities".

2. Little progress was achieved in the institution of ORT (ORS and SSS) in the treatment of diarrheal disease.

3. ORS was not usually obtained from traditional community sources, whereas antimalarials were.

4. Survey data did not adequately reflect the "welldocumented and dramatic improvements in the quality of services" that occurred between 1984 and 1988.

STUDY LIMITATIONS

- The authors note that a coverage survey using only card-documented immunization probably yielded conservative estimates of coverage levels. Administrative data suggested that coverage was in the range of 60-70% for DPT-1 and 50-60% for measles.

- Because the MUHS surveys were carried out during different periods (November 1984 vs. May 1988) malaria and fever prevalence could not be compared.

- Because measles occurrence in populations is cyclical, the interpretation of a 2-year drop in measles morbidity is difficult. The decline might have been due to an inter-epidemic interval.

POLICY IMPACT

A decline in neonatal tetanus and changes in treatment of fever were the most demonstrable changes documented by the Liberia study. Ironically, the survey did not directly measure changes in maternal tetanus toxoid immunization, and levels cited were derived from administrative estimates. The discrepancy noted between levels derived from administrative methods and the coverage derived from the MUHS survey have apparently favored utilization of the administrative data in preference to MUHS findings for all antigens.

More serious is the fact that civil unrest and warfare in the country have effectively put a stop to virtually all CCCD and related public health activities. Although not often included in equations evaluating health impact, the negative role of civil instability and war are becoming increasingly difficult to ignore. (See also TOOLE MJ et al: Are War and Public Health Compatible. Lancet 341:1193-6 1993).

PUBLICATIONS

FOSTER SO, SPIEGEL RA, MOKDAD A, et al.: Immunization, oral rehydration therapy, and malaria chemotherapy, under-five children in Bomi and Grand Cape Mount counties, Liberia, 1984 and 1988. Int J Epidemiol. In press.

A STUDY OF INFANT AND JUVENILE MORTALITY, INCIDENCE OF DIARRHEAL DISEASE AND FEVER EPISODES, THEIR TREATMENT, AND CERTAIN MATERNAL CHARACTERISTICS, PLATEAUX REGION, TOGO 1984

STUDY LOCATION:	TOGO
SHORT TITLE:	**MUHS — PART I STUDY, TOGO, 1984**
PRINCIPAL INVESTIGATOR:	WALDMAN Dr. Ronald TSD-IHPO, Mailstop F-03 Centers for Disease Control and Prevention, Atlanta (currently with WHO, Geneva)
CO-INVESTIGATORS:	Karsa T, Murphy K

STUDY DESIGN

This study describes the baseline Mortality and Use of Health Services (MUHS) study in Togo, undertaken in the Maritime Region in Oct-Nov 1983, and in the Plateaux Region in Aug- Sept 1984. It used two-phase cluster sampling to achieve a target sample size of 4,500 live births since 1978; there were thirty clusters of 100 households each in each region. An eight-page questionnaire was administered using a truncated birth history covering live births (6-year recall), deaths, immunization, diarrheal disease practices, and fever episodes.

RESULTS

Results are for the Plateaux Region.

There were 4,958 mothers and caregivers interviewed. Data on childbearing history was available for 2,965 women.

- Of those giving birth in the last year, 82% had at least one prenatal visit and 59% had at least one tetanus toxoid (TT) immunization. The percentage of women younger than 40 years of age who received at least two doses of TT ranged from 48% to 52%.
- Of all women, 68% claimed to have taken chloroquine during their last pregnancy, and 74% knew of chemoprophylaxis, but only 25% took it weekly.
- Only 1% recognized a packet of ORS salts or knew its use, and only 13% knew of SSS. Of these, only a small proportion could identify the ingredients of SSS correctly.
- Of 4,966 live births, 5.6% had died. The estimated IMR (using truncated birth histories) was 33/1000 live births, 1-4 year mortality was 42/1000, and 0-4 year mortality was 74/1000.
- Among children aged 13 to 24 months of age, coverage ranged from 35% for DPT-1 to 12% for DPT-3 (OPV coverage closely paralleled DPT). Measles coverage was 25%. Only 8.9% of children aged 13 to 24 months were completely immunized.
- Fifteen percent of children had a diarrheal episode in the prior 15 days; 34% had at least one fever episode, and 9% reported both fever and diarrhea.

STUDY CONCLUSIONS AND RECOMMENDATIONS

1. Despite relatively good access to health services, maternal and childhood immunization levels were generally low.

2. There was very little familiarity with ORS and SSS.

3. In spite of a strong knowledge of chemoprophylaxis, few pregnant women took it regularly.

STUDY LIMITATIONS

This mortality data suffers from all the limitations previously identified for the other MUHS studies. These included questions of incomplete recall, differential recall of births and deaths, uncertainty about dates and birthdates, and recall biases associated with cause-of-death questioning. These and other limitations are described in other MUHS summaries (see Liberia and Zaire studies).

A number of additional limitations were identified by JANSSENS (1985) in the reliability study done as a follow-up to this survey. These included the following:

- The survey data showed an internal inconsistency — analysis of birth histories resulted in an estimated IMR of 33/1000 live births, whereas BRASS indirect estimates yielded a figure at least double this rate (data not shown).

- The Togo study (unlike the Liberia MUHS study) used a "birth history" questionnaire. In Liberia, the study estimates, which were believed to be closer to the expected rates, were obtained from a "pregnancy history".

- The truncated birth history required mothers to recall events going back to a very exact date. Mothers may have not been able to judge accurately whether a child was born before or after the fixed date.

- Because the sample units of the survey were villages, an important sub-population of the Plateaux region who generally settle outside of villages was underrepresented. This population of "allochtons" (generally migrants from the north of Togo) had been previously identified as a population with higher infant mortality than the "autochtonous" or indigenous population of the Plateaux region (JANSSENS, 1985).

PROGRAM AND POLICY IMPACT

The uncharacteristically low mortality rates obtained for Togo were largely responsible for the decision not to include Togo in further cycles of the MUHS surveys. The two main reasons for this decision were: (1) There was some debate about the accuracy of results, and (2) Beacuse of the initially low mortality, demonstrating a significant improvement would be technically much more difficult and would require a much greater accuracy of estimates than was envisioned in the MUHS study design.

Although the results of the Togo MUHS study and reliability resurvey (see below) were not initially adopted as reliable estimates, the revised rates were later found to be more consistent with estimates derived from the Demographic Health Survey (DHS).

PUBLICATIONS

None cited.

"The Togo study (unlike the Liberia MUHS study) used a 'birth history' questionnaire. In Liberia, the study estimates, which were believed to be closer to the expected rates, were obtained from a 'pregnancy history'".

RELATED STUDIES

JANSSENS M, GITTLEMAN D et al.: Reliability survey on infant morality in Togo. Unite de Recherche Demographique (URD). Unpublished report. Lomé, Togo. October 1985.

This 1985 re-survey used six clusters of the original 30 in the Plateaux Region (stratified by low, medium and high mortality levels). Complete pregnancy histories for the ten most recent pregnancies were used. A supplementary survey among the "allochtonous" population living outside cluster villages was also carried out. Of the reinterview sample, 640 women or 64% were interviewed. Infant mortality derived from BRASS indirect estimates was 93/1000 for females and 113/1000 for males. From the pregnancy histories, the direct estimate of IMR was calculated to be 103/1000 live births by excluding the two birth years at either extreme (1978-79 and 1984-85). Recalculating the IMR from the original 1984 survey yielded an indirect estimate (BRASS method) of 89/1000 live births for females and 103/1000 for males, findings consistent with the 1985 reliability survey. However, the direct estimate from birth histories in the 1984 survey (excluding 1978, 1979 and 1984) was 35/1000, only a third of the 1985 estimate. Comparison of the surveys showed that 43% of deaths not registered during the 1984 MUHS survey occurred during the first two weeks of life, 72% during the first year.

Appendix 1

Listing of ACSI-CCCD Applied Research Projects
1982 - 1993

ACSI-CCCD APPLIED RESEARCH PROJECTS, 1982-93
APPLIED RESEARCH BY CCCD-SUPPORTED INVESTIGATORS

	PRINCIPAL INVESTIGATOR	SHORT TITLE	PROJECT TITLE	DATE COMPL	RESULTS	PUBLICATIONS AND STATUS
**						
EPI	BROGAN, D	VACCINE EFFICACY USING CASE-EXPOSURE METHOD	ESTIMATION OF VACCINE EFFICACY USING THE CASE-EXPOSURE METHOD	1988	Report on file.	Proceedings Section on Survey Research Methods, ASA 1988 p715-19 [CONF PROCEEDNG]
HSR	BRYCE, J	FACILITY BASED ASSESSMENT OF SERVICES	ASSESSING THE QUALITY OF FACILITY-BASED CHILD SURVIVAL SERVICES	1991	PUBLISHED Described findings of FBA studies in 10 CCCD countries - including methodology, findings and application.	HEALTH POLICY AND PLANNING 7:155-63 (1992) [PEER-REV JNL]
MAL	MOUNT, DL	TLC DETECTION OF CHLOROQUINE IN FINGER-STICK BLOOD	FIELD ADAPTED METHOD FOR HIGH PERFORMANCE THIN LAYER CHROMATOGRAPHIC DETECTION AND ESTIMATION OF CHLOROQUINE IN FINGER-STICK BLOOD	1987	PUBLISHED Support cited: WHO/UNDP/TDR. Field-adapted HPTLC used to detect and estimate quantities of CQ in 100ul samples of finger-stick blood.	J CHROMATOGRAPHY 428:196-202 (1988) [PEER-REV JNL]
MAL	MOUNT, DL	FIELD ASSAY OF CQ IN URINE	COLORIMETRIC AND THIN-LAYER CHROMATOGRAPHIC METHODS FOR FIELD ASSAY OF CHLOROQUINE AND ITS METABOLITES IN URINE	1986	Two modifications of Haskins test compared for detection of urine CQ and desethylCQ. Absorbance at 420 nm was linear to 100 umol/l. A single dose of CQ was detectable by Haskins I for 28 days.	BULLETIN WHO 65:615-623 (1987) [PEER-REV JNL]
HSR	SUDRE, P	COST EFFECTIVENESS OF CQ RESISTANT MALARIA Tx	TREATMENT OF CHLOROQUINE RESISTANT MALARIA IN AFRICAN CHILDREN: A COST-EFFECTIVENESS ANALYSIS	1991	Cost-effectiveness of Chloroquine, amodiaquine and pyrimethamine/sulphadoxine compared using decision-analysis model. Cost of drug, compliance and level of CRPF (RIII) had greatest effect on cost-effectiveness ratio.	INTL J EPIDEMIOL 21:146-54 (1992) [PEER-REV JNL]
MAL	SUDRE, P	DELPHI SURVEY OF MALARIA MORTALITY	DELPHI SURVEY OF MALARIA MORTALITY AND DRUG RESISTANCE IN AFRICA	1990	Nineteen experts surveyed on 2 occasions by standardized questionnaire to establish probable outcome of drug treatment (probability of death) at varying levels of CQ resistance. Used as basis of cost-effectiveness study.	LANCET 335:722 (1990) LETTER [PEER-REV JNL]

ACSI-CCCD APPLIED RESEARCH PROJECTS, 1982-93
APPLIED RESEARCH BY CCCD-SUPPORTED INVESTIGATORS

PRINCIPAL INVESTIGATOR	SHORT TITLE	PROJECT TITLE	DATE COMPL	RESULTS	PUBLICATIONS AND STATUS
** BURKINA					
MAL GBARY, AR	DIAGNOSIS AND Tx OF MALARIA, BOBO DIOULASSO	LE TRAITMENT DES ACCES PALUSTRES: CONNAISSANCES ET PRATIQUES DES PERSONNELS DE SANTE DE LA VILLE DE BOBO DIOULASSO	1987	n=63 HCWs Record review showed 49% of 625 cases of uncomplicated malaria treated with injectable quinine, vs. 16% (children) and 10% (adult) by self-report of HCWs. Doses were generally too high. Approx 48% of fevers were treated with antimalarials.	Submitted to MEDECINE D'AFRIQUE NOIRE? [MANUSCRIPT]
MAL ROISIN, AJ	MALARIA AND CQ IN PREGNANCY, BURKINA	IMPACT OF MALARIA AND POSSIBLE IMPACT OF CHEMOPROPHYLAXIS ON BIRTHWEIGHT, BURKINA FASO	1987	n=780 RETROSPECTIVE SURVEY. Fever history unrelated to parasitemia. Placental parasitemia =6.9% with prophylaxis, 13% without. Avg. bthwgt difference greatest in first pregnancies.	Presented at CCCO Yamoussoukro Conf 1988 [CONF PROCEEDNG]

ACSI-CCCD APPLIED RESEARCH PROJECTS, 1982-93
APPLIED RESEARCH BY CCCD-SUPPORTED INVESTIGATORS

	PRINCIPAL INVESTIGATOR	SHORT TITLE	PROJECT TITLE	DATE COMPL	RESULTS	PUBLICATIONS AND STATUS
** BURUNDI						
EPI	BIRMINGHAM, M	EPI/FP LINKAGE - BURUNDI	IMPACT OF THE INTEGRATION OF FAMILY PLANNING WITH THE EPI PROGRAM IN BURUNDI.		Baseline study June 92, intervention started Nov'92. ..In progress. Baseline contraceptive prevalence = 4.8% (study sites) and 11.6% (controls).	Presented at CCCD Dakar Conf 1993 [IN PROGRESS]
CDD	BIRMINGHAM, M	RISK FACTORS FOR DYSENTERY IN BURUNDI	EPIDEMIOLOGY AND RISK FACTORS FOR BACILLARY DYSENTERY IN BURUNDI	1992	n=9319 CASE-CONTROL STUDY. Risk factors associated with dysentery include not washing hands before food prep, lack of soap in household, use of bucket for water transport, use of rag for anal cleansing, prior wgt loss, older age and female gender.	[FNL REPORT]
EPI	CHEN, R	MEASLES OUTBREAK INVESTIGATION - BURUNDI	EPIDEMILOGIC FOLLOW-UP OF MEASLES OUTBREAK, 1988 - BURUNDI	1989	Shift in age distribution noted. Age >24mo comprised 30% of cases in 1985 and 57% in 1988. Excess mortality rose from 2.5% to 4.2%. Vaccine efficacy within expected limits. Increased inter-epidemic period noted.	Presented at Swazi Consultative Mtg. 1990. MS in preparation. [SWAZI CONF]
MAL	COOSEMANS, MH	ANTIMALARIAL DRUG EVALUATION, BURUNDI	EVALUATION DES MEDICAMENTS ANTIPALUDIQUES DANS UNE REGION A FORTE PREVALENCE DE P FALCIPARUM CHLOROQUINO-RESISTANT (BURUNDI, AFRIQUE CENTRALE)	1984	PUBLISHED. 39% failure with CQ25 @ D7, 59% with A10 (amodiaquin), 5% with A25. Only 2/109 with pyrimeth-sulfadoxine. In vitro 86% resistant to pyrimethamine @ 48hr.	ANN SOC BELGE MED TROP 65 (S2):115-121 (1985) [PEER-REV JNL]
EPI	DEMING, M	MATERNAL TET-TOX SEROPREVALENCE, BURUNDI	NATIONAL STUDY ON LEVELS OF TETANUS ANTITOXIN SEROPOSITIVITY AMONG RECENTLY DELIVERED WOMEN IN BURUNDI	1989	30 CLUSTER SURVEY Estimated 18% coverage by immunizn record (49% urban, 17% rural) and 67% by serology (84% urban, 67% rural). Mothers' history (73%) correlated better with seroprevalence. Only 66% of women with history of 2 doses were seropositive.	Presented at CCCD Swazi Consultative Mtg. 1990 [SWAZI CONF]
CDD	MARIMBA, J	ORT IMPACT,BURUNDI	ORT IMPACT ON COST OF DIARRHEAL TREATMENT IN CHILDREN LESS THAN FIVE, BURUNDI	1990?	REPORT?	[PRELIM REPORT?]

