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The REACH Experience



NEONATAL TETANUS

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Other technical reports in this series are available from REACH and include the following:

- Computerized EPI Information Systems (CEIS)
- Urban EPI
- Missed Opportunities for Immunization
- Acceptability of Immunization
- Cost and Financing of EPI.

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ACRONYMS

A.I.D.	(United States) Agency for International Development
ANC	Antenatal Care
CDC	Centers for Disease Control
CFR	Case Fatality Rate
DHS	Demographic and Health Survey
DOH	Department of Health (Philippines)
DPT	Diphtheria/Pertussis/Tetanus vaccine
DT	Diphtheria/Tetanus vaccine
EPI	Expanded Program on Immunization
ICC	Inter-Agency Coordinating Committee
KAP	Knowledge, Attitudes and Practices
KEPI	Kenya Expanded Program on Immunization
MCH	Maternal and Child Health
MOH	Ministry of Health
MORA	Ministry of Religious Affairs (Indonesia)
NIH	National Institute of Health (Islamabad)
NNT	Neonatal Tetanus
PAHO	Pan American Health Organization
PREMI	Program for the Reduction of Infant Mortality
TBA	Traditional Birth Attendant
Td	Tetanus/Diphtheria vaccine
TT	Tetanus Toxoid
UNICEF	United Nations Children's Fund

USAID United States Agency for International Development, country mission

WHO World Health Organization

EXECUTIVE SUMMARY

Tetanus kills 750,000 babies annually, and non-neonatal tetanus kills an additional 120,000 to 300,000 persons. Neonatal tetanus (NNT) is completely preventable by means of maternal immunization with tetanus toxoid (TT) or aseptic care of the umbilical cord. Prevention of NNT will reduce neonatal mortality by up to half and infant mortality by up to a quarter in unimmunized populations (Galazka et al., 1989). Increasingly, the level of NNT is being recognized as a barometer of the health status and well being of mothers and newborns, with each case attesting to multiple failures of the health system (Galazka and Cook, 1985).

The World Health Assembly of the World Health Organization (WHO) set a goal in 1989 for the Expanded Program on Immunization (EPI) of global elimination of NNT by 1995. The goal itself has generated increased recognition of the public health importance of NNT. The degree of political support engendered and allocation of required resources will, in large measure, determine whether as many as 8,000,000 babies and 2,000,000 children and adults (at current incidence rates) die from tetanus during the 1990s.

The Resources for Child Health (REACH) Project serves as a resource on behalf of the United States Agency for International Development (A.I.D.) in the field of NNT control. In close partnership with other technical agencies (particularly WHO), REACH has become an advocate in support of global and regional initiatives and has taken a lead in fostering policy discussions. Countries in which REACH has supported national control strategies include Kenya, Bolivia, Ecuador, Bangladesh, Pakistan, Indonesia and the Philippines.

REACH has been involved in all facets of the control of NNT through immunization. Activities have been conducted in the area of advocacy, policy review, mortality surveys, surveillance systems, coverage surveys, anthropological studies, identifying high-risk populations, social marketing, refining tools for monitoring coverage, developing cost guidelines, conducting workshops, and disseminating information.

Financial sponsorship and technical support of the first regional workshop in Africa in July 1988 on accelerated NNT control gave REACH exposure and established it as a credible actor in the field. Co-organizing with MotherCare an important global exchange of views at a "Meeting on NNT Elimination: Issues and Future Directions" in January 1990 further contributed to REACH's high visibility in NNT control. The timing and content of the latter meeting was particularly appropriate as it was the first such gathering of technical and donor agencies to occur after the global goal of NNT elimination by 1995 was declared. The joint sponsorship of the meeting on NNT by an EPI (REACH) and a Maternal and Child Health (MotherCare) project was a powerfully symbolic reminder to other donors of the need for an integrated approach to NNT control.

REACH has actively participated in and, on occasion, taken the lead in discussions of new areas in NNT control. REACH challenged the orthodoxy regarding the way in which routine service statistics are inappropriately used to derive TT coverage rates. This was important in stimulating a discussion about indicators, searching for improved analytic tools, and increasing awareness of their valid interpretation. REACH work on costing alternative control strategies for the African workshops and reviewing past economic studies on NNT control for a chapter in a World Bank book (*Disease Control Priorities in Developing Countries*) has broken new ground.

REACH conducted pioneering anthropological studies in Bolivia and Bangladesh of the cultural understanding of tetanus to identify appropriate programmatic responses.

REACH will continue to be in a position to shape future technical issues and refine analytic tools. As a result of the meeting on NNT in January 1990, a REACH staff member was invited by WHO to participate in a small Consensus Group on NNT Elimination. This group met for the first time in September 1990 to review new ideas and approaches and formulate recommendations for the consideration of the WHO EPI Global Advisory Group.

Since NNT is often a localized problem, well-focused cost-effective interventions will be needed. As there can be no global blueprint for NNT control, REACH expertise to advise countries on appropriate strategies will continue to be in demand. Strategies chosen for immunization, as well as target groups, should be defined locally and will depend on a number of different factors, including:

- level of incidence;
- level of resources available (nationally and from donors);
- organization and utilization of health services (particularly preventive and maternal and child health [MCH] services);
- existence of other channels for contact (schools, bride registration, traditional birth attendants [TBAs], etc.);
- immediacy of desired impact (campaigns versus routine service);
- cost-effectiveness and opportunity cost of other health interventions and strategies;
- incremental cost of different TT strategies; and
- operational and behavioral considerations.

At country level, REACH staff members must become advocates to counteract some frequent omissions. They should ensure that:

- TT policies and delivery strategies are reviewed for appropriateness and, if necessary, re-formulated;
- NNT control or elimination plans exist and are implemented;
- 30-cluster coverage surveys include questions about the TT status of the mother at the time of the most recent birth;
- surveillance systems give equal importance to NNT and report NNT separately from non-neonatal tetanus;
- national vaccination days include giving TT to all women of childbearing age;

- the prevailing two-dose mentality in many countries is challenged;
- studies on missed opportunities for immunization always include questions on TT;
- social mobilization and communication efforts stress NNT and TT immunization;
- results from NNT mortality surveys and knowledge, attitudes and practices (KAP) studies are used to inform operations; and
- behavioral researchers take the initial trouble to establish firm linkages with health care providers and decision makers to increase the likelihood that findings will be accepted.

Lessons learned by REACH for improved control of NNT can be summarized as follows:

- Increased awareness is needed by health planners, providers, women and their families about prevention of NNT.
- Within the EPI, equal emphasis must be given to TT immunization of women.
- EPI and MCH staff have a joint role in eliminating NNT.
- Girls and all women of childbearing age are targets for TT immunization.
- Every service contact with women should be used to increase TT coverage.
- Improved indicators and records are needed to strengthen program monitoring.
- Costing information can assist program managers to select control strategies.

Prevention of NNT should be a priority for resource allocation in many developing countries given the magnitude of the disease (high incidence rates in poorer countries), the severity of the disease (high case-fatality rates even with treatment), low numbers of cases seen in health facilities, high costs of treatment and the availability of a safe, highly efficacious and cost-effective vaccine.

TETANUS AND ITS PREVENTION

Tetanus kills 750,000 babies annually, and non-neonatal tetanus (non-NNT) kills an additional 120,000 to 300,000 persons. Neonatal tetanus (NNT) is completely preventable by means of maternal immunization with tetanus toxoid (TT) or aseptic care of the umbilical cord. Prevention of NNT will reduce neonatal mortality by up to half and infant mortality by up to a quarter in unimmunized populations (Galazka et al., 1989). Increasingly, the level of NNT is being recognized as a barometer of the health status and well being of mothers and newborns, with each case attesting to multiple failures of the health system (Galazka and Cook, 1985).

Tetanus is caused by contamination of wounds with an anaerobic bacillus, *Clostridium tetani*. The organism is ubiquitous in soil and dust and has the ability to form highly resistant spores. It exists harmlessly in the gut of many animals, including man. If the pathogen is introduced into necrosed tissues, it multiplies and produces a powerful neurotoxin. Tetanus is an endemic environmental hazard, rather than a communicable disease, and consequently does not spread in explosive epidemics (Cvjetanovic et al., 1978).

Tetanus in newborns is caused by infection from unsterile methods of cutting the umbilical cord or dressing the stump. The first sign of neonatal tetanus is the inability to suck and swallow when the baby is a few days old. This is due to rigidity initially of the lips and mouth (lockjaw), which cause a characteristic ironic smile (*risus sardonius*). Rigidity quickly develops throughout the body, often accompanied by generalized convulsions. Death, usually caused by respiratory failure, occurs between 6 and 10 days of life, 2 to 3 days after the onset of symptoms.

In children and adults, tetanus infection follows puncture wounds, cuts and burns. Cases have been documented after ear and skin infections, unsterile injections and surgical procedures, ear-piercing, scarification rituals and tatoos, circumcision, and animal bites or scratches. A relatively common cause of tetanus in adult women is postabortal or postpartum contamination of the uterus, which is accompanied by high fatality. Frequently, the portal of entry in non-NNT cannot be determined by either the patient or physician.

The World Health Organization (WHO) estimates the case fatality rate (CFR) of untreated NNT to be 85% (Galazka and Stroh, 1986; Stanfield and Galazka, 1984). Without treatment, the rate approaches 100%. On the basis of available evidence, the CFR for non-NNT is estimated to be 40%-50%.

With the exception of measles, NNT kills more children than any other vaccine-preventable disease. NNT has been a neglected disease of "peculiar quietness" (Tateno et al., 1961) and may be the most underreported lethal infection in the world. If tetanus had the potential to spread in sweeping epidemics, or if the disease left a lasting disability like polio, or if it occurred primarily in adults like tuberculosis, NNT would likely have attracted the attention of public health authorities long ago.

Instead, NNT kills its victims, who are generally born at home, before they are old enough to be registered or missed by the health system. Routine disease surveillance systems in most developing countries detect only a small fraction of cases, less than 5% according to WHO (EPI, 1982). Lacking its own three-digit code in the *International Classification of Diseases* (WHO, 1977), NNT is frequently not reported separately from cases of non-NNT despite epidemiologically significant differences in risk factors and options for prevention. On consolidated disease reports

at each level of health services, NNT incidence is often lost amidst the figures for "infections specific to the perinatal period," or cannot be disaggregated from tetanus in broader age groupings (e.g., 0-4 years old).

NNT also is neglected for sociocultural reasons. The family of the baby with NNT is typically, but not exclusively, poor and illiterate and does not view the disease as a biomedical entity amenable to modern medical treatment.

Given the high CFR of NNT and non-NNT, the high cost of treatment, and the fact that most cases in developing countries are not brought to medical attention, the most cost-effective approach is to prevent the disease from occurring in the first place. Pioneering field trials in developing countries during the past 30 years have dramatically demonstrated that, despite a contaminated environment, NNT can be rapidly controlled and even eliminated by wide use of TT immunization (Schofield et al., 1961; Newell et al., 1966; Black et al., 1980; Berggren and Berggren, 1971).

Immunization against tetanus is achieved by vaccinating different target groups with vaccines such as tetanus toxoid (TT), diphtheria/pertussis/tetanus (DPT), diphtheria/tetanus (DT), and tetanus/diphtheria with a reduced component of diphtheria antigen (Td) - all of which contain tetanus toxoid. TT or Td are suitable for adults, while DPT is given to children less than five years old and preferably during infancy. DT is used for young children unable to receive DPT and is mainly administered in schools. The WHO-recommended TT schedule appears in the following table (EPI, 1988). Five doses of TT have been recommended for protection throughout the childbearing years. Protective levels of antibody in the woman assure protection for the newborn (as well as for the mother herself), since antibody crosses the placenta from mother to baby.

