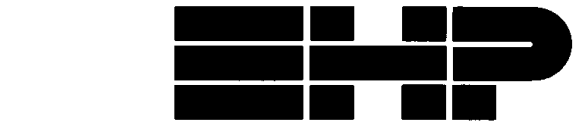

ENVIRONMENTAL HEALTH PROJECT

ACTIVITY REPORT

No. 46

Indicators for Programs to Prevent Diarrheal Disease, Malaria, and Acute Respiratory Infections

Report of a Meeting of an
EHP Technical Advisory Group (TAG)
July 30 - 31, 1997

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by
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CONTENTS

1 INTRODUCTION 1

1.1 Overview 1
1.2 Goal of the TAG 1
1.3 Members of the TAG 2
1.4 Organization of the TAG 2
1.5 How This Report Is Organized 3

2 PREVENTIVE FRAMEWORK: EHP'S PREVENTION PARADIGM 4

3 DIARRHEAL DISEASE 7

3.1 Framework for Child Survival Indicators 7
3.2 Breaking the Fecal-Oral Transmission Route 7
3.3 Objectives for Diarrheal Disease Programs 7
3.4 Indicators 10
3.4.1 Higher Level: Improved Health Status 10
3.4.2 Secondary Level: Improved Practices 10
3.4.3 Third Level: Improved Access, Quality, Demand, and Sustainability 10
3.5 Issues and Challenges 10

4 MALARIA 13

4.1 Framework 13
4.2 Objectives and Indicators 13
4.3 Issues and Challenges 16

5 ACUTE RESPIRATORY INFECTION (ARI) 19

5.1 Framework 19
5.2 Indicators 21
5.3 Issues and Challenges 21

6 CONCLUSION 25

6.1 Unresolved Issues 25
6.2 Next Steps 26

TABLES

1 Diarrheal Disease Prevention Indicators 11
2 Diarrheal Disease: Topics for Third-Level Indicators 12
3 Malaria Prevention Indicators 14
4 AIMI: Use of Insecticide-Impregnated Materials 17
5 Example of Fuel Type and Usage in Hypothetical African Household 22
6 ARI Prevention Indicators 23

FIGURES

1 Disease Prevention and Child Survival 5
2 Prevention Preserves Wellness 6
3 Child Survival Indicators Framework 8
4 From Exposure to Various Outcomes 8
5 Fecal-Oral Transmission 9
6 Achieving Effective and Sustainable Change 20

ANNEX

The TAG Members: Background and Experience

1 INTRODUCTION

1.1 Overview

Re-engineering at USAID has increased the need for more rigorous indicators and for their judicious use in program design and measuring program results. This is especially true for environmental health program results. The three child survival target diseases persist partly because primary preventive interventions— those that attack root environmental and associated behavioral causes—have not been integrated with traditional child survival activities. Nevertheless, health personnel are sometimes skeptical about the results that can be achieved through environmental health programs. Lack of clear, measurable indicators that can be used in the field is one reason.

In order to provide a foundation for demonstrating the effectiveness of environmental health interventions in the context of child health programs, the Environmental Health Project (EHP) convened a Technical Advisory Group (TAG) to review and discuss existing and potential environmental health indicators, beyond the traditional access indicators, which have not proved to be adequate predictors of health status. Environmental health interventions have an important role to play in preventing childhood disease and supporting the sustainability of successful interventions to reduce child mortality. Reliable, agreed-upon environmental health indicators will not only assist in refining program design to improve health results, but will also provide opportunities to document the effectiveness of environmental health interventions in reducing the burden of childhood disease.

The TAG comprised experts on the three diseases—diarrheal disease, malaria, and acute respiratory infection (ARI)—and on community participation and evaluation. TAG members met for two days, July 30-31, 1997, with members of EHP's technical staff. The first day was devoted to discussion and development of the indicators, mainly in small groups, one for each disease; the second to group presentations before an audience of about 50 persons from USAID and USAID partner projects and organizations. The TAG achieved consensus regarding the best possible set of indicators to monitor, evaluate, and promote environmental health activities in child health programs.

1.2 Goal of the TAG

EHP convened the TAG to provide a foundation for demonstrating the effectiveness of environmental health activities in the context of child health programs.

The group was charged with two objectives:

1. To identify a set of indicators for the prevention of diarrheal diseases, malaria, and ARI that are practical and feasible for data collection. These will include both those which have been verified through empirical research as well as those that need further refinement and testing or have not been tested at all.
2. To provide guidance for assessing the performance of environmental health activities in the context of child health programs.

The TAG was asked to think broadly about indicators, starting with high-quality, tested indicators for which data are available, and then moving on to more problematic ones. At the same time, TAG members were asked not to exclude indicators for which data might not be available at

present. Because environmental health data are not routinely collected, it is probable that new data collection will have to be embedded as an activity in any disease prevention program.

The indicators are for use by strategic objective teams within USAID missions, USAID Washington, host-country counterparts, other external support agencies (UNICEF, WHO, UNDP, etc.), non-governmental organizations (NGOs), and others for designing, monitoring, and evaluating disease prevention components of child health programs. Developing good indicators is a fundamental step in making environmental health a programmatic component of child survival.

Based on the input of the TAG, EHP will refine environmental health program goals.

1.3 Members of the TAG

The three disease specialists on the TAG were Dr. O. Massee Bateman, USAID's Child Survival Division, Office of Health and Nutrition (diarrheal disease); Dr. Nigel Bruce, Department of Public Health, Liverpool University (ARI); and Dr. Trent Ruebush, III, Division of Parasitic Disease, U.S. Centers for Disease Control and Prevention (malaria).

Two experts represented cross-cutting specialties: Dr. Shirley Buzzard, consulting anthropologist (community participation) and Dr. Thomas J. Cook, Strategic Program Development Director, Research Triangle Institute (evaluation).

The meetings were facilitated by Graeme Frelick, Training Resources Group. (See the Annex for information on the TAG members' background and experience.)

1.4 Organization of the TAG

Members of the TAG, the EHP technical staff, EHP's technical advisors from USAID, and Frederick Guymont, Chief of the Environmental Health Division of the Office of Health and Nutrition, met briefly to review the purpose of the TAG and discuss the agenda. Guymont welcomed the TAG and stressed the importance of its work in mainstreaming environmental health within the Population, Health and Nutrition Center.