ACSI-CCCD APPLIED RESEARCH PROJECTS, 1982-93
APPLIED RESEARCH BY CCCD-SUPPORTED INVESTIGATORS

	PRINCIPAL INVESTIGATOR	SHORT TITLE	PROJECT TITLE	DATE COMPL	RESULTS	PUBLICATIONS AND STATUS
HSR	MCKEOWN, S	FACILITY NEEDS ASSESSMENT, BURUNDI 1987	STUDY OF THE PERIPHERAL LEVEL TRAINING NEEDS AND FOLLOW-UP, NGOZI REGION, BURUNDI, NOV. 1987	1987	n=69 Not random sample. ORT use in clinic approx 20%. 80% determined age, less than 40% checked skin turgor. Health ed messages and worker practices both need improvement.	[PRELIM REPORT]
CDD	MURRAY, J	MORTALITY FROM DYSENTERY IN BURUNDI	MORTALITY FOLLOW-UP STUDY OF DYSENTERY PATIENTS, BURUNDI	1993	n=791 Fifty-seven of 791 patients (7.2%) were dead at follow-up, 61% died at home. CFR was highest in 50+ agegroup (18.5%). Estimated CMR = 1.5/1000/yr in 1991. 94% of S dysenteriae resistant to SxT and ampicillin ,but sensitive to nalidixic acid.	[FNL REPORT]
EPI	NDIHOKUBWAYO, T	MISSED OPPORTUNITIES, BURUNDI	IMPACT POLITIQUE DE VACCINER A TOUT CONTACT, BURUNDI	1989	n=12 hlth centers CCCD and UNICEF support. Centers with daily or all-contacts policy had lower dropout rate DPT1-DPT3.. 23% missed opportunities. Main reasons= failure to verify status, misinterpretation, insuff personnel, fear of wastage, stock ruptures	[FNL REPORT]
CDD	NTAKIBIRORA, M	COMMUNITY PRACTICES FOR DIARRHEA Tx, BURUNDI	PRATIQUES COMMUNAUTAIRES POUR LE TRAITEMENT DE LA DIARRHEE AU BURUNDI	1990	FOCUS GROUPS. Dehydration risk NOT generally recognized by mothers. Health facilities WERE commonly consulted for tx. Salt or sugar was rarely used as ingredient of traditional home fluids for diarrhea tx.	Presented at CCCD Swazi Consultative Mtg. 1990 [SWAZI CONF]
EPI	NTAREME, F	EPIDEMIOLOGY OF MEASLES, BUJUMBURA	ASPECTS EPIDEMIOLOGIQUES, CLINIQUES ET EVOLUTIFS DE LA ROUGEOLE EN MILEU HOSPITALIER COMMUNITAIRE DE BUJUMBURA	1987	n=154 (116 controls) 48% cases were <1yo, 23% <8mos. 55% of cases malourished vs 16% of contrls. Complicns: dehydrn=25% pneum=12%. Only 28/95 cases followed x 12mo after d/c. Mortality=18% vs 4% controls. 92% deaths = in hosp or pre-1st visit.	[FNL REPORT]
CDD	OLIVIOLA, D	CASE MANAGEMENT OF DYSENTERY - BURUNDI	CASE MANAGEMENT OF DYSENTERY - BURUNDI	1992	IN ANALYSIS (per Update 10/91)	[]
CDD	RIES, A	STUDY OF BLOODY DIARRHEA IN BURUNDI	DESCRIPTIVE EPIDEMIOLOGY OF BLOODY DIARRHEA IN BURUNDI, 1990	1990	n=189, 6 hlth centers 44%= S. Dysenteriae Type I, 17% Other Shigella Spp., 4.6% E. Histolytica. 100% of 23 isolates of S.Dysenteriae Type I were resistant to the 4 recommended antibiotics available in Burundi.	See 90-91 Annual Report (p36). [FNL REPORT]

ACSI-CCCD APPLIED RESEARCH PROJECTS, 1982-93
APPLIED RESEARCH BY CCCD-SUPPORTED INVESTIGATORS

	PRINCIPAL INVESTIGATOR	SHORT TITLE	PROJECT TITLE	DATE COMPL	RESULTS	PUBLICATIONS AND STATUS
HIS	WEIERBACH,R	PRECEEDING BIRTH MORTALITY, BUJUMBURA	PRECEEDING BIRTH MORTALITY AMONG WOMEN PRESENTING TO TWO CLINICS IN BUJUMBURA, BURUNDI	1990	Two urban sites: HPRC (n=738) Ngara (n=750). PBT index was 0.149 at HPRC (110 deaths from 738 live births), 0.148 at Ngara (111/750). From lifetables, 0-2 mortality = 0.118 (HPRC) 0.125 (Ngara). Main causes of death = measles, diarrhea and "other."	Presented at Swazi Consultative Mtg. 1990 [SWAZI CONF]
CDD	WILSON, R	CDD/ARI PRACTICES AND BELIEFS, BURUNDI	MOTHERS' PERCEPTIONS, BELIEFS, PRACTICES, RELATIVE TO CDD/ARI, BURUNDI	1990	See also Swazi Conf Re: NTAKIBIRORA (CDD). Dehydration not generally recognized as a danger. ORS generally familiar, and often given with supplemental feeding.	CDD presented at Swazi Consultative Mtg. 1990 [SWAZI CONF]
CDD	WILSON, R	CHILDHOOD DIARRHEA AND DYSENTERY, BURUNDI	CHILDHOOD DIARRHEA AND DYSENTERY: RESULT OF A FOCUS GROUP ACTIVITY IN BURUNDI, 1990	1990	n=22 FOCUS GROUPS Intestinal worms, "bad breast milk" most frequently cited causes of diarrhea. Knowledge of ORS was widespread, but rural mothers frequently did not have utensils for mixing. Most could differentiate dysentery from other diarrheal dx.	[FNL REPORT]

ACSI-CCCD APPLIED RESEARCH PROJECTS, 1982-93
APPLIED RESEARCH BY CCCD-SUPPORTED INVESTIGATORS

	PRINCIPAL INVESTIGATOR	SHORT TITLE	PROJECT TITLE	DATE COMPL	RESULTS	PUBLICATIONS AND STATUS
** C'IVOIRE						
HSR	BRYCE, J	TRAINING FIELD ASSESSMENT, C'IVOIRE, 1990	EVALUATION OF TRAINING IMPACT ON HEALTH WORKER PERFORMANCE - COTE D'IVOIRE, MARCH 1990	1990	n=136 children See Swazi Conf MOUSSA et al: 82% cases received addl meds for diarrhea. Materials for ORS prep and CQ were frequently unavailable. 78% of febrile infants txd with antimalarials. Systematic exam for dehydration rarely done (pre-intervn).	Included in BRYCE et al: HEALTH POLICY AND PLANNING 7:155-63 (1992) [FNL REPORT]
CDD	COULIBALY, A	DIARRHEA STUDY HOSPITAL MORBIDITY/ MORTALITY	MORBIDITE ET MORTALITE HOSPITALIERES DUES AUX MALADIES DIARRHEIQUES COTE D'IVOIRE	1987	n=1746, 4 sites Diarrhea =12% of hospital cases (9-17% seasonal varn). Diarrheal disease =12% of hospital mortality. Case fatality rate was 102/1000 (10%) and average stay was 5.7 days.	[FNL REPORT]
MAL	DAVIS, CE	MALARIA TREATMENT PRACTICES OF HCWs, C'IVOIRE	MALARIA TREATMENT PRACTICES OF HEALTH CARE PROVIDERS, COTE D'IVOIRE 1987.	1987	n=64 HCWs Fever was the main diagnostic sign of Malaria. Few HCWs used slide confirmation. 63% of HCWs used CQ in tx, but only 18% gave correct amount.	Presented at CCCD Yamoussoukro Conf 1988 [CONF PROCEEDNG]
CDD	DAVIS, CE	FOODBASED FLUIDS FOR HOME ORS	DETERMINING FOODBASED FLUIDS SUITABLE FOR HOME THERAPY OF DIARRHEA	1986	n=203 38% of respondents had ever heard of SSS, 10% had ever used. 70% of households had no sugar available. 14% had rice available, 90% some access to sugar. 53% treated diarrhea with traditional herbs, 20% with porridge, 27% no Rx.	[FNL REPORT]
CDD	DAVIS, CE	ORS DEMONSTRATION UNIT, PORT-BOUET	ORT IN COTE D'IVOIRE - A REVIEW OF THE FIRST SIX MONTHS OF A DEMONSTRATION UNIT AT PORT-BOUET	1986	n=2056 Plan A=92%, Plan B=7%, Plan C (severe)=1%. Less than 5% of mothers used SSS, 24% used purging. (program evaln study)	[PRELIM REPORT]
OTH	GLIK, D	FOCUS GROUP METHODS FOR FORMATIVE RESEARCH, C'IVOIRE	FOCUS GROUP METHODS FOR FORMATIVE RESEARCH IN CHILD SURVIVAL: AN IVORIAN EXAMPLE	1987	n=24 FOCUS GROUPS 6 language or ethnic groups from 3 regions were represented. Study examined treatment preferences, local classifications of febrile illness, and access and availability of tx.	INTL Q COMMUNITY HLTH ED 8:297-316 (1987-88) [PEER-REV JNL]

ACSI-CCCD APPLIED RESEARCH PROJECTS, 1982-93
APPLIED RESEARCH BY CCCD-SUPPORTED INVESTIGATORS

	PRINCIPAL INVESTIGATOR	SHORT TITLE	PROJECT TITLE	DATE COMPL	RESULTS	PUBLICATIONS AND STATUS
MAL	IMBOUA-BOGUI, G	MALARIA IN CHILDREN 0-4YO, AGBOVILLE	PREVALENCE DU PALUDISME DANS LAS CAS DE FIEVRE OBSERVES CHEZ LES ENFANTS DE 0-4ANS AU CENTRE DE PROTECTION MATERNELLE ET INFANTILLE D'AGBOVILLE	1987	Prevalence of parasites was only 39% of febrile cases (wet season), 22% (dry season). 78% of febrile cases were due to virus or other infection, not malaria. 80% of CQ treatment by mothers was at ineffective dose. Treatment was usually delayed.	[FNL REPORT]
EPI	KOFFI, J	1987 EPI CAMPAIGN EVALUATION, C'IVOIRE	PROBLEMS AND SUCCESSES OF THE 1987 NATIONAL EPI CAMPAIGN, COTE D'IVOIRE	1989	Presentation NOT on file. Immunization coverage in 1989 increased relative to 1988, although significantly lower than 1987.	Presented at CCCD Swazi Consultative Mtg. 1990. [SWAZI CONF]
CDD	KOUAME, K	PURGING PRACTICES IN CHILDREN	IN DEPTH STUDY ON THE USE OF PURGING IN CHILDREN IN COTE D'IVOIRE	1987	FOCUS GPS, DIRECT OBSERVN, INTERVIEWS: Main use was children, pregnant women in labor and elderly. Composition includes herbs/leaves or pepper. Adverse reactions from solution too hot or xs "dose" (sweating, colic, etc) Practice most prevalent in Baoule.	[FNL REPORT]
CDD	LEE, L	STUDY OF SEVERE DIARRHEA - COTE D'IVOIRE	RISK FACTORS ASSOCIATED WITH SEVERE ILLNESS AMONG AFRICAN CHILDREN WITH DIARRHEA	1992	n=78 cases, 186 controls CFR= 19%. Risk factors for severe illness included decreased skin turgor, serum Na<130, bacteremia, malaria parasitemia, Hgb <6gm%, malnutrition and no measles vaccination.	Presented at 1992 ICAAC and CCCD Conf Dakar 1993 [CONF PROCEEDNG]
EPI	MARIAM, D	MEASLES MATERNAL ANTIBODY	SEROLOGICAL STUDIES ON THE ACQUISITION OF MEASLES BEFORE 9 MONTHS OF AGE	1987	n=?. 77% Seronegative @ 7mo. 100% negative @ 10 mo. Same as REY J et al?	[PRELIM REPORT]
EPI	MORINIERE, B	COMPARATIVE IMMUNOGENICITY MEASLES VAX/ SCHEDULE	THE COMPARATIVE IMMUNOGENICITY OF HIGH-TITRE E-Z VACCINE AT 6 MONTHS AND SCHWARZ VACCINE AT 9 MONTHS, ABIDJAN, COTE D'IVOIRE	1991	ON FILE. MS in preparation?	[]
EPI	MORINIERE, B	COMPARATIVE IMMUNOGENICITY OF POLIOVAX/ SCHEDULE	A COMPARATIVE TRIAL OF A SUPPLEMENTAL DOSE OF TRIVALENT ORAL POLIO VACCINE (OPV) OR ENHANCED-POTENCY INACTIVATED POLIO VACCINE IN CHILDREN	1991	n=400 (6mo old), 400 (9mo old) Children who had received 3 doses OPV randomized to receive OPV or IPV with measles vaccine. Among children with no antibodies after 3 doses OPV, IPV was 2-13 times more likely to induce seroconversion.	LANCET 341:1545-50 (1993) ABSTRACT: 92 EIS Conf. [PEER-REV JNL]

ACSI-CCCD APPLIED RESEARCH PROJECTS, 1982-93
APPLIED RESEARCH BY CCCD-SUPPORTED INVESTIGATORS

	PRINCIPAL INVESTIGATOR	SHORT TITLE	PROJECT TITLE	DATE COMPL	RESULTS	PUBLICATIONS AND STATUS
EPI	REY, J	NEONATAL TRANSMISSION OF MEASLES ANTIBODIES, C'IVOIRE	TRANSMISSION DES ANTICORPS MATERIAL ANTIROUGEOLEUX AU NOUVEAU-NE IVORIAN	1987	n=208 (Adzope), 36 (Marcory) Estimated 60% of infants would have no maternal antibodies by 6 months.	MEDECINE TROPICALE 51:215-18 (1991) [PEER-REV JNL]
COD	SHAW, E	EVALUATION OF HOME ORS	EVALUATION DE L'UTILASATION A DOMICILE DES SOLUTIONS FAMILIALES DE REHYDRATION ORALE DANS LES DIARRHEES AIGUES BENIGNES	1986	62% of SSS was within safe limits (40-100 meq/L Na), 32% were >100 meq/L Na, 17% were >120 meq Na. (20% of children lost wgt by D3).	Presented at CCCD Yamoussoukro Conf 1988 [CONF PROCEEDNG]
MAL	SORO B	IN VIVO CQ EFFICACY, C'IVOIRE	MISSION EFFECTUEE DANS LE CADRE DU COURS INTERNATIONAL SUR LA CHEMOSENSIBILITE PALUSTRE, USAID ET CDC, 3 AU 25 SEPT 1986	1986	n=1266 Prevalence of malaria = 51% of fevers, 39% = P. falcip and P. malariae, n=109 given CQ10. All but one were parasite negative by D7. In vitro, 6% (2/33) of isolates were resistant to CQ by RIECKMANN.	ANN TROP MED PARASITOL 83:101-106 (1989) [PEER-REV JNL]
EPI	SORO, B	MENINGOCOCAL MENINGITIS SURVEILLANCE	ELEMENTS D'EPIDEMIOLOGIES DES MENINGITES DANS LE NORD DE LA COTE D'IVOIRE	1987	n=2243, (1980-85) Epidemic peaks Feb-Mar 83,84,85. Age-specific attack rates highest in 5-14 yo. Estimated CFR = 8.5%, 135/346 CSF samples positive for gm neg diplococci, 96=Serogp A, 7=Serogp B.	MED TROP 48:145-8 (1988) [PEER-REV JNL]
EPI	SWISS, S	EVALUATION OF '87 CAMPAIGN, N.E. C'IVOIRE	EVALUATION OF THE 1987 MASS VACCINATION CAMPAIGN IN TWO NORTHEASTERN SECTORS OF COTE D'IVOIRE	1988	Bouna and Bondoukou sectors: Coverage in children 12-23 months increased to 98% and 91% for DPT1, dropping to 72% and 53% for DPT3. Stock ruptures, inadequate documentation and transport costs were concerns.	[FNL REPORT]
HSR	TRAORE, M	FIELD ASSESSMENT OF HCW PERFORMANCE, C'IVOIRE	EVALUATION DES BESOINS DE FORMATION DES PERSONNELS DE SANTE, C'IVOIRE, MARS 1990	1990	n=41 facilities Resurvey of 1990 facilities. Improved HCW practices with training documented, but ORS use on-site still <20%. ORS and SSS materials/supplies still lacking. Hlth Ed practices showed greatest gains. Antidiarrheal use still 47%.	Presented at CCCD Consultative Mtg. 1990 [SWAZI CONF]
POP	WILSON, R	ETHNOGRAPHY FOR FAMILY PLANNING, COTE D'IVOIRE	POLICY ETHNOGRAPHY FOR FAMILY PLANNING IN COTE D'IVOIRE	1991	ETHNOGRAPHIC METHODS: participant observation, key-informants, and interviews. Responses suggested no conflict between family solidarity and limiting fertility. Responsibility for spacing births was attributed principally to "couple" and family.	Submitted for publicn [FNL REPORT]

ACSI-CCCD APPLIED RESEARCH PROJECTS, 1982-93
APPLIED RESEARCH BY CCCD-SUPPORTED INVESTIGATORS

	PRINCIPAL INVESTIGATOR	SHORT TITLE	PROJECT TITLE	DATE COMPL	RESULTS	PUBLICATIONS AND STATUS
HSR	YAPO, E	HEALTH FACILITY SURVEY, C'IVOIRE 1986	SURVEY OF HEALTH FACILITIES: DESIGN, ANALYSIS AND USE OF RESULTS, COTE D'IVOIRE 1986	1986	n=54 facilities (Abidjan), 100 in interior. Vaccinations offered 13-15 days per month. Less than 20% used one needle per use. 50% facilities used ORS in diarrhea tx. Only 3% of facilities received written feedback (See also Emory MPH Thesis: KHANTAWAY)	Presented at CCCD Yamoussoukro Conf 1988. [CONF PROCEEDNG]

ACSI-CCCD APPLIED RESEARCH PROJECTS, 1982-93
APPLIED RESEARCH BY CCCD-SUPPORTED INVESTIGATORS

	PRINCIPAL INVESTIGATOR	SHORT TITLE	PROJECT TITLE	DATE COMPL	RESULTS	PUBLICATIONS AND STATUS
** CAR						
HIS	ENDSLEY, S	EARLY CHILDHOOD MORTALITY, BANGUI	EARLY CHILDHOOD MORTALITY AMONG WOMEN PRESENTING TO MATERNITIES IN BANGUI, CENTRAL AFRICAN REPUBLIC	1991	n=1562 0-2 mortality= 71.9/1000 (Brass), 68.3 (cohort life tables), May-Jul 89.	Presented at CCCD Swazi Consultative Mtg. 1990 [SWAZI CONF]
CDD	ENDSLEY/ OLIVOLA	HOME CASE MANAGEMENT STUDY, CAR	CASE CONTROL STUDY OF CHARACTERISTICS AND PRIOR Tx OF CHILDREN WITH DIARRHEA WITH AND WITHOUT DEHYDRATION.	1990	n=123 Less than 50% diarrh episodes txd at home. Maize based soln was used by 15% of families. Only 11% gave increased fluids. Use of SSS and antimicrobial drugs were both protective (OR=0.33 and 0.30).	See 90-91 Annual Rpt. "Intended for publicn" (10/91 update) [PRELIM REPORT]
HIS	FALKENBERG, G	PRECEEDING BIRTH TECHNIQUE, CAR	THE PRECEDING BIRTH TECHNIQUE AS A MEASURE OF CHILD MORTALITY IN URBAN CLINICS, BANGUI	1992	n=3180 mothers Among 3259 live-born children, 242 deaths reported (231 singleton deaths). Mortality= 74/1000. Median birth interval= 29 mos. Mortality was elevated at extremes of age and inversely associated with years of maternal schooling.	Manuscript in clearance. [MANUSCRIPT]
EPI	KAHN, JG	MISSED OPPORTUNITIES SURVEY - CAR	IMPROVING VACCINATION COVERAGE, POTENTIAL IMPACT OF AVOIDING MISSED OPPORTUNITIES, C.A.R.	1989	n=642 See Swazi Conf (ROUNGOU): "Taux d'abandon" of 40% (63% rural, 24% urban, 12% Bangui). Less than 5% children correctly vaccinated by 6 WHO criteria. Coverage could be raised 1-24% for various antigens by including all missed opportunities.	Cited in WHO/EPI/GEN/92.8 Also CCCD Swazi Conf 1990 MS in preparn. [SWAZI CONF]
CDD	KAHN/ ENDSLEY	EVALUATION OF CEREAL BASED ORT	RESULTATS PRELIMINAIRES DE L'ETUDES DES SOLUTIONS A BASE DE CEREALE POUR LA PREVENTION DE LA DESHYDRATION, R.C.A.	1992	"REPORT IN DRAFT" (OCT 91) "Bouillie de Mais" was preferred home tx. All solutions had low Na content (0.9-1.4 mEq/l) and low K+ (0.2-0.4 mEq).	Presented at Swazi Consultative Mtg. 1990 [SWAZI CONF]
CDD	KAHN/ ENDSLEY?	CLINICAL TRIAL OF ALTERNATIVE ORS SOLUTIONS	CLINICAL TRIAL OF STANDARD ORS VS. MAIZE-BASED ORT IN DIARRHEA TREATMENT, CAR.	1990	N=606 Standard preparation of ORS vs. Maize-based "bouillie", with and without added salt. ORS and bouillie WITH salt gained significantly more wgt. by D21. No significant difference in duration of diarrhea (p=0.19).	See 90-91 Annual report. [PRELIM REPORT]

