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The Control of Epidemic Dysentery in Africa:
Overview, Recommendations, and Checklists

Claudine Cobra, M.D.
David A. Sack, M.D.
Johns Hopkins University

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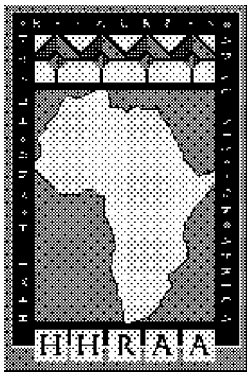

Claudine Cobra, M.D.
David A. Sack, M.D.
Johns Hopkins University

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LIST OF ABBREVIATIONS

AIDS	Auto-Immune Deficiency Syndrome
CCED	Coordination Committee for Epidemic Diarrhea
CDC	Centers for Disease Control
CDD	Control of Diarrheal Disease
DTC	Diarrheal Control Center
HHRAA	Health and Human Resources Analysis for Africa project
HIV	Human Immuno-deficiency Virus
HUS	Hemolytic Uremic Syndrome
IEC	Information, Education, and Communication
MOH	Ministry of Health
NGO	Non-Governmental Organization
ORT	Oral Rehydration Therapy
PRITECH	Technologies for Primary Health Care project
ORS	Oral Rehydration Salts
ORT	Oral Rehydration Therapy
PVO	Private Voluntary Organization
SD1	*Shigella dystenteriae* type 1, or Shiga's bacillus
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization
WHO CDR	World Health Organization/Control of Diarrheal and Acute Respiratory Diseases

FOREWORD

Combating infectious diseases is one of the high priority areas for cooperative action in the new transatlantic agenda signed by President Clinton and representatives from the European Union. The topic of emerging infectious diseases also is a key element of the U.S.-Japan common agenda. The Health and Human Resources Analysis for Africa (HHRAA) Project of the Africa Bureau in USAID's Office of Sustainable Development continues to support the analysis and guidance for the development of activities to respond to and mitigate infectious disease outbreaks.

This report was prepared at the request of HHRAA to provide an analysis of the lessons learned and recommended actions to consider for addressing the reemerging infectious diseases of cholera and drug-resistant shigella dysentery. One of the concrete results of this analysis was the support through HHRAA of the placement of Dr. Allen Ries of the Centers for Disease Control and Prevention to the World Health Organization's (WHO) Sub-Regional Office in Harare, Zimbabwe. Dr. Ries is working with WHO staff, ministries of health, and medical personnel of the southern Africa sub-regions to increase the capacity of the countries to control epidemic dysentery and cholera. Dr. Ries's work has focused on improving the public health laboratory and epidemiologic infrastructure; developing a sustainable, region-wide system to share epidemiologic and laboratory data; and identifying and developing practical methods to control the size and extent of the outbreaks of epidemic dysentery and cholera.

This paper begins with an overview of cholera and dysentery, followed by a brief history of dysentery epidemics in Africa, its current epidemiology, a few of the lessons learned about the disease in other parts of the world, and concludes with recommendations. Following the main part of the paper is one of its notable innovations, checklists on epidemic dysentery, which are intended to provide guidance to ministry of health planners, mission health officers, and health workers in the field who are formulating and reviewing national and regional control plans. We hope these checklists prove useful, and we encourage users to adapt them to their own needs and contexts, to test them, modify them, and then to provide feedback, both positive and negative.

Hope Sukin
HHRAA Project Director
Africa Bureau
Office of Sustainable Development
U.S. Agency for International Development

OVERVIEW

Over the last several decades, Africa has experienced epidemics of cholera and dysentery in addition to the usual diarrheal diseases experienced in most developing countries. Both dysentery and cholera epidemics have affected large numbers of people in all age groups and been associated with high fatality rates. Moreover, the control of these diseases has exceeded the capabilities of the national health authorities. The dysentery epidemics have been due to strains resistant to nearly all antibiotics, and inappropriate use of antibiotics. While cholera epidemics have been scattered over most of the continent, the dysentery epidemic has involved a more limited number of countries in Central and Southern Africa.

This report supports the concept proposed by WHO that, because of the similarities in the transmission of the two diseases and in many of the control activities, a coordinated control program aimed at both diseases is appropriate. These similarities should not, however, mask the differences in transmission, symptoms, case management, and clinical complications. Programs dealing with these epidemic diseases will have to take into account the differences as well. Whatever strategies are developed, they should include preparations for a new strain of cholera that is now spreading more quickly than any previous cholera epidemic.

There is no "magic bullet" that will control epidemic dysentery. In this regard dysentery is a more difficult problem to control than other diarrheal diseases. Several interventions can, however, decrease the risk of acquiring the infection and decrease the risk of complication or death. Innovative strategies using these interventions are needed that involve the medical community as well as the private sector. Given current technologies and resources, it is unrealistic to expect that the disease will be eradicated or that the case fatality rates will be lowered to less than one percent.

Epidemic dysentery is different from "ordinary diarrhea" in that an epidemiologic surveillance and laboratory system is needed to detect and track epidemics and to monitor antibiotic resistance. This surveillance system could be greatly aided by the development of simple rapid tests to avoid the need for establishing standard laboratory services. Social science studies are needed to fully understand the modes of transmission and the culturally acceptable changes that could interrupt the spread of the agents. Behaviors such as water collection and storage, food preparation and storage, personal hygiene, and toilet habits are all important to controlling these diseases. The interrelation of these epidemic diseases with other common diseases should also be understood, especially the potential interrelations between shigellosis and AIDS, and malnutrition and malaria, since these are all common in the same geographic areas.

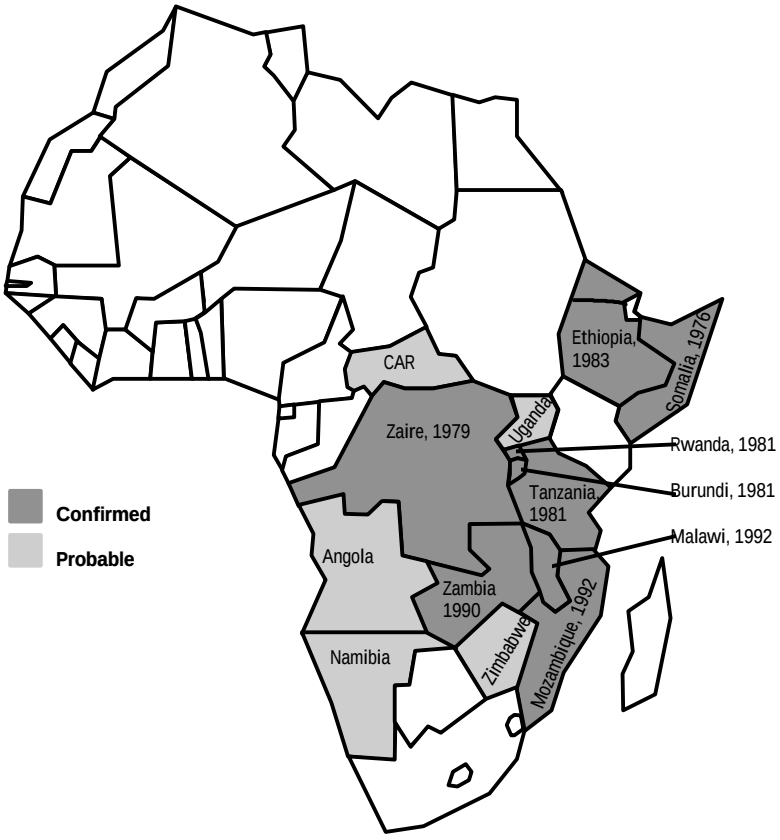
Epidemic dysentery and cholera are major public health problems in Africa, and the donors interested in health should take a more active role in assisting countries to deal with them. The U.S. Agency for International Development (USAID), through its projects and funding of international organizations, can play a key role in the control of epidemic dysentery in Africa.

