Prioritising health care in complex emergencies

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Acute refugee crises such as those that have occurred recently in Goma, Bosnia, Somalia, Kosovo, East Timor, Angola, Sierra Leone, the Democratic Republic of Congo, to name but a few, are the emergency rooms of international public health. As with clinical emergency medicine, the primary objective of emergency relief is to stabilise the health of the refugee or internally displaced population, not to address the underlying causes. In fact, limiting the damage is often the most that can be achieved. To lower the daily crude mortality rate to one death per 10 000, the most commonly cited public-health objective in complex emergencies, would leave the affected population still dying at two to three times its baseline rate. So, when the emergency is over, things are at best better than they might have been. They are never good.

Accordingly, the public-health approach to managing complex emergencies is one of triage. Over the years, there have been many, too many, opportunities to develop a consistent approach to the organisation and delivery of health services in complex emergencies. In the first days and weeks, interventions should limit mortality. The

basics—food, water, sanitation, and shelter—usually need to be provided, after which (or preferably at the same time, if resources are available) specific health programmes are quickly put into place.[1] Measles, diarrhoea, pneumonia, malaria, malnutrition, and a limited number of other diseases with epidemic potential, such as cholera and meningitis, have recurrently been prominent causes of morbidity and mortality. The most recent of the few textbooks devoted to health care for refugees identifies the "ten top priorities" for intervention in the emergency phase and clearly distinguishes them from activities that should wait until after mortality has fallen to "acceptable" levels.[2]

Implementing these early priorities has always been problematic. For example, whereas epidemiological data have usually directed emergency health interventions toward children and women, many societies have cultural norms that would preferentially protect other groups—the elderly, for example. Also, delivering adequate food to civilians, knowing that a large share might be diverted to support armed forces and potentially prolong conflict, has been a devilish conundrum for the relief community. At times, tensions have arisen between humanitarian groups, who need cooperation from local authorities, and human rights groups, who challenge the same authorities over alleged, and usually real, violations of human rights and international humanitarian law. Issues like these have been debated in the humanitarian literature. Underlying them, however, has been the presumption that what needs to be done is clear.

Recently, there seems to be increasing confusion on the issue of priorities. Perhaps this is because some emergencies, such as those in Kosovo and East Timor, have not been characterised by mortality in excess of the daily threshold of one death per 10 000 population. Or perhaps this is because global priorities are being accorded an urgency that competes with those of the local situation, or because much needed advocacy for previously neglected issues has been so successful. In any event, there are indications that the few lessons identified from past experiences have not been adequately learned and are not being consistently applied.

Several examples illustrate this point. Mass measles vaccination as early as possible in an emergency has become a priority for relief organisations since measles was shown to be responsible for half the deaths that occurred during a series of African emergencies 20 years ago. But at a recent WHO meeting, reports indicated that efforts to control the recent Ebola virus outbreak in Uganda were hampered by the occurrence of a measles epidemic in refugee camps in which international non-governmental organisations were providing a variety of other needed services.

The Médecins Sans Frontières textbook[2] lists measles vaccination as the second most urgent priority in emergency health interventions. However, the world's current emphasis for vaccination is the eradication of poliomyelitis and there has been increasing pressure to carry out polio vaccination campaigns during complex emergencies. It is unquestionably true that global polio eradication cannot be achieved unless all countries participate in the effort, and polio vaccination campaigns have even helped to bring about temporary cease-fires in some conflict areas. But poliomyelitis has never been an important cause of morbidity or mortality in complex emergencies, at least not when compared with measles and other health concerns. And when resources are scarce and time is short, any diversion from urgent priorities can interfere with the ability of the public-health sector to achieve its already limited objectives. Difficult as the dilemma may be, it seems fair to ask, in situations where mortality rates are unconscionably high and where lives are threatened by lack of even the most basic necessities, which priorities should be most respected: global or local?

Fortunately, women's reproductive health issues have received increased attention in recent emergencies. The appalling situation of women during times of societal upheaval had frequently been neglected in programmes addressing refugee health needs. Effective advocacy has gone a long way towards correcting this wrong, and a minimum initial service package for reproductive health has been widely adopted. Although this package of urgent interventions should be implemented along with other health services, all too often it has not been adequately integrated. Recent data from eastern Sierra Leone (International Rescue Committee, 2001, unpublished data), for example, estimate that the infant mortality rate in parts of the country is in excess of 300 deaths per 1000 livebirths per year. And yet in this setting, many important interventions were not being implemented, whereas reproductive health services were. When situations like this arise, the source of the problem is not always easy to define. Funding from donors sometimes supports only some programmes, but not the complete package of emergency services; at other times, an organsiation may focus its efforts only in one problematic area without ensuring that other organisations are complementing its efforts. In any case, populations caught up in complex emergencies will always benefit most from unrestricted access to a comprehensive package of essential

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interventions, one that addresses all major causes of mortality to which it is exposed. When essential programmes are pitted against each other for whatever reason, forcing choices that should never have to be made, it is obvious that the system is not working.

But the fact remains that in complex emergencies, in which resources are commonly limited and in which logistical and security constraints place severe limitations on what can be achieved, difficult choices will always have to be made. In practising public-health triage, even when everything is important, some things must be accorded more importance than others. Only after the essentials have been taken care of should the next wave of priorities be addressed, then the next, until the emergency is over. In emergencies, lives will always be lost that could have been saved, and diseases that could be addressed under better circumstances will go untreated. Without a systematic approach, and without a clear sense of priorities, the situation would be even worse.

Yet how can we be sure that we are doing the right things in such situations? Do lessons learned from the past truly apply to the kinds of situations we are likely to encounter in today's and tomorrow's worlds? What are the priorities in complex emergencies that are characterised by low mortality, where psychosocial and reproductive health concerns outweigh those posed by the incidence, if not the threat, of acute communicable diseases, and where chronic diseases, currently ignored by the relief community, are of greater importance even in the emergency setting? Even if we can identify those priorities, do we know how to intervene safely and effectively? The only way to answer these questions is to carry out carefully targeted, appropriately designed, applied research in complex emergencies. Important areas of essential research include the comparison of different treatment regimens for severe malnutrition in children (and adults) how and when to provide HIV/AIDS testing, counselling, and treatment services and how to assess and treat severe depression in different cultures. Although doing research in emergencies is fraught with ethical issues, real progress in addressing the health needs of refugees cannot be made until questions, which currently have no answers, are addressed. In fact, the argument has been made that it would be unethical not to do research to improve the delivery of health care to those caught up in complex emergencies—the most vulnerable and the most compromised populations in the world.

The next few years will be crucial for emergency relief. Increasingly, humanitarian assistance is being provided not in camp settings, but to entire countries whose populations are affected by societal collapse. The long-term solutions to the seemingly hopeless problems that refugees endure are fundamentally political in nature. Emergency public-health interventions provide temporary solutions at best, but unless these interventions are carefully chosen and correctly implemented, even these attempts at palliation will be inadequate. It is simply not enough for the relief community to do the right thing—it must also do it right.

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Documenting violence against refugees

Wars today are characterised by increased violence against the civilian population. As a result, refugees and internally displaced persons (IDPs) often form unprotected groups which are difficult to access. Once the international aid does reach them, however, the collection of surveillance and survey data is essential to document past abuses, notably those perpetrated during the migration. Collecting testimonies is vital; the validity of which is reinforced by the methods used to attain them and by the quality of the information obtained.

After the civil war restarted in Congo-Brazzaville in December, 1998, a third of the population of Brazzaville fled into the forests of the neighbouring Pool region, where some 250 000 displaced people remained trapped for several months with limited access to international aid. From May, 1999, targeted surveys, and the collection of surveillance and screening data among returnees in Brazzaville enabled the documentation of the health consequences of war on this population. A retrospective mortality survey registered a mortality rate during the migration of more than five times the alert threshold. Lack of food was a major problem for the displaced, as shown by the proportion of deaths due to malnutrition (50%), and by the prevalence of severe malnutrition among children younger than 5 years returning to Brazzaville (20%). Further, the 1600 cases of rape reported between May and December, 1999, from the hospitals of Brazzaville highlight the high prevalence of sexual violence directed against women and girls during migration.

In July, 1997, surveys were carried out in Ndjoundou camp in Congo-Brazzaville to document the 1500 km flight of Rwandan refugees through Zaire during the previous 9 months. Researchers found that 82·5% of the initial group disappeared or died during the migration, and that peaks of mortality matched the attacks of the AFDL forces along their journey. These findings support the argument that there was major violence directed against this civilian population. Similar results were found in Rosaye, Montenegro, in 1999, where surveys have shown that a third of families who fled Kosovo to avoid the exactions reported being separated from at least one close family member—either "left behind" in Kosovo (28%), or "missing" (5%). The programme of attacks launched by Serbian forces was reconstructed through the documention of details from refugees on their villages of origin and the dates that they were forced to flee. These surveys enabled detailed accounts of the events to which Kosovan refugees were subjected before they left their country, and will contribute to the process of recognition by the international community of the abuses directed against this group.