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	PRINCIPAL INVESTIGATOR	SHORT TITLE	PROJECT TITLE	DATE COMPL	RESULTS	PUBLICATIONS AND STATUS
EPI	NAIMOLI, J?	FACILITY SURVEY - EPI, CAR	ASSESSMENT OF HEALTH WORKER PRACTICES FOR EPI, 1988-89 CAR	1989	See 89-90 Annl Rpt: 86 item checklist. n=35(pre) 33(post): Performance in patient ed. criteria was generally weakest. Substantive improvements in performance from 1988 to 89 noted.	See 89-90 Annual Rpt. [PRELIM REPORT]
MAL	NATL MAL COORDINATOR	RETROSPECTIVE REVIEW OF MALARIA AT CNHU, BANGUI	RETROSPECTIVE RECORD REVIEW OF MALARIA AT CTR NATIONAL HOSPITALIER UNIVERSITAIRE, CAR	1988	Substantive increase in #cases in 1988, peak in May-Jun. Increase in CFR from 87-89. Increase in all causes hospitalization. Malaria was #4 cause of hospitalization after malnutrn. GE, pneumonia.	[PRELIM REPORT]
HIS	NEDERLOF, K	PBT, CASTORS MATERNITY, BANGUI	PRECEDING BIRTH TECHNIQUE STUDY IN CASTORS MATERNITY - BANGUI, CAR, 1989	1989	n=1020 women Median birth interval= 27 months, PBT index =0.073, 0-2 mortality= 0.062 (life tables). Preliminary pilot study at one maternity clinic prior to 1991-92 study (see Falkenberg et al)	[FNL REPORT]
CDD	YAYA, M	FACILITY SURVEY OF CDD PRACTICES, CAR	L'EVALUATION DE LA PERFORMANCE DES AGENTS DE SANTE EN MATIERE DE LUTTE CONTRE LES MALADIES DIARRHEIQUES EN REPUBLIQUE CENTRAFRICAINE	1989	n=65 trainees, 144 infants 46 item standard checklist. 116 item CDD questionnaire. CDD trng manual produced Jun 90.	Presented at CCCD Swazi Consultative Mtg. 1990. [SWAZI CONF]
CDD	YAYA, M?	USE OF KULU GRUEL FOR DIARRHEA TX	ANTHROPOLOGICAL STUDY ON USE OF LOCAL FOODS FOR DIARRHEA TX	1989	Kulu (Koulou?), a maize based weaning food, was identified as possible fluid for cereal based ORS. Others: Corn and rice based gruels were preferred. Corn was more available than rice (79% vs 70%) and half the price (33CFA vs 60CFA for 80 gm).	Presented at CCCD Swazi Conf (YAYA et al) 1990 [PRELIM REPORT]

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** CONGO					
EPI DABIS, F	MATERNAL MEASLES ANTIBODY IN AFRICAN INFANTS	LOSS OF MATERNAL MEASLES ANTIBODY DURING INFANCY IN AN AFRICAN CITY	1987	n=252 Detectable antibody dropped from 96% @ 2 months to 49% @ 4 months, 8% @ 7-8 months. Decline of 4.7% per wk between 8 and 28 wks.	INTL J EPIDEMIOL 18:264-68 (1989) [PEER-REV JNL]
EPI DABIS, F	EPIDEMIOLOGY OF URBAN MEASLES, POINTE-NOIRE, CONGO	THE EPIDEMIOLOGY OF MEASLES IN A PARTIALLY VACCINATED POPULATION IN AN AFRICAN CITY: IMPLICATIONS FOR IMMUNIZATION PROGRAMS	1986	n=1942 cases From 1983 to 1985 there was a 49% decrease in attack rate for children 9-23 months and a 20% increase for children 5+ yrs. Children <9 mo increased from 13% to 17% of cases. Coverage =54%.	AM J EPIDEMIOL 127:171-8(1988) AM J EPIDEMIOL 132:193(1990) [Reply] [PEER-REV JNL]

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** GAMBIA					
EPI DEMING, M	CLINICAL EFFICACY OF OPV, GAMBIA	EPIDEMIC POLIOMYELITIS IN THE GAMBIA: II. CLINICAL EFFICACY OF TRIVALENT ORAL POLIO VACCI	1990	n=195 cases, 839 controls Vaccine efficacy of 3+ doses of OPV was 81% in children 1-2 yo (95% CI = 66-90). For all children, efficacy = 72% (CI = 57-82).	AM J EPIDEMIOL 135:393-408 (1992) [PEER-REV JNL]
EPI OTTEN, M	DESCRIPTIVE EPIDEMIOLOGY OF POLIO, GAMBIA	EPIDEMIC POLIOMYELITIS IN THE GAMBIA FOLLOWING THE CONTROL OF POLIOMYELITIS AS AN ENDEMIC DISEASE: I. DESCRIPTIVE FINDINGS	1988	n=305 cases (1986) National attack rate= 40/100,000 popln. For children 1 yo = 394/100,000. OPV3+ coverage = 64% (1-2 yo). 75% of cases in children <4 yo.	AM J EPIDEMIOL 135:381-92 (1992) [PEER-REV JNL]
EPI ROBERTSON, RL	COST EFFECTIVENESS OF IMMUNIZATION IN THE GAMBIA	COST-EFFECTIVENESS OF IMMUNIZATION IN THE GAMBIA	1985	Neonatal tetanus, measles and pertussis immunization appeared to be more cost effective than poliomyelitis or diptheria. Vaccines were 12% of total pgm costs, personnel = 45%, transport = 15%.	J TROP MED & HYGIENE 88:342-351 (1985) [PEER-REV JNL]
MAL WHITE, NJ	CHLOROQUINE TREATMENT OF SEVERE MALARIA IN CHILDREN	CHLOROQUINE TREATMENT OF SEVERE MALARIA IN CHILDREN	1985	n=58 CQ by IM or subQ administration produced high peak blood levels but transient hypotension in 5/18 pts. Intermittent IV infusion also produced wide fluctuations. CQ by NG tube was well absorbed, even in comatose pts.	NEJM 319:1493-1500 (1988) [PEER-REV JNL]
MAL WHITE, NJ	HYPOGLYCEMIA IN AFRICAN CHILDREN	HYPOGLYCEMIA IN AFRICAN CHILDREN WITH SEVERE MALARIA	1985	n=47 Prospective study of children with severe malaria - 15/47 developed hypoglycemia, of which 5 died (vs 1/32 normoglycemic). Plasma insulin was appropriately low, ketones high. Hypoglycemia was unrelated to antimalarial treatment.	LANCET i:708-711 (1987) [PEER-REV JNL]

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** GUINEA						
EPI	CUTTS, F	EPI PROGRAM EVALUATION IN GUINEA, 1988-89	APPLICATION OF MULTIPLE METHODS TO STUDY THE IMMUNIZATION PROGRAM IN AN URBAN AREA OF GUINEA	1989	MULTIPLE METHODS USED. Deficiencies in HCW practices demonstrated by both facility survey and household survey. Missed opportunities reduced vacc coverage almost 30%.	BULLETIN WHO 68:769-76 (1990) [PEER-REV JNL]
EPI	CUTTS, F	MISSED OPPORTUNITIES STUDIES, GUINEA	DETERMINANTS OF VACCINATION IN AN URBAN POPULATION IN CONAKRY, GUINEA	1989	n=377 PUBLISHED. Two articles on file, (one includes Mozambique): 19% of children with records had sufficient contacts to be completely vaccinated but 1 or more missed opportunities.	INT J EPIDEMIOL 20:1099-106 (1991) J TROP PEDIATRICS 37:153-8(1991) [PEER-REV JNL]
CDD	DABIS, F	IMPROPER TREATMENT FOR DIARRHEA TREATMENT, GUINEA	IMPROPER TREATMENT FOR DIARRHOEA TREATMENT IN AFRICA	1988	n=304 cases COMMUNITY SURVEY. Of 193 children txd at home, 80% given antidiarrheal drugs or antibiotics. Only 16% received ORT. Only 40% of ORT administered in adequate quantities.	TRANS ROYAL SOC TROP MED & HYGIENE 82:935-6 (1988) [PEER-REV JNL]
HSR	DABIS, F	MONITORING SELECTIVE COMPONENTS OF PHC, GUINEA	MONITORING SELECTIVE COMPONENTS OF PRIMARY HEALTH CARE: METHODOLOGY AND COMMUNITY ASSESSMENT OF VACCINATION, DIARRHEA AND MALARIA PRACTICES, CONAKRY	1988	n=1415 caretakers Full immunization coverage was <25%. Only 28% of measles immunizn received at appropriate age. Only 10% of children with diarrhea treated with ORS/SSS, 51% received antibiotics or antidiarrheal drugs.	BULLETIN WHO 67:675-84 (1989) Also CCCD Yamoussoukro Conf 1988. [PEER-REV JNL]
MAL	GLIK, D	MALARIA TREATMENT PRACTICES AMONG MOTHERS IN GUINEA	MALARIA TREATMENT PRACTICES AMONG MOTHERS IN GUINEA	1988	n=243 Access and availability factors were more important than knowledge or beliefs in seeking care for children with fever.	J HLTH SOC BEHAV 30:421-35 (1989) [PEER-REV JNL]
CDD	ROISIN AJ	REVIEW OF ORT CENTER ACTIVITIES, DONKA	RAPPORT SUR LES ACTIVITES MENEES AU CENTRE DE REHYDRATION DE L'HOPITAL DE DONKA, SEPT 1986 - JUL 1987, CONAKRY	1987	n=8051 20%=Plan B, 1.5%=Plan C. CFR = 1% (Plan B), 24% (Plan C). Of 218 hospitalized cases, 48% <1yo. Blood or mucus in stool = 16% of cases. 82% of cases received no antibiotic, 83% rec'd no antidiarrheal.	[FNL REPORT]
EPI	ROISIN, AJ	NEONATAL TETANUS, GUINEA	EPIDEMIOLOGY OF NEONATAL TETANUS, GUINEA	1987	n=154 hospital cases CFR=73%. Avg age on admission was 6.7 days. Incidence= 13.2/1000 for home delivery, 2.9 for maternity center (4.2/1000 all live births). Only 12% mothers had less than 3 prenatal visits. By records 39% mothers protected, by hx = 85%.	Presented at CCCD Yamoussoukro Conf 1988 [CONF PROCEEDNG]

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EPI	ROISIN, AJ	EVALUATION OF VACCINATION CAMPAIGN, CONAKRY	EVALUATION DES JOURNEES DE VACCINATION DE CONAKRY, NOVEMBRE 1986 - FEVRIER 1987	1987	For children 12-23 mo, coverage increased from 23% to 94% for DPT1, from 8% to 64% for DPT3 and from 16% to 81% for measles. 67% of measles vaccn. administered to children < 1yo was given too early (before 9mo), 10% of DPT1 also given too early.	[FNL REPORT]

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** KENYA						
MAL	BEACH, RF	KENYA BED-NET STUDY, PT II	EFFECTIVENESS OF PERMETHRIN IMPREGNATED BED-NETS AND CURTAINS FOR MALARIA CONTROL IN A HOLOENDEMIC AREA OF WESTERN KENYA	1991	COMMUNITY STUDY P Falcip prevalence was lower in bed net and curtain groups than controls. Also lower incidence of P falcip infections, parasitemia >2,500, documented fevers, and entomological inoculation rates.	AM J TROP MED & HYGIENE. In press. [PEER-REV JNL]
EPI	KENYA, PR	RETROSPECTIVE MEASLES STUDY	A RETROSPECTIVE STUDY OF MEASLES IN KAKAMEGA DISTRICT, KENYA 1985	1986	n=982 (0-59mo) RETROSPECTIVE SURVEY: 13.5% gave hx of measles. Median age= 9mo, Vaccn coverage= 32% (Starting @ 8 mo). Coverage increased with age. No cases below 8 mo reported. HAI antibodies suggest mothers' hx was accurate.	[FNL REPORT]
CDD	KINOTI, SN	MAIZE-BASED ORS EFFICACY	A COMPARISON OF THE EFFICACY OF MAIZE-BASED ORS AND STANDARD WHO ORS IN THE TREATMENT OF ACUTE CHILDHOOD DIARRHOEA AT KENYATTA NATIONAL HOSPITAL	1985	Two concns. of maize soln: 50gm/L (n=18), 25gm/L (n=18) vs. WHO ORS (n=33). No significant difference in ORS consumption, stool output, time to hydration, wgt gain, serum Na, K+ or Hct, or plasma specific gravity.	[FNL REPORT]
EPI	MUTIE, DM	NEONATAL TETANUS MORTALITY	MORTALITY FROM NEONATAL TETANUS IN KENYA: A COMPARISON OF TWO DIFFERENT SURVEY METHODS	1986	Compare house to house cluster survey (mort=38/1000, n=1547) vs. recall interview of ANC attendees (mort=16/1000). Much lower rate at ANC suggested sample may not represent general population, or interview method inadequate.	MELGAARD et al: INT J EPI 17:174 (1988) E AFR MED J 64:458 (1987) [PEER-REV JNL]
MAL	PERTET, A	MALARIA PROPHYLAXIS AND BWT	MALARIA PROPHYLAXIS AND ITS EFFECT ON BIRTHWEIGHT, GROWTH, AND HEMOGLOBIN STATUS OF INFANTS	1986	DOUBLE-BLIND STUDY: CQ (n=131) vs placebo (n=127). Mean bwt significantly higher for tx in 2nd trimester (3059 vs 2833, p=0.03). Percentage LBW was signiticantly different, % preterms not signif different but higher in controls. Approx 20-25% missing bwt	[FNL REPORT]
MAL	SEXTON, J	MALARIA BEDNET STUDY, KENYA	PERMETHRIN-IMPREGNATED CURTAINS AND BED NETS FOR MALARIA PREVENTION IN WESTERN KENYA	1988	n=105 families P falcip infections, clinical malaria, and indoor resting A gambiae/A funestus levels were higher in control group than curtain or bed net group. See Swazi Conf for impact.	AM J TROP MED HYGIENE 43:11-18 (1990) Presented at CCCD Swazi Conf. [PEER-REV JNL]

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MAL	VULULE, JM	REDUCED PERMETHRIN SUSCEPTIBILITY IN KENYA	REDUCED SUSCEPTIBILITY OF ANOPHELES GAMBIAE TO PERMETHRIN ASSOCIATED WITH THE USE OF PERMETHRIN IMPREGNATED BED-NETS AND CURTAINS IN KENYA	1990	Reduced susceptibility of An gambiae by LT50 was seen in intervention villages when compared to controls. LT50 was increased 2.5 times @ 1 yr.	Submitted for publicn to J MED ENTOMOL. [SUBMITTED PUBL]

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** LESOTHO						
OTH	BENNETT, S	UNIT COST STUDY, LESOTHO	UNIT COST STUDY OF EPI AND CDD SERVICES IN LESOTHO	1989	For CDD pgm, minimum cost per child txd was obtained for clinics with 300+ treated per year. Vaccines = 14% of EPI pgm costs, drugs = 13% of CDD pgm costs. Personnel = 38-40% pgm costs.	[FNL REPORT]
HIS	DIMMOCK, F	EARLY CHILDHOOD MORTALITY BY PRECEEDING BIRTH	EARLY CHILDHOOD MORTALITY STUDY IN LESOTHO, USING THE PRECEEDING BIRTH TECHNIQUE	1991	n=8764 records Not a population representative sample. Avg birth interval estimated @ 30 months. Early childhood mortality crude rate = 65/1000, highest for women 15-20 yo (170/1000) and 20-25 yo (73/1000).	[FNL REPORT]
CDD	GRIFFIN, P	FACTORS FOR CHILDHOOD DIARRHEA MORTALITY	FACTORS CONTRIBUTING TO CHILDHOOD MORTALITY DUE TO DIARRHEAL DISEASES IN HOSPITALS IN LESOTHO, 1983 AND 1984	1987	n=109 RETROSPECTIVE REVIEW of 2233 admissions to 6 hospitals. 50% deaths were 1-7 mo old. 70% txd with IV, 30% ORT, 78% received antibiotics. Significant risk factors for death = major infection, age <6 mo, or illness >7 days prior to admission.	AM J EPIDEMIOL 128:1322 (1988) [PEER-REV JNL]
CDD	HATCH, D	IMPACT OF QEII ORT UNIT ON DIARRHEAL Dx, LESOTHO	THE EFFECTIVE CASE MANAGEMENT OF CHILDHOOD DIARRHOEA WITH ORT IN THE KINGDOM OF LESOTHO.	1987	Pediatric admissions decreased from 388 to 230 after ORTU opened. Only 24% of addmissions were from ORTU. CFR declined from 1.4% to 0% for children txd in ORTU. Delay in seeking care associated with increased risk of tx failure.	INTL J EPI 19(4):1066-71 (1990) [PEER-REV JNL]
EPI	KARENZI, D	MEASLES OUTBREAK IN MAFETENG HSA	INVESTIGATION AND CONTROL OF MEASLES OUTBREAK IN MAFETENG HSA	1990	REPORT ON FILE? Is this same as serosurvey of schoolchildren (n=610, 89-90 Ann Rpt p91)? Of first year schoolchildren in 60 primary schools, 13.6% were seronegative and susceptible to measles.	[?]
CDD	MCFARLAND, D	COST ANALYSIS OF DIARRHEA Tx, LESOTHO	COST EFFECTIVENESS ANALYSIS OF ORAL REHYDRATION THERAPY AT QEII HOSPITAL, MASERU, LESOTHO	1987	Only 6.2% of children with diarrhea were txd as inpatients in 1987 (vs 12.4% in 1985, prior to ORTU). Estimated cost savings to hospital from decreased admissions was US $15,000.	WKLY EPIDEM REC 38:275-79 (1990) [PEER-REV JNL]