A strategy which exclusively requires for its success the identification and immunization of women during pregnancy is unlikely to succeed in many areas for operational and cultural reasons. Coverage with prenatal care at fixed facilities is low or frequently occurs very late in pregnancy, leaving insufficient time to administer two doses to the previously unimmunized woman. With periodic outreach or mobile strategies, trying to identify only pregnant women is like trying to hit a moving target when the marksman, or health worker, is also on the move.

Historically, the exclusive focus on pregnant women as a target group for TT has been well intended but operationally impractical in many developing countries. Administration of TT to individuals in this high-risk group is known to have an immediate effect on protecting the newborn. But unless the health services are well developed and appropriately utilized, a target group focusing on pregnant women exclusively will have low programmatic efficacy and not achieve a rapid reduction of NNT or non-NNT. Thus, a population-based approach is required since susceptibility to tetanus is general.

For this reason, WHO recommends routine continuous immunization of women of childbearing age, including pregnant women. Every contact with the health services is an opportunity to screen a woman's TT status and provide immunization. This strategy is less immediate in protecting individual births than a strategy focusing on women already pregnant, but its effect on the population will be more rapid. For this approach to work, a change in attitude of health workers, particularly curative staff, will be needed. Because this target group is less specifically at risk than women already pregnant, more doses of TT will be needed per NNT case averted since many doses will be given to older, less fertile age groups.

TABLE 1
TT immunization schedule for women

Dose	When to Give TT	Percent Protected	Duration of Protection
TT-1	at first contact or as early as possible in pregnancy	Nil	None
TT-2	at least four weeks after TT-1	80	3 years
TT-3	at least six months after TT-2 or during subsequent pregnancy	95	5 years
TT-4	at least one year after TT-3 or during subsequent pregnancy	99	10 years
TT-5	at least one year after TT-4 or during subsequent pregnancy	99	throughout childbearing years*

*Original citation indicates "for life," but WHO now considers protection to last throughout the childbearing years.

Source: Expanded Programme on Immunization. Neonatal tetanus: immunize all women of childbearing age. Update. Geneva: World Health Organization, September 1988.

Tetanus toxoid costs about \$.02 per dose in multi-dose vials, can withstand temperatures of 37° C for at least six weeks (EPI, 1990), has more than 95% efficacy when used according to the correct schedule, and is extremely safe. Studies on the immunological response to TT have been reviewed by Rey (1982) and Galazka (1982, 1983).

Reactions are minor and local, usually lasting less than one day. TT can be given at any stage of pregnancy without increased risk of abortion or congenital abnormality (Heinonen et al., 1977). Contraindications to TT immunization are virtually non-existent (Rey and Tikhomirov, 1989).

The impact of TT immunization on reducing NNT mortality and lowering overall neonatal mortality has been widely documented in developing countries using a variety of control strategies. To accelerate this decline in tetanus, the World Health Assembly of WHO set a goal in 1989 for the Expanded Program on Immunization (EPI) of global elimination of NNT by 1995. The goal itself has generated increased recognition of the public health importance of NNT. The degree of political support engendered and allocation of required resources will, in large measure, determine whether as many as 8,000,000 babies and 2,000,000 children and adults (at current incidence rates) die from tetanus during the 1990s.

REACH INVOLVEMENT IN NNT PREVENTION

Defining the Importance of NNT as a Public Health Problem and Advocating Its Control

The Resources for Child Health (REACH) Project serves as a resource on behalf of the U.S. Agency for International Development (A.I.D.) in the technical field of NNT control. REACH has become an advocate in support of global and regional initiatives and has taken a lead in fostering policy discussions.

REACH provided technical and financial support to the African Region of WHO in conducting a joint WHO/A.I.D. (REACH) Workshop for Accelerated Control of Neonatal Tetanus in Harare, Zimbabwe, 18-25 July 1988. This was the first of a series of five such workshops planned by WHO to cover the continent. As such, REACH support for this regional initiative was timely and well appreciated by WHO. Participants from nine English-speaking East and West African countries attended, as well as representatives from external agencies engaged at the country level. REACH sent a team of three technical and administrative staff. Original contributions of the REACH contingent were presented in plenary sessions and covered the following topics:

- How to assess tetanus toxoid coverage through routine reporting
- Cost issues related to NNT control strategies.

REACH played an important role in this first regional workshop in documenting its process, as well as its content. A paper, "Issues for Future Workshops on the Accelerated Control of Neonatal Tetanus," discussed planning, organizational and administrative, and technical issues relevant for subsequent workshops. (A list of REACH documents appears in Appendix A.) To structure country presentations, REACH also prepared a useful list of demographic, epidemiological and health service data required to assess NNT and its control at country level. (See Appendix B.)

The result of this and subsequent regional workshops was the elaboration of country-specific action plans for NNT elimination. REACH technical staff participated with national colleagues in preparing these plans. The Harare workshop was followed by two Francophone workshops in Cotonou, Benin (September 9-26, 1988) and Dakar, Senegal (December 7-20, 1988). A REACH consultant participated in each of these workshops and made presentations on "assessing vaccination coverage based on doses administered" and "estimating the incremental cost of national plans for strengthening the control of NNT." He also participated in the design of national action plans. Finally, a REACH staff member observed the fourth workshop held in Kenya for remaining Anglophone countries in May 1989 and assisted the Kenyan participants in devising a plan of action. (REACH did not participate at the fifth workshop, which was held for Portuguese-speaking countries.)

In recognition of REACH interest and expertise, WHO headquarters and A.I.D. solicited comments from a REACH staff member on the draft plan of action, "The Vision of WHO: Elimination of NNT by 1995." (EPI, 1989) These comments were thus incorporated into this global policy initiative.

In support of WHO's worldwide goal of NNT elimination by 1995, REACH joined with the MotherCare Project (John Snow, Inc.), another A.I.D.-funded project, to organize and conduct a Meeting on Neonatal Tetanus Elimination: Issues and Future Directions in Alexandria, Virginia from January 9-11, 1990. International experts in immunization and maternal and child health (MCH) were assembled to discuss technical issues and control strategies. Besides A.I.D., REACH and MotherCare, key representatives of WHO, the Pan American Health Organization (PAHO), the United Nations Children's Fund (UNICEF), the Centers for Disease Control (CDC) and other organizations participated to:

- clarify methodological and technical issues in NNT control,
- identify gaps in service and research,
- document lessons learned,
- disseminate information on current efforts and future plans, and
- identify areas for collaboration for NNT elimination.

A WHO document entitled "A Vision for the World: Global Elimination of Neonatal Tetanus by Year 1995," which is a plan of action endorsed at the WHO EPI Global Advisory Group Meeting in October 1989, served as the primary reference document for the meeting (EPI, 1989).

The meeting stimulated individual and organizational resolve, and set a strong foundation for future collaborative efforts. The joint sponsorship of the meeting by A.I.D. projects engaged in immunization services (REACH) and in maternal and neonatal health (MotherCare) served as an important example of the collaboration which will be required to eliminate NNT. An immediate outcome of the meeting was the realization that a forum for developing technical recommendations on NNT elimination at the global level is needed. As a result, WHO established an integrated EPI/MCH Consensus Group on NNT Elimination to address some of the issues and themes identified by the meeting. A REACH technical officer served as a member of the group, the first meeting of which was held in September 1990 in Geneva.

In the summer of 1990, REACH staff prepared a chapter on tetanus for a World Bank book edited by D. Jamison and W.H. Mosley on *Disease Control Priorities in Developing Countries*. To be published in 1991, this book has the potential to shape World Bank lending policies in the health sector for years to come. The chapter prepared by REACH staff includes a major review of economic considerations of and cost studies in control of tetanus. The median cost per NNT case averted for all the studies reviewed was \$98 and the median cost per NNT death averted was \$110. Although cost is not the only, or even the most important, criterion for selecting interventions, these costs compared very favorably with those of alternative health interventions discussed in other chapters of the volume. The chapter recommends that prevention of NNT should be a priority for resource allocation in many developing countries given the magnitude of disease (high incidence rates), the severity of the disease (high CFRs even with treatment), high costs of treatment and the availability of a safe, highly efficacious and cost-effective vaccine.

The chapter concludes:

"WHO now recommends efforts to eliminate neonatal tetanus worldwide by 1995. Achievement of this global target will require a global commitment of resources and mobilization of political will at all levels. Unlike other eradication and elimination

efforts (e.g., smallpox and polio), there can be no cessation of vaccination and re-vaccination efforts once NNT elimination is achieved. This is because of universal susceptibility to the infective agent, which exists in the environment and cannot be eradicated. Elimination itself will need to be sustained forever by means of active immunization. NNT is easily preventable and can be eliminated as a public health problem in most countries at a reasonable cost. This cost would be affordable for most countries, although many of the poorest countries (which also tend to have the largest tetanus problem) will require donor assistance for years into the future."

REACH's involvement in NNT at the global level is now well established. In contributing to policy dialogue in August 1986, REACH staff prepared a discussion paper entitled "Neonatal Tetanus Control Strategies" in which the advantages and disadvantages of alternative strategies were highlighted. The staff also reviewed the cause-attributable mortality patterns prevalent at three levels of infant mortality in a paper entitled "Are we ignoring different levels of mortality in the primary health care debate?" and published in *Health Policy and Planning* (Hirschhorn et al., 1989). Among other conclusions, the paper showed that NNT diminishes in importance as overall infant mortality is reduced. The so-called "replacement mortality" phenomenon probably does not operate in the case of NNT, since the disease has high fatality in individuals otherwise exposed to similar risks.

Supporting National Control Strategies

Participating at the national level in policy dialogue and formulation, situation analyses, studies, evaluations, and social marketing, REACH staff and consultants worked with ministries of health (MOH) in various countries on NNT control. REACH activities in those countries are summarized below. (Detailed descriptions of REACH activities by country appear in Appendix C.)

Kenya

- provided epidemiological and financial support for a 30-cluster NNT mortality survey in Kilifi District (1989).
- participated in formulating NNT control action plan at WHO Workshop on Accelerated Control of Neonatal Tetanus (1989).
- determined whether data at hospitals and public health offices in three districts could be used to identify trends and areas of high risk (1990).
- planned a seriological study to determine the extent of maternal protection and to validate the relative precision of coverage estimates derived by cards, verbal histories and service statistics (1990).

Bolivia

- conducted epidemiological assessment on child survival which included situation analysis on NNT (1987).

- provided recommendations on policy issues and strategy options at the national Inter-Agency Coordinating Committee (ICC) annual review of EPI plans (1988).
- conducted a medico-anthropological study of the cultural perceptions of NNT and programming implications in three cultural and topographical areas (1988).
- conducted epidemiological review in Santa Cruz of the magnitude of NNT and status of control efforts and provided guidance on the establishment of a comprehensive strategy for control (1989).

Ecuador

- analyzed TT coverage data (1986).
- recommended review of policies and control strategies (1989).
- participated in control efforts in Esmeraldas Province (1988-1990).

Bangladesh

- determined relationship between NNT and birth order and previous sibling deaths in Matlab (1986).
- conducted anthropological study of perceptions of childhood diseases and attitudes toward immunization among Dhaka slum dwellers (1989).
- recommended review of policies and control strategies (1989).
- planned special campaign for TT vaccination in garment factories (1989).
- initiated pilot project using medical students on community health rotation to immunize primary school children with TT (1990).

Pakistan

- developed plan for local production of TT (1987 and 1988).
- provided guidance on NNT control strategies as part of the EPI component of the Child Survival Project Plan (1987).

Indonesia

- conducted NNT mortality survey in Pidie District, Aceh Province (1987).
- provided social marketing consultant to develop a training video and plans for its use to support the innovative effort to immunize future brides with TT (1989).
- conducted market research on knowledge, attitudes and practices (KAP) concerning NNT and TT (1990).

Philippines

- provided input to develop national plan and guidelines for NNT control (1989 and 1990).
- recommended national assessment of NNT problem, control options and policy choices (1989 and 1990).