Most of the morning was spent in small groups, one for each disease, led by the disease experts. The cross-cutting specialists floated from group to group. The small group task was to brainstorm a maximum list of indicators; clarify, refine, and hone the list; and be ready to present the results to other TAG participants.

In the afternoon, each small group presented its findings, and, after some discussion, the group leaders prepared overheads for the next day's presentation to invited persons from USAID, other USAID-sponsored projects, and other organizations.

The morning of the second day, approximately 50 invitees assembled for the presentations. After introductory remarks by Frederick Guymont and EHP Senior Technical Director Patricia Billig, each group made a half-hour presentation of the indicators developed. These presentations were followed by a wide-ranging discussion of the indicators and the issues and challenges of developing good indicators.

Members of the TAG stressed that developing indicators for the three diseases is a work in progress. What appears in this report is the product of less than a full day of deliberation. Most indicators are not finely crafted, but they do give an indication of the changes that environmental health programs would want to track.

1.5 How This Report Is Organized

Following this introduction are five chapters. Chapter 2 discusses the overall prevention paradigm within which the TAG worked. Chapters 3, 4, and 5 are devoted to the three

disease areas. In each of these chapters (1) the framework for developing the objectives and indicators is explained, (2) the indicators are given, and (3) issues and challenges are noted. The report ends with a chapter on next steps.

2 PREVENTIVE FRAMEWORK: EHP's PREVENTION PARADIGM

The indicators were developed within the context of EHP's prevention paradigm. To understand this paradigm, it is important to distinguish environmentally based preventive interventions from other types of prevention in child survival programs. Figure 1 (*Disease Prevention and Child Survival*) illustrates the relationship between "classical" child survival disease prevention activities, as shown in the middle and right-hand columns and environmentally based prevention activities listed in the left-hand column. It is these and other preventive interventions—listed in Figure 2 (*Prevention Preserves Wellness*)—that are the focus of EHP. One of EHP's goals is to encourage USAID health personnel to expand their concept of prevention to include the types of environmentally based disease prevention interventions listed in Figures 1 and 2.

Environmental health interventions are not new. What is new, however, is implementing these interventions in a manner which mobilizes the local community's insights and resources to ensure sustainability. Also, where the goal is to prevent illness by inhibiting the generation and transmission of disease agents and reducing people's exposure to them, it is more informative to track morbidity as well as mortality trends.

A number of publications describing the environmental health prevention paradigm in more detail are available from EHP.

"Prevention: Environmental Health Interventions to Sustain Child Survival," EHP Applied Study 3.

"Child Survival and Environmental Health Interventions: A Cost-Effectiveness Analysis," EHP Applied Study 4.

"Addressing Environmental Health Issues in the Peri-Urban Context: Lessons Learned from CIMEP Tunisia," EHP Activity Report 24

"Monitoring the Effect of Behavior Change Activities on Cholera: A Review in Chimborazo and Cotopaxi, Ecuador," EHP Activity Report 25.

"Prevention Notes"—a bimonthly bulletin: Issue 1: "Environmental Health and Child Survival," Issue 2: "Breaking Environmental Links to Diarrheal Disease"; Issue 3: "A Community Approach that Gets Results."

"Prevention Preserves Wellness"—an 18X26 wall poster.

"Diarrheal Disease Prevention Guide"—forthcoming from EHP.

For copies of these publications, contact the EHP Information Center, 1611 North Kent Street, Arlington, VA 22209, tel. (703) 247-8730, fax. (703) 243-9004, email: EHP@ACCESS.DIGEX.COM. Or visit the EHP home page on the internet; many reports can be down-loaded. Homepage: http://www.access.digex.net/~ehp.

Figure 1
Disease Prevention and Child Survival

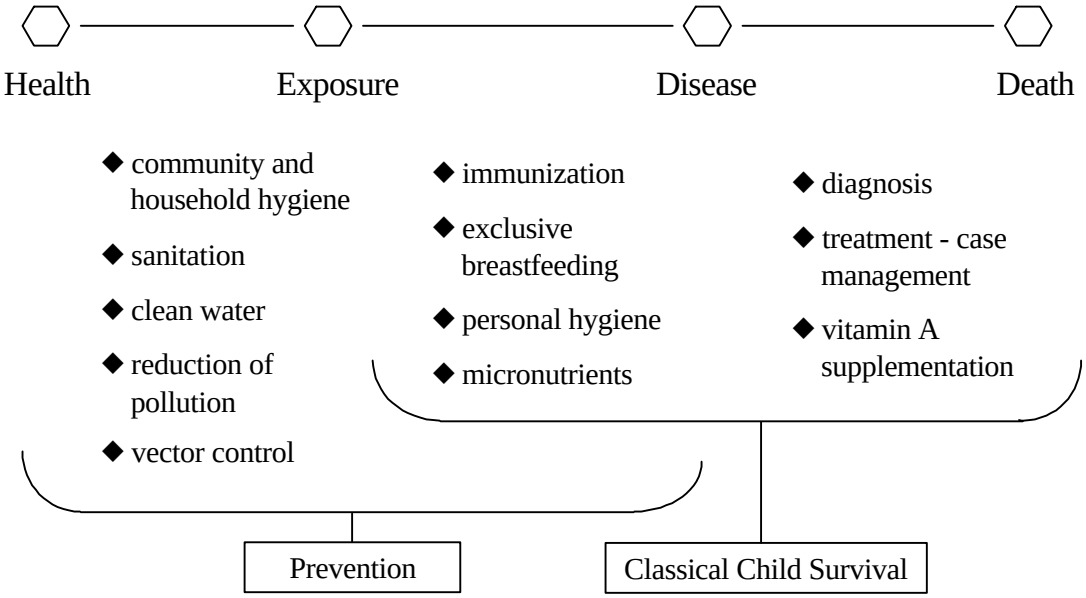


Figure 2
Prevention Preserves Wellness

3 DIARRHEAL DISEASE

3.1 Framework for Child Survival Indicators

In developing their indicators, the diarrheal disease group of the TAG used a draft framework developed by USAID's Child Survival Indicator Working Group (see Figure 3—*Child Survival Indicators Framework*). The figure shows three levels of indicators. The first, and highest level, is improved health status, the ultimate goal for which all child survival activities strive. The second level refers to improved use of health services and improved health-related behaviors. The PHN strategic objective for child health is "increased use of key child health and nutrition interventions." The third level analyzes and refines the second level indicators under four categories: access, quality, demand, and sustainability.

