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MID-YEAR PROGRESS REPORT

STRENGTHENING HEALTH DELIVERY SYSTEMS

OBJECTIVE III SURVEILLANCE

PASA HZ/AR-0398-6-78

Period Covered
January 1, 1980 - June 30, 1980

Report Submitted on

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by

Research and Development Division

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Mid-Year Progress Report
Strengthening Health Delivery Systems
Objective III - Surveillance

I. Introduction

In accordance with the Participating Agency Service Agreement (PASA HZ/AR-0398-6-78), this mid-year progress report is submitted by CDC for activities through June 30, 1980. The report is related to the project work plan (as revised and adopted by PCC November 1979), showing progress made towards the achievement of program objectives.

II. Achievements Towards Work Plan Objectives

A. Sub-Objective I

To Expand Immunization Activities in the Region.

Achievement: This activity has proceeded well. The development of delivery programs has progressed as scheduled; reduction of morbidity and mortality resulting from the immunization activitie are being documented; and training in the demonstration-training areas has been formally implemented. A detailed look at the activities which comprise this objective follows:

1.1 Develop demonstration-training vaccine delivery programs in three countries. In each country the training area will be divided into three segments of 200,000 population each, or a total of 600,000 per country.

Ivory Coast	-	One area by October 1, 1978 Two areas by December 1, 1978 Three areas by April 2, 1979
Cameroon	-	One area by October 1, 1978 Two areas by January 1, 1979 Three areas by July 1, 1979
The Gambia	-	One area by January 1, 1980 Two areas by July 1, 1980 Three areas by December 1, 1980

Achievement:

Ivory Coast: Target date for third area (April 1, 1979) was inadvertently omitted from plan of action. All three demonstration-training areas now have functioning vaccine delivery programs. The three areas are Abidjan, Abengourou, and Korhogo.

Cameroon: Despite some unforeseen delays in reaching agreement with Ministry of Health on the areas to be selected, the three areas were operational by June 30, 1979. In addition to Yaounde, the areas of Eseka and Bafousam/Bamenda were chosen.

The Gambia: Current plans call for developing the Western Division and the North Bank Division immunization activities first. Establishment of activities in the third demonstration-training area will be carried out during the second half of 1980.

Problems/Constraints: With the exception of the Ivory Coast, supervision in the demonstration-training areas has been hampered by lack of reliable transport.

1.1.1 Achieve 70 percent of identified target populations in demonstration areas within 18 months of initiation of full operations.

Achievement:

Despite being less than 18 months into full operations in several areas, available data permit some observations.

Cameroon: Immunization activities in Yaounde have been ongoing since 1975, predating the inception of activities under this PASA. However, 70 percent coverage has not been attained even after 4 years of operation (Appendix I). As noted in the mid-year 1979 report, in April 1979 a meeting was held in Atlanta to discuss this problem and attempts to identify possible causes. Those attending the meeting, including Dr. Heymann and his two predecessors in the CDC/OCEAC epidemiologist post, decided that surveys needed to be done to determine why mothers do not utilize the available immunization services. Subsequently, arrangements were made to engage a social anthropologist to conduct these surveys. Dr. Judith Brown has completed her studies and her report (Appendix II) presents her findings.

Ivory Coast: Coverage assessments after 18 months or more of operations in Abidjan and Abengourou showed that the 70 percent target has been attained in Abengourou and is within reach in Abidjan (Appendix III).

Gambia: As noted in the Gambia report (Appendix IV), second coverage evaluation in areas operational for 12-15 months showed progress towards this objective.

Problems/Constraints: Dr. Brown's study in Yaounde identified some of the problems. Operational strategies in Yaounde have been modified to address the problems. Another

operational deficiency common to most immunization programs from time to time is an interruption in vaccine supply. Since most immunization schedules call for simultaneous administration of DPT and poliomyelitis serial vaccinations, any differences in coverage rates for these two vaccines usually indicates a stock interruption. Programs in the demonstration-training areas seem not to be immune from such occurrences.

1.1.2 Document coverage through ongoing sample assessment in all areas.

Achievement: Assessment activities are ongoing in all eight operational areas.

Problems/Constraints: None. It is noteworthy that, without exception, countries engaging in EPI are including evaluation as an integral function of the program. This represents a shift in thinking and requires a change in budget priorities, since in the 1960's and 70's, ongoing program evaluation was often considered a luxury.

1.1.3 Decrease by 50 percent morbidity and mortality due to target diseases by 36 months after initiation of full operations.

Achievement: Except for Yaounde, where EPI activities predate the inception of SHDS field implementation, none of the demonstration-training areas have been operational for 36 months. Morbidity and mortality data from Yaounde show marked variation of behavior among the EPI diseases. Surveillance data from the Ivory Coast, through no more than 18 months into EPI operations, also show marked differences:

Measles - After one and a half years full operations in Abidjan and Abengourou, measles morbidity in 1979 showed an increase in Abidjan of 24 percent and a decrease of 67 percent in Abengourou. Hospitalized measles cases showed a decrease during the same time period of 28 percent in Abidjan and 42 percent in Abengourou. Measles mortality declined 54 percent in Abidjan hospitals and 52 percent in the Abengourou hospital. Korhogo morbidity and mortality will be measured against base line data collected in 1979.

Polio - Hospitalized polio cases decreased 53 percent in Abidjan and 67 percent in Abengourou. Polio deaths decreased 95 percent in Abidjan. There were no polio deaths recorded in Abengourou during 1978 or 1979.

Neonatal tetanus - Hospitalized neonatal tetanus cases increased 3 percent in Abidjan and decreased 79

percent in Abengourou. Hospitalized neonatal tetanus deaths increased 53 percent in Abidjan and decreased 100 percent in Abengourou.

Problems/Constraints - As mentioned.

1.1.4 Cost Effectiveness Study.

Although not a CDC responsibility, the proposed study in the Ivory Coast would provide valuable information and therefore has CDC's support.

1.1.5 Explore strategies for other studies such as assessing factors affecting community response to EPI programmes, determining optimal schemes for delivery of vaccine, comparing relative merits of use of fixed centres vs. mobile teams in various programme settings, etc.

Achievement: The Judith Brown studies in Yaounde (Appendix II) have already been mentioned. EPI-Ivory Coast is now visiting grade schools and providing teachers with a short, simple lesson plan to be taught to the pupils emphasizing vaccination needs for their small brothers, sisters, and neighboring infants. After completing the lesson plan, the children take home appointment slips for parents to take their infants, 3 months to 3 years of age, to the nearest vaccination center. The two areas where this strategy has been applied has increased vaccination activities tenfold. The number of vaccinations will undoubtedly drop off after a given time, but at least parents will be well sensitized to the need for infant immunization. During 1981 the school strategy program will be expanded to all EPI active areas. All schools will be visited in the spring and fall.

Problems/Constraints: None.

1.2 Collaborate with countries of the region in development of country EPI programmes.

1.2.1 Give support to the countries having demonstration zones (Cameroon, Ivory Coast, and the Gambia) in planning for eventual nationwide coverage by EPI.

Achievement: The national EPI plans for all three countries, developed with SHDS collaboration, have the approval and endorsement of AID, WHO, and UNICEF and have attracted support from other donors.

Problems/Constraints: None.

1.2.2 Give support to other countries of the region, as requested, on development of country programme for EPI for up to nine visits per year.

Achievement: SHDS-CDC staff have carried out planning and evaluation visits in Congo, Liberia, Sierra Leone, Gabon, and Upper Volta.

Problems/Constraints: None.

1.3 Measles vaccine/jet injector parts provision (not a CDC responsibility).

1.4 Conduct at least one in-depth surveillance and managerial assessment of each immunization program demonstration and training area.

Achievement:

Ivory Coast	-	Done, report submitted, Jan. 1980
The Gambia	-	Scheduled Oct/Nov 1980
Cameroon	-	Done, 1978

Problems/Constraints: None.

Sub-Objective 2: Development of training capabilities. (To provide training in the region in EPI management and methodology, disease surveillance, data collection, and epidemiology, and to strengthen regional training capabilities in these subjects).

2.1 Identify and train national counterparts for SHDS/CDC field staff positions.

2.1.1 and 2.1.2 Not CDC responsibilities.

2.1.3 Identify national counterparts to work with the SHDS/CDC operations officer and PCV's, where applicable, in the three demonstration countries. Provide on-the-job training for national counterparts who will ultimately replace SHDS/CDC operations officers.

Achievement: Accomplished in Cameroon and the Gambia. Ivory Coast has identified a counterpart for the operations officer who will assume that position in August 1980.

Problems/Constraints: None.

2.2 Continue to develop EPI-related training activities in demonstration-training programmes.

Achievement: See below (2.2.1 and 2.2.2)

2.2.1 Conduct in-service training programmes for all demonstration-training programme personnel in each of the three country programmes, covering topics such as administration, planning, supervision, supply, logistics, maintenance, and repair of jet injection equipment and evaluation. Materials may be taken from the mid-level managers training course.

Achievement: Mid-level managers training course curriculum in English became available near the end of 1979. The French translation was completed and field tested in June 1980. With the availability of these training materials, the in-service training, which had been conducted ad hoc, will be formalized and carried out in conjunction with activitiy 2.2.2 below.

Problems/Constraints: See 2.2.2 Problems/Constraints below.

2.2.2 Provide training programme in the Ivory Coast and Cameroon demonstration-training programmes for EPI personnel from other countries of the region in methods of planning, implementation and evaluation of EPI programmes, as well as maintenance and repair of jet injection equipment. Offer 2-week training programme for up to six participants from other countries in each of the two programmes. Materials may be taken from the mid-level managers training course.

Achievement: The first such training program was conducted in the Gambia in May 1980. In addition to the Gambian participants (28), there were two each from Nigeria, Ghana, and Sierra Leone. Liberia had been invited but declined because of civil unrest. Similar courses will be given in Cameroon, for the OCEAC sub-region (August 1980), and Ivory Coast, for the OCCGE sub-region (January 1981).

Problems/Constraints: Because AID and WHO both have policies which discourage financial support (travel and per diem) to training participants for courses in their own country, the Ministries of Health in the country hosting such a course must be prepared to support its national participants. In the course given in the Gambia, this was not well understood and created some difficulties. Moreover, per diem rates should be the same for all participants, nationals, and international alike, in order to avoid bad feelings.

2.3 Collaborate in improving training capability of WHO Regional Training Centers in areas of disease surveillance, data collection and epidemiology.

Achievement: Primary responsibility does not rest with CDC. For this sub-objective CDC has only consultative responsibility. Ms. Annie Voigt, Nurse/Educator from CDC Atlanta, has been working with the RTC in Lagos to integrate the EPI training materials into the curriculum at the Center.

Problems/Constraints: None.

Sub-Objective 3: Development of capability to gather information (data necessary for health planning, including

demographic data). (To strengthen regional and national systems of disease surveillance and health information gathering necessary for effective health planning).

3.1 Collaborate with WHO/AFRO in strengthening national disease surveillance systems within the framework of the national health information systems. Gather information, make indepth analysis of current national disease surveillance systems and collaborate on development of plan for national disease surveillance system, on request, for up to three countries. (Training of necessary personnel and institution of disease surveillance system will be planned for 1981).

Achievement: See below (3.1.1 through 3.1.6). See also Appendix V, Heymann annual report to OCEAC, and Appendix VI Hull mid-year report.

3.1.1 Assign epidemiologist to OCCGE.

Achievement: Dr. David Sokal took up his assignment in Bobo-Dioulasso, Upper Volta, in April 1980.

Problems/Constraints: As has been noted previously, there were considerable delays in recruiting for this position.

3.1.2 Complete indepth analyses of current national surveillance systems and submit recommendations for improvement.

Achievement: Cameroon - report submitted 1979

1980 Scheduled	Completed
Congo - March 1980	May 1980
The Gambia - March 1980	June 1980
Ivory Coast - March 1980	Deferred to Sept. 1980 because of late arrival of OCCGE epidemiologist
Gabon - August 1980	
Liberia - August 1980	
Upper Volta - August 1980	
CAR - December 1980	
Sierra Leone - December 1980	
Togo - December 1980	

Problems/Constraints: As mentioned.

3.1.3 Determine baseline levels of morbidity and mortality of neonatal tetanus, measles, and poliomyelitis in immunization program demonstration-training areas. These diseases have been selected both because they are of priority importance and because feasible means exist for measuring incidence and/or prevalence.

Achievements: In Cameroon, completed for all three demonstration-training areas. In the Gambia, completed in May 1980. Ivory Coast activity will be carried out by Dr. Sokal and is scheduled for completion by September 1980.

Problems/Constraints: None.

3.1.4 Establish in immunization program demonstration and training areas on-going system of disease surveillance.

Cameroon	-	January 1980
Ivory Coast	-	May 1980
The Gambia	-	October 1980

Achievements: Cameroon - completed
Ivory Coast - completed
The Gambia - progressing on schedule

Problems/Constraints: None.

3.1.5 Implement systematic program activity reporting system conforming with WHO Management Information Systems requirements.

Achievements: Implemented in April 1980.

Problems/Constraints: Because the reporting system is phased to meet WHO needs in terms of timing, the completeness and effectiveness of the system will not be fully functional until the first annual cycle has been completed.

3.1.6 Assist regional/national authorities in investigating unexpected outbreaks of morbidity and mortality. Such investigations may include both diseases included in national immunization programs (e.g. measles, poliomyelitis) and other diseases of low incidence but high mortality (e.g African hemorrhagic fever, yellow fever). Such investigations are expected to involve 10 percent of Medical Epidemiologist's time.

Achievements: Ongoing (see Appendix VII, Sokal Meningitis investigation in Upper Volta and Appendix VIII, Heymann Yellow Fever investigation in Cameroon).

Problems/Constraints: None.

3.2 Plan and implement an annual epidemiological conference of 1 week in Yaounde, Cameroon, for the OCEAC subregion.

Achievements: Conference held instead in the Gambia in conjunction with mid-level managers EPI training course April/May 1980.

Problems/Constraints: Conference in Banjul lasted only 3 days. As a result, the agenda was excessively compressed. These conferences must be scheduled for at least 5 full days.

3.3 Publish and distribute monthly disease surveillance newsletters in one or two of the sub-regions.

Achievements: Ongoing in OCEAC sub-region. Begun early 1980 in Anglophone sub-region.

Problems/Constraints: None.

Sub-objective 4: To develop a coordinated laboratory system to provide necessary back-up services to the disease surveillance and control system.

4.1 Provide short-term assistance to Institute Pasteur in Abidjan to develop their capabilities to do seroconversion titration for measles.

Achievements: Deferred.

Problems/Constraints: Timing and scope of work of consultant visit to be worked out.

4.2 Provide support for African laboratory person who will run SHDS/OCEAC laboratory.

Achievements: Ongoing. Will be completed July 1980.

Problems/Constraints: None.

4.3 Identify specific laboratory needs for surveillance support of the Gambia EPI programme.

Achievements: Completed April 1980. Request for supplies/equipment being developed.

Problems/Constraints: None.

4.4 Identify and provide for needs associated with SHDS laboratory work at Institute Pasteur in Abidjan, OCEAC and labs to be identified in the Gambia.

Achievements: Ongoing. OCCGE expected to submit request for needed supplies and equipment during second half of 1980.

Problems/Constraints: None.

WORLD HEALTH ORGANIZATION
ORGANISATION MONDIALE DE LA SANTÉ

EPI/GEN/80/7
ENGLISH ONLY

EVALUATION - 1979
YAOUNDE, UNITED REPUBLIC OF CAMEROON

(Extract from report by Dr D. Heymann, CDC/SHDS, Yaoundé, 4 March 1980)

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1. Introduction

In November and early December of 1979, the Fourth Annual Evaluation of the immunization coverage of Yaoundé was carried out. 209 infants between the ages of 12-23 months were selected at random according to the EPI cluster sampling method. The purpose of the evaluation was:

(a) to establish the level of immunization coverage in Yaoundé;

(b) to attempt to demonstrate if a relationship exists between the nutritional status and vaccination status of the children sampled;

(c) to determine if certain sociological variables, such as ethnicity, number of children in the family, rank of infants in the family, and occupational status of the head of household, influence the immunization status of the children sampled;

(d) to determine the extent of information regarding the EPI available in Yaoundé, such as knowledge of clinic sites and hours;

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(e) to determine attitudes held by mothers regarding vaccination efficacy;

(f) to determine measles vaccine efficacy by serologic testing of the sampled infants.

Table 1

Immunization Coverage of Infants from 12-23 Months of Age, 1976-1979

	1976	1977	1978	1979
Infants sampled	187	206	216	209
% with vaccination cards	46%	54%	44%	49%
% with BCG	38%	49%	44%	59%
DPT + Polio No. 1	35%	46%	41%	57%
DPT + Polio No. 2	22%	36%	33%	48%
DPT + Polio No. 3	17%	27%	27%	39%
Polio No. 1				54%
Polio No. 2	*	*	*	45%
Polio No. 3				35%
Measles vaccine	39%	40%	32%	40%

* DPT + Polio 1976, 1977, 1978
DPT only 1979.

Of the 209 infants surveyed in 1979 only 31% had received all of the indicated vaccinations. Another 28% had received some but not all of the vaccinations. Fully 41% had never received any vaccination.

2. Nutritional Status

Preliminary analysis of nutritional status versus immunization status fails to reveal any obvious correlation between the two (see Annex 1). Only 8 children in the 1979 sample were found to be malnourished according to CDC standards.