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EPI	OLTHOF, B	QUACHAS NEK IMMUNIZATION COVERAGE SURVEY	QUACHAS NEK HSA IMMUNIZATION COVERAGE SURVEY	1989	Cited in Lesotho listing 16 May 1991	[?]
EPI	QEII HSA TEAM	QEII IMMUNIZATION COVERAGE SURVEY	QUEEN ELIZABETH II HSA IMMUNIZATION COVERAGE SURVEY	1988	Cited in Lesotho list 16 May 1991	[?]
ARI	REDD, S	PREDICTORS OF PNEUMONIA IN CHILDREN, LESOTHO	SIGNS AND SYMPTOMS WHICH PREDICT PNEUMONIA IN CHILDREN AT QEII HOSPITAL IN LESOTHO	1989	n=393 Cited in Lesotho listing 16 May 1991. Elevated respiratory rate was the most sensitive predictor for radiographic evidence of pneumonia. However, sensitivity varied with age. Same as 1AR88 "ARI Case Defintion"?	Cited in GOVE S et al: LANCET 338:1453 (1991) [FNL REPORT]
ARI	REDD, S	DIAGNOSIS AND MANAGEMENT OF ARI, LESOTHO	DAIGNOSIS AND MANAGEMENT OF ACUTE RESPIRATORY INFECTION IN LESOTHO	1989	n=11 physicians, 12 nurses, 44 nurse clinicians. Only 17% recommended antimicrobials for moderate ALRI. Cinician agreement on signs/symptoms was generally good. Preferred antibiotic = penicillin (mild/mod), ampicilin (severe). Same study as 2AR88?	HEALTH POLICY AND PLANNING 5:255-60 (1990) [PEER-REV JNL]
ARI	REDD/WILSON	PILOT INTERVENTION FOR ARI - LESOTHO	PILOT INTERVENTION FOR ARI - LESOTHO		Cited in Lesotho listing (22.2AR89). Status?	[?]
EPI	ROSENBLUM, L	EPIDEMIOLOGY OF MEASLES IN LESOTHO	DESCRIPTIVE STUDY OF THE EPIDEMIOLOGY OF MEASLES IN LESOTHO	1986	Reported in Lesotho list 16 May 1991. Measles incidence decreased from 40-50/10,000 in 1981-85 to 7.7% in 1989, 50% of cases occurred in school-aged children.	[?]
EPI	VORISEK, J	MANTSONYANE HSA COVERAGE SURVEY	MANTSONYANE HSA IMMUNIZATION COVERAGE SURVEY	1987	Cited in Lesotho list 16 May 1991.	[?]
ARI	WILSON, R	MOTHERS' PERCEPTION OF ALRI, LESOTHO	ACUTE RESPIRATORY INFECTIONS IN LESOTHO: THE KNOWLEDGE, BELIEFS, AND BEHAVIORS AMONG CARETAKERS OF CHILDREN UNDER THE AGE OF FIVE	1990	Qualitative rapid assessment methods and quantitative survey. Widespread acceptance and use of health care system was demonstrated. Common practices included binding child's chest with strips of cloth and increase or decrease amount of clothing.	GADOMSKI A ed: ALRI AND CHILD SURVIVAL IN DEVELOPING COUNTRIES, 1990 [CONF PROCEEDNG]
ARI	WILSON, R	RAPID ASSESSMENT PROCEDURES FOR ARI CONTROL, LESOTHO	RAPID ASSESSMENT PROCEDURES IN THE EARLY PLANNING FOR CONTROL OF PEDIATRIC ACUTE RESPIRATORY INFECTIONS, LESOTHO 1989	1989	PUBLISHED (Book chapter) Exploration (using RAP) of illness terms related to general childhood illness, breathing difficulty, categories of severity, narratives of ARI-related illness and suggestions for appropriate health	SCRIMSHAW and GLEASON: RAPID ASSESSMENT METHODOLOGIES, UNESCO 1992. [NON-PEER REV]

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** LIBERIA						
HIS	BECKER, S	MUHS 1988 FOLLOW-UP MORTALITY SURVEY, LIBERIA	INFANT AND CHILD MORTALITY IN TWO COUNTIES OF LIBERIA: RESULTS OF A SURVEY IN 1988 AND TRENDS SINCE 1984	1988	n=2385 women 25% decline in IMR using adjusted rates (240 to 181/1000). Under-5 mortality declined 21%. Unadjusted rates showed no clear decline.	INT J EPIDEMIOL 22(S1):S56-S63 (1993) [PEER-REV JNL]
HIS	BECKER, S	MUHS BASELINE SURVEY, LIBERIA 1984	INFANT AND CHILD MORTALITY ESTIMATES IN TWO COUNTIES OF LIBERIA: 1984	1984	n=3337 women (636 in reinterview survey). About 20% of infants born alive died in first year of life and only 70% survived to 5th birthday. Greater under-reporting of deaths than births was seen in both 1984 surveys.	INT J EPIDEMIOL 22(S1):S42-S49 (1993) [PEER-REV JNL]
HIS	FOSTER, SO	MUHS FOLLOW-UP SURVEY IN LIBERIA, 1988	IMMUNIZATION, ORT AND MALARIA CHEMOTHERAPY IN UNDER-FIVE CHILDREN IN BOMI AND GRAND CAPE MOUNT COUNTIES, LIBERIA 1984 AND 1988	1988	n=3337 women Immunization rates increased for all antigens but none exceeded 60% coverage. Immunization days accounted for 27% of DPT3 and 36% of all measles vaccinations. ORS/SSS use remained low (<36%).	INT J EPIDEMIOL 22(S1):S50-S55 (1993) [PEER-REV JNL]
CDD	HOGE, M	ASSESSMENT OF ORT TRAINING, LIBERIA	ASSESSMENT OF TRAINING IN ORT IN LIBERIA, 1988.	1988	n=149, 45 HCWs ORS was NOT given in 30% of diarrhea cases. 83% of HCWs knew signs of dehydrn and correct OR preparation.	Presented at CCCD Yamoussoukro Conf 1988 [CONF PROCEEDNG]
EPI	MACAULEY, R	EPI REASONS FOR DROPOUT	IMMUNIZATION DROP OUTS AND MATERNAL BEHAVIOR: EVALUATION OF REASONS GIVEN AND STRATEGIES FOR MAINTAINING GAINS MADE IN THE NATIONAL CAMPAIGN, LIBERIA	1988	n=242 Mothers' main reasons for non-return were: sore/abscess, fever, "sick after", cost, or "not told." Health worker reasons were: "lack of knowledge," poor service delivery, vaccine side-effects, and failures of health personnel.	BENDER D, MACAULEY RJ: INT Q COMM HLTH ED 9:283 (1988-89) [PEER-REV JNL]
OTH	MCFARLAND, D	ROF COST STUDY, LIBERIA	A REVIEW OF HEALTH FINANCING SYSTEMS IN LIBERIA (WITH EMPHASIS ON REVOLVING DRUG FUND AND FEE FOR SERVICE)	1990	Study demonstrated substantial "willingness to pay" if drugs are available. Problems included supervision, drug availability, and price fluctuation. Revenues were generally adequate to cover limited recurrent costs, excluding salaries.	Presented at CCCD Swazi Consultative Mtg. 1990 [SUBMITTED PUBL]
CCD	MOMOLU, M	DIARRHEA & MALARIA SURVEY, BOMI COUNTY	HOUSEHOLD DIARRHEA AND MALARIA SURVEY IN TWO TOWNS OF BOMI COUNTY, LIBERIA	1987	n=106 Non-random sample. One third gave hx of diarrhea in prior month, 9% received ORS, 65% received "tablets", 55% gave hx of fever 2wks prior to study, 48% received "some" (0, 7% were tvd at home	[PRELIM REPORT]

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** MALAWI						
MAL	BLOLAND, P	COTRIMAZOLE Tx OF FEBRILE ILLNESS	CO-TRIMOXAZOLE FOR CHILDHOOD FEBRILE ILLNESS IN MALARIA ENDEMIC REGIONS	1990?	n=46 children Children with parasitemia plus clinical ALRI treated with cotrimoxazole 20mg/kg. Parasitemia abolished in all of 44 by D14. Mean clearance time 2.7days. 28% patients met both definitions (ALRI & malaria).	LANCET 337:518-20 (1991) [PEER-REV JNL]
MAL	BLOLAND, P	MORTALITY IN A PROSPECTIVE COHORT, MALAWI	MORTALITY IN A PROSPECTIVE COHORT OF NEWBORNS IN MALAWI, 1987-90	1990	n=3770 live births 19.2% mortality. NNMR=44/1000, IMR=151/1000. Lead causes= diarrhea (30%), fever (17%), pneum (11%), measles (10%). LBW most important factor for mortality.	ABSTRACT: 92 EIS Conf. [CONF PROCEEDNG]
MAL	BLOLAND, PB	HEMATOLOGIC RESPONSE OF CQ VS. P/S, MALAWI	BEYOND CHLOROQUINE: IMPLICATIONS OF DRUG RESISTANCE FOR EVALUATING MALARIA THERAPY EFFICACY AND TREATMENT POLICY IN AFRICA	1990	Two sites: Malawi and Kenya. Tx with CQ failed to produce durable clinical improvement of hematologic recovery. Children txd with pyrimethamine-sulphadoxine maintained clinical improvement, and had greater increase in Hgb.	J INFEC DIS 167:932-7 (1993) [PEER-REV JNL]
MAL	ETTLING, M	ECONOMIC IMPACT OF MALARIA - HOUSEHOLDS, MALAWI	ECONOMIC IMPACT OF MALARIA, FOCUS ON THE HOUSEHOLD, MALAWI	1992	n=1531 h/holds Only 10% h/holds spent on preventive measures. Very low income h/holds spent US$ 19.13 or 28% of annual income on tx measures, other households spent 2% (or $19.94).	Manuscript submitted for publicn [MANUSCRIPT]
MAL	HELITZER-ALLEN, D	MALARIA PROPHYLAXIS IN PREGNANCY - INTERVENTION STUDY	MALARIA CHEMOPROPHYLAXIS COMPLIANCE IN PREGNANT WOMEN: FACTORS INFLUENCING UTILIZATION AND A COST-EFFECTIVENESS ANALYSIS OF ALTERNATIVE INTERVENTIONS	1988	Improved health education and coated CQ tablets both improved compliance with antenatal CQ chemoprophylaxis. Combined strategy was less cost-effective than either intervention separately.	SOC SCI MED 36:403-407 (1993) [PEER-REV JNL]
MAL	HELITZER-ALLEN, D	COMMUNITY INTERVENTION IN MALARIA, MALAWI (TBA STUDY)	FEASIBILITY, ACCEPTABILITY AND COST OF PROVIDING CHLOROQUINE THROUGH TRADITIONAL HEALTH WORKERS IN MALAWI	1987	INTERVENTION STUDY in 18 of 47 villages. 58% of all mothers consulted TBAs. Mothers' recall of Tx instructions was better with TBAs. Estimated cost $20.52 to train one TBA. Mothers used health facilities less when trained TBAs available (29% vs. 81%).	Presented at CCCD Yamoussoukro Conf 1988 (MSACHI) HCOM rpt on file [FNL REPORT]

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CDD	HELITZER-ALLEN, D	FORMATIVE RESEARCH ON DIARRHEA	FORMATIVE RESEARCH ON DIARRHEA, MALAWI	1987	Focus groups and questionnaire showed mothers had low opinion of SSS. Most mothers wanted tx to stop diarrhea, and had little appreciation of dehydration risks.	[FNL REPORT]
MAL	HELITZER-ALLEN, D	CHEMOPROPHYLAXIS DURING PREGNANCY, MALAWI	EXPLAINING DIFFERENCES BETWEEN QUALITATIVE AND QUANTITATIVE DATA: A STUDY OF CHEMOPROPHYLAXIS DURING PREGNANCY	1988	Clinic study and community survey. Of 265 ANC pts, 49% claimed to take CQ, 31% confirmed by urine testing. Self-reported symptoms were not reliable predictor of parasitemia. Low compliance "undoubtedly" due to reluctance to ingest bitter meds during preg	HLTH ED QUARTERLY 19:41-54 (1992) [PEER-REV JNL]
MAL	HEYMANN, D	HOME PRACTICES FOR FEVER AND MALARIA, SALIMA	PRACTICES FOR RECENT EPISODE OF FEVER/MALARIA AND PARASITE PREVALENCE IN UNDER-FIVES, SALIMA DISTRICT	1987	n=526 SEE LINE LISTING FIELD EPIDEM RPT.	[PRELIM REPORT]
MAL	HEYMANN, D	PEDIATRIC RECORD REVIEW, KAMUZU HOSPITAL 1980-86	PEDIATRIC INPATIENT RECORD REVIEW FOR MALARIA, 1980-86, KAMUZU CENTRAL HOSPITAL, LILONGWE, MALAWI	1987	PRELIM REPORT ON FILE. Rate of malaria admissions in 0-5 yo increased from 8-15% of admissions prior to 1983, to 27-31% (1983-85). Cerebral malaria was 8-16% of cases. Transfusions increased from 20-30% to 37-46%. Increases attributed to increased CRPF.	Presented at CCCD Yamoussoukro Conf 1988 [PRELIM REPORT]
MAL	HEYMANN, D	FOCUS GROUP STUDY OF ANC WOMEN RE: CQ PROPHYLAXIS	FOCUS GROUPS TO DETERMINE USES OF CHLOROQUINE PROVIDED TO PREGNANT WOMEN IN ANC CLINICS	1987	SEE FLD EPIDEMIOLOGISTS RPT 86. Also HCOM report MAR 31, 1988. Results: see HELITZER-ALLEN (1992).	[PRELIM REPORT]
EPI	HEYMANN, D	MEASLES EPIDEMIOLOGY	RECORD REVIEW, CHILDREN WITH MEASLES: DESCRIPTIVE EPIDEMIOLOGY AND RISK FACTORS	1987	SEE FIELD EPIDEMIOLOGIST'S LISTING.	[PRELIM REPORT?]
HIS	HEYMANN, D	PRACTICES PRIOR TO ARRIVAL AT OUTPATIENT FACILITIES	MONITORING COMMUNITY PRACTICES FOR MALARIA AND DIARRHEAL DISEASES AT FIXED HEALTH FACILITIES	1987	FINAL REPORT ON FILE. n=12 sentinel facilities, 58,563 visits. Sentinel reporting did not accurately correlate with community surveys. Data from individual sites did reflect practices in vicinity of site.	[FNL REPORT]

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MAL	HEYMANN, D	HEALTH FACILITY PRACTICE SURVEY	HEALTH FACILITY PRACTICE SURVEY FOR FEVER/MALARIA	1986	n=234 See 86 FLD EPI REPORT. Of children with fever, 59% txd with CQ, 38% with aspirin at health facility.	[PRELIM REPORT]
MAL	HEYMANN, DL	ANTENATAL CQ PROPHYLAXIS IN MALAWI	ANTENATAL CHLOROQUINE CHEMOPROPHYLAXIS IN MALAWI: CHLOROQUINE RESISTANCE, COMPLIANCE, PROTECTIVE EFFICACY AND COST	1988	n=642 Only 36% of ANC patients had urine CQ metabolites. Of 288 women under supervised CQ prophylaxis, 37% had parasites after 4 wks (vs 48% without CQ). Protective efficacy of CQ was only 8%.	TRANS ROY SOC TROP MED & HYGIENE 84:496-8 (1990) [PEER-REV JNL]
CDD	HEYMANN, DL	ORT IN MALAWI: IMPACT AND COST	ORT IN MALAWI: IMPACT ON HOSPITAL ADMISSIONS, HOSPITAL TREATMENT PRACTICES, SEVERITY OF DISEASE AND HOSPITAL RECURRENT COSTS	1987	n=3495 records Study showed 50% decrease in diarrhea admissions, 56% decrease in IV fluid use, threefold increase in exclusive use of ORS, and 32% decrease in hospital recurrent costs.	BULLETIN WHO 68:193-97 (1990) Also CCCD Yamoussoukro Conf 1988 [PEER-REV JNL]
MAL	HEYMANN, DL	ALTERNATIVE THERAPIES FOR P FALCIPUM, MALAWI	COMPARATIVE EFFICACY OF ALTERNATIVE PRIMARY THERAPIES FOR P FALCIPARUM INFECTIONS IN MALAWI	1986	Therapy success was greater for amodiaquine 10 mg/kg (90%), AQ25 (97%) and pyrimeth-sulphadoxine (100%), than for CQ25 (59%). Same as WIRIMA study?	TRANS ROY SOC TROP MED & HYGIENE 81:722-4 (1987) [PEER-REV JNL]
CDD	KALILANI, JA	NA CONCENTRATION OF SSS, MALAWI	NA CONCENTRATION OF SSS MIXED IN OUTPATIENT FACILITIES, MALAWI	1986	n=271 SEE FLD EPI REPORT, 1986. Of 138 women (51%) who said they previously used SSS, 20% mixed a solution with Na+ concentration of 80-110 meq/L, 50% had Na+ concn greater than 110 meq/L.	[PRELIM REPORT]
MAL	KHOROMANA, C	RE-EVALUATION OF CQ RESISTANCE AT KARONGA, 1986	REPEAT CHLOROQUINE RESISTANCE TESTING AT KARONGA SENTINEL SITE AFTER 36 MONTHS, DECEMBER 1986	1986	n=53 SEE FLD EPI REPORT, 1986. Failure to clear parasites by D2 seen in 21% of children (vs 11% in 1984), 56% had parasites at D7 (vs 58% in 1984).	[PRELIM REPORT]
MAL	KHOROMANA, CO	DRUG THERAPY OF CQ-RESISTANT MALARIA, MALAWI	IN-VIVO ASSESSMENT OF EFFICACY OF CHLOROQUINE TREATMENT FOR P FALCIPARUM IN MALAWIAN CHILDREN UNDER FIVE	1984	n=224 Based on 7D in vivo test in 6 regions. Parasitologic failure rates were 41-65% with CQ25. However, only 8% with positive parasites on D7 were febrile or ill. Results used in Natl Malaria Policy.	AM J TROP MED HYG 35:465 (1986) Also CCCD Yamoussouk p43 for impact [PEER-REV JNL]