3.2 Breaking the Fecal-Oral Transmission Route

Figure 4 (*From Exposure to Various Outcomes*) illustrates that the occurrence of diarrhea may be influenced, not only by the pathogen, but also by a number of host factors, principally nutrition and measles. The indicators discussed in this chapter, however, are not concerned with such host factors. They deal only with the determinants of exposure, such as hygiene behavior, water, and sanitation.

The potential exposure pathways are shown graphically in Figure 5 (*Fecal-Oral Transmission*—the "F" diagram). Preventing diarrheal disease essentially amounts to breaking the fecal-oral transmission route. It may be accomplished by creating a primary barrier between feces and a host through sanitary disposal of feces. Since the primary barriers may be difficult to maintain perfectly in developing countries, secondary barriers— most involving changes in behavior—are also needed. These include *avoidance* or *removal* of infectious organisms. For example, water (fluids) contaminated by dirty hands (fingers) should be *avoided*, along with food contaminated by dirty hands or water or soil (fields). In sum, people should avoid putting unclean objects (including their hands), food, or water in their mouths. If it is not possible to create a secondary barrier through avoidance, infectious organisms may have to be *removed*— through disinfection (boiling, filtering, chlorinating), cleaning, cooking. The "F" diagram provides a check point for developing indicators to be sure that all exposure routes, or determinants of exposure, have been covered.

3.3 Objectives for Diarrheal Disease Programs

Using the framework of Figure 3 described in Section 3.1, a number of objectives for diarrhea prevention programs can be identified. At the highest level (the level of improved health status), the objective is reduction in diarrhea morbidity and mortality in children five years of age and younger. At the second level (the

Figure 3
Child Survival Indicators Framework

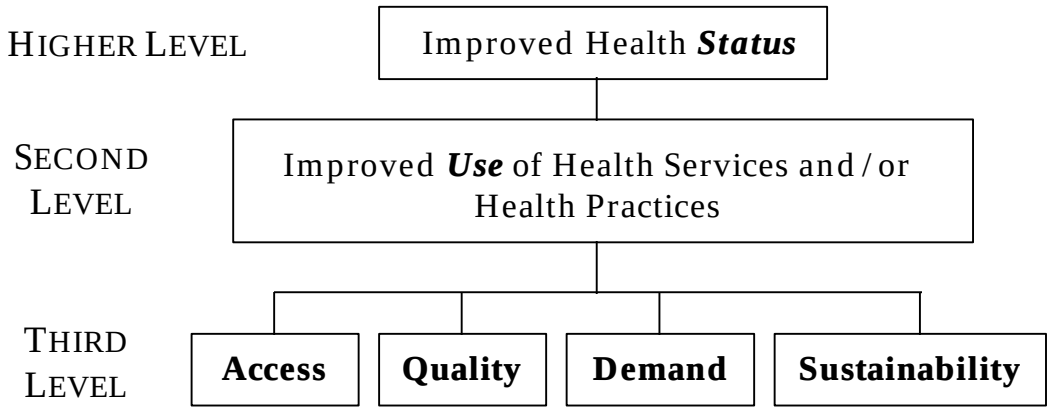
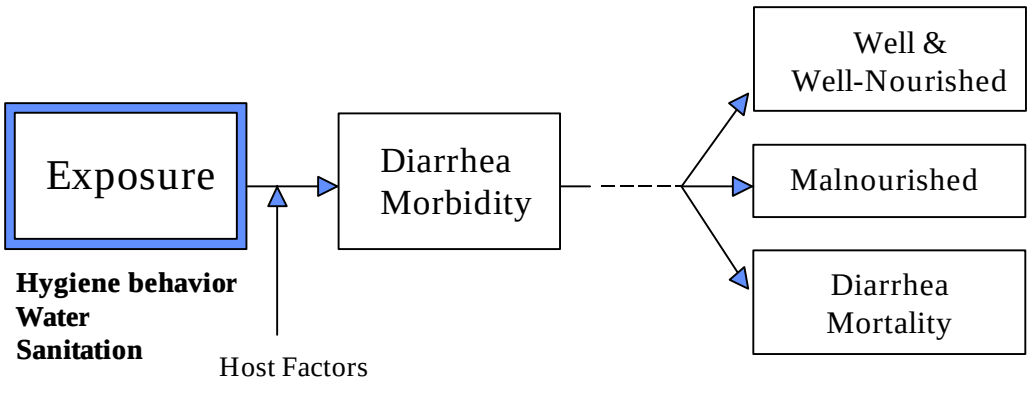
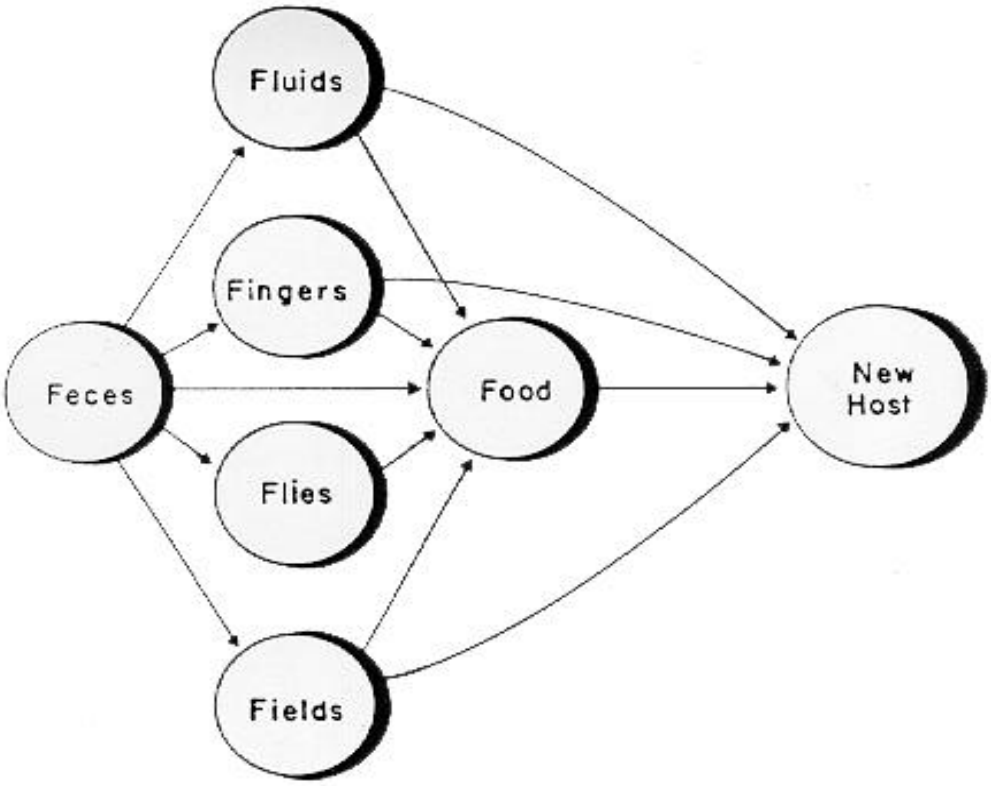