Shaping Technical Issues and Refining Tools

In close partnership with other technical agencies (particularly WHO), REACH has been active in NNT control and has participated in exploring new avenues. REACH staff members have contributed to the formulation of policies and strategies through input to WHO's global action plan for NNT elimination and through collaboration with country teams designing action plans at a series of regional workshops in Africa.

REACH staff developed a step-by-step method for program managers to use in estimating the incremental costs of alternative TT immunization programs. This effort begins to fill a void on the subject. The method was presented in a series of five regional workshops devoted to NNT control in Africa. The module provides managers with a tool to understand the fixed and variable costs involved in current or proposed strategies.

REACH also systematically reviewed the findings from studies and simulation models pertaining to the cost and cost-effectiveness of TT immunization programs. The results will be published as a chapter in a World Bank book and may influence discussions on health interventions in the 1990s.

Much discussion has been stimulated by REACH on the long-neglected subject of monitoring TT coverage through routine reporting. Partially as a result of REACH publications and presentations, the need for improved indicators is now widely acknowledged. WHO requested comments from a REACH staff member on new indicators to be presented to the WHO EPI Global Advisory Group in October 1990. REACH has provided input in the design of the TT component of the coverage survey analysis system, which is software for analyzing data generated during vaccination coverage surveys.

The problem of determining simple but valid coverage rates based on routine service statistics to monitor TT protection may be unsolvable. Unlike the case of infants, a cohort which renews itself annually and is consequently easily calculated, multiple doses of TT are administered with varying intervals over a 30-year reproductive span, and women enter and leave the eligible age range all the time. "Coverage" in a given year does not equal "protection," because it overlooks vaccinations given in past years which are still protective.

The MOH in Kenya along with REACH has tested new approaches relying on routine data to identify areas of high risk for NNT. REACH experience has been fed back to WHO in Geneva and to PAHO, which originated the approach and is applying it throughout Latin America. REACH and the MOH will test in Kenya another approach, now under development, which analyzes neonatal mortality by day of death to determine areas of high risk.

REACH has stressed the need for program managers to select from a menu of implementation strategies those approaches which meet the diverse operational, technical and social realities at the local level. For instance, REACH has repeatedly alerted global and national policy makers that an often overlooked approach ("missed strategic opportunity") is the immunization of young school girls in the early grades before attrition. This is appropriate where school enrollment rates are high, as in Kenya, but rates of TT coverage and modern obstetrical care are low. Global policy statements now include this approach.

In Bolivia and Bangladesh, REACH has pioneered the use of anthropological approaches to understand cultural perceptions and to increase demand for services.

REACH has finalized the design of a curve which can be used to prospectively estimate the neonatal tetanus mortality rate based upon the overall neonatal mortality rate. Estimates derived from such a curve could eliminate the need to conduct costly NNT surveys. The curve was developed from data collected in 60 retrospective NNT surveys, conducted by WHO in Africa, the Eastern Mediterranean, South-East Asia and the Western Pacific. The curve is derived from a linear regression model from which a prediction interval can be calculated to estimate prospectively the NNT mortality rate at a given level of total neonatal mortality.

REACH will continue to be in a position to shape future technical issues and refine analytic tools. As a result of a meeting on NNT which it co-organized with the MotherCare Project in January 1990, a REACH staff member was invited to participate in the WHO Consensus Group on NNT Elimination. This group will meet at least annually to review new ideas and approaches and formulate recommendations for the consideration of the WHO EPI Global Advisory Group.

Dissemination and Training

An important part of REACH work has been dissemination of information on NNT. (A complete list of REACH documents in the field of NNT is in Appendix A.) One document in particular, the proceedings from the Meeting on Neonatal Tetanus Elimination: Issues and Future Directions (January 1990), has been widely distributed. WHO, UNICEF, and the CDC are distributing 500 copies to EPI and MCH field officers.

REACH participated with the MotherCare Project in preparing an annotated bibliography on NNT. This bibliography, which covers the major published and unpublished documents of the past quarter century, is potentially a resource for staff, consultants and the public. MotherCare is planning to update the bibliography periodically. The existence of this resource needs to be widely publicized.

In addition to documents, REACH has also been active in presenting information on NNT at training courses and professional conferences. These presentations (also listed in Appendix A) include sessions at the annual meetings of the American Public Health Association, National Council for International Health, and A.I.D. State-of-the-Art Technical Courses for Health, Population and Nutrition Officers. Presentations were also given at workshops and at annual meetings of pediatric societies in Kenya and Bolivia.

REACH was invited by WHO to send a consultant epidemiologist to Geneva for a special one-week "Training Workshop for Consultants of the Elimination of NNT by the Year 1995" in

July 1989. The goal of participation for the REACH consultant was to reaffirm and coordinate REACH's active role in this vital aspect of child health. The workshop provided a unique opportunity to open channels of communication and coordination with WHO/EPI and colleagues from other parts of the world, to share experiences in tetanus control efforts, and to enhance REACH's capacity to help countries achieve NNT control or elimination. The REACH consultant intends to continue making use of his skills in this area, and has already organized training in NNT in Santa Cruz, Bolivia to bring health officials up to date on recent developments in NNT control.

Finally, REACH prepared "Issues for Future Workshops on the Accelerated Control of NNT" as a follow-up to the first regional workshop in Africa in Harare in July 1988 to improve the content and process of future workshops. This document has been widely disseminated.

ASSESSMENT OF REACH WORK IN NNT CONTROL

Relevance

REACH has been involved in all facets of the control of NNT through immunization. Depending on what was required at the time in the particular setting, REACH has either proposed activities or responded to requests. Activities have been conducted in the area of advocacy, policy review, mortality surveys, surveillance systems, coverage surveys, anthropological studies, identifying high-risk populations, social marketing, refining tools for monitoring coverage, developing cost guidelines, conducting workshops, and disseminating information.

REACH has provided timely assistance and helped fill some gaps. Financial sponsorship and technical support of the first regional workshop in Africa in July 1988 on accelerated NNT control increased attention on and catalyzed action for NNT control. Co-organizing with MotherCare an important global exchange of views on NNT elimination in a meeting in January 1990 further advanced the agenda. The timing and content of the latter meeting was particularly appropriate as it was the first such gathering of technical and donor agencies to occur after a global goal of NNT elimination by 1995 was declared in May 1989 by the World Health Assembly. It was a powerfully symbolic reminder to other donors of the need for an integrated approach to NNT control.

REACH has actively participated in and, on occasion, taken the lead in discussions of new areas in NNT control. REACH challenged the orthodoxy regarding the way in which routine service statistics are inappropriately used to derive TT coverage rates. This was important in stimulating discussion about indicators, searching for improved analytic tools, and increasing awareness of their valid interpretation. REACH work on costing alternative control strategies for the African workshops and reviewing past economic studies on NNT control for a chapter in a World Bank book (*Disease Control Sector Priorities in Developing Countries*) has broken new ground.

REACH has been willing to explore controversial areas. Besides its critique of current methods of monitoring TT coverage, REACH has promoted the use of occasional serological surveys to assess levels of protection. There is a plan to conduct such a survey with the MOH

in Kenya. REACH and the MOH have put to the test the novel PAHO approach of using routine data to identify geographical areas of high risk in Kenya. This approach was found unworkable in Kenya as major investments in time and staff (which would be better used to increase coverage) would be necessary, but might not even be sufficient, to make use of existing incomplete and inaccurate data.

Since mortality surveys are costly and impractical and routine surveillance data are frequently inaccurate or incomplete, REACH has explored other methods to assess the magnitude of NNT. The method used will be applied to Demographic and Health Survey (DHS) data in Kenya to identify high-risk areas where the neonatal mortality at 4-14 days (typically due to NNT) exceeds the expected declining curve of neonatal mortality. This method is now being developed by CDC and was shared with REACH prior to the first Consensus Group Meeting on NNT Elimination in Geneva.

REACH conducted one of the first anthropological studies of the cultural understanding of tetanus to identify appropriate programmatic responses. The fact that studies in Bolivia and Bangladesh have met with initial indifference or even outright resistance on the part of those accustomed to a medical model has been disappointing. The likelihood of using the findings would have been greater if a more concerted effort was made at the outset to forge linkages with health staff responsible for disease control and health education. Also, responsibility should have been clearly assigned for translating the findings into concrete actions.

REACH assisted the Government of Indonesia in 1986 in its NNT mortality survey in Pidie District, Aceh Province. At a time when the campaign approach to immunization delivery was being justifiably criticized by REACH for its failure to build a structure capable of immunizing future cohorts of children, the NNT survey clearly demonstrated the impact of a mass TT immunization campaign in achieving an 85% reduction in NNT mortality.

Effectiveness

While REACH has been active in the field, effectiveness is difficult to measure. REACH has certainly had a role to play in raising consciousness about NNT in Washington, DC; Ecuador; Bolivia; and Kenya. There is no way to know definitively whether current policy initiatives and reexamination of EPI norms throughout Latin America, and elsewhere, have been influenced or accelerated in some small measure by REACH initiatives in NNT control. Bolivia and Ecuador have both recently changed their policies which previously restricted TT to certain specified months of pregnancy. The REACH recommendation to the Bolivia MOH to include TT during vaccination days has subsequently been endorsed in high-risk areas throughout Latin America by PAHO.

Since there can be no global blueprint for NNT control, REACH expertise to advise countries on appropriate strategies will continue to be in demand. NNT is often a localized problem, so well-focused and cost-effective interventions will be needed. REACH has promoted this search for local solutions by its involvement in a series of African workshops whose goal was the formulation of country-specific action plans for NNT control.

One measure of effect has been the willingness of United States Agency for International Development (USAID) missions to buy-in to REACH for NNT control activities. This has

occurred in Kenya and Ecuador, and is likely under REACH II to be extended to Bolivia and Haiti and continue in Kenya.

Lessons Learned

Additional resources are required for NNT control, but political commitment is the greatest need. Following the lead from donors, countries have been preoccupied with universal childhood immunization or polio elimination. NNT has been neglected.

Prevention of NNT should be a priority for resource allocation in many developing countries given the magnitude of the disease, the severity of the disease, low numbers of cases seen in health facilities, high costs of treatment and the availability of a safe, highly efficacious and cost-effective vaccine.

Strategies chosen for immunization, as well as target groups, should be defined locally and will depend on a number of different factors, including:

- level of incidence;
- level of resources available (nationally and from donors);
- organization and utilization of health services (particularly preventive and MCH services);
- existence of other channels for contact (schools, bride registration, TBAs, etc.);
- immediacy of desired impact (campaigns versus routine service);
- cost-effectiveness and opportunity cost of other health interventions and strategies;
- incremental cost of different TT strategies; and
- operational and behavioral considerations.

As Berman et al. (1989) noted:

"The appropriate agenda for planning is not an absolute choice amongst different strategies, but a flexible schedule for how different approaches can be combined over time to maximize results at an affordable cost. This approach was suggested by Cvjetanovic (1972) and still remains valid."

To eliminate NNT worldwide by 1995, a global commitment of resources is required. Since the infective agent is ubiquitous and cannot be eradicated, efforts to control and eliminate NNT will need to be sustained forever by means of active immunization. NNT can be prevented and eliminated as a public health problem in most countries at an affordable cost; however, the poorest countries, which also tend to have the largest tetanus problem, will require donor assistance for the foreseeable future.

Currently, half of immunization costs (capital and recurrent) in developing countries are financed by external resources from donor organizations (Brenzel, 1989). Tools for making resource allocation decisions, such as cost-effectiveness analyses, have had limited applicability in cases where resources are not restricted. However, sustaining immunization coverage gains is becoming a greater priority for program managers, and this translates into selecting the most affordable and effective strategies for tetanus prevention.

WHO has recommended expanding the target population for tetanus toxoid immunization from pregnant women to all women of childbearing age (EPI, 1986). Initially, there was concern that enlarging the population would not be an affordable strategy for developing countries. The incremental cost of implementing a five-dose schedule for all women of childbearing age will increase total costs within the first five years of adopting this strategy. Costs would then revert to the pre-expansion phase. If the incremental costs of additional vaccine, storage, training and monitoring could be financed through donor resources, this policy would not represent an economic burden to developing countries in the short-run.