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MAL	KHOROMANA, CO	SULPHADOXINE-PYRIMETHAMINE EFFICACY STUDY	PRELIMINARY REPORT ON SULPHADOXINE-PYRIMETHAMINE (FANSIDAR) EFFICACY STUDY IN MZUZU	1986	PRELIM RPT: N=40, 38 treated with pyrimeth-sulphadoxine (Fansidar). No resistance, no recrudescence at D7 and D14. Results used in N&tl Malaria Policy.	[PRELIM REPORT]
MAL	MACHESO, A	PARASITEMIA PREVALENCE IN CINICAL MALARIA	PARASITEMIA AMONG CHILDREN WITH SIGNS/SYMPTOMS RECOGNIZED AS MALARIA BY CLINICAL OFFICER	1986	n=122 SEE FLD EPIDEMIOLOGIST'S REPORT 86. Only 39% of children with fever and 39% classified as "ill-looking" had parasites.	[PRELIM REPORT]
MAL	MACHESO, A	IMPACT OF CQ RESISTANT MALARIA, MALAWI	IMPACT OF CQ RESISTANT P FALCIPARUM ON HOSPITAL ADMISSIONS, TREATMENT PRACTICES AND COSTS	1987	n=8454. RECORD REVIEW. From 83-85 admission rate for malaria was 2 1/2 times preceding 3 years. CFR was 2-3%. Transfusions increased from 28% to 46% of cases in 1985. Cost increases for hospitalization and meds increased threefold.	Presented at CCCD Yamoussoukro Conf 1988 [CONF PROCEEDNG]
CDD	MALENGA, G	KAP IN CHILDHOOD DIARRHEA, MULANJE	A STUDY OF KNOWLEDGE ATTITUDES AND PRACTICES CONCERNING CHILDHOOD DIARRHOEA AND DEHYDRATION IN MULANJE DISTRICT, MALAWI	1986	n=896, 90 villages 24% gave hx of diarrhea in past 2 wks. 97% know signs, 29% know association with food/water. 95% knew of SSS, only 14% knew correct formula. Salt available in 79% of homes, sugar in 28%.	[FNL REPORT]
MAL	MCDERMOTT, JM	EFFICACY OF CQ PROPHYLAXIS IN PREGNANCY, MALAWI	EFFICACY OF CHEMOPROPHYLAXIS IN PREVENTING P FALCIPARUM PARASITEMIA AND PLACENTAL INFECTION IN PREGNANT WOMEN IN MALAWI	1987	n=73 Of 73 pregnant women, 25% became parasitemic on prophylaxis and 56% had evidence of placental infection at delivery. Few women with parasitemia had any signs or symptoms of fever or malaria.	TRANS ROY SOC TROP MED & HYGIENE 82:520-3 (1988) [PEER-REV JNL]
MAL	NGUYEN-DINH, P	RAPID POSTPARTUM CLEARANCE OF P FALCIPARUM	RAPID SPONTANEOUS POST-PARTUM CLEARANCE OF P FALCIPARUM PARASITEMIA IN AFRICAN WOMEN	1987?	Two sites (Malawi & Zaire). In Malawi, 35/43 parasitemic women (81%) spontaneously cleared parasites within 24 hrs after delivery, 3 more were cleared by 48 hrs. In Kinshasa, 15/17 cleared parasites within 24 hrs.	LANCET 2(8613):751-2 (1988) [PEER-REV JNL]
CDD	NYASULU, Y	HEALTH IMPACT WATER/SANITATION PROJECT, CHINGALE	EVALUATION OF THE HEALTH AND SOCIAL IMPACT OF A WATER AND SANITATION PROJECT IN ZOMBA, CHINGALE	1987	n=168 water samples Coliforms: spring <well <river, and dry season <wet. Water source was not significantly associated with frequency of diarrhea. However, populn/household density WAS strongly associated with diarrhea frequency.	[FNL REPORT]

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MAL	PAPPAIOANOU, M	CLINICAL RESPONSE TO CQ25 VS SP25	CLINICAL AND PARASITOLOGIC RESPONSE TO CHLOROQUINE 25mg/kg COMPARED TO FANSIDAR 25mg/kg SULFA	1986	n=117(CQ25), 40(P/S) Of 117 children, 77% afebrile on D7 with CQ25 vs 90% with pyrimeth-sulphadoxine. At D14, 80% afebrile with CQ25, 89% with P/S.	[MANUSCRIPT]
MAL	PAPPAIOANOU, M	CLINICAL RESPONSE INDICATORS IN MALARIA	INDICATORS FOR USE IN DETERMINING CLINICAL RESPONSE DURING IN VIVO RESISTANCE TESTING OF PLASMODIUM FALCIPARUM INFECTIONS AMONG MALAWIAN CHILDREN	1985	n=94 Study to develop clinical indicators for malaria treatment success/failure, using factor analysis of 12 clinical signs and symptoms. Unpublished study.	[FNL REPORT]
ARI	REDD, S	MALARIA AND ALRI - MALAWI	USEFULNESS OF CLINICAL CASE DEFINITIONS IN GUIDING THERAPY FOR AFRICAN CHILDREN WITH MALARIA OR PNEUMONIA	1990	n=1599 Fever only was seen in 31%, cough only = 15%, fever and cough = 54%. Although 89% had clinical diagnosis of malaria, only 35% had lab confirmation of parasitemia.	LANCET 340:1140-3 (1992) [PEER-REV JNL]
MAL	SHULTZ, L	PYRIMETHAMINE/ SULPHADOXINE EFFICACY IN PREGNANCY	MONITORING THE EFFECTS OF SULFADOXINE/ PYRIMETHAMINE (FANSIDAR) IN PREGNANCY, MALAWI	1992?	Two doses sulfadoxine/ pyrimethamine had lower placental infection (9%) vs. single treatment dose of SP followed by CQ (27%), or CQ tx plus weekly CQ (35%). Estim cost SP=$8300 vs $7100 SP/CQ and $3400 wkly CQ.	? [FNL REPORT?]
MAL	SLUTSKER, LM	MEFLOQUINE THERAPY FOR P FALCIPARUM, MALAWI	MEFLOQUINE THERAPY FOR P FALCIPARUM MALARIA IN CHILDREN UNDER 5 IN MALAWI: IN VIVO/ IN VITRO EFFICACY - CORRELATION OF DRUG CONCENTRATION WITH OUTCOME	1988	n=121 Of 56 children given MQ25, failure rates were 15% @ D7, 18% @ D14, 42% @ D28. MQ15 failure rates did not differ significantly. Vomiting was frequent and was associated with low MQ concentration at D2.	BULLETIN WHO 68:53-59 (1990) [PEER-REV JNL]
MAL	STEKETEE, R	MANGOCHI MALARIA RESEARCH PROJECT	PROSPECTIVE STUDY OF MALARIA AND PREGNANCY OUTCOME IN MALAWI: MANGOCHI MALARIA RESEARCH PROJECT	1990	n=4200 women At delivery 42% placental parasites with CQ vs. <10% with mefloquine. Incidence LBW reduced in MQ group for 1st and 2nd pregnancies. LBW was due to both IUGR and prematurity. NMR for prematurity was 245/1000, for IUGR 52/1000.	See 90-91 annual report. [FNL REPORT?]
MAL	STEKETEE, R	ALTERNATIVE ANTIMALARIAL TESTING IN PREGNANCY, MALAWI	CHLOROQUINE, AMODIAQUINE AND FANSIDAR RESISTANCE AMONG PREGNANT WOMEN, MALAWI	1986	n=95 Of 33 pregnant women txd with CQ25, 21% failure @ D7, vs 4% for AQ (n=24), 0% for P/S (n=38). At D14 resistance to CQ25 = 25% (vs 5% AQ, 0% P/S).	[PRELIM REPORT]

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MAL	VOIGT, A	NATIONAL JOB PERFORMANCE SURVEY, MALAWI	HEALTH FACILITY SURVEY TO EVALUATE POST-TRAINING PERFORMANCE IN CDD AND MALARIA CONTROL	1986	n=204 children SEE 86 FLD EPI RPT: 70% cases given ORS, only 4% adequate amount. CQ prescribed for 90% malaria cases only 20% correct dosage. Used in development of HCW training.	[PRELIM REPORT]
MAL	WIRIMA, JJ	EFFICACY OF QUININE IN HOSPITALIZED CHILDREN	IN VIVO EFFICACY OF QUININE TREATMENT FOR P. FALCIPARUM IN MALAWIAN CHILDREN	1986	n=37 One patient failed to clear parasites after 8D tx with Quinine (30 mg/kg), 2/18 discharged with no further meds showed recrudescence at D15, 0/18 recrudescence with single dose pyrimeth/sulph.	ANNALS TROP MED PARASITOL 84:223-7 (1990) [PEER-REV JNL]
MAL	WIRIMA, JJ	ANTIMALARIAL DRUGS EVALUATION, MALAWI 1985	COMPARATIVE EFFICACY OF ALTERNATIVE PRIMARY THERAPIES FOR CHLOROQUINE RESISTANT PLASMODIUM FALCIPARUM MALARIA IN MALAWI	1985	n=152 Modified 7-day in vivo test. Success rates = 90% with Amodiaquine 10 mg/kg, vs 97% with A925, vs 100% with pyrimeth/sulph.	HEYMANN DL et al: TRANS R SOC TROP MED & HYG 81:722 (1987) [PEER-REV JNL]
MAL	YAMADA, M	P FALCIPARUM PLACENTAL PATHOLOGY	P FALCIPARUM ASSOCIATED PLACENTAL PATHOLOGY: A LIGHT AND ELECTRON MICROSCOPIC AND IMMUNOHISTOLOGIC STUDY	1989	n=20 Offshoot of Malawi Preg Study. Severity of placental changes appeared to correlate with level of maternal and placental parasites, irrespective of infant bwt or placental wgt. Support= USAID DPE-0453-A-00-4027.	AM J TROP MED & HYGIENE 41:161-8 (1989) [PEER-REV JNL]

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** NIGERIA						
NUT	ABOSEDE, OA	COMMUNITY BASED NUTRITION INTERVENTION	DETERMINATION OF AN APPROPRIATE COMMUNITY-BASED NUTRITION INTERVENTION FOR A FISHING AND FARMING COMMUITY IN NIGERIA		AWAITING FUNDS	[IN PROGRESS]
MAL	ABUBAKAR, D	MALARIA MORBIDITY, MORTALITY IN KATSINA STATE	MALARIA MORBIDITY AND MORTALITY PATTERN IN CHILDREN 0-5 YEARS OLD IN DUTSIN-MA LGA, KATSINA STATE	1990	n=150 Only 7% related fever to mosquitoes. 44% sought tx at health facility. 17% chemist, 12% tradl. medicine. Most sought care within 48 hrs. Main reason for insecticide use is nuisance control, not disease prevention.	[PRELIM REPORT]
EPI	ADIGUN, IO	KAP FOR EPI PROMOTION, OYO STATE	FORMATIVE RESEARCH ON KNOWLEDGE, ATTITUDES, PRACTICES AND MEDIA HABITS RELATED TO EPI IN OYO STATE, NIGERIA	1989	FOCUS GPS, INTERVIEWS & SURVEY: 85% of respondents recognize signs/symptoms of EPI diseases, 93% had immunized chldrn, 73% "fully". 99% had access to radio but preferred info source was health staff. Main complaints were waiting time and repeat visits.	[FNL REPORT]
CDD	AKINFELEYE, RA	KAP IN ORT, LAGOS STATE	COMMUNITY KNOWLEDGE, ATTITUDE, AND PRACTICES OF ORT IN LAGOS STATE	1990	n=1000 Of all respondents, 88% knew of SSS or ORT, and 88% had "ever used" SSS. Of these, only 35% could prepare it properly, 52% of respondents used SSS "to stop diarrhea" vs 46% to prevent dehydration.	[FNL REPORT]
NUT	ALIKOR, EAO	ANEMIA IN CHILDREN, OYO STATE	ANEMIA IN CHILDREN UNDER FIVE: A COMMUNITY-BASED SURVEY IN RURAL NIGERIA		IN PROGRESS	[IN PROGRESS]
REP	ARAOYE, _	REPRODUCTIVE HEALTH IN SECONDARY SCHOOL CHILDREN	SEXUALITY, CONTRACEPTION AND REPRODUCTIVE HEALTH IN SECONDARY SCHOOL CHILDREN IN ILORIN LGA		AWAITING FUNDS	[PENDING]
EPI	BABANIYI, OA	INCIDENCE POLIO AND NEONATAL TETANUS IN ILORIN	MORTALITY/ INCIDENCE OF POLIO AND NEONATAL TETANUS IN ILORIN	1988	40 CLUSTER SURVEY NNT=14.9/1000 live births. Avg onset=7.5D, prevalence of polio=6.8/1000 aged 5-9 yo. Annual incid=38.3/100,000 populn. High NNT rate despite 60% antenatal coverage Only 22 cases of NNT were seen at Univ hospital, estimated 6% of actual.	J TROP PEDIATRICS 35:137 (1989) INTL J EPI 20:515-20 (1991) [PEER-REV JNL]

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EPI	BABANIYI, OA	MATERNAL MEASLES ANTIBODY, ILORIN	LOSS OF MATERNAL MEASLES ANTIBODY DURING INFANCY IN ILORIN	1992	"Report being written"	[RPT PENDING]
HIS	BAMBGBOYE, EA	ESTIMATION MORTALITY BY INDIRECT METHOD	ESTIMATION OF INFANT AND UNDER FIVE YEAR-OLD MORTALITY RATES BY INDIRECT METHOD	1990	n=6296 women Estimated fertility= 5.07-6.05. Drop in IMR from 100/1000 in 1965 to 56 in 1985 (Ibadan). In Elfon-Alaye drop from 124/1000 to 77/1000 in 1985. Estimated IMR (Brass et al) 60 and 82/1000 live births (1986-87).	[FNL REPORT]
EPI	BINCHAN, RK	INCREASING TET-TOX COVERAGE, KADUNA	COMMUNITY BASED RESEARCH TO INCREASE TETANUS TOXOID IMMUNIZATIONIN KADUNA LOCAL GOVERNMENT	1991	n=12 FOCUS GPS Home delivery and traditional practices remained prevalent, including use of hot compresses and herbal mixtures on the umbilical stump. Perceived barriers to services included fees, vaccine shortages and staff attitudes.	[MANUSCRIPT]
ARI	BONDI, FS	ACUTE RESPIRATORY TRACT INFECTION	ACUTE RESPIRATORY TRACT INFECTION		IN PROGRESS	[IN PROGRESS]
MAL	BRIEGER, W	BEHAVIORAL ASPECTS OF BEDNET USE, NSUKKA LGA	SOCIAL AND BEHAVIORAL ASPECTS OF IMPLEMENTING A STRATEGY OF IMPREGNATED BEDNETS FOR MALARIA CONTROL: BASELINE STUDY	1992	n=405 interviews 37% reported malaria in past month. Symptoms include fatigue, joint pain, fever, yellow eyes and urine. No cultural barriers to bednet use, main obstacles to use were cost and discomfort (due to heat).	[FNL REPORT]
HSR	BRYCE, J	COMPARATIVE ASSESSMENT OF TRAINING METHODS, NIGERIA	SKILLS ASSESSMENT IN PRIMARY HEALTH CARE TRAINING, NIGERIA	1991	Pre/post training assessment using FBA. Mean scores increased from 27.6 to 43.1 (maximum of 100) in a series of standardized interactive tasks.	ARTS Document 099-4001. [NON-PEER REV]
HSR	BRYCE, J	ASSESSMENT OF NIGER STATE IMMUNIZATION CAMPAIGN	MASS IMMUNIZATION CAMPAIGNS AND QUALITY OF IMMUNIZATION SERVICES, NIGER STATE	1989	n=20 (39 controls) CCCD standardized facility assessment instrument. Mass immunization centers performed less well than routine services on several indicators of quality of care (per HCW practices and exit interviews with mothers).	LANCET 335:739-40 (1990) [PEER-REV JNL]
MAL	DANIEL, HI	CQ EFFICACY IN GONGOLA STATE, NIGERIA	EFFICACY OF CHLOROQUINE IN THE TREATMENT OF MALARIA IN CHILDREN UNDER FIVE YEARS IN BAISSA (GONGOLA STATE, NIGERIA)	1988	n=53 Parasitologic failure with CQ25 in 48 children followed to D14 was 25%. No correlation with clinical illness.	ANN TROP MED PARASITOL 83:331-8 (1989) [PEER-REV JNL]

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EPI	DICKIN, KL	NNT PERCEPTIONS DURING PREGNANCY, KADUNA	PERCEPTIONS OF NEONATAL TETANUS AND IMMUNIZATION DURING PREGNANCY: A REPORT OF FOCUS GROUP DISCUSSIONS IN KADUNA, NIGERIA	1990	Same study as 90/003 (BINCHAN)?	M/S FOR SUBMISSION [MANUSCRIPT]
CDD	EKANEM, EE	ORT ACCEPTABILITY AND UTILIZATION, OYO STATE	A COMMUNITY-BASED SURVEY OF THE FACTORS INFLUENCING THE ACCEPTABILITY AND UTILIZATION OF ORT IN THE MANAGEMENT OF DIARRHOEA IN CHILDREN IN LAGOS	1989	"Report being written"	[RPT PENDING]
MAL	EKANEM, O	IN-VIVO SENSITIVITY TO CQ AND S/P IN NIGERIA	SENSITIVITY OF P FALCIPARUM TO CHLOROQUINE AND SULFADOXINE/ PYRIMETHAMINE IN NIGERIAN CHILDREN	1987	n=80 Of 36 children at Igbo Ora, no parasitologic failure for CQ25 or SP. At Oban, 64% of 44 children were failures with CQ25 by D14.	BULLETIN WHO 68:45-52 (1990) Also CCCD Yamoussoukro Conf 1988 [PEER-REV JNL]
MAL	EKE, F	MALARIA CHEMPROPHYLAXIS IN SICKLE CELL	MALARIA CHEMIPROPHYLAXIS IN CHILDREN WITH SICKLE CELL ANEMIA, PORT-HARCOURT		"AWAITING FUNDS"	[PENDING]
EPI	EREGIE, CO	CLUSTER SURVEY OF NEONATAL TETANUS, KANO	CLUSTER SURVEY OF NEONATAL TETANUS: THE MAGNITUDE AND EPIDEMIOLOGY IN KANO METROPOLIS, NORTHERN NIGERIA		"REPORT SUBMITTED"	[FNL REPORT?]
MAL	EZEDINACHI, EN	CQ RESISTANT P FALCIPARUM IN ANAMBRA AND BENUE STATES	NEW TRENDS IN CHLOROQUINE EFFICACY IN THE TREATMENT OF MALARIA: CHLOROQUINE RESISTANT P FALCIPARUM IN ANAMBRA AND BENUE STATES OF NIGERIA	1988	Parasitologic failure rates of 52% and 60% at 2 sites with CQ25. Clinical success was 69% and 94%.	CENT AFR J MED 37:180-6 (1991) [PEER-REV JNL]
MAL	EZEDINACHI, EN	CQ RESISTANT P FALCIPARUM IN CALABAR, NIGERIA	PROBLEMS OF CHLOROQUINE RESISTANT P FALCIPARUM IN NIGERIA: ONE ANTIMALARIAL DRUG'S UTILIZATION IN METROPOLITAN CALABAR	1989	n=496 Malaria most commonly self-diagnosed and Rx self-prescribed (54%) vs 32% by MD. Common drugs = CQ (59%), P/S (10%), paracetamol/ acetaminophen (52%). Only 21% took adequate curative dose.	CENT AFR J MED 37:16-20 (1991) [PEER-REV JNL]