Figure 4
From Exposure to Various Outcomes



- Nutritional Factors
  - Malnutrition
  - Low birth weight
  - Exclusive breastfeeding
  - Micronutrients (Zn)
- Measles (vaccination)

Figure 5
Fecal-Oral Transmission



level of improved practices—in this case to reduce fecal-oral transmission) there are four major objectives, listed in order of documented effectiveness. The first three came out of a WHO consultation in 1992.*

1. Cleansing of hands
   ➤ at specific times: after defecation, after cleaning babies' bottoms, before eating or feeding, and before preparing or handling food, and
   ➤ in a prescribed manner: both hands cleansed with water, soap or ash; rubbed at least three times; and dried hygienically.
2. Sanitary disposal of feces—especially those of babies, young children, and persons with diarrhea.
3. Drinking water kept free from fecal contamination.
4. Food kept free from fecal contamination.

From each of these objectives, many sub-objectives can be developed. An idea of what these may be can be derived from the list of indicators in the following section.

3.4 Indicators

* *Improving water and sanitation hygiene behaviors for the reduction of diarrhoeal disease: the report of an informal consultation.* Unpublished document. WHO/CWS/90.7/WHO/CDD/93.5, 1993 (available upon request from Division of Child Health and Development, World Health Organization, 1211 Geneva 22, Switzerland).

3.4.1 Higher Level: Improved Health Status

Two indicators are recommended to measure changes in diarrheal disease morbidity: (1) proportion of households with a child under three (or under five) who has experienced one or more episodes of diarrhea in the past two weeks or (2) proportion of households with a children under three (or five) who has experienced diarrhea in the past 24 hours.

3.4.2 Secondary Level: Improved Practices

Table 1 (*Diarrheal Disease Prevention Indicators*) lists all secondary indicators for diarrheal disease prevention; these are organized according to the four objectives listed in the Section 3.3.

If these indicators were to be put to use in a specific program, some decisions would have to be made and some issues resolved. Some indicators refer to the household level and some to each child under a specific age (three to five years). Similarly, a decision would have to be made about whether data should be collected through observation or through reporting. These and other issues were raised as the indicators were developed, but resolving them was outside the scope of work of the TAG.

Breastfeeding is definitely at the top of the list of indicators for maintaining food free of fecal contamination. The last two indicators in that category have not been associated with the risk of diarrhea, but are associated with contamination. Three additional indicators could also have been added in this category but were not; they deserve to be on a maximum list, but not in the "A" group because there is not enough documentation of the effectiveness of the interventions to which they relate. These are as follows:

Proportion of households. . .

- Where only clean water is used in food preparation.
- Where food is covered during storage.
- Where fruits and vegetables are washed or peeled before eating or preparation.

3.4.3 Third Level: Improved Access, Quality, Demand, and Sustainability

Using the child survival framework model, third-level indicators were developed only for diarrheal disease, and they have not been put into the language of indicators; only the topics are given, and there is no claim to completeness. The topics are shown in Table 2 (*Diarrheal Disease: Topics for Third-Level Indicators*) to illustrate how the Child Survival Framework Model can be used to develop a full and complete list of indicators.

3.5 Issues and Challenges

- *Need for Reviewing Existing Research.* There is experience with using most of the indicators listed in Table 1, but it would be good to go back and review the supporting research.
- *Incremental Approach to Food Hygiene.* Child survival programs have not generally included food hygiene. Some elements have been covered, such as exclusive breastfeeding, use of cups and spoons. These indicators could be built on in an incremental approach.

Table 1
Diarrheal Disease Prevention Indicators

Cleansing of Hands	Sanitary Disposal of Feces	Drinking Water Free of Fecal Contamination	Food Free of Fecal Contamination
Proportion of households. . . # Where the mother (or caretaker) reports washing her hands at least once within the previous 24 hours on each of the four critical occasions. # Where the mother (or caretaker) demonstrates all elements of adequate handwashing technique.	*Proportion of households. . .* # Where all family members three years or older usually use a sanitary facility for defecation (report). # Where the feces of children under three are disposed of in a sanitary fashion (report). # Where the house area and yard are free of human fecal contamination (observation). *Proportion of sanitary facilities*. . . # That appear to be in use (observation). # That are free of soiling with human feces (observation).	*Proportion of households. . .* # That use water from an acceptable source for cooking and drinking. # That either have in-house piped water or have a system of water collection, transport, storage, and access that maintains water free of contamination.	*Percent of infants 6 months and under* # That are exclusively breastfed. *Proportion of households*. . . # Where the mother reports washing her hands before preparing or serving food or feeding children. # Where food is eaten within 3 hours of cooking. # Where cups and spoons rather than bottles are used to feed infants and small children (report, observation).

Table 2
Diarrheal Disease: Topics for Third-Level Indicators

Access	Quality	Demand	Sustainability
# Continuous access to safe water at household level. # Access to devices for water collection, transport, storage. # Access to sanitary excreta disposal. # Access to soap or ash for handwashing. # Access to sufficient water quantity (20 liters per capita per day).	# Water supply: collection time, continuous availability, level of potability. # Sanitary excreta disposal: odors/aesthetics, durability of solution, ease of maintaining cleanliness, cultural appropriateness of design. # Behavior change: locally appropriate design, use of participatory processes.	# An understanding that diarrhea is preventable. # Knowledge of the causes of diarrhea and the means to prevent it. # Willingness to pay for adequate water supply, sanitation, soap or ash and to participate (money or in-kind contribution). # Functioning community environmental health committee. # Community norms supportive of appropriate behavior.	# Effective policies and institutions that support access and quality. # Percent of costs recovered from users. # Evidence that operation and maintenance are taking place. # Availability of capital financing # Adequately trained personnel. # Functioning community environmental health committees.