INTRODUCTION

Shigellosis, also known as bacillary dysentery, is an acute infectious enteritis of human and subhuman primates caused by bacteria of the genus *Shigellae*. It usually causes frequent passage of small-volume, bloody mucoid stools, accompanied by abdominal cramps and rectal pain. Life-threatening complications of shigellosis include hemolytic uremic syndrome (HUS), encephalopathies, colonic ulceration and perforation, shigellemia, toxic megacolon, intestinal stenosis and obstruction, persistent diarrhea, severe malnutrition, and wasting. Disease can result from infection with any one of four known shigella species, but only *Sh. dysenteriae* type 1 (SD1 or Shiga's bacillus) is known to cause outbreaks of epidemic proportions. For reasons not entirely understood, Shiga's bacillus eventually goes from playing a minor role in the cause of shigellosis to suddenly and dramatically becoming the dominant factor in massive dysentery epidemics.

Dysentery epidemics exacerbate the already important burden of endemic shigellosis in developing countries. An estimated 140 million cases and 576,000 deaths occur annually due to shigella infection in children under five years of age worldwide. Because of problems in clinical and laboratory diagnosis, these numbers are probably grossly underestimated.

Countries Affected by Epidemic Dysentery



REAPPEARANCE OF EPIDEMIC DYSENTERY IN CENTRAL AFRICA

Dysentery epidemics have occurred in Central African countries for at least the last 65 years. During a huge outbreak in the Belgian Congo (Zaire) in 1928-1932, dysentery killed half of the cases in some of the affected areas. Eleven years later it became an important problem in Zaire again, as well as in Rwanda and Burundi. This new epidemic moved through Central Africa affecting a population already devastated by the effects of the serious 1943-1945 famine. The case-fatality rate at that time approached 25 percent. The next reports of outbreaks came from Somalia during 1963-1964[1] and in 1976. In November 1979, 28 years after the last reported isolation of Shiga's bacillus in Central Africa,[3] a multiresistant form reappeared in a massive epidemic in Northeastern Zaire. The epidemic subsequently involved Rwanda (1981),[2,3] Burundi (1981), [4] Tanzania (1981),[5] Ethiopia (1983)[6], Zambia (1990)[7], and possibly Uganda, Central African Republic, Zimbabwe, Namibia, and Angola. In 1992, Malawi and Mozambique also started reporting increasing cases of epidemic dysentery.[8]

Early genetic studies of Shiga's bacillus strains isolated in Zaire and Rwanda in 1981 and 1982 showed great similarities with strains isolated in Somalia in 1976, suggesting that the initial outbreaks in these countries were epidemiologically related, reflecting the spread of a single *Sh. dysenteriae* clone that changed in response to antibiotic pressures.[9,10] Recent studies, however, suggest that there are several clones in Africa. The Burundi 1993 strain is very similar to the Zambia 1992 strain, but different from the Burundi 1990 strain and from the strains from Mozambique, Zaire, and Rwanda.

EPIDEMIOLOGY OF CURRENT CENTRAL-AFRICA EPIDEMICS

Dysentery Incidence and Attack Rates

Calculating infection rates requires detecting not only cases of classical dysentery syndrome, but also mild and asymptomatic infections not usually recognized by facility-based surveillance systems. Both bacteriological and serological surveys can be used in prospective community-based studies to more accurately determine the incidence, prevalence, and risk factors for infection with dysentery, yet no such studies have been conducted in the countries currently affected by Shiga epidemics. Most estimates of incidence and prevalence in Central Africa relied on clinically apparent dysentery, and therefore represent the incidence of symptomatic disease, not necessarily the overall spread of the infection in the community.

It is important to keep in mind that epidemic dysentery in developing countries occurs in settings with already high rates of endemic dysentery. For example, in 1954 a community-based bacteriological survey in Egypt showed that in an endemic situation the incidence of symptomatic infections was one infection per person per year; an equal number of asymptomatic

shigella infections were detected. Thus, the total incidence was two infections per person year.[11]

Absolute Numbers and Overall Rates

At the beginning of the current Central African epidemic, the overall attack rate reported for Cyangugu, Rwanda was 5 percent[7] and 6.4 percent for Zaire. [6] In the 1979 epidemic in Zaire, it was estimated that over 100,000 persons became ill, with 5,000-10,000 deaths.[6] In Ethiopia, approximately 5,000 cases were reported during a one month interval, and the overall attack rate was 7.3 percent. In Zambia, from June 1990 to November 1991, there were close to 30,000 dysentery cases reported.[12] In Burundi, the reported numbers have been much higher. There were 110,361 dysentery visits in 1991, 75,532 visits in 1992, and more than 50,000 since the beginning of 1993. This makes dysentery the fifth most common cause of health care visits in Burundi. The annualized national incidence rate of dysentery for 1991 in Burundi was estimated to be 16.3 per 1,000. In other words, *one in every 60 persons was affected in Burundi during 1991*.[12,13,14]

According to Age and Sex

While endemic dysentery is a childhood disease, epidemic dysentery affects all age groups, with the highest incidence among adults. The predominance of epidemic disease among adults suggests the recent introduction of the strain into a susceptible adult community, lowering of general hygiene and environmental sanitation, and/or increased vulnerability to infection among the most affected age group. Concentration of adult cases in the early twenties age group may also reflect an increased risk of exposure to infection from outside of the household.

Gender differences in case rates appear to be country or region-specific and may reflect distinct socio-cultural or occupational patterns within each country that could increase the risk of exposure or susceptibility to infection, or limit access to care.

Seasonality

Seasonal changes appear to be factors leading to the increase in the number of cases during certain periods of the year. In Burundi, for example, annual epidemics have been occurring during the rainy season—a higher number of cases occur from September through December—every year for the last 10 years.[23,24] The environmental factors that lead to seasonal transmission are not well understood. It may be that peaks during the rainy season may be related to increased contamination of water supplies, seasonal worsening of nutritional status, or increased susceptibility to infection.

Mortality

Dysentery mortality is associated with inadequate treatment. In the Zaire epidemic of the early 1980s, the overall case fatality rate was 2.0-2.4 percent when effective treatment was used and 4.6 percent when antibiotic resistance developed.[6] In Rwanda, the fatality rate dropped from around 10 percent at the beginning of the epidemic to 2 percent after the introduction of adequate antibiotic treatment.[7] In Zambia, regional fatality rates ranged from 0.4 to 10.8 percent during 1991. However, these values were considered to be underestimated because not all deaths were being appropriately reported.[12,22] A community survey of recent history of dysentery indicated a fatality rate of 3.2 percent in Burundi during 1991.[23,24] Due to strong cultural reluctance of discussing death, these mortality data were believed to be underestimated by a factor of at least three. During the 1992 epidemic in the same country, a facility-based study revealed an overall fatality rate of 7.2 percent. Essentially, *1 out of 14 patients died, with most dying in the first 10 to 14 days.*[25] During 1991 and 1992, almost all detected cases in Burundi were being treated with drugs found to be ineffective against the epidemic strain, and this could have contributed to the high attendant fatality rate.

According to Age and Sex

Case fatality rates are higher in children and older adults. In Zaire, fatality rates were comparable among males and females.[6] In Rwanda, fatality rates in adult males were higher than in adult females.[7] In Zambia, death rates per 100,000 per year were higher among men than among women.[12,22] Among men, the highest rate was among the 20 to 29 and 40 to 49 year-olds. Among women, the highest rates were among those 50 to 59 year-olds.

