

## A More Expansive Concept of Prevention

*“The benefits of child survival programs can be enhanced if a partnership is forged between communities and the health care system and a better balance is achieved between prevention and curative care.”*

The words “environmental health” may conjure up images of ozone depletion and toxic wastes. The more fundamental problems of water and sanitation may not come to mind. Yet both kinds of problems are important and relate to environmental health. How important may depend on whether the society has made the transition to industrialization. In pre-transition societies, the greatest health burden is created by infectious agents that cause diarrheal diseases, cholera, malaria, and other vector-borne diseases such as leishmaniasis, dengue, or onchocerciasis. In post-transition societies, such as the former Soviet Union, industrialization has polluted the land, air, and water with such noninfectious toxic agents as lead and nuclear wastes. The health effects of these agents are often insidious; only over time do they produce clinical sequela. Some countries, such as Mexico or India, face both pre- and post-transition problems.

### Pathway to Wellness

EHP's definition of environmental health stresses prevention: *Environmental health is a branch of public health devoted to preventing illness through managing the environment and changing people's behavior to reduce exposure to biological and non-biological agents of disease and injury.*

Figure 1, a “diagram” of the definition, presents a framework for understanding the nature of environmental health interventions. Main-

Disease Agents	Production Breeding Multiplication Manufacture	Transmission Dissemination Emissions	Exposure Individual Household Community	Host Factors	Illness
<b>Biological</b> Bacterial Viral Protozoal Nematodal	† Prevent amplification of contaminants in food † Excreta treatment	† Protection of water † Handwashing † Corraling of animals † Excreta containment	† Food hygiene: time/ temp † Water handling/ purification † Shoes (helminths)	† Immunization † Nutrition † Breast-feeding † Low birth weight prevention	<b>Diarrhea</b>
Protozoal	† Larvicides † Residual spraying † Reduce breeding sites (drainage, filling) † Land use/ planning	† Vector diversion † Surveillance/ early treatment	† Housing (screens) † Personal protection (bednets, protective clothing, repellents)	† Chemoprophylaxis † Immunization † Nutrition † Breast-feeding † Low birth weight prevention	<b>Malaria</b>
<b>Non-biological</b> Particulates in air	† Fuel substitution	† Efficient stoves	† Ventilation	† Immunization † Nutrition † Breast-feeding † Low birth weight prevention	<b>ARI</b>

Figure 1. Pathway to Maintaining Wellness

Source: Helen Murphy, EHP

taining good health or “wellness” depends on blocking disease agents that contribute to illness. Understanding the roles of production, transmission, and exposure in bringing the disease agent to the human host helps clarify the points at which interventions to manage the environment and change people's behaviors can be introduced.

Within USAID, child survival efforts have focused mainly on case management and on building up or reinforcing the individual's resistance to disease agents through immunization programs. (The traditional child survival activities appear to the right of the vertical line in the figure.)

In contrast, environmental health seeks to prevent disease agents from causing ill health by interrupting production and transmission of the agents and reducing exposure to

them. These preventive interventions appear to the left of the vertical line. Examples include destroying mosquito breeding sites (production); use of more efficient stoves (transmission); and using bed nets to keep off mosquitoes (exposure).

### Strategic Importance

Investments in child survival over the last two or three decades have

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## UPDATE: Current Activities of Note

### Support Increases for EHP's Innovative, Community-Based Approach to Improving Environmental Health

An innovative method to improve environmental health, designed by the Water and Sanitation for Health (WASH) Project and further developed under EHP, is now being applied in two secondary cities in Tunisia with support from the Offices of Women in Development, Health and Nutrition, and RHUDO/NENA. Inhabitants of these cities' slum areas have retained environment-related behaviors that, while perhaps appropriate in the rural villages from which they have migrated, are hazardous in a crowded urban setting. Municipal officials tend to concentrate on providing formal services to rectify health-threatening environmental conditions without attempting to involve residents in creating healthier neighborhoods.