Having helped to document difficulties in the use of routine service statistics for monitoring TT coverage, REACH has learned that many international health workers share this concern about the lack of simple, valid indicators. REACH must be prepared to participate with WHO and others in the long process of identifying and implementing solutions.

For REACH to be more effective in NNT control, its intense focus of activity at the central level must permeate to the field. REACH central and field staff will need to be trained on recent developments in NNT control. The long-term intervention sites should be used to identify problems and test appropriate solutions to the extent possible.

At country level, REACH staff must become advocates to counteract some frequent omissions. They should ensure that:

- TT policies and delivery strategies are reviewed for appropriateness and, if necessary, reformulated;
- NNT control or elimination plans exist and are implemented;
- 30-cluster coverage surveys include questions about the TT status of the mother at the birth of her 0-11-month-old child;
- surveillance systems give equal importance to NNT and report it separately from non-NNT;
- national vaccination days include giving TT to all women of childbearing age;
- the prevailing two-dose mentality in many countries is challenged;
- studies on missed opportunities for immunization always include questions on TT;
- social mobilization and communication efforts stress NNT and TT immunization;
- results from NNT mortality surveys and KAP studies are used to inform managers and guide program plans; and
- behavioral researchers take the initial trouble to establish firm linkages with health care providers and decision makers to increase the likelihood that findings will be accepted.

REACH field staff need to know that they have the support of technical staff in Washington to call upon.

Lessons learned by REACH can be summarized as follows:

- 1. Increased awareness is needed by health planners, providers, women and their families about prevention of NNT.**
 - MOH officials, staff from health training institutes, and members of pediatric, obstetrical and gynecological, midwifery and medical associations all need to be brought up-to-date on the many recent developments in NNT prevention. A broader coalition is needed in each country, including medical staff, women's groups, religious leaders, teachers and school children, and international agencies, to reformulate and apply new national policies and delivery strategies.
 - Women and their families require information about the importance and safety of receiving TT immunization before or as early as possible during pregnancy for the health of their babies and their own health. They need to know where and when immunization is offered.
 - Communication and social mobilization strategies aimed at both consumers and health care providers are required to overcome barriers to changing behavior. Behavioral research and social marketing will be needed in many settings to transform providers into active supporters of NNT control.
- 2. Within the EPI, equal emphasis must be given to TT immunization of women.**
 - Presently, the predominant focus of the Expanded Program on Immunization is on infant immunization coverage, to the relative neglect of TT immunization of women. Reasons for missed opportunities for immunizing women with TT must be identified and corrected.
- 3. EPI and MCH staff have a joint role in eliminating neonatal tetanus.**
 - Closer collaboration is needed at every level between staff engaged in MCH care and those involved in EPI.
 - Strategies to ensure clean delivery and postpartum care and to increase immunization coverage need to be formulated at each level of health services by staff familiar with local technical, operational and social factors.
- 4. Girls and all women of childbearing age are targets for TT immunization.**
 - Programmatic shifts are needed in many settings toward immunizing all girls and women of childbearing age with a five-dose schedule of TT (with a special emphasis on pregnant women), and away from the traditional approach which exclusively targets pregnant women.

5. **Every service contact with women should be used to increase TT coverage.**
 - Simple surveys on missed opportunities for immunization will be useful to alert program managers to inefficiencies in service delivery.
6. **Improved indicators and records are needed to strengthen program monitoring.**
 - Improved indicators are required for monitoring TT activity, coverage and protection, as well as indicators for clean delivery and proper cord care.
 - A review of experiences using women's records and lifetime immunization cards would be instructive.
 - A shift from achieving targets to achieving disease control through improved surveillance is needed. NNT must be reported separate from non-NNT.
7. **Costing information can assist program managers to select control strategies.**
 - Costing guidelines need to be designed to help EPI and MCH managers select strategies, allocate resources for immunization and clean delivery, and sustain disease control.

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APPENDIX A

PUBLICATIONS AND PRESENTATIONS BY REACH

PUBLICATIONS

GENERAL

Behavioral Aspects of TT Immunization

Michael Favin
December 1989

The Control of Neonatal Tetanus

Mothers and Children
Robert Steinglass
September 1989

Cost Effectiveness of Elimination Strategies

In: Neonatal Tetanus Elimination: Issues and Future Directions
Meeting Proceedings
REACH/MotherCare
Gerard Foulon
January 9-11, 1990 (Alexandria, Virginia)

Cost Issues Related to Neonatal Tetanus Prevention

Logan Brenzel and Richard Arnold
July 1988

A Curve for Estimating Incidence of Neonatal Tetanus Mortality from Total Mortality

Norbert Hirschhorn, Paul Steele, Layla Barraaj, Martha Pennay, and Lisa Dubay
1988

Detailed Preparations for a WHO/USAID (REACH) Workshop for Accelerated Control of Neonatal Tetanus

Robert Steinglass
March 4-14, 1988 (Brazzaville, Congo)

How to Estimate Incremental Resource Requirements and Costs of Alternative TT Immunization Strategies: A Manual for Health and Program Managers

Logan Brenzel and Gerard Foulon
June 1989

Issues for Future Workshops on the Accelerated Control of Neonatal Tetanus

Robert Steinglass and Cynthia Dunn
July 1988 (Harare, Zimbabwe)

Meeting Women Half-Way: Rethinking our Tetanus Toxoid Immunization Strategies
In: Neonatal Tetanus Elimination: Issues and Future Directions
Meeting Proceedings
REACH/MotherCare
Pierre Claquin
January 9-11, 1990 (Alexandria Virginia)

Monitoring Tetanus Toxoid Coverage and Activity Using Service Statistics
In: Neonatal Tetanus Elimination: Issues and Future Directions
Meeting Proceedings
REACH/MotherCare
Robert Steinglass
January 9-11, 1990 (Alexandria, Virginia)

Neonatal Tetanus
Outreach
Robert Steinglass
Summer 1988

Neonatal Tetanus and Birth Order, Bangladesh
Weekly Epidemiological Record 1987; 62(35):262
August 28, 1987

Neonatal Tetanus Control Strategies
Norbert Hirschhorn, Cynthia Dunn, and Donna Frank
August 28, 1987

Neonatal Tetanus Elimination: Issues and Future Directions
Meeting Proceedings
REACH/Mothercare
January 1990

Proceedings of the Workshop for Accelerated Control of Neonatal Tetanus, sponsored by WHO
and A.I.D. (REACH)
Robert Steinglass
July 18-25, 1988 (Harare, Zimbabwe)

Tetanus
Chapter in: Jamison D, Mosley WH, eds. Evolving Health Sector Priorities in Developing
Countries
Robert Steinglass, Logan Brenzel, and Allison Percy
In press, 1990 (Washington, DC: World Bank)

Training Workshop for Consultants in the Elimination of NNT by the Year 1995
Claude Betts
July 1989

Trip Report: WHO Workshop on the Acceleration for the Control of Neonatal Tetanus in Africa.
Gerard Foulon
September 9-26, 1988 (Cotonou, Benin)
December 7-20, 1988 (Dakar, Senegal)

BANGLADESH

Assessment of REACH Project Technical Assistance to EPI in Bangladesh, 1986 - 1990
Rebecca Fields, Yassin Hazza and Richard Pollard
February 15-March 5, 1990

Perceptions of Childhood Diseases and Attitudes Towards Immunization Among Slum Dwellers,
Dhaka
Therese Blanchet
June 1989

Neonatal Tetanus and Birth Order, Bangladesh
Weekly Epidemiological Record 1987; 62(35): 262
August 28, 1987

Technical Assistance for Planning Urban Immunization Activities, Bangladesh
Robert Steinglass
October 1989

BOLIVIA

Annual Review of EPI Plans in Bolivia in 1988
Robert Steinglass and Claude Betts
February 1988

Assessment of Neonatal Tetanus and its Control Activities in Bolivia
Claude Betts
September 1989

Child Survival in Bolivia: Current Status and Priorities for Action
Duncan Pedersen, Claude Betts, Jorge Mariscal, Javier Goitia C.
November 1987

Cultural Perceptions of Neonatal Tetanus and Programming Implications
Joseph Bastien
August 1988

Participation in the Workshop for Technical Cooperation in EPI/ARI and in the Interagency
Coordination Committee Meeting
Robert Steinglass
August 1988 (Bolivia)

ECUADOR

Assessment of REACH Project Technical Assistance to EPI in Ecuador, 1986 - 1990
Michael Favin, Claude Betts, and Jean Andre
March 1990

Evaluation of the Expanded Program on Immunization Information System and KAP Survey
Coverage Analysis, Ecuador
Rodrigo Rodriguez
November 1987

Immunization Coverage Analysis (KAP2), Ecuador
Marjorie Pollack
August-September 1986

Technical Support to the Expanded Program on Immunization, Ecuador
Robert Steinglass
January 1989

HAITI

REACH/Haiti Internal Evaluation
Mary Carnell, John Mobarak and Harry Godfrey
April 16-May 5, 1990

INDONESIA

Assessment of REACH Project Technical Assistance to EPI in Indonesia, 1986 - 1990
Alasdair Wylie and Mrudula Amin
June 1990

Assistance to CHIPPS/Indonesia with Neonatal Mortality Survey in Aceh Province, August 1987
Richard Arnold
August 1987

Neonatal Tetanus Mortality Survey, Pidie District (Aceh Province)
Donna Bertsch, Burhanuddin Yusuf, Syariffudin Anwar, Steven Solter, and Richard Arnold
August 1987

Participation in the Aceh Province Neonatal Tetanus Survey
Donna Bertsch
August 17-September 13, 1987

Social Marketing of Tetanus Toxoid Immunization Program for Brides-to-Be in Indonesia
Lonna Shaffritz
October-November 1990

KENYA

Status of REACH Support to EPI in Kenya and Planning for Future USAID Assistance
Robert Steinglass
March 9-31, 1990

Epidemiological Support for a Neonatal Tetanus Mortality Survey and for EPI-Target Disease Surveillance, Kenya
Robert Steinglass
February 2-March 9, 1989

Neonatal Tetanus Mortality in Kilifi District, Kenya: Results of a Community Survey, 1989
Robert Steinglass, Dominic Mutie, Geoffrey Kimani, Mary Mjomba, Vincent Orinda, and Peter Bjerregaard
May 3, 1989 (Nairobi, Kenya)

PAKISTAN

Assistance to USAID/Islamabad in Drafting Child Survival Project Paper
Didier Patte
November-December 1987

EPI Technical Assistance Advice to Child Survival Project
Norbert Hirschhorn
April 1987

Project Plan for the Establishment of a Facility to Produce Tetanus Toxoid at the National Institute of Health, Pakistan
Robert Binnerts
December 1989

Proposed Production of Tetanus Toxoid for Neonatal Use at National Institute of Health in Pakistan
Robert Binnerts
April 1987

PHILIPPINES

Assessment of REACH Project Technical Assistance to EPI in the Philippines, 1986 - 1990
Rebecca Fields and Richard Sang
May 1990

PRESENTATIONS

Cost Issues Related to NNT Control Strategies
Workshop for the Accelerated Control of Neonatal Tetanus
Logan Brenzel and Richard Arnold
July 1988 (Harare, Zimbabwe)

Monitoring TT Coverage through Routine Reporting: Present and Proposed Methods Presented at the WHO/USAID (REACH) Workshop for Accelerated Control of Neonatal Tetanus
Robert Steinglass
July 18-25, 1988 (Harare, Zimbabwe)

Infant Mortality and Specific Causes: Some Implications for Primary Health Care Presented at the Johns Hopkins University School of Hygiene and Public Health Seminar
Norbert Hirschhorn, Mark Grabowsky, Robin Houston, and Robert Steinglass
November 21-22, 1988
Published in: Health Policy and Planning 1989; 4(4): 343-53 as "Are We Ignoring Different Levels of Mortality in the Primary Health Care Debate?"