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ARI	FAGBULE, O	ARI IN CHILDREN	ACUTE RESPIRATORY INFECTIONS IN CHILDHOOD	1990	N=497 PRELIM RESULTS: ARI Sx identified by mothers= cough 25%, fever 23%, diffic breathing 15%, Sneezing 14%. Sx of severe ARI= fast breathing 54%, chest moving 21%, fast heartrate 11%. Verbal autopsy suggests 51% of preventable deaths due to ARI.	Submitted for publicn? [FNL REPORT]
CDD	FALASHADE, B	TREATMENT OF DIARRHEA, OYO STATE	MEDICAL AND SOCIO-CULTURAL ASPECTS OF TREATMENT OF DIARRHEA IN UNDER-FIVES IN OYO STATE - A KAP STUDY		IN PROGRESS	[IN PROGRESS]
EPI	GINDLER, J	URBAN MISSED OPPORTUNITIES STUDY, LAGOS	MISSED OPPORTUNITIES AT URBAN HEALTH FACILITIES, LAGOS	1992	n=2081 clinic visits, 70 hlth cntrs. Of 1841 children with cards, there were 532 missed opportunities, 433 during vaccination visits. At 97% of centers, immunizations given only once a week. Only 9-10% of HCWs would immunize child with fever or diarrhea.	[FNL REPORT]
MAL	HEDBERG, K	MOTHERS' HISTORY OF ANTIMALARIAL DRUG USE	ASSESSMENT OF THE RELIABILITY OF MOTHER'S HISTORY OF ANTIMALARIAL DRUG USE, IGBO ORA, OYO STATE	1987	n=128 Concurrent with in vivo workshop, 1987. Ability of Dill-Glazko or HaskinsII to confirm negative hx was more reliable than ability to confirm positive hx of ingestion. Mothers hx was reliable in excluding recent CQ ingestion.	[FNL REPORT]
MAL	IKWUEKE, JK	PLASMODIAL RATES, PLATEAU STATE	DETERMINATION OF THE PLASMODIAL RATES IN TWO DIFFERENT COMMUNITES OF PLATEAU STATE	1990	Completed 3/90	[RPT PENDING]
MAL	ILOABACHIE, GC	PYREMETHAMINE SENSITIVITY IN PREGNANT WOMEN, ENUGU	IN-VIVO STUDY OF PLASMODIUM FALCIPARUM TO PYREMETHAMINE IN PREGNANT WOMEN IN ENUGU		IN PROGRESS	[IN PROGRESS]
ARI	INUSA, PDB	INCIDENCE OF ARI IN CHILDREN - ABU HOSPITAL, ZARIA	INCIDENCE OF ACUTE LOWER RESPIRATORY INFECTION IN 0-5YO CHILDREN AT ABU TEACHING HOSPITAL, ZARIA		IN PROGRESS	[IN PROGRESS]

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	PRINCIPAL INVESTIGATOR	SHORT TITLE	PROJECT TITLE	DATE COMPL	RESULTS	PUBLICATIONS AND STATUS
CDD	JINADU, MK	EVALUATION OF HOME ORS, OYO STATE	EVALUATION OF HOME CAPACITY TO MIX AND USE SALT SUGAR SOLUTION IN A RURAL AREA, OYO STATE	1989	n=224 45% could recall correct ingredients of SSS, 30% gave prescripn drugs before seeking tx, 40% gave SSS. 44% of mothers taught SSS @ clinic stopped using it by D2. Lab analysis: 50% of solutions had Sodium=30-80 mmol/L, 50% were over 80 mmol.	[FNL REPORT]
CDD	KEFAS, JG	PERSISTENT DIARRHEA IN CHILDREN, ZARIA	PERSISTENT DIARRHEA IN CHILDREN 2-35 MONTHS OF AGE, ABU, ZARIA		IN PROGRESS	[IN PROGRESS]
MAL	LEGE-OGUNTOYE L	CQ RESISTANCE IN SEMI-IMMUNE CHILDREN, ZARIA	CHLOROQUINE RESISTANCE OF P FALCIPARUM IN SEMI-IMMUNE CHILDREN IN ZARIA, NORTHERN NIGERIA	1988	n=59 Of 59 children txd with CQ25, 10% were resistant at RI-RII level.	TRANS ROY SOC TROP MED HYGIENE 83:599-601 (1989) [PEER-REV JNL]
MAL	LEGE-OGUNTOYE, L	MALARIA PROPHYLAXIS IN PREGNANCY, ZARIA	EFFECT OF MALARIA CHEMOPROPHYLAXIS ON THE OUTCOME OF PREGNANCY IN ZARIA	1990	PRELIM RPT ON FILE Completed (per 12/91 report).	[PRELIM RPT]
MAL	LEGE-OGUNTOYE, L	CQ, MEFLOQUINE AND QUININE IN MALARIA, ZARIA	CHLOROQUINE RESISTANT P FALCIPARUM WITH REDUCED SENSITIVITY IN VITRO TO MEFLOQUINE AND QUININE IN ZARIA	1989	In vitro tests of isolates from 1987 in vivo study. 37% of isolates grew in 1.6umol CQ/l, Mefloquine and quinine sensitivity both reduced.	J TROP MED & HYGIENE 94:73-75 (1991) [PEER-REV JNL]
MAL	MIDALA, TAS	QUALITY TESTING CHLOROQUINE TABLETS	QUALITY TESTING OF CHLOROQUINE TABLETS IN NORTHERN NIGERIA		"BEING REVISED"	[RPT PENDING]
MAL	MOLTA, NB	COMPARATIVE EFFICACY OF ALTERNATIVE DRUGS, N.E. NIGERIA	EFFICACIES OF CHLOROQUINE, PYRIMETHAMINE/ SULPHADOXINE AND PYRIMETHAMINE/ SULPHALENE AGAINST P. FALCIPARUM IN NORTHEASTERN NIGERIA	1990	PUBLISHED. Acknowledgement CCCD. 58-72% of children positive for P falciparum. Varying levels of parasitologic failure with CQ, delayed clearance or recrudescence (Type II) at D7 & D14. Parasitol failure in 1/50 children on P/S at D7 and D14.	J TROP MED & HYGIENE 98:253-9 (1992). [PEER-REV JNL]
MAL	MOUNT, DL	ADAPTATIONS OF SAKER-SOLOMONS, FIELD TEST	ADAPTATIONS OF THE SAKER-SOLOMONS TEST: SIMPLE, RELIABLE COLORIMETRIC FIELD ASSAYS FOR CHLOROQUINE AND ITS METABOLITES IN URINE	1987	Field comparison of semiquantitative Saker-Solomons S-S/CqI (1 ug/ml detection limit) with Haskins MMII and laboratory validation of S-S/CqII (2ug/ml detection limit), using HPLC.	BULLETIN WHO 67:295-300 (1989) [PEER-REV JNL]

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	PRINCIPAL INVESTIGATOR	SHORT TITLE	PROJECT TITLE	DATE COMPL	RESULTS	PUBLICATIONS AND STATUS
CDD	NDIOLWELU, CI	EFFICACY OF AKAMU IN PERSISTENT DIARRHEA	EVALUATION OF THE EFFICACY AND ACCEPTABILITY OF AKAMU/COWPEA MIXTURE IN THE MANAGEMENT OF PERSISTENT DIARRHOEA IN CHILDREN, ENUGU		"AWAITING FUNDS"	[PENDING]
CDD	NWAORGU, OC	HEALTH ED TO IMPROVE MOTHERS' SSS PREPARATION	A COMPARISON OF TWO HEALTH EDUCATION METHODS FOR IMPROVING MOTHERS' ABILITY TO PREPARE AND ADMINISTER SSS, ANAMBRA STATE		"IN PROGRESS"	[IN PROGRESS]
CDD	OGBEIDE, O	KAP FOR ORT PROMOTION, BENDEL STATE	KAP STUDY FOR ORT PROMOTION, BENDEL STATE	1989	n=400 FOCUS GPS AND SMALL-SCALE SURVEY. "Prevalence" of diarrhea = 61%, 41% of mothers continued regular feeding, only 39% of mothers knew SSS/ORT, 40% of these could prepare it correctly.	[FNL REPORT]
MAL	OGBUOKIRI, JE	QUALITY ASSURANCE TESTING OF CQ SYRUPS	QUALITY ASSURANCE TESTING OF CHLOROQUINE IN EASTERN NIGERIA	1989	n=147, (133=Anambra State) 40% of samples were less than 85% of stated concn., 8% were over 115%. BPC method agreed favorably with TLC method.	[FNL REPORT]
MAL	OGUNBODE, O	PYRIMETHAMINE PROPHYLAXIS IN PREGNANT WOMEN, ILORIN	IN VIVO AND IN VITRO SENSITIVITY OF PLASMODIUM FALCIPARUM TO PYRIMETHAMINE IN PREGNANT WOMEN IN ILORIN	1988	In vivo parasite resistance with weekly pyrimeth prophylaxis = 67% (n=88). In vitro = 60% (n=10). A second group (n=34) received pyrimeth 25 mg wkly after curative dose of CQ. No difference with controls (n=37) was seen over 16 wks.	NAHLEN et al: LANCET ii 8667:830 (1989) [PEER-REV JNL]
EPI	OJOMO, AA	KAP FOR EPI, ONDO STATE	AUDIENCE KNOWLEDGE, ATTITUDES AND PRACTICES RESEARCH FOR EPI COMMUNICATION STRATEGY DEVELOPMENT, ONDO STATE		"Report being written"	[RPT PENDING]
CDD	OLADEPO, O	FACTORS AFFECTING ADOPTION OF SSS, IBADAN	EVALUSTION OF FACTORS AFFECTING THE ADOPTION AND USE OF SUGAR SALT SOLUTION IN THE HOME IN IBADAN		"BEING REVISED"	[RPT PENDING]

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CDD	OLUSANYA, O	LOCAL FLUIDS IN DIARRHEA TX	EFFECTIVENESS, SAFETY AND ACCEPTABILITY OF FLUIDS DERIVED FROM LOCAL FOODSTUFF IN PREVENTION AND MANAGEMENT OF DEHYDRATION IN CHILDREN, OGUN STATE		PENDING	[RPT PENDING]
ARI	OSINUSI, K	VITAMIN A STATUS IN ARI	VITAMIN A STATUS OF PRE-SCHOOL CHILDREN WITH ACUTE LOWER RESPIRATORY TRACT INFECTION		AWAITING FUNDS	[PENDING]
EPI	OWA, JA	NEONATAL TETANUS, IFE LGA	INCIDENCE OF NEONATAL TETANUS AND THE IMPACT OF PREVENTIVE MEASURES ON NEONATAL TETANUS IN IFE LGA, OYO STATE		"COMPLETED. Awaiting analysis."	[RPT PENDING]
OTH	OYEJIDE, CO	DRUG UTILIZATION IN CHILDHOOD MORBIDITY	TRENDS IN DRUG UTILIZATION PATTERNS FOR VARIOUS CAYSES OF CHILDHOOD MORBIDITY IN A GENERAL OUTPATIENT DEPARTMENT	1989	n=7547 RETROSPECTIVE REVIEW. Most common dx were ARI (40-49%), diarrhea (5-13%), nutritional (8-13%), malaria (7-19%). Antimalarials were received by 28-32% of children, antipyretics 24-31%. Approx 20% of all children received injectable pro-pen.	[FNL REPORT]
MAL	OYEYIPO, AC	KAP IN TX OF FEVERS, KWARA STATE	ASSESSMENT OF THE KNOWLEDGE AND PRACTICES CONCERNING MANAGEMENT OF FEVERS IN CHILDREN 0-5 YEARS AMONGST PARENTS AND DRUG SELLERS IN EDU LGA, KWARA	1990	Completed 5/90. REPORT?	[RPT PENDING]
MAL	SEXTON, J	MALARIA BEDNET STUDY, NIGERIA	MALARIA BEDNET STUDY, NIGERIA		IN PROGRESS	[IN PROGRESS]
EPI	SHOREMI, MO	KAP FOR EPI, OGUN STATE	COMMUNITY-BASED RESEARCH ON KNOWLEDGE, ATTITUDES, PRACTICES AND MEDIA HABITS OF PEOPLE OF OGUN STATE ABOUT EPI	1990	FOCUS GROUPS, SMALL-SCALE SURVEY. Mothers demonstrated widespread knowledge of immunization but incomplete knowledge of diseases prevented and number of immunizations required. Clinics were usual source of information re EPI.	[FNL REPORT]

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MAL	SOWUNMI, A	EFFICACY ANTIMALARIALS IN CHILDREN	EVALUATION OF RELATIVE EFFICACY OF ANTIMALARIAL DRUGS IN CHILDREN UNDER FIVE YEARS OF AGE	1991	Report submitted (12/91) NOT ON FILE (2/93).	[FNL REPORT]
HSR	TOOLE, M	FACILITY BASED NEEDS ASSESSMENT, NIGER STATE	FACLITY BASED NEEDS ASSESSMENT, NIGER STATE, NIGERIA	1988	EPI practices were generally good. Most HCWs prescribed ORS or SSS but also prescribed antidiarrheals or antibiotics. Less than half gave correct CQ dose for malaria. Over half of malaria cases received injections.	Presented at CCCD Yamoussoukro Conf 1988. [CONF PROCEEDNG]
MAL	UMOTONG, AB	CORRELATION OF IN-VIVO/ IN-VITRO CQ RESPONSE, CALABAR	CORRELATION BETWEEN IN-VIVO AND IN-VITRO RESPONSE OF CHLOROQUINE RESISTANT P FALCIPARUM IN CALABAR, NIGERIA	1989	n=28 Failure rate at D7 with CQ25 was 54%. Isolates showed in vitro resistance to CQ concentrations of 5.7 pmol/well.	ACTA TROPICA 49:119-25 (1990) [PEER-REV JNL]
MAL	USANGA EA	CQ AND FANSIDAR EFFICACY IN BENUE STATE, NIGERIA	EFFICACIES OF CHLOROQUINE AND PYRIMETHAMINE/ SULFADOXINE IN A NIGERIAN POPULATION WITH CHLOROQUINE RESISTANT P FALCIPARUM	1988	n= 42(CQ), 45(P/S) Of 471 children screened, 59% were parasitemic. Of 42 children on CQ25, 50% parasitologic failure by D14, vs 8.9% failure with P/S (4/45).	EAST AFR MED J 67:295-301 (1990) [PEER-REV JNL]
MAL	WALKER D	RISK FACTORS AND Tx OF CEREBRAL MALARIA	STUDIES ON CEREBRAL MALARIA IN NIGERIA: RISK FACTORS AND EVALUATION OF DIFFERENT TREATMENT REGIMENS	1990	n=61 HOSPITAL-BASED STUDY: 25% of children (15/61) with cerebral malaria had hx of prophylaxis, 14/15 on pyrimethamine, 93% hx of convulsions, 33% elevated urea. CFR = 18%. CSF lactate elevated in 13/16 pts, vs 0/7 controls with febrile convulsions.	[FNL REPORT]
ARI	WILSON, R	ARI IN NIGERIA: FOCUSED ETHNOGRAPHIC STUDY.	THE USE OF ETHNOGRAPHIC RESEARCH IN ARI PROGRAM DEVELOPMENT: RESULTS FROM A FOCUSED ETHNOGRAPHIC STUDY IN ILE-IFE, NIGERIA	1991	MULTIPLE ETHNOGRAPHIC METHODS. Fast breathing rarely recognized as a danger signal. Sypmtoms of ARI often seen as normal and common part of development. Antibiotics and antipyretics frequently obtained from drug-sellers, vendors.	ARTS Document 093-4068 [SUBMITTED PUBL]
?	YUSUF, U	SUPPURATIVE OTITIS MEDIA IN CHILDREN, ZARIA	SUPPURATIVE OTITIS MEDIA IN CHILDREN 0-5 YEARS OF AGE IN ZARIA	1989	n=35 Of 507 isolates, 60%= acute otitis, 40% chronic. Staph aureus=24%, albus=10%, pseudom=21%, proteus=12%, klebs=10%, B-hem strep=8%. Forty percent of cases recurred, 85% with same organism. Gram pos most common in acute otitis, gm neg in chronic.	[FNL REPORT]