Most complex emergencies are chaotic. Intervention teams are overwhelmed with work and resources and qualified personnel are limited. Carrying out such surveys can put the refugee populations and the surveyors in danger. In such situations, collection of quality epidemiological data for monitoring or advocacy purposes becomes a challenge. Nevertheless, the work done so far indicates that these surveys are practical and worthwhile in order to quantify violence targeted at civilians. Collecting testimonies is a moral obligation; in some cases it should be a priority, whatever the consequences on the official authorisations, to provide further medical and humanitarian assistance. Although documenting violence will not do much to help victims of violence in past wars, we are convinced that the documentation of these events will have an impact on the prevention of abuses against vulnerable populations, notably refugees, in the future.

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Guidelines for Evaluating Surveillance Systems

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INTRODUCTION

This document describes the evaluation of epidemiologic surveillance systems. Its purpose is to promote the best use of public health resources through the development of effective and efficient surveillance systems. It can serve as a guide for persons conducting their first evaluation and as a reference for those who are already familiar with the evaluation process.

Epidemiologic surveillance is the ongoing and systematic collection, analysis, and interpretation of health data in the process of describing and monitoring a health event. This information is used for planning, implementing, and evaluating public health interventions and programs. Surveillance data are used both to determine the need for public health action and to assess the effectiveness of programs.

The evaluation of surveillance systems should promote the best use of public health resources by ensuring that only important problems are under surveillance and that surveillance systems operate efficiently. Insofar as possible, the evaluation of surveillance systems should include recommendations for improving quality and efficiency, e.g., eliminating unnecessary duplication. Most importantly, an evaluation should assess whether a system is serving a useful public health function and is meeting the system's objectives.

Because surveillance systems vary widely in methodology, scope, and objectives, characteristics that are important to one system may be less important to another. Efforts to improve certain attributes--such as the ability of a system to detect a health event (sensitivity)--may detract from other attributes, such as simplicity or timeliness. Thus, the success of an individual surveillance system depends on the proper balance of characteristics, and the strength of an evaluation depends on the ability of the evaluator to assess these characteristics with respect to the system's requirements. In an effort to accommodate to these objectives, any approach to evaluation must be flexible. With this in mind, the guidelines that follow describe many measures that can be applied to surveillance systems, with the clear understanding that all measures will not be appropriate for all systems.

ORGANIZATION OF THIS DOCUMENT

This document begins with an outline of the tasks involved in doing an evaluation, which is followed by sections describing each element of an evaluation. The first such section addresses the public health importance of the disease or health condition under surveillance. The second provides a framework for describing the components of a surveillance system. Subsequent sections focus on the attributes of a surveillance system (simplicity, flexibility, acceptability, sensitivity, predictive value positive, representativeness, and timeliness) and demonstrate how these combine to affect the usefulness and cost of a system. The document concludes with a discussion of resources needed to operate the surveillance system and sections detailing conclusions and recommendations.

As feedback is received on evaluations based on the guidelines given in this document, relevant examples will be incorporated into future updates.

OUTLINE OF TASKS FOR EVALUATING A SURVEILLANCE SYSTEM

A. Describe the public health importance of the health event. The following are the three most important categories to consider:

1.Total number of cases, incidence, and prevalence

2.Indices of severity such as the mortality rate and the case-fatality ratio

3.Preventability

B. Describe the system to be evaluated

1.List the objectives of the system

2.Describe the health event(s) under surveillance. State the case definition for each health event.

3.Draw a flow chart of the system

4.Describe the components and operation of the system

a. What is the population under surveillance?

b. What is the period of time of the data collection?

c. What information is collected?

d. Who provides the surveillance information?

e. How is the information transferred?

f. How is the information stored?

g. Who analyzes the data?

h. How are the data analyzed and how often?

i. How often are reports disseminated? j. To whom are reports distributed?
k.How are the reports distributed?

C. Indicate the level of usefulness by describing actions taken as a result of the data from the surveillance system. Characterize the entities that have used the data to make decisions and take actions. List other anticipated uses of the data.

D. Evaluate the system for each of the following attributes:

.Simplicity

2.Flexibility

3.Acceptability

4.Sensitivity

5.Predictive value positive

6.Representativeness

7.Timeliness

E. Describe the resources used to operate the system (direct costs).

F. List your conclusions and recommendations. State whether the system is meeting its objectives, and address the need to continue and/or modify the surveillance system.

PUBLIC HEALTH IMPORTANCE

Task : Describe the public health importance of the health event

Definition
The public health importance of a health event and the need to have that health event under surveillance can be described in several ways. Health events that affect many people or require large expenditures of resources clearly have public health importance. However, health events that affect relatively few persons may also be important, especially if the events cluster in time and place--e.g., a limited outbreak of a severe disease. At other times, public concerns may focus attention on a particular health event, creating or heightening the sense of importance. Diseases that are now rare because of successful control measures may be perceived as "unimportant," but their level of importance should be assessed in light of their potential to re-emerge. Finally, the public health importance of a health event is influenced by its preventability. Measures

Parameters for measuring the importance of a health event--and, therefore, the surveillance system with which it is monitored--include:

1. Total number of cases, incidence, and prevalence
2. Indices of severity, e.g., the case-fatality ratio
3. Mortality rate
4. An index of lost productivity, e.g., bed-disability days
5. An index of premature mortality, e.g., years of potential life lost (YPLL
6. Medical costs
7. Preventability

These measures of importance do not take into account the effect of existing control measures. For example, the number of cases of vaccine-preventable illness has declined following the implementation of school immunization laws, and the public health importance of these diseases would be underestimated by case counts alone. In such instances, it may be possible to estimate the number of cases that would be expected in the absence of control programs (1).

Preventability can be defined at several levels--from preventing the occurrence of disease (primary prevention); through early detection and intervention with the aim of reversing, halting, or at least retarding the progress of a condition (secondary prevention); to minimizing the effects of disease and disability among those already ill (tertiary prevention). From the perspective of surveillance, preventability reflects the potential for effective public health intervention at any of these levels.

Attempts have been made to quantify the public health importance of various diseases and health conditions. Dean et al. describe such an approach using a score that takes into account age-specific mortality and morbidity rates as well as health- care costs (2).

SYSTEM DESCRIPTION

Tasks

1. List the objectives of the system.

2. Describe the health event(s) under surveillance. State the case definition for each health event.

3. Describe the components and operation of the system.

4. Draw a flow chart of the system.

Methods

Objectives may include detecting or monitoring outbreaks, monitoring trends, identifying contacts and administering prophylaxis, enrolling case-patients in a study, and generating hypotheses about etiology. The objectives of the system define a framework for evaluating the specific components.

The next task is to describe the components of a surveillance system. This can be done by answering the following questions:

a. What is the population under surveillance?

b. What is the period of time of the data collection?

c. What information is collected?

d. Who provides the surveillance information? What is the data source?

e. How is the information transferred?

f. How is the information stored?

g. Who analyzes the data?

h. How are the data analyzed, and how often?

i. Are there preliminary and final tabulations, analyses, and reports? j. How often are reports disseminated? k. To whom are reports distributed? l. How are the reports distributed?

It is often useful to list the discrete steps in the processing of the health-event reports by the system and then to depict these steps in a flow chart (Figure 1).

USEFULNESS

Tasks

1. Describe the actions that have been taken as a result of the data from the surveillance system.

2. Describe who has used the data to make decisions and take actions.

3. List other anticipated uses of the data.

Definition

A surveillance system is useful if it contributes to the prevention and control of adverse health events, including an improved understanding of the public health implications of such events. A surveillance system can also be useful if it helps to determine that an adverse health event previously thought to be unimportant is actually important. Methods

An assessment of the usefulness of a surveillance system should begin with a review of the objectives of the system and should consider the dependence of policy decisions and control

measures on surveillance. Depending on the objectives of a particular surveillance system, the system may be considered useful if it satisfactorily addresses at least one of the following questions.

Does the system:

a.Detect trends signaling changes in the occurrence of disease?

b.Detect epidemics?

c.Provide estimates of the magnitude of morbidity and mortality related to the health problem under surveillance?

d.Stimulate epidemiologic research likely to lead to control or prevention?

e.Identify risk factors associated with disease occurrence?

f.Permit assessment of the effects of control measures?

g.Lead to improved clinical practice by the health-care providers who are the constituents of the surveillance system?

Discussion

Usefulness may be affected by all the attributes of surveillance. Increased sensitivity may afford a greater opportunity for identifying epidemics and understanding the natural course of an adverse health event in a community. Improved timeliness allows control and prevention activities to be initiated earlier. Increased predictive value positive enables public health officials to focus on productive activities. A representative surveillance system will better characterize the epidemiologic characteristics of a health event in a defined population. Systems that are simple, flexible, and acceptable also tend to be more useful. SYSTEM ATTRIBUTES Task

Evaluate the system for each of **the following attributes**:

a. Simplicity

b. Flexibility

c. Acceptability

d. Sensitivity

e. Predictive value positive

f. Representativeness

g. Timeliness

A. Simplicity Definition

The simplicity of a surveillance system refers to both its structure and ease of operation. Surveillance systems should be as simple as possible while still meeting their objectives. Methods

A chart describing the flow of information and the lines of response in a surveillance system can help assess the simplicity or complexity of a surveillance system. A flow chart for a generic surveillance system is illustrated in Figure 1.