Risk Factors

In Burundi, a case-control study of patients seeking care for bloody diarrhea during November 1990[15] identified that among shigellosis cases, those with epidemic infection were more likely to have had contact with a person with dysentery and to have recently taken an antibiotic. Epidemic dysentery patients did not differ significantly from non-dysenteric controls, except for a history of diarrhea in the previous months, and recent contact with a person with dysentery. There were no differences in regard to the number of persons in the household, diet, water source, and amount of water available for the family. Approximately 25 percent of individuals

Household Risk Factors

- Prior case of dysentery in the household
- Hand washing with no soap by food preparer
- No soap in the household
- Use of open latrines
- Shared latrines among households
- Open bucket for water collection

in dysenteric households (aside from index case) also reported dysentery.

In February 1992, a community case-control study identified factors associated with past history (last six months) of dysentery in Burundi.[24] Individual risk factors included being older, being female, using a cloth rag for anal cleansing after defecation, weight loss before disease onset, and no education. No association was observed for activities such as going to the market, traveling, receiving visitors, or taking care of a sick person. Significant household risk factors identified included carrying water in an open bucket, not having soap in the house, and not washing hands before preparing food. Households with and without dysentery were comparable in regards to indicators for crowding, socio-economic and sanitary status.

In 1992, a facility-based case-control study in Zambia identified the following individual risk factors for dysentery: eating food purchased from the market or a street vendor, having a family member with dysentery, and having recent contact with a person with dysentery.[12,22] There were no significant differences regarding frequency of market visits, number of meals eaten outside of the home, or number of meals from a common plate. Household risk factors included a food preparer with a history of dysentery, drinking water obtained by hand-dipping a cup in wide-mouth water container rather than by pouring it out, having open latrines, and sharing latrines with other households. No significant differences were found in other aspects of hygiene, such as availability of soap and toilet paper, wash water volume, distance to water source, or cleanliness of latrine.

In addition, studies conducted outside Africa have identified lack of breastfeeding as an important risk factor for symptomatic shigellosis in children.[16]

Risk Factors for Severity

Risk Factors for Death

- Extremes of age
- Delayed treatment
- Malnutrition
- No breastfeeding

Mortality has been higher among the very young and the very old. In Burundi, the largest proportion of deaths occurred in the youngest age-group. The probability of survival 100 days after the onset of dysentery was significantly lower for the oldest age group than for the other age groups. Individuals who waited longer than one day before going to the clinic were less likely to survive than individuals who went to the clinic earlier.[25] That may reflect the effect of delayed treatment or other underlying conditions associated with increased risk of death, such as low socio-economic status. There was no association between completeness of treatment and survival. In Zambia, many of the deaths in the Southern region were reported to be among fishermen. This was the only reference regarding occupational risk factors in the available literature for Central African SD1 epidemics.

The influence of nutritional status in infection incidence and outcome was not reported in most studies of the Central African epidemics. Nonetheless, studies in other developing

settings have identified an association between isolation of shigella and the presence of malnutrition. Nutritional status was also found to affect chronicity of established illness.[20,30,17] Malnourished individuals may develop chronic relapsing disease extending over months. In addition, shigella infection itself may cause severe malnutrition, which is strongly associated with mortality.[18]

Shigellosis and the HIV epidemic

As of mid-1993, WHO estimated that over eight million adults were infected with HIV in sub-Saharan Africa. Of this total, about half to two-thirds were in East and Central Africa. HIV prevalence among adults in major urban areas may exceed 20 percent, but varies widely according to risk groups.[19,20]

All Central African countries currently affected by dysentery epidemics face an increasing AIDS burden. The cumulative number of AIDS cases reported to WHO for some countries in Central Africa are in Table 1. The extent to which dysentery and HIV infection interact in these countries needs to be further evaluated. Diarrhea is common in individuals infected with HIV and may occur in up to 90 percent of patients with AIDS. Although the association of dysentery and HIV has not been fully explored in developing countries, it is reasonable to expect that HIV positive individuals in shigella endemic and epidemic countries would be at a higher risk of acquiring shigella infection and developing symptomatic disease with potentially more severe progression. In one study in Kenya, about 30 percent of diarrhea in HIV positive individuals (free of shigella infection on admission) was due to salmonella or shigella infections, in contrast to 15 percent in HIV negative individuals. Twenty-eight percent of adults with nosocomial diarrhea had a diagnosis of HIV infection. In Burundi, weight loss prior to dysentery onset was a significant risk factor for shigellosis.[25] Even though weight loss is certainly a non-specific finding, it could, among other things, represent a marker for HIV wasting syndrome. A study in Kenya showed that shigella antimicrobial multiresistance was a serious problem among AIDS patients. In such patients, selection of or increased vulnerability to multiresistant strains may be due to their intense drug use as a result of AIDS.

Table 1: Cumulative number of AIDS cases reported to WHO, and AIDS rate/100,000 for specific Central African Countries

Central Africa

Country	Cumulative reports until June 1993	1992 Rate per 100,000 pop.
Zaire	21,008	10.8*
Zambia	7,124	14.0
Burundi	7,131	27.4
Rwanda	9,486	37.5
Tanzania	8,719	42.5*
Malawi	26,955	51.6
Uganda	34,611	53.5

* 1991 rate.

Sources and Routes of Transmission

Shigellosis is transmitted by fecal-oral contamination directly through person-to-person contact (direct [hand-to-hand-to-mouth] or indirect [hand-to-fomites/food/water-to-mouth]), or indirectly through fecal contamination of food (foodborne) and water sources (waterborne), and houseflies (fly-borne). A variation on the mechanism of fecal-oral transmission has been demonstrated among homosexual men engaging in anal-oral sex practices.[21]

Person-to-person contact seems to be the most important mode of shigellosis transmission. It is believed that this may also be the case during epidemic circumstances. In Central Africa, direct transmission within families, hospitals, and institutions apparently played a more important role than other modes of transmission. However, a combination of direct and indirect contamination is likely to have occurred in the settings where inadequate hygiene and sanitary patterns prevailed. The relative importance of the housefly in comparison with other routes of transmission is not known, but is likely to be minimal.

Shigella species are potentially the most communicable of bacterial pathogens. Shiga's bacillus is transmitted very efficiently through the fecal-oral route. The infectious dose for symptomatic infection of shigella can be as low as 10 organisms. Large numbers of shigella are present in stools of clinical cases and healthy carriers. This level of contamination combined with conditions that facilitate the spread of the inoculum needed to initiate the infection may explain the rapid involvement of large numbers of individuals in communities with poor sanitary conditions and hygienic practices. Most risk factors identified in Central Africa were related to person-to-person spread.

However, low secondary attack rates were detected in the Central African epidemic despite the postulated efficient person-to-person spread. Household transmission was estimated to account for only seven percent of the cases in Burundi.[23,24] A similar rate was identified in a study in Dhaka, Bangladesh where only 13.3 percent of the contacts of shigella index patients developed symptomatic illness.[16]

One possible explanation for low secondary attack rates is the presence of certain individual host characteristics associated with differential susceptibility to overt infection among members of the same household (e.g., hypochlorhydria and blood group type O are known risk factors for cholera). Household contacts may also differ in their levels of acquired immunity due to past exposure and to other shigella species (cross-immunity) and therefore respond differently to the new infection.

Finally, the secondary attack rate does not reflect the actual person-to-person spread of dysentery among family members. To fully evaluate the role of direct contact as a mode of transmission in Central Africa, the proportion of secondary asymptomatic infections, the case-to-infection ratio, and the distinction between concurrent and secondary cases would need to be investigated.