4 MALARIA

4.1 Framework

Setting aside the use of anti-malarial drugs, such as chloroquine, which are outside the scope of environmental health, there are essentially three ways to prevent malaria.

1. Decrease the number of vectors. Examples: residual spraying, space spraying in streets and houses, biological control measures, eliminating existing breeding sites, or preventing the creation of new breeding sites from construction and road building.
2. Reduce the contact between vectors and humans. Examples: use of bednets, screens, curtains, insect repellents, mosquito coils, burning certain materials to drive mosquitoes away.
3. Reduce the infection rate in the vector. Examples: vaccines to interrupt transmission (not realistic for 5 to 10 years), genetic modification of vectors so that they are not susceptible to the infection (not for 10 to 20 years), diversion of vectors from humans to other animals.

The third option is not very realistic at the present time.

4.2 Objectives and Indicators

Table 3 (*Malaria Prevention Indicators*) presents the indicators in three categories: general indicators relating to the overall objective of reducing people's exposure to malaria and indicators relating to the behavioral and environmental objectives that would lead to reduction in the number of vectors and in vector-human contact.

Note that the indicators in the first column relate to malaria prevention plans put in place by the government at the district and community level. The assumption behind these indicators is that an effective malaria prevention program would include community participation and be based on an understanding of the knowledge, attitudes, and practices of individuals and communities regarding malaria exposure.

In the second column of Table 3, several indicators are included for assessing the effectiveness of district programs by checking for *Anopheles* in breeding sites or houses targeted for malaria control. District control plans may look good on paper but may not be carried out effectively. Often a program may run out of insecticide or fuel, or the spraying may not be completed for one reason or another. Similarly, it is important to find out whether or not residents' refusal to allow residual spraying is a factor in the effectiveness of spraying programs. Lack of communication between sprayers and residents may be partly to blame: thus, the inclusion of an indicator on residents who can describe the benefits and adverse effects of chemical methods for malaria control.

The remainder of the indicators in the second column are for use in monitoring changes in the knowledge of residents or malaria program staff. For residents, perhaps the most important indicator is an understanding of how mosquitoes breed. Residents should know that mosquitoes breed

Table 3
Malaria Prevention Indicators

General: **Reduction of Exposure**	**Reduction of Vectors**	**Reduction of Vector-Human Contact**
Proportion of districts. . . * That have conducted a participatory needs assessment for malaria control, including KAP information on malaria vector avoidance/ control. * With a malaria control plan that includes measures to prevent or reduce exposure.	*Proportion of* Anopheles *breeding sites. . .* * Targeted for chemical, environmental, or biological control that were managed in accordance with the district malaria control plan.	*Proportion of households. . .* *That own and have correctly installed at least one bednet in their homes. * With a bednet in good condition that state they slept under an insecticide-impregnated bednet the previous night. * With a bednet in good condition that state they have reimpregnated the net in the last 6 months. * That have a bednet distribution AND insecticide reimpregnation site within 10 km.
Proportion of communities. . . * That have participated actively in a community program to reduce exposure to malaria.	*Number of* Anopheles *larvae. . .* * In breeding sites targeted for larval control.	*Proportion of heads of household. . .* * Who can correctly describe 3 or more ways to avoid contact with mosquitoes.
Proportion of vector control staff. . . * Who can accurately describe the influence of human behavior on vector avoidance/ control.	*Number of adult* Anopheles *. . .* * In houses in communities targeted for vector control.	*National policies on tax exemption for bednets AND insecticides . . .* * Are in place.
	Proportion of houses targeted for residual spraying. . . * That are sprayed in accordance with malaria control program norms. * That are not sprayed due to refusal by the head of household.	

General: **Reduction of Exposure**	**Reduction of Vectors**	**Reduction of Vector-Human Contact**
	Proportion of heads of households. . . * Who can describe correctly the role of standing water in mosquito production AND identify at least one breeding site in or near their community. * Who can correctly describe the benefits and potential adverse effects of chemical methods for malaria control.	*Appropriate IEC messages. . .* * Produced and disseminated about - benefits of bednets - sources of bednets - sites for reimpregnation.
	Proportion of malaria control program staff. .. * Who can accurately describe 3 or more traditional approaches to vector avoidance/ control.	

in standing water if they know nothing else about malaria transmission. For malaria program staff, it is important that they know what actions residents traditionally take to control or avoid vectors.

In the third column of Table 3 the focus is on bednets, particularly insecticide-impregnated bednets. The indicators look at bednet ownership, correct installation, adequate maintenance, use, and impregnation with insecticide at correct intervals. They also focus on supportive national policies and activities that make bednet programs effective, such as reasonable tax exemptions and social marketing activities. Table 4 (*AIMI: Use of Insecticide-Impregnated Materials*) is the list of indicators developed for the Africa Integrated Malaria Initiative (AIMI).

4.3 Issues and Challenges

- *Regional Variation.* Malaria varies from country to country and region to region within a country: features of the disease differ markedly from place to place. This means that the interventions and indicators will also be different from place to place. For example, in urban areas in Africa, reduction of *Anopheles* breeding sites would be an appropriate program goal, while in rural areas it would not, due to the large number of potential breeding sites.
- *Little Attention Paid to Vector Reduction and Avoidance.* Environmental and behavioral interventions for malaria prevention have been largely ignored in favor of case management strategies and bednets. Part of the reason for this is that WHO guidelines for indicators were based mostly on experience in sub-Saharan Africa where vector control is not as appropriate as in other areas, for example, southern Africa or Latin America.