CIMEP (Community Involvement in Management of Environmental Pollution), as the methodology is called, is a systematic process for improving neighborhood environmental health conditions by opening up a dialogue among community members, NGOs, municipal officials, and elected representatives. USAID's RHUDO/NENA Office considers CIMEP/Tunisia to be an integral part of its Local Government Strengthening Project and the first in a number of regional applications.

The method comprises four elements: (1) community risk assessment, (2) training, (3) policy dialogue, and (4) support for microprojects, with special consideration given to strengthening the role of women as guardians of family health. In Tunisia, the risk assessment has been completed and training, with practicums, has begun.

The approach is implemented over a year to eighteen months with the aid of a host-country technical team and combines health, governance, and participation goals. (See *Activity Report 8* listed on page 8.)

### New Series of Environmental Health Seminars Planned for This Fall

EHP is coordinating a series of seminars sponsored by the Office of Health and Nutrition to define the adverse health consequences of poor environmental conditions and outline cost-effective approaches to prevention. The series, to be held at USAID/Washington, gets underway in September with a presentation on "Environmental Health in the 21st Century" by Dr. Philip Landrigan of Mount Sinai School of Medicine. Laurie Garrett, author of *The Coming Plague*, will speak on "New and Emerging Infectious and Tropical Diseases" in October. Other topics will include "Comparative Health Risk Assessment for Export," "Benefit of Hindsight: The Unintended Negative Health Impacts of Development," and "An Ounce of Prevention." For information about times and places, contact EHP.

### Guidelines Tell How to Get More from the Sanitation Dollar

Sanitation is one of the most effective ways to prevent diarrheal disease. Studies have shown that adequate sanitation leads to improved health and nutrition, particularly of children, and that the benefits of water supply are not appreciated without sanitation. Yet 1.9 billion people still lack a safe means of excreta disposal, a number that is not expected to diminish over the next four decades. The death toll from diarrheal disease is now estimated to

be 3 million people per year, mostly children.

EHP and the World Health Organization (WHO) are assisting UNICEF in the preparation of programming guidelines for sanitation that derive from the principles of empowering communities, involving the private sector, changing behavior by understanding local beliefs and practices, minimizing outside subsidies, and creating demand. The new guidelines will be available in early 1996.

### Chloroquine Efficacy Studies Begin in Zambia

A malaria consultant from EHP was part of a project design team preparing for a child survival initiative in Zambia, a seven-year commitment to support the Government of Zambia's health reform process. The consultant assisted the design team to integrate malaria prevention and case management in the Project Paper.

Malaria is one of the major causes of childhood morbidity and mortality in Zambia. In 1994, 3 million new cases of the disease were reported (a rate of over 355 per 1,000 population). From 1990 through 1992, the case fatality rate among children under five was 20 to 48 for every 1,000 admitted cases.

A third of all clinic visits by children under five are due to malaria; children experience nine to eleven episodes of malaria in their first five years, leaving them anemic and vulnerable to other diseases.

Treatment is increasingly hampered by what is suspected to be a growing resistance of the malaria parasite, *Plasmodium falciparum*, to chloroquine. Case fatality rates jumped from 13/1,000 cases in 1982 to 29.5/1,000 in 1992. Crude incidence rose from 168 to 354/1,000.

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## Update (Continued from page 2)

Because no consistent, standardized method to collect data on this problem has been applied, the government of Zambia wants to establish a sentinel surveillance system to analyze the efficacy of chloroquine. This will involve (1) standardizing testing methodologies, (2) selecting sentinel sites based on epidemiological data, (3) training clinical and laboratory staff, and (4) providing information to policymakers. EHP, in coordination with the U.S. Centers for Disease Control and Prevention, is providing technical assistance to establish this surveillance system, in anticipation of the start-up of the USAID-supported Zambian Child Health Project.

By July, pilot drug efficacy tests had been carried out in two areas (one by EHP and the other by WHO). Preliminary results suggest that chloroquine's efficacy is diminishing. The next steps will be to gather data from the other sentinel

sites to get a full country picture of chloroquine's efficacy.