The following measures might be considered in evaluating the simplicity of a system

a. Amount and type of information necessary to establish the diagnosis

b. Number and type of reporting sources

c. Method(s) of transmitting case information/data

d. Number of organizations involved in receiving case reports

e. Staff training requirements

f. Type and extent of data analysis

g. Number and type of users of compiled case information

h. Method of distributing reports or case information to these users

i. Time spent with the following tasks:

Maintaining the system

2. Collecting case information

3. Transmitting case information

4. Analyzing case information

5.Preparing and disseminating surveillance reports

Discussion

It may be useful to think of the simplicity of a surveillance system from two perspectives: the design of the system and the size of the system. An example of a system that is simple in design is one whose case definition is easy to apply and in which the person identifying the case will also be the one analyzing and using the information. A more complex system might involve some of the following:

a.Special laboratory tests to confirm the case

b.Telephone contact or a home visit by a public health nurse to collect detailed information

c.Multiple levels of reporting (e.g., with the Notifiable Diseases Reporting System, case reports may start with the doctor who makes the diagnosis and pass through county and state health departments before going to the Centers for Disease Control) Simplicity is closely related to timeliness and will affect the amount of resources that are required to operate the system.

B. Flexibility

Definition

A flexible surveillance system can adapt to changing information needs or operating conditions with little additional cost in time, personnel, or allocated funds. Flexible systems can accommodate for example, new diseases and health conditions, changes in case definitions, and variations in reporting sources. Methods

Flexibility is probably best judged retrospectively, by observing how a system responded to a new demand. For example, when acquired immunodeficiency syndrome (AIDS) emerged in 1981, the existing notifiable disease reporting system of state health departments was used to report cases, and AIDS surveillance has adapted to rapidly advancing knowledge about the disease, its diagnosis, and its risk factors. Another example is the capacity of the gonorrhea surveillance system to accommodate special surveillance for penicillinase-producing Neisseria gonor- rhoeae. Discussion

Unless efforts have been made to adapt a system to another disease, it may be difficult to assess the

flexibility of that system. In the absence of practical experience, one can look at the design and workings of a system. Generally, simpler systems will be more flexible--fewer components will need to be modified when adapting the system for use with another disease. C. Acceptability Definition

C. Acceptability reflects the willingness of individuals and organizations to participate in the surveillance system.

Methods
In terms of evaluating a surveillance system, acceptability refers to the willingness to use the system by: a) persons outside the sponsoring agency, e.g., those who are asked to do something for the system and b) persons in the sponsoring agency that operates the system. To assess acceptability, one must consider the points of interaction between the system and its participants (Figure 1), including persons with the condition and those reporting cases.

Quantitative indicators of acceptability include:

a. Subject or agency participation rates

b. If participation is high, how quickly it was achieved

c. Interview completion rates and question refusal rates (if the system involves interviews with subjects)

d. Completeness of report forms

e. Physician, laboratory, or hospital/facility reporting rates

f. Timeliness of reporting Some of these measures may be obtained from a review of surveillance report forms, while others would require special studies or surveys.

Discussion

Acceptability is a largely subjective attribute that encompasses the willingness of persons on whom the system depends to provide accurate, consistent, complete, and timely data. Some factors influencing the acceptability of a particular system are:

a. The public health importance of the health event

b. Recognition by the system of the individual's contribution

c. Responsiveness of the system to suggestions or comments

d. Time burden relative to available time

e. Federal and state legislative restrictions on data collection and assurance of confidentiality

f. Federal and state legislative requirements for reporting

D. Sensitivity
Definition
The sensitivity of a surveillance system can be considered on two levels. First, at the level of case reporting, the proportion of cases of a disease or health condition detected by the surveillance system can be evaluated. In Table 1 this is represented by A/(A+C). Second, the system can be evaluated for its ability to detect epidemics (3). Methods

The sensitivity of a surveillance system is affected by the likelihood that:

a. Persons with certain diseases or health conditions seek medical care;

b. The diseases or conditions will be diagnosed, reflecting the skill of care providers and the sensitivity of diagnostic tests; and

c. The case will be reported to the system, given the diagnosis. These three conditions can be extended by analogy to surveillance systems that do not fit the traditional disease care-provider model. For example, the sensitivity of a telephone-based surveillance system of morbidity or risk factors is affected by

a. The number of people who have telephones, who are at home when the call is placed, and who agree to participate;

b. The ability of persons to understand the questions and correctly identify their status; and

c. The willingness of respondents to report their status. The extent to which these questions are explored depends on the system and on the resources available for the evaluation. The measurement of sensitivity in a surveillance system requires a) the validation of information collected by the system and b) the collection of information external to the system to determine the frequency of the condition in a community (4). From a practical standpoint, the primary emphasis in assessing sensitivity--assuming that most reported cases are correctly classified--is to estimate the proportion of the total number of cases in the community being detected by the system.

Discussion

A surveillance system that does not have high sensitivity can still be useful in monitoring trends, as long as the sensitivity remains reasonably constant. Questions concerning sensitivity in surveillance systems most commonly arise when changes in disease occurrence are noted. Changes in sensitivity can be precipitated by such events as heightened awareness of a disease, introduction of new diagnostic tests, and changes in the method of conducting surveillance. A search for such surveillance "artifacts" is often an initial step in outbreak investigations. E. Predictive Value Positive Definition

E. Predictive value positive (PVP) is the proportion of persons identified as having cases who actually do have the condition under surveillance (5). In Table 1 this is represented by A/(A+B).

Methods

In assessing PVP, primary emphasis is placed on the confirmation of cases reported through the surveillance system. Its effect on the use of public health resources can be considered on two levels. At the level of an individual case, PVP affects the amount of resources used for case investigations. For example, in some states every reported case of type A hepatitis is promptly investigated by a public health nurse, and family members at risk are referred for prophylactic treatment with immune globulin. A surveillance system with low PVP--and therefore frequent "false-positive" case reports--would lead to wasted resources.

The other level is that of detection of epidemics. A high rate of erroneous case reports may trigger an inappropriate outbreak investigation. Therefore, the proportion of epidemics identified by the surveillance system that are true epidemics is needed to assess this attribute.

Calculating the PVP may require that records be kept of all interventions initiated because of information obtained from the surveillance system. A record of the number of case investigations done and the proportion of persons who actually had the condition under surveillance would allow the calculation of the PVP at the level of case detection. Personnel activity reports, travel records, and telephone logbooks may all be useful in estimating the PVP at the epidemic detection level.

Discussion

PVP is important because a low value means that a) non-cases are being investigated and b) epidemics may be mistakenly identified. PFalse-positiveP' reports may lead to unnecessary intervention, and falsely detected PepidemicsP' may lead to costly investigations and undue concern in the community. A surveillance system with high PVP will lead to fewer wild-goose chases and wasted resources.

An example of a surveillance evaluation that examined PVP was reported by Barker et al. They reviewed hospital charts to determine the proportion of persons admitted with a diagnosis of stroke

who had the diagnosis confirmed (6). Of 1,604 patients admitted to seven acute-care hospitals with a stroke-related diagnosis, 903 (PVP = 56%) were subsequently confirmed to have had strokes.

The PVP for a health event is closely related to the clarity and specificity of the case definition. Good communication between the persons who report cases and the receiving agency also can improve PVP. The PVP reflects the sensitivity and specificity of the case definition and the prevalence of the condition in the population (Table 1). The PVP increases with increasing specificity and prevalence.

F. **Representativeness**

Definition

A surveillance system that is representative accurately describes a) the occurrence of a health event over time and b) its distribution in the population by place and person.

Methods

Representativeness is assessed by comparing the characteristics of reported events to all such actual events. Although the latter information is generally not known, some judgment of the representativeness of surveillance data is possible, based on knowledge of:

a. Characteristics of the population--e.g., age, socioeconomic status, geographic location (5);

b. Natural history of the condition--e.g., latency period, mode of transmission, fatal outcome;

c. Prevailing medical practices--e.g., sites performing diagnostic tests, physician-referral patterns (7,8);

d. Multiple sources of data--e.g., mortality rates for comparison with incidence data, laboratory reports for comparison with physician reports. Representativeness can be examined through special studies that seek to identify a probability sample of all cases.

Quality of data is an important part of representativeness. Much of the discussion in this document focuses on the identification and classification of cases. However, most surveillance systems rely on more than simple case counts. Information commonly collected includes the demographic characteristics of affected persons, details about the health event, and notification of the presence or absence of potential risk factors. The quality and usefulness and representativeness of this information depends on its completeness and validity.

Quality of data is influenced by the clarity of surveillance forms, the quality of training and supervision of persons who complete surveillance forms, and the care exercised in data management. A review of these facets of a surveillance system provides an indirect measure of quality of data. Examining the percentage of unknown or blank responses to items on surveillance forms or questionnaires is straightforward. Assessing the reliability and validity of responses would require such special studies as chart reviews or re-interviews of respondents. Discussion

In order to generalize findings from surveillance data to the population at large, the data from a surveillance system should reflect the population characteristics that are important to the goals and objectives of that system. These characteristics generally relate to time, place, and person. An important result of evaluating the representativeness of a surveillance system is the identification of population subgroups that may be systematically excluded from the reporting system. This process allows appropriate modification of data collection and more accurate projection of incidence of the health event in the target population.

For example, an evaluation of reporting of hepatitis in a county in Washington State suggested that cases of type B hepatitis were under-reported among homosexual males and that cases of type non A-non B hepatitis were under-reported among persons given blood transfusions. The importance of these risk factors as contributors to the occurrence of these diseases was apparently underestimated by the selective under-reporting of certain types of hepatitis cases (9).