Neonatal Tetanus and Its Control
A.I.D. Health, Population and Nutrition State-of-the Art Technical Course
Robert Steinglass
July 11, 1990 (Arlington, Virginia)

Neonatal Tetanus Mortality in Kilifi District, Kenya: Results of a Community Survey, 1989
Robert Steinglass, Dominic Mutie, Geoffrey Kimani, Mary Mjomba, Vincent Orinda, and Peter Bjerregaard
May 3, 1989 (Nairobi, Kenya)

Cultural Perceptions of Neonatal Tetanus and Programming Implications, Bolivia
American Public Health Association Annual Meeting on "Closing the Gap: Ethics and Equity in Public Health"
Robert Steinglass
October 1989 (Chicago, Illinois)

Neonatal Tetanus Mortality in Kenya, 1989
American Public Health Association Annual Meeting
Robert Steinglass
October 1989 (Chicago, Illinois)

New Developments in the Control of Neonatal Tetanus
A.I.D. Health, Population and Nutrition State-of-the-Art Technical Course
Robert Steinglass
July 9-21, 1989 (Arlington, Virginia)

Methods of Assessing TT Coverage Using Reported Data
National Council for International Health Annual Conference
Robert Steinglass
June 19-21, 1989

How to Assess TT Coverage through Routine Reporting
WHO/AID Workshop for Accelerated Control of Neonatal Tetanus
Robert Steinglass
July 1988 (Harare, Zimbabwe)

APPENDIX B

DEMOGRAPHIC, EPIDEMIOLOGICAL AND HEALTH SERVICES DATA

Workshop for Accelerated
Control of Neonatal Tetanus

Harare, Zimbabwe
July 18-25, 1988

WHO/US AGENCY FOR INTERNATIONAL DEVELOPMENT (REACH)

1. Demographic Data

1.1 Total population of country

- also give year of census and annual rate of population increase

1.2 Population by province, region, district

1.3 Population of women 15-44 years

1.4 Annual no. of newborns

- also give crude birth rate = $\frac{\text{no. of births}}{1000 \text{ pop.}}$

2. Surveillance Data

2.1 No. of neonatal tetanus (NNT) cases and deaths by administrative area for each year 1984-1987 according to routine reports

2.2 No. of NNT cases and deaths by administrative area for each year 1984-1987 according to sentinel surveillance system, if any

2.3 Results of NNT mortality survey, if any

- year and area of execution
- no. of live births surveyed
- length of recall period used
- no. of neonatal deaths surveyed
- no. of NNT deaths surveyed

2.4 Completeness of routine disease surveillance system (1987, or most recent year - specify)

- $\frac{\text{NNT deaths (or cases) reported}}{\text{NNT deaths (or cases) estimated}} \times 100$
- 2.5 Efficiency of routine disease surveillance system (1987, or most recent year - specify)
 - no. of country's health facilities
 - no. of health facilities reporting disease data at any time during year
 - no. of health facilities reporting more than 80% of time to higher levels
 - 2.6 No. and type of sentinel sites and location. Report any special findings on NNT.
 - 2.7 Results of any NNT case investigations
3. Operational data
 - 3.1 Target group for TT immunization
 - national policy and common practice (if different)
 - 3.2 Immunization schedule for TT
 - national policy and common practice (if different)
 - 3.3 List of contra-indications to TT immunization
 - national policy and common practice (if different)
 - 3.4 Is there an immunization card for TT for women?
 - if not, where is TT immunization recorded?
 - 3.5 No. of immunization centers administering vaccines to infants (specify year)
 - 3.6 No. of immunization centers administering TT to women (specify year)
 - 3.7 Population (as absolute no. and as % of total population) living within catchment area of fixed health facilities
 - 3.8 Population (as absolute no. and as % of total population) served by outreach and mobile units
 - 3.9 Estimated % of total population with access to EPI
 - 3.10 No. of antenatal visits in country (specify year)
 - 3.11 No. of births occurring in health facilities (specify year)

- 3.12 No. of TBAs trained each year, 1984-1987
- 3.13 Is NNT notified separately from other tetanus?
- 3.14 Existence of a standard NNT case definition (if yes, specify)

4. Immunization Activities

- 4.1 No. of TT (by dose) administered to the target group(s) for each year, 1984-1987
- 4.2 Based on routine reporting, what is the estimated national TT coverage by dose for the target group(s) for each year, 1984-1987?
 - show absolute figures used and method of computation for each dose and year
- 4.3 No. of TT coverage surveys, by age group surveyed, 1984-1987
 - which women were surveyed? (i.e., mothers of index children 0-11 or 12-23 months; all women; etc.?)
 - which TT immunizations were counted? (i.e., up to time of survey; up to birth of child 12-23 months old; during pregnancy of child 12-23 months old at time of survey; etc.?)
- 4.4 No. of child immunization coverage surveys, 1984-87
- 4.5 TT drop-out rate for each year, 1984-87

$$\frac{TT1 - TT2}{TT1} \times 100$$
- 4.6 Immunization performed by country, by dose and age
 - fill attached standard forms for most recent two years (specify)
- 4.7 Results of missed opportunity surveys for TT immunization, if any
- 4.8 Results for immunization acceptability surveys, if any

5. Immunization Approaches Used

- 5.1 Pregnant women only
- 5.2 Women of childbearing age including pregnant women
- 5.3 School children

- 5.4 Antenatal clinic only
- 5.5 During outreach activities
- 5.6 Mass campaign
- 5.7 At child immunization sessions
- 5.8 At any visit to a health center for curative or preventive care

- 6. Social Mobilization Strategies Used
 - 6.1 Posters, TV, radio, newspapers
 - 6.2 Frequency and content of messages
 - 6.3 Resources allocated in 1986 or 1987
 - 6.4 Any information on cultural understanding of NNT or TT

- 7. Additional Data and Materials which Country Team Should Bring to Workshop
 - 7.1 Overall EPI action plan
 - 7.2 Population figures for country, and by towns and villages, if available
 - 7.3 Reporting forms used for NNT and other reported diseases
 - 7.4 Reporting forms used for TT doses administered
 - 7.5 Child immunization card, woman's immunization card, registers
 - 7.6 Detailed map of country, showing administrative areas
 - 7.7 NNT mortality survey report (for Uganda, Gambia, Ethiopia and Zimbabwe and if done in other countries)
 - 7.8 Report of most recent EPI review
 - 7.9 Sample of health education materials used for NNT or TT
 - 7.10 Sections of national training curricula for doctors, nurses, and immunization staff concerning NNT control.

APPENDIX C

REACH COUNTRY ACTIVITIES IN NNT CONTROL

KENYA

During 1984-1985 (before the REACH Project began), house-to-house NNT mortality surveys were conducted in three districts of Kenya using the standard WHO 30-cluster survey methodology. Estimates of NNT mortality ranged among the three districts from 6 to 15 per 1,000 live births. It was inferred that 8,000 to 12,000 newborns die annually in Kenya from this preventable disease.

Because the routine disease surveillance system is not able to provide a good estimation of NNT incidence since most cases are not brought to medical attention, REACH was requested to assist the Kenya EPI (KEPI) in conducting another community survey in February and March 1989. REACH provided epidemiological and most of the financial support for a 30-cluster NNT mortality survey in Kilifi District. As a step toward strengthening control activities, such community surveys in Kenya, as elsewhere, have helped to determine the magnitude of NNT as a public health problem and to alert decision makers about its importance.

For the REACH-assisted Kilifi District survey, the MOH provided survey teams. The Danish International Development Agency, KEPI, and UNICEF supplied additional staff and resources. Results were analyzed and written up by REACH and presented by one of the co-authors, Dr. Vincent Orinda, at the annual Kenya Pediatric Association Conference in May 1989.

The survey and additional data indicate that during the past decade Kilifi District has greatly reduced NNT incidence and overall neonatal mortality. The NNT mortality rate is 3 per 1,000 live births. These results are not generalizable to other districts of Kenya, where the NNT problem still remains undefined and where coverage with TT and antenatal care (ANC) is much lower than in Kilifi District.

The survey has identified three areas where improvement in services is especially needed. Missed opportunities for TT immunization must be reduced. Twelve percent of mothers had not received TT during their last two pregnancies despite having attended antenatal clinics at least twice during the index pregnancy. Those 12% contributed four of the eight cases of NNT found on the survey. The introduction of durable tetanus protection cards for recording all TT doses and the strengthening of screening, referral and immunization at every antenatal contact would reduce the level of missed opportunities. In other districts, where antenatal services are less developed or utilized, screening and immunization of all women of childbearing age at every contact with the health services is needed.

Whereas 89% of the infants had their umbilical cord cut aseptically, in most cases at home with a clean unused razor blade, potentially infectious material was applied to the stump in 62% of the cases. Suitable messages need to be formulated and communicated to mothers about care of the umbilical stump.

Young women during their first pregnancy were found to be significantly less well protected by TT than other women; however, given the small number of NNT deaths, age did

not constitute a statistically significant risk factor. It is therefore necessary for communications officers to design immunization strategies and messages specifically aimed at increasing TT coverage in this high-fertility group of young mothers. This could be done by introducing a five-dose TT schedule for all women of childbearing age and starting TT immunization in schools and on contacts with the health services before the age of first pregnancy.

The survey report concluded that, with the encouragement provided by the start of NNT control in Kilifi District, Kenya should now design NNT elimination strategies tailored to the operational, epidemiological and social realities in each district.

Surveillance of NNT cases and monitoring of trends will need strengthening as a prerequisite for improved control. Although tetanus is a notifiable disease, NNT is not yet reported separately from other tetanus.

In a visit in April 1989, a REACH staff member was invited as an observer to the Workshop on Accelerated Control of Neonatal Tetanus, held in Nairobi with WHO technical involvement. He participated in the Kenya country team's formulation of an action plan for NNT control. However, as of mid-1990, the action plan had still not been formally adopted by the MOH. The reason for this is not entirely clear.

In a visit in March 1990, a REACH staff member accompanied the KEPI Manager to three districts to determine whether data in hospitals and at district public health offices could be used to identify trends over time and areas of high risk, as is now being attempted throughout Latin America by PAHO. The conclusion was that the data in Kenya are too incomplete and inaccurate to be used for this purpose.

During the March 1990 visit, there was some continued resistance to include briefings on NNT in a proposed workshop on accelerated measles control for senior-level policy makers and pediatricians. Without such meetings to consider NNT policy options and control strategies, the potential value of the Kilifi NNT mortality survey will remain unrealized.

Relevant recommendations from REACH visits, including some now in the process of implementation, follow:

1. Publicize the Kilifi District NNT mortality survey results widely within the MOH. The consequences of the survey (e.g., in terms of new policy and operational initiatives) need to be evaluated before additional surveys are funded. The REACH and Kenyan authors of the survey results should submit the document for publication in a journal.
2. In districts with reported low TT coverage because of low ANC coverage, accelerate NNT control by expanding the eligible age group to include all women of childbearing age. This should be carefully studied before implementation. Five properly spaced doses provide immunity at least throughout the reproductive years. The series can begin even before the woman's first pregnancy during any visit to a health facility for whatever reason, and will require fewer doses over the woman's lifetime than the current schedule.