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** RWANDA						
MAL	BUGLIMFURA, L	CQ, AMODIAQUINE AND P/S SENSITIVITY IN RWANDA	EFFICACITE DE LA CHLOROQUINE, DE L'AMODIAQUINE ET DE L'ASSOCIATION PYRIMETHAMINE/ SULFADOXINE POUR LA TRAITEMENT DU PALUDISME A GIKONKO	1986	n=98 PUBLISHED. See also DELORON et al (1988). 70% parasitemia @ D7 with CQ25, 47% with CQ50. For CQ tx failures given AQ, 76% cleared parasites by D7, 100% aparasitemic with P/S.	REVUE MEDICALE RWANDAISE 20:93-97 (1988) [PEER-REV JNL]
MAL	DELORON, P	AMODIAQUINE AND S/P IN CQ-RESISTANT MALARIA,RWANDA	AMODIAQUINE AND SULFADOXINE/ PYRIMETHAMINE AS TREATMENT FOR CHLOROQUINE RESISTANT PLASMODIUM FALCIPARUM IN RWANDA	1986	n=68 (AQ), 34 (S/P) CQ treatment failures txd with AQ or P/S - 50/68 cleared parasites by D7 with AQ, 34/34 cleared parasites with P/S by D7.	AM J TROP MED & HYGIENE 38:244-8 (1988) [PEER-REV JNL]
CDD	DEMING, M	Tx OF FEVER AND DIARRHEA IN CHILDREN 0-5 YO, RWANDA	ENQUETES NATIONALES SUR LE TRAITMENT DE LA FIEVRE ET DE LA DIARRHEE CHEZ LES ENFANTS DE MOINS DE 5 ANS A DOMICILE ET DANS LES FORMATIONS SANITAIRES	1985	n=860 (infants) 691 (mothers) 8% of fevers txd at home, 52% had no tx. 42/193 were seen at health center in <2 days, 42% were txd with injections at hlth center. Of 469 diarrhea cases, 66% also c/o fever, 28% of diarrhea txd with ORS, 35% txd with injecn	[FNL REPORT]
HSR	GLIK, D	INTEGRATING QUALITATIVE AND QUANTITATIVE TECHNIQUES	INTEGRATING QUALITATIVE AND QUANTITATIVE SURVEY TECHNIQUES	1985	FOCUS GPS & IN-DEPTH QUANTITATIVE METHODS. 10% subsample of 1985 cluster survey. Mothers' knowledge of diarrheal illness was limited. A major obstacle to health center use was lack of regularly available meds.	INTL Q COMMUNITY HLTH ED 7:181-200 (1986-87) [PEER-REV JNL]
EPI	HATEGEKIMANA, B	EPI MINI-CAMPAIGNS, RWANDA	MINI-CAMPAIGNS FOR EPI COMMUNICATION, RWANDA	1987	n=398 (pre), 685 (post) Recall rate for more than 3 messages was only 6%. Recall for 1-3 messages was 51%. Print materials were less effective than verbal ones.	Presented at CCCD Yamoussoukro Conf 1988 [CONF PROCEEDING]
EPI	NDIKUYEZE, A	MEASLES VACCINE IN ILL CHILDREN	IMMUNOGENICITY AND SAFETY OF MEASLES VACCINE IN ILL AFRICAN CHILDREN	1986	n=267 (251 controls) 79% of cases were malnourished. No significant difference in reactions to immunization or seroconversion of ill (81% of 208) vs well (80% of 215) children. For children <9 months, seroconversion = only 55-68% (11/20 ill, 15/22 well).	INT J EPIDEMIOL 17:448-55 (1988) [PEER-REV JNL]

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MAL	SEXTON, J	EFFICACY OF CQ25 AND CQ50 IN RWANDAN CHILDREN	PARASITOLOGIC AND CLINICAL EFFICACY OF 25 AND 50 mg/kg OF CHLOROQUINE FOR TREATMENT OF P FALCIPARUM MALARIA IN RWANDAN CHILDREN	1986	Parasitologic failure rates of 73% with CQ25 (n=90) and 67% with CQ50 (n=48) at D14. GMPD decreased at least 96% in both groups. By D14, 9% of CQ25 (4/44) and 33% of CQ50 (4/12) still had fever.	AM J TROP MED HYGIENE 38:237-43 (1988) [PEER-REV JNL]
HSR	SHEPARD, DS	HOUSEHOLD FINANCING OF HEALTH CARE, RWANDA	HOUSEHOLD PARTICIPATION IN FINANCING OF HEALTH CARE AT GOVERNMENT HEALTH CENTERS IN RWANDA	1986	Four hlth centers in Gikongoro, Kigali prefectures. Cost recovery range = 14% -59% of operating costs. Annual health expenditures = $3.01-$4.52 per capita (2.4% of household income). Higher fees WERE associated with some reduction in use of services.	MILLS & LEE: HEALTH ECONOMICS RESEARCH IN DEVELOPING COUNTRIES, 1993 [NON-PEER REV]

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** SWAZILAND						
HSR	BRYCE, J	FACILITY ASSESSMENT OF CDD CASE MANAGEMENT, SWAZILAND	FACILITY ASSESSMENT OF CDD CASE MANAGEMENT AND FIELD ASSESSMENT OF CDD TRAINING, SWAZILAND 1989	1989	N=45 Greater than 80% checked 6 specified signs of dehydrn, Over 80% instructed mothers in 5 education messages (breastfeeding, ORS prep, ORS intake, return if child is worse, etc.). Used in continued development of DTU evaluation guidelines.	90-91 Annual Rpt. Also included in BRYCE: H POLICY & PLANNING (1992) [PRELIM REPORT]
OTH	MCFARLAND, D	COST ANALYSIS OF EPI AND CDD, SWAZILAND	COST OF THE EXPANDED PROGRAM ON IMMUNIZATION AND THE CONTROL OF DIARRHEAL DISEASES PROGRAM IN SWAZILAND	1989	Cost per immunizn dose (ca.1989) = $3.58, per immunized child = $54.89. Cost per child txd for diarrhea = $3.83. Donors provided 13% of CDD costs, 35% of EPI costs. Vaccine wastage = 2.6-5.7 doses used per dose administered.	MS in preparation. [SUBMITTED PUBL]
EPI	SIMPSON	MEASLE CONTROL INVESTIGATION, SWAZILAND	EPIDEMIOLOGY OF MEASLES IN SCHOOL-AGED CHILDREN IN SWAZILAND, 1989	1989	Investigation of measles in high coverage population (74% in 1987). Change in age distribution noted from 1986 to 87. Children > 6yo increased to 41% of cases in 1987 (from 25% in 1986). 100% of 283 blood samples seropositive for measles antibody.	[FNL REPORT]
MAL	TANGERMANN, R	MALARIA Tx IN CHILDREN WITH FEVER, SWAZILAND	SOURCES AND FREQUENCY OF MALARIA TREATMENT RECEIVED BY YOUNG CHILDREN WITH FEVER - SWAZILAND	1990	"MANUSCRIPT PENDING." 77% of children with fever are txd at health facilities, but only 25% are brought on the first day of fever.	[RPT PENDING?]
HIS	TANGERMANN, R	PRECEEDING BIRTH MORTALITY, SWAZILAND	PRECEEDING BIRTH MORTALITY AMONG WOMEN PRESENTING TO ANTENATAL CLINICS IN RURAL AND URBAN SWAZILAND	1990	n=836 women ANC-based PBI study, 2 urban, 3 rural sites. Median birth interval = 28 mos, mean = 33.6 mos. PBI index = 87/1000 live births. Under-2 mortality estmate from cohort life tables = 0.066. Mortality was higher at extremes of age and parity.	Presented at CCCD Swazi Consultative Mtg. 1990 [PRELIM RPT]
MAL	TSHABALALA R	CQ EFFICACY SWAZILAND	PRELIMINARY STUDIES ON CHLOROQUINE EFFICACY IN SWAZILAND	1985	PRELIM RPT ON FILE. 7-day in vivo test, 2 sites, 2776 screened, 7% pos smears. 34% of children continued low-grade parasitemia after tx with CQ10.	[PRELIM REPORT]

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ARI	WILSON, R	HEALTH SEEKING BEHAVIORS, SWAZILAND	DIAGNOSIS AND MANAGEMENT OF ARI BY SWAZI CHILD CARETAKERS, HEALERS AND HEALTH PROVIDERS, 1990-91	1992	INTERVIEWS & FOCUS GPS A broad range of illness terms were used to describe ARI-related illness. Fever, cough, rapid breathing and groaning were most common symptoms. Mothers generally preferred tx at health centers to home tx.	ARTS DOC 099-4064 Also presented at CCCD Dakar Conf 1993. [NON-PEER REV]

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** TOGO						
ARI		G-6PD DEFICIENCY AND ANEMIA, CHU, LOME	LA FIABILITE DU DOSAGE QUALITATIF DE L'ACTIVITE ENZYMATIQUE DE LA G6PD ET ROLE DE SON DEFECIT DANS LA SURVENUE DES ANEMIES CHEZ LES ENFANTS, CHU	1993?	Data collection completed. ?In analysis, report pending.	[RPT PENDING]
NUT	AGBERE, A	ANEMIA AND NUTRITION, KARA	ANEMIE ET ETAT NUTRITIONNEL CHEZ LES ENFANTS DE 3 MOIS A 4 ANS AU CENTRE HOSPITALIER REGIONAL DE KARA (TOGO)	1992	n=495 Prevalence of anemia in hospitalized children = 66%, malnutrn = 12%(acute), 18%(chronic). Chronic malnutrition associated with multiparity, dietary taboos. There was a significant association between anemia and chronic malnutrn (RR=1.9, p=0.004)	[FNL REPORT]
STD	AGBODJAVOU, D	RISK BEHAVIOR FOR STD/HIV IN STREET CHILDREN, LOME	RISQUES D'EXPOSITION AUX MALADIES SEXUELLEMENT TRANSMISSIBLES ET SIDA CHEZ LES JEUNES DE LA RUE A LOME (TOGO)	1992?	n=382 82% of street children had prior sex encounters (vs 84% controls). Age of first encounter = 14.5 yrs (vs 16.1 controls), 38% of subjects had prior hx of STD vs. 17% controls. Only 24% used condoms, 22% "correctly" (vs 42% and 36% of controls).	[FNL REPORT]
CDD	AKOGO, K	IMPACT OF HEALTH EDUCATION ON ORT USE - MONO, TOGO	IMPACT DE L'EDUCATION POUR LA SANTE SUR LES CONNAISSANCES ET PRATIQUES DES MERES DANS LA REHYDRATION PAR VOIE ORALE A DOMICILE DANS LE MOYEN MONO TOGO	1992	n=15 intervention villages (799 mothers) vs 25 control villages (800). More mothers used medications (36%) than SSS (31%) for diarrhea. Only 6% used ORS. Overall, health educn had a positive effect on knowlege and practices vs controls.	[FNL REPORT]
EPI	ASSIMADI, K	EFFICACY OF VIT A - TOGO	EFFICACY OF VITAMIN A IN PREVENTING DEATH IN HOSPITALIIZED CHILDREN WITHOUT MEASLES - TOGO	INCOMP	Dropped after initial phase due to HSR concerns.	[SUSPENDED]
OTH	ATTISSO,	DRUG PURCHASING BEHAVIOR, ZIO PREFECTURE, TOGO	PRATIQUES D'ACHAT DES MEDICAMENTS DANS LES COMMUNAUTE RURALES DE LA PREFECTURE DU ZIO.	1993?	Reported finished 2/93. ?In analysis, report pending.	[RPT PENDING]

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OTH	BATCHASSI, E	PHARMACY PRACTICES AND DRUG UTILIZATION, TOGO	ATTITUDES, OPINIONS ET PRATIQUES DES POPULATIONS RURALES DE LA KOZAH VIS-A-VIS DES MODES D'APPROVISIONNEMENT EN MEDICAMENTS	1991	n=858 79% of mothers used the local dispensary for tx of sick children. At least 39% of respondents estimated the nearest pharmacy was over 5 km away, 99% of respondents favored creation of village pharmacies.	[FNL REPORT]
MAL	BREMAN, J	SINGLE DOSE CQ THERAPY, TOGO	SINGLE DOSE CHLOROQUINE THERAPY FOR P. FALCIPARUM IN CHILDREN IN TOGO, WEST AFRICA	1984	n=178 children 98% parasitological cure with CQ10 (ca.1986). Low blood levels of CQ in 4/4 treatment failures.	AM J TROP MED HYGIENE 36:469-73 (1987) [PEER-REV JNL]
CDD	BRIEND	FEEDING PRACTICES DURING DIARRHEA - TOGO	FEEDING PRACTICES DURING DIARRHEA - TOGO	1992	Same as WILSON 2D89? ...Use of Home Fluids in ORT - TOGO?	[]
EPI	DEMING, M	ALL CONTACTS STUDY, TOGO	THE IMPACT ON VACCINATION COVERAGE AND VACCINE WASTAGE OF VACCINATING ELIGIBLE CHILDREN AT EVERY HEALTH FACILITY CONTACT, TOGO.		Large scale intervention study. Baseline and initial study done. Later phase suspended due to civil disturbances.	[ON HOLD?]
EPI	DEMING, M	TT ALL CONTACTS STUDY, TOGO	THE IMPACT ON TETANUS TOXOID COVERAGE, ANTITOXIN SEROPREVALENCE AND VACCINE WASTAGE OF VACCINATING ELIGIBLE WOMEN AT EVERY FACILITY CONTACT, TOGO		Completion target 6/93. Initial baseline completed. Suspended due to civil disturbances.	[ON HOLD?]
MAL	DEMING, M	HOME TREATMENT OF FEVER, TOGO	HOME TREATMENT OF FEBRILE CHILDREN WITH ANTIMALARIAL DRUGS IN TOGO	1988	n=586 mothers Of children with fever, 83% txd at home, 97% txd on the first day of fever - 94% gave CQ (64% from street vendor or market seller). Most gave too low a dose of CQ. Only 10% of mothers prefered injections to pills for malria tx of children.	BULLETIN WHO 67:695-700 (1989) [PEER-REV JNL]
MAL	ECHITEY, N	MALARIA AND ANEMIA - AFAGNAN, TOGO	PALUDISME ET ANEMIE CHEZ LES ENFANTS DE 0 A 12 ANS A AFAGNAN (TOGO)	1992	n=701 children (hospital), 397 (community). Anemia = 25% (hospitalized children), 51% (community). Mean Hgb=7.7 in parasite positive children, vs 8.8 in controls (RR of anemia = 1.2, p=0.0005). Anemia severity worse with increasing parsite density.	Presented at CCCD Dakar Conf 1993. [FNL REPORT]

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	PRINCIPAL INVESTIGATOR	SHORT TITLE	PROJECT TITLE	DATE COMPL	RESULTS	PUBLICATIONS AND STATUS
HED	ENG, E	FOCUS GROUP METHODS, TOGO	FOCUS GROUP METHODS: EFFECTS ON VILLAGE-AGENCY COLLABORATION FOR CHILD SURVIVAL	1987	n=81 focus gps, 324 women Main obstacles to immunization were effort required to keep and use immuniztion card, lack of access to information, and "laziness" of some mothers who possessed aqequate knowledge. Recommendations used in 1987 "mini-campaigns."	HLTH POLICY PLANNING 5:67-76 (1990) [PEER-REV JNL]
EPI	ENG, E	ACCEPTABILITY OF CHILDHOOD IMMUNIZATION, TOGO	THE ACCEPTABILITY OF CHILDHOOD IMMUNIZATION TO TOGOLESE MOTHERS: A SOCIOBEHAVIORAL PERSPECTIVE	1987	n=9 focus gps, 110 mothers Failure to complete immunization was explained by lack of knowledge of when to return, requirements for vaccination card, waiting time, lack of info, and laziness. Mothers suggested increasing social control measures.	HEALTH ED QUARTERLY 18:97-110 (1991) [PEER-REV JNL]
MAL	GAYIBOR, A	CQ SENSITIVITY IN TOGO, 1987	EVALUATION OF CHEMOSENSITIVITY OF P FALCIPARUM TO CHLOROQUINE IN TOGO, 1987(?)	1987	n=79 33% parasite positive on D7 (CQ10). 58% failure at Lome, 37% Kara (CQ10). With CQ25, 31% failure in Lome, 40% in Kara.	Presented at CCCD Yamoussoukro Conf 1988. [CONF PROCEEDNG]
MAL	GNAMEY K	ANTIMALARIAL EFFICACY IN TOGO	EFFICACITE DES ANTIPALUDIQUES SUR LE PLASMODIUM FALCIPARUM AU TOGO. RESULTATS D'UNE SERIE D'ENQUETES EN 1988 ET EN 1989	1988	Four regions. Mean CQ resistance = 32% (range 27-39%). Riii resistance = 2%. Amodiaquine= 18.5% resistence, quinine = 0% (n=86). See CCCD SWAZILAND CONF for impact: CONF SEMINAIRE ATELIER, Mar 89.	BULLETIN SOC PATHOL EXOTIQUES FILIALES 84:1005 (1991) [CONF PROCEEDNG]
HIS	JANSSENS, M	TOGO MUHS RELIABILITY SURVEY, 1985	TOGO MUHS RELIABILITY SURVEY, 1985	1985	n=6/30 clusters Brass indirect IMR = 93/1000 female, 113/1000 male. Direct IMR = 103/1000. 43% of deaths NOT registered during MUHS were in first 2 wks of life, 72% in first yr.	[FNL REPORT]
POP	KAMPATIBE, N	INTEGRATION OF EPI/FP - TOGO	COMBINAISON DE LA PLANIFICATION FAMILIALE AU PROGRAMME ELARGI DE VACCINATION AU TOGO		PRELIM RPT ON FILE. n=16 centers (8 intervention, 8 control). Number of new acceptors of family planning increased from avg 200 to 307 per month. 50% referred by EPI. No evidence of negative impact on EPI. Sponsored by Pop Council with CCCD tech support.	[PRELIM REPORT]
EPI	KARSA, T	ACCELERATED VACCINATION CAMPAIGN,TOGO	LES CAMPAGNES DE VACCINATIONS ACCELEREES: UNE STRATEGIE A PERENNISER?	1987	Advantages of campaign included raised coverage, sensitization of population and govt. Disadvantages = cost, diversion of resources, poor or inadequate vaccination practices, misinformation, and neglect of fixed centers	Presented at CCCD Swazi Conf 1990 [SWAZI CONF]

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HSR	LENT, D	TOGO FACILITY BASED ASSESSMENT, 1988	HEALTH FACILITY NEEDS ASSESSMENT, TOGO 1988	1988	n=25 facilities Demonstration of ORT on-site was rare. Mothers more familiar with ORS than SSS. 42% diarrhea cases received antidiarrheals, 16% antibiotics. 47% fever cases received injectable CQ. ORS supply adequate, sterile syringes often unavailable.	[FNL REPORT]
MAL	N'DITSI, K	KAP STUDY OF MALARIA & CDD, PLATEAUX REGION, TOGO	LUTTE CONTRE LE PALUDISME ET LES MALADIES DIARRHEIQUES, REGION DES PLATEAUX: PRATIQUES DES MERES ET DU PERSONNEL DE SANTE	1991	n=1203 mothers Although 64% of mothers knew of SSS and 71% ORS, only 28% correctly prepared SSS, 50% ORS. CQ used by 94% of mothers for fever, 46% gave "at least" 3 days tx. HCWs tended to give xs doses of CQ and generally did not use dose schedules.	[FNL REPORT]
MAL	TAIROU, A	CLINICAL DIAGNOSIS OF MALARIA, TOGO	MORBIDITE PALUSTRE CHEZ LES ENFANTS DE 0 A 5 ANS A SOTOUBOUA: FIABILITE DE L'EXAMEN CLINIQUE	1992	n=1020 HOSPITAL STUDY. Fever was main Sx (62%). Only 35% had fever on examination. Parasitemia was higher in febrile (62%) than non-febrile (38%) children (p=0.0001). For parasite density = 10,000/mm3, sensitivity = 99%, specificity =59%.	[FNL REPORT]
HIS	WALDMAN, R	MUHS PT-I STUDY, TOGO (1984)	A STUDY OF INFANT AND JUVENILLE MORTALITY, INCIDENCE RATES OF DIARRHEAL DISEASE AND FEVER, TREATMENT AND CERTAIN MATERNAL CHARACTERISTICS	1984	n=2965 women Of 4,966 live births, 5.6% had died. Estimated IMR = 33/1000, 1-4 mortality = 42/1000, 0-4 mortality = 74/1000. Immunizn coverage was generally low despite relatively good access to services. See also JANSSENS 1985.	[PRELIM REPORT]
CDD	WILSON, R	USE OF HOME FLUIDS IN ORT- TOGO	USE OF HOME FLUIDS IN ORT - TOGO	1990	Also called "Feeding Practices during Diarrhea, Togo" -- Mrs. Vernay Mitchell is cited as principal investigator (See trip report: Briend 2/90).	[?]