Errors and bias can make their way into a surveillance system at any stage. Because surveillance data are used to identify high-risk groups, to target interventions, and to evaluate interventions, it is

important to be aware of the strengths and limitations of the information in the system

So far the discussion of attributes has been aimed at the information collected for cases, but in many surveillance systems morbidity and mortality rates are calculated. The denominators for these rate calculations are often obtained from a completely separate data system maintained by another agency, e.g., the Bureau of the Census. Thought should be given to the comparability of categories (e.g., race, age, residence) on which the numerators and denominators of rate calculations are based.

G. Timeliness

Definition

Timeliness reflects the speed or delay between steps in a surveillance system.

Methods

The major steps in a surveillance system are shown in Figure 2. The time interval linking any two of the steps in this figure can be examined. The interval usually considered first is the amount of time between the onset of an adverse health event and the report of the event to the public health agency responsible for instituting control and prevention measures. Another aspect of timeliness is the time required for the identification of trends, outbreaks, or the effect of control measures. With acute diseases, the onset of symptoms is usually used. Sometimes the date of exposure is used. With chronic diseases, it may be more useful to look at elapsed time from diagnosis rather than to estimate an onset date.

Discussion

The timeliness of a surveillance system should be evaluated in terms of availability of information for disease control--either for immediate control efforts or for long-term program planning.

For example, a study of a surveillance system for Shigella infections indicated that the typical case of shigellosis was brought to the attention of health officials 11 days after onset of symptoms--a period sufficient for the occurrence of secondary and tertiary transmission. This suggests that the level of timeliness was not satisfactory for effective disease control (10). In contrast, when there is a long period of latency between exposure and appearance of disease, the rapid identification of cases of illness may not be as important as the rapid availability of exposure data to provide a basis for interrupting and preventing exposures that lead to disease. In another time frame, surveillance data are being used by public health agencies to track progress toward the 1990 Objectives for the Nation and to plan for the Year 2000 Objectives.

The need for rapidity of response in a surveillance system depends on the nature of the public health problem under surveillance and the objectives of that system. Recently, computer technology has been integrated into surveillance systems and may promote timeliness (11,12).

RESOURCES FOR SYSTEM OPERATION

Task

Describe the resources that are used to operate the system (direct costs).

Definitions

This document covers only the resources directly required to operate a surveillance system. These are sometimes referred to as Pdirect costsP' and include the personnel and financial resources expended in collecting, processing, analyzing, and disseminating the surveillance data. Methods

In estimating these resources consider the following

A .Personnel requirements A first step is to estimate the time it takes to operate the system (e.g., person-time expended per year of operation). If desired, these measures can be converted to dollar estimates by multiplying the person-time by appropriate salary and benefit figures.

b. Other resources These may include the cost of travel, training, supplies, equipment, and services (e.g., mail, telephone, and computer time).

The application of these resources at all levels of the public health system--from the local health-care provider to municipal, county, state, and Federal health agencies--should be considered.
The costs of surveillance systems from two studies are illustrated in Tables 2 and 3 below (7,13).

Discussion
This approach to assessment of resources includes only those personnel and material resources required for the operation of surveillance and excludes a broader definition of costs that might be considered in a more comprehensive evaluation. Estimating the overall costs of a surveillance system can be a complex process. The estimates may include the estimation of a) indirect costs, such as follow-up laboratory tests or treatment incurred as a result of surveillance; b) costs of secondary data sources (e.g., vital statistics or survey data); and c) costs averted (benefits) by surveillance.

Costs are often judged relative to benefits, but few evaluations of surveillance systems are likely to include a formal cost-benefit analysis, and such analyses are beyond the scope of this document. Estimating benefits (e.g., savings resulting from preventing morbidity through surveillance data) may be possible in some instances, although this approach does not take into account the full spectrum of benefits that may result from surveillance systems. More realistically, costs should be judged with respect to the objectives and usefulness of a surveillance system. Examples

Examples of resource estimation for surveillance systems operated in Vermont and Kentucky follow. Vermont example (7)

Two methods of collecting surveillance data in Vermont have been compared. The PpassiveP' system was already in place and consisted of unsolicited reports of notifiable diseases to the district offices or state health department. The PactiveP' system was implemented in a probability sample of physician practices. Each week, a health department employee called these practitioners to solicit reports of selected notifiable diseases.

In comparing the two systems an attempt was made to estimate their costs. The estimates of resources directly applied to the surveillance systems are shown in Table 2. Kentucky example (13)

Another example is provided by an assessment of the costs of a surveillance system involving the active solicitation of case reports of type A hepatitis in Kentucky. Table 3 summarizes the costs of this system. The resources that went into the direct operation of the system were for personnel and telephone and were estimated as $3,764 and $535, respectively. This system found nine more cases than would have been found through the passive surveillance system, and an estimated seven hepatitis cases were prevented through prophylaxis of the contacts of the nine case-patients.

CONCLUSIONS AND RECOMMENDATIONS

Tasks
List your conclusions and recommendations. These should state whether the system is addressing an important public health problem and is meeting its objectives. Recommendations should address the continuation and/or modification of the surveillance system. Discussion

The attributes and costs of a surveillance system are interdependent. Before recommending changes in a system, interactions among the attributes and costs should be considered to ensure that benefits resulting from strengthening one attribute do not adversely affect another attribute.

Efforts to increase sensitivity, PVP, timeliness, and representativeness tend to increase the cost of a surveillance system, although savings in efficiency with automation may offset some of these costs (12).

As sensitivity and PVP approach 100%, a surveillance system is more likely to be representative of the population being monitored. However, as sensitivity increases, PVP may decrease. Efforts to increase sensitivity and PVP tend to make a surveillance system more complex--potentially decreasing its acceptability, timeliness, and flexibility. For example, a study comparing

health-department-initiated (active) surveillance and provider-initiated (passive) surveillance did not improve timeliness, despite increased sensitivity (8). SUMMARY STATEMENT

Evaluating surveillance systems is not easy. There is no perfect system; trade-offs must always be made. Each system is unique and therefore requires a balancing of the effort and resources put into each of its components if the system is to achieve its intended goal.

This document has presented guidelines--not absolutes--for the evaluation of surveillance systems. Attributes have been described that can be examined and evaluated to assess a system's ability to achieve the objectives for which it was designed.

Our goal has been to make the evaluation process more explicit and objective. Suggestions on how we may improve these guidelines would be welcomed.

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Viewpoint

Health in countries torn by conflict: lessons from Sarajevo

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During the past 50 years there have been major and far-reaching improvements in our capacity to prevent disease, improve health, and enhance quality of life. In the developed world, and increasingly so in developing countries, indicators such as infant and maternal mortality have improved consistently. As we approach the end of the 20th century, however, a tendency to deny health through civil conflict is becoming more obvious; if allowed, this could cruelly reverse many of the hard won health and human rights successes of previous decades.

Role of war

As of April, 1996, 22 wars were in progress around the world. Estimates place the global number of refugees at about 25 million, and at least the same number of people again are thought to be classified as internally displaced. Women and children constitute most of these refugees and displaced persons, and for various social and biological reasons are the most vulnerable to the indirect as well as the direct results of war. Because the circumstances of the war in Bosnia, especially in and around Sarajevo, could present in other man-made disasters, we must learn from the Bosnian tragedy, and share the lessons with governments and the humanitarian organisations to whom the lot of helping people to survive falls.

Impact of war in Bosnia

The war in former Yugoslavia was designed to destabilise if not destroy an entire people. In Bosnia and Herzegovina, about 3 million people—half the country's original population—were uprooted from their homes. Early estimates indicate that sexual violence was a key weapon in the strategy, and that thousands of women were repeatedly raped in the largest ethnic cleansing exercises since World War II. In Bosnia, over 156 000 people died, and around 175 000 were injured, many of them being permanently disabled.[1]

One of the military strategies was to besiege major towns, and, as in the case of Sarajevo, cut off medical supplies as well as access to food, water, electricity, and fuel. Over a period of 36 months, repeated sniping of civilians and shelling of houses, hospitals, and schools further eroded health and wellbeing, placing people under constant stress. In Sarajevo alone, 10 608 people were killed during this period and another 61 104 were seriously injured and disabled.[2] Countless others, especially older people, died of hypothermia and diseases whose impact was exacerbated by the weakened health condition of the population.

Direct and indirect effects

Data collected on 3000 pregnancies during this period show how fundamentally the siege of Sarajevo affected pregnant women, determined the outcomes of their pregnancies, and has possibly influenced the development of their offspring for years to come. Among the first of the impacts of the shelling was the destruction of the central hospital's obstetrics and gynaecology facility, effectively disrupting all services and reducing the number of available beds from the pre-war 450 to 50, and the number of operating rooms from four to one. More than 60 senior medical staff were lost in Sarajevo during the war. Shelling and sniping of civilians also limited all movement, and reaching any medical facility became difficult and dangerous. As a result, women were often unable to get to health centres and clinics, and antenatal care suffered. Shelling also meant long hours in makeshift underground shelters and basements, with little or no possibility of heating or lighting.