3. In districts with high utilization of ANC, high coverage with TT, and low NNT incidence, the current ANC-based delivery of TT can continue. TT should be offered as early as possible during the pregnancy on the first ANC visit.
4. In all districts, especially where TT coverage is low, school enrollment is high, and NNT incidence is presumed high, greater attention is needed to vaccinate female students repeatedly in the early grades before attrition. This will help solve the NNT problem in the long run, since women will enter their childbearing years with long-lasting protection and need fewer doses.
5. Social communications must be directed toward the problem of NNT and its control.
6. Missed opportunity surveys at antenatal clinics are needed to evaluate the degree to which national TT schedules are efficiently implemented.
7. A durable tetanus protection card, to be retained by the woman, with the TT schedule and space for recording all primary and booster doses of TT, is needed.
8. A TT vial should be opened even if only a single woman is to be immunized.
9. On the next revision of the "road to child health" card, information should be included on the woman's TT vaccination status. This will increase the likelihood that health workers will screen women for TT status and vaccinate them as necessary.
10. A serological component to determine the extent of maternal protection with tetanus antitoxin should be conducted at a convenient time. As the "gold standard" of protection, serological findings will be useful to validate the relative precision of coverage estimates derived by cards, verbal histories, and service statistics.
11. Since routine surveillance data cannot now be used without a major investment in time and effort, and surveys are too costly and impractical, other means of determining the magnitude and area of high risk for NNT need to be found. The possibility of using existing DHS data to analyze neonatal deaths, by age at death in days, should be explored.
12. NNT surveillance should be improved by requiring that it be reported separate from all other tetanus cases and by disseminating a standard case definition to improve diagnosis. Recording and reporting of TT by dose also needs to be standardized.
13. The low number of TT doses given in some districts and facilities relative to the high number of new and repeat ANC visits deserves investigation.

BOLIVIA

A detailed epidemiological assessment of Bolivia was conducted by a four-person REACH team in October and November 1987. This assessment, entitled "Child Survival in Bolivia: Current Status and Priorities for Action," was completed to guide planning for a new bilateral Community and Child Health Project which was to have a strong EPI component.

The team noted that 80% of births are attended at home by untrained attendants - one of the highest rates in South America. NNT incidence is high because of traditional cord care practices and low vaccination coverage with TT. Whereas the incidence of most vaccine-preventable diseases had decreased, NNT incidence was presumed to be unchanged. Cause-of-death data in the civil registry are aggregated and do not permit a breakdown of "certain infections originating during the perinatal period." Fortunately, a 1982-1983 study by Toro et al. (1984) of causes of death in children 0-35 months of age, according to civil registries in urban areas with more than 6,000 inhabitants, disaggregates NNT. It represents 10.5% of deaths due to "certain perinatal disorders." In hospitals, 18.2% of deaths due to "certain perinatal disorders" are caused by tetanus. NNT was responsible for 49% of "certain perinatal infections" in the plains, 9% in the valleys, and 0% in the high plateaus according to civil registries. The authors note that, given underreporting, the true incidence of NNT is much greater.

Noting the very low coverage with TT (3% with 2 doses) among urban mothers of children 12-23 months of age, as recorded in 11 immunization coverage surveys (which a REACH staff member had suggested performing on an earlier visit), the authors of the epidemiological assessment recommended that a child survival strategy should offer TT to pregnant women receiving prenatal care and to mothers bringing their children for immunization. They also recommended that mass campaigns be conducted among women 15-35 years of age residing in the plains and valley regions.

A REACH staff member and consultant participated in the national ICC annual review of EPI plans in February 1988. They also recommended that the MOH:

- change the present national policy limiting TT to women in their fifth and seventh months of pregnancy. (Td should be given at the first contact to any eligible woman 15-45 years of age, regardless of month of pregnancy, as this vaccine is safe and efficacious.)
- offer Td (or DT for adult use) to all females of childbearing age in the high-risk ecological zones (tropics, subtropics, and possibly valleys) during the existing mass campaigns directed toward children.
- develop and use a Td card for women.

The MOH agreed to the recommendation to include Td vaccination for all women of childbearing age during the three annual mass campaigns, particularly in the ecological zones of highest incidence.

This recommendation to include TT during national vaccination days has subsequently been endorsed throughout Latin America by PAHO's EPI Technical Advisory Group on Eradication of Poliomyelitis in the Americas. TT is now offered by the MOH in Bolivia, as elsewhere, during national vaccination days.

Periodic visits by REACH staff permitted a dialogue on policy concerning NNT control. In August 1988, a REACH staff member encouraged the MOH to:

- explore operational implications before adopting the WHO-recommended five-dose

TT schedule, including revision of the TT card to reflect the five-dose schedule. (How to ensure the required minimum intervals during the four-month mobilization cycles would need to be determined.)

- update its policies which inappropriately stated that TT is suitable only during the fifth and seventh months of pregnancy. (Health workers need to hear that TT is safe and effective during the first trimester and should be given as early as possible during pregnancy.)

In August 1988, REACH provided a three-person team to conduct a medico-anthropological study of the cultural perceptions of NNT and programming implications in three cultural and topographical areas. The study was probably the first of its kind devoted to NNT and will serve as a model for future work elsewhere. It led to the following recommendations:

1. The MOH should continue its recent efforts to accelerate vaccination of all women from 15 to 44 years of age with TT. This effort could include women of the Altiplano (high plateau), but should initially target ecological areas of known high incidence.
2. The MOH is encouraged to tailor health education messages concerning NNT and TT vaccinations to people in each of the Aymara, Quechua, and Tupi-Guarani cultures.
3. Health educators need to focus on the specific symptoms of tetanus identified by each culture as being prevented by TT vaccinations. This is to avoid misperceptions that all the symptoms of the culturally defined syndromes will be prevented by TT vaccinations.
4. The MOH needs to provide more training and supervision in proper and sterile vaccination techniques.
5. The MOH should consider introducing training in cross-cultural communication skills and information about tetanus and its prevention into the curricula of medical schools.
6. The MOH should consider recruiting and assigning personnel in health posts who speak the native languages and understand the local culture.
7. The Episcopal Conference of Bishops of the Catholic Church should be requested to issue a statement endorsing TT immunization of women. The statement could be distributed to and read in all parishes in Bolivia and published in *Presencia*. Statements by Pope John Paul II in favor of immunization during his recent visit to Bolivia might be included.
8. Auxiliary nurses should train TBAs in hygienic methods.

9. Health personnel should coordinate efforts with TBAs and *curanderos* in promoting TT vaccinations.
10. Because birth practices are such an integral part of Aymara, Quechua, and Tupi-Guarani cultures, it is difficult to change them. It is easier to introduce an innovation such as TT vaccinations to prevent NNT. The MOH needs to concentrate its efforts on TT vaccinations to reduce NNT in the short-run.

Having identified cultural obstacles to TT immunization acceptability, the findings can be used to develop social communication strategies, design appropriate health messages, and refine delivery approaches. The study includes detailed information on how the peasants perceive tetanus and TT vaccination and suggests ways that native concepts can be used to educate and motivate them to participate in these programs. Health educators at UNICEF and the MOH need to create demand for TT by exploiting areas of convergence between traditional and modern beliefs.

Despite the promise provided by this study, the results and methods were greeted with skepticism by the medical establishment, including PAHO and the MOH. The survey was an attempt to gain deeper insights into the understanding of the people interviewed in selected communities. Qualitative social science methods unfamiliar to practitioners of the hard sciences were used in the study. There had been no attempt to derive a representative sample. The effort had been taken to establish trust and rapport with the respondents.

The Director of Epidemiology agreed that in the future health education messages concerning NNT prevention will need to have a regional and culture-specific focus to account for the varied understanding of the disease. However, no one specifically assumed responsibility for translating the findings into an action plan for implementation.

In August 1989, a REACH consultant epidemiologist reviewed the magnitude of the NNT problem and status of control efforts in Bolivia, and presented to the Bolivian Pediatric Society an overview of recent global advances in NNT control policies and strategies. He also provided guidance on the establishment of a comprehensive control program in Bolivia. The epidemiologist concentrated his field work in Santa Cruz, the department which had reported 88% of all NNT in the country during the first half of 1989. At a NNT control workshop held in La Paz with representation from the MOH and supporting agencies of the ICC, the participants arrived at the following conclusions and recommendations:

1. Enhance the surveillance system: strengthen supervision of institutions presently reporting, identify those which are not, and start requiring reports (including zero cases) of NNT from all health institutions.
2. Measure TT vaccination coverage using vaccination records or field surveys if necessary.
3. Study missed opportunities for TT vaccination, particularly in the known high-risk areas.

4. Give training and orientation to health personnel about recent advances in NNT control. Stress the importance of avoiding missed opportunities of TT vaccination for women of childbearing age.
5. Improve communication about NNT control activities within the health sector and to the general public.
6. Coordinate with medical and nursing associations to get their support for promotion of NNT control.
7. Communicate NNT control messages through the mass media to the public as permanent health promotion activities throughout the year.
8. Strengthen regular EPI activities throughout the year.
9. Develop mechanisms to increase the rate of attendance for follow-up doses of TT according to the WHO schedule.
10. Establish a systematic review of vaccination status whenever a woman of childbearing age, with or without her child, comes for health care for any reason.

ECUADOR

REACH EPI involvement in Ecuador in 1986 initially concerned analysis of nationwide coverage survey data. Because of a lack of time, disaggregation of TT coverage by rural versus urban areas could not be done.

Nevertheless, useful information regarding NNT and TT coverage was generated. Thirty-five percent of women know they need TT and 29% of women above the age of 15 had received at least one dose. Only 14% had a vaccination card, compared to 85% of children with cards. The problem is not retention, since only 8% of children's cards had been lost. Women are simply not given a record of maternal immunizations in the first place.

Whereas coverage with TT1 was 22% and TT2 13%, coverage with a third dose was only 5%. In more than 80% of cases, administration of TT was based on verbal accounts. Of all TT given for which a year of administration was stated, half were administered in 1985-1986 during the active years of the Program for the Reduction of Infant Mortality (PREMI) campaigns.

The survey found that 82% of women had received prenatal care during the last pregnancy, with the mean of first prenatal visit being 2.9 months. The mean number of prenatal visits was a high 5.7. Two-thirds of deliveries occur in health facilities.

The coverage and KAP surveys neglected to inquire about communications related to TT and NNT, although many questions about childhood immunizations and primary health care were asked. Recommendations exclusively concern communication messages for childhood vaccination.

Despite the wealth of information generated, recommendations concerning improved TT

delivery by campaign or routine services are absent from the analysis and discussion, as the focus is concentrated on childhood vaccinations. This omission is important given the unusual approach of restricting TT during the campaigns only to women currently pregnant. Also, although other EPI norms were discussed in relation to survey findings, no mention was made of the norms as they relate to the TT schedule.

REACH sent another consultant in 1987 to try to reconcile coverage level differences between surveys conducted by PREMI and routine service statistics maintained by the MOH. Coverage with TT was completely overlooked during this assignment, as the consultant concentrated only on immunization coverage of children.

In January 1989, a REACH staff member visited Ecuador to prepare a long-term strategy for involvement of the REACH EPI Field Coordinator in Ecuador. It was found that prevention of NNT has been neglected relative to other EPI target diseases and that many of the norms used do not reflect internationally accepted WHO EPI policies. The MOH was advised to revise and widely circulate EPI norms related to TT (as well as to other antigens) as follows:

- inter-dose interval with TT primary series should be shortened to four weeks,
- TT should be given at first contact in any month of pregnancy,
- eliminate contraindications for TT, (TT should not be restricted to only fifth and seventh months of pregnancy), and
- cease using 40-dose vials of TT, as such a large vial discourages its being opened for a single eligible person.

NNT has been identified to be a significant cause of preventable neonatal mortality (Tangermann and Crespo, 1988; Rutstein et al., 1987), causing up to 5% of deaths nationwide in children born during the last five years (Rutstein et al., 1987). The need to intensify efforts to immunize all women of childbearing age with TT in high-risk areas was reiterated in November 1988 by the PAHO EPI Technical Advisory Group for the Eradication of Poliomyelitis in the Americas.

Despite the use of varied complementary delivery strategies for childhood vaccines, delivery of TT is overlooked. In high-risk areas where pregnant women do not regularly attend antenatal clinics, a five-dose TT schedule should be implemented. TT should be offered during every immunization campaign. To ensure that females are protected prior to their first pregnancy, TT could be started from age 13. To focus limited resources further, the upper age limit could be 35. (While possibly at higher risk due to traditional birth practices, women over 35 have low fertility rates.)