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** UGANDA					
HSR MALISON, MD	A NEW APPROCAH TO LOCAL AREA MONITORING, UGANDA	ESTIMATING HEALTH SERVICE UTILIZATION, IMMUNIZATION COVERAGE AND CHILDHOOD MORTALITY, A NEW APPROACH IN UGANDA	1984	n=2450 households Purposive sample. IMR of 95/1000 births, 1-4 mortality of 25/1000. Approx 3.2 episodes diarrhea per yr. Only 12% episodes txd with ORS/SSS, 62% received drugs. Only 38% children 1-4 fully immunized.	BULLETIN WHO 65:325-30 (1987) [PEER-REV JNL]

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	PRINCIPAL INVESTIGATOR	SHORT TITLE	PROJECT TITLE	DATE COMPL	RESULTS	PUBLICATIONS AND STATUS
** ZAIRE						
COD	BROWN, J	KNOWLEDGE AND PRACTICES IN DIARRHEAL DISEASE, KINSHASA	CROYANCES ET PRATIQUES A PROPOS DE LA DIARRHEE, KINSHASA, 1984	1984	Interviews with 40 mothers, 7 nurses re:traditional practices. Treatments include traditional fluids and purges. For SSS, 4 different size spoons, 5 grades of salt and 5 types sugar identified. 0/10 mothers had sugar in household, only 5/10 had salt.	[PRELIM REPORT]
HIS	CHAHNAZARIAN, A	MUHS FOLLOW-UP MORTALITY STUDY, ZAIRE 1988-89	IMPACT OF SELECTIVE PRIMARY CARE ON CHILDHOOD MORTALITY IN A RURAL HEALTH ZONE OF ZAIRE	1989	n=1947 mothers Estimated under-five mortality declined from 41 to 33/1000 person-years. IMR was virtually unchanged (77.4 vs 75.9).	INT J EPIDEMIOL 22(S1):S32-S41 (1993). [PEER-REV JNL]
EPI	CUTTS, F	E-Z VACCINE DEMONSTRATION, ZAIRE	THE IMPACT ON MEASLES MORBIDITY AND MORTALITY OF ADMINISTERING MEDIUM-TITRE E-Z VACCINE AT 6 MONTHS OF AGE AND MEASURES TO INCREASE VACCINE COVERAGE,	1992	Coverage in 12-23 mo age group increased from 50% in 1985 to 68% in 1990 (55% to 69% by verbal hx). Measles rates declined by 90% from 37.5/10,000 in 1980 to 1.6 in 1991. Proportion of cases in older children increased.	Submitted for publication. [SUBMITTED PUBL]
EPI	CUTTS, F	AIK/ E-Z VACCINE STUDY, ZAIRE	COMPARISON OF THE IMMUNOGENICITY OF AIJ-C AND HIGH-TITRE EDMONSTON ZAGREB VACCINE AT 4 MONTHS OF AGE WITH MEDIUM AND HIGH TITRE E-Z AT 6 MONTHS	1992	In manuscript.	[SUBMITTED PUBL]
EPI	CUTTS, F	MEASLES SEROCONVERSION IN HIV+ CHILDREN - ZAIRE	IMMUNOGENICITY OF HIGH-TITER E-Z VACCINE IN HIV POSITIVE CHILDREN - KINSHASA, ZAIRE	1991	n=49 HIV-infected children, 376 controls. No increase in post-vaccination symptoms 7-10 days after vaccination. Seroconversion was somewhat lower in HIV-infected (76%) vs controls (86%).	J INFEC DIS 167:1418-21 (1993) [PEER-REV JNL]
MAL	GREENBERG, AE	INTRAVENOUS QUININE THERAPY OF P FALCIPARUM, KINSHASA	INTRAVENOUS QUININE THERAPY OF HOSPITALIZED CHILDREN WITH P FALCIPARUM MALARIA IN KINSHASA, ZAIRE	1987	n=34 Of 34 children txd with quinine, 33 were clinically well with negative smears by D7. One child, who presented in coma, died. Mean fever clearance time was 44.1 hr, parasite clearance = 59.6 hrs.	AM J TROP MED & HYGIENE 40:360-4 (1989) [PEER-REV JNL]
MAL	GREENBERG, AE	BLOOD TRANSFUSION AND HIV SEROPOSITIVITY, ZAIRE	THE ASSOCIATION BETWEEN MALARIA, BLOOD TRANSFUSIONS, AND HIV SEROPOSITIVITY IN A PEDIATRIC POPULATION IN KINSHASA, ZAIRE	1986	n=167 Of 167 hospitalized children, 67% had malaria, 47% received transfusions, 13% were HIV seropositive. Of 11 seropositive patients, 10 received transfusions during current stay, 4 were confirmed previously seronegative.	JAMA 259:545-9 (1988) [PEER-REV JNL]

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MAL	HEDBERG, K	ANEMIA AND MALARIA IN CHILDREN, KINSHASA	P FALCIPARUM ASSOCIATED ANEMIA IN CHILDREN AT A LARGE URBAN HOSPITAL IN ZAIRE	1988	n=748 HOSPITAL STUDY. 43% of children were anemic, 10% severely anemic. Parasitemic children were 2.4 times more likely to be mildly anemic and 8.0 times severely anemic than controls.	AM J TROP MED HYG 48:365-71 (1993) [PEER-REV JNL]
CDD	MOORE, M	RECIPE FOR HOME SSS IN ZAIRE	DEVELOPMENT OF A RECIPE FOR HOME PREPARED SALT-SUGAR SOLUTION IN ZAIRE: A COMBINED ANTHROPOLOGIC, EPIDEMIOLOGIC AND LABORATORY APPROACH	1987	Field test of SSS recipe: With original recipe, 6% of solutions exceeded WHO recommendations for sugar, 40% for salt. With revised formula, 40% had >150 meq/L glucose, 24% >120 meq Nat. Final recipe, 14% exceeded sugar concentration, 8% salt.	[PRELIM REPORT]
CDD	MOORE, M	ORT EXPERIENCE AT MAMA YEMO HOSPITAL, 1984-85	NEW PARAMETERS FOR EVALUATING ORAL REHYDRATION THERAPY: ONE YEAR'S EXPERIENCE IN A MAJOR URBAN HOSPITAL IN ZAIRE	1985	RECORD REVIEW. On average, 16% used SSS before coming to hospital. Admissions for non-severe diarrhea decreased from 30% to 12% of admissions between 1st and 4th quarters. CFR decreased from 6.9% to 1.2%.	J TROP PEDIATRICS 35:179-84 (1989) Also CCCD CONF Yamoussoukro 1988 [PEER-REV JNL]
MAL	NGUYEN-DINH, P	CQ SUSCEPTIBILITY IN KINSHASA AND MBUJI-MAYI	IN VIVO AND IN VITRO SUSCEPTIBILITY TO CHLOROQUINE OF P FALCIPARUM IN KINSHASA AND MBUJI-MAYI, ZAIRE	1983	n=109 All patients cleared parasites with no recurrrence by D21 with CQ10 or CQ25. In week 4, 10/43 recurrence with CQ10, 3/66 with CQ25. Full sensitivity in all but 3 of 101 in vitro tests.	BULLETIN WHO 63:325-330 (1985) [PEER-REV JNL]
MAL	NGUYEN-DINH, P	IN VITRO STUDY OF P. FALCIPARUM, KINSHASA 1986	PLASMODIUM FALCIPARUM IN KINSHASA, ZAIRE: IN VITRO DRUG SUSCEPTIBILITY STUDIES	1986	n=33 Resistance found in 82% of isolates. Pyrimethamine resistance in 52% of isolates.	AM J TROP MED HYG 37:217-19 (1987) [PEER-REV JNL]
MAL	PALUKU, KM	CQ EFFICACY IN PREGNANCY, KINSHASA	ETUDE IN-VIVO CHLOROQUINE: FEMMES ENCIENTES ET ENFANTS A KINGASANI	1986?	n=71 women, 33 children 41% of pregnant women were CQ10 tx failures vs 31% with CQ25, 74% of children txd with CQ25 were parasitologic failures.	[FNL REPORT]
MAL	PALUKU, KM	CQ RESPONSE IN CHILDREN AND NATIONAL POLICY, ZAIRE	RESPONSE OF CHILDREN WITH P. FALCIPARUM MALARIA TO CHLOROQUINE AND DEVELOPMENT OF A NATIONAL MALARIA TREATMENT POLICY IN ZAIRE	1985	n=339 7D in vivo CQ sensitivity in 4/9 regions. With CQ10, parasitologic cure at D7 was 92% (Bwamanda) to 29% (Kinshasa). With CQ25, range = 74% (Kindu) to 44% (Kinshasa). Only 1/51 children was febrile at D7. Amodiaquine had 69% cure (vs 44% CQ25).	TRANS ROY SOC TROP MED HYG 82:353 (1988) [PEER-REV JNL]

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MAL	PALUKU, KM	MALARIA PROPHYLAXIS IN PREGNANCY, KINSHASA	FAISABILITE/ EFFICACITE DE LA CHEMOPROPHYLAXIE/ TRAITMENT CHEZ LES FEMMES ENCIENTES	1987?	n=1885 1200 mg CQ/mo vs. tx prn for fever vs. control: Primips had lower birthwgt, otherwise no significant in birhtwgt difference was seen with CQ prophylaxis. Significant increase in failure rate seen with CQ1200 compared with CQ 25 mg/kg.	[FNL REPORT]
MAL	PALUKU, KM	EFFECTIVENESS OF ALTERNATIVE ANTIMALARIALS, ZAIRE	EFFICACITE COMPARATIVE DES TRAITEMENTS ALTERNATIFS DANS LES INFECTIONS A P FALCIPARUM AU ZAIRE	1987	Surveillance at 3/14 sites. Failure rates at D7 were 44%-81% for CQ25, 2%-9% for quinine (140 mg/kg) and 2%-4% for pyrimethamine/ sulphadoxine (Fansidar).	ANNALES DE LA SOCIETE BELGE DE MEDECINE TROPICALE 69:25-33 (1989) [PEER-REV JNL]
MAL	SHAFFER, N	TUMOR NECROSIS FACTOR AND SEVERE MALARIA	TUMOR NECROSIS FACTOR AND SEVERE MALARIA	1989?	n=61 Geometric mean concentration of TNF among children with severe malaria (71 pg/ml) was higher than 26 severely ill children without parasitemia (10 pg/ml, p < 0.001). Principal support = USAID PASA BAF 0421 PHC 22333, WHO TDR.	J INFECT DISEASES 163:96-101 (1991) [PEER-REV JNL]
MAL	SHAFFER, N	TRENDS AND RISK FACTORS FOR HIV SEROPOSITIVITY, ZAIRE	TRENDS AND RISK FACTORS FOR HIV-1 SEROPOSITIVITY AMONG OUTPATIENT CHILDREN, KINSHASA, ZAIRE	1988	n=1110 Prospective study. Evaluation post-introduction of blood screening program. Association of transfusion with HIV seropositivity was higher for children who received a transfusion before 1987. Principal support: USAID PASA BAF 0421 PHC 22333.	AIDS 4:1232-6 (1990) [PEER-REV JNL]
MAL	STEKETEE, R	MALARIA AND PREGNANCY IN ZAIRE, 1985	MALARIA INFECTION IN PREGNANT WOMEN IN ZAIRE: THE EFFECTS AND POTENTIAL FOR INTERVENTION	1985	Five maternity centers in 3 regions. Women in first or second pregnancy had a higher frequency of parasitemia, higher parasite densities, higher rates of stillbirths and low birth weight babies.	ANN TROP MED PARASITOL 82:113-20 (1988) [PEER-REV JNL]
HIS	TAYLOR, W	MUHS BASELINE SURVEY 1984, ZAIRE	MORTALITY AND USE OF HEALTH SERVICES SURVEYS IN RURAL ZAIRE	1985	n=7000+ women, 8000+ births 15% of pregnancies resulted in fetal death. Estimated under-5 child mortality= 44/1000 (reinterview) vs. 25.5 (baseline). Resurvey increased reported deaths 116% (vs. 14% increase in reported births).	INSERM 145:491-8 (1986) INT J EPIDEMIOL 22(S1):S15-S19 (1993) [PEER-REV JNL]

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EPI	TAYLOR, WR	EPIDEMIOLOGY OF MEASLES, KINSHASA, 1980 - 1985	MEASLES CONTROL EFFORTS IN URBAN AFRICA COMPLICATED BY HIGH INCIDENCE OF MEASLES IN THE FIRST YEAR OF LIFE	1986	MULTIPLE METHODS. Vaccine coverage increased from 37% in 1977 to 62% in 1983, remaining static from 1983-86, 27% of measles cases occurred in children before age 9 months.	AM J EPIDEMIOL 127:788-94 (1988) [PEER-REV JNL]
MAL	TAYLOR, WR	COMMUNITY SURVEY FOR MALARIA, KINSHASA	CLUSTER SURVEY FOR MALARIA AND EPI, KINSHASA 1983	1984	n=1879 mothers, 3092 children 374/1000 episodes of fever in preceding 2 wks, estimated 9.7 episodes per year. For adults, estimated 4 episodes per year.	Cited in ANN SOC BELGE MED TROP 65(S2):215-22 (1985) [PEER-REV JNL]
HIS	VERNON, A	MUHS FOLLOW-UP SURVEY 1988-89, ZAIRE	CHANGES IN USE OF HEALTH SERVICES IN A RURAL HEALTH ZONE IN ZAIRE	1989	n=1947 mothers Immunization coverage increased for all antigens. Greater recognition of SSS noted. Little change in treatment of febrile children from 1984.	INT J EPIDEMIOL 22(S1):S20-S31 (1993) [PEER-REV JNL]
EPI	VERNON, AN	ACTIVE SURVEILLANCE FOR POLIO, KINSHASA	SURVEILLANCE ACTIVE DE LA POLIOMYELITE PARALYTIQUE DANS LA VILLE DE KINSHASA, ZAIRE	1989	n=132 cases 53% of cases reported by main rehab center, 22% by largest pediatric hospital. Type 1 wild poliovirus isolated from 13/56 cases. Also presented at CCCD CONF SWAZILAND, 1990.	WKLY EPIDEMIOL REC 66:81-83 (1991) Also CCCD Conf Swaziland 1990. [NON-PEER JNL]

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** ZIMBABWE						
CDD	MTERO, S S	KAP IN DIARRHEA PREVENTION AND TREATMENT, ZIMBABWE	ASSESSMENT OF KNOWLEDGE ATTITUDES AND PRACTICES IN THE MANAGEMENT AND PREVENTION OF DIARRHEA IN ZIMBABWE	1985	n=480 COMMUNITY SURVEY. 73% believed diarrhea not preventable. 46% of mothers took child to hlth center. Although 72% had been taught SSS, only 21% able to recall formula correctly (vs 75% of HCWs). Sugar/salt available in >80% of households.	[FNL REPORT]
CDD	SIMANGO, C	WEANING FOODS AND DIARRHEA, ZIMBABWE	STUDIES ON THE ROLE OF WEANING FOODS AND DRINKING WATER IN THE TRANSMISSION OF DIARRHOEA IN CHILDREN OF FARM LABOURERS IN A COMMERCIAL FARMING AREA	1987	n=222 Most foods stored for 13-24 hrs, few were stored more than 24 hrs. E coli present in 17% of "leftovers" vs 15% other. Overall, 3% of samples contained bacterial pathogens.	ALNWICK et al.: IMPROVING YOUNG CHLD FEEDING ICRC-265e, 1987 [CONF PROCEEDNG]
MAL	TAYLOR P	COMPLIANCE MALARIA PROPHYLAXIS	COMPLIANCE WITH MALARIA CHEMOPROPHYLAXIS PROGRAMMES IN ZIMBABWE	1986	Program review/ evaluation study of National Railways of Zimbabwe and Hippo Valley Estates prophylaxis programs. On-site observations and questionnaires. ..CCCD study?	[FNL REPORT]
MAL	TAYLOR, P	MALARIA DRUG UTIL AND AVAILABILITY	ASPECTS OF DRUG AVAILABILITY AND UTILISATION IN RELATION TO MALARIA IN ZIMBABWE	1986	n=817 Four regions. Only 10% of clinics used slide confirmation. Less than 50% of households knew correct transmission/ prevention. 81% of clinics knew correct adult dose of CQ, 48-85% knew correct pediatric dose, 62% of VHWs knew correct adult dose.	[FNL REPORT]