Institutionalized populations may also play an important role in spreading dysentery. In Zambia, the first outbreak apparently started in one prison and spread to other custodial institutions through the transfer of infected prisoners.[12,22] The epidemic eventually found its way to the community at large, but the mechanism involved in this process was not fully investigated. In Tanzania, close to 11 percent of hospitalized cases appeared to have become infected in institutions such as schools, prisons, and work places; and one percent were nosocomial infections.[10]

Another point of uncertainty is the mechanism through which the organism maintains itself in the community for long inter-epidemic periods. It is not clear why after almost 30 years of absence, epidemic dysentery has recently reemerged as the most common cause of shigellosis in Central Africa. The role of environmental contamination in the maintenance of the disease in the community is not well understood, and the possibility of a viable, but non-culturable form in the environment needs to be investigated.

OBSTACLES FOR CONTROL

Obstacles for Reduction in Morbidity

Inadequate sanitary infrastructure, poor standards of personal hygiene, lack of early recognition of the epidemic, inadequate laboratory facilities, supplies, and expertise, inappropriate antibiotic treatment, and poor understanding of the epidemiology of infections and the interaction of Shiga's bacillus with humans have led to the rapid and uncontrolled spread of infection in Central Africa.

Unresolved Problems

- Inadequate sanitary infrastructure
- Deficient and contaminated water supplies
- Poor standards of community and personal hygiene
- Underdiagnosis and inappropriate case management
- Inadequate laboratory facilities, supplies, and expertise
- Lack of appropriate understanding of shigella epidemiology

In Zaire, it took more than a year to identify the agent responsible for the 1979 epidemic.[6] In Zambia, more than a year into the epidemic, there were still conflicting reports on what the responsible agent was.[12] In Tanzania, the 1981 epidemic was initially mistakenly attributed first to chemical poisoning from contaminated oil.[10]

Bacteriological diagnosis and drug resistance characterization have not always been available at the regional level in quality-controlled surveillance laboratories. There has been a lack of clear guidelines on collection, storage, and transport of specimens. For example, Salmonella-Shigella agar has been a commonly used culture medium in Central Africa. However, Salmonella-

Shigella agar is too inhibitory to shigella, and should not be recommended unless it will be used together with other screening media.

Poor environmental and personal hygiene standards are key elements for the spread of Shiga's bacillus. Lack of information on behavior patterns, of individuals' perceptions, and of the acceptability of preventive measures hinders the design and implementation of appropriate interventions.

Obstacles for Reduction in Mortality

Adequate treatment reduces considerably the length and the lethality of the disease. Delayed or incorrect antibiotic treatment is associated with higher case-fatality rates. It is not clear whether inappropriate antibiotic treatment has no effect or actually causes harm. Theoretically, ineffective antibiotics may aggravate the patient's condition by altering the normal gut flora, allowing for more aggressive shigella growth. Incomplete therapy is also a major problem and may contribute to selection of resistant strains.

An important feature of the Central African epidemic has been its rapid adaptation to changes in antimicrobial therapy. WHO has recommended that antibiotic therapy be administered only to patients at higher risk of severe outcome, namely the very young, the very old, the malnourished, and the severely ill. Adults with mild disease should receive supportive therapy alone. This recommendation is especially important in areas where antimicrobial supplies are limited. Case definitions for "severe disease" are not clearly defined, however, and most cases coming for treatment likely have "severe disease."

Table 2: Drugs used during Central African *Sh. dysenteriae* type 1 epidemic and year resistance developed

Year	**79**	**81**	**82**	**84**	**85**	**90-92**	**93**
		July/Sept.					
Ampicillin	✓	✓ ✓	✓	✓	✓	✓	✓
Chloramphenicol	✓	✓ ✓	✓	✓	✓	✓	✓
Tetracycline	⧗✓	✓ ✓	✓	✓	✓	✓	✓
Streptomycin	✓	✓ ✓	✓	✓	✓	✓	✓
Sulfathiazole	✓	✓ ✓	✓	✓	✓	✓	✓
Co-trimoxazole		⧗ ⧗✓	○	✓	✓	✓	✓
Nalidixic acid		⧗	✓	✓	⧗✓	✓	○⧗
Norfloxacin					⧗	⧗	

○ = Reversed resistance
✓ = Development of resistance
⧗ = Recommended for use

The availability of treatment depends on adequate drug supplies and distribution systems. An inadequate drug procurement system can lead to the recommended antibiotic arriving after the epidemic has peaked. In Zaire, for example, it took several months to overcome the administrative, financial, and logistical barriers to delivering the drug to affected areas.[6] In countries where cholera is also epidemic, there is the concern that drugs designated for the treatment of multi-resistant Shiga's bacillus could be misused in the treatment of cholera cases, which would likely to contribute to resistance development.

LESSONS FROM OTHER REGIONS

Intervention Studies

Interventions aimed at environmental sanitation and the improvement of personal and community hygiene have reduced shigella morbidity. For example, a study in Bangladesh showed that giving soap to contacts of shigellosis patients resulted in reduction in secondary infection rates among the targeted population. The same study found that providing additional water was effective only when soap was provided as well. The researchers suggested that provision of soap and water could result in an 80 percent reduction in hospitalization for shigellosis.[17] A handwashing intervention study in Burma also demonstrated that handwashing is effective in reducing the morbidity from dysentery. The diarrheal incidence was reduced by as much as 40 percent.[22]

A water, sanitation, and hygiene education intervention project in rural Bangladesh showed that children in the intervention area had 25 percent fewer episodes of diarrhea than those in the control area. Stewart *et al.* showed that by making potable water more available the frequency of shigella infections halves. A study in Libya also demonstrated reduction of shigella incidence rates after the introduction of a water treatment center.[23]

Housefly control has also reduced the prevalence of carriage of shigella organisms, diarrhea, and mortality due to diarrheal disease among young children.[24]

Breast-feeding confers a high level of protection against shigellosis through the first three years of life, especially among malnourished children. Therefore, breast-feeding promotion has also been recommended as an important component of shigella control efforts.[25,26]

Interventions aimed at environmental sanitation, food and water safety, and health education for changes in personal hygienic practices are bound to have an impact on disease morbidity and mortality. However, such interventions need to be affordable, feasible, introduced in response to country-specific situations, accepted at the community level, and have guaranteed sustainability in order to achieve lasting results. In Libya for example, the failure to adequately maintain a water treatment unit quickly hampered achievements in shigella infection reduction, and infection rates reverted to pre-intervention levels.

RECOMMENDATIONS

Assumptions

In developing recommendations for dysentery control in Africa, some assumptions must first be made.

Assumptions Concerning Dysentery Program in Africa

USAID dysentery activities will be coordinated with other agencies and donors.
National ministries of health will develop policies for dysentery control for their own countries.
The national dysentery control activities will be carried out within the context of the national CDD program, and will include activities related to cholera control as well as dysentery.
The choice of USAID-sponsored dysentery activities will be those for which USAID is best suited and has a comparative advantage.
Projects funded by USAID will coordinate their activities.

1) There are several potential agencies and donors involved in the dysentery program including WHO, UNICEF, the Red Cross, and the European Community, and most importantly, African ministries of health (MOHs). To maximize the impact of the interventions, the agencies involved must coordinate their efforts and avoid duplication and competition. Coordination will require meetings to clarify the strengths, priorities, and opportunities of each agency.