Without heating fuel, temperatures in the main hospital remained below 7°C for weeks at a time during three winters; in basements and shelters the temperature may have been even lower. Sleeping bags and blankets provided by humanitarian organisations became a major source of protection against hypothermia, and the city quickly become dependent on what little emergency relief supplies could be brought in by airlift or overland convoy. But since these too were susceptible to sniping and shelling, relief was irregular at best, and weeks could go by with little food available to the over 350 000 people in Sarajevo. Early weight loss among adults averaged 10–14 kg.[3]

Because there had been large stocks of cigarettes in local warehouses when the war broke out, cigarettes became a main source of currency and barter. Smoking rates increased among all age-groups, especially among women, and heavy smoking in the confinement of shelters and overcrowded dwellings made concentrated passive smoking almost unavoidable.

Severe chronic water shortages and persistently poor water quality in some sections of the city gave rise to frequent outbreaks of hepatitis and diarrhoeal disease, especially around the homes, disused factories, schools, and warehouses that housed the thousands of displaced people who had fled to Sarajevo from other parts of Bosnia.[4]

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Implications for reproductive health

The immediate impact of the war on reproduction was a profound reduction in the number of livebirths, from a pre-war average of 10 000 per year to 2000 per year during the course of the war.[4] Some of this decline was the result of a partial evacuation of women who were pregnant at the time shelling began, but this effect was offset shortly afterwards by a major influx of women displaced from other parts of the country. As in most complex disasters, women and children outnumbered men among the displaced populations. Men from communities elsewhere in Bosnia were still "unaccounted for", and as the war progressed more and more men from within Sarajevo were conscripted into the new defence force and were away from partners for long periods of time.

Health staff and others noted that the desire to postpone pregnancies because of fear and insecurity was common among women of all backgrounds, whether displaced or not. Nevertheless, rates of contraceptive use were low, at about 5%,[5] for several reasons. Contraception had not had high priority even before the war, but during much of the war it was generally felt to be even less important by many health workers and was not actively promoted. Just as with other healthcare services, many women had difficulty getting to family planning services; even if they had, the blockade on all medical supplies would have often affected the availability of contraceptive methods.

Pregnancy termination and perinatal mortality

The rate of pregnancy termination increased significantly, one probable factor being a combination of attitudes and restricted access to contraception. For most of the war it averaged more than two abortions for every pregnancy taken to term.[7] Complications of abortion nevertheless remained low and maternal morbidity did not increase—an indication of the sound medical operating conditions that were maintained despite the working conditions. However, because these conditions were far from perfect, the possibility of longer-term sequelae, including infertility, cannot be discounted. In the post-war period that will almost inevitably see fertility emphasised, this could place even greater burdens on women who have difficulty conceiving.

Pregnancy outcomes were seriously affected in other ways too. The perinatal mortality rate, for example, rose from about 15·3 per 1000 livebirths before the war to 38·6 per 1000. One of the most important underlying factors was the steep increment in low birthweight babies, from a rate of 5·3 to 12·8,[8] and the difficulties that were encountered in helping these infants to survive.

Birthweight

The increase in low birthweight (<2500 g) could have been related to a several factors. The almost chronic stress and the combination of active and passive smoking must rank high. At least 50% of the women who gave birth during this period and who said they smoked, reported smoking more than ten cigarettes per day. Poor food intake was probably another contributing factor, for even when humanitarian food parcels began to become available there was no guarantee that pregnant women actually consumed the food destined for them. Feeding children seems to have been the first priority for most parents, and, in addition, food aid was at times bartered for other goods.

Causes of perinatal mortality

The main causes of death among neonates were respiratory distress syndrome, congenital abnormalilties, and asphyxia.[9] Some of these disorders would not have presented serious difficulties to local health staff before the war, but under the prevailing conditions, otherwise routine problems often became impossible to manage. Staff often had to work without electricity, and there was rarely any heating, so thermal control for neonates in transport, even between floors, became a challenge. Drugs and other medical supplies relevant to perinatal care were often in just as short supply as other materials.

Congenital abnormalities

During the war the frequency of congenital abnormalities involving anencephalus, hydrocephalus, or both rose from 0·37% to 3·0% (until February, 1994).[10] Before the war antenatal screening would have identified many of these abnormalities at an early stage and mothers would have been offered elective termination of pregnancy. Even so, the lack of screening during the war does not explain the observed rise. The increased rate of neural-tube defects points to serious deficiencies in specific nutrients among women. Many were clearly anaemic but there was little that could be done to rectify that at the time, or to ensure folic acid fortification of supplementary food destined for pregnant women.

Implications and lessons to be learned

Wars are being increasingly directed at civilian populations, and the availability and use of heavier and more destructive weapons makes civilians all the more vulnerable. Apart from the many and serious implications of physical and psychological aggression, several less immediately visible effects need to be considered—prominently the serious abrogation of the rights of women and couples to healthy reproduction and family life.

Denial of access to food, water, adequate shelter, and appropriate health care severely affected the wellbeing of Sarajevo's populations (and that of other towns), and had an especially serious impact on the health of pregnant women and their offspring. The immediate result was an unacceptably high pregnancy wastage, which in itself caused untold suffering to parents already exposed to ethnic cleansing, sexual violence, and the threat of genocide. The high and unnecessary maternal and perinatal morbidity was especially hard for a society whose standards and outcomes of health services before the war approximated those of western European countries, and exceeded those of many others. The long-term effects of this high physical and psychosocial morbidity are unclear, but the high priority that has had to be given by national and international authorities to mental as well as physical rehabilitation programmes indicates the severity of the problem. The consequences for future reproductive and mental health, as well as for fertility, are equally uncertain.

The wellbeing and future health of young infants remains a matter of concern, especially their recovery from complications of low birthweight. The seige of Sarajevo resulted in a systematic denial of water, food, heat, and light to families engaged in helping their infants "catch up". To what extent this will go on to mark the development of these infants remains to be seen. The contribution of these children to the future of Bosnia and to their capacity fully to enjoy the post-Dayton peace and

reconstruction of their country may have been permanently imperilled by the politicians and military strategists who saw fit to target civilians and deny them their fundamental human rights.

From an immediate and practical point of view, the impact of the siege and war on mothers and children calls for specific interventions to be formulated by all humanitarian agencies working with war-torn societies. First, everything possible should be done to maintain the continuity, and in some cases improvement, of healthcare services in war situations. The notion that healthcare services must inevitably suffer along with other services must be challenged and replaced by one that emphasises the ethical obligation of the international community to ensure continuity and even improvement of services in war. Only by doing so will the ravages of war be attenuated during and long after conflicts have been resolved.

We also need to recognise that, in all disasters, the social and biological profile of people makes some more vulnerable than others. Unless their vulnerability and needs are attended to appropriately, they will suffer most. This in itself cannot be condoned. But in the case of women, mothers, and children, their suffering will have widespread and possibly more complex implications for family life and for social reconstruction. At no time is the investment in women, mothers, and children more important than in conflict and post-conflict periods.

Interventions to support women, mothers, and children must take account of their special biological needs and the way in which these needs vary under different conditions. For pregnant women, special food supplements should be fortified according to state-of-the-art knowledge and local epidemiological needs. Folic acid fortification and greater attention to iron-deficiency anaemia in supplementary food for women in Sarajevo might have averted the high incidence of congenital abnormalities and inevitable problems of development of low birthweight babies. Food aid and supplementation should be more focused around the specific biological needs of vulnerable groups.

The need for more priority to be given to the provision of family planning advice and support is also evident, and humanitarian programmes should include appropriate steps to meet the requirements of couples and women. The reproductive health of people displaced by disasters has been overlooked in the past, yet it is fundmental to the health of women and their offspring. The fact that war imposes special and unusual stresses on reproductively active women must be recognised, and interventions tailored accordingly.

Although all conflicts tend to present similar threats to health and human rights, there may be differences according to social, political, ecological, and climatic conditions, as well as to the health of people before the disaster. These differences must be accounted for in planning interventions, and after the speedy introduction of standard approaches, additional assessments of specific needs are called for and justified.

More than in many other conflicts, the Bosnian tragedy has highlighted how wars are being focused on civilians, and are being designed to break the fabric of society by eroding health and the capacity of people to function normally. The denial of food, water, heat, shelter, and physical and mental wellbeing to the people of Sarajevo and the other towns that were besieged for three and a half years has reminded us of medieval strategies in which the health and human rights of people were of little meaning.

If the right of people to health is to be truly secured and maintained, the international health community has a responsibility to take up the challenge of exposing how that right to health is being denied. If the responsibility is not assumed, then much of the progress made in health so far will have been for nothing. The goal of health everywhere is to enhance and promote health equally and without discrimination.

Although health professionals may not have the power to intervene in the political decision-making that governs wars, they can and should take every opportunity to make clear how fundamentally war contradicts the struggle for health. And unless they actively defend the right to health, the gains that have been made and that have become such an important and impressive part of the 20th century risk being lost. If that happens, we will all be party to taking health back in time.

We thank Barbara Stoll and Brian McCarthy for their technical advice.

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Public health impact of Rwandan refugee crisis: what happened in Goma, Zaire, in July, 1994?

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Summary

The flight of 500 000–800 000 Rwandan refugees into the North Kivu region of Zaire in July, 1994, overwhelmed the world's response capacity.

During the first month after the influx, almost 50 000 refugees died, an average crude mortality rate of 20–35 per 10 000 per day. This death rate was associated with explosive epidemics of diarrhoeal disease caused by *Vibrio cholerae* 01 and *Shigella dysenteriae* type 1. 3–4 weeks after the influx of refugees, acute malnutrition rates among children under 5 years old ranged between 18 and 23%. Children with a recent history of dysentery and those in households headed by women were at higher risk of malnutrition. A well-coordinated relief programme, based on rapidly acquired health data and effective interventions, was associated with a steep decline in death rates to 5 to 8 per 10 000 per day by the second month of the crisis.