  In 1993, USAID sponsored a workshop to develop guidelines for indicators for malaria control and to test them in the field. The results were presented in a meeting where most of the attendees were from francophone Africa. Most indicators referred to case management. USAID's current program, the Africa Integrated Malaria Initiative (AIMI), has created an inventory of indicators. These focus on case management and bednets. Although many organizations are promoting the use of insecticide-treated bednets, there are many unanswered serious questions about their sustainability at the community level. The indicators presented here attempt to reflect a more integrated, multifaceted approach.
- *Verticality of Malaria Control Programs.* Malaria programs tend to be fairly vertical, particularly spraying programs. People doing the spraying may have very little appreciation for the attitudes of the population, let alone involving them to increase the effectiveness and sustainability of the program.
- *Need for Policy-Level Indicators.* There is a need for more policy-level indicators.
- *Environmental Versus Health Goals.* Many environmental groups are trying to restore wetlands, a goal that appears to be at odds with draining wetlands for malaria control. Programs may need to reconcile conflicting goals.
- *Malaria Control and Water Project.* Some water supply programs have created breeding sites for malaria vectors. Consideration should be given to drainage as part of all water projects. Such inter-sectoral collaboration is needed, but at present only lip service is paid to it.
- *Use of Indicators.* Malaria programs in Africa rarely use indicators to monitor their progress. The major reason is that, like other groups within ministries of health, they are not accustomed to monitoring their progress.

Table 4
AIMI
Use of Insecticide-Impregnated Materials (IIMs)

IMPACT

Performance Indicator	Indicator Definition and Unit of Measurement	Data Source	Method of Data Collection
Not applicable			

OUTCOME

Performance indicator	Indicator Definition and Unit of Measurement	Data Source	Method of Data Collection
Increased ownership and correct installation of bednets	Proportion of households that (a) own and (b) have correctly installed at least one bednet in their homes	Heads of household	Household cluster survey with examination of nets by interviewer
Increased use of bednets by target population	Proportion of target population living in a household with a bednet in good condition for whom there is *objective evidence* that they slept under the IIM the previous night	Heads of household	Household visits at night-time to observe IIM use or some other objective measure of IIM usage
Increased use of bednets by target population	Proportion of target population living in a household with a bednet in good condition who *state* that they slept under an IIM the previous night	Women of childbearing age; caretakers	Household cluster survey
Regular impregnation of bednets	Proportion of homeowners with a bednet in good condition who state that they have reimpregnated the net in the last 6 months	Heads of household	Household cluster survey

PROCESS

Performance Indicator	Indicator Definition and Unit of Measurement	Data Source	Method of Data Collection
Improved knowledge about benefits, sources of bednets and sites for reimpregnation	Appropriate IEC messages produced about each of the following: * benefits of bednets * sources of bednets * sites for reimpregnation	IEC records	Review of IEC records
Improved knowledge about benefits, sources of bednets and sites for reimpregnation	Number of IEC messages disseminated * benefits of bednets * sources of bednets * sites for reimpregnation	IEC records	Review of IEC records
Increased accessibility of bednet distribution and insecticide reimpregnation sites	Proportion of households that have (a) a bednet distribution and (b) an insecticide reimpregnation site within 10 km of their homes	Maps of district and distribution sites	Review of maps
Effective dissemination of health education messages about bednets	Proportion of target population who state that they have heard one of the health education messages about insecticide-impregnated bednets	Target population	Household survey
Reduced cost of bednets and insecticide	National policies on tax exemption for bednets and insecticide supportive of bednets are in place	Ministry of Health	Review of MOH regulations
Increased knowledge about hanging and maintenance of bednets	Proportion of heads of household who state that they have received training in hanging and maintenance of bednets	Heads of household	Household survey
Increased knowledge about bednet reimpregnation	Proportion of heads of household who state that they have been trained in reimpregnation of bednets	Heads of household	Household survey

5 ACUTE RESPIRATORY INFECTION (ARI)

5.1 Framework

Malnutrition and low birth weight are acknowledged risk factors for pneumonia, and studies have shown that children living in crowded households have an increased susceptibility to ARI. There is growing evidence that indoor air pollution is an important risk factor for ARI. Indoor air pollution is considerably more harmful than outdoor (ambient) air pollution. The major source of indoor air pollution in the less developed countries is the use of biomass fuel for cooking and heating. Women and children are most severely affected. It is estimated that approximately one billion people, mostly women and children, are regularly exposed to unhealthful levels of domestic smoke. There is increased focus on the development of improved stoves as a simple and low-cost method of addressing environmental, economic, and energy concerns. These initiatives have concentrated on improvement of the combustion efficiency of stoves, development of stoves that use cleaner fuels, and improving household ventilation. Increased importance is now being given to addressing the linkages between indoor air pollution and health.

An important manifestation of the toxic effects of indoor air pollution on the respiratory tract is the concentration of suspended particulate matter, especially particulates below 10 microns in size (PM10) that can reach the lower respiratory tract. The level of concentration of particulate matter can be measured directly or by proxy.

Acute respiratory infection (ARI) covers a wide range of conditions. In child survival terms, the main concern is with pneumonia, or acute lower respiratory infection (ARLI), which is often associated with other illnesses and conditions, such as measles, pertussis, and malaria. ALRI is responsible for approximately 27% of the deaths of children <5 years of age.