2) Country-specific interventions will be carried out in individual countries, each of which has national interests and cultural and behavioral differences. While the general policies for dysentery, especially related to sanitation and case management, may be generalizable, decisions about specific policies need to be defined for each country. USAID and other relevant agencies should be available to assist the MOHs to develop these policies.

3) The shigella control activities will be carried out within the context of control of "epidemic diarrheal diseases," which includes both cholera and epidemic dysentery, and these activities should complement and build up the national CDD programs. Generally a program to control epidemic diarrheal diseases includes a central coordinating role for the national CDD manager, but it may also include officials from other ministries.

4) USAID cannot assume responsibility for the entire range of shigella control activities, and should, therefore, choose those aspects of the control strategy that best match its strengths, are not being addressed by other donor agencies, and are less susceptible to rapidly changing political

situations.

5) USAID will want to use its various offices and projects it supports to accomplish the goal of dysentery control in Africa. USAID supports several projects wholly, contributes substantially to others, and has other mechanisms for funding needed work. Many of these funding sources and offices may need to coordinate their activities if the goal is to be reached.

SPECIFIC RECOMMENDATIONS

Joint Strategy for Epidemic Diarrhea

In evaluating interventions for epidemic dysentery in Africa, consideration should initially favor interventions with a broad public health benefit as opposed to targeting dysentery alone. WHO has initiated the concept of "epidemic diarrhea" as the target for an intervention strategy, especially for Africa. Within the "epidemic diarrheas" WHO includes diseases due to both cholera and dysentery. Though the respective diseases are unique, these two agents go logically together for several practical reasons. They both occur in epidemics, affect all age groups, are transmitted through fecal-oral routes, and have a high fatality ratio if not treated appropriately. Furthermore, many of the preventive interventions for one are also effective for the other. From a logistical and administrative viewpoint, coordinating committees can be of great usefulness in attacking both diseases. Clinical and laboratory surveillance is needed to detect and monitor the course of the epidemics and the antibiotic sensitivity patterns of the pathogens. Finally, many of the countries affected by one epidemic are also affected by the other; thus, a joint effort would seem most beneficial.

Summary of Recommendations

Support a cooperative effort with WHO on epidemic diarrhea control in Africa, but increase the emphasis of this effort toward dysentery.

Encourage the development of national coordinating committees for epidemic diarrhea in African countries under the threat of cholera and Shiga's bacillus.

Develop country specific program for epidemic diarrhea control based on the checklist. The program should stress:

- Prevention
- Policy for appropriate antibiotics
- Training of health personnel
- Epidemiologic and laboratory surveillance
- Coordination between cholera and shigella control efforts

Target one country for emphasis in shigellosis control.

Carry out selected biomedical research projects to provide tools for above control strategy.

Carry out selected social science operations research projects to better target IEC and commercial intervention.

Sponsor a meeting on control of dysentery in Africa.

Hence, for many practical reasons, an intervention strategy for shigellosis should include cholera. While favoring a joint strategy, certain differences between the two diseases must also be recognized. Disease symptoms and the clinical management of the two are quite distinct, and the benefit of case management is relatively lower with shigellosis. For example, good case management for cholera lowers the case fatality rates from 40 percent to less than 1 percent using very simple intravenous and oral rehydration techniques. With dysentery, case fatality rates decrease from 10 to 20 percent to 2 to 5 percent with appropriate antibiotics and supportive care. However, this care is considerably more expensive, and patients may develop unusual and chronic complications that are not seen in cholera. Training and improvement in case management is thus important for both, but expectations should be lower, and inputs will be higher with dysentery.

Development of Country Plans in Cooperation with the Ministries of Health and Other Donors

In developing the strategy for epidemic diarrhea, planners should understand differences among countries, and host-country decisionmakers should be making the plans. USAID should provide consultants who can provide technical assistance in developing the plans.

Combination of Activities

There is no simple intervention for either of the epidemic diarrheal diseases. Both require a multicomponent program to decrease risk, treat those with illness, and minimize the complications of the illnesses. To assist in developing a multicomponent national strategy, a checklist was developed for cholera. It has now been updated for use with dysentery and epidemic diarrhea with special reference to Africa. The components include a) planning/management/administration, b) case management, c) training of health professionals, d) epidemiology/surveillance, e) water and sanitation, f) personal/family hygiene, g) laboratory services, h) logistics and supply, and i) information/education/ communication. The checklist is not a set of instructions about how to control epidemic diarrhea; rather, it provides a framework for dialogue between consultants and ministry officials for jointly developing a plan that is country-specific and specific to the resources and constraints of the society.

Target One Country or Small Area

While many countries have been affected by the dysentery epidemic, it may not be possible for USAID to work in all of them. Since there are no examples of successful national strategies for the control of epidemic diarrhea in Africa, it may be wise to begin working in one or two countries to develop such a strategy, and to proceed step-by-step, and thereby build

experience. The emphasis countries should have: a) expressed interest from the MOH in developing a shigellosis control strategy, b) a research center that can collaborate with the MOH or NGOs in evaluating strategies, and c) a suitable diagnostic laboratory facility interested in collaborating with scientists/public health officials.

Research and Evaluation

USAID should support a range of research activities that will be directly useful in Africa within the next one to five years. Many of these activities are related to the clinical aspects of shigella, or to the social sciences, and some are more basic and biomedical. The biomedical areas suggested will directly relate to control activities and should either clarify or simplify them. Some of these activities are fairly simple adaptations that solve practical problems in the field; others address more complex research issues for eventual control of the problem.

Some biomedical research projects with immediate relevance to controlling the epidemic include:

Developing an appropriate use of rapid diagnostic tests for appropriate categorization of a case as watery diarrhea or dysentery, rapid detection of cholera and epidemic dysentery infections in surveillance systems, and a simpler method for determinng antibiotic sensitivity of the strains detected. These tests should be cheaper, faster, more adaptable to field conditions, and should yield more reliable information than the current methods, especially for dysentery. Development and appropriate use of rapid and inexpensive assays would improve clinical practice and avoid unnecessary use of antibiotics.

Determining the interaction of dysentery and HIV infection, especially in relation to response to treatment and in the potential of AIDS patients being a reservoir for infection.

Identifying patients who will benefit from more aggressive nutritional rehabilitation.

Identifying the risks of the use of inappropriate antibiotics.

In addition to these applied research projects with immediate application, the development of a shigella vaccine should be given high priority. Bacterial genetics has progressed rapidly in recent years, and a bivalent cholera-Shiga vaccine could be within reach within three to four years. Such a vaccine would contain protective antigens of both bacteria, but it could be safely given by mouth, without the need for an injection. If such a vaccine were developed, a single oral vaccine could be given that could protect against both diseases. While a vaccine would

not solve the root socioeconomic causes of diarrheal diseases, it would prevent many deaths, especially in Africa where the fatality rates of these diseases is so high.

The development of such a vaccine would require research funding by USAID. However, if a mechanism were found for funding such a project in a cooperative manner between for-profit and not-for-profit groups, a successful outcome would be highly likely at moderate cost. Though scientifically feasible with current technology, this type of vaccine development has not been a high priority of pharmaceutical companies, because they do not see sufficient profits from the development of a vaccine that will be used exclusively in poor countries.

Social Science Research

Among the social science research projects with immediate relevance are the following: a) identification of country-specific risk factors for transmission of Shiga's bacillus, b) identification of acceptable methods for water purification and food storage, c) development of market strategies for promoting the appropriate use of soap, and d) identification of constraints to access to medical care.

Sponsor a Conference on Control of Dysentery in Africa

As USAID's strategy becomes more clearly defined, increased awareness of the problem is needed by the donors, scientists, public health officials, and ministries. A major meeting bringing these groups together can highlight opportunities for successful control of epidemic diarrhea, and can also be used to strengthen the concept of carrying out the programs within the context of the CDD program.