In 1987, the statistics unit in Quito reported 371,000 first and 223,000 second prenatal consultations. Although this number of first visits exceeds the annual number of births, it appears that coverage with prenatal consultations is very high. If every opportunity were seized to screen pregnant women at each contact and vaccinate them when appropriate, neonatal tetanus could be rapidly reduced.

Long-lasting TT protection cards need to be used, since multiple doses are needed over a long reproductive span. Since it will be necessary to record TT immunizations given over many years, the card should be designed to encourage mothers to retain it. Culturally important colors and symbols, such as religious, fertility, or good luck symbols, should adorn the card. A clear plastic envelope should be provided to protect it.

TT should be offered to mothers bringing their children for vaccination and on every contact with the health services. Where vaccination of only pregnant women is the norm, a booster dose at the time the newborn later receives measles vaccination would make sense given the required interval.

Administration of Td or DT in primary schools, especially in areas of high enrollment, should be strengthened, since this will help solve the NNT problem in the long term. Two doses in first grade, followed by a single dose in grade two, three, and four, would likely provide lifelong immunity.

Just as BCG documentation is now required for birth registration, documentation of one recent dose of TT prior to issuance of a marriage certificate could be required.

The findings from the Bolivian medico-anthropological study which pertained to the Quechua were shared with Ecuador, since a large population of Quechua also reside in Ecuador.

Additional work on NNT to identify areas of high risk was recommended. Several data sets with neonatal mortality exist and have been examined by Tangermann and Crespo (1988) and Rutstein et al. (1987). Unfortunately, the data which are said to exist by age at death in days have been aggregated into categories which mask the potential importance of NNT as a cause of death. The data should be re-analyzed by geographic area and death in days since excess deaths above the declining mortality curve between days 4 and 14 are likely attributable to tetanus.

The EPI norms were revised in 1990 in a manual and reflect the fact that all women of childbearing age should receive TT in endemic provinces and that pregnant women can be immunized regardless of the month of pregnancy. This latter recommendation still falls short of saying that vaccination as early as possible in pregnancy is preferred and is safe. Also, the minimum interval between primary doses is still two rather than one month. Unfortunately, many tens of thousands of vaccination cards for women have recently been printed which perpetuate the old norms restricting TT to the fifth and seventh months of pregnancy.

The REACH EPI Field Coordinator has mostly been involved in raising immunization coverage in Esmeraldas Province, where coverage figures had been among the lowest. Data from Esmeraldas indicate that a dramatic reduction has occurred in reported tetanus in under-one-year olds from a high of 345 per 100,000 in 1983 to only 27 per 100,000 in 1988. Also the occurrence of tetanus has shifted to older age groups, which is further evidence of the epidemiological impact achieved in Esmeraldas. In 1981, 69% of cases were in neonates and this rate remained fairly stable in the following years. In 1985, this proportion began to drop and reached a low of only 10% in 1988. This shift is an indication that control programs are succeeding. TT is now offered in Esmeraldas during mass campaigns.

HAITI

PAHO locally expressed interest during the REACH assessment in April and May 1990 in the possibility of REACH assisting in defining and implementing various NNT control strategies. PAHO sees such an effort as a potential way to begin the important work of integration of the priority programs into a tenable MCH strategy. Current overlap at the district and commune level of programs dealing with EPI, acquired immune deficiency syndrome, control of diarrheal diseases, and family planning is leading to considerable duplication of funding for training, supervision, vehicles, etc.

PAHO has recently assisted in the definition of high- or unknown-risk areas for NNT using a rapid assessment methodology based on hospital data. This methodology was applied to one hospital in the north, and the national program hopes to continue the process on their own to cover other hospitals in Haiti. However, various internal administrative and political obstacles are impeding this work in the north, so PAHO is considering trying to begin this effort in the southern region.

BANGLADESH

To identify high-risk groups, REACH, in 1986, commissioned a study with the Johns Hopkins School of Hygiene and Public Health on existing data from the International Center for Diarrheal Diseases Research, Bangladesh. The purpose of the study was to determine whether risk for NNT (and non-tetanus neonatal mortality) increases with higher birth order or with the number of previous sibling deaths in the family. The study found that there was no increased risk of NNT death with higher birth order or in families with sibling deaths. The results of the study appeared in the *Weekly Epidemiological Record* 1987; 62(35).

Another study, conducted in 1989 by a REACH consultant anthropologist, investigated the perceptions of childhood diseases and attitudes toward immunization among Dhaka slum dwellers. Research from this anthropological study and a subsequent REACH KAP study shows relatively high acceptability of immunization. Perceptions of value of EPI rest more on trust in the health system and the experience with it rather than on specific resistance points to immunization itself.

The anthropological study found that TT is the vaccine which has received the greatest publicity in the last ten years in Bangladesh. When mothers are asked which diseases the vaccination campaign is addressing, tetanus is the one which is never omitted. The TBA training programs and antenatal clinics have contributed to increased awareness about prevention of tetanus. To what extent this teaching has displaced the traditional explanation for the symptoms of tetanus, which were well known in infants, is a subject for further exploration.

Tetanus is referred to as "tetanus," "donoshtonkar" or "kichuni." To some informants, these terms signified different diseases. "Tetanus," the English word used in the midst of Bangla speech, is said to be a disease of the patient who suffers from convulsions and spasms. Such convulsions and spasms are sometimes also associated with eclampsia. "Donoshtonkar," a high Bangla word used by educated people, is said to be a disease "for the doctor" which occurs when poison enters the body through a cut or a wound. Finally, "kichuni" is a condition affecting the

newborn in the house of pollution soon after birth. It is a disease for the fakir. Here "tetanus," "donoshtonkar" and "kichuni" are understood to have different causes and require different treatments. In this case, teaching about tetanus has not modified the category "kichuni" but seems to have created one, or possibly two, new ones.

The symptoms of tetanus, i.e., convulsions, spasms, and stiffness, traditionally have been attributed to the possession of spirits called "bhut" or "bhut petni." What allopathic medicine calls NNT is well recognized and mothers know that it is nearly always a fatal disease.

If "kichuni" in a newborn or spasms in a parturient occur, the treatment of a fakir will be sought first, with the doctor being consulted as a second recourse. This holds for the city where doctors may be gaining some credibility in the treatment of tetanus. Cases of NNT admitted at the Infectious Disease Hospital in Dhaka increased fourfold between 1985 and 1988. Considering that the number of pregnant women being immunized is increasing, this rise in NNT suggests that "kichuni" is slowly becoming a disease for doctors.

Health workers at Radda Barnen, the New Life Centre and Azimpur Maternity Hospital give great emphasis to antenatal care. During the last three years, TT has become increasingly popular and it is the women's main purpose for attending antenatal clinics. This shows an interesting change in attitudes, for in the past, the very idea that a pregnant woman should visit a clinic and go for check-ups was incomprehensible. Pregnant women, even if ill, would refuse allopathic medication for fear that it would harm the fetus and provoke an abortion. Some women still feel this way because they believe that the vaccination needle might contain a contraceptive. But on the whole, the new attitude is rather positive. Do women clearly understand what TT injections prevent? This recent interest is hard to reconcile since tetanus (at least in its neonatal form) is believed to fall largely outside the realm of allopathic intervention. But even if confusion remains, it may suffice that women consider immunization as beneficial to their health in a similar way as vitamins, which are often given at the same antenatal visits.

Middle-class women, well represented at antenatal clinics, are probably positively influencing poorer and less educated women to attend. Middle-class women go to private practitioners for medicine, but they have greater trust in the clinics for vaccination.

Only a minority of the slum women interviewed had been vaccinated against tetanus, but this is not because they have strong opinions against it. For this disease in particular, women seem to be easily convinced because tetanus is frightening. Unlike measles, tetanus is not regarded as a disease mothers can manage. Fakir treatment may be best, but their rate of failure is very high. And the agent which is believed to cause tetanus, "Chorachuni" or another "bhut," is not the object of any devotion. If there is a vaccine to render the latter harmless, so much the better.

The change of attitude among the middle class toward TT injection is encouraging. Now, far more should be done to reach the poor and uneducated whose belief in the spiritual cause of tetanus is likely to be the strongest.

Although the anthropological study notes that tetanus should be billed as the lead disease preventable by immunization, this does not appear to have been seriously considered. Unlike the report of the anthropological study conducted in Bolivia where the results and native

concepts were used to fashion sample health messages, the ethnological insights in the Bangladesh report have not been crafted into messages or recommendations by the author. The REACH assessment team which visited Bangladesh in February and March 1990 noted that the findings were not easily translated into messages or practical actions. Despite energetic efforts being made by REACH and others in the area of social marketing for EPI, tetanus and TT vaccination has received relatively little attention. Although this inattention has slowly begun to change, the primary interest of donors in universal child immunization has been clearly reflected at country level.

One finding of the anthropological study is that women always prefer to be served by women. Thus, it would seem that an effort should be made to recruit female vaccinators. The vaccination center should be located somewhere where women feel free to go, for example, not a mosque or a religious school. However, placement of immunization sites seems based less on the needs of women than on the preferences of ward commissioners.

A REACH staff member, in a visit in October 1989 was concerned that in Dhaka the three persons assigned per vaccination session are in many instances being underutilized. Placement of staff and scheduling of sessions has been unrealistically predicated on 100% coverage of 20% of the total population with an initial two doses of TT and 100% coverage of infants with an average of four visits. However, less than 10 children and 15 women were the norm for most of the daily tally sheets reviewed. Granted, the Dhaka program is still new, but one needs carefully to consider staff efficiency at each stage of program development.

Confusion abounds regarding the vaccination schedule in Bangladesh. One of the goals of the urban EPI is to reach 85% coverage of women with two doses of TT. No mention is made of reinforcing ("booster") doses. Some projects, like the Bangladesh Rural Advancement Committee, continue to immunize only pregnant women. The recommendations and findings concerning tetanus from the October 1989 visit of a REACH Senior Technical Officer are as follows:

1. The NNT elimination plan for Bangladesh, presented at the Regional EPI Consultative Meeting in Bali in June 1989, deserves support from all agencies. Measles and NNT are the two greatest killers among the vaccine-preventable diseases in Bangladesh.
2. Strategies to eliminate NNT must be flexible and consider local factors. For example, in selected areas where primary school female attendance is high, opportunities should currently be taken to immunize all school girls with two doses of TT. Then, in subsequent years, the following schedule could be implemented: two doses given to those in first grade and one in second, third, and fourth grades. Some countries have virtually eliminated NNT with infant DPT and school DT programs. These five doses, properly spaced, provide long-lasting immunity to cover the childbearing years.
3. Present efforts to make NNT a notifiable disease, reported separately from other tetanus, are laudable.
4. The present card for recording TT needs to be revised. While it is essential to

categorize women as being pregnant or not on daily tally sheets, this information does not belong on the TT card. As it now stands, the woman's pregnancy status is recorded on the card one time only, although there are spaces for up to four doses of TT. Also, the very question on the card reinforces the impression that only pregnant women need TT. The health worker is expected to tick the month of pregnancy (three through eight).

5. WHO recommends that TT be given on the first contact, at any time during pregnancy. WHO also recommends five (not four as on the present card) doses of TT. The advice on the front of the card does not correspond with the duration of protection from two doses of TT, which is three and not five years. These policy changes should be adopted by the MOH and reflected on the cards and forms.
6. Several coverage evaluation surveys in upazilas (counties) where EPI has intensified efforts were conducted early in 1989 and found high TT2 coverage (mostly around 80% or more). This is a noteworthy achievement. In the future, EPI should conduct surveys using the latest WHO methodology. Mothers of children currently 0-11 months of age should be asked about their lifetime history of TT prior to the recent birth. One can then determine whether the birth was protected based on the duration of immunity provided by all doses of TT.
7. Greater emphasis on NNT is needed in the media and communications materials being produced, especially since this is one of the diseases recognized and feared by mothers. The findings from the anthropological study need to be studied and applied to designing communications materials.
8. REACH could financially support TT teams to immunize women in garment factories and in schools. Alternatively, EPI could designate staff from among fixed or outreach teams who can be used for this purpose. Presently, the three persons on teams at vaccination sites are not fully utilized.
9. The commitment of national authorities to NNT elimination could be enhanced by conducting a national workshop for the accelerated control of NNT, along the lines REACH and WHO have sponsored in Africa.