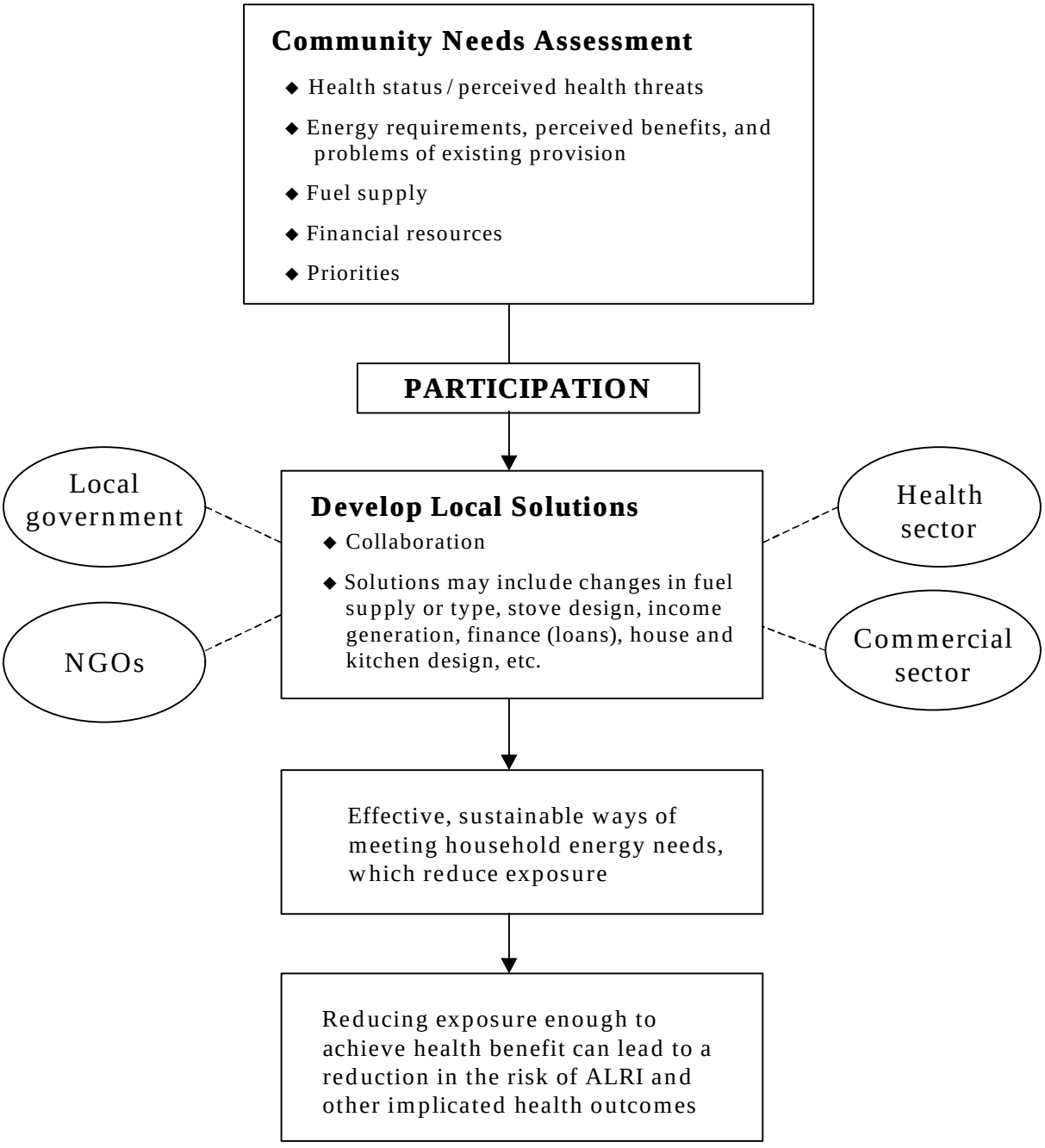
The approach to ARI prevention has been dominated by case management and the development of vaccines. Putting those aside, three types of environmental interventions for preventing ARI can be identified:

1. Improvement of socio-economic conditions to reduce transmission (poor housing, crowding in homes and clinics) and to make it possible for families to make changes in fuels and stoves.
2. Reduction of exposure to air pollution: outdoor, indoor, environmental tobacco smoke (ETS).
3. Improvement of nutrition (including promotion of breastfeeding, micronutrients, programs to improve prenatal health—low birth weight, short birth interval).

The inter-related, cross-sectoral nature of these interventions means that vertical programs are of limited effectiveness.

Figure 6 (*Achieving Effective and Sustainable Change*) informed the way the ARI indicators were developed. An approach to ARI prevention that focuses solely on improved chimneys and stoves and use of cleaner fuel (the bottom half of the figure) is not sufficient. The kinds of improved chimneys and stoves

Figure 6
Achieving Effective and Sustainable Change



This scheme for achieving effective and sustainable change at the local level should be carried out within the framework of a national policy.

introduced so far will decrease exposure but not enough, and, in many cases, these interventions have not been sustainable. And the trend to moving from biomass fuels (wood, dung) up to cleaner fuels (gas and electricity) has slowed. A community development approach is needed (the top half of the figure).

A community approach starts with an assessment of community perceptions, needs, and requirements. It seeks to involve the community, in particular local governments, NGOs, the health sector, and producers of fuel and manufacturers of stoves. This kind of assessment should cover issues related to other key maternal and child health problems, including diarrheal disease and malaria.

The community approach must be backed by effective policies and based on an understanding of fuel use, stoves, and exposures. Each country should have a national ARI committee committed to an environmental approach to ARI. Studies of fuel use must take into consideration the fact that many households do not use the same fuel for all purposes. Table 5 (*Fuel Type and Usage in Africa*) presents results from an analysis of a hypothetical African community where households use three types of fuels. It is sometimes difficult to define what fuel is being used predominantly. Any attempt to improve stoves or move up to cleaner fuels must answer these questions:

- Does the improved stove/fuel meet needs for cooking, space heating, lighting, cultural preference?
- Is the stove/fuel sustainable from the perspective of cost, availability, maintenance, durability, subsidies versus private purchase? (An indicator on private-sector manufacture of improved stoves is included because research shows that programs promoting home-made stoves are not sustainable, nor are the stoves greatly improved.)

An attempt should also be made to measure exposure to air pollution, including exposure to environmental tobacco smoke. For ETS the focus is on mothers because of the relationship of smoking to low birth weight, and low birth weight is a major risk factor for pneumonia. There is a good case for developing more indicators on smoking than appear below. Measuring exposure to particulates is not a straightforward process, since assessment of both the level of ambient pollution and duration of exposure are important. Personal sampling is ideal, but especially difficult for young children. Proxy measures, such as passive carbon monoxide (CO) monitoring, may have to be relied on for routine assessment.

5.2 Indicators

Proposed indicators are summarized in Table 6 (*ARI Prevention Indicators*). One health measure, ALRI period prevalence, has been included to focus attention on the need to assess this very important child health issue. It is recognized that measurement of this indicator is quite resource-intensive and could not be routinely or frequently undertaken.

All of the indicators in Table 6 reflect the key environmental risk factors for ARI and the process of achieving effective and sustainable change summarized in Figure 6. They cover elements of strategy from national through to local community and household actions.

Most of these indicators are at an early stage of development and have been designed in part to stimulate the process of change. Discussion and testing in the context of practical experience in various settings, and at different levels of policymaking, are required to refine and develop these initial proposals.

5.3 Issues and Challenges

- *Need for Further Study.* There is a lack of fundamental information, such as the dose-response relationship between particulate

Table 5
Example of Fuel Type and Usage in Hypothetical African Household

Fuel	Use			
	Cooking	Space Heating	Light	Domestic Appliances
Biomass – crop residues – dung – wood	✔	✔		
Charcoal				
Kerosene	✔		✔	
Coal				
LPG				
Electricity			✔	✔

Table 6
ARI Prevention Indicators

Areas of Change	Indicators
Policy level	# Presence of a national ARI strategy that includes environmental approaches to the prevention of ALRI. # Presence of a national policy that discourages smoking.
Crowding	# Percentage of households with a specified number of children <5 years sleeping in the same room.
Environmental tobacco smoke	# Percentage of smoking mothers of children <5 years.
Exposure	# Presence of a city program to reduce multiple sources of air pollution. # Level of urban air pollution (e.g., Global Environmental Monitoring System) # Level of human exposure, which for routine purposes may need to be by measurement of a proxy for PM10, such as CO.
Fuel use	# Percentage of households predominantly using biomass, coal, charcoal, kerosene, or cleaner fuels (electricity and gas).
Stoves	# Percentage of households burning biomass or coal in vented stoves. # Percentage of households using vented stoves purchased from the private sector.
Integrated approach	# Completion of participatory studies covering cultural beliefs and practices relating to the environmental causes and prevention of ARLI. # Use of community study findings for program design, in collaboration with community and relevant agencies.
Main child health outcome	# ARLI period prevalence

matter and ARI. When research develops some of this key information, then indicators can be developed with more assurance. Nevertheless, we should still move ahead to do what we can, so that experience with effective and sustainable implementation can develop alongside scientific knowledge or health outcomes.

- *Dominance of Ad Hoc Activities.* The national level is not where the action is for indoor air pollution. Most activities are carried out on an ad hoc basis by NGOs, research groups, and district authorities. Indicators should be developed with those groups, building on their experiences with the communities concerned, while at the same time seeking to strengthen national initiatives.
- *Behavior Change.* For ARI it is still unclear whether or not behavior changes— particularly of mothers and caretakers— offer the opportunity to reduce exposure. For example, does it make sense to encourage mothers to leave their children in another room when they are cooking? The issue of child safety is complicated. Incidence of ARI is highest in the first six months of life. We should not promote behavior changes that would separate mothers and children at a key time in a child's life, especially given the fact that behavioral change may be at the margin.
- *Participation of Women.* Not enough is known about women's perceptions and related social factors. Mothers often do not understand (or at least acknowledge) the linkage between air pollution and ARI. There is a need for KAP studies and education to create demand for better stoves and fuels. A few things are for certain: women should participate in assessments, as respiratory illness is an important issue for women as well as children. The indicators developed refer to maternal AND child health: a mother sick or dead is a child survival issue.
- *Links between Stove and Health Projects.* We should tie together people working with stoves and people working with health. An integrated approach to the home and kitchen environment, which can be termed a "healthy kitchens" approach, is now being recommended. The activities and concerns of women are central to developing such interventions. Women should also participate in identifying priorities for evaluation.

6 CONCLUSION

6.1 Unresolved Issues

The following general issues were raised by the TAG members, EHP staff, and others attending the presentations of the three disease groups on the second day of the TAG.

- *Refining Indicators.* The question was raised as to when an indicator is "developed," i.e., not a work in progress. The best answer is that an indictor is developed when it serves the purpose of a specific program: when it is used to make a decision. Environmental health indicators are more site- and context-specific than indicators for treatment interventions. Details of indicators can be defined only in a programmatic context.
- *Needs of Consumers of Data.* Indicators should take into consideration what consumers of data want. Ask them. People are not used to being asked what kind of information they need to make decisions. It is also important to find out what information people actually use for decision making. Often indicators are not linked clearly enough to the goal or ultimate outcome desired.
- *Community Data.* We must find low-cost substitutions for high-cost methodologies, for example, community methods for gathering data. There is a danger of measuring what is easy to measure rather than what we need to measure. It is hard to collect community data. Many development workers are trained scientifically and want to do reliable valid studies, but a "good enough" study may consist of interviewing ten women. Part of planning must be to determine what data are needed and how they will be collected and used by contractors, cooperating agencies, or grantees.
- *Data-Driven Programming.* To some extent, programming has been driven by what data are available. Missions are sometimes reluctant to collect new data. USAID must resolve this issue. Is the agency going to put resources into collecting data to demonstrate results? In present-day USAID culture there is more emphasis on measuring results, yet there is resistance to spending money on data collection in the missions, which are more programmatically oriented. Until this issue is resolved, EHP, for example, will have to find ways to collect the data needed to monitor environmental health activities.

  It is probably wise not to put a price tag on data collection. It is better to express the cost in terms of level of effort. Often ways can be found to collect data that utilize local personnel. For example, in Bolivia EHP was able to collect baseline data for a diarrhea prevention program using trained interviewers from the Ministry of Health.

  An argument also can be made for tying data collection with the Demographic and Health Studies.
- *Few Environmental Health Indicators.* Many missions have objectives that relate to environmentally based prevention, but the indicators they have developed often have to do with case management and clinic-based activities. Often the only environmental health indicator is access to water and sanitation. EHP has been able to help missions to hone in on ways to measure their objectives more comprehensively and rigorously.
- *Data Quality.* Country data used by missions to assess their programs often lack reliability and validity. There is a need for improved data quality assessment.

Need for Good Theory. Indicators must be based on good theory and on research that demonstrates that certain interventions are effective. There are good substantive data for some indicators; others have not been adequately tested.

6.2 Next Steps

EHP will work further on the indicators developed by the TAG in order to identify a shorter list of "sentinel" indicators. It will be made available to missions and bureaus and will be used by EHP staff in two ways: (1) to guide program design and (2) to measure program results.

Further work on the indicators will consist of:

Refining the wording of the indicators, including striving for some uniformity in units of measurements. Because of the limited time, TAG members were unable to devote much attention to the exact wording of the indicators.
Prioritizing indicators according to whether or not they are empirically tested or supported by research.
Suggesting likely data sources and approaches to data collection and analysis for each indicator.
Seeking and incorporating feedback from USAID's Child Survival Indicators Working Group and other personnel from USAID and USAID-partner organizations.

EHP will keep all mission health officers informed on the progress of developing these indicators through mailings for inclusion in the Environmental Health Resource Book for Disease Prevention, a looseleaf binder sent to all missions for storing EHP publications about disease prevention.

ANNEX

The TAG Members: Background and Experience

The Annex of Activity Report 46 has been omitted in the electronic version. If you would like to receive the curriculum vitae and a full publications list for the TAG members, please contact the Environmental Health Project.