CHECKLISTS FOR EPIDEMIC DIARRHEA

In response to the dysentery epidemic in Africa, the Technologies for Primary Health Care (PRITECH) project prepared checklists to assist with control of epidemic diseases. The checklists are intended to provide guidance for the formulation and review of national and regional control plans. PRITECH adapted the checklists from a similar document developed for the control of cholera in Latin America, following a review of literature sources, relevant publications from WHO, and clinical experience. The checklists are divided into a short *Administrative Checklist* that will likely be more useful for administrators tracking activities and nine detailed *Technical Checklists* that should be useful for planners attempting to organize the technical activities. These checklists may be useful to several groups, including: diarrhea epidemic coordinating committees developing a national plan, for whom the checklists are intended to illustrate the various components of the plan; consultants reviewing national plans, for whom the checklist will serve as a reminder of the types of components and indicators usually expected in a plan; health administrators, for whom the checklist will assist in defining the types of technical assistance that might be appropriate for a country dealing with epidemics of dysentery or cholera; and students of public health, for whom the checklist will illustrate the multifaceted nature of cholera and epidemic dysentery.

The checklists were devised with the assumption that a coordination committee is responsible for epidemic diarrhea control activities, and that it must secure cooperation from various ministries, donor agencies, NGOs, and industry. The primary role of the committee is policy development, coordination, and monitoring. To carry out the work, most committees have representation from several agencies, disciplines, and groups, including the national CDD program (probably the lead agency), physicians, nurses, water/sanitation, communications, epidemiology, logistics, laboratory services, hospital administration, training, high-risk minority groups, and tourism. Most country plans will cover the following major areas:

Planning/Management/Administration
Training of Health Professionals
Water and Sanitation
Laboratory Services
Information, Education, Communication
Case Management
Epidemiology and Surveillance
Personal and Family Hygiene
Logistics and Supply

Not all areas are equally important—clear prioritization is necessary. Some activities are

immediately life-saving, while others will be of longer-term benefit. Each activity should be undertaken with clear lines of responsibility so that it can be carried out with a minimum of duplication.

The checklists are formatted as a series of questions that allows the reviewer to assess the situation and determine whether plans have been formulated. A national committee is unlikely to have answers for every item on the technical checklists, and there is not necessarily a correct answer to every item. When information is unavailable, it will be necessary to determine whether it is important; if not, nothing further need be done. However, the lack of information may bring attention to an overlooked area. The annotations that accompany each checklist provide some guidance as to appropriate directions, but each national committee must develop a strategy it feels is most appropriate.

Few of the activities or interventions suggested by the checklist have been evaluated in a systematic "scientific" manner; however, from all available evidence, the components described here are thought to be effective in controlling epidemic diarrhea. The final list covers a number of activities that are often included in cholera plans but are controversial, of limited or no benefit, or even detrimental.

Administrative Checklist

	Plan exists?	Agencies involved?	Last evaluation?
1. Planning/Management/Administration • National plan • Coordination of implementation • Donor coordination • Program evaluation			
2. Case management • Treatment standards • Indicators developed • Accessibility of care			
3. Training of health professionals • Linked to CDD • Training courses for MDs • Training for health workers • Continuing education			
4. Epidemiology and Surveillance • Definitions established • Reporting system • Rapid response team			
5. Water and sanitation • Personal and family hygiene • Municipal water • Non-municipal water • Long-term issues in water and sanitation • Solid waste • Excreta collection • Excreta disposal and waste water treatment			
6. Laboratory services • Appropriate use of lab? • Technical capabilities			
7. Logistics and supply • ORS, intravenous, and antibiotics • Supplies for remote areas • Inventory system?			
8. Information, education, communication • Strategy developed?			
9. Avoidance of unnecessary activities • No vaccine at borders • No or limited prophylactic antibiotics • Avoiding unnecessary isolation			

1. Planning/Management/Administration

This list emphasizes the need for a national coordinating body to formulate a national strategy to control epidemic diarrhea and to include important elements into the policy. It also emphasizes the need to garner the available resources both within the country and from outside donor sources, and to prepare realistic plans within available budgets.

Planning/Management/Administration	Notes/Comments
Has a national coordination committee for epidemic diarrhea (CCED) been established?	
What is the frequency of the CCED meetings?	
Have a policy for epidemic diarrhea and a plan been formulated?	
Are appropriate antibiotics available at the Diarrheal Treatment Centers (DTC)? What antibiotics are available? What was the lab and epidemiologic basis for the selection of the antibiotic used?	
Does the policy have a stated and realistic goal?	
Do the goals have measurable outcomes?	
Have communication channels been established with regions, districts, and municipalities to report cases and permit a smooth flow of information?	
Has communication been established between the national CCED and WHO CDR?	
Has communication been established between the national CCED and possible donors and outside technical resources?	
What is the relation of the CCED to the CDD program? Will the CCED enhance the CDD program?	
Have economic aspects of the control plan been considered? If the budget must be cut, what activities will be scaled back or eliminated?	

2. Case Management

Case Management I: Items that indicate the medical system's ability to give life-saving care during an epidemic.

Treatment of epidemic diarrhea patients depends on the ability of trained health persons to administer rehydration rapidly, and on the capability of patients to reach and have access to proper care. For those living in remote areas, rapid response may be needed to bring care to the patients—thus improving accessibility.

Case Management I	Notes/Comments
Have specific hospitals and DTCs been clearly identified as being available for epidemic diarrhea treatment?	
Are flow sheets illustrating management of cholera and shigellosis cases prepared and available to medical staff? Are they posted in the DTC?	
Does the flow sheet clearly provide type and volume of fluids, antibiotic selection, and doses?	
Are appropriate I.V. polyelectrolyte solutions available at the DTC? What are the names (and formulas) of the solutions and do they conform to acceptable standards? Are they available in sufficient quantities?	
Are appropriate ORT solutions available at the hospitals/treatment centers? Are they available in sufficient quantities?	
Does the ORT solution conform to WHO formula?	
Are cholera cots available at each of the DTCs?	
Among the physicians who are to treat cholera and dysentery patients, how many have been trained in clinical management?	
Is there a schedule for training these physicians in case management of diarrhea so that more than 90 percent will be trained within six months?	
Among the nurses who are to treat cholera and dysentery patients, how many have been trained in clinical management?	
Is there a schedule for training these nurses in case management of diarrhea so that more than 90 percent will be trained within six months?	

Case Management II: Items that indicate that medical care is accessible.

Most diarrhea-related deaths occur among persons who do not have ready access to care. Though poor access is usually thought to be related to geographic distance from health facilities, it may also be related to social distance due to language, ethnic, or socioeconomic separation. Subgroups within urban or rural areas may be at high risk, but have poor access, and these groups need to be specially targeted for treatment. For epidemic diarrhea, treatment delayed is treatment denied.

Case Management II	Notes/Comments
What proportion of households are within two hours of a DTC/hospital? How does this differ between urban and rural areas?	
Have certain groups been identified who have poor access because of geographic remoteness, language, cultural, or economic barriers?	
Have plans been formulated to provide medical care to these groups?	
Has a rapid-response team been formed to serve remote areas affected by epidemics?	
Has a supply kit been formulated for rapid-response teams?	
Are the cholera/dysentery supply kits ready and available?	

3. Epidemiology and Surveillance

Cholera and epidemic dysentery tend to appear multi-focally, striking certain areas and populations. Early detection of epidemics assists appropriate resource allocation. National surveillance and reporting of cases to WHO allow the problem to be monitored on an international scale. Reporting of cases depends on case definitions; generally a case needs to be confirmed bacteriologically only if it is among the first in a new area. After cholera or SD1 is known to be occurring in an area, a clinical case definition can be used, and a sample system can monitor the epidemic. Tracking cases can also assist in developing intervention strategies. For example, health education messages can warn the population against foods or water known to be high-risk, and medical care can be directed toward high-risk groups. In addition to monitoring cases, identifying and reporting complications and deaths can provide an index of the quality of care. If cholera is being well managed, rates of renal failure or death should be less than 0.5 percent. Higher rates signal the need for additional interventions or improved treatment strategies. Though not all dysentery is preventable, the case fatality rate should be under 3 percent.

Epidemiology and Surveillance	Notes/Comments
Is there a monitoring system for counting and mapping cholera and dysentery cases?	
Is there a system for reporting the surveillance information to the medical community?	
Is there a standard "case definition" for the following terms— "cholera case," " cholera complication," "cholera death," "dysentery case," "dysentery complication," and "dysentery death"? Does a cholera case depend on laboratory confirmation?	
Based on knowledge of cholera and dysentery epidemiology, have high-risk vehicles of transmission (e.g., certain foods or certain water types) been identified for the country?	
Has a rapid-response team been formed to investigate and treat outbreaks of cholera and/or dysentery?	
Is there a clear definition of what type of outbreak will stimulate an investigation by the rapid-response team?	
Has an instrument been developed for data collection by the rapid-response team?	
Has a case-control-study protocol been developed to identify high-risk activities or vehicles of transmission?	
Is there a system for sampling a proportion of cholera and dysentery cases for bacteriologic confirmation?	

Are travelers from cholera and dysentery endemic areas being advised (via a handout) to report to a treatment facility if they develop diarrhea?	

4. Training of Health Professionals

Quality of care provided by the DTC will depend on the knowledge and abilities of the medical staff as well as on the availability of the resources. Improving knowledge and skills of the medical staff will likely start with workshops, courses, and conferences, but must continue to be reinforced with continuing education and messages. An especially important component of the training is the hands-on treatment of cholera patients under supervision, followed by the availability of reference materials when treating patients independently (to clarify certain details that may not have been remembered accurately).

Training of Health Professionals	Notes/Comments
Have brochures stating national policies on epidemic diarrhea treatment been published?	
Have WHO manuals of treatment of cholera and dysentery (or comparable manuals) been distributed to appropriate physicians and DTCs?	
Have national/district/municipal workshops on epidemic diarrhea treatment been held for physicians? Does a cholera case depend on laboratory confirmation?	
Have national/district/municipal workshops on epidemic diarrhea been held for nurses?	
Have the workshops stressed practical "hands-on" treatment of patients?	
Have national medical journals included review articles on treatment of cholera and dysentery?	
Have regular reports been provided to health personnel on the dysentery and cholera situation in country?	
Has there been a program of medical conferences in teaching and municipal hospitals on epidemic diarrhea?	
Has a national or regional cholera/dysentery training center been established?	

5. Water and Sanitation

Improved water and sanitation can cut the numbers of cholera and dysentery cases dramatically by decreasing rates of secondary spread. Secondary spread can be divided into intercommunity spread, interfamily spread, and intrafamily spread. The many vehicles that can transmit cholera and dysentery make it difficult to stop all spread; however, fairly simple measures can decrease rates. Water and sanitation is often thought to depend on huge capital investment (e.g., municipal water and sewage systems) and, in the long run, this is true. However, in the short run, many improvements can be made by families and individuals that will decrease risk.

Water and Sanitation 1: Personal and Family Hygiene	Notes/Comments
Are current behaviors known? Including: **• personal hygiene practices, especially handwashing and bathing** **• water handling practices** **• defecation and excreta disposal practices, including the disposal of infant and children's stools** **• water source selection** **• household disinfection of water, if any** **• solid waste disposal practices**	
If information on current behaviors is not available, is there a plan to collect such information? Are technical resources available to implement the plan?	
Is hand soap available? How widely? Is it affordable?	
How do families without in-house piped water supplies store water inside and outside of the home? Are there small scale improvements, such as spigots on tanks, or small neck containers, that may decrease contamination of stored water supplies?	

Water and Sanitation 2: Municipal Water	Notes/Comments
What proportion of households are served by municipal water? Of these, what proportion have water piped into the home and what proportion are served by public standpipes?	
What proportion of municipal water supplies have facilities for chlorination?	
Is chlorination equipment in working order?	
Is chlorine available? What are the current stocks of chlorine country-wide?	
What are the obstacles to increasing chlorine supplies? Including: • foreign exchange • water authority budget • tariffs • storage facilities	
Is there a system for monitoring chlorine levels? At the treatment plant? In the distribution system? At the tap?	
If collected, are records on chlorine levels available? How are monitoring data used to adjust chlorine levels?	
What is the percent water loss in municipal systems?	
Is there a plan for identifying leaks and repairing them?	
Is there constant positive water pressure in municipal systems? If not, how often is pressure down or negative in municipal systems?	
Are there provisions for water conservation? • public education • rationing system	

Water and Sanitation 3: Non-Municipal Water	Notes/Comments
What is the proportion of households with other water sources? Determine this by type, including: **• protected wells, pumps** **• unprotected wells** **• surface water sources** **• tanker trucks** **• others, as appropriate**	
What is the proportion of households with the primary water source greater than 150 meters from the house?	
What proportion of these water sources are chlorinated (including tanker trucks)?	
Have standard messages been developed for the method of chlorination? Is there a dissemination plan for the messages?	
Are materials available for chlorination of water sources? Are they affordable?	
Can access to potable water be increased in the short run by any of the following? **• improving the tanker truck distribution system** **• digging new wells** **• protecting existing wells** **• tapping springs** **If so, does such a plan exist?**	

Water and Sanitation 4: Long-Term Issues in Water and Sanitation	Notes/Comments
Is there a plan to extend coverage of potable water sytems? Sanitation?	
Does the institutional capacity exist to increase water and sanitation coverage if capital is available? What is the absorptive capacity in five years? Ten years?	
Is there a plan to increase the institutional capacity in the water and sanitation sector?	
Are water tariff systems effective? Are they enforced? Is there a plan to improve tariff systems?	
Does legislation exist that regulates water quality, solid waste disposal, wastewater disposal, and wastewater reuse? Are the standards appropriate? Are they enforced?	
Are there opportunities/needs to introduce or develop new technologies? Including: • latrines that consume less water • alternative methods of water collection and distribution, e.g., rainwater harvesting • exploiting new water sources • low cost sanitation and sewage systems • alternative waste-water treatment technologies	

Water and Sanitation 5: Solid Waste	Notes/Comments
What are the practices of the community? Is solid waste a major concern with regard to cholera and shigella transmission, e.g., do they dispose of fecal matter such as disposable diapers and toilet paper in solid waste?	
Is there a public education campaign regarding solid waste? If so: • Is it appropriate and based on knowledge of the solid waste practices of the community? • Is it targeted to appropriate populations such as children who scavenge in dumps, or mothers who throw diapers in the trash? • Does it provide a realistic, practical alternative to current practices?	
Are disposal sites appropriate, located at safe distance from population centers?	
What are the alternatives to solid waste disposal, such as burning waste or burying waste on a community level?	

Water and Sanitation 6: Excreta Collection	Notes/Comments
What is the percentage of sanitation coverage: **• What percentage of the population is served by on-site excreta disposal (e.g., latrines)?** **• What percentage off-site (e.g., septic tanks, sewers)?** **• What populations are most at risk (e.g., urban slums)?**	
In areas where latrines are used: **• Are they being used correctly** **• Are they placed to avoid contamination of water supply?** **• What are the behaviors of adults vs children vis a vis the latrine?**	
In case of off-site sanitation, where does it go? Is it treated (see section on disposal waste-water)?	
Are education and public awareness campaigns disseminating appropriate messages (culturally and technically correct) regarding latrine usage, etc.?	
Are there opportunities to use new technologies in sanitation collection?	

Water and Sanitation 7: Excreta Disposal and Wastewater Treatment	Notes/Comments
Are there guidelines for disposal of feces for people who are known to be infected (e.g., hospitals)? Are necessary materials available?	
Is wastewater treatment practiced in any municipalities?	
What government body is responsible for wastewater treatment?	
Is there a wastewater re-use program?	
Are there regulations for wastewater use on crops? Are they enforced?	
Are short-term priorities established relating to wastewater treatment?	
What is the state of the sewer systems? Is there cross-contamination of water supplies? Is there a system for detecting problems and repairing the sewer system?	

Water and Sanitation 8: Hospital Sanitation.	Notes/Comments
Are the sewage systems adequate at hospitals where dysentery/cholera patients will be treated?	
Do these hospitals have a plan for disinfecting soiled linens?	
Do these hospitals have a plan for disposal of dysentery/cholera-contaminated solid wastes?	

6. Laboratory Services

Each country should have laboratory capability to confirm cholera and dysentery cases and to monitor the course of the epidemic. Accurate detection of *V. cholerae* and *Sh. dysenteriae* 1 in fecal specimens is not difficult nor expensive for adequately-equipped and staffed laboratories, but careful plans must be formulated to test only appropriate specimens and to use optimal media and methods. Testing specimens from every patient suspected to have cholera or dysentery is clearly not indicated, but confirmation of initial cases in an area, and confirming a sample of cases as the epidemic continues is wise. Periodic antibiotic sensitivity testing is also appropriate from a sample of *V. cholerae* and *Sh. dysenteriae* 1 isolates. Countries with more specialized laboratories will want to carry out additional research on the isolates, but this is not necessary for routine surveillance.

Laboratory Services	Notes/Comments
Does the nation have a plan for collecting fecal specimens from (a sample of) suspected cases?	
Is Cary Blair medium being used as transport medium for suspected cholera cases and buffered glycerol saline for suspected dysentery cases, and does the specimen get plated within 24 hours of collection?	
Does the plan include confirmation of a proportion of cases at a reference laboratory?	
Does the laboratory use TCBS agar and alkaline peptone enrichment for suspected cholera cases and at least two standard enteric media for suspected dysentery cases?	
Are antibiotic sensitivity tests being carried out on a sample of cholera and shigella isolates?	
Have the central laboratories participated in a workshop on cholera and shigella identification within two years?	
Does the laboratory report cholera and shigella results to the national authorities at least monthly?	

7. Logistics and Supply

Effective care of patients depends on adequate availability of supplies and equipment and an optimal system in which to work. Treatment is therefore not only the job of the clinician, but of a team of persons working within a system to ensure that the rehydration fluids, antibiotics, and other supplies, as well as the expertise, are all provided to patients in need. To develop a logistics system that is not only effective, but also cost-effective, careful planning is needed to be sure that supplies are available, overstocking of supplies is avoided, and that supplies are purchased at reasonable prices. In the midst of epidemics, panic frequently results in unwise purchases and inefficient planning.

Logistics and Supply	Notes/Comments
Has an estimate of the numbers of cases of cholera and dysentery expected been prepared with an estimate of the timing of the cases?	
Has a plan been prepared for procuring supplies for the estimated number of cases? What was the method used to estimate the supply lists?	
Is there a list of vendors, prices, and plans for procuring cholera and dysentery supplies?	
Is there a plan for distributing the supplies to centers around the country?	
Which supplies will be procured locally and which from international sources?	
Are supplies, antibiotics, fluids, etc. being obtained from reputable suppliers at optimal prices? Is there evidence of "comparison shopping"?	
How will logistics for epidemic diarrhea control be coordinated with logistics for other activities of the CDD or other programs?	
Are the logistic requirements sustainable within CDD or Essential Drugs Programs?	

8. Information, Education, Communication

Education of the public is an important component of a control strategy so that families can avoid high risk behavior and seek medical care when appropriate. Common mistakes have been: a) raising the awareness of the dangers without sufficient information to let families know what cholera and dysentery are, how they can be prevented, and where to seek treatment; b) delivering mixed or conflicting messages that leave the population confused; and c) providing excessive numbers of messages so that none has the required impact. Because of the panic that often accompanies an epidemic, information needs to be presented effectively, but in a manner that does not unnecessarily raise additional panic. Epidemic diarrhea often stimulates rumors, and educational messages are needed to correct misunderstandings about its transmission, its symptoms, and treatment.

Communication messages that are directed towards policymakers can also be significant stimuli toward correcting long-neglected problems of poor sanitation and contaminated water. An educated public is more likely to demand needed services and can help direct public policy.

Information, Education, Communication (IEC)	Notes/Comments
What are the major agencies, both implementing agencies and donors, involved in IEC work on epidemic diarrhea? What are the resources available to them?	
Has a communication coordinating committee been established (e.g., including representatives from the MOH, the media, PVOs, churches, food industry, tourist industry)?	
Have necessary linkages been established between the communication component and other related components, e.g., policy and training, to ensure consistent and technically correct messages?	
Has a formal communication plan been written? Have specific objectives been articulated in the context of the country's overall policy (i.e., increase awareness of the threat; teach effective management of cases; teach essential prevention behaviors)?	
Have target audience segments been clearly identified and prioritized (e.g., special risk groups)?	
Have specific behaviors to be changed been identified for each target group?	
Has any research been carried out among target groups to investigate knowledge, attitudes, and practices relevant to cholera and dysentery?	
Has the information contained in the communication plan been summarized in a creative brief to guide the development of communication materials?	
What communication materials have already been produced—brochures, radio, TV spots, documentaries, instructional videos, posters, etc.? How were they developed? Who are the target audiences? Were the materials pre-tested within the target audience?	
What resources are available for future communication work on epidemic diarrhea in the areas of consumer research? Communication strategy and planning? Media production?	
Have the IEC messages been checked for consistency?	
Has the timing of the IEC activities been considered in relation to the epidemic and to other important events (e.g., festivals or holidays)?	
Has the cost of the IEC activities been determined?	

9. Avoidance of Unnecessary and Controversial Measures

In the past many measures have been taken that have been either counterproductive, ineffective, or distracting. For example, the injectable cholera vaccine is no longer recommended, yet a few border stations still require it for travelers crossing borders. Prophylactic antibiotics have, in the past, been used indiscriminately, leading to the emergence of antibiotic resistant strains. Nonspecific and ineffective antidiarrheal drugs have been used and unnecessary isolation of patients has been carried out. Each of these detracts from the central mission of caring for patients effectively and minimizing the rate of disease transmission.

Avoidance of Unnecessary and Controversial Measures	Notes/Comments
Cholera vaccine is not being given?	
Prophylactic antibiotics are not being given (except perhaps single dose doxycycline to immediate family members of cholera patients)?	
Vaccination is not required for travelers at the airport or other border crossings?	
Antidiarrheal drugs (e.g., Lomotil, steroids, etc.) are not being given?	
Cholera attendants are not carrying out unnecessary precautions (e.g., routine gowns and gloves and masks)?	
Duplication and/or contradiction with CDD activities is being avoided?	

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