The prevention of high mortality due to diarrhoeal disease epidemics in displaced populations relies primarily on the prompt provision of adequate quantities of disinfected water, basic sanitation, community outreach, and effective case management of ill patients. In the emergency phase, effective, low-technology measures include bucket chlorination at untreated water sources, designated defaecation areas, active case-finding through community outreach, and oral rehydration. Relief agencies must place increased emphasis on training personnel in relevant skills to address major public health emergencies caused by population displacement.

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Introduction

In April, 1994, the presidents of Burundi and Rwanda were killed in an airplane crash near the Rwandan capital, Kigali. Civil disturbance throughout Rwanda followed, resulting in the deaths of between 500 000 and 1000 000 civilians, mostly ethnic Tutsis. In July, the Tutsi-dominated Rwandan Patriotic Front defeated government forces and established a new national government. Between July 14 and 17, large numbers of ethnic Hutus fled Rwanda and sought refuge in the North Kivu region of neighbouring Zaire; initial estimates were as high as 1·2 million. Many refugees entered through the town of Goma, at the northern end of Lake Kivu, and others crossed the border and settled in the vicinity of Kibumba camp (figure 1). During subsequent weeks, thousands of refugees died in the streets of Goma. Most of those who survived moved out of the town to camps at Munigi, Kibumba, Katale, and Mugunga. In early August, Munigi was closed and its residents relocated in the other three camps. Unknown numbers of refugees settled in smaller groups to the north of Katale, to the west of Mugunga, and in the town of Goma.

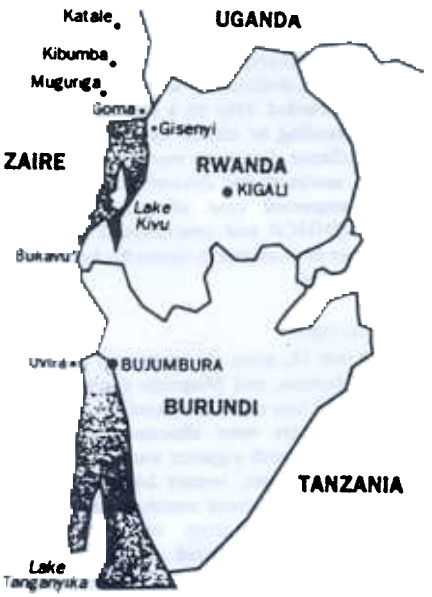

Figure 1: Map of Rwanda, Zaire, and Burundi

Refugee assistance was provided by several United Nations agencies, non-governmental relief organisations, and military forces, and was coordinated by the Office of the United Nations High Commissioner for Refugees (UNHCR). The arrival of such an enormous number of dependent refugees during a short period overwhelmed the capacity of the host government and relief organisations already present. We summarise the public

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health consequences of this influx of refugees during the month after their arrival.

Methods

Mortality surveillance

Mortality rates were calculated from daily counts of the number of bodies collected and estimates of the refugee population. Because the ground in the area where most refugees were located is hard volcanic rock, graves cannot readily be dug and most bodies were left beside roads and in other public places, to be picked up later by trucks for burial in mass graves. Information on mortality was based on records maintained by the agencies that supplied the trucks; body tallies were reported to UNHCR daily. During the week of July 18–25, when the truck collection system was first established, several agencies reported that their workers may have been exaggerating the body counts because of the misconception that payment was related to the number of bodies collected. Body counts from this period have been adjusted downward by as much as 40% by comparing truck collection figures on certain days with burial figures collected by the French army on the same days. The problem of over-reporting was resolved by UNHCR on July 26, and figures after this date are thought to be reliable. Where possible, mortality data were also collected from health facilities and centres caring for unaccompanied children.

Morbidity surveillance

After the onset of the cholera outbreak in Goma, a surveillance system was established in which cases and deaths associated with diarrhoeal disease were reported daily from most clinics and hospitals in Goma and the camps. Initially, the reporting system did not differentiate between cholera, dysentery, and non-specific dehydration. Laboratory support was provided locally by French (Bioforce) and Israeli military forces, and by reference laboratories in France and the Netherlands. From July 31, cases of watery diarrhoea and bloody diarrhoea were reported separately.

In early August, a more comprehensive morbidity surveillance system was established, covering all health facilities in the three main camps and in the town of Goma. Cases of watery diarrhoea, bloody diarrhoea, measles, meningitis, acute respiratory infections, malaria (or unexplained fever), and other conditions were recorded daily on a standard data form. Illness was classified according to clinical case definitions supplied by UNHCR. Surveillance data were reported weekly to UNHCR, which compiled, analysed, and disseminated the information in a bulletin. Any suspected case of meningitis was reported immediately to UNHCR and cerebrospinal fluid samples were sent to the military laboratories in Goma for bacterial culture and antigen detection tests.

Population surveys

Between Aug 4 and 14, three cluster-sample surveys were done, in the Katale, Kibumba, and Mugunga camps. Each camp was mapped and divided into segments based on size and population density. Thirty clusters were allocated to each camp; the proportion assigned to each segment was based on the estimated population. In each cluster, twenty households were sampled randomly to ascertain how many members had died since arrival in Zaire. Household members who were missing and unaccounted for were not counted as deaths. In addition, 20 children aged between 6 and 59 months (or <110 cm tall) were sampled randomly in each cluster, weighed on Salter scales, and measured on standard height-measuring boards. Children smaller than 85 cm were measured while supine; taller children were measured standing. The weight-for-height index of each child was compared with a standard reference population.[4]

Additional information gathered by some or all surveys included probable cause of death, adequacy of shelter, presence or absence of adult men in the household, access to distributed food rations and local markets, size of household food reserves, history of diarrhoeal disease, and access to health care. Survey data from each of the three camps were analysed separately.

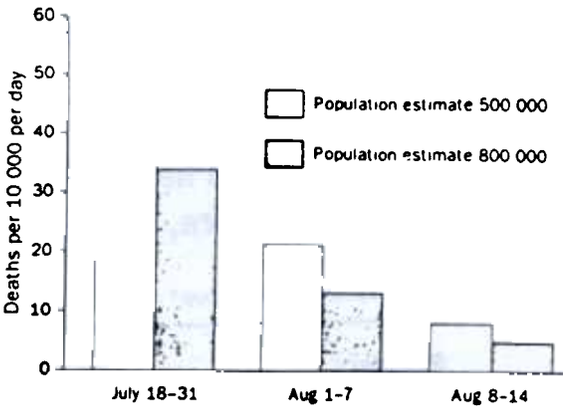

Figure 2: **CMR estimates for Rwandan refugee population**

Results

Mortality

48 347 bodies were collected by the trucks between July 14 and Aug 14. This figure represents a minimum estimate for mortality in this population because an unknown, though probably small, number of refugees who died during the first few weeks were buried privately and, therefore, were not counted by the body collection system. The estimation of mortality rates was complicated by the lack of a reliable total population figure for refugees in the Goma area, since no census or registration procedure was done. Although early estimates put the total number of refugees at more than a million, later population estimates ranged between 500 000 and 800 000, based on water and food ration distribution figures and on mapping exercises by relief agencies.

The average crude mortality rate (CMR) from July 14 to Aug 14 was between 19·5 and 31·2 per 10 000 per day, based on population estimates of 800 000 and 500 000, respectively. Even if the population estimate of 1·2 million were used, the average CMR would have been 13·0 per 10 000. By comparison, the baseline, pre-war CMR in Rwanda was about 0·6 per 10 000 per day.[2] An overall mortality rate was calculated for the period July 14–31 because many bodies were left uncollected during the early days of the emergency and not counted until later. During this period, the average CMR was between 28·1 and 44·9 per 10 000 per day; by the week of Aug 8–14, it had fallen to less than 10·0 per 10 000 per day (figure 2).

Mortality reporting systems were unable to distinguish between age groups. However, unaccompanied children, a particularly high-risk group of more than 10 000, had extremely high death rates. Between July 23 and Aug 12, for example, the CMR in some centres for unaccompanied children ranged between 20 and 120 per

	Survey period (July 14 inc)	Estimated population (×10⁴)	CMR (per 10 000 per day)	% population dying during period (95% CI)
Katale survey	Aug 4	80	41·3	8·3 (7·1–9·5)
Kibumba survey	Aug 9	180	28·1	7·3 (6·2–8·4)
Mugunga survey	Aug 13	150	29·4	9·1 (7·9–10·3)
Body count (all areas)	Aug 14	500/800	31·2/19·5	9·7/6·0

Table 1: **Comparison of CMR estimates derived from body count and from population surveys**

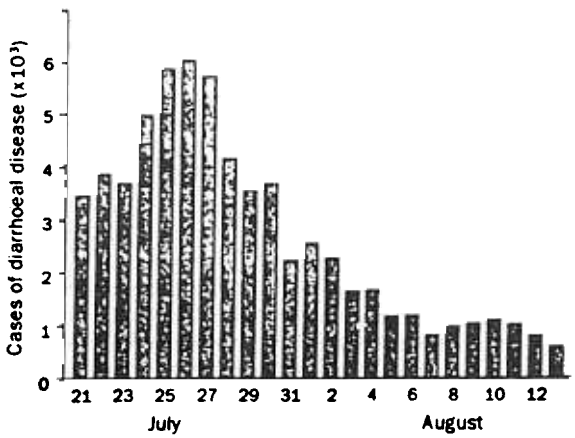

Figure 3: **Reported cases of diarrhoeal disease (cholera, dysentery, and dehydration)**

10 000 per day. Among unaccompanied infants, average daily death rates ranged from 100 to 800 per 10 000.