3. Sociological Variables

The most important variable influencing immunization status of children appears to be the ethnicity of the parents (see Table 2). The rank of the child in the family does not seem to be a significant factor in his vaccination status (see Table 3). Birth order does however influence maternal recognition of measles (see Table 4). Occupational status of the head of household was found to be not statistically related to the immunization status of the infants residing in the household (see Table 5).

Table 2

Immunization Coverage and Ethnic Group

Ethnic group	Number of children	Number of vaccinations received (8 possible)	
		Mean	Median
Group of the Western Highlands	59	5.3	7
Group of Northern Cameroon	22	4.2	5
Central Bantu	12	3.9	3
Bassa	29	2.9	1
Pahouin-Beti	70	2.6	0

The ethnic group of the family is related to the vaccination coverage of the children. The Western Highlands group had the highest coverage, while the Pahouin-Beti group had the lowest.

Table 3

Immunization Coverage and Birth Order

Birth order*	Number of children who had			
	No vaccinations	Some vaccinations	All vaccinations	Total
1 - 3	48	32	42	122
4 - 6	25	16	18	59
7 - 9	10	9	4	23
Total ...	83	57	64	204

$X^2_4 = 3.12$ $p = .54$ not significant

* In cases of twins, only the second twin was included here.

The birth order of the child does not seem to have an effect on his vaccination status.

Table 4

Birth Order of Child and Reported Cases of Measles

Parents' report	Birth order of child			
	First-born	Second-born	Later-born	Total
Child had measles	26	7	31	64
Child did not have measles	26	36	77	139
Total ...	52	43	108	203

$X^2_2 = 13.2$ $p = .001$

Although the rank of children in their families was not related to vaccination status, it was related to parents' reports of cases of measles.

It has been established during the EPI programme that in Yaoundé, many rashes and fevers are incorrectly called "measles". This shows that inexperienced parents are much more likely than experienced parents to report that their children had "measles".

Table 5

Occupation of Head of Household and Vaccination Coverage

Occupational level of head of household*	Vaccinations received by child			
	None	Some	All 8	Total
A (Upper)	4	3	5	12
B (Middle)	39	18	31	88
C (Lower)	40	31	25	96
Total ...	83	52	61	196

$X^2_4 = 4.46$ not statistically significant

* For specification of professions by level, see Annex 2.

Within the middle level, however, some interesting differences were noted. Of the total 88 children in this group, 35% had received all eight of their vaccines. Two groups stand out with their unusually good vaccination coverage:

(a) Of the 7 children in nurses' households, 57% had all their vaccines.

(b) Of the 30 children in the households of soldiers, gendarmes and police, 60% had all their vaccines. The locality of Ngoa-Ekélé II is especially interesting. It is adjacent to a military camp, and 11 of the 14 heads of households are in the military. This locality had the highest overall vaccination coverage of all the localities evaluated, despite the fact that it is among the most distant from a vaccination centre (1.5km map distance from CUSS).

4. Extent of Public Information Regarding Immunization Programme

Parents of the 85 non-vaccinated children were asked certain questions regarding their knowledge of available immunization clinics and their feelings regarding the efficacy of vaccination (see Table 6). Twenty-nine per cent (29%) said they felt that vaccination did not protect children from diseases; 36% did not know that a vaccination team was working in Yaoundé; 50% did not know where they could go to have their child immunized; and 76% did not know the dates of the immunization clinics.

Table 6

Public Knowledge on Immunization

Questions asked:		
1. Are you aware that there is a vaccination team here in Youndé?	78 replies	36% said NO
2. Do you know where you can have your child vaccinated?	76 replies	50% said NO
3. Do you know what day you can have your child vaccinated?	76 replies	76% said NO
4. Do you believe that vaccinations really protect your child against illnesses?	75 replies	29% said NO

As in past evaluations, a lack of information concerning the place, and especially the day of vaccinations, appears to be the major problem.

5. Serologic Studies

Serologic studies of the infants studied are now being processed. Of the 209 infants studied, 28.7% had histories of having had measles; however, only 3.6% had histories of measles after having received measles vaccine (see Table 7). This indicates that the vaccine has been well conserved and correctly used. However, the extent of challenge with measles virus is not possible to ascertain and, therefore, the true level of efficacy of the vaccine can be judged only after the serologic results are known. This will be the subject of a separate paper.

6. Loss of Vaccination Cards

The parents of fourteen percent (14%) of the 118 infants who had begun receiving their immunizations had subsequently lost their vaccination cards. These children were found to be far less likely to be fully immunized than those for whom cards were available (see Table 8).

Table 7

Measles Incidence in Relation to Vaccination Status

Parent's report	Ill with measles	Not ill	Total
Children vaccinated against measles	15	68	83
Children not vaccinated against measles	49	70	119
Total ...	64	138	202

$X_1^2 = 12.05$ $p = .001$

We have examined the replies for these 15 children whose parents said they had had both measles vaccine and measles illness. Ten parents reported an age at the time of illness which was before the age when the child received the vaccine. Only four parents indicated that the illness occurred after the vaccine, and for one child the date of the vaccine was unknown. Thus, at the most, 5 children of the 202 had measles after having been vaccinated.

Table 8

Immunization Coverage and Immunization Card Retention

	Vaccinations completed	Vaccinations not completed	Total
Card found	58	43	101
Card lost	5	12	17
Total ...	63	55	118

$X_1^2 = 4.6$ $p < .05$

The loss of immunization cards often stops the family from continuing the vaccination of their child. Among the 118 children who had been vaccinated at least once, and who thus had owned a card, 17 had lost it before our visit. These children were less apt to have completed their series of vaccinations than were the children who still had their cards.

7. Discussion

The vaccine coverage levels in Yaoundé seem to have regained some of the upward momentum of the early years of the programme. This is a bit surprising since the basic team and the means available to it were not substantially augmented during 1979. However, during the year 4 vaccinations centres about 60kms outside of Yaoundé were dropped from the programme to better concentrate efforts in the city itself. Late in the year 2 additional centres were opened in Yaoundé itself to augment city coverage.

As in previous years infants who had recently arrived in Yaoundé were excluded from the study. This was done to ensure that each survey participant had temporally an equal chance to be immunized and was not merely in temporary or transient residence in Yaoundé. In 1976, 1977

and 1978 children were excluded if they had resided in Yaoundé less than 1 month. In 1979 they were excluded if they had resided in Yaoundé less than 3 months.

For the past several years, vaccine coverage levels of the city have remained on a plateau at less than desirable levels. The current study indicates that this may be due to the lack of participation in the programme of the ethnic groups native to the area of Yaoundé itself. The startling contrast between the relatively high participation in the programme of the ethnic groups native to the West and North of Cameroon currently residing in Yaoundé, and the very low participation of the locally born and raised ethnic groups of South Cameroon is certainly the most remarkable finding of the study.

This difference was also noted in surveys of vaccine coverage done in 1979 in the towns of Bafoussam and Bamenda in the West and Northern Provinces where relatively high vaccine coverage levels were found, and in the town of Eséka, in the South, where low levels of vaccine coverage were found (see Table 7).

However, it should be noted that these zones are not strictly comparable : Eséka being more rural in character than either Bamenda or Bafoussam and, therefore, perhaps less able to achieve programme goals due to lack of personnel, supplies and public information.

Since the members of a given ethnic group tend to live in neighbourhoods with members of the same ethnic group in Yaoundé, the location of clinic sites was also examined to determine if certain geographic areas of Yaoundé were preferentially endowed with vaccination clinics while other neighbourhoods were slighted. This was found not to be the case. The present 18 clinic sites in Yaoundé are located such that no infant lives more than 3 kilometers from a vaccination centre, with the majority living within 1½km. There appears to be no correlation between proximity to vaccination centres and vaccine coverage in Yaoundé.

Similarly the number of children in the household and the birth order of the evaluated infant was examined to see if first children might be preferentially treated or if children from larger families might be less likely to receive immunization than those of families with fewer children. Neither was found to be the case (see Table 3).

8. Recommendations for the Yaoundé EPI

1. Continue to study the causes and attempt to remedy the problem of the lower participation in the immunization programme of the ethnic groups native to the area of Yaoundé.

Possible solutions to this problem might include: (1) health education by mass media in the languages local to the area concerned and (2) house to house visits by a trained group of health educators of the same ethnicity as that of the quartiers with low vaccine coverage in order to motivate parents to bring their children to existing immunization centres.

2. Augment health education activities among new mothers at maternity clinics in Yaoundé where over 98% of all births in Yaoundé occur. Emphasis should be placed on those mothers of ethnic groups known to have low participation in the current vaccination programme.

3. As of January 1980, 5 new agents have been added to the Yaoundé vaccination programme. These workers should be fully trained not only to staff immunization clinics but also to conduct educational programmes as needed in recommendations 1 and 2 above.

ANNEX 1

Nutritional Status and Measles Vaccination in Yaoundé

Malnourished children should routinely be considered at high risk of contracting a serious or fatal case of measles. Thus they are in special need of measles vaccine.

How many malnourished children live in Yaoundé?

The 1978 National Nutrition Survey of 895 Yaoundé-Douala children ages 3-59 months found 13, or 1.5% malnourished (below 85% of CDC standard weight-for-length).

The October 1979 survey of 284 children ages 0-36 months in the Etoa-Meki locality found 12, or 4.2% malnourished (below 85% of Harvard Standard weight-for-length).

The 1979 city-wide EPI survey of 207 children ages 12-23 months found 8, or 3.9% malnourished (below 85% of CDC standard weight-for-length).

There are an estimated 46,000 children under age 3 in Yaoundé*. We can estimate that a maximum of 4% of them, or 1,840 children, are malnourished.

Are these malnourished children being vaccinated under the present EPI programme? Are they as likely as well-nourished children to receive measles vaccine?

The Etoa-Meki surveyors examined each child for a smallpox vaccination scar, which serves as a marker for measles vaccine, given simultaneously by the EPI team. (Virtually no child was likely to have been vaccinated by anyone other than the EPI team). Table A indicates no statistical relationship between vaccination status and nutritional status.

In the city-wide EPI evaluation, the history of measles vaccination was obtained from the child's vaccination card or from the mother's statements, if the card could not be found. Table B shows no significant relationship between nutritional status and vaccination status of the 200 children.

Another variable should be considered here : whether or not a child has had a case of measles, a factor which is usually related to both nutritional and vaccination status. Table C shows only the 64 children whose parents said they had suffered an attack of measles. Table D shows the 136 children who had never had measles. In neither of these subgroups were nutritional and vaccination status related.

A second type of analysis has been done on the data of the 136 children who had never had measles. The actual nutritional scores (percent of CDC standard weight-for-length) of vaccinated children were compared with the scores of unvaccinated children. Table E shows the t-test results, again not statistically significant.

In sum, malnourished children in the studies done to date are just as likely to be vaccinated against measles as are well-nourished children. There is no reason to believe that malnourished children are being neglected by the present EPI programme. The numbers of malnourished children are quite small, and are likely to be small in any randomly selected sample of Yaoundé children. The 8 malnourished children identified in the EPI survey, however, did show certain consistent characteristics. All heads of household were in the lowest of the three occupational levels. Six of the eight were of the Pahouin-Beti ethnic group; the other two were of the Western Highlands group.

* This figure was arrived at as follows: the 1976 census showed 291,360 as the total population of Yaoundé, of which 33,164 or 11.4% were children under age 3. If the previous growth rate of 8.4% per year has continued, Yaoundé's 1980 population is 402,000. We can thus estimate that 11.4% or 45,862 are children under age 3.

Should special efforts be made to vaccinate the unvaccinated high-risk children?

Of the 200 children in the 1979 EPI sample, only 3 (1.5%) were malnourished and had not had measles and had not been vaccinated (see the fourth cell of Table D). If we were to generalize this figure to the total population of Yaoundé, we would find that 690 children (1.5% of 46,000) would thus qualify as "high risk". This is a relatively small number of children, and they are dispersed throughout the city*. Finding them at home would be a very expensive, if not impossible, task.

The only known concentration of malnourished children in Yaoundé is at the Central PMI. The nutrition department there follows on an ambulatory basis malnourished children seen by the outpatient department or discharged from central hospital. Special efforts should be made to vaccinate frequently the malnourished children found at the central PMI. In addition, the staffs of other large PMI centres could be alerted to identify high-risk children and to arrange their vaccination.

The results of the 1979 EPI evaluation presented here represent only a preliminary analysis of the data. Other statistical analyses on other vaccines and other anthropometric measurements can and should be done. Raw data will be sent to CDC, Atlanta, USA, for further analysis by computer.

Table A

Nutritional Status and Vaccination Status
Etoa-Meki children, 12-36 months

	Vaccinated against measles	Not vaccinated against measles	Total
$\geq$ 85% of Harvard standard weight-for-length	103	81	184
$<$ 85% of Harvard standard weight-for-length	3	3	6
Total ...	106	84	190

$X_1^2 = .08$ not statistically significant

* Four of the eight malnourished children in the EPI survey were in the Djoungolo II locality (which is, incidentally, just adjacent to Etoa-Meki). This result may be due to sampling error, or it may represent a real pocket of malnutrition. Further investigation is needed.

Table B

Nutritional Status and Vaccination Status
Yaoundé children, 12-23 months

	Vaccinated against measles	Not vaccinated against measles	Total
≥85% of CDC standard weight-for-length	80	111	191
<85% of CDC standard weight-for-length	1	7	8
Total ...	81	118	199

$X_1^2 = 2.15$ not statistically significant

Table C

Nutritional Status and Vaccination Status
Children 12-23 months who HAD HAD MEASLES

	Vaccinated against measles	Not vaccinated against measles	Total
≥85% of CDC standard weight-for-length	15	45	60
<85% of CDC standard weight-for-length	0	4	4
Total ...	15	49	64

$X_1^2 = 1.31$ not statistically significant

Table D

Nutritional Status and Vaccination Status
Children 12-23 months who HAD NOT HAD MEASLES

	Vaccinated against measles	Not vaccinated against measles	Total
> 85% of CDC standard weight-for-length	65	66	131
< 85% of CDC standard weight-for-length	1	3	4
Total ...	66	69	135

$X_1^2 = .94$ not statistically significant

Table E

Nutritional Status of Vaccinated + Unvaccinated
Children 12-23 months who HAD NEVER HAD MEASLES

	Vaccinated against measles	Not vaccinated against measles
Number of children	67	69
Mean nutritional score ±1 standard deviation (% of CDC standard weight-for-length)	100.2 ± 10.0	98.1 ± 8.7

$t = 1.30$ $.1 < p < .2$ (two tailed)
not statistically significant

ANNEX 2

Occupation of Head of Household

For every child the question was asked: "What is the profession of the head of the household?" Replies were coded in the office as follows:

A - Upper level

Fonctionnaires	Functionaries
Magistrat	Magistrate
Ingénieur	Engineer
Entrepreneur	Contractor
Commissaire de police	Police commissioner

B - Middle level (salaried workers)

Infirmier	Nurse
Instituteur	Teacher
Secrétaire	Secretary
Militaire	Soldier in army
Gendarme	Gendarme
Policier	Policeman

C - Lower level

Ménagère	Housewife
Chauffeur	Driver
Manoeuvre	Unskilled laborer
Ouvrier	Semi-skilled laborer
Commerçant	Small merchant
Elève	Student

IDENTIFYING THE REASONS FOR LOW VACCINATION COVERAGE:

A CASE STUDY OF YAOUNDE, CAMEROON

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BACKGROUND

Yaounde had a rapid growth rate of nine percent per year during the years 1969-1976. Its population in the 1976 census (just after the beginning of EPI) was 314,000, including 36,000 children under 3 years. If the previous growth rate has continued the 1979 population is estimated at 406,000, including 46,000 children under 3 years.

The 1979 city-wide EPI evaluation, using cluster sampling methods. covered 209 children, 12-23 months of age, who had lived in Yaounde for at least 3 months. The vaccination card of the child, a BCG scar and occasionally recollections of the mother, were accepted as evidence of vaccinations. Each child should have received eight doses of vaccine:

Visit	Age	Vaccinations
1	6- 8 weeks	DPT + Oral Polio + BCG
2	1 month later	DPT + Oral Polio
3	1 month later	DPT + Oral Polio
4	9-23 months	Measles*

Table 1 shows that only 59 percent of Yaounde children had begun their vaccines. Moreover, only half the children who started vaccines went on to complete the whole series. Two groups are thus of concern to EPI planners:

1. The 41 percent of the children who had no vaccines at all;

2. The 28 percent of the children who began the series but never finished.

These two groups may not be alike. The problems which keep the first group from getting even one vaccination may not be the problems which prevent the second group from returning to complete their vaccinations. Both groups were kept in mind as problems to be studied.

Table 1

1979 Vaccination Coverage, Yaounde
Children Ages 12-23 Months

	Number	Percent
Received no vaccines	85	41
Received some vaccines	58	28
Received all eight vaccines	65	31
	208	100 percent

*Smallpox vaccinations were still being given (at the same time as measles vaccinations), but they were not studied in the 1979 evaluation.

INTRODUCTION

Among the problems encountered today in Expanded Programmes of Immunization (EPI) is the failure to reach an acceptable level of vaccination coverage in rapidly growing urban areas.

In Yaounde, Cameroon, the EPI began in November 1975. The goal for the first 2 years of the program was 80 percent vaccination coverage. After 4 years of EPI, however, only 59 percent of Yaounde children 12-23 months of age had received a BCG vaccination; only 40 percent had received a measles vaccination; and 41 percent had never received any vaccination at all.

Research during the last half of 1979 has identified a number of reasons for this low coverage. The present paper shows how the problems were studied and identified. The four-part checklist developed for Yaounde is believed to have much wider applicability. The method is offered here for testing and use in other EPI programs.

During the last half of 1979, research was begun to identify the reasons for the continuing low vaccination coverage in Yaounde. Four types of problems were listed, which could possibly have been associated with low coverage:

A. Socio-Economic Characteristics

B. Poor Vaccination System

C. Parents' Lack of Information

D. Unfavorable Attitudes Toward Vaccinations

Each of these possible problems was phrased as a question and expanded to several sub-questions, each requiring YES or NO answers. The result was the following four-part checklist.

A. DO THE UNVACCINATED CHILDREN AND THEIR FAMILIES HAVE SPECIAL CHARACTERISTICS THAT CAN HELP IDENTIFY THEM?

	YES	NO
A-1. Do certain neighborhoods (or villages) have larger proportions of unvaccinated children than other neighborhoods (or villages)?	___	___
A-2. Do certain ethnic groups have larger proportions of unvaccinated children than other ethnic groups?	___	___

	YES	NO
A-3. Do families at a certain socio-economic level (education, occupation, income, housing, etc.) have a larger proportion of unvaccinated children than families at other levels?	___	___
A-4. Are new arrivals in the area less likely to be vaccinated than long-time residents?	___	___
A-5. Are malnourished children less likely to be vaccinated than well-nourished children?	___	___

B. IS THE PRESENT VACCINATION SYSTEM INADEQUATE?

B-1. Are the vaccination sites inconvenient (with more than 10 percent of the population living more than ___* kilometers from a site)?	___	___
B-2. Are the vaccination sessions held at irregular, infrequent, or inconvenient times?	___	___
B-3. Do the vaccines cost the parents too much money (fees, transportation, time lost from work)?	___	___
B-4. Are the procedures too complicated or too time-consuming for the parents?	___	___
B-5. Does the vaccination team's language or culture differ from those of the parents?	___	___
B-6. Do the parents suffer indignities during the vaccination session?	___	___
B-7. Does the EPI team lack a method for finding children who are not vaccinated?	___	___

C. DO THE PARENTS LACK ACCURATE INFORMATION?

C-1. Do parents lack necessary information on childhood disease (local names, seriousness, causes, contagiousness)?	___	___
C-2. Do parents lack necessary information about the vaccines (names, diseases, total number a child needs)?	___	___

*The criterion for an inconvenient distance must be defined locally. Yaounde = 3 km.

	YES	NO
C-3. Do parents lack information about their own child (his age, which vaccines he has had, when he should receive his next vaccine)?	___	___
C-4. Do parents lack basic information about the vaccination program (when, where, how to get vaccine)?	___	___

D. DO UNFAVORABLE ATTITUDES OUTWEIGH EVEN A GOOD VACCINATION SYSTEM AND GOOD INFORMATION?

	YES	NO
D-1. Are influential persons opposed to the vaccination program (grandparents, traditional healers, physicians, nurses, chiefs, religious leaders)?	___	___
D-2. Do parents believe that supernatural or interpersonal causes of disease are more powerful than biological causes or vaccines?	___	___
D-3. Have parents had past experience with poor vaccination programs, ineffective vaccines, or bad side effects?	___	___

YAOUNDE FINDINGS

Sources of Information

In Yaounde, answering the checklist required very little new community research. A great deal of information on Yaounde children and their families could be extracted from existing surveys and reports.

A census had been done in 1976. The general sex and age tables had been published for Yaounde, providing an estimate of the current child population.

The National Nutrition Survey of 1978 contained information on children's nutritional status.

An invaluable source of data was the city-wide Study of Infant Mortality being conducted by the Institut de Formation et de Recherche Démographiques (IFORD). The study covered a random sample of 9,753 infants born in Yaounde during 1978. A large amount of family information was collected in the

maternity wards at the time of each child's birth, including mother's ethnic group, her marital status, the number of living children she had, whether she earned any income, her educational level, and her husband's educational level. The child was then visited at home at regular intervals during its first 2 years of life and other information was recorded including the type of housing and the vaccinations the child had received.

The IFORD staff generously allowed EPI researchers access to their raw data. For EPI purposes, six neighborhoods were selected from IFORD data for special study, three because of their consistently high vaccination coverage and three because of their low coverage. IFORD records were studied on the 325 infants born to mothers of these neighborhoods during the months of January - April 1978.

The annual city-wide EPI Evaluations from 1976, 1977, and 1978 contained important information on vaccinated and unvaccinated children. A total of 600-700 children, under 3 years of age, had been studied each year. Each evaluation had included questions on parents' knowledge of the vaccination program. In addition, parents who had not had their children vaccinated were asked their reasons. Another EPI Evaluation was scheduled for the end of 1979. Questions were added in order to study certain items that had not been investigated before - ethnic group of families and nutritional status of the children.

One new survey was undertaken. A church-related health center was planning a child health survey of the Etoa-Meki neighborhood. The study was to cover all children under 3 years of age in one very crowded sector with a total of 300 children. The EPI investigators and the health center staff jointly conducted the survey. A number of vaccination-related questions were included.

In addition to the above data, other informal information was gathered, particularly in early stages of the research. The EPI vaccination team, clinic personnel, community leaders, and many parents were interviewed. Though they were selected on a non-probability (opportunistic) basis, and though they were interviewed informally, their knowledge and opinions helped to define and clarify the problems.

Answers to the Checklist

The rest of this paper demonstrates the use of the Checklist to identify EPI problems specific to Yaounde. For each question, the answer YES or NO is stated, the source of information is specified, and the data is presented. For YES answers, major recommendations for improvement are underlined.

If a problem does not seem to be a major one, that is, it is not keeping large numbers of children from getting vaccinated, that question is answered NO. (Sometimes, in the discussion of NO answers, small problems are noted and recommendations are made, but they are only minor and are not of first priority). NO answers are just as significant as YES answers, for NO answers show where the EPI does not need to expend time and effort.

A. DO THE UNVACCINATED CHILDREN AND THEIR FAMILIES HAVE SPECIAL CHARACTERISTICS THAT CAN HELP IDENTIFY THEM?

A-1. Do certain neighborhoods have larger proportions of unvaccinated children than other neighborhoods?

YES

The annual EPI evaluations in Yaounde had used the method of cluster sampling in which a small group of children in 30 different neighborhoods were studied each year. This sampling procedure was not intended to allow detailed comparisons of one neighborhood with another. Nevertheless, it seemed reasonable to use the data on neighborhoods which had been evaluated repeatedly in order to make some comparisons.

The following procedure was followed. A list was made of the 23 neighborhoods which had been evaluated at least twice during the 1976, 1977, and 1978 evaluations. For each year, the neighborhood was given a DPT coverage score (the percent of children 6-35 months old who had received at least one dose) and a measles coverage score (the percent of children 12-35 months who had received one dose). Thus each neighborhood had two scores for each of the 2 or 3 years. Some neighborhoods were consistently among the highest in town; others were consistently among the lowest.

Each neighborhood's scores (four scores if evaluated twice, six scores if evaluated three times) were averaged to provide its overall coverage score. The overall scores ranged from 13 percent to 60 percent coverage, with a mean of 42 percent coverage. The seven neighborhoods with lowest coverage (13 percent to 35 percent) can thus be singled out for special attention. During the coming year, the EPI should concentrate on increasing coverage in these seven neighborhoods.

A-2. Do certain ethnic groups have larger proportions of unvaccinated children than other ethnic groups?

YES

City-wide surveys of Yaounde show five major ethnic groups (following the classification of the Institut de Recherches Scientifiques du Cameroun). Here they will be designated simply as Groups A, B, C, D, and E.

Table 2 shows three independent surveys of children's measles vaccination coverage and ethnic group of the mothers. In each of the three surveys, Group D has the highest coverage, while Group A has the lowest. The implications are clear. Group A children should be special targets of the EPI program in coming months.

Table 2

Ethnic Groups and Measles Vaccination Coverage in Three Surveys

	IFORD Data on 6 Neighborhoods Children, Age 12 Mos.		Etoa-Meki Neighborhood Survey Children 12-36 Mos.		1979 EPI Evaluation Children 12-23 Mos.	
	No.	% With Measles Vaccination	No.	% With Smallpox Scar (Given With Measles Vaccine	No.	% With All 8 Vaccines
Group A	116	20 %	33	48 %	70	20 %
Group B	48	42 %	56	50 %	29	24 %
Group C	25	32 %	33	52 %	12	33 %
Group D	87	46 %	60	70 %	59	44 %
Group E	-	-	-	-	22	36 %
Total:	276	33 %	182	57 %	192	31 %
	$X^2_3 = 17.38$		$X^2_3 = 6.6$		$X^2_4 = 9.7$	
	$p < .001$		n.s.		$p = .056$	

A-3. Do families of a certain socio-economic level (education, occupation, income, housing, etc.) have a larger proportion of unvaccinated children than families at other levels?

YES

The IFORD data on six neighborhoods were combined to compare the children who had received all the vaccines, some of the vaccines, and none of the vaccines, when visited at age 12 months. The significant results were as follows:

- Mothers in poorer housing were less likely to vaccinate their infants than were mothers in better housing (Table 3).

- Non-working mothers were less likely to vaccinate their infants than were working mothers (Table 4).

- Mothers who had not gone beyond primary school were less likely to vaccinate their infants than were mothers who had gone beyond primary school (Table 5).

- Mothers whose husbands had not gone beyond primary school were less likely to vaccinate their infants than were mothers whose husbands had gone beyond primary school (Table 6).

- The mother's marital status was not related to her infant's vaccinations (Table 7).

- The total number of children a mother had was not related to her infant's vaccinations (Table 8).

In sum, children in this sample were least likely to be vaccinated if they lived in poor housing, or if their mothers were not working and not well educated. Future EPI publicity should be aimed at this type of family. Vaccination sessions and health lessons should be organized with them in mind.

Table 3

Housing and Vaccinations IFORD Data

Type of Flooring and Utilities	Child had All Vaccines	Child had Some Vaccines	Child had No Vaccines	Total
Cement floor/ electricity & running water	13 (46%)	10 (36%)	5 (18%)	28 (100%)
Cement floor/ electricity or water	43 (42%)	29 (28%)	31 (30%)	103 (100%)
Cement floor/no electricity or water	27 (28%)	23 (23%)	48 (49%)	98 (100%)
Dirt floor	15 (22%)	17 (25%)	36 (53%)	68 (100%)

$X^2_6 = 19.32 \quad p < .01$

Table 4

Working Mothers and Vaccinations

	Child had All Vaccines	Child had Some Vaccines	Child had No Vaccines	Total
Mother works for for income	22 (46%)	14 (29%)	12 (25%)	48 (100%)
Mother does not work	70 (30%)	59 (26%)	101 (44%)	230 (100%)

$X^2_2 = 6.53 \quad p < .05$

Table 5

Mother's Schooling and Vaccinations

	Child had All vaccines	Child had Some Vaccines	Child had No Vaccines	Total
Mother went beyond primary school	50 (41%)	37 (30%)	36 (29%)	123 (100%)
Mother did not go beyond primary school	46 (29%)	41 (26%)	73 (46%)	160 (100%)

$X^2_2 = 8.2 \quad p < .02$

Table 6

Husband's Schooling and Vaccinations

	Child had All Vaccines	Child had Some Vaccines	Child had No Vaccines	Total
Husband went beyond primary school	41 (41%)	29 (29%)	29 (29%)	99 (100%)
Husband did not go beyond primary school	24 (28%)	22 (26%)	39 (46%)	85 (100%)

$X^2_2 = 5.85 \quad p = .054$

Table 7

Mother's Marital Status and Vaccinations

	Child had All Vaccines	Child had Some Vaccines	Child had No Vaccines	Total
Mother married	85 (36%)	61 (26%)	90 (38%)	236 (100%)
Mother not married	14 (22%)	19 (30%)	30 (48%)	63 (100%)

$X^2_2 = 4.32$, not significant

Table 8

Mother's Total Children and Vaccinations

Number of Living Children	Child had All Vaccines	Child had Some Vaccines	Child had No Vaccines	Total
1 - 2	36 (36%)	29 (29%)	36 (36%)	101 (100%)
3 - 4	32 (31%)	24 (23%)	47 (46%)	103 (100%)
5 - 6	20 (32%)	21 (34%)	21 (34%)	62 (100%)
More than 6	9 (35%)	4 (15%)	13 (50%)	26 (100%)

$X^2_6 = 5.92$, not significant

A-4. Are new arrivals in the area less likely to be vaccinated than longer-time residents?

YES

In 1976, 1977, and 1978, EPI evaluations all asked whether the child was newly arrived in Yaounde (within the preceding 2 or 3 months). The results for the 3 years were combined to study measles coverage. Nearly nine percent of the children were newly arrived. Table 9 shows that newly arrived children were less likely than longer-time residents to have had measles vaccine. Special efforts must be made to reach newly arriving families.

Table 9

In-Migration and Measles Vaccination
Combined Data from 1976, 1977, 1978
EPI Evaluations, Children Ages 12-35 Months

	Child had Measles Vaccine	Child had No Measles Vaccine	Total
Child in Yaounde at least 3 months	408 (40%)	608 (60%)	1,016 (100%)
Child in Yaounde less than 3 months	25 (26%)	72 (74%)	97 (100%)

$X^2_1 = 7.67, \quad p < .01$

A-5. Are malnourished children less likely to be vaccinated than well-nourished children?

NO

The National Nutrition Survey of 1978 covered children ages 3-59 months. Combined results for the cities of Yaounde and Douala showed only 1.5% malnourished.* EPI studies have found similar low rates of malnutrition.

The Etoa-Meki neighborhood survey of 190 children ages 12-36 months found only 6 (3.2%) malnourished.** Malnourished children were just as likely as well nourished children to have been vaccinated against measles (Table 10).

In the 1979 EPI Evaluation, 207 children 12-23 months old were weighed and measured. Only eight children (3.9%) were malnourished.* These children were just as likely as well-nourished children to have been vaccinated against measles (Table 11). A further analysis of the nutritional scores of children who had never had a case of measles showed no significant difference between the mean scores of vaccinated children (Table 12).

No special action is required for increasing vaccination coverage among Yaounde's small number of malnourished children.

Table 10

Nutritional Status and Measles Vaccination
Etoa-Meki Survey of Children 12-26 Months

	Vaccinated Against Measles	Not Vaccinated Against Measles	Total
≥85% of Harvard standard weight-for-length	103 (56%)	81 (44%)	184 (100%)
<85% of Harvard standard weight-for-length	3 (50%)	3 (50%)	6 (100%)

X_1^2 = .08, not significant

Table 11

Nutritional Status and Measles Vaccination
1979 EPI Evaluation of Children 12-23 Months

	Vaccinated Against Measles	Not Vaccinated Against Measles	Total
≥85% of CDC standard weight-for-length	80 (42%)	111 (58%)	191 (100%)
<85% of CDC standard weight-for-length	1 (12%)	7 (88%)	8 (100%)

X_1^2 = 2.75, not significant

* Below 85% of CDC standard weight-for-length (approximately the third percentile)
**Below 85% of Harvard standard weight-for-length

Table 12

Nutritional Status and Measles Vaccination
1979 EPI Evaluation of Children 12-23 Months
Who Had Never Had Measles

	Vaccinated Against Measles	Not Vaccinated Against Measles
Number of children	67	69
Mean nutritional score ± 1 standard deviation (% of CDC standard weight-for-length)	100.2 ± 10.0	98.1 ± 8.7

$t = 1.30$ $.0 < p < .2$ (two tailed), not significant

Postscript to Section A

In Section A, low vaccination coverage was found related to neighborhood, ethnic group, socio-economic level and in-migration. It seemed likely that low coverage and high coverage neighborhoods would differ on the other three factors. Therefore, three neighborhoods of consistently low vaccination coverage were compared with three neighborhoods of consistently high coverage:

- Low coverage neighborhoods had a large proportion of residents of ethnic group A. High coverage neighborhoods had a large proportion of residents of ethnic group D. ($X^2_4 = 27.0$ $p < .001$, IFORD data)

- Low coverage neighborhoods had more new arrivals than high coverage neighborhoods. ($X^2_1 = 6.16$ $p = .01$, data from EPI Evaluations 1978, 1977, and 1978)

- There were no differences between low and high coverage neighborhoods on any of the socio-economic characteristics:

  - type of housing
  - proportion of mothers working
  - educational level of mothers
  - educational level of husbands
  - mother's marital status
  - total number of children

In sum, low coverage neighborhoods have a large proportion of ethnic group A residents and a large proportion of new arrivals. These two distinguishing characteristics must be recognized in any attempts to increase coverage in these neighborhoods.

On the other hand, the low coverage neighborhoods do not have an unusually large proportion of poor housing or of non-working or uneducated mothers. In other words, the poorer and less educated mothers or families (who were found in Section A-3 to be less likely to vaccinate their children) are not grouped together in certain neighborhoods. Therefore, in all parts of the city, the EPI team must be sensitive to the special needs of these families.

B. IS THE PRESENT VACCINATION SYSTEM INADEQUATE?

B-1. Are the vaccination sites inconvenient (with more than 10 percent of the population living more than three kilometers from a site)?

NO

The vaccination team members feel that three kilometers is a reasonable distance to walk for vaccinations. The entire population of Yaounde lives within a two kilometer radius of one of the 15 vaccination sites. This radius refers to distance measured on a map, so in some cases, hills and winding roads could increase the total walking distance to three kilometers, but never more than that.

Nevertheless, distance does seem to be somewhat related to vaccination coverage. Rough estimates were made of the distances of various neighborhoods from vaccination sites. In the six neighborhoods with the highest vaccination coverage, residents live, on the average, about 600 meters from a vaccination site. In the seven neighborhoods with the lowest coverage, residents live about 1,200 meters from a site.

If the EPI team wishes to reduce the maximum walking distance to two kilometers, the map reveals one neglected area. The next new vaccination site should be established in that area.

B-2. Are the vaccination sessions held at irregular, infrequent, or inconvenient times?

NO

Vaccination sessions are held monthly at each site. The date for a given site is stated, "the second Tuesday of the month," or "the last Friday afternoon of the month." This designation is easily understood and is used by vaccination team, regular dispensary staff, and parents. For the city as a whole, the present schedule seems adequately regular, frequent, and convenient.

The one site which might profit from a different schedule is the Central Maternal and Child Health Center. Currently, there are two sessions a month, but they fall in adjacent weeks (and occasionally within the same week). Since a large number of high-risk children (poor, sick, malnourished) are seen at this center every day, vaccinations should be offered there at least weekly, if not daily.

B-3. Do the vaccines cost the parents too much (fees, transportation, time lost from work)?

NO

No fees of any kind are charged for cards or vaccines in Yaounde. All residents live within walking distance of a vaccination site.

Time lost from work could be costly in a certain number of cases. The IFORD researchers found that 34 of 205 mothers (17 percent) earned some income. Some of them had salaried jobs and would need time off to take their children for vaccinations. Others worked as seamstresses or sold food or small merchandise in the market. These are the women who would most likely suffer loss of income when taking a child to a vaccination session. However, the EPI vaccination schedule requires, at the most, that the child spend a total of only four mornings at vaccination sessions during his entire first year of life. In addition, many mothers have women relatives or adolescent girls who help them with market work and child care, including taking a child to vaccination sessions. Finally, in our many conversations and surveys with parents, they very rarely mentioned their work schedule as a reason their children had not been vaccinated. No changes are needed in this respect.

B-4. Are the procedures too complicated or too time-consuming for the parents?

NO

The procedure at vaccination sessions appears simple and efficient for both the mothers and the team. Mothers are accustomed to listening to a health lesson and then lining up for triage, where they get a colored plastic disc for each vaccine the child is to receive. They help each other find the proper line for each vaccine. Newcomers are aided by the team and by other mothers. Though at some sites traffic flow could probably be improved, the present system is generally efficient and is understood by the mothers who attend.

Nor are the sessions too time consuming. Most women probably spend less than 3 hours from the time they leave home until they return.[5] Evidently large crowds and long sessions were more of a problem in the past. In the 1977 evaluation, five percent of all mothers interviewed said they had been turned away from at least one session because the crowd was too large. Vaccination sessions now continue until all children are seen, and the crowd problem was mentioned much less frequently in 1978 and 1979. Currently, the EPI team

monitors attendance at each session; extra sites and extra sessions are added as needed. If coverage and attendance are greatly increased during the coming months, new sessions and new procedures may be needed. The EPI team should be thinking and planning ahead.

There are two current procedures which do discourage some parents from completing their children's vaccinations. First, the team refuses to vaccinate sick children. In November 1978, 56 mothers were interviewed right after a health lesson at a vaccination session.[5] Nearly all of them (98 percent) had understood that no vaccination would be given to a sick infant.

In the 1978 EPI Evaluation, the mothers of 362 never-vaccinated children were interviewed, four percent of them had actually been to a vaccination session but had been turned away because their child was sick. In the 1979 Evaluation, the question was not specifically asked, but parents continued to mention sickness, <u>any</u> sickness, as their reason for not having their child vaccinated.

According to current EPI policy, the team should refuse to vaccinate a child only if he has a fever. In Yaounde though, both the EPI team and the parents are still unaware that children with mild colds, coughs, and diarrhea can be vaccinated.

The second current procedure which might be improved concerns lost vaccination cards. In the 1979 evaluation, 14 percent of the 118 mothers who had received cards had lost them. Their children were less likely to have completed their series than were children who still had cards ($X^2_1 = 4.6$, $p < .05$).

The vaccination team does not like to vaccinate a child without his past record. If a mother brings her child without his card, she is sent home to look for it. She is told that if she does not find it, she may return the next month to ask for a replacement. It is possible many never return.

The lost card procedure could be modified to encourage the mothers to complete the series. The mothers' word could be accepted on the vaccines her child had in the past. (Mother's recent memory seems to be fairly accurate on how many times she has brought her child to a session). If necessary, a small fee could be charged for a replacement card, but in any case, mothers should understand that losing a card is not a reason to stop all vaccinations.

B-5. <u>Does the vaccination team's language or culture differ from those of the parents?</u>

<u>YES</u>

Cameroon is ethnically a very diverse country, and Yaounde, as its capitol, reflects this diversity. The city contains five major ethnic groups, each with numerous sub-groups of differing languages and traditional customs.

In the face of the linguistic diversity, the vaccination team has resorted to the one language likely to be understood by the largest number of mothers -

French. Indeed, most of the women at the sessions do understand "market French" and can answer simple questions and follow simple directions. After one health lesson in November 1978, mothers were questioned about details of the lesson.[5] A majority gave correct answers.

New findings during 1979 though suggest that language, education, and ethnic differences are contributing to low vaccination coverage. Certain ethnic groups have consistently shown low vaccination coverage (Section A-2 above). Less educated mothers are less likely than educated mothers to vaccinate their children (Section A-3). During the 1979 evaluation and surveys, the researchers were trained to be sensitive to languages. It became clear that many Yaounde women do not speak French at all or only with difficulty.

Is it possible that the women who do come to vaccination sessions are the ones who can communicate at a basic level in French? Are non-French speakers less likely to come at all? Are they less likely to return to complete the vaccination series? These questions cannot be answered definitely by available data, but the vaccination team should certainly try using local languages in their sessions. To do this, the EPI team itself must have members of all Yaounde's major ethnic groups.

B-6. Do the parents suffer indignities during the vaccination session?

NO

The Yaounde EPI team is generally calm and pleasant during vaccination sessions. Sometimes at the end of long, busy sessions they become short-tempered and overbearing, especially with latecomers, but this behavior is infrequent. Recently, one team member's behavior was judged by local cultural standards to be unnecessarily rude and harsh; he was transferred off the team. Courtesy must be emphasized in team training from time to time, but no major changes are necessary.

B-7. Does the EPI team lack a method for finding children who are not vaccinated?

YES

The Yaounde EPI program has no built-in methods for listing eligible children and for knowing which ones are not yet vaccinated. A good monitoring system would require a census of children under 3 years old, kept up-to-date with vaccines marked regularly.

Such a census for the entire city of Yaounde is not logistically or economically feasible. It is worth attempting though, in neighborhoods with consistently low vaccine coverage. A separate census list could be made for each "bloc," the area administered by a single chief, called "Chef de Bloc."

Four steps would be necessary:

a. House-to-house survey to list the names, birthdates, and vaccinations of all children under 3.

b. Ongoing registration of newborns and new arrivals.

c. Regular recording of vaccinations received by bloc children.

d. Visits to children who have not been vaccinated on schedule to inform and encourage their parents.

The initial house-to-house survey could be done by persons appointed by the chief, by a local community group, or by nursing students. The ongoing registration of children and the recording of vaccinations could be done by a community resident on a voluntary or paid basis. The home visits could be done at intervals by volunteer or paid residents or by nursing students. Supervision should be provided by the central EPI team.

C. DO PARENTS LACK ACCURATE INFORMATION?

C-1. Do parents lack necessary information on childhood diseases (local names, seriousness, causes, contagiousness)?

YES

There is considerable confusion about disease names and symptoms. For example, most speakers of French as a second or third language (whether Cameroonians, Americans, mothers, students, or school leavers) tend to confuse the French words variole, varicelle, and rougeole, which in English are smallpox, chickenpox, and measles. In addition, coqueluche (whooping cough) is an unfamiliar word.

This confusion is aggravated in translating between French and local languages. In the Etoa-Meki neighborhood survey, mothers were asked to name children's illnesses or vaccines in their own language, then to translate the words into French. Here are some of their responses:

Lanauge X

makele	- rougeole, variole, varicelle
libimbe	- rougeole, varicelle
makele ma libimbe	- rougeole
makele ma bas	- variole, varicelle
makele ma kohol	- coqueluche, BCG, tetracoq
kohol hiot	- coqueluche

Language Y

kalegatsha	- rougeole
olada	- rougeole, variole
mintsang miyoge	- variole, varicelle, petite variole
mbarr menye	- grande variole
ekoe	- coqueluche
eko oso	- coqueluche
otugu	- coqueluche

The confusion is compounded by errors in diagnosing illnesses. Actual measles is notoriously difficult. A study was made of children diagnosed as having measles at a one-time visit to the chief physician at Yaounde's Central Child Health Center.[6] Blood tests showed that 36 percent of the children did not have serologically confirmed measles. It is quite understandable that parents are confused.

Before recommending an intensive educational program on childhood diseases in several languages though, one should ask whether it is really necessary for parents to have detailed medical information. This topic will be further explored in the next section.

C-2. Do parents lack necessary information about the vaccines (names, diseases, total number a child needs)?

YES

In the Etoa-Meki neighborhood study, 43 mothers were asked to name in their own language and in French, children's vaccines or illnesses which could be prevented by vaccines. Seven different correct answers were possible. Five of the mothers (12 percent) could not name a single vaccine or disease. Twelve (28 percent) could name only one or two. Many who did name BCG, Polio or DTCoq, were unable to give equivalent words in their own language. These were special French vaccine words, which had no vernacular meaning and no connection with the childhood illnesses known to the mothers.

The EPI program currently teaches about vaccines in lessons during vaccination sessions, not through general public channels. Thus, the mothers who have attended vaccination sessions should be the best informed. However, in Etoa-Meki, mothers of vaccinated children were no more likely to give three correct answers than were mothers of unvaccinated children ($X^2_1 = 2.69$). Health lessons did not seem to increase the mothers' knowledge.

In fact, in some ways, current lessons may add to a mother's confusion. For example, a mother is told in French at a vaccination session that her child is being vaccinated against "rougeole." She translates that word as "makele." The next week, or even months later, her child gets a rash and mild fever, and the relatives call the illness "makele." The mother will link this illness with the vaccine, and she will declare that the vaccine did not work, or even

that the vaccine caused the illness. Confusion occurs between measles and other rashes, between smallpox and chickenpox, between whooping cough and other coughs. Every such incident gives vaccines a bad name.

In light of the difficulties in diagnosing, explaining, and translating childhood diseases and vaccines, one wonders whether educating parents is truly necessary. Do technical health lessons actually cause misinterpretation and mistrust of vaccines? Might it not be better and more helpful to parents to concentrate on the total number of vaccines a child needs? A single message could be used in maternity wards, in public announcements, and in health lessons: "In the first year of life, bring your baby to us four times. He needs five injections and three drops in his mouth."

Many health workers find unacceptable this idea of giving less information. They feel strongly that parents must have complete knowledge about diseases, vaccines, and side effects. At the least then, lessons can be simplified. Only one disease should be discussed during one lesson. A short talk should be repeated in several languages. These points should be clearly and simply emphasized:

- The real disease "measles" has these symptoms: .....
- Vaccination will prevent real measles.
- Other illnesses look something like measles, and in our language people often use the same word for them all. But they are not really measles.
- Vaccinations will not work against these other illnesses.

If parents have questions or doubts, they should, of course, be encouraged to speak up. The lesson, though, should not overwhelm them with information they do not need or want.

C-3. Do parents lack information about their own child (his age, which vaccines he has had, when he should receive his next vaccine)?

NO

Yaounde mothers know young children's ages. They generally have written records of their child's birth date, since most of them deliver in maternity hospitals (over 98 percent, according to the National Nutrition Survey). The large majority of mothers know that their child should be vaccinated during his first year of life. Then, when they attend a vaccination session, the child receives a card marked with vaccines given and an appointment slip marked with the date of his next visit.

A large number of children born in Yaounde, though, never attend even one vaccination session. Their mothers may not know when and where to take them the first time. This information could be provided right in the maternity hospitals: each newborn could be given an appointment slip showing the date he should begin his vaccinations at the site closest to his home.

C-4. Do parents lack basic information about the vaccination program (when, where, and how to get vaccine)?

YES

In the 1978 city-wide EPI evaluation, the mothers of 362 unvaccinated children were questioned. Of these, 80 percent did not know the schedule for vaccinations in their neighborhood.

In the 1979 evaluation, 76 mothers of unvaccinated children were questioned. Of these, 50 percent did not know where to get vaccines and 76 percent did not know when.

Clearly, current publicity on the EPI program is not reaching a large number of parents. This is probably the major reason that 41 percent of Yaounde children ages 12-23 months have never received even one vaccine. New and imaginative avenues of publicity are needed, perhaps the following:

- Bull horn announcements by persons walking through the low coverage neighborhoods.
- Tribal dance groups
- Women's savings clubs
- Churches

D. DO UNFAVORABLE ATTITUDES OUTWEIGH EVEN A GOOD VACCINATION SYSTEM AND GOOD VACCINATION INFORMATION?

D-1. Are influential persons opposed to the vaccination program (grandparents, traditional healers, physicians, nurses, chiefs, religious leaders)?

NO

In Yaounde, none of these groups seems to object to the vaccination program. Community leaders generally seem to know about the program and to favor it.

Individuals, though, occasionally speak out against the program. Some of them have had medical training in the past but do not have current information. A nurse, for instance, publicly criticized the practice of giving a child several live virus vaccines on the same day because of rules he learned in school years ago. A pediatrician criticized "mass campaigns" and ineffective vaccines, but does not know current procedures or tested effectiveness. Efforts must be continued to inform medical personnel about the progress of the current EPI program, but much more important will be efforts to inform parents directly.

D-2. Do parents believe that supernatural or interpersonal causes of disease are more powerful than biological causes or vaccines?

NO

Yaounde parents have strong faith in injections and medicines, whether traditional or modern. In the Etoa-Meki neighborhood, for example, fifty mothers were asked about their children's most recent illnesses. Forty-three said they had gone for medical help. Of these,

- 33 went to a hospital or clinic only
- 4 went to a pharmacy only
- 3 went to a traditional healer only
- 3 went to both a clinic and a traditional healer.

It is likely that at every visit to a clinic or a healer the child received some type of medicine or injection. The traditional healers may have dealt also with supernatural causes of the illness.

Some Yaounde parents do believe that bad magic, sorcery, and "poisons" can cause certain illnesses, among them tetanus and tuberculosis. It is doubtful, though, that such beliefs lead parents to reject vaccines as useless. Instead, they are likely to try to prevent the illnesses by using both traditional means (charms, preventive magic) and modern means (vaccines).

D-3. Have parents had past experience with poor vaccination programs, ineffective vaccines, or bad side effects?

YES

In the 1979 EPI Evaluation, 75 mothers of unvaccinated children were interviewed; 22 of them (29 percent) doubted that vaccines really work. Nearly everyone in Yaounde seems to know a story of a child who was vaccinated against measles and later was sick with measles. In some of these cases, the illness may not really have been measles (Sections C-1 and C-2 above). Many of the stories, though, could have been based on correct facts.

Some of the stories may refer to children who were vaccinated while still possessing maternal antibody which can prevent the vaccine from being effective. In February 1975, a study was done of 28 Yaounde children who were seronegative for measles antibody.[2] After vaccination, 100 percent of the children 9-23 months of age were seropositive; only 63 percent of the children 6-8 months of age were seropositive. On the basis of this study and others on the age of measles disease and mortality, the Yaounde EPI policy since late 1975 has been to give measles vaccine to children 9 months to 23 months of age.

Another problem in the earlier vaccination programs was that vaccines often became ineffective because of careless handling. In 1972, a study followed sixty children, 9-36 months of age, who had no measles antibody.[1] The children were vaccinated with measles vaccine at various Yaounde centers. Only 40 percent of them developed antibody. For 60 percent of the children, the vaccine was ineffective.

Since the beginning of EPI in 1975, the vaccine handling system has improved. Repeated studies have been done on random samples of Yaounde children. Table 13 shows that among vaccinated children the proportion with antibody has increased.

To summarize, two major changes have been made in the measles vaccination system since the beginning of EPI: vaccine is given to children at a later age, when it is more likely to produce antibody; and vaccines are now kept cold and thus more effective. These improvements appear to have decreased substantially the number of cases of measles in children who have been vaccinated. In the 1979 city-wide EPI Evaluation, investigators recorded whether the child had received measles vaccine and the date, as well as whether the child had had a case of measles, and his age then. The parents of only five (2.5 percent) of the 202 children reported that the illness has occurred at an age later than the age when the child was vaccinated. Thus, very few people in Yaounde are likely to know of a child in the past year or two, who has actually had measles after having been vaccinated. The stories which continue to circulate are probably old stories. To put an end to these rumors, the EPI team must continue to handle the cold vaccines properly and to inform medical personnel and the community of current low rates of vaccine failure. In large part, the team must cultivate the parents' trust and confidence in statements that vaccines are better than they used to be.

Table 13

Antibody to Measles - Random Samples of Children Ages 12-23 Months

	Vaccinated Children		Unvaccinated Children	
Year	Number Tested	% With Antibody ≥1:10 Acute Serum	Number Tested	% With Antibody ≥1:10 Acute Serum
1972	105	62 %	61	66 %
1976	51	70 %	93	40 %
1977	83	80 %	122	37 %
1979	84	70 %	122	51 %

Source: Heymann and Guyer (1979)

Setting Priorities

In Yaounde, ten checklist questions were answered YES.

Recommendations were made for ten improvements:

A. Socio-Economic Characteristics

A-1. Concentrate publicity and efforts in the neighborhoods with consistently low vaccination coverage.

A-2. Concentrate on Ethnic Group A.

A-3. Concentrate on families in poor housing, where mothers are poorly educated and do not work.

A-4. Develop ways to bring new arrivals in Yaounde into the vaccination program.

B. Poor Vaccination System

B-5. Ensure that a variety of languages are represented on the EPI team. Use various languages in lessons and vaccination sessions.

B-7. Organize an ongoing childhood census in low-coverage neighborhoods.

C. Parents' Lack of Information

C-1. Consider carefully how much medical information parents truly need.

C-2. Simplify the teaching about diseases and vaccines.

C-4. Publicize vaccination sessions in new and imaginative ways.

D. Unfavorable Attitudes Toward Vaccinations

D-3. Continue proper handling of vaccines and inform the public of good current rates of effective vaccination. Develop mutual trust with the parents.

Section A recommends a reorientation and a new focus for the EPI team's thinking and efforts. No longer should they think of Yaounde as a whole, a vast population to be reached through mass media. Instead, they should concentrate their publicity in the low coverage neighborhoods, which have large numbers of residents of Ethnic Group A and large numbers of new arrivals.

Section B calls for improvements in the current vaccination system. These are changes which the team itself can make in its own procedures. A minor change, such as using several languages, is relatively easy to make. On the

other hand, a childhood census of a few neighborhoods will require new procedures and new personnel. A relatively simple system, though, could prove very effective in increasing vaccination coverage.

Section C requires a rethinking of the information parents need and new methods for getting information to them. Unlike in Sections A and B, actions here cannot be unilateral by the EPI team alone. The parents' needs and desires are important. Sending out facts is not enough. The parents must receive and assimilate the facts presented. A two-sided process of education is essential.

Section D requires the team to overcome unfavorable, distrusting public attitudes, which are due to ineffective vaccines in the past. The cold handling of vaccines has already improved, and Yaounde measles cases are fewer than 5 years ago.[6] Yet the scepticism remains, even among knowledgeable people. Changing their attitudes will not be easy. Only facts supplemented by good personal relationships and mutual trust are likely to be effective.

Conclusion

The checklist presented in this paper is designed for testing and use in other EPI programs. An attempt was made to include all problems which could lead to low vaccination coverage. A local EPI team can best use the checklist by following these steps:

1. Read checklist
2. Decide where data can be obtained to answer checklist
3. Answer checklist. Every YES answer identifies a problem
4. Make recommendations for solving the problems
5. Take actions on the recommendations.

Finally, it is worth recalling that improvements suggested by the checklist are not goals in themselves. They are worthwhile only if they result in wider vaccination coverage and, beyond that, in a decrease in childhood diseases.

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Mr. R. Rowe, student in medicine at the University of Pittsburgh (USA) conducted the census and measurements of children in the Etoa-Meki neighborhood.

Dr. S. Foster, U.S. Center for Disease Control, contributed many valuable suggestions throughout the research and preparation of this paper.

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IVORY COAST

EXPANDED PROGRAM OF IMMUNIZATION

MID-YEAR PROGRESS REPORT - JULY 1980

INTRODUCTION

Between January and June 30, 1980 EPI-Ivory Coast expanded immunization, disease surveillance and training activities in the three demonstration zones - Abidjan, Abengourou and Korhogo - increasing the population served from 1.5 million people in 1979 to nearly 2 million in 1980. This represents 28% of Ivory Coast's 7 million population.

Perhaps the most significant innovation to EPI during the past six months was initiation of a school visitation program in June. A simple lesson plan was distributed to all primary school teachers in certain trial areas to teach pupils the need for having their younger siblings and neighboring children 3 months to 3 years of age vaccinated against childhood diseases. The lesson plan explains where the vaccination centers are located and emphasizes that the vaccinations given in the centers are not for school children but for small children only between 3 months and 3 years of age. After completing the lesson plans the children carry the lesson home along with appointment slips for their parents and neighboring parents to have their target children vaccinated. The following month, vaccinations increased ten fold wherever the school visitation program was carried out. The natural extension to the school program is to visit secondary schools, churches, mosques, factorys, and other places of large gatherings to teach and sensitize the population of the needs and benefits of infant immunization.

A counterpart for the coordinator of EPI-Ivory Coast (operations officer) has been identified and is scheduled to join the program in August 1980.

Three Peace Corps Volunteers completed their tours of duty (two years) with EPI and contributed immensely toward launching the program. One volunteer who joined the program in September 1979 will continue to serve in Abengourou until August 1981.

The revolutionary heat stable measles vaccine is now employed throughout Ivory Coast

The polio prevalence surveys which were started in June 1979 were completed in March 1980. A high rate of polio prevalence was found in all three areas surveyed suggesting an annual polio incidence rate in the Ivory Coast superior to those of the United States and Europe prior to the production of polio vaccines. Crude* prevalence rates ranged from 8 cases per 1,000 children examined in urban Abidjan and the forest area of Abengourou to 12 cases per 1,000 in the savannah area of Ferkessedougou.

ACTIVITIES

Vaccinations

During the past six months, the total numbers of vaccinations administered through EPI for a population of nearly 2 million people were as follows :

	DPT POLIO	TETANUS (Expectant mothers)	MEASLES	BCG
1st inj.	65,907	27,559	52,548	30,690
2nd inj.	48,556	17,092	10,504	-
3rd inj.	40,375	-	-	-
Booster	17,417	6,064	-	-
TOTAL	172,255	57,260	63,052	30,690

For details see attached vaccination sheet.

Surveillance

January thru June 1980 morbidity and mortality data reflect the following changes compared to the same time period last year :

- Measles
  - Abidjan outpatient measles cases up 24% (3,175/3,926)
    hospitalized cases up 4% (862/895)
    hospital measles deaths up 37% (57/78)
  - Grand Bassam cases down 45% (184/101)
  - Dabou cases down 36% (534/344)
  - Bonoua percentage undetermined - 226 cases Jan.-Jun. 1980
  - Abengourou ville outpatient cases up 324% (204/865)
    hospital cases down..... 5% (80/76)
    hospital deaths no change .. 25% (4/3)

* Paralytic polio cases affecting legs only. Does not include cases [illegible]

Abengourou (villages) cases down .. 68% (665/211)

- Korhogo ville cases up 90% (131/249)
  hospital cases down 17% (40/33)
  hospital deaths no change (2/2)

Korhogo (villages) cases down 74% (698/183)

- Ferkessedougou cases down 56% (476/208)

- Polio

  - Abidjan hospitalized cases down ... 46% (24/13)
    hospital deaths unchanged (1/1)

  - Abengourou hospitalized cases unchanged (1/1)

- Tétanos néo-natal

  - Abidjan hospitalized cases unchanged (18/18)
    hospital deaths down 9% (11/10)

- Pertussis

  - Abidjan hospitalized cases down ... 37% (8/5)

  - Abengourou outpatient cases down .. 18% (45/37)

Training

Five public health personnel received training in vaccination techniques, disease surveillance, program planning and program evaluation methods in order to launch the Ferkessedougou area (population 46,000) program in the beginning of the year.

Eight medical officers participating in the Seventh International Epidemiologic Course held in Abidjan May 27 through June 1980 received formal and field training in disease surveillance and vaccination coverage assessment through EPI-Ivory Coast. The medical officers come from Rwanda, Algeria, Senegal, Mali, Togo, Zaire, Madagascar and Guinea.

The Director of EPI-Ivory Coast assisted with the top level EPI Management Course held in Brazzaville in March.

The Coordinator (SHES/CDC assignee) for EPI-Ivory Coast assisted with the Bamako-ville EPI Course and the Mid Level EPI Management Course in Gambia in May.

Field training is an ongoing process for all personnel involved in EPI activities.

Health Education

Need for immunizations is taught in all the primary schools within the EPI zones. Live puppet shows, video tape shows, radio announcements, newspaper articles and mobile public address system announcements are ongoing activities to promote EPI.

An EPI information bulletin is circulated quarterly to provide feedback to all Ivory Coast health sectors and other interested agencies.

An EPI-Ivory Coast vaccination guide outlining program objectives, policies, techniques, etc... was published and distributed in June 1980.

Evaluation

- Vaccination Coverage

Assessments were carried out in all three EPI zones.

The percentages of children vaccinated in each zone are as follows :

	BCG	DTP-POLIO			MEASLES
		1st	2nd	3rd	
Abidjan (June 1980)	66%	74%	62%	51%	61%
Abengourou (June 1980)	84%	90%	84%	80%	79%
Korhogo (May 1980)	71%	58%	42%	28%	37%

- Vaccine testing

Oral polio vaccine was tested on three occasions. One shipment on arrival was worthless. Two other lots were tested after three months proper storage in freezer and were considered "insufficient".

Measles vaccine was tested on five occasions and was consistently reported "satisfactory".

OBSERVATIONS

Deficiencies which occur in the use of oral polio vaccine in Africa are probably caused more from poorly conserved vaccine (improper transport, lack of storage) than by deficiencies attributed to heat, freezing, parasites, etc...

Hospital cases serve as best index to measure increase or decrease in measles morbidity. Apparently, many outpatient clinic consultants confuse skin eruptions caused by rubella, roseola, heat rash, food allergies, medicine allergies, even measles vaccine reactions with rubeola.

UNICEF-Ivory Coast has recently experienced a significant increase in adenitis cases among BCG vaccinees. The administration of BCG has been discontinued pending resolution of the problem.

VACCINATION

JANVIER - JUIN 1980

REGIONS	Population	BCG	DT-COQ POLIO					ROUGEOLE			TETANOS (Femmes enceintes)			
			1ère	2ème	3ème	Rap.	Total	1ère	2ème	Total	1ère	2ème	Rap.	Total
ABIDJAN ville et banlieue	1,500,000	17,482	37,448	26,506	23,428	10 956	98,338	29,467	9,441	38,908	21,488	13,831	4,156	39,475
GRAND-BASSAM	40,000		1,973	8[illegible]2	599	73	3,447	1,575	141	1,716	211	137	-	348
DABOU (à partir de Mars)	40,000	587	443	346	309	109	1,207	259	21	280	578	503	91	1,172
DABOU	80,000	3,377	4,598	3,369	2,439	914	11,320	3,029	568	3,597				
DIMBOKRO ville	35,000	833	2.300	2,169	2,005	2,305	8,779	1,986	105	2,091				5,279
villages (45)	115,000	3,383	7,090	2,912	1,930	743	12,665	5,788	48	5,836				1,266
DIMBOKRO ville	80,000	5,028	5,810	[illegible],377	4,871	1,624	17,682	4,992	180	5,172	4,514	2,275	1,817	8,606
villages (17)	24,000		2,416	[illegible],918	1,521	693	6,548	1,841	-	1,841				
YAMOUSSOUKRO ville	25,000		2,423	3,455	2,159	-	8,037	2,423	-	2,423	768	346	-	1,114
villages (3)	21,000		1,416	1,702	1,114	-	4,232	1,188	-	1,188				
TOTAL	1,900,000	30,690	[illegible],907	[illegible],556	40,375	17,417	172,255	52,548	10,504	63,052	27,559	17,092	6,064	57,260

21st July, 1980.

To: Burean of Small pox Eradication, CDC

From: Stephen A. Fitzgerald, EPI Operation Officers, The Gambia.

Subject: Semi-Annual Progress Report. 80 AUG 21 P 2: 46

Progress towards the achievement of the sub-objectives I and II of the 1980 Program and Implementation Plan for Objective III of the SMDS/CDC project in the Gambia.

Sub-Objective I: To Expand Immunization Activities

1.1. Expansion of immunization activities, particularly since January 1980, has progressed at an accelerating pace. Since the Gambia's total population nearly matches that of the three demonstration-training areas the entire country will eventually be covered. To date Western Division (one demonstration-training area) has expanded to full implementation and EPI activities have begun expansion in Lower River Division, which along with North Bank Division, constitutes the second demonstration-training area. Expansion in part of North Bank Division has been hampered by lack of reliable transport at one of the health centers. It is from the health centers, particularly the MCH section, that mobile immunization outreach services take place.

1.1.1. Achieve 70% coverage of identified target population within 18 months of initiation of full operations.

Cluster surveys were conducted in Western Division in July and September of 1979 and April and May of 1980. These surveys show strong progress towards achievement of the 70% coverage target. The percentage of children with the completed series of DPT and Polio and coverage for BCG measles and yellow fever has shown steady improvement between the baseline surveys of 1979 and the on-going assessments of early 1980. Coverage comparisons are as follows:-

	DPT	DPT2	DPT3	POLIO	POLIO2	POLIO3	BCG	MEASLES	Y/F
1979	74.3%	63.7%	44%	37%	17.7%	7.7%	82.3%	45.1%	54.3%
1980	91.5%	83.6%	61%	75.6%	46.5%	23%	88.7%	48.4%	31%

SEE ATTACHMENTS I & II

Yellow Fever coverage has declined since the nation-wide campaign and special emphasis is being placed on this and measles vaccinations not just in Western Division but throughout the country.

Baseline surveys have been performed in Lower River and North Bank Division (second demonstration-training area). See attachment I & II . In addition, baseline surveys are planned for the third demonstration-training area (MacCarthy Island and Upper River Division) for August and September.

While not formally concentrating on expansion of EPI activities in the other demonstration-training areas as yet, expansion of immunization activities is proceeding apace in all areas of the country through expanded MCH/FHC outreach teams from almost all health centers. See attachments III and IV for comparison of immunizations. The EPI unit has assisted this expansion through logistical support, technical backup, vaccines, Ped-o-jets and cold chain maintanence and repair.

Sub-Objective II: To Develop Training Capabilities

Individual health center and divisional seminars are planned utilizing modules from the EPI Mid-Level Managers Course. (See Dr. Hull's Report). The first such seminar is planned for selected personnel from health centers in MacCarthy Island Division utilizing coverage assessment, vaccination session, and cold chain modules. A divisional baseline cluster survey will be one of the practical exercise in this seminar. Ped-O-Jet maintenance and repair will also be included in the seminar material. This pilot divisional seminar will be used as a basis for seminars in all other divisions.

COUNTRY: GAMBIA
DATE: 22-4-80

TABLE 1[1]

RESULTS OF COVERAGE EVALUATION SURVEYS

This format may be used to summarize the results of each survey performed. It is understood that not all surveys will cover all immunizations and that some surveys may include immunizations other than those listed.

1. CHILDREN

DATES OF SURVEY	AREA/LOCALITY	TOTAL POPULATION OF AREA/LOCALITY	EXAMINED		% POSITIVE								
			AGE GROUP	NUMBER	BCG	DPT I	DPT II	DPT III+	POLIO I	POLIO II	POLIOIII+	MEASLES	YELLOW FEVER
16-7-79 11-9-79	ALL WESTERN DIVISION EXCEPT BANJUL, KOMBO ST MARY & KOMBO NORTH	88,440	12-15 MOS.	350	52.3	74.3	63.7	44	32	17.7	7.7	46.1	54.3
20-9-79	NORTH BANK DIVISION	110,044	12-15 MOS	211	86	68	42	28	36	9	9	42	58
11-10-79	LOWER RIVER DIVISION	49,988	12-15 MOS	211	50	71	47	29	38	14	2	41	55
11-4-80	WESTERN DIVISION ALL	200,807	12-15 MOS	213	88.7	91.5	83.6	61	75.6	46.5	23	48.4	31

2. WOMEN (Programme target: ☐ All women of childbearing age ☑ Pregnant women)

DATES OF SURVEY	AREA/LOCALITY	TOTAL POPULATION OF AREA/LOCALITY	No. OF WOMEN EXAMINED	% POSITIVE		
				T I	T II	T III+
11-9-79	FOUNT JINTANG BONDALI, KANSALA & JARROL	27,194	140		97	
20-9-79	NORTH BANK DIVISION	110,044	210		41	
11-10-79	LOWER RIVER DIVISION	49,988	211		21	
11-4-80	WESTERN DIVISION	199,807	210		70	

[1] When reporting from Region to global level, a separate sheet for each country is requested

COUNTRY THE GAMBIA
DATE 15 JULY 1980

TABLE 4[1]

RESULTS OF COVERAGE EVALUATION SURVEYS

This form may be used to summarize the results of each survey performed. It is understood that not all surveys will cover all immunizations and that some surveys may include immunizations other than those listed.

1. CHILDREN

DATES OF SURVEY	AREA/LOCALITY	TOTAL POPULATION OF AREA/LOCALITY	EXAMINED		% POSITIVE								
			AGE GROUP	NUMBER	BCG	DPT I	DPT II	DPT III+	POLIO I	POLIO II	POLIO III+	MEASLES	YELLOW FEVER
13 MAY 1980	BANJUL & KOMBO ST. MARY	92,581		219	86.8	87.2	77.2	63	79	59.4	33	44.1	237

2. WOMEN (Programme target: ☐ All women of childbearing age ☐ Pregnant women)

DATES OF SURVEY	AREA/LOCALITY	TOTAL POPULATION OF AREA/LOCALITY	No. OF WOMEN EXAMINED	% POSITIVE		
				T I	T II	T III+

[1] When reporting from Region to global level, a separate sheet for each country is requested

ATTACHMENT II.

VACCINATION COVERAGE KONBO ETI PORT A PAKIN

MAY 18, 1980

NUMBER OF CHILDREN	219	
VACCINATION CARDS	192	87.7%
TA 1	191	87.2%
TA 2	169	77.2%
TA 3	138	63.0%
POLIO 1	173	79.0%
POLIO 2	130	59.4%
POLIO 3	70	33.0%
MEASLES	90	41.1%
YELLOW FEVER	52	23.7%
BCG	190	86.8%
AVERAGE NO. MCH VISITS	8.96	

Immunisation Status

Fully immunised children	16/219 = 7.3%
No immunisations	23/219 =10.5%
Average number of immunisations	5.50
Minimun number of MCH visits for complete immunisation	10
Average number of MCH visits	8.96
Immunisations per visit	0.63
Visits per immunisation	1.60

Measles Immunisation.

Immunisations given	119/219 = 54.3%
History of measles	3/219 = 1.4%
Immunisations given at correct age	91/219 = 41.6% of children
	91/119 = 76.5% of immunisations
Immunisations given at 8 months or less	28/219=12.8% of children
	28/119=23.5% of immunisations
Immunisations given at 7 months or less	11/219=5.8% of children
	11/119=9.2% of immunisations.

Yellow Fever Immunisation

Immunisations given	88/219 = 40.2%
Immunisations at correct age	52/219=23.7% of children
	52/88 =59.1% of immunisations
Immunisations given at 8 months or less	36/219=16.4% of children
	36/88 =40.9% of immunisations.

REPUBLIC OF THE GAMBIA

SUMMARY OF

IMMUNIZATION SERVICES

(ALL SOURCES)

JANUARY - DECEMBER 1979

DIVISION	DPT 1	DPT 2	DPT 3	DPT 5	DPT TOT	VACCINE POLIO 1	POLIO 2	POLIO 3	POLIO TOT	BCG	MEAS-LES	Y/FEVER	TT 1
WESTERN	10877	8586	7567	6739	35814	12153	5216	2215	19584	9831	16500	6764	6806
NORTH BANK	3224	2471	1659	632	8337	2545	815	185	3870	4025	3492	224	2568
LOWER RIVER	1737	1156	774	192	3859	1575	467	69	2111	2073	946	328	4859
MACCARTHY ISLAND	5603	4101	3638	966	14308	4499	846	384	5779	5910	4462	31	6717
UPPER RIVER	2597	1811	1177	344	5929	1882	548	142	2572	3320	1288	590	2746
TOTAL	24038	18125	14755	8873	68247	22654	7942	2995	33916	25159	25159	7937	23696

REPUBLIC OF THE GAMBIA
SUMMARY OF
IMMUNIZATION SERVICES
(ALL SOURCES)
JANUARY - JUNE 1980

DIVISION	VACCINE																
	DPT 1	DPT 2	DPT 3	DPT B	DPT TOT	POLIO 1	POLIO 2	POLIO 3	P.TOT	BCG	MEAS-IES	Y/F.	T.T1	T.T2	T.T3	T.TB	TTTO
WESTERN	6,63[illegible]	5,806	5,468	1,601	19,525	9,382	8,258	5,900	23,540	5,480	4,253	3,732	3176	2329	1652	2056	9213
NORTH BANK	3,0[illegible]	1,537	1,204	138	5,907	2,307	1,448	945	4,700	1,856	775	845	870	560	269	812	2511
LOWER RIVER	2,1[illegible]	1,065	761	209	4,151	2,695	960	702	4.357	1,371	1,636	451	556	169	69	464	1258
MACCARTHY ISLAND	3,89[illegible]	2,710	1,928	17	8,553	4,414	2,408	1,123	7,945	3,899	2,164	2,034	2216	1016	424	578	4234
UPPER RIVER	2,711	1,237	738	65	4,75[illegible]	1,670	863	327	2,860	1,789	741	293	897	477	805	288	2467
TOTAL	18,403	12,355	10,099	2,030	42,887	20,468	13,937	8,997	43,402	14,325	9,569	7,335	7715	4551	3219	4198	19[illegible]

ATTACHMENT IV.

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NO. all v

GAMBIA

ATTACHMENT VI.

WESTERN DIVISION

TABLE 3[1]

NUMBER OF PERSONS IMMUNIZED IN RELATION TO TARGET POPULATION, BY AGE

	Age Group		
	Below one Year	One Year	Two Years and above
Target population	8294	7356	18,512
BCG	3946	1534	
DPT I	1994	2062	2594
DPT II	1741	1771	2294
DPT III	1422	1968	2078
DPT total[2]	5856	6248	7421
Polio I	3378	2252	3752
Polio II	2808	3716	1734
Polio III	1652	2537	1711
Polio total[2]	7768	10,358	5414
Measles	893	1829	1531
Other	637	1604	1491

Country: GAMBIA
WESTERN DIVISION
Total population: 200,955
Period: JAN - JUNE 1980

	Pregnant Women	Others
Target population		
Tetanus I	2826	350
Tetanus II	1467	862
Tetanus total[2]	8236	977

[1] When reporting from Region to Global level, a separate sheet for each country is to be posted.

[2] In totals, include immunizations for which the dose is unknown, as well as DPT I+, Polio IV and I III

USE APPLICABLE LOCALLY ESTIMATED TARGET GROUP

already on Wang
(Aug 31 Rec'd)

SUMMARY OF ACTIVITIES OF THE OCEAC EPIDEMIOLOGY SERVICE

SEPTEMBER 1979 - SEPTEMBER 1980

I - Surveillance of Quarantinable Diseases

(1) Smallpox-like disease

Since September 1979, a total of 3 specimens from persons with smallpox-like disease were received and transmitted for analysis to the WHO reference laboratory for pox-virus (Atlanta). Two specimens were from Cameroon, one from the Central African Republic. The specimen from the Central African Republic was negative for pox virus, one specimen from Cameroon contained varicella virus, and the second from Cameroon, monkeypox virus.

The patient with confirmed monkeypox was a 3 year old female who had onset of disease in September 1979. She was admitted to a rural hospital in Cameroon, where specimens were obtained and transmitted to OCEAC. This was the first monkeypox confirmed in the OCEAC member nations, the 48th in the world. Investigation of this outbreak, as a teaching exercice for nursing students in conjunction with the OCEAC teaching service and Cameroon ministry of health, revealed no other monkeypox-like disease in the region.

With the declaration of the eradication of smallpox in the world, the WHO general assembly has recommended that routine smallpox vaccination be permanently discontinued, and that surveillance for other pox-like illness be continued, intensified in regions where monkeypox has occurred.

(2) Cholera

The system of routine surveillance for cholera continues to function well in Cameroon. Since September 1979, 16 suspect cholera specimens on Cary-Blair transport media were received at OCEAC. All specimens were received from Cameroon, and 5 were positive for vibrio cholerae, El Tor, serotype Ogawa, confirmed both at the OCEAC surveillance laboratories and at CDC (Atlanta). Cholera training seminars were proposed to all OCEAC member nations at the 1979 OCEAC Ministerial Conference and two nations, Congo and Gabon, requested these seminars. The seminars, held in host nations in May 1980, included self training laboratory and surveillance modules, with a goal of training physicians, nurses and technicians in feasible cholera surveillance in African Nations.

Yellow Fever and the African Hemorrhagic Fevers

At the request of the Cameroonian ministry of health, technical assistance was given in establishing a surveillance system for yellow fever and the African Hemorrhagic Fevers (Lassa, Ebola and Marburg) in the Petto region of north Cameroon. This system, based on capillary bloods collected on filter paper from persons with fever not responsive to treatment detected 4 patients with IFA to yellow fever and led to epidemiologic studies in June 1980 which confirmed the circulation of the yellow fever virus in the Petto region. At the request of the Cameroonian ministry of health, a training seminar for expansion of this surveillance system was carried out in August 1980 by the epidemiology service. Techniques in blood collection and post-mortem liver necropsy were reviewed in detail during this training seminar.

Work continues on better defining populations with indirect fluorescent antibody to the Ebola virus in Central African Republic (in conjunction with the Institut Pasteur, Bangui, and the WHO program for STD) in Gabon (in conjunction with the Institut Pasteur, Bangui) in Congo, and in Cameroon. Continuing evidence suggests that the Ebola caused disease is usually a mild febrile disease not differentiated from other illness of the regions where antibody is found.

In February 1980, an International Commission composed of members from the Prince Leopold Institut (Antwerp), CDC (Atlanta and Sierra Leone), OCEAC and the Cameroonian ministry of health studied Ebola disease patterns and collected forest animals living in the Moloundou region of Cameroon in an attempt to discover the reservoir of the Ebola virus in nature. Analysis of these animal specimens continues at present in Antwerp and Atlanta.

Surveillance for both yellow fever and the hemorrhagic fevers must be increased in the OCEAC countries to better define zones of risk for these viral diseases.

II - Expanded Program in Immunizations

A 2 week seminar for nurses and technicians for the Expanded Program in Immunizations was held in August 1980 in Cameroon. Two participants from each OCEAC country were invited, through WHO/Brazzaville, to participate in this seminar which was conducted by the Cameroonian ministry of health in conjunction with the OCEAC epidemiology service and WHO. Through a series of self-instruction modules, all aspects of successful immunization programs, including cold chain and surveillance of target disease, were studied and a field training exercice in evaluation of vaccination coverage carried out by participants.

Cameroon, Gabon and Congo have given strong committments to the Expanded Program in Immunizations. Cameroon and Congo both have five year plans which have been reviewed and approved by WHO/Brazzaville qualifying these nations for EPI assistance from UNICEF and donor nations.

The epidemiology service continues to work with the Cameroonian ministry of health in three EPI zones of Cameroon, studying the impact of the EPI on target diseases and designing a workable system of EPI surveillance for use in these zones. In conjunction with the Office of Expanded Program in Immunizations WHO/Geneva, and the Cameroonian ministry of health, studies were carried out to establish the prevalence of residual flaccid paralysis from polio in three zones of Cameroon. Zones of differing population density were examined by a series of school lameness surveys and house-to-house surveys for lame children. Several reports have been written on all surveillance activities, in hopes of offering feasible EPI surveillance techniques to other member nations.

III - Vaccine Field Trials

Field trials on measles and oral polio vaccine have been continued in coordination with the Cameroonian Ministry of Health and CUSS

Attenuvax (further attenuated heat stable measles vaccine) has been shown to successfully cause seroconversion in susceptible children after dilution and storage at 25°C for 48 hours and at 37°C for 4 hours.

Oral polio vaccine is currently being studied by a CUSS student to determine fecal oral transmission of the vaccine virus to non-vaccinated siblings.

Gonorrhea Surveillance

Training in gonorrhea culture and surveillance techniques was carried out in three regions of Cameroon in conjunction with the OCEAC gonorrhea study protocol. The surveillance laboratory is at present designing self-teaching modules for gonorrhea surveillance and laboratory confirmation, similar to those already designed for cholera and used during the ch training seminars during the year.

IV - Studies by CUSS Medical Students in conjunction with the OCEAC Epidemiology Service as preparation of thesis for their M.D.

(1) Gonorrhea/Trichomonas

Comparison of three techniques of laboratory confirmation of gonorrhea was undertaken by Dr. Sede Mbakob. Simple gram stain of urethral specimen and gram stain of urinary sediment were compared to results from the same patient by GC culture. Urine sediment was examined for trichomonas as well. Studies were carried out on male patients at a venereal disease clinic in Nkongsamba.

(2) Rotavirus as an etiologic agent in childhood diarrhea

Random samples of children with acute diarrheal disease were studied by Dr. Abbenyi Sam. Stools on all children were examined by the ELIZA test for rotavirus (ROTAZYME) and a prevalence rate of rotavirus infection established.

(3) Diabetes/Hypertension in rural Cameroon

Random samples of villagers living in rural Cameroon were examined by Dr. Pisoh Tangnyin for glucosurea, proteinurea and increased blood pressure. All persons with glucosurea had blood sugar analysis performed using Dextrostix.

(4) Congenital Syphillis

VDRL and FTA (both IgG and IgM) were done on mothers who delivered at the Yaounde Central Hospital and on their children by Dr. Nko'o Samuel to establish the importance of this disease in pregnant women.

(5) Malaria HI antibody among pregnant women

Malaria HI antibody was examined among pregnant women taking varying doses of oral malaria prophylaxis in Yaounde by Dr. Nkwate Charles, to establish which dose permits maximum antibody in the mother effective suppression.

(6) Importance of spread of oral polio vaccine virus to unvaccinated siblings

Stool virus isolation carried out on vaccinated children and their unvaccinated siblings to determine potential of Trivalent Oral Polio Vaccine spread in the community was done by Dr. Tembon Andy.

(7) Rubella Antibody among pregnant women

Rubella IFA levels were determined in pregnant women at the Yaounde central maternity by Dr. Nissack Onlawn Françoise, from sera collected at the time of delivery.

To-date, a total of 18 students have coordinated their thesis research projects through the OCEAC Surveillance Laboratory and the epidemiology service.

V. - Laboratory Examinations available at OCEAC surveillance laboratory

The surveillance laboratory, established with funds from the SHDS project (Abidjan) and supplied with continuing reagents through CDC (Atlanta) is open to any physicians, health worker or health student in the OCEAC member nations to support research or field studies in epidemiology. A full time laboratory technician is available to assist with the following procedures :

Routine

- CBC
- Urinalysis
- Malaria thick/thin smear
- Microfilaria concentration/smear
- Gram smear
- Stool for Ova and Parasites/occult blood
- Skin snips
- Sickle cell preparation.

Serologies

- Pertussis agglutination
- Measles Hemagglutination Inhibition
- Malaria Indirect Hemagglutination (P. Falciparum)
- RPR
- VDRL
- FTA (IgG and IgM)
- IFA Lassa - Marburg - Ebola
- IFA Pertussis
- IFA R. bella

Bacteriology

- Cholera
- Salmonella
- Gonorrhea
- Pertussis

Miscellaneous

- Dark field Microscopy
- Stool ELIZA for Rotavirus
- Polio neutralizing antibody
- Virus isolation stool
- SGOT
- SGPT
- Serum Bilirubin

° In collaboration with WHO reference laboratory for viral diseases, Lyon (France)

During its first full year of operations, over 10,000 analyses were performed in this laboratory, as follows :

Gonorrhea cultures	978	
Complete Blood Count (CBC)	306	
Urinalysis	118	
Malaria thick/thin smears	592	
Skin snips	468	
Gram stain	1.454	
Stool for ova and parasites	646	
Sickle cell preps	5	
Measles HAI	1.065	
Rubella HAI	214	
Malaria IHA	892	
VDRL	754	
FTA	500	
IFA ELM screening	1.706	
IFA Lassa	300	
IFA Marburg	300	
IFA Ebola	400	
IFA Yellow fever	1.480	
IFA Malaria	52	
IFA Rubella	210	
Cholera culture	16	
Rotavirus Stool (ELIZA Test)	106	
Polio neutralizing antibody	306	(Lyon)
Enter virus isolation stool	520	(Lyon)
Total	13,388	

VI - WHO Phase III International Epidemiology Course

The epidemiology service of OCEAC assisted the Cameroonian Ministry of Health and WHO in designing training modules and field exercises for this annual international training course for Anglophone African epidemiologists. Laboratory support for the 4 week course (held in December 1979 and again in June 1980) was supplied through the OCEAC surveillance laboratory.

VII - OCEAC EPI-NOTES

Circulation of this bilingual (French - English) monthly review is now 600. Epi-Notes is designed as a means of publishing epidemiologic investigations done by nationals in the OCEAC member nations and is a good means of sharing results of investigations with others. Circulation is designed to reach even the smallest health center in rural OCEAC countries, and subscription is provided at no cost.

VIII - Publications, Epidemiology Service

Published :

- Le Programme Elargi de Vaccination de Yaoundé (Rép. Unie du Cameroun). Evaluation après deux ans d'activités
  Médecine d'Afrique Noire, August 1978.

- Field Trials of a Heat Stable Measles Vaccine in Cameroon
  British Medical Journal, July 1979.

- Essai contrôlé d'un vaccin Antirougeoleux Thermostable au Cameroun
  Médecine Tropicale, January 1979.

- Ebola Hemorrhagic Fever, Tandala, Zaïre, 1977 - 1978
  The Journal of Infectious Disease, September 1980.

First Draft Completed

- Immunofluorescent Antibody to the Ebola Virus Among Inhabitants of the Tropical Rain Forest, United Republic of Cameroon.

- Ebola Hemorrhagic Fever in Africa,
  A short report.

- Measles in Yaoundé
  A Ten Year Evaluation of Measles Control in an African city.

- Further Field Trials of a Heat Stable Measles vaccine in Cameroon.

- Paralysis due to Poliomyelitis in Cameroon
  A comparison of Regions and Survey Methods.

- Yaws among the forest people of southeastern Cameroon.
  A study in Field Diagnosis with the RPR Card Test.

Early draft completed - awaiting results or more work

- Measles Vaccination at 9 months
  A three part study, Yaoundé, Cameroon.

- Trivalent Oral Polio Vaccine (Sabin)
  in a Tropical African city.

- Cholera in Cameroon since 1971
  A successful System of Surveillance in an African Port.

- Establishing Childhood Mortality Rates through Retrospective Survey Techniques.

.../...

- Surveillance of Yellow Fever and the African Hemorrhagic Fevers. A Reliable, Practical System for Rural Africa.

- Gonorrhea among African Youth Medical Student Studies in Cameroon.

- International Technical Assistance and the African Medical Student.

APPENDIX I

To: Bureau of Smallpox Eradication, CDC

From: Harry F. Hull M.D. Banjul, The Gambia.

Subject: Semi Annual Progress Report.

80 JUL 1 P4:00

17th July, 1980.

Under Objective III of the Strengthening Health Delivery Systems Project, a demonstration training program in epidemiology for Anglophone West Africa is to be developed in The Gambia. A guideline for development of that program is given in the SHDS Program and Implementation Plan 1980, and the following report follows the format of that plan.

Sub-Objective II. To develop training capabilities.

2.1.1. Identify a health professional in the subregion to work with the SHDS/CDC epidemiologist for the anglophone subregion. This is scheduled to occur in 1981 if possible. Contact was made with the West Africa Health Community in Lagos, Nigeria to discuss the possibility of creating an Anglophone epidemiology service similar to OCEAC and OCGGE. The idea was favorally received but all parties concerned felt that best to let the idea grow slowly because the member countries were not willing to make major commintments at the present time. As the program is sucessful in the Gambia, Sierra Leone and Liberia, the other countries will want to share in the formation of a more permanent organisation.

2.2. Continue to develop EPI - related training activities in demonstration-training programs. A mid-level managers course for the Expanded Programme for Immunisation was held in Banjul. 35 Gambians, 2 Sierra Leonian, 2 Nigerian, and 2 Ghanians participated. The epidemiologist was responsible for the scientific program and the immunisation survey. The course was well received by the participants and. EPI reports that immunisation services have improved throughout the country as a result.

Sub-Objective III To develop capability to gather information.

3.1.2. Complete in-depth analysis of current national surveillance systems and submit recommendations for improvement.

The Gambia epidemiologic surveillance system has been analyzed and a report submitted to the government. A new system for the collection of outpatient data has been designed. It will be placed in a small number of health centers for a trial period of several months and by January 1, 1981 be in use for the entire country.

Sierra Leone's surveillance system was anlyzed in part during the October, 1979 EPI evaluation. A report from this visit has been submitted to the government and a request for a more complete evaluation has been made. This is tentatively scheduled for October 1980.

Liberia's surveillance system will be formally evaluated in August, 1980.

3.13. Determine baseline levels of morbidity and mortality of neonatal tetanus, measles and poliomyelitis in demonstration training areas.

Surveys have been conducted and reports submitted regarding the baseline incidence of neonatal tetanus deaths and poliomyelitis caused lameness. A measles survey has been performed, but results are still being analysed and report prepared. A sero survey is being planned to provide addition information about disease distribution.

3.1.4. Establish in immunization program demonstration and training areas-on-going systems of disease surveillance.

As mentioned above. The Gambia in the process of testing and implementing a new national surveillance program.

3.1.5. Implement systematic program activity reporting systems conforming with WHO Management Information Systems requirements. The Gambia has reported 1979 epidemiologic data in the SPISS format.

3.1.6. Assist national authorities in investigating unexpected outbreaks of morbidity and mortality.

An outbreak of probable meningococcal meningitis occured in March 1980. This was investigated by Mr. Pap Williams with the guidance of Mr. Fitzgerald and Dr. Gowers. The epidemic was controlled through the use of sulfanamide prophylaxis.

Liberia has requested epidemiologic assistance to document the effect EPI is having on the incidence of measles. This will be accompleded on the same trip as the surveillance system evaluation. Sierra Leone was expressed an interest in evaluating the impact of EPI on neonatal tetanus.

3.3. Publish and distribute monthly disease surveillance newsletter.

Siimaya Ning Jaatata. Kendeya The bimonthly newsletter of the Gambia has just published it's fourth issue. It serves to provide, not only results of epidemiologic investigations, but to give health education, and discuss policy dicisions with field staff. A bimonthly schedule was chosen because of logistical difficulties getting the issues to the field. Consideration will be given to changing to a monthly schedule when the new surveillance system is in operation and the need for rapid dissemination of information is greater.

Copies of the newsletter are sent to other anglophone countries, but regional newsletter will not materialise until there is a more formal association of the countries.

Sub-Objective IV. To develop a coodinated laboratory system to provide necessary book-up services to the disease surveillance and control systems

4.3. Identify specific laboratory needs for surveillance support of Gambia EPI programme.

Visits have been made to the Pasteur Institute/Dakar and the MRC/Fajara to survey current capabilities. Both institutions have indicated a willingness to provide laboratory backup. The MRC, however is in a state of change with a new director and new personnel arriving. A virologist is among the additions to the staff. The full capabilities of his laboratory will not be known until often his arrival. One of his major interests, though is measles.

The MRC-WHO proposal also contains a provision for training a microbiologist and supply of some equipment for a microbiology laboratory. With the implementation of this proposal, the nucleus of a public health laboratory will be formed, and SHDS can supplement the laboratory to assure the full range of services required.

4.4. Identify and provide for needs associated with SHDS laboratory work at labs in the Gambia - as above.

In addition to the above work, the Gambian epidemiology unit has conducted the following surveys with the assistance of the SHDS medical epidemiologi .

A smoking survey was performed in Banjul at the request of the Director of Medical Services. This information was provided to WHO for their smoking and health program.

An interest has been expressed by the Gambia government in performing a culture survey of mothers delivering at government health facilities to determine the gonorrhea carriage rate and the cost benefit of prophylaxing against gonnoccal opthalmia neonatarum. In preparation for primary health care, a well and latrine survey, a Tuberculosis survey, and a childhood nutrition survey is currently being conducted in Lower River Division.

In addition, efforts are being made to obtain assistance to conduct an accurate infant mortality study and implement a vital registration scheme.

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PUBLIC HEALTH SERVICE-CDC-ATLANTA
EPI

TO: Director, Center for Disease Control

FROM: Research and Development Division
Bureau of Smallpox Eradication

SUBJECT: Meningococcal Meningitis in Tangaye, Upper Volta

SUMMARY

An epidemic of type C meningococcal meningitis occurred in Tangaye, a small village in Upper Volta in March of 1980. There were 23 cases and 21 deaths. The high case fatality rate was due to delayed recognition of the epidemic and the absence of treatment for cases which occurred before the outbreak was recognized.

Despite the endemnicity of meningitis in this area, this epidemic was undiagnosed and unreported for 1 month. Three factors contributed to this: the villagers' lack of medical sophistication, poor diagnostic acumen at the dispensary level and poor communication between the village and the dispensary.

INTRODUCTION

Meningococcal meningitis is endemic in the Sahel region of Africa.[1] Epidemics typically occur during the hot dry season of the year.[2] In Upper Volta, this season lasts from approximately December through May. About every 10 to 12 years major epidemics occur, usually due to Group A meningococci.[1,3] The last major epidemic occurred in Upper Volta in 1970.[3,4] Between major epidemics, localized outbreaks are common, and recently Group C meningococci have been identified in Upper Volta and Northern Nigeria.[3,5]

Over the weekend of March 28 to 30, 1980, Ms. Gay Morgan, a USAID employee and former Peace Corps Volunteer, made two visits to Tangaye, a small village which is part of an ongoing AID project. She was told that many people but mostly children seemed to be dying of a severe acute febrile illness. On her return to Ouagadougou, she contacted Dr. Michael K. White, USAID Health Advisor to Permanent Inter State Committee to Fight the Drought in the Sahel (CILSS). Following discussions in Ouagadougou with Dr. Michael K. White and Dr. David C. Sokal, CDC Epidemiologist assigned to the Organization of Coordination and Cooperation for the Struggle Against the Great Endemic Diseases (OCCGE), Bobo Dioulasso, Upper Volta, Dr. Sokal called Dr. Adamou Yada, Epidemiologist for Upper Volta, on Monday morning March 31. Dr. Yada dispatched the local public health officer, Dr. David Kyelema from Fada N'Gourma to investigate the outbreak. On Tuesday Dr. Kyelema arrived in Tangaye and performed a lumbar puncture on a woman who had just died. Purulent spinal fluid was found and gram negative diplococci were seen on microscopic examination. Culture was not

performed. The next day a vaccination session was held in the village using bivalent meningococcal vaccine for types A and C. Six days later, on April 8, a second vaccination clinic was held for those villagers who did not attend the first one due to a lack of advance publicity.

Because three Voltaique USAID employees had been working in the village conducting an anthropological interview study, it was felt that this was a unique opportunity to perform a casefinding survey of the village, determine access to medical care, and try to identify reasons for the delay in notification of the epidemic.

BACKGROUND

Tangaye is a small village with an estimated population of 2700. It stradles the main road between Ouagadougou and Niamey and is located about 40 km west of Fada N'Fourma. It is a traditional agricultural village except that there is a USAID solar panel demonstration project that provides electric power for a water pump and for a grain machine. Housing is traditional: mud huts with thatched roofs, which are grouped around courtyards. Each separate family grouping is called a concession. There are about 180 concessions that make up the village, and they are spread over an area of about 5 km by 6 km. No one in the village owns an automobile. Transport is by bicycle or by donkey cart.

The nearest medical facility is 15 km away over a dirt road, in Diabo. It is a small dispensary staffed by a nurse and an assistant and several auxillary personnel. It has several beds, medicines and some IV apparatus. The nearest hospital is in Fada N'Gourma; patients may be evacuated to the hospital from the dispensary.

METHODS

Prior to the survey two clinics were held in the village, one on April 5 and the other on April 8, to look for any active cases of meningitis. The plans were to treat contacts of cases with a single dose of long acting oral sulfa, and to treat cases with a depot preparation of chloramphenicol in oil (Tifomycin),[6,7] or IV penicillin depending on the clinical severity of the illness.

Cooperation for the survey was requested from the chief of the village, and announcements to explain the purpose of the survey were made at religious services a few days before the survey was conducted.

A brief questionnaire was designed, and the three interviewers were instructed to visit all the concessions in the village and inquire about all fatal illnesses in the preceding 2 months. Demographic information; a check list of signs and symptoms; date of onset and duration; and details of treatment were included on the questionnaire. Over a 3-day period, April 9 - 11, the interviewers canvassed the village. Data for the period following the survey was provided by Ms. Morgan and Mr. Larry Dominessy, an AID employee who has worked with the village for several years.

In addition to the questionnaire survey, dispensary records at Diabo were reviewed to determine the number of cases admitted there.

Case criteria for a case of probable meningitis were sudden onset of illness, high fever, stiff neck, severe headache, or abnormal fontanel, rapid (less than 1 week) fatality if untreated[8] with antibiotics, and no other apparent diagnosis.

Case criteria for a definite case were a positive spinal tap and gram stain or immunologic confirmation.

Laboratory identification of one specimen was performed at the Centre Muraz in Bobo Dioulasso by CDR. Warren R. Sanborn and Dr. Isak Toure, using a counter-immuno-electrophoresis technique. Antibiotic sensitivity testing could not be done because the laboratory was in the midst of a major renovation.

RESULTS

1. Clinic Sessions. A large number of people presented themselves at the two clinics held April 5 and April 8. One severely ill person was examined in his concession. Several patients with serious non-meningococcal illnesses were seen. They were treated in the village and then referred to the clinic at Diabo for follow-up.

At the first clinic two lumbar taps were done on young children. One was culture positive from a 7-month old male infant. During the entire outbreak, this was the only isolate available for microbiologic identification. The positive fluid was not turbid but was foamy on agitation, indicating increased protein. The infant was not severely ill when first seen and did not have a stiff neck. He was given a depot injection of chloramphenicol. When he was seen three days later he was severely dehydrated and lethargic. He was put on IV therapy at the dispensary overnight and then evacuated to the hospital in Fada N'Gourma. He was subsequently discharged from the hospital in good health.

2. Dispensary Records. Prior to the recognition of the epidemic, two Tangaye residents had been admitted to the dispensary at Diabo on March 7 and March 26. Both died in the dispensary from illnesses compatible with meningitis. The diagnosis of meningitis was not made in either case. One was treated with antimalarial medication for presumed cerebral malaria. The other's treatment is unknown.

Following recognition of the epidemic, two cases were diagnosed at the dispensary: one was cured and one died.

3. Survey Results and Combined Results. The survey identified 25 deaths and 15 serious illnesses. Eighteen of the deaths were probably due to meningitis and seven were ascribed to other causes (Table 1). Five of the serious illnesses were felt to be suggestive of meningitis. However on follow-up, only one was verified. He turned out to be the case seen at the dispensary and successfully treated after the epidemic was recognized.

A total of 21 probable and 2 definite meningitis cases were identified: 16 by the survey alone, 1 by the clinic and dispensary, 3 by the survey and dispensary, 1 by the dispensary along, and 2 by informal contacts and follow-up. Of the 23 cases, 21 were fatal.

Figure 1 shows the epidemic curve including all the cases. The epidemic appeared to stop about one week after the first vaccination session. The last known case occurred in a 4-month old male child of a family who came from Fada N'Gourma and visited the village a few days following the second vaccination session. The child had not been vaccinated. He became ill on his return to Fada N'Gourma and was taken to the hospital. Despite treatment, he died 6 hours following onset of the illness, on about April 15.

Of the 16 cases ascertained by the survey and not admitted to the dispensary seven were seen by the traditional village healer and seven died at home without receiving any kind of treatment. One of the patients seen by the village healer was also treated unsuccessfully as an outpatient at the dispensary. Two other patients also went to the dispensary - one was treated unsuccessfully as an outpatient and one died on the way to the dispensary and was not examined by the nurse.

The lack of medical care for some patients was probably due to the rapid course of the illness. Fatalities occurred in less than 24 hours in seven cases and between 24 and 48 hours in six other cases.

Another factor may have been a lack of confidence in the local dispensary. Several people expressed dissatisfaction with the dispensary in hindsight. However, it was not possible to determine what the attitudes toward the dispensary were before the occurence of the epidemic.

According to one informant, villagers felt the epidemic was caused by an old man whose time had come but who was refusing to die. Thus yound people were being taken in his stead. This conception of causality may have contributed to the lack of urgency in seeking modern medical treatment.

Figure 2 shows the age distribution of the cases. From the demographic data obtained from the interviewed households, a population pyramid was constructed, Figure 3. By extrapolating this population distribution to the remainder of the village, one can calculate attack rates by age group, Table 2.

There were only two cases which occurred in the same concession, two brothers of 17 and 24 years of age with onset March 6 and 4, respectively. The secondary attack rate is thus quite low, approximately 0.6 percent, if one considers the susceptible population to be those under 20 years of age.

DISCUSSION

Two features of this outbreak merit special discussion: the failure of disease surveillance, and the age distribution of cases.

The failure of surveillance can be seen as a result of several factors: poor understanding of modern concepts of disease by the villagers, poor communication between the village and the dispensary, and poor diagnostic facilities at the clinic.

The villagers were aware of the epidemic. But many attributed it to supernatural causes. This is probably why only a few cases were taken to the dispensary.

If there had been better communication between villagers and dispensary personnel, i.e. between the chief of school teacher and the dispensary nurse, health authorities might have been notified earlier.

Diagnostic facilities at most dispensaries are minimal. Most are without microscopes and so are unable to confirm diagnoses of malaria. Malaria is less common in the dry season in Upper Volta. However, severe fevers are often presumed to be malarial. Medical personnel often give patients an injection of an antimalarial and consider alternative diagnoses if the fever persists for longer than 24 hours.

The age distribution in this epidemic is unusual because of the number of young infants affected. Previous descriptions of Group A meningococcal epidemics in the Sahel have noted a predominance of older children and teenagers (1-5). The present inquiry may have been confounded by the high infant mortality rate in Upper Volta. If a baseline under five infant mortality rate of 250 per 1,000 is hypothesized, 11.7 deaths would be expected in a 2-month period. Sixteen were observed: 12 were ascribed to meningitis and 4 to other causes. Thus it is likely that the survey methodology overestimated the meningococcal mortality in the youngest age group.

The overall mortality rate for all age groups was significantly elevated. Twenty-seven deaths in a village of 2,700 in a 2-month period gives an annual rate of 60 per 1,000 or 12.6 deaths in a 2-month period.[9] The chi square for this difference is 5.2

RECOMMENDATIONS

1. Health education should include a description of meningitis. Villagers should be taught that severe headache with mental confusion during the dry season requires prompt medical attention. This has been done in Northern Ghana with some success.[2]

2. Before the usual epidemic season, i.e. in December or early January, the Upper Volta Ministry of Health should circulate a directive or newsletter discussing the coming meningitis season and urging all nurses or physicians to do spinal taps on suspicious cases. In case of a positive tap, the spinal fluid should be saved for later testing even if it cannot be cultured or refrigerated. The nurse or physician should notify his superior immediately of any case of purulent meningitis.

3. Individual case reports of meningitis should be rapidly investigated. A single reported case may be the only indication of an epidemic.

4. Spinal fluid specimens should be sent to the Ministry of Health in Ouagadougou or to the Centre Muraz in Bobo Dioulasso, where rapid immunologic identification can be done.

5. Adequate stocks of bivalent vaccine against Group A and C meningococci should be maintained at the national level.

ACKNOWLDGEMENTS

The assistance of a number of USAID employees was invaluable, especially Mr. Larry Dominessy and the three interviewers: Mr. Pascal Leossoggo, Mr. Keyoure Kouela and Ms. Marie-Jeanne Legma. The Upper Volta epidemiologist Dr. Adamou Yada and his colleague Dr. David Kyelema provided invaluable guidance.

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TABLE 1

Other cases of death found in Meningitis Survey,

Tangaye, 1980

1) 2 year old Female : "sick for 2 years",Pertussis was immediate cause of death.

2) 7 month pregnacy : infant died a few minutes after birth.

3) 5 year old female : sick for 8 months : edema : abdomen + feet + head, nose bleeds.

4) 1 year old female : died of pertussis.

5) 20 day old: diarhea, vomiting, possible neonatal tetanus.

6) 50 year old male : sick for 6 years : swollen belly, died of hemorrhage.

7) 35 year old female : acute abdomen in a pregnant women with previous operation, shock without fever.

TABLE 2

ESTIMATED AGE SPECIFIC ATTACK RATES, MENINGITIS

TANGAYE, 1980

Age Group	Estimated Population	No of cases	Attack rate/ 100,000
65 +	57	0	
60 - 4	68	0	
55 - 9	100	1	1,000
50 - 4	116	0	
45 - 9	84	0	
40 - 4	173	0	
35 - 9	108	1	926
30 - 4	157	0	
25 - 9	165	0	
20 - 4	157	2	1,274
15 - 9	232	1	431
10 - 4	446	1	224
5 - 9	381	3	787
0 - 4	470	14	2,979
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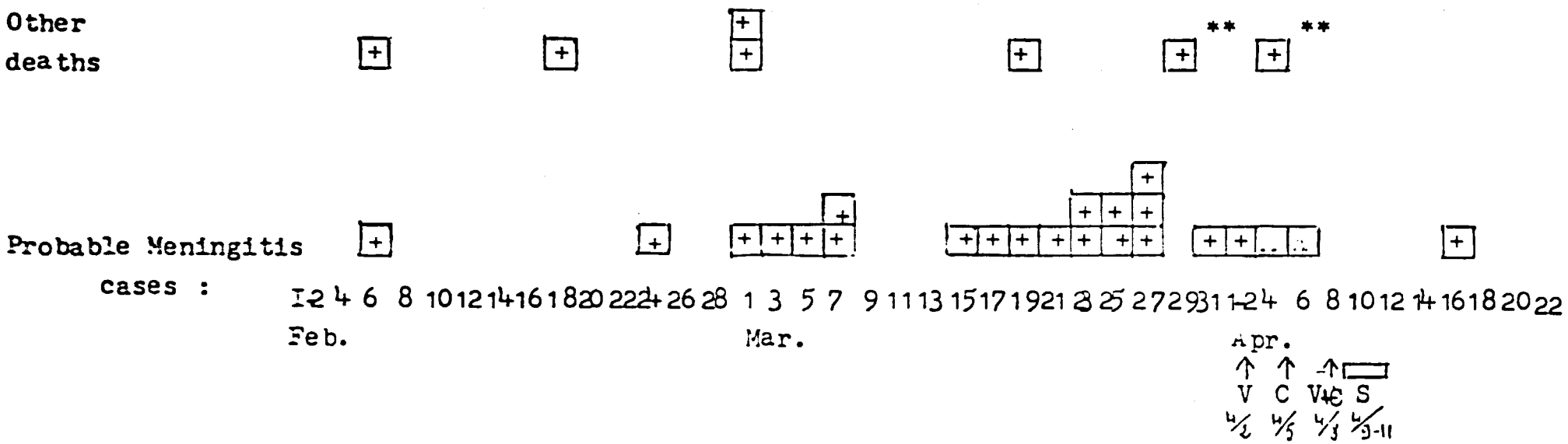
ALL AGES	2,714	23	852

FIGURE 1

Cases of Meningitis and other fatal illnesses * by date of onset in Tangaye, Upper Volta
Feb 1 - April 30, 1980



Legend :

- □ = one case
- + = death
- V = vaccination session
- C = Clinic held in villahe
- S = Survey

* surveillance for other fatal illnesse: not continue past April 11.

** Date of death from a chronic illness

FIGURE 2

Age of cases of Meningitis, Tangaye, 1980

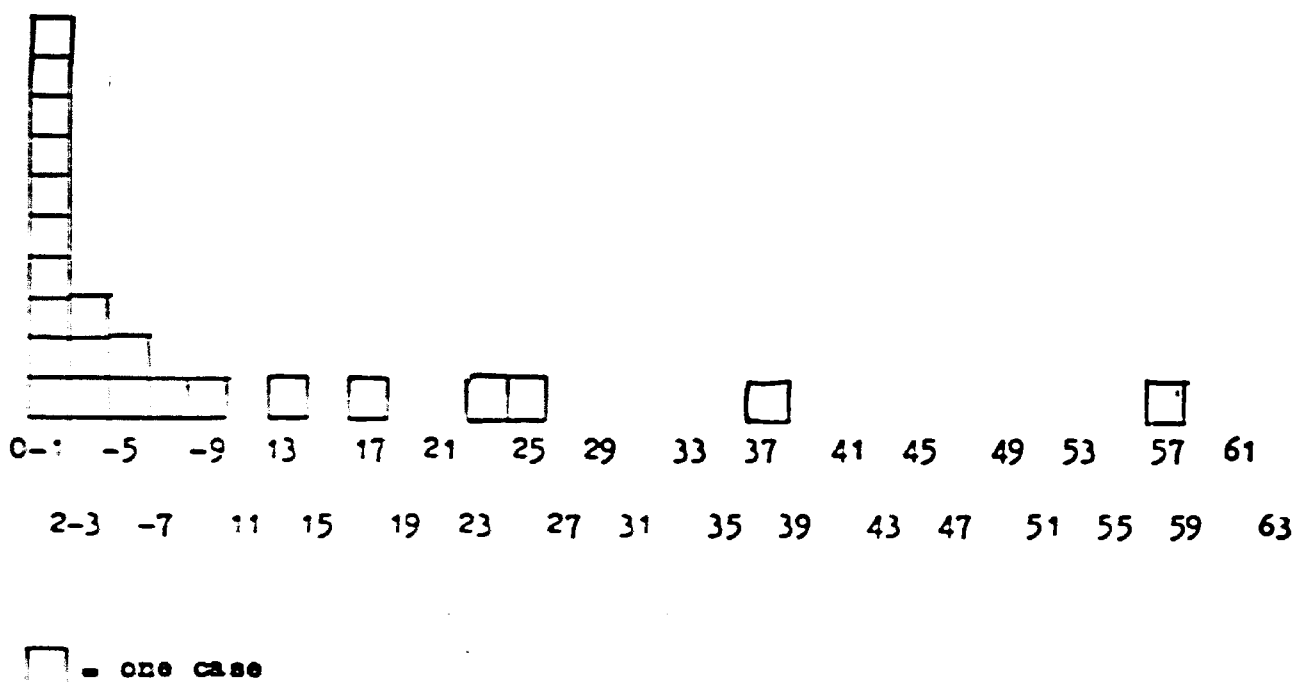
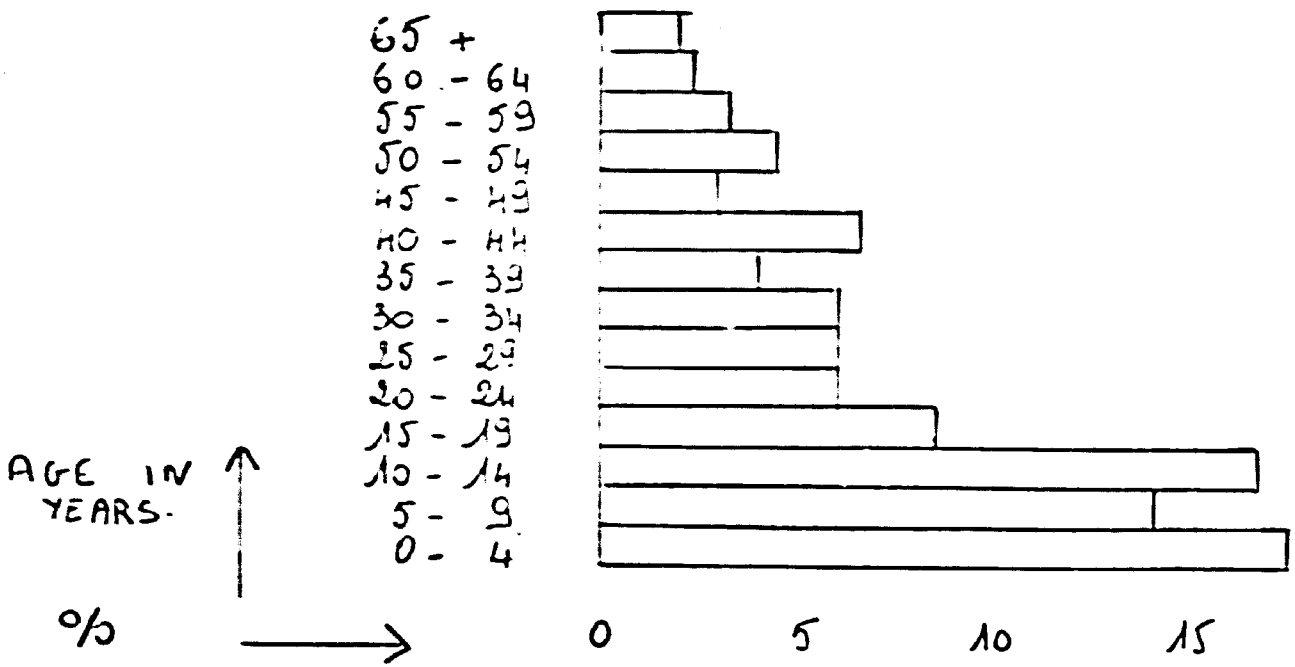


FIGURE 3

POPULATION PYRAMIDE FROM A SAMPLE OF 327 PEOPLE, TANGAYE
UPPER VOLTA, 1980



SERVICE EPIDEMIOLOGIQUE

INITIAL REPORT : YELLOW FEVER IN NORTH CAMEROON

(PETTE - June 1980)

In November 1979, in conjunction with the Direction of Preventive Medicine and Public Health of the Cameroonian Ministry of Health, a sentinel system of surveillance for yellow fever and the African hemorrhagic fevers (Ebola, Marburg and Lassa) was set up in Pette (North Cameroon). Pette is situated 20 kilometers south of the Waza game reserve, in pre-sahelian savanah 400 kilometers north of the equatorial rain forest. Yellow fever was last confirmed in the region in 1974 by the then Institute Pasteur of Yaoundé. A yellow fever vaccination campaign in 1971, nine years ago, was the last time yellow fever vaccination was offered to the local population.

The surveillance system was set up in the Pette hospital and clinics, where the chief physician had reported a recent increase in fatal febrile jaundice. Preliminary screening of the 20 hospital and clinic staff revealed none with immunofluorescent antibody to yellow fever, Ebola or Lassa. One staff member, a gardener/handyman, did have immunofluorescent antibody to Marburg virus in a titer of 1:64, which has persisted until present. Detailed questioning of this gardener failed to reveal any recent or past history of severe febrile disease.

The surveillance system consists of obtaining capillary blood on filter paper from all persons with fever, with or without jaundice, who do not respond to treatment with antibiotics or antimalarials, and whose diagnosis can not be established. If the patient survives, a convalescent capillary specimen on filter paper is collected three weeks later. Filter papers are dried over night at room temperature, then stored frozen in airtight plastic bags with silica gel until mailing by regular post at the end of each month.

Between December 1, 1979 and June 1, 1980, eighteen acute specimens on filter paper were received, and among these, four contained immunofluorescent antibody to yellow fever, two with titers of 1:16 and 2 with titers of 1:64. The positive blood specimens were obtained from patients hospitalized during the months of January, May and June ; none of the four had a history of yellow fever vaccination. Three of the four had marked jaundice ; three (75 %) died before a second, convalescent serum could be obtained. A convalescent specimen which was obtained after three weeks from the one survivor showed a four-fold rise in antibody titer, from 1:64 to $\geq$ 1:256.

In June 1980, after confirmation of this patient with four-fold rise in yellow fever antibody, serosurveys were undertaken in the region to better evaluate the epidemiologic situation. Three villages were chosen for the investigation ; two, Mangabe and Pette, were home villages of two of the deceased ; the third, Korma, was the village of the survivor with the confirmed four-fold rise in antibody titer.

Bloods were obtained by vacutainer from all village residents, who had been instructed by the village and regional leaders to remain in the village on the specified date until the blood drwing teams had completed their work. A total of 883 bloods were drawn, 266 in Korma, 289 in Mangabe, and 329 in Pette. Serum was decanted after 24 hours, and stored refrigerated in sterile vials until freezing facilities were permanently available at which time they were stored frozen at -20°C until analysis.

A random sample of 150 sera from Mangabe and 158 from Korma were screened for immunofluorescent antibody to Ebola, Lassa, Marburg and the yellow fever virus at the surveillance laboratory of OCEAC. All sera from children under 15 years of age from Pette were screened for antibody to yellow fever virus. Results of screening for yellow fever antibody which will be sent to CDC (Atlanta) for confirmation are shown in Table I. Only antibody titers equal to or greater than 1:16 were considered as positive, to eliminate false positive results at lower titers. Results were analyzed by sex for three different age groups : greater than 15 years of age (those who were alive and over 5 years of age at the time of the most recent yellow fever vaccination campaign in 1971), 10 to 15 years of age (those who were five years old or less at the time of the most recent vaccination campaign and may not have been considered for vaccination), and less than 10 years of age (those who were not yet born at the time of the campaign). It can be seen that antibody to yellow fever was found in all three age groups ; the prevalence among those less than 10 years of age is significantly less ($p < .001$) than that of those over 15. No disease histories were obtained from persons surveyed, but it can safely assumed that some no doubt had seroconversions resulting from disease not recognized as yellow fever. It has been shown by Causey and Theiler in 1958 (Brazil) and Keer in 1960 (Colombia) that antibody may be found in up to 44 % of unvaccinated persons who have not had symptoms of classic yellow fever, and clinically yellow fever may not be recognized from other febrile diseases in the area. The fact that antibody to yellow fever has

been found in the group of children less than 10 years of age, and has been confirmed in a four-fold rise in titer in one person with febrile jaundice, makes it certain that the yellow fever virus is circulating in the Pette region of north Cameroon. Immediate yellow fever preventive measures must be undertaken.

Results of screening of these same sera for antibody to the Ebola, Lassa and Marburg virus are shown in Table II. Lassa and Marburg screening, except for the hospital staff member with a persistant titre of immunofluorescent antibody to the Marburg virus of 1:64, revealed no antibody in the sera surveyed. Antibody to the Ebola virus was found, however, with an overall prevalence of 3 %, considerably less than that of 7 % - 10 % found among inhabitants of the tropical rain forest of Cameroon. It's presence, however, justifies continued Ebola, Lassa and Marburg screening in surveillance systems in this region.

Recommendations :

1. Immediate yellow fever immunization of inhabitants in the region of Pette. Include the yellow fever vaccine in all future plans for the Expanded Program in Immunizations in this region of Cameroon.

2. Determination of the geographic limits of the yellow fever zone by expansion of the sentinel surveillance system, continued seronurveys in regions confirmed by the surveillance, and entomological studies as possible. Post-mortem liver specimens should be obtained through the surveillance system when possible.

3. Training of all hospital staffs in the region in surveillance measures and treatment/isolation procedures for persons with suspect yellow or African Hemorrhagic fever.

YAOUNDE July 8, 1980

Chief, Epidemiology Service OCEAC,

Dr. David L. MEYMANN

Table I : Immunofluorescent Antibody to Yellow Fever Virus, Pette Region (Mangabe, Korma and Pette) - Cameroon, 1980

Age	Total examined		Total with IFA 1:16		Total with IFA ≥ 1:64	
	M	F	M	F	M	F
> 15 years	56	126	8 (14 %)	31 (25 %)	2 (4 %)	15 (12 %)
10 - 15 years	38	32	6 (16 %)	1 (3 %)	2 (5 %)	1 (3 %)
< 10 years	66	91	4 (6 %)	5 (6 %)	1 (2 %)	2 (2 %)
Total (by sex)	160	249	18 (11 %)	37 (15 %)	5 (3 %)	18 (7 %)
Total (Overall)	409		55 (13 %)		23 (6 %)	

Table II : Immunofluorescent Antibody to Ebola Virus, Pette Region (Mangabe, Korma) - Cameroon, 1980

Age	Total examined		Total with IFA 1:16		Total with IFA ≥ 1:64	
	M	F	M	F	M	F
> 15 years	56	126	0	5 (4 %)	1 (2 %)	3 (2 %)
10 - 15 years	15	12	1 (7 %)	0	0	0
< 10 years	36	63	0	0	0	0
Total (by sex)	107	201	1 (1 %)	5 (2 %)	1 (1 %)	3 (2 %)
Total (Overall)	308		6 (2 %)		4 (1 %)	