There has been little progress toward implementing these recommendations. Nor has a dialogue ensued between REACH/Washington and REACH/Dhaka to clarify the steps or promote progress. The report from the REACH assessment of Bangladesh in February 1990 noted that certain types of external technical assistance will be needed to work effectively toward global EPI goals such as the elimination of NNT.

The one activity specifically planned by the urban EPI project which concerned NNT was launching a pilot team for TT vaccination in factories. The REACH assessment team reported that little progress has been made. This is due mostly to resistance by factory managers who do not want their operations disrupted. To minimize this, REACH staff members have attempted to use jet injectors, but difficulty in making them functional has resulted in a setback of several months. Meanwhile, negotiations with factory owners have been halted. Also, the project has not ascertained how many women work in the factories, the proportion of the target population

they represent, and thus the level of effort that is warranted.

REACH plans to initiate a pilot project using medical students on community health rotation to immunize primary school children with TT. Another area where REACH EPI could play an important role is in strengthening the disease surveillance capabilities in urban areas.

PAKISTAN

Since NNT incidence in Pakistan is high, Pakistan decided to accelerate TT immunization of married women of childbearing age, as well as the customary target group of pregnant women. In line with the MOH's policy of vaccine self-sufficiency and to upgrade their outmoded production facilities, the Government of Pakistan approached USAID in 1987 to fund the purchase of a fermentor for local manufacture of TT.

A REACH consultant specialist in vaccine production visited Pakistan in April 1987 and recommended that USAID assist the National Institute of Health (NIH) in Islamabad to establish TT production by providing a fermentor as well as other selected equipment and materials, "subject to NIH developing an integrated Project Plan for the execution thereof."

The same consultant returned in January 1988 to develop a project plan in collaboration with NIH staff. Detailed technical specifications for physical plant, equipment and staff were prepared with the expectation that the project would take two and a half years to complete. REACH involvement ended with this second visit and the mission continued to explore ways of assisting NIH. REACH technical assistance was greatly appreciated.

A REACH staff member advised USAID/Islamabad on Pakistan's Child Survival Project Plans and discussed logistic issues in April 1987. He noted that TBAs had been trained to motivate women to immunize their children and could be further enlisted to promote or give TT. He reviewed results of a 1987 national survey which established an NNT mortality rate of 4.5 per 1,000 live births. The 1982 survey in Punjab had found 31.2. He felt the 1982 survey may have overestimated and the 1987 survey underestimated the true rate. Nevertheless, in 1987 29% of neonatal mortality was still due to tetanus (compared to 60% in 1982). He concluded by endorsing the accelerated emphasis on TT for all women of childbearing age, but not by mass campaign.

In November and December 1987, a REACH consultant assisted USAID/Islamabad in actually designing the EPI component of the Child Survival Project. Coverage of mothers with two doses of TT was 40% (derived from vaccination cards and verbal histories) and 19% (from cards only) in a 1987 national coverage survey. The REACH consultant noted serious flaws in the design and methodology of the 1987 NNT mortality survey and felt the NNT mortality rate was nearer to 20 per 1,000, rather than 4.5 per 1,000. The consultant felt reliance on TBAs to vaccinate women with TT was unrealistic.

A number of obstacles must be overcome for NNT control to become more effective. Immunizing pregnant women against tetanus poses a difficult problem in Pakistan as the overwhelming number of vaccinators are males. Some upper-level program managers have expressed the fear that focusing more intensely on TT administration would disrupt the functioning of the regular program. In this matter, the various provinces have adopted different

approaches for the administration of TT, usually providing delivery through use of EPI centers, regular outreach or mobile teams, and to some extent through MCH centers. Only the Northwest Frontier Province has undertaken a specifically designed accelerated program in some of its districts and has temporarily assigned 24 Lady Health Visitors to exclusively female mobile teams.

Further action on TT immunization would first require that the real magnitude of the problem be known. The Child Survival Project should therefore include a morbidity and mortality survey which could also give valuable information on the infant mortality rate. A baseline survey followed by another in four years is desirable.

Given the cultural constraints that prevail in Pakistan, the consultant concluded that perhaps the most feasible strategy for the present time is implementation of several provincial campaigns, conducted by female teams and supported by intensive publicity. Tried in the Northwest Frontier Province, this approach resulted in coverage twice as high as the national average (36% versus 18%). The consultant recommended the organization of two TT immunization rounds at one month intervals in every province twice a year. This would be aimed at reaching pregnant women, as it was felt culturally inappropriate to target all women of childbearing age.

INDONESIA

In 1987, REACH provided two staff to participate in a NNT mortality survey in Pidie District, located in Aceh Province. The survey was conducted as part of USAID/Jakarta's Comprehensive Health Improvement Project - Province Specific Project. This was an important survey because it occurred after a mass TT campaign had succeeded in reaching 84% of women of childbearing age with two doses of TT.

A baseline survey of the entire district in May 1984 had estimated that in Pidie, the NNT mortality rate was 32.1 (C.I.: 17-47) per 1,000 live births per year. It was decided to provide the vaccine on a mass basis (called the Crash Program) in areas where the problem was particularly acute, like Pidie. This survey, therefore, was meant to measure the impact of the Crash Program on the NNT mortality rate in Pidie. The survey methodology followed the well-known WHO 30-cluster sampling procedure.

The results of the 1987 survey were encouraging. Data revealed a NNT mortality rate of 4.9 per 1,000 live births (C.I.: 2.3-7.5) among 2,637 live births which had occurred since June 1986. This 1987 rate was 85% lower than the 1984 estimate. This decline in NNT mortality is thought to be attributable to the Crash Program for several reasons:

1. The neonatal mortality rate attributable to causes other than tetanus remained unchanged between the two surveys.
2. Between the two surveys, there were no additional health interventions in Pidie which might directly affect the NNT mortality rate - such as TBA training or acceleration of the routine immunization program.

3. Mothers who were not immunized in the Crash Program were six times more likely to have a baby with NNT than mothers who reported receiving two TT injections during the campaign.

The results of this survey were reported in the *Weekly Epidemiological Record* 1988; 63(40) which concluded:

- TT immunization has a dramatic impact upon NNT mortality when high coverage levels are achieved.
- Although a TT crash program or mass campaign is somewhat disruptive of the routine immunization program, it need only be done once if it can reach nearly all women of reproductive age.
- A cost study in Pidie found that the cost per completed TT2 was about the same when the routine immunization program was compared with the mass campaign.
- A TT mass campaign can be very effective in mobilizing the community and in motivating people to participate in an immunization program. Active involvement of women's groups and local religious leaders was crucial to achieving high TT coverage levels in Pidie District.

In September and October 1989, a REACH social marketing consultant worked with the communications component of EPI's innovative effort to immunize future brides with TT. Although a 1985 survey had identified NNT as the country's leading cause of infant mortality, TT coverage of pregnant women remained below 40%, well below coverage figures for the other EPI antigens.

In response to this situation, a strategy for immunizing prospective brides was developed to increase the chances of infants being born protected against NNT. In 1985, the program was introduced into five provinces. Three years later, a case study in Central Java found that 72% of recently married women had received TT1 immunization prior to marriage. This success led to the decision to expand the program throughout the country.

The Central Java program, which serves as the model for the national program, involves intersectoral collaboration between the Ministries of Health, Religious Affairs (MORA), and Interior. When registering for marriage with local religious officials, couples are required to show proof of the woman's TT1 immunization. This procedure applies specifically to Moslems, who constitute about 90% of Indonesia's population. The program is supported by a small administrative fee levied on the prospective brides when they register.

While this is now a nationwide program, five provinces have been selected to receive intensive application. Training meetings are planned for all subdistricts in these provinces as well as at the provincial level. Village-level providers are to be thoroughly oriented at subdistrict meetings, with the support of a training video. It was also decided to develop a mass media communication program in East Java to promote TT immunization within the community for both brides-to-be and pregnant women.

The REACH consultant worked closely with an intersectoral team from the MOH and MORA to develop a training video and plans for its use. This involved working with private-sector video producers to ensure that the video was both technically sound and completed on schedule. The video story concerns a bride-to-be who does not want to get her TT immunization because she does not understand why it is important. By the end of the drama, because of the persuasive explanations from the doctor and local religious official, the woman is seen getting both shots before her wedding. A second part, which explains the program details and also trains service providers from both the MOH and MORA, includes appearances by the respective Ministers.

The consultant also reported some findings from the East Java Mass Media Project. In general, brides-to-be and pregnant women appear not to know why they have to get TT shots. Brides-to-be know that getting TT1 is a requirement for marriage registration and therefore comply, but they do not want to get TT2 since it is not required before the actual marriage. Some women claimed that they did not get a second shot because the first one gave them fever or local pain.

Pregnant women, most not knowing they are supposed to get a shot, are immunized when they attend the health center or health post for any reason. Some think it is a vitamin injection. Other respondents mentioned that they thought the shot was for family planning.

In two of the sites, the local religious officials either did not know the purpose of the immunization or of the need for a second shot. Some rural women interviewed had not heard of the shot (or even of the need to register for religious marriage certification).

Other findings included the following:

- Brides-to-be were difficult to locate at certain times of year since most marriages take place in the few months following Ramadan. Communications should obviously be most intensive before and during the matrimonial season.
- Local terms for tetanus and TT were identified.
- Mothers appeared to be motivated by the idea that TT immunization was good for them and their babies.
- The most influential sources of information for pregnant women and brides-to-be appear to be husbands or fiances, as well as parents and neighbors who have young children. Radio also appears to be influential, while mobile cinema, fliers, billboards, posters, and banners have good potential as reinforcing media.

It is hoped that careful attention to planning will enhance the effectiveness of Indonesia's innovative prospective brides program. Thought is still needed on how to increase coverage with the second dose of TT before marriage.

A systematic social marketing approach, using data generated by REACH-supported market research conducted in 1990, will be needed to increase demand for TT. The market research found that TT coverage was very low (12% for TT2) relative to infant immunization coverage and

that awareness as to the need for TT shots was poorer than for infant immunizations.

A REACH assessment team in February and March 1990 felt that, while preparations for developing materials for a media campaign are underway, it is equally important to direct attention and effort toward improving communications at the point of service delivery. Operations research is needed to identify mechanisms for tracking drop-outs and reminding individual mothers to return for subsequent doses, specifically TT2 for themselves and measles for their children.

PHILIPPINES

The REACH resident advisor has been involved in developing national plans for disease control, particularly for polio and tetanus. The eradication of polio has been a top priority of the Department of Health (DOH). Some respondents interviewed during the REACH assessment in May 1990 felt that the focus on polio has been at the expense of efforts to control NNT and measles. The REACH advisor has provided ongoing assistance at workshops and at the DOH in the preparation, review, and revision of guidelines for the control of these diseases, particularly NNT. Draft guidelines for NNT control have been developed and are currently under review by the Undersecretary for Public Health before being shared with donor agencies.

The assessment team felt that the DOH recognized the magnitude of the NNT problem but needed technical assistance in planning control strategies. The team found that about two-thirds of women do receive prenatal care but information on the timing and number of these visits was not available. A nationwide coverage survey in 1989 found that 44% of pregnant women had received TT2, compared to 37% in 1988. NNT is reported as a separate notifiable disease through a sentinel surveillance system.

Given the important emphasis in Indonesia on NNT and design of creative control strategies, the Philippines conceivably has much to learn from efforts there. In coordination with WHO, REACH has encouraged an assessment at national level of the problem, control options and policy choices.