Population surveys in Katale, Kibumba, and Mugunga allowed us to estimate the proportion of the population who died between the time of the influx and the date of the surveys (table 1). The estimates correspond to average daily CMRs consistent with those derived from body counts (table 1). According to the surveys, 85–90% of deaths reported by household respondents were associated with diarrhoeal disease. In most refugee emergencies, death rates are several times higher among children under 5 years old than in older age groups.[3] However, the Katale survey reported that 8·0% (5·2–10·8) of children under 5 years died during the 20-day recall period, compared with 8·4% (7·1–9·7) of people over 5 years, which suggests that diarrhoeal diseases equally affected all age groups.[4]

Morbidity

Following the diagnosis of the first case of cholera on July 20, there was a massive increase in diarrhoeal disease, reaching a peak of more than 6000 cases reported on July 26 (figure 3). Laboratories isolated *Vibrio cholerae* O1, biotype El Tor, serotype Ogawa, which was resistant to tetracycline and doxycycline but sensitive to furazolidone and ciprofloxacin.

The total number of cases of cholera, including those who did not present to clinics, was approximated so that the overall cholera attack rate could be calculated. Between July 14 and Aug 12, more than 62 000 cases of diarrhoeal disease were reported from health facilities. If we assume that 57% of these cases were cholera (the Mugunga survey found that 57% of diarrhoeal deaths were due to watery diarrhoea), about 35 500 (57% of 62 000) patients with cholera presented to health facilities (assuming that the case-fatality rates for cholera and dysentery were approximately equal). Estimation of the number of cholera cases never seen at health facilities is more difficult. According to the Mugunga survey, about 88% (41 800) of the 47 500 deaths during this period were associated with diarrhoeal disease, and 57% of diarrhoeal deaths (23 800) were due to cholera. Of the 23 800 people who died of cholera, 47% (11 200) had never sought health care. If we assume, from anecdotal information, that the cholera case-fatality rate among people who never received medical attention was between 25% and 50%, a further 22 400 to 44 800 cases of cholera could have occurred among patients who never presented at health facilities. Overall, therefore, we estimate that between 58 000 and 80 000 cases of cholera occurred in the first month after the influx, giving an attack rate between 7·3% (58 000 cases in 800 000 refugees) and 16·0% (80 000 cases in 500 000 refugees).

The centre of the cholera outbreak was probably Goma town. 57% of all cases of diarrhoeal disease between July 21 and 27 were reported in health facilities in Goma, and a further 21% were reported from Munigi camp, only 10 km away. Nevertheless, the lack of geographically precise population figures during this period precludes any comparison of incidence rates in different locations. According to surveillance reports, the case-fatality rate among patients with diarrhoea seen in clinics reached as high as 22% on July 23 (when most cases were probably cholera), decreasing to 3–5% between July 27 and Aug 12. The case-fatality rate for treated diarrhoea and dysentery was 6·7% between July 21 and Aug 12. WHO suggests that the cholera case-fatality rate should be as low as 1%; however, in most cholera epidemics in refugee camps during the past 10 years, case-fatality rates have been between 2 and 3%.[3,5] Since the early surveillance system did not differentiate between bloody and non-bloody diarrhoea and since most deaths occurred outside health facilities, it is not possible to estimate the overall cholera-specific case-fatality rate in this epidemic.

Bloody diarrhoea surpassed watery diarrhoea in terms of number of reported cases by July 31 in Mugunga, Aug 2 in Kibumba, and Aug 4 in Goma and Katale. Laboratories identified *Shigella dysenteriae* type 1 as the causative organism; the strain was resistant to most commonly used antibiotics, including nalidixic acid, but sensitive to ciprofloxacin. The UNHCR morbidity surveillance system reported 15 543 cases of dysentery between Aug 8 and 14, a weekly incidence rate of 2–3%, twice the rate of watery diarrhoea reported during the same period. The case definition for dysentery was clinical; since blood in the stool may not have been verified for all patients, there may have been over-reporting of this disorder. According to the Mugunga survey, almost 40% of all deaths during the first month after the influx were associated with bloody diarrhoea.

Between Aug 1 and 16, 162 patients with suspected meningitis were detected by the surveillance system; 83 (52%) were confirmed as having meningitis caused by *Neisseria meningitidis*, group A, sensitive to penicillin and chloramphenicol. To decide whether to proceed with mass immunisation, a threshold incidence rate of 15 cases per 100 000 per week in a camp was established as predictive of a meningitis outbreak.[6] In Kibumba camp, 4 cases were reported during the first week of surveillance, followed by 34 cases during the second week (weekly incidence rate 19 per 100 000). Consequently, mass immunisation against meningococcal meningitis was instituted in this camp.

Nutritional status

The three population surveys between Aug 4 and 14 showed that 18–23% of children aged 6–59 months had acute protein-energy malnutrition (table 2). The prevalence in non-refugee populations in Africa is normally between 5 and 8%.[3] Both of the surveys that carried out the analysis found a significantly higher prevalence of acute malnutrition among children in

Camp	Date	Sample size	Percentage of children		Overall percent with malnutrition (95% CI)
			Moderate malnutrition	Severe malnutrition	
Katale	Aug 4	567	16·6	6·5	23·1 (18·3–28·7)
Kibumba	Aug 9	694	17·1	3·0	20·1 (16·1–25·0)
Mugunga	Aug 13	723	14·4	3·3	17·7 (15·0–21·0)

Moderate malnutrition=weight-for-height *z* score less than −2 but more than −3 (between 2 and 3 standard deviations below reference population mean); severe malnutrition=weight-for-height *z* score less than −3 or oedema.

Table 2: **Frequency of acute malnutrition according to population surveys in children 6–59 months**

female-headed households (without at least one man 18 years or older). In Mugunga, the only survey that asked about a history of diarrhoeal disease, 36% of children who had had dysentery during the 3 days preceding the survey were acutely malnourished, compared with 12% of children with no recent history of dysentery (relative risk 2·89 [95% CI 2·16–3·86]). All three surveys found that more than 25% of households did not have adequate water-resistant shelter. The Mugunga survey found that significantly fewer female-headed households than households headed by men reported having received food rations.

Discussion

The data gathered during the month after the influx of Rwandan refugees into Zaire describe a public health disaster of major proportions. Although early surveillance data on diarrhoeal cases and deaths varied in quality and how representative they were, three rapid population surveys collected comparable data by similar methods and provided consistent information on mortality, nutrition, and programme indicators. By early August, a standardised surveillance system was established, allowing relief agencies to monitor disease trends, reassess priorities, and evaluate the effectiveness of interventions. This combination of rapid surveys and standardised surveillance needs to be a routine element of emergency relief programmes.

Between 6 and 10% of the refugee population died during the month after arrival in Zaire, a death rate two to three times the highest previously reported rates among refugees in Thailand (1979), Somalia (1980), and Sudan (1985).[3] This high mortality was due almost entirely to the epidemic of diarrhoeal diseases. Epidemics of diarrhoea and dysentery have caused high rates of morbidity and mortality in several refugee and displaced populations lately—among Kurdish refugees in 1991,[7] displaced Somalis in 1992,[8] and Burundian refugees in Rwanda in 1993.[9] Long-term solutions require time and resources, but the excess mortality associated with diarrhoeal disease outbreaks may be mitigated by prompt implementation of several effective measures that depend more on human than technological resources. These measures include the organisation of chlorination brigades at untreated water sources, the designation of physically isolated defaecation fields, community outreach to identify and treat patients outside of clinics, and oral rehydration therapy. In addition, greater emphasis needs to be placed on education about personal hygiene and the provision of soap.

After the July 14 influx into Goma, many of the refugees were located near a large body of water, Lake Kivu; however, at the time there was no available way to purify and transport sufficient quantities of water. Efforts were made by some agencies to chlorinate water in containers as refugees removed it from the lake, but coverage was inadequate and most refugees consumed untreated water. The diarrhoea epidemic had already peaked before July 29, when the relief operation was able to provide an average of only 1 L purified water per person per day. UNHCR recommends a minimum of 15–20 L water per person per day.[10]

At least 58 000 cases of symptomatic cholera occurred in this population. Given the usual high ratio of symptomless to symptomatic infections (up to 10 to 1), it is likely that most refugees in the Goma area were infected with *V cholerae* O1, and that few infections were prevented.[11] The speed of transmission and the high clinical attack rate of cholera in Goma were related to the common practice of drinking untreated lake water (the likely common source of infection), crowding, poor personal hygiene, and the debilitation of this refugee population. Once significant numbers of refugees had been infected by drinking lake water, it is likely that there was substantial secondary contamination of other water sources and storage containers in the area. This situation was exacerbated by inadequate sanitation, due in part to the rocky, volcanic nature of the soil in the Goma area, which made digging latrines almost impossible.

Mass vaccination would not have altered the course of this cholera epidemic.[12] Of the two newer and potentially effective vaccines available, one requires two doses and does not induce immunity until 7–10 days after the second dose. The other, a single-dose, oral, live vaccine, has not been subjected to testing under field conditions and its use in refugee populations would be questionable. In any event, it is unlikely that the vaccine could have been given rapidly enough to affect the progression of the epidemic. Vaccination teams of 8–10 people managed to immunise up to 5000 refugees per day with oral poliomyelitis vaccine in Kibumba camp. Therefore, to vaccinate the whole population of between 500 000 and 800 000 refugees with a single-dose oral cholera vaccine would have taken 80–100 health-care workers 10–16 days. Clearly, by the time vaccine could have been obtained, administered, and provided immunity, the epidemic would have already run its course.

The diarrhoeal disease case-fatality rate early in the epidemic was extremely high, reaching 22% on July 23. The relatively few health-workers on the scene early in the epidemic were overwhelmed by the patient load and had inadequate therapeutic resources. However, by the 6th day of the epidemic (July 26), the efforts of medical workers had had a pronounced impact and the case-fatality rate among patients treated in clinics had decreased to 4%. It seems that the high death rate during this epidemic was due largely to the inability of many refugees to reach health facilities. Outreach programmes to identify sick patients promptly and to initiate early treatment were not launched until the second week of the epidemic.

Even when the number of agencies and relief workers increased substantially at the end of July, there was substantial variation among health-workers in the level of expertise in rehydration. Skills in effective oral rehydration are still rare among physicians and nurses trained in western-style medical practice. There is an urgent need for more intensive and focused training of

relief workers to develop relevant expertise in the prevention and management of diarrhoeal diseases, as well as other essential elements of relief programmes, such as measles immunisation, public-health surveillance, community outreach, and nutritional rehabilitation.

The cholera outbreak was quickly followed by a lethal outbreak of bacillary dysentery. Earlier studies in Burundi, Rwanda, and Tanzania showed that epidemic dysentery in that region is predominantly caused by *S dysenteriae* type 1.[6,13] In addition, these studies had alerted the public-health community to a trend of rapidly increasing antibiotic resistance. In Goma, after laboratory confirmation of shigella resistance to nalidixic acid, an expert committee was formed to consider treatment options. After comparing the risks of untreated shigellosis and the risks of treating large numbers of patients (including young children, for whom there are theoretical risks from fluoroquinolones), the committee decided to advocate a policy of carefully monitored treatment with ciprofloxacin for certain high-risk groups, including children under 5 years, pregnant women, people older than 55 years, and patients with severe illness. There is a need for operational research to develop more effective prevention and case-management strategies for this disorder.

By the third week of the influx, the international community's response began to have a significant impact. Routine refugee relief measures such as measles immunisation, vitamin A supplementation, standard disease treatment protocols, and community outreach programmes were established in each camp, and the water distribution system provided an average of 5–10 L per person per day. A consensus was quickly reached on standard information gathering, and a high level of cooperation and coordination of public health programmes was achieved, under the leadership of UNHCR.

The prevalence of acute malnutrition among children was probably related to the high incidence of diarrhoeal diseases and to the food distribution system, which was controlled by Rwandan political leaders and was unable to distribute food rations directly to refugee families. Children in households headed by women were at high risk of malnutrition. The survey findings led to recommendations for supplementary and therapeutic feeding programmmes, systematic registration of refugees, and changes in distribution procedures to allow for more equitable access to relief food. However, changes in the food distribution procedure were dificult to implement because of the insecure situation in the camps and resistance by former Rwandan political and military leaders who exercised stringent control over the refugee population. Lack of security has been a feature of several recent refugee operations; therefore, effective means of preventing the misuse of relief items need to be developed by the international community.

The high mortality rates experienced by Rwandan refugees in eastern Zaire were almost unprecedented in refugee populations, and the world must take note of the lessons from this disaster. The immediate, medical cause of most deaths was diarrhoeal disease, but the underlying causes were the historical, ethnic, demographic, socioeconomic, and political factors that led to the collapse of Rwandan society and to this mass population migration.[14] Correspondents to *The Lancet* have pointed out that extensive information on the deteriorating conditions in Rwanda had been published during the past 20 years.[15] However, the international community has been unable to develop effective strategies to prevent the collapse of small, vulnerable countries such as Rwanda, Liberia, and Somalia. The observations of early warning information systems, where they exist, are often ignored, especially if the immediate political interests of wealthy nations are not threatened.

Although generally proven interventions against diarrhoeal disease were eventually implemented in Goma, they were insufficient in relation to the scale of the disaster. The world was simply not prepared for an emergency of this magnitude. The leaders of wealthy nations tend to wait until public opinion forces them to respond to disasters with enormous resource infusions. Although this delayed response has included the deployment of military forces with their formidable logistic capability, the mobilisation of military resources is very expensive. Because military deployment depends on political decisions, it cannot always be integrated into disaster preparedness planning. Therefore, while continuing to explore ways of improving the efficiency and cost-effectiveness of the military role in emergency relief, donor nations would be wise to invest funds in strengthening the existing network of relief organisations. These agencies need resources to implement early warning systems, maintain technical expertise, train staff, build reserves of relief supplies, and develop their logistic capacity. Unless global action is taken urgently to improve the state of emergency preparedness, there will be more public health disasters like the one we have described in Goma.

Goma Epidemiology Group

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Effects of pulsed β-stimulant therapy on β-adrenoceptors and chronotropic responsiveness in chronic heart failure

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Summary

In animals, intermittent sympathomimetic stimulation with dobutamine produces benefits analogous to those of physical conditioning. Longer intermittent or continuous β-stimulant therapies have not, however, been successful in managing patients with chronic heart failure. We have investigated the role of β-receptor stimulants in patients with severe chronic heart failure by changing the method of administration to intermittent, very short-duration pulsed intrope therapy (PIT).

We studied 10 patients (mean age 64 [SE 2] years) with stable moderate to severe chronic heart failure (ejection fraction 23 [3]%) who received PIT, and 10 control patients matched for age and severity. We infused sufficient dobutamine to raise heart rate to 70–80% maximum for 30 min per day, 4 days per week for 3 weeks. PIT increased exercise tolerance (from 10·4 [1·2] min at baseline to 13·0 [1·5] min at 3 weeks; p<0·001, 95% CI for difference 1·6 to 3·9) and lowered peripheral vascular resistance (19·8 [3·1] to 17·7 [2·4] mm Hg.min.L^{-1}; p<0·05, −4·1 to −0·1). PIT produced significant increases in lymphocyte β-receptor density (502 [110] to 1200 [219] per cell, p<0·02, 258 to 1138) and chronotropic responsiveness to exercise (change in heart rest to peak exercise 51·0 [3·2] to 57·5 [3·9] beats per min; p<0·01, 2·9–10·1). Plasma noradrenaline concentrations (2·39 [0·28] to 1·65 [0·19] nmol/L, p<0·05) were reduced. The patients' symptoms were also improved. By contrast, no change in autonomic function or exercise capacity was seen in the control group.

Short-duration PIT induces pharmacological conditioning with improved symptoms, autonomic balance, exercise tolerance, β-receptor up-regulation, and enhanced chronotropic responsiveness in chronic heart failure.

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Introduction

Chronic heart failure is a complex syndrome with many non-cardiac abnormalities, which may contribute to the associated symptoms, exercise tolerance, and high mortality rate. Specific strategies to reverse these abnormalities have not yet been discovered. One important abnormality that contributes to exercise intolerance in chronic heart failure is β-receptor down-regulation[1] and, as a consequence, a reduced ability to mount an adequate heart-rate response to exercise (chronotropic incompetence).[2]

Long-term inhibition of angiotensin-converting enzyme (ACE)[3] and β-blocker therapy[4] have been reported to up-regulate β-receptors. Although sympathetic withdrawal cannot be excluded, this up-regulation may be secondary to a general improvement in condition with ACE inhibition, and may be possible in only a minority of the affected patients in the case of β-blockade. No specific treatment to up-regulate β-receptors is available.

The mechanism of β-receptor down-regulation is thought to be persistent β-stimulation by the sympathetic hyperactivation known to occur in chronic heart failure. It is not known whether pulsatile rather than continuous chronic β-receptor stimulation would cause less down-regulation but evidence from receptor-agonist systems suggests the possibility.

Experiments in animals have shown that intermittent sympathomimetic stimulation with dobutamine can produce beneficial changes analogous to the effects of physical training.[5] As did physical training,[6] dobutamine infusions improved exercise performance and reduced resting heart rate, exercise-provoked increases in heart rate, arterial blood lactate, plasma renin activity, and plasma noradrenaline concentration.[7] These encouraging results led to studies in patients with severe chronic heart failure; the treatment produced significant improvements in resting haemodynamics, exercise tolerance, and symptoms that persisted for weeks.[8] Long-term β-stimulant or other inotrope therapy has not, however, been successful in management of chronic heart failure for two main reasons—tolerance to the inotropic stimulation, which for β-stimulants is substantially related to β-receptor down-regulation,[9] and an increased frequency of ventricular arrhythmias, which may increase mortality.[10,11]

There was an important difference, however, between the animal and human studies. The short infusions

Public health

Evolution of complex disasters

Brent T Burkholder, Michael J Toole

Famine, wars, civil strife, and persecution have caused mass population migrations and subsequent public health disasters throughout history. Scenes of Rwandan children dying by the side of the road, of Chechen civilians fleeