AN ASSESSMENT OF EPIDEMIC CHOLERA IN THE GAZA STRIP
NOVEMBER 1994

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BASICS Technical Directive No: 000 HT 04 300
USAID Contract No: HRN-6006-C-00-3031-00
# TABLE OF CONTENTS

ABBREVIATIONS

EXECUTIVE SUMMARY ................................................................. 1

I. PURPOSE OF VISIT/SCOPE OF WORK .............................................. 5

II. BACKGROUND ........................................................................ 5
   A. General Background ............................................................... 5
   B. Demographics ..................................................................... 6
   C. Health Indicators ................................................................. 6
   D. Structure of the Health Care System ...................................... 6
   E. Disease Surveillance System .................................................. 7

III. DESCRIPTION OF THE OUTBREAK ............................................. 8

IV. METHODS .................................................................................. 9

V. ASSESSMENT AND RECOMMENDATIONS ...................................... 10
   A. Coordinating Committee ....................................................... 10
   B. Cholera Policy .................................................................... 11
   C. Surveillance and Epidemiology .............................................. 13
   D. Case-Control Study .............................................................. 15
   E. Case Management ................................................................ 16
   F. Laboratory ........................................................................... 17
   G. Drugs and Supplies ............................................................... 19
   H. Public Health Education ....................................................... 20
   I. Environment, Water and Sanitation ....................................... 21

APPENDICES

Appendix A: Bibliography
Appendix B: Principal Persons Met
## ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASICS</td>
<td>Basic Support for Institutionalizing Child Survival</td>
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<tr>
<td>CDC</td>
<td>Centers for Disease Control and Prevention</td>
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<td>EHP</td>
<td>Environmental Health Project</td>
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<td>MOH</td>
<td>Ministry of Health</td>
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<td>NGO</td>
<td>Nongovernmental Organization</td>
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<td>ORS</td>
<td>Oral Rehydration Solution</td>
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<td>TABS</td>
<td>Thiosulfate Citrate Bile Salts Sucrose Agar</td>
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<td>UNRWA</td>
<td>United Nations Relief and Works Association</td>
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<td>USAID</td>
<td>United States Agency for International Development</td>
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<td>WHO</td>
<td>World Health Organization</td>
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EXECUTIVE SUMMARY

On November 9, 1994, the Minister of Health in the Gaza Strip requested that the United States Agency for International Development (USAID) in Jerusalem provide assistance with the management of epidemic cholera. USAID mobilized a team from the Centers for Disease Control and Prevention (CDC), the USAID/BASICS project, and the USAID/Environmental Health Project. The team was asked to work collaboratively with the MOH, UNRWA, WHO and nongovernmental organizations to attempt to identify a source of the outbreak and to assist with the cholera control program. The team arrived in the Gaza Strip on November 11, 1994.

On November 4, 1994, a case of culture-confirmed cholera was reported from the Shejaia area of Gaza City. The first case was in a 35 year old woman who was admitted to the hospital on November 2, 1994, with symptoms of watery diarrhea. The organism was characterized as *Vibrio cholerae* O1, biotype El Tor, by the local laboratory. The Ministry of Health responded rapidly by forming a cholera coordinating committee and by establishing three hospitals in Gaza City as cholera treatment centers. All MOH and UNRWA health clinics were notified of the cholera outbreak and instructed to refer all suspected cases to the central Shifa hospital (for adults) or the pediatric hospital (for children under 18 years of age).

Data are available only on culture confirmed infections with *V. cholerae* O1. All isolates were found to be biotype El Tor and serotype Ogawa. These results were confirmed by the Israeli Ministry of Health laboratory and the Centers for Disease Control and Prevention. As of November 21, there were 82 persons with culture-positive infections, 13 (16 percent) were asymptomatic contacts of 69 cases with diarrhea. Cases peaked on November 10, six days after the first confirmed case, and subsequently progressively declined. One death was reported (a two year old boy who arrived at hospital severely dehydrated) for a case-fatality ratio of 1.4 percent.

More than 65 percent of the 69 cases were 20 years of age or younger; only 17 percent of cases were over 30 years of age. Fifty-seven percent of cases were female and 43 percent male.

The assessment and recommendations of the USAID team are summarized by each key area below:

**Coordinating Committee**

**Assessment:** The MOH responded rapidly and appropriately by forming a coordinating committee of representatives from the Ministry, clinical and preventive medicine, epidemiology, health education and environment.

**Recommendation:** The committee could benefit from more participation from environmental health specialists.
Cholera Policy

**Assessment:** Many neighboring countries applied inappropriate quarantine and restrictions on the passage of persons and produce from the Gaza Strip. The MOH was forced to vaccinate travelers to Egypt and Jordan. WHO has determined that cholera vaccination has low efficacy for preventing cholera and does not prevent carriage. Restrictions on the movement of persons or produce has never been shown to prevent the spread of cholera across borders as up to 90 percent of infected persons are asymptomatic.

**Recommendations:** The MOH should formulate clear policies based on WHO guidelines, on the inappropriate practices of food trade restriction, vaccination, and mass antibiotic treatments, and disseminate the policies to surrounding countries.

Surveillance and Epidemiology

**Assessment:** All culture positive cases are confirmed at the Central Laboratory and reported to the MOH daily. There is no standard case definition or standard case reporting form for all health care agencies in Gaza Strip. Surveillance data is not routinely summarized and reported back to reporting health care agencies.

**Recommendations:** The MOH should adopt the following WHO surveillance case definition for cholera for the duration of the epidemic period:

*Watery diarrhea in a patient 5 years of age or older in an area where an epidemic is occurring.*

Standard case report forms and standard case definitions and a weekly summary of cholera data should be disseminated to health care agencies.

Case-Control Study

**Assessment:** Results of the case-control study suggest that failure to wash vegetables that are eaten raw and the consumption of foods and beverages sold by mobile food traders may be associated with cholera transmission. A lack of soap and water in the household may also increase the risk of cholera transmission. Further analysis is pending.

**Recommendations:** The MOH should investigate the standard practices of mobile food traders to determine if regulatory activity is indicated. Health education programs should stress the importance of washing vegetables that are to be eaten raw, and hand washing with soap. Farmers should be discouraged from irrigating vegetables with sewage.
Case Management

Assessment: Both symptomatic culture-positive cholera cases and asymptomatic culture-positive contacts are admitted to hospital and given a three to five day course of doxycycline in a dedicated isolation hospital. They are released after three consecutively negative stool cultures. All contacts are given doxycycline. Patients that were capable of taking oral fluids were often given intravenous rehydration.

Recommendations: Oral rehydration solution (ORS) should be the mainstay for cholera patients with mild or moderate dehydration. Ringers lactate intravenous solution and antibiotics should be used only for the treatment of severe cases. If antibiotics are to be used, a single 300 mg dose of doxycycline would be the regimen of choice. The MOH should only hospitalize patients that require intravenous rehydration and abandon the hospital isolation policy and routine culture of contacts. Patients treated with intravenous therapy should be transferred to ORS as soon as possible as it is cheaper and has fewer complications.

Laboratory

Assessment: The laboratory staff are using standard international practices for the isolation and identification of Vibrio cholerae. The laboratory is having difficulty maintaining the workload demanded by the above policies.

Recommendations: Stool cultures need not be performed on all suspect cases. Weekly cultures of a representative sample of suspect cases can confirm the continued presence of cholera in the area. Antimicrobial susceptibilities should be monitored on a monthly basis by referring isolates to a reference laboratory.

Drugs and Supplies

Assessment: The central pharmacy did not have a large buffer stock of supplies at the beginning of the outbreak and rapidly depleted supplies of antibiotics and intravenous rehydration fluids suggesting they were being overused. Supplies will last longer if they are used in accordance with WHO guidelines.

Recommendations: Requests for supplies should be based on WHO estimates of supplies required for managing epidemic cholera which stress the importance of ORS.

Public Health Education

Assessment: Public health education activities have been conducted by the MOH, UNRWA and several NGOs through public meetings, readings at mosques, leaflets, schools, newspapers and clinics.
Recommendations: The MOH should continue to use community-based educational strategies and adapt the simple brief messages developed by WHO for the prevention of cholera in the Gaza Strip. Clinic visits by family members of cases should be used as educational opportunities.

Environment, Water and Sanitation

Assessment: The water supply in the Gaza Strip is drawn from covered underground wells and, since the outbreak, has been closely monitored for chlorination and coliform level. Water supply is intermittent and may allow back flow of sewerage into the distribution system. Both piped and open sewage systems are in use and both can overflow into the streets forming ponds, particularly after heavy rainfall. Food crops were occasionally being irrigated with untreated sewage.

Recommendations: The MOH should reduce fecal coliform monitoring to a weekly basis and continue residual chlorine monitoring at wells and peripheral sites on a daily basis. Flow monitoring devices are required to commence a leak detection program. Additional well water supplies are needed to increase the coverage of the population and maintain 24 hour service to all points in the system. A food safety program for commercial food retailers should be initiated and health education activities should instruct the public on the safe handling and storage of food. Medium to long term projects could included treatment of sewage to make it safe for the irrigation of crops and a complete overhaul of the sewage system.
I. PURPOSE OF VISIT/SCOPE OF WORK

There were three primary objectives for this visit:

1. To work with the MOH in the Gaza Strip to conduct an assessment of the cholera control program by reviewing the available literature, interviewing key officials in the MOH and other governmental organizations, and conducting field visits. This evaluation focused on the following key areas:

   i) Coordinating committee
   ii) Policy and planning
   iii) Cholera surveillance and epidemiology
   iv) Case-management
   v) Laboratory
   vi) Drugs and supplies
   vii) Health education
   viii) Environment, water and sanitation

   The aim of the evaluation was to make recommendations, where necessary, for improving each of these key elements and to discuss strategies for implementing recommendations.

2. To work with the MOH in Gaza to conduct a case-control study to investigate the possible source(s) of epidemic cholera, including designing a questionnaire, conducting interviews with cholera cases and controls, analyzing the data, and making recommendations based on these findings.

3. To present all key findings and recommendations in a joint meeting with members of the MOH, UNRWA, WHO, NGOs and USAID.

II. BACKGROUND

A. General Background

The Gaza Strip is an autonomous area located at the southeast corner of the Mediterranean Sea between Israel and Egypt. It is approximately 40 kilometers long and 5-12 kilometers wide, with a surface area of 365 square kilometers. The country lies between the semi-humid coastal zone of Israel to the north and the arid Sinai Desert of Egypt to the south. The wet season is between October and March and the mean annual rainfall 400 mm. The population is almost exclusively Moslem (99 percent) and literacy rates for both men and women are around 70 percent (1).

The population composition of this area was dramatically altered as a result of the 1947-48 war. An influx of approximately 200,000 refugees tripled the population in the area which became
known as the Gaza Strip. As a consequence, about 70 percent of the population today are refugees or descendants of refugees; half of the refugee population lives in refugee camps or settlements. The population is highly urban, with 75-80 percent of residents (both refugees and non-refugees) living in or near the three principal towns (Gaza, Khan Yunis, Rafah). In addition, there are 16 Jewish settlements located within the Gaza Strip with an estimated total population of between 3000 and 5000 people. These settlements together with the land bridge connecting them with Israel occupy about 80 square kilometers. (1)

Following the 1947-48 war, the Gaza Strip was occupied and controlled administratively by Israel. Peace negotiations between Israel and Palestinian authorities at the end of 1993 resulted in a transfer of power to Palestinian authorities and in May 1994, the Israeli government began withdrawing from the Gaza Strip. As a consequence, an autonomous local government has recently been formed. All government health activities are now controlled and administered by the Palestinian National Health Authority.

B. Demographics

The total permanent population of the Gaza Strip is approximately 800,000, of which about 560,000 are refugees. Of the refugee population, 336,000 live in refugee camps or settlements. Forty percent of the population live in Gaza city. The age structure is characteristic of populations with high total fertility rates; 50 percent of the population is under 15 years of age and 20 percent is under 5 years of age. The recent shift to Palestinian authority has resulted in an increase in movement both into and out of the Gaza Strip, although the effects of this population shift are unclear (2).

C. Health Indicators

In 1993, the total fertility rate was 7.4. Fifty percent of all reported deliveries were conducted at home by midwives or private physicians. In 1993 the infant mortality rate based on death certificate reporting to the Health Authority was 28.7/1000 live births, which was slightly elevated from the rate in 1990 (26.4/1000 live births). The principal causes of infant mortality in 1993 were pneumonia, prematurity, congenital abnormalities, and diarrhea, representing 22 percent, 20 percent, 16 percent and 11 percent respectively of all causes of infant mortality. The mortality rate for children aged 1-4 years was estimated in 1993 to be 1.7/1000. The completeness of death reporting is unclear. (2)

D. Structure of the Health Care System

Health care delivery in the Gaza Strip is provided by three principal groups: the National Health Authority, the United Nations Relief and Works Agency (UNRWA), and several nongovernmental organizations (NGOs). The recently formed Ministry of Health operates 27 primary health care clinics, distributed throughout the five districts of the Gaza Strip, and five hospitals. UNWRA operates 17 primary health care centers and leases 50 beds in a privately run
NGOs provide community-level health care to a number of communities. There are two privately run hospitals.

The three principal health providers have achieved good population coverage. It is estimated that most of the population lives within 2-4 kilometers of a health center and 8-12 kilometers of a hospital. UNRWA provide care for refugees, who are issued a refugee health card; it is estimated that between 60 and 70 percent of the population seeks care at UNRWA clinics. Government clinics provide care for non-refugees who are required to purchase health insurance; it is estimated that 30-40 percent of the population seeks care at government clinics. Government clinics will provide care free of charge to persons 3 years of age or younger, and following the outbreak of cholera agreed to see all patients with diarrhea free of charge. NGOs are estimated to provide care to 5-10 percent of the population.

E. Disease Surveillance System

Routine disease surveillance systems are operated by the Ministry of Health and UNRWA. Information is routinely collected in the following areas:

Ministry of Health

I) **Births and deaths** A vital registration system for births and deaths is in place. Standard birth and death forms are sent to the Gaza Health Services Research Center in the MOH where data are entered into a vital statistics computer program. Completeness and accuracy of death and birth reporting are uncertain.

ii) **Clinic visits (maternal and child care), and vaccinations administered** All government health clinics collect this information monthly on a standard reporting form. Reports are sent to the Gaza Health Services Research Center in the MOH where the information is entered into EPIINFO software.

iii) **Hospital discharge data** Information is collected using standard forms and sent weekly to a separate unit responsible for hospital data management in the MOH. Standard case definitions are not used. Data are entered into a hospital database.

iv) **Infectious diseases** A standard form which collects information on 33 infectious diseases, of which 13 are notifiable, is available. Data return is erratic and irregular and standard case definitions are not used. Data are not entered into a database. Since no routine infectious disease reports are available from health clinics, monthly reports are generated using information from notifiable reports, pediatric hospital records, central laboratory records, blood bank records, and UNRWA weekly infectious disease summaries.
All surveillance information is summarized in a quarterly report produced by the Gaza Health Services Research Center in the Ministry of Health. The report for the second quarter of 1994 is currently available. Data are presented as tables and graphics; rates are not usually calculated.

UNRWA

I) Infectious diseases Routine infectious disease reporting began in 1991. In July 1994, a single page weekly infectious disease summary report which collects information on 20 diseases, of which 6 are notifiable, was introduced. Forms are completed weekly by all UNRWA health clinics and returned to the central UNRWA epidemiology unit in Gaza City where data are entered into EPIINFO software. A standard data collection form is used by all health centers. WHO standard case definitions are used for all disease reporting; standard case definitions have been distributed to all clinics. Completeness and timeliness of reporting are good. Data summaries are produced weekly and used for identifying changes in disease incidence.

III. DESCRIPTION OF THE OUTBREAK

On November 4, 1994, the first case of culture-confirmed cholera was reported from the Shejaia area of Gaza City. The first case was in a 35 year old woman who was admitted to the hospital on November 2, 1994, with symptoms of watery diarrhea. The organism was characterized as Vibrio cholerae 01, biotype El Tor, by the local laboratory. The Ministry of Health responded rapidly by forming a cholera coordinating committee and by establishing three hospitals in Gaza City as cholera treatment centers. All MOH and UNRWA health clinics were notified of the cholera outbreak and instructed to refer all suspected cases to the central Shifa hospital (for adults) or the pediatric hospital (for children <18 years of age). All suspected cases have stool specimens taken and cultured for Vibrio cholerae; suspected cases are all admitted to the hospital until the results of the culture are known. All culture-negative persons are discharged and given a three to five day course of doxycycline. All culture-positive adults and children are sent to a third hospital (the ophthalmic hospital) where they are isolated and treated. Culture-positive persons are discharged after three successive stool specimens are culture-negative for Vibrio cholerae. All asymptomatic family members and close contacts of culture-positive persons are also cultured for Vibrio cholerae, and if culture-positive, are admitted to the central isolation hospital until they have produced three successive culture-negative stools. All family members and contacts are given a course of doxycycline.

Data are available only on culture-confirmed infections with V. cholerae 01. All isolates were found to be biotype El Tor and serotype Ogawa. These results were confirmed by the Israeli Ministry of Health laboratory. Toxin production has not been confirmed. A sample of isolates was sent to the laboratory section of the food borne and diarrheal diseases section of the Centers for Disease Control and Prevention on November 18, 1994, and results are pending. Of the 82
persons with culture-positive infections, 13 (16 percent) were asymptomatic. The following analysis was conducted using the 69 symptomatic persons who were culture-positive for cholera.

By November 20, 1994, a total of 69 symptomatic cases had been confirmed in the Gaza Strip. Fifty eight cases (84 percent) were reported from the Gaza District, with 3 cases in the mid-zone (4.3 percent) and 8 cases in the northern District (12.0 percent). Within the Gaza District, 71 percent of cases were reported from three areas; Shejaia (23 cases), El Tufaah (15 cases) and El Zatoon (11 cases). Only two cases were reported from a refugee settlement (Mughazi). Cases peaked on November 10, six days after the first confirmed case, and subsequently progressively declined. One death was reported (a 2 year old boy who arrived at the hospital severely dehydrated) for a case-fatality ratio of 1.4 percent.

More than 65 percent of cases were 20 years of age or younger; only 17 percent of cases were over 30 years of age. Fifty-seven percent of cases were female and 43 percent male.

On November 9, 1994, the Minister of Health in the Gaza Strip requested that the United States Agency for International Development (USAID) in Jerusalem provide assistance with the management of epidemic cholera. USAID mobilized a team from the Centers for Disease Control and Prevention, the USAID/BASICS project and the USAID/Environmental Health Project. The team was asked to work collaboratively with the MOH, UNRWA, WHO and nongovernmental organizations to attempt to identify a source of the outbreak and to assist with the cholera control program. The team arrived in the Gaza Strip on November 11, 1994.

IV. METHODS

The assessment was conducted by reviewing background literature on the Gaza Strip population, by interviews with key health personnel, visits to local hospitals, laboratories and clinics, and by field visits to communities. For the case-control study, in-depth interviews were conducted with case patients both in the community and in the central isolation hospital. Key health personnel in the MOH, UNRWA, WHO and NGOs were contacted and visits were conducted between November 11-18, 1994 (Appendix A). During the visit, the team presented lectures on epidemic cholera to clinical staff, gave a presentation on cholera control programs to a meeting of NGOs, and worked closely with staff in the epidemiology unit on a cholera database, cholera summary report, and standard cholera reporting form. Findings and recommendations were presented at a meeting with the MOH, UNRWA, WHO, USAID and representatives of NGOs on November 22, 1994. Methods for the case-control study are discussed separately.
V. ASSESSMENT AND RECOMMENDATIONS

This assessment focused on the following nine key areas:

i) Coordinating committee
ii) Policy and planning
iii) Cholera surveillance and epidemiology
iv) Case-control study to identify risk-factors for transmission
v) Case management
vi) Laboratory
vii) Drugs and supplies
viii) Health education
ix) Environment, water and sanitation

A. Coordinating Committee

1. Assessment

World Health Organization (WHO) guidelines call for "an interministerial committee or special task force with appropriate decision-making authority...quickly formed to carry out the coordinating functions..." (3).

A cholera coordinating committee for the management of the outbreak in the Gaza Strip was established by the Minister of Health. The committee is composed of representatives of the clinical staff in cholera treatment hospitals, Ministry of Health staff from preventive medicine, epidemiology, health education and environment, as well as UNRWA and NGO representatives. During the first days of the outbreak, the committee initially met daily and was responsible for the following key activities:

a) presenting the number of culture positive cholera cases each day by district and area
b) notifying MOH and UNRWA health staff of the risk of epidemic cholera and asking all suspected cases of diarrhea to be referred to the central cholera hospitals
c) arranging logistics and supplies for treatment hospitals
d) coordinating environmental monitoring of water and food
e) coordinating public health education activities

By the 18th day of the epidemic, with the number of cases remaining low, daily coordination meetings were no longer necessary; meeting were scheduled bi-weekly. The committee has been
effective for the purposes of coordinating daily activities within the MOH. Environmental specialists have not been well represented on the committee, however, and a number of inappropriate environmental control strategies have been discussed; the committee would benefit from a stronger environmental presence. In addition, the committee has not been very effective for coordinating the activities of other governmental and nongovernmental organizations. It is important that these organizations apply standard MOH policy during any outbreak and that they work cooperatively to respond to the priority needs of the MOH.

2. Recommendations

- The Ministry of Health should consider forming a coordinating committee with governmental (UNRWA, WHO, USAID) and nongovernmental organizations (NGOs) to ensure that all groups are applying MOH cholera policy and to prioritize and coordinate assistance to the MOH.

- Environmental health specialists from both inside and outside the MOH should be invited to attend future committee meetings.

B. Cholera Policy

1. Assessment

Soon after the first cases of cholera were reported by the MOH in the Gaza Strip, Israel, Jordan and Egypt imposed border restrictions in an attempt to control the spread of the disease. Israel imposed a ban on the importation of fruits and vegetables, cut flowers and some canned goods. Jordan and Egypt both instituted a policy which required all persons crossing their borders from the Gaza Strip to present evidence of cholera vaccination. In addition, some individuals crossing into Egypt were required to take a single dose of an antibiotic at the border. As a consequence of the vaccination policy, the MOH began vaccinating travelers to Jordan and Egypt.

Restrictions on food trade

According to the WHO, "travel and trade restrictions between countries or different areas within a country do not prevent the spread of cholera" (3) and these measures have never been effective in preventing the spread of the disease. A large number of tests carried out on commercially imported foods from cholera-affected countries have not detected *Vibrio cholerae* 01 and the organism is not efficiently carried across borders on food. Although sporadic cases have occurred, "...WHO has not documented a significant outbreak of cholera from commercially imported food." (3). Currently, the risk of cholera transmission through international food trade is considered to be low, and embargo on the importation of foods are not considered an effective or appropriate measure. Although Israel has subsequently eased some of its restrictions on fruits and vegetables, it is important that the MOH establish a clear policy on food trade based on WHO recommendations; this policy should be disseminated to surrounding countries.
Cholera vaccine

The currently available parenterally administered cholera vaccines are not recommended for the following reasons:

- The vaccine is not very potent or effective; at best 50 percent of vaccinated persons receive some protection.
- Any protection that does occur lasts for only three to six months.
- Vaccination does not reduce the incidence of asymptomatic infections or prevent the spread of the infection.
- Vaccination can give a false sense of security to those who are vaccinated, who may then neglect other more effective measures.
- Vaccination campaigns divert resources from more effective cholera control activities.

Vaccination cannot, therefore, protect a community from importation of the vibrio (4). The MOH should establish a clear policy on the use of cholera vaccine and ensure that this policy is disseminated to surrounding countries.

The use of antibiotics at borders

The mass distribution of doxycycline at borders is not recommended for the following reasons:

- Large-scale use of doxycycline will increase the likelihood that resistant strains of Vibrio cholerae will develop.
- There is no evidence to support that the cholera now reported in Gaza is coming from outside the country. It is more likely that cholera is now circulating inside the country.
- The effect of an antibiotic lasts for only a few days; people can then be re-infected.
- Doxycycline is not recommended for use in pregnant women or children younger than 8 years of age; these persons should not be treated. Mass treatment increases the likelihood that these groups will receive antibiotics inappropriately.
- Mass distribution of an antibiotic is expensive because of personnel and drug costs; resources will be diverted from strategies which are well known to be
effective for the management of cholera (case management, water, sanitation, and hygiene).

- Mass border chemoprophylaxis is actively discouraged by all international health authorities.

The MOH should establish a clear policy on the use of mass antibiotic distribution at borders and ensure that this policy is disseminated to surrounding countries.

Cholera in the Gaza Strip should be seen as part of a regional problem rather than a local one. Conditions in many countries and considerable population movement throughout the region will favor transmission of the disease; policies and guidelines for managing the disease should be standardized throughout the region. It would be useful to put together a coordinating body with representatives from several countries in the region; the WHO regional office in Alexandria, Egypt, may be the best able to arrange such a group.

2. **Recommendations**

- The MOH should formulate clear policies on the use of food trade restrictions, vaccination, and mass antibiotic treatment based on WHO guidelines. These policies would be disseminated to surrounding countries.

- The regional office of WHO should consider arranging a regional cholera coordinating committee to develop clear policies and control strategies for cholera in the region.

C. **Surveillance and Epidemiology**

1. **Assessment**

   Reporting system

Health care workers in all clinics have been informed of the risk of epidemic cholera and instructed to refer all suspected cases to the central adult and pediatric hospitals. Standard case definitions for cholera are not used. Culture-positive cases are reported daily to the MOH. The name, location, age, and sex of all cases are reported. Information on whether cases were symptomatic or asymptomatic is not routinely recorded.

Surveillance data on cholera cases are not reported using a standardized format. Incidence and mortality rates are not routinely calculated. Graphics are not routinely used to summarize tables and lists. There is no organized system for sending a summary of weekly surveillance information to health personnel at central, district, or local levels, or to Ministries of Health in other countries. In addition, there is no organized mechanism for sending this information to
WHO or other governmental and nongovernmental organizations. The WHO recommends the calculation of weekly cholera incidence rates by age and sex, and weekly mortality rates by age and sex (3). Ideally this information should be summarized each week and sent to local health staff, WHO, and other organizations assisting with cholera response activities (3).

**Standard case definitions**

The Ministry of Health currently reports only confirmed cases of cholera. A case of cholera is currently defined as any person who has *V. cholerae* isolated from a stool sample. There is no clear standard case definition for "suspected" cholera being used by health clinics or central treatment hospitals. Since there are no clear case definitions, it is possible that case referral varies among health centers; some areas may be using different criteria for referring suspected cases from others. WHO recommends that standard case definitions be used by all areas reporting cholera (3).

A case of cholera should be defined as

1) **Watery diarrhea in a patient 5 years of age or older in an area where an epidemic is occurring.**

2) **Watery diarrhea with stool culture yielding toxigenic *V. cholerae* 01 in any patient in an area where cholera is not known to be present.**

Cholera should be strongly suspected, even in non-epidemic areas, in a patient 5 years of age or older with profuse watery diarrhea and dehydration. The Ministry of Health should be notified immediately of such cases so that stool cultures can be obtained rapidly and therapy begun.

All suspects and contacts of positive cases are currently being laboratory tested. Intensive use of the laboratory is unlikely to find all persons infected with *V. cholerae* since the majority of infections are asymptomatic and since there is often considerable population movement in communities. In addition, intensive use of the laboratory is very expensive, and can consume resources which could be spent on activities which are known to be effective for cholera. For this reason, laboratory testing is recommended only on the first cases at the beginning of an outbreak and then at regular intervals to check antibiotic sensitivity results. Cholera should then be defined clinically. Each illness meeting the standard case definition is considered to be a case of cholera and reported as such. Culturing contacts of cases is not considered to be a useful control strategy, since it is rarely possible to find all infections: asymptomatic infections are not usually reported. The use of a standard case definition for cholera will allow early detection of the disease in non-epidemic areas. In addition, it will allow epidemic disease to be followed across borders. The Ministry of Health should consider adopting a standard case definition, rather than a laboratory definition of cholera.
Standard reporting forms

Standard reporting forms are not used by the cholera treatment hospitals. Information is not routinely collected on whether cases are symptomatic or asymptomatic. In addition, only the dates of positive stool cultures are recorded. Ideally, only symptomatic cases should be used for cholera surveillance purposes and the date of onset of symptoms is required to plot an outbreak curve. The use of standard forms can improve the accuracy and completeness of data collected and the efficiency with which the data can be obtained. A simple form for all cholera cases which collects information on name, location, age, sex, date of onset, and whether the individual was symptomatic or asymptomatic would be useful. Forms could be collected daily and entered directly into a cholera database.

2. Recommendations

- The MOH should consider adopting the standard case definitions listed above for cholera. Standard definitions should then be distributed to all health workers. If the number of cholera cases increases, the MOH should consider replacing laboratory testing of all cases with a standard clinical case definition.

- The MOH should consider producing a weekly summary of cholera data to be disseminated to MOH staff, field workers, and governmental and nongovernmental organizations. Weekly incidence and mortality rates should be used where possible. Weekly reports should be standardized, brief, and use simple graphics.

- The MOH should consider adopting standard cholera reporting forms for use at the treatment hospitals. Information collected should include whether the patient was symptomatic or asymptomatic and the date of onset of symptoms of clinical disease.

- The MOH should consider developing a simple cholera data-base for epidemic disease surveillance in the infectious disease unit. A simple EPIINFO database may be useful.

- The MOH should consider sharing weekly or monthly cholera surveillance reports with the Ministries of Health in surrounding countries. Sharing cholera surveillance information may encourage regional cooperation.

D. Case-Control Study

A case-control study investigating possible risk-factors for acquiring cholera was conducted. Preliminary results suggest an association between cholera infection and eating unwashed vegetables and eating food sold by street vendors. A full description of the study and final results is reported elsewhere.
E. Case Management

1. Assessment

All persons with cholera are currently admitted to the hospital, where their level of dehydration is assessed and rehydration therapy commenced. Confirmed cholera cases receive doxycycline for five days. Suspected cases who prove culture negative are given a three to five day course of doxycycline and discharged. In addition, family members and contacts are given doxycycline in the home. Assessment and classification of dehydration appears to be consistently practiced. In the isolation hospital, it was noted that several patients capable of taking fluids orally were being treated with intravenous therapy. The most frequently used intravenous solutions were Ringer's lactate and 0.9 percent sodium chloride although 5 percent dextrose solution was being used for some patients. Oral rehydration solution (ORS) was used consistently in the pediatric hospital, but not in the adult hospital, where rice-water was frequently being used for oral rehydration.

Overall the case management of cholera appears to be appropriate with a focus on rapid rehydration. A tendency was noted to over-use intravenous rehydration therapy for mild or moderately dehydrated patients. In addition, antibiotics are currently being over-used.

Rehydration therapy

The majority of clinical cholera patients can be managed with oral rehydration therapy alone. WHO guidelines state that "80-90 percent of cholera patients can usually be adequately treated with ORS solution alone, without intravenous therapy. Intravenous electrolyte solutions should be used only for the initial rehydration of severely dehydrated patients..." (3) It is important that approved formulations of ORS be used since the electrolyte composition of these solutions will replace the electrolyte losses expected in cholera stools; health staff and patients should be instructed in how to make ORS correctly. Rice-water and other locally available fluids are not usually recommended for the management of dehydration due to cholera since they do not contain an appropriate electrolyte composition. In the early stages of the disease, patients often require assistance to drink small volumes frequently. Provided that families are instructed in how to mix and administer ORS correctly, most cholera patients with mild or moderate dehydration can be managed as outpatients.

Use of antibiotics

Antibiotics are only recommended for patients with severe dehydration. Although antibiotics can reduce the duration and severity of symptoms, they do not play a role in the control of cholera epidemics. WHO guidelines state, "The patients who benefit most from antibiotics are those who are severely dehydrated. Indiscriminate use of antibiotics in mild cases can quickly use up supplies and hasten the development of antibiotic resistance among cholera vibrios."(4) The widespread use of antibiotics is expensive, can rapidly lead to the development of antibiotic resistance, and does not prevent the transmission of the disease in communities; individuals
receive a period of brief protection from infection, but within 7-10 days are again susceptible. Patients infected with *Vibrio cholerae* will clear the organism themselves without treatment. Household treatment of family members may be useful if household attack rates are relatively high (greater than 20 percent) but mass chemoprophylaxis is not an effective control measure. The recommended adult dose of doxycycline is 300 mg as a single dose. The doses currently being used in the Gaza Strip are very high, are unlikely to improve the clinical outcome, and they will contribute to the development of antibiotic resistance.

**Isolation policy**

Isolating cholera patients is not an effective cholera control strategy, since it is likely that there are many more undetected, asymptomatic cholera patients in the community. For that reason, it is recommended that most cholera patients be discharged and managed as outpatients with ORS. As mentioned previously, laboratory testing to confirm that the vibrio has been cleared from the stool is not required. Only severely dehydrated patients should be admitted to the hospital. Adopting a policy of outpatient management will considerably reduce the costs of patient management.

2. **Recommendations**

- Oral rehydration solution (ORS) should be the mainstay of cholera treatment for patients with mild or moderate dehydration. An adequate stock of ORS should be obtained.

- Ringers lactate solution should be used for the intravenous rehydration of severely dehydrated patients.

- Antibiotics should only be used for the treatment of severe cases. Antibiotics should not be given to suspected cases and contacts. Patients who are given doxycycline, should receive the recommended dose. Choice of antibiotic should be based on the antibiotic resistance pattern of *V. cholerae*.

- The MOH should consider abandoning the policy of isolating cholera patients and testing stool specimens until they are negative. The majority of cholera patients should be managed as outpatients. Patients who require admission for cholera could be managed at the adult and pediatric hospitals.

**F. Laboratory**

1. **Assessment**

The Ministry of Health central laboratory is located in Gaza City, less than three miles from all three treatment hospitals. A courier service transports whole stool specimens from the hospitals
to the laboratory 24 hours per day. No transport media is used because specimens are carried to the laboratory every one to two hours and immediately placed in enrichment media. After a six to eight hour enrichment in alkaline-peptone water, broth is streaked onto thiosulfate citrate bile salts sucrose agar (TABS) and blood agar plates. To conserve agar, each plate is divided in two and used for two patients. The plates are reviewed 12 hours later and the TABS is subcultured onto non-selective media. The isolate is serogrouped with polyvalent antisera. Antibiotic susceptibles were determined using the disc diffusion method.

By November 21, the central laboratory had received 82 stool specimens that were culture-positive for *Vibrio cholerae* O1. Antibiotic susceptibility testing showed resistance to trimethoprim-sulfamethoxazole and intermediate resistance to doxycycline. All isolates were sensitive to cephalothin, cefotaxime, erythromycin, tetracycline and gentamicin. Fourteen isolates were sent on to the Israeli Ministry of Health laboratory and were confirmed as *Vibrio cholerae* O1 El Tor, serotype Ogawa. The antibiotic resistance pattern was also confirmed.

Currently, laboratory policy is to culture all suspected cases and all contacts of confirmed cases. All culture-positive cases have specimens re-tested until three consecutive negative stool cultures have been obtained. The laboratory has rapidly exhausted the supplies required to continue testing according to the standard laboratory protocol; donations of TABS and polyvalent antisera have been received from the Red Crescent Society, the Israeli Ministry of Health, and the Islamic University of Gaza. In addition, there are shortages of autoclave bags, and the added volume of specimens has created a demand for an additional autoclave and incubator. The laboratory has no dedicated incinerator, and all medical waste is incinerated on the ground behind the laboratory.

According to WHO, "a sufficient number of stool specimens should be examined to identify the causative organism and test its sensitivity to antibiotics. Once the presence of cholera is confirmed, it is not necessary to examine specimens from all cases or contacts. In fact, this should be discouraged since it places an unnecessary burden on laboratory facilities and is not required for effective treatment." The considerable demands placed on the laboratory could not be sustained if a large number of cholera cases occurred.

Laboratory personnel were able to cope with the demands of the outbreak by working extended hours but felt that they lacked the necessary supplies and personnel to deal effectively with any increment in workload.

2. **Recommendations**

- The clinical laboratory staff should continue using their current methodology for isolation and diagnosis of *Vibrio cholerae*.

- Stool cultures need not be cultured from all patients in areas where *V. cholerae* has been confirmed. Weekly cultures of an appropriate group of patients can confirm the continued presence of cholera and track antibiotic resistance.
Repeat cultures need not be performed on stool from persons proven to have V. cholerae.

Stool from asymptomatic contacts of persons with cholera need not be tested.

The laboratory and preventive health services section of the Ministry should negotiate a threshold level of laboratory workload at which the current practice would be suspended and recommendations b to d, above would be enacted.

Isolates of V. cholerae should be forwarded to the Centers for Disease Control and Prevention (CDC) in Atlanta for further testing including antibiotic susceptibility testing using minimal inhibitory concentration technique and molecular subtyping.

G. Drugs and Supplies

1. Assessment

The central pharmacy did not have a large buffer stock at the beginning of the epidemic and supplies of antibiotics, intravenous fluids, and basic materials were quickly depleted. In addition, chlorine stock was reported to be low. There were no buffer stocks available at peripheral sites. A list of urgently required supplies was compiled which included a large number of antibiotics (including trimethoprim/sulfamethoxazole, tetracycline, chloramphenicol, and vibramycin), and intravenous solutions; ORS was not included on this list. The rapid depletion of antibiotics and intravenous solution reflects a tendency to over treat with both. WHO guidelines for ordering supplies for an outbreak of cholera were not used to estimate stock requirements. On November 12, the pharmacy distributed guidelines to 250 private pharmacists in the Gaza Strip instructing them not to give any anti-diarrheal medications to patients presenting to them with diarrhea.

The WHO recommends that "small 'buffer' stocks be placed at local health facilities, larger buffer stocks at district or provincial levels and an adequate emergency stock at a central distribution point. The buffer stocks are additional to the supplies needed to meet normal demands....to allow the distribution system to absorb sudden increases in the demand for specific supplies."(3) Since the Gaza Strip is relatively small, it may not be necessary to have peripheral buffer stock. A central buffer stock is required, however, and stock requirements should be carefully estimated based on current stocks and on those required for cholera management. WHO estimates of the stock requirements for 100 cases of cholera are good guidelines to use (3). Carefully documented stock requirements based on these guidelines should be distributed to governmental and nongovernmental organizations who may be able to provide some supplies during the epidemic period.
2. **Recommendations**

- The MOH should summarize cholera supplies provided, consumed and remaining quantities needed. Stock requirements should be based on WHO estimates of supplies required for managing epidemic cholera. Stock requirements should be distributed to governmental and nongovernmental organizations so that further assistance can be provided. Estimates of ORS requirements are particularly important.

- A buffer stock of cholera treatment supplies should be placed at the central level to prepare for a larger number of cases.

- The recommendations cited above in the "case management" and "laboratory" sections should be followed to conserve resources currently in short supply.

- The pharmacy should continue to educate private pharmacists regarding the management of cholera where possible.

H. **Public Health Education**

1. **Assessment**

Public health education activities have been conducted by the recently formed health education unit in the MOH, as well as UNRWA and several NGOs. Coordination between the MOH and other organizations has been limited; several different messages and approaches to disseminating messages have been used. There are no clear MOH health education guidelines for other governmental and nongovernmental organizations available. Standard WHO health education messages on water, sanitation, latrines, hand-washing, food preparation and seeking prompt medical attention for watery diarrhea were not used. According to WHO, "health education is the key to public awareness and cooperation. An outbreak can be more quickly controlled when people understand how to limit its spread."(3) The MOH health education unit was established in September 1994, and has a limited operating budget. Despite a lack of resources, a large proportion of the population appears to have been reached using the following strategies:

- **Printed materials:** Simple information sheets were produced for school children, for the general public, and for health care workers. Several NGOs had their own information materials. MOH messages were simple and direct. Diarrheal disease information posters are planned.

- **Community groups:** Cholera prevention messages were given to school teachers who taught these messages in classes. In many areas, messages were read out at mosques before praying by religious leaders.
- **Direct contact:** Visits by MOH staff were made to health clinics and many community-based NGOs included cholera education on their community outreach programs.

- **Television:** Television is not an important channel for reaching the population, and it has been used in a limited fashion. Lectures on cholera have been transmitted at night.

It was noted that health workers in hospitals have often not been instructed in how to educate patients when they present with cholera or other diarrhea. The MOH does not yet have a health education program in place for training health educators, developing training materials, or developing training strategies, and these are required in the long term. It is important that the MOH develop clear guidelines for the content of cholera education messages to ensure that the messages by other organizations are in accordance with MOH policies.

2. **Recommendations**

- The MOH should continue using community-based strategies for conducting public cholera education where possible.

- The MOH should consider developing clear health education guidelines based on cholera policy for NGOs and other groups conducting community education activities.

- The MOH should consider adapting the simple, brief messages developed by WHO for the prevention of cholera for use in the Gaza Strip.

- The MOH should consider training health care workers to better educate patients with cholera and their families in simple preventive strategies. Materials could be provided to health care workers for this purpose.

1. **Environment, Water and Sanitation (5-9)**

1. **Assessment of water supply**

**Physical characteristics**

In general, the land surface of the Gaza strip is a layer of sand deposited by west-to-east currents in the Mediterranean Sea from the Nile Delta and the north coast of the Sinai. Offshore winds have carried the sand inland, forming sand dunes. The sand deposits are thicker at the southwest corner of Gaza Strip, becoming thinner to the north and east going inland, and having a maximum thickness between 10 to 25 meters. This sand layer is not continuous being intersected by relatively thin clay formations as well as marine shales and marls. It is also underlain by a calcareous sandstone formation (known as the continental Kurkar formation) which forms four land ridges running roughly parallel to the longitudinal axis of the Gaza Strip. The ridges are
separated by deep depressions with alluvial deposits. The Kurkar formation is the main groundwater aquifer reaching a maximum depth of 180 meters at the sea shore.

The Gaza Strip is bisected in the middle by an intermittent stream (Wadi Gaza) which flows in from Israel in the east and discharges west into the sea. The Wadi Gaza intersects the Kurkar ridges and forms a narrow river channel valley through them. There are no perennial streams nor permanent surface water bodies in the Gaza Strip, although a large number of temporary ponds are formed by storm water runoffs often mixed with raw sewage overflowing from sewers during the rainy season.

Taking the Gaza Strip as a whole, more water is being pumped out of the ground than is being recharged by rainwater and other surface water infiltration. As a result, the groundwater table is being lowered in certain areas and seawater intrusion may already be taking place. There is also mounting evidence from chemical analyses that sewage is leaching into the groundwater aquifer.

**Water supply**

The typical well supply consists of a drilled well with steel casing equipped with an electrically driven turbine pump. The well is superimposed by a concrete block pump house with a concrete slab floor which protects the well from contamination by surface drainage. At some of the newer well sites, there is also a diesel-powered generating set which is used to provide electricity in the case of an electrical power failure. The discharge pipe from the pump is equipped with a flow measuring device, a chlorine solution injection unit, and a sand trap to catch the small amount of sand brought up out of the well. There are usually at least two faucets, one upstream from the point where the chlorine solution is injected where samples for bacteriological analysis are taken and one downstream to obtain samples for chlorine residual testing.

Since the onset of the cholera epidemic, all well water is being chlorinated on a continuous basis. A spot check made of eight wells in the Gaza City system during this assessment showed residual chlorine levels ranging from 1.1 to 3.0 p.p.m. (parts per million) except at one well which showed no residual chlorine. An examination of the chlorine injection unit showed that it had an air block which had stopped the flow of the chlorine solution. This malfunction was immediately corrected and a second sample was taken and tested. This sample produced a reading of 1.6 p.p.m. While these dosage rates are reasonable, the goal is to obtain a chlorine residual of 0.5 p.p.m. at the periphery of the distribution system.

Chlorine residuals are monitored on a daily basis at various points around the periphery of the distribution system. Sampling is done at public places such as schools, hospitals, and markets. Sampling of specific points is not done daily but on a rotation basis covering each point about twice a week. The chlorine residuals are reported to range from 0.3 to 0.5 p.p.m. Spot checks made at the Cliff Hotel and the Palestine Hotel gave readings of 0.1 and 0.5 p.p.m.. While these results are not perfect, they do indicate that a concerted effort is being made to provide a safe water supply. Since the goal of chlorination is to obtain a residual of 0.5 p.p.m. around the
periphery of the distribution system, the sampling should be done daily. The number of sampling points may have to be increased over time in order to develop a basis for adjusting the dosage rates at each well to obtain the recommended chlorine residuals. The pump house operators could be trained and equipped to take and test water samples for residual chlorine which should be done at the beginning of each work shift. This would reduce the work load of the municipal staff who could then could make less frequent visits to the wells, perhaps on a weekly basis, to monitor the work of the operators. A simple record keeping form or notebook should also be provided.

Each well is also tested daily for the presence of fecal coliforms. Of the more than 550 samples tested so far, none were positive for fecal coliforms. Considering the type of wells being used and how the pumping stations are designed, it would be unusual to find fecal coliforms entering the water supply system at this point. Because parts of the distribution network are shut down frequently, it is more likely that contamination could occur through leaks in the system.

Since the outbreak of cholera, ten water samples are taken every two to three days from various points around the periphery of the distribution system and are analyzed for fecal coliforms. To date only one sample has produced a positive analysis. This sample was taken downstream from where a break in the supply pipe was found by the person taking the sample. This information was reported to the municipality which has since repaired the pipe.

Based on the observations made and on information provided by those involved in managing the various water supply systems, the responsible authorities have reacted in a timely and adequate manner in controlling the possible spreading of cholera through the water supply systems. In certain aspects, more is being done than is absolutely required. This is a reasonable approach in the early phases of an epidemic. However, as time passes and the situation stabilizes, it would be useful to review and analyze the costs and benefits of the actions being taken with the goal of conserving the resources being used while maintaining the safety of the water supply.

2. **Recommendations for water supply**

   **Short-term**

   - The MOH should consider reducing the well sampling schedule for fecal coliforms. Rather than continuing to sample each well daily, a weekly schedule of sampling should be tried. If there are no positives during the ensuing four weeks, a monthly schedule should then be tried. This monthly schedule should be sufficient as long as no positive samples are found.

   - The MOH should consider training pump operators to take daily residual choline measurements from wells and peripheral sites and to record results. Visits from central staff would then be reduced.
The flow measuring devices that are not operating need to be repaired or replaced and records kept of flow meter readings which should also be taken at the beginning of each work shift. This is the first step in developing a leak detection program.

Health education activities being conducted through the media and, especially, at health facilities, schools, mosques, and other public gathering places need to be continued and, if the epidemic becomes worse, they may need to be intensified. The messages should focus on the safe storage, handling, and use of potable water. Special emphasis must be placed on washing hands with soap, especially after using the toilet and before handling foods.

**Long-term**

- Leak detection programs should be developed and implemented to reduce losses in the distribution systems.
- Additional well supplies need to be added to existing water systems with the goal of providing 24-hour service to all points in the systems.
- Plans to extend distribution systems to provide greater coverage of the population need to be developed and implemented.

3. **Assessment of sewerage**

The collection, treatment, and disposal of wastewater is a problem of the highest magnitude in the Gaza Strip. Minimal investment has been made in the installation of sewerage systems to date. Most of the inhabitants are not connected to a piped sewerage system.

About 65 percent of the population in Gaza City is served by its sewerage system. In Jabalia village, about 60 percent is covered by its sewerage system. The other towns and villages either have less coverage or no piped system at all. Of the refugee camps only Jabalia and parts of Beach and Rafah camps have piped sewerage systems. The remaining camp population is served by open drainage ditches which discharge waste directly to the sea or to nearby low lying areas. These drainage ditches were built to carry only gray water, i.e., water used for bathing, laundry, and cleaning purposes. It was originally planned that human waste would be deposited into unsealed vaults which are periodically emptied by vacuum tankers which dispose of waste at the Gaza City sewage lagoons. Unfortunately, due to the utilization of the limited land area over the years for construction of permanent homes, sections of the streets where the vaults are located have been taken over by housing and many vaults have been abandoned or are not accessible to the vacuum trucks. Therefore some inhabitants dump fecal wastes directly into drainage ditches.
In towns and villages that do not have piped sewerage systems, people use vaults, unprotected boreholes, and open drainage ditches. Most of the waste from these systems flows untreated to the sea or to low lying areas.

Although it would seem that the use of unconventional sewage disposal systems creates the most serious problem, piped systems are also problematic. This is especially true during the rainy season when the sewage overflows in many areas, mixing with the storm water and forming ponds in the streets. This was precisely the situation that existed shortly before the outbreak of the present cholera epidemic and continues to exist.

4. Recommendations on sewerage

Short-term

* Intensify the cleaning of clogged and partially clogged sewers.
* Re-grade unpaved streets to improve drainage of sewage overflows and storm waters.
* Clean debris and vegetation from open drainage ditches.
* Improve the management and operation of existing sewage lagoons.
* Include in ongoing health education programs messages about ways to minimize contact with sewage and the importance of handwashing after any contact with sewage.
* Initiate periodic monitoring of sewage outflows with Moore swabs to determine if the area served no longer has active cholera cases.

Long-term

* Rehabilitate existing piped sewerage systems to reduce clogging and overflowing.
* The immediate extension of existing piped sewerage systems is not recommended. This would tend to exacerbate existing problems. The problem of disposing of sewage must be addressed first. Part one of the "Gaza Environmental Profile", produced by the Palestinian Environmental Protection Authority, provides the obvious starting point for initiating a unified and concerted effort to develop a master plan for the disposal of sewage and storm water. Once a strategy has been developed, then the extension and construction of piped sewerage systems can move forward. Ongoing projects for piping and intercepting sewage along the sea coast
should move ahead. The main disposal problem lies inland where sewage and storm waters pose a threat to nearby inhabitants and to groundwater aquifers.

5. **Assessment of solid wastes**

In the towns and villages, the municipality or the village council is responsible for the collection and disposal of solid wastes. In Gaza City there are large metal bins (dumpsters) distributed at various points throughout the city. There are also areas where garbage is dumped on the side of the street. Dry wastes such as plastic bags and paper are strewn throughout the city. It is not known how often the waste bins are emptied but it is not often enough. Therefore, the towns and villages appear very cluttered with solid wastes of every kind.

In the refugee camps, UNRWA operates the solid waste collection and disposal system. Waste bins are distributed throughout each of the camps and a fleet of trucks empty them or carry them off to be dumped at the town dump site. Because UNRWA tends to give higher priority to this service than do the towns and villages, it does a better job of collecting and disposing of the solid wastes from the camps.

In Gaza City, solid wastes are present everywhere. In most areas, the problem is more one of aesthetics than health. Dry wastes such as paper, plastics, and bottles do not attract flies and rodents as much as do food wastes. Nevertheless, there is still a large quantity of organic waste left in the open, and this may attract rodents and provide habitat for flies and other insects.

6. **Recommendations on solid waste**

   **Short-term**

   - UNRWA should consider training municipalities and villages in solid waste management based on experiences in refugee populations; UNRWA has, for example, developed vehicle specifications for conditions in the Gaza Strip.
   - Municipalities and villages should consider expanding their solid waste collection program by utilizing the large unemployed labor force. Labor intensive methods using hand tools and animal drawn carts may be appropriate.
   - The health education program should instruct communities on how to organize themselves into block committees to clean up solid wastes from their neighborhoods. The Bureij camp experience in organizing and conducting their clean up campaign should be studied. Bureij camp is kept cleaner than any other camp or town.
Long-term

- Develop an overall strategy for managing solid wastes in tandem with a strategy for the disposal of sewerage and storm water. Once land use areas are categorized, the planning and design of final disposal sites, as well as the development of collection and transport systems, can take place.

7. Assessment of food safety

The types of foods which are of main concern during a cholera epidemic are fish and shellfish caught near sewage outfalls and low-growing and root type vegetables irrigated, intentionally or unintentionally, with untreated or partially treated sewage. In these situations, the food can be subject to direct contamination. Other fruits and vegetables may be subject to indirect contamination by farmers or vendors who may be carriers of the cholera vibrio.

There appears to be little or no control of how food is handled as it moves from the farmer to the marketplace and to the consumer. At the Gaza City market, the level of sanitation in the market is very low. Passageways are strewn with solid and vegetable wastes and there is no evidence of any active cleaning of the market area. Produce is displayed on tray tables set up above the ground. Stores have paved floors.

It is a common practice in the region, since water supplies are limited, to irrigate crops with a combination of waste-water and sewerage; as a consequence, the risk of transmitting enteric diseases on fruit or vegetables is elevated. Most vegetables in markets are not well washed. Foods commonly eaten raw are cucumbers, green onions, herbs and tomatoes. Fish is generally not a commonly consumed food item. Street food vendors are seen frequently and serve a variety of cooked and uncooked food, ice cream, and drinks. There is no food safety unit; policies for safe food handling are not well developed.

8. Recommendations on food safety

Short-term

- The health education program should instruct the public on simple precautions to take to keep foods, especially those eaten raw, from possible contamination. Simple practices such as not placing or storing fruits and vegetables on the ground or on the floor may be useful. Further precautions could include washing greens in a household detergent solution and then rinsing them in water from the tap.

- All foods should be thoroughly cooked and consumed as soon as possible.

- Foods that are to be stored for more than four hours must be refrigerated at 10 degrees Centigrade or below.
All cooking and serving utensils, cutting boards, and tables used for preparing foods must be washed with soapy water and air dried after use.

Hands must be washed with soap before handling foods.

The health education program should include the above messages to the public but it should also provide specific safe food handling practices for street food vendors.

The ongoing activity of sampling and testing a variety of foods for coliform and cholera should be continued at its present level of 10 samples per day.

**Long-term**

A comprehensive program for controlling the quality and safety of fresh, dry, and processed foods should be planned and implemented. The present bacteriological testing of foods should be continued. In addition, foods should be tested for the presence of pesticides and for food additives. Also a system for dating processed foods should be mandatory.
APPENDIX A

BIBLIOGRAPHY
APPENDIX A: BIBLIOGRAPHY


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APPENDIX B

PRINCIPAL PERSONS MET
APPENDIX B: PRINCIPAL PERSONS MET

USAID

Dr. Jamal Tarazy, Health Program Manager
Ms. Karen Turner, Acting Director, USAID Jerusalem
Mr. Soficien Mushasha, Project Officer
Ms. Holly Fluty, HPN Officer

PALESTINIAN HEALTH AUTHORITY

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Dr. Abdul Jabar-Tebe, Director of Preventive Medicine and Primary Health Care
Dr. Yehia Abed, Director of Central Epidemiology Unit
Dr. Amer El Hossini, Infectious Disease Epidemiology
Dr. Ali Bakr, Chief Internist, Central Hospital
Dr. Yacoub Shoubaki, Consultant Gastroenterologist
Dr. Alaa Shorab, Medical Resident
Dr. Emad El Shorafa, Chief of Pediatrics
Dr. Maged El Masri, Vice Director of Pediatric Hospital
Dr. Ahmed El Wadeya, Pediatrician
Dr. Samir A. Khatib, Director of Laboratories
Dr. Randa El Khondary, Director of Laboratories in Gaza
Dr. Nabegha Abushahla, Head of Supplies and Purchasing, Laboratory Services
Dr. Mohmed Afifi, Director of Public Health Education Unit
Dr. Abulla Nassar, Chief Pharmacist
Dr. Yousef Abu-Safieh, Advisor, Palestinian Energy Research Center
Dr. Atia El Egla, Director, Environmental Unit
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Mr. Rizk Nagem, Engineer, Gaza City Municipal Council
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