### Initial Tests Show Blood Lead Levels of Children in Zlatna, Romania, Greatly Exceed U.S.

#### Guidelines

With funding from the Environment Office of the Bureau for Europe and the New Independent States (ENI/ENR), EHP has provided a year of technical assistance to Zlatna, Romania, to find short-term solutions to the health problems caused by a state-owned copper smelting plant, problems ranging from lead intoxication to respiratory cancer to workplace injury and disease. Although it is a big polluter, the plant cannot be closed down because it employs so many people.

A multidisciplinary team of EHP consultants used a participatory process in which stakeholders made decisions about what problems to

address and what actions to take. The team trained people to use equipment procured through EHP to test blood lead levels. The results of testing three hundred children showed that median blood lead levels ranged from 34 to 41  $\mu\text{g}/\text{dL}$  for children 1-6 and 35 to 39  $\mu\text{g}/\text{dL}$  for children 7-11, rates that significantly exceed the 10  $\mu\text{g}/\text{dL}$  U.S. guideline for action. While further testing will be conducted, a local committee has launched a community program to reduce lead exposure among children that includes creating safe play areas and counseling families whose children have high blood lead levels.

EHP's work in Zlatna will continue with support to stakeholder groups, blood testing to see if preventive activities are making an impact, and replication in other communities with similar problems. Officials in Zlatna have come to appreciate the value of community-level inter-institutional working groups.

## Malaria: Serious and Getting Worse

To think of malaria as a "re-emerging" disease may be difficult. Malaria is one of the oldest diseases to threaten mankind, striking an estimated 300-500 million people each year. WHO's 1993 *Global Strategy for Malaria Control* calls the global malaria situation "serious and getting worse." Malaria cases are increasing in severity, growing numbers of its parasite are resistant to anti-malarial drugs, and preventive control measures are deteriorating.

Reporting of malaria cases is deceiving. Although an estimated 90% of cases occur in Africa, no statistics are available. An estimated 550 million persons in sub-Saharan Africa are at risk for malaria each year, with 250-450 million clinical cases and 1 million deaths. The rest of the world reports about 5 million cases per year, but, according to WHO, that figure represents only 20-25% of the actual total.

- Each year in sub-Saharan Africa, 1 out of 20 children dies from malaria before the age of five. The disease accounts for 10% of hospital admissions and 20-30% of outpatient consultations. In 1987, direct and indirect costs of malaria were estimated at \$800 million. This year the costs are more than twice as high: \$1.8 billion.

- Brazil reported 55,000 cases of malaria in 1970; that number rose to 400,000 in 1985 and 600,000 in 1992. (The vast majority of these cases are in the Amazon basin.) In Sri Lanka, where malaria was almost eradicated by 1963 (only 17 confirmed cases that year), 600,000 cases were recorded in 1987 and 400,000 in 1992.

- Chloroquine-resistant strains of *Plasmodium falciparum*, the causative agent of the most severe form of malaria, emerged in the 1950s in South America and Southeast Asia and spread rapidly. By 1979-80, these resistant strains appeared in East Africa and took only 10 to 15 years to spread throughout the continent, jeopardizing future reliance on existing anti-malarial drugs, especially chloroquine.

- Prevention activities in most of Africa have never been well developed because of limited financial and human resources. In other tropical areas, existing malaria programs have often stagnated and resources and quality personnel have been diverted to other health programs.

In 1996, a new USAID malaria initiative will get underway in several African countries. This initiative combines prevention, through the use of insecticide-impregnated bednets, and case management, through integrating malaria with the management of other major childhood illnesses.

— Andrew Arata

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## WRAP-UP: Completed Activities

### Case Studies Link Environment & Development

Key presentations from the 1993 National Council for International Health Conference on the Environment and Development have been collected in a new book, *Down to Earth: Community Perspectives on Health, Development, and the Environment*, published by Kumarian Press. USAID support assisted the co-editors—who also organized the conference—to conceptualize and write the introductory material. The 14 case studies, including two by EHP staff, examine community-based approaches for linking environment and health.

### Assessment Sets Agenda for Reform of Guatemala's Water & Sanitation Sector

EHP participated with PAHO, CARE, and UNICEF in an assessment of the water and sanitation sector in Guatemala. The assessment team found that diarrheal diseases, including cholera, are responsible for 30% of infant mortality in Guatemala, and that of a total of 10.3 million inhabitants, 3.7 million are without water and 4.2 million are without sanitation. More than 60% of the human resources required to manage the sector are located in Guatemala City.

The team recommended establishment of a national commission to coordinate the sector, declaration of an emergency to spur completion of lagging projects, strengthening of potable water quality monitoring, and privatization or semi-privatization of community water systems. To assist in developing a policy to reform the sector, the Bureau for Latin America and the Caribbean pledged \$140,000 in cholera funds as its contribution to PAHO's Regional Investment in Environment and Health Program. (Report available from PAHO.)



Zambian health worker collects blood sample of child with malaria to test efficacy of chloroquine (see page 3). Photo: Mary Etling

### Twenty-five PVO Representatives Explored an Expanded Role in Environmental Health

An EHP workshop for PVOs, held at the end of the 1995 National Council for International Health annual conference, featured presentations by EHP and Office of Health and Nutrition staff on environmental health tools and approaches. Because many environmental health interventions take place on the community level, they are especially suitable for PVO involvement. (Report forthcoming.)

### Sanitation Component Designed for Housing Guarantee Program in Jamaica's Montego Bay Slums

EHP consultants assisted RHUDO/Jamaica with design and start-up of the sanitation component of a program to create serviced lots in the slum areas of Norwood and Rosemont in Montego Bay. The EHP team used participatory processes such as focus group meetings, a plot-by-plot sanitation inventory, consultation with Jamaican institutions, and a project start-up workshop to support the installation and

maintenance of appropriate excreta and graywater disposal systems. The word "appropriate" is key: the project aims to assure that the types of sanitation systems provided meet residents' needs, preferences, and ability to pay, and that residents understand their health benefits.

### Rapid Assessment Weighed Possible Sources of Cholera Outbreak in Gaza

After a sudden cholera outbreak in Gaza in November 1994, an environmental engineer consultant from EHP, a diarrheal disease specialist from the BASICS Project, and an epidemiologist from the U.S. Centers for Disease Control and Prevention conducted an emergency assessment. The EHP consultant's report pointed to several possible sources of the outbreak: the use of untreated wastewater for irrigation, poor vendor food handling, open sewers and uncovered sewage holding tanks, and lack of hygiene.

### Evaluation of Bolivian Water & Sanitation Projects Demonstrated Health & Socioeconomic Impacts

A three-person EHP team examined the impact and cost-effectiveness of water and sanitation projects in Bolivia sponsored by USAID or other agencies: CARE, Community and Child Health (CCH), pilot project Yacupaj under World Bank/UNDP, and UNICEF. Health impact data were scarce, and the team recommended that USAID encourage the monitoring of health impacts as an integral part of project work. The CARE project, the only one for which hard data were available, showed reductions in diarrheal incidence (27% to 7% in the Altiplano and 27% to 21% in Chuquibamba) as well as declines in malnutrition prevalence. (See Activity Report 4 listed on page 8.)

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## USAID Marks 40 Years of Malaria-Control Efforts in Nepal

### New Center Is Culmination of USAID Support

Malaria has re-emerged in many areas of the world, but in Nepal the disease has been drastically reduced. Over the past 40 years, USAID has been the primary donor agency to assist Nepal in anti-malaria efforts. This support has led to improvements in health and in economic development. Controlling malaria made it possible to reclaim thousands of hectares of fertile land in the Terai region.

The final milestone of USAID's achievement is the renovation and expansion of the Malaria Research and Training Center in the town of Hetauda, in the inner Terai. USAID, through EHP, also provided new laboratory equipment and training in its use for performing essential diagnostic tests and epidemiological surveillance. Ministry of Health staff assigned to the new facility, which will be called the Vector-borne Disease Center, received management and technical training. (See *Activity Report 9* listed on page 8.)

### Building Surveillance Capacity

With USAID support, the VBDC will build up its surveillance capacity, which will serve as the foundation for community-based environmental prevention of vector-borne diseases, in particular

leishmaniasis (or kala-azar) and Japanese encephalitis. In recent years, the kala-azar epidemic has spread to southern Nepal from neighboring areas of India and Bangladesh. The disease is usually fatal and results from the bites of infected sandflies. Diagnosis is difficult and treatment is costly and becoming less effective. It is estimated that more than 1 million children and adults have been affected in the region since the mid-1980s. Japanese encephalitis, caused by arbovirus-transmitting mosquitoes breeding in rice fields, also has a high case fatality rate and severe neurological sequelae. Outbreaks occur sporadically.

### A Collaborative Approach

The VBDC has already generated new collaboration in Nepal. WHO is cooperating to support training and research at the Center; the Centers for Disease Control and Prevention and Walter Reed Institute have assisted in technical training; and the U.S. Peace Corps assigned a volunteer epidemiologist to the VBDC to work with Ministry of Health counterparts.

With its excellent facilities and highly trained cadre, the VBDC has the potential to become a regional center for the prevention and control of vector-borne diseases and the early detection of emerging or resurgent infections.

— Charles W. Oliver

## Wrap-Up (Continued from page 4)

### Snapshots of Other Completed Activities

- BASICS and EHP jointly reviewed the national cholera plans in Guatemala, Honduras, and Ecuador to identify future technical assistance needs. (See *Activity Report 3* listed on page 8.)
- An EHP evaluation of the USAID-supported community-based Ivermectin Distribution Program in Guatemala (1991-1994) gave it high marks for replicability. The program distributed 130,289 doses of ivermectin to persons living in isolated locations where onchocerciasis is hyperendemic. (See *Activity Report 2* listed on page 8.)
- EHP supported the participation of two WASH/EHP host-country government counterparts in the April 1995 USAID-supported meeting of "Lessons without

Borders" in Seattle. Participants discussed community-based environmental protection approaches with applicability for the United States.

- A review of the environmental health program of the Peruvian NGO Instituto de Salud Popular (INSAP), requested by the Inter-American Foundation, suggested ways that INSAP could sustain behavior changes and strengthen community management. (See *Activity Report 6* listed on page 8.)
- EHP assisted a multisectoral workshop in March 1995 on environmental health in Sri Lanka. Participants from Health and Environment Ministries developed an action plan and priorities including communicable and tropical diseases, food hygiene, housing, and water and sanitation.



An EHP consultant trains VBDC personnel to conduct diagnostic tests (see box above). Photo: Shreedar Pradhan

## Information Center Resources

### Services & Resources of the EHP Library

The first stop for many EHP staff and consultants en route to field assignments is the EHP Library. Computerized tie-ins with various databases and reciprocal agreements with other organizations give the EHP Library access to a virtual mountain of information on environmental health, even though its document collection is modest.

In addition to supporting EHP technical assistance and keeping staff specialists apprised of advances in their fields, the Library responds to several hundred requests for information each month, from USAID missions and bureaus and from other development organizations and research institutes.

### Specialized Databases

Through the INTERNET and National Library of Medicine, the EHP Library can search more than 200 databases containing toxicological information, abstracts of published articles, and statistical information for answers to the most difficult questions. The most frequently used databases are MEDLINE, which indexes and abstracts over 5,000 health journals from 1966 to the present, and TOXNET, a network of 12 toxicology-oriented databases and data banks that includes HSDB, the Hazardous Substances

Data Bank; RTECS, the Registry of Toxic Effects of Chemicals; and CCRIS, the Chemical Carcinogenesis Research Information System.

The INTERNET also gives EHP access to specialized information from many agencies and organizations, including the Centers for Disease Control and Prevention, Environmental Protection Agency, Library of Congress, National Institute of Environmental Health Sciences, and World Health Organization.

### Specialized Journals & Documents

The EHP Library, in collaboration with USAID's Development Information Unit, subscribes to a wide variety of specialized journals, on all aspects of environmental health and vector-borne diseases.

The 2,300 documents in the Library's collection were selected judiciously and include only widely useful books, reports, and reprints of articles not readily available on-line or in nearby libraries. A bibliographic database of the collection, maintained on the PRO-CITE system, allows searches and retrieval by keyword, title, author, country, and language.

The Library also contains approximately 4,000 documents from the WASH library's collection and over 3,000 articles and documents from the Vector Biology and Control Project library.

— Dan Campbell

## Prevention (Continued from page 1)

significantly reduced mortality. Under-five mortality in developing countries has dropped dramatically, from 216 per 1,000 live births in 1970 to 102 per 1,000 live births in 1993, largely due to the efficacy of life-saving interventions such as ORT and immunizations.

It appears that resources for these social sector programs are likely to be reduced in the coming years, especially those provided by donors. Diminishing support could jeopardize child survival programs.

This is especially true in developing world cities, where population growth is soaring. By 2025, projected world population will be four times what it was in 1950: an increase from 2.5 to 8.2 billion. Between 1994 and 2025, approximately 2.3 billion people will be added to developing world cities, often in areas with the

weakest infrastructure.

Some recent studies reveal the increasing gravity of the problem. In the poor areas of Jakarta, infant mortality is from four to five times higher than in middle-income areas. In Manila, the infant mortality rate is 210 per 1,000 in squatter areas compared with 76 per 1,000 elsewhere. Demographic survey data are generally disaggregated between urban and rural; only rarely are data on urban poor areas available. The relatively favorable infant mortality rates for urban areas mask the plight of the urban poor.

### The Burden of Environment-Related Disease

What is the burden of disease attributable to environmental conditions? Figure 2 lists the top 10 diseases in developing countries as of

1990, according to disability-adjusted life years (DALYs) lost. (The DALY measures productivity losses from morbidity—injury or illness—and mortality—premature death.) Two of the three top diseases are highly correlated with environmental conditions, and most can be linked to some extent to the environment. Of the five main causes of child mortality, shown in Figure 3, three are environmentally related: acute respiratory infection, malaria, and diarrheal diseases. These three are responsible for more than 50% of total mortality; they account for 257.5 million DALYs lost per year.

Given these three critical causes of child mortality, it seems appropriate to develop a strong partnership between environmental health, with an exclusive focus on prevention,

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**Prevention** (Continued from page 6)

Disease (ranked)	DALYs	Related to EH
1. Respiratory infections	1118.8	✓
2. Diarrheal disease	986.6	✓✓
3. Unintentional injuries	982.4	✓✓
4. Perinatal	962.3	
5. Malignant neoplasms	529.3	✓
6. Tuberculosis	459.3	✓
7. Respiratory diseases (COPD & asthma)	413.4	✓✓
8. Congenital abnormalities	369.1	✓
9. Malaria	357.3	✓✓
10. Measles	341.0	

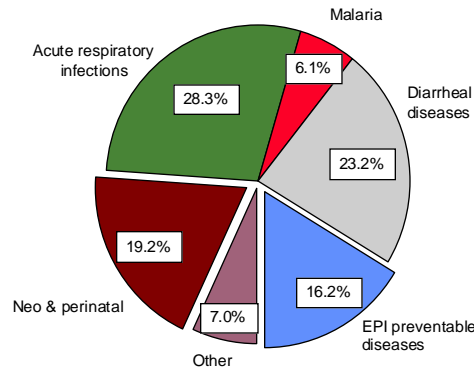
✓ = partially environment-related    ✓✓ = environment-related  
 Source: World Development Report, 1994

**Figure 2. Top 10 Diseases by DALYs Lost Annually (in hundreds of thousands)**

and traditional child survival strategies targeted on managing the “sick child.” Figure 1 lists some of the community- and family-level options available to complement facility-based approaches. These interventions, which involve environmental management and behavior change, can reduce health care costs for households, communities, and health care systems.

Many of these interventions have been put on a back burner as too expensive and unsustainable. EHP operates on the belief that no matter how efficacious an intervention appears to be under controlled conditions, its impact will be diminished without implementation that addresses consumer demand and cost recovery.

Environmental-health interventions need not be costly and unsustainable if a consumer-demand driven approach is used. The three essential elements of such an approach are 1) involvement of the community in the identification of its environmental hazards, 2) responsiveness to the community’s need for information



Source: Eighth Report to U.S. Congress on Child Survival, 1993.

**Figure 3. Causes of Child Mortality**

on interventions appropriate to its environmental conditions and resources, and 3) participation of the community in financing and management schemes able to provide accountable, sustained services.

The benefits of child survival programs can be enhanced and sustained if a partnership is forged between communities and the health care system and a better balance is achieved between prevention and curative care. Over the next four years EHP intends to bring together donors, PVOs, and government agencies to work in concert to develop packaged approaches and measure results.

— Helen Murphy and John Tomaro



In the year 2000, 17 of the 20 most populated cities will be in developing countries. The poor flock to the cities to seek opportunities, but services are often inadequate or nonexistent. Above, a woman looks out over an open drain in a Rio de Janeiro favela. Photo: Fernando Miceli/IAF

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**Contributors**

Helen Murphy, *EHP Technical Director for Epidemiology*; John Tomaro, *Acting Chief, Environmental Health Division, COTR for EHP, USAID*; Andrew Arata, *EHP Deputy Project Director, Vector Control and Tropical Diseases*; Charles W. Oliver, *Environmental Health Division, EHP Tropical Diseases Advisor, USAID*; Dan Campbell, *EHP Librarian*; and Betsy Reddaway, *EHP Publications Manager*

*Editor* Diane B. Bendahmane  
*Copyeditor* Kathy Wenner

*Production and layout* Ray Light  
*Design* Leslie Shapiro, ArtConcepts

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## New EHP Publications

*Voices from the City*, a newsletter begun under the Water and Sanitation for Health (WASH) Project, is now being published jointly by two centers in the Global Bureau: Population, Health and Nutrition (PHN) and Environment (ENV). The first issue of the new *Voices* was published in May 1995. The publication features articles on development efforts in poor urban areas and contains information sources, reviews of recent articles and books, and a reader exchange forum. It is published three times a year. For copies, contact EHP.

EHP publishes two types of documents, Activity Reports and Applied Studies. Activity Reports discuss a specific field activity; Applied Studies examine a particular topic. Titles of documents published to date are listed below. Copies can be obtained by contacting EHP. Reports from the now-defunct WASH and VBC projects are also available.

### EHP Activity Reports

1. *Survey of U.S. Private Voluntary Organizations Working in Environmental Health*. Ann Hirschev.
2. *Evaluation of the Suchitepequez Ivermectin Distribution Program in Guatemala*. Gilbert Burnham and Charles W. Oliver.

3. *A Review of National Cholera Plans in Guatemala, Honduras, and Ecuador*. John Paul Chudy.
4. *Evaluation of Water Interventions in Bolivia*. Clydette Powell, Oscar Larrea, and Veronica Vargas. Also available in Spanish.
5. *A Review of Sanitation Program Evaluations in Developing Countries*. Anne LaFond. Jointly prepared with UNICEF.
6. *Review of an NGO-Based Peri-urban Environmental Health Project in Lima, Peru*. Carolyn McCommon and Laura Altobelli.
7. *Technical Assistance in Curriculum Development for the University of Medicine and Pharmacy, Cluj, Romania*. Kathleen Rest.
8. *Community Risk Assessment in Tunisia: Socioeconomic, Hygienic, and Environmental Analysis of Three Outlying Quarters of Kasserine and Sousse*. Ridha Boukraa and Nadia Bechraoui. Also available in French.
9. *Towards a Functional Vector-Borne Disease Research and Training Center in the Endemic Terai, Nepal*. Pandu Wijeyaratne, Charles W. Oliver, Tara S. Upreti, and Robert A. Wirtz.

### EHP Applied Studies

1. *Talking Drums: A Communication Handbook for Field Managers of River Blindness Prevention Programs*. Charles W. Oliver.
2. *Financial Services and Environmental Health: Household Credit for Water and Sanitation*. Robert C. G. Varley.

— Betsy Reddaway



## ENVIRONMENTAL HEALTH PROJECT

1611 North Kent Street, Suite 300  
Arlington, VA 22209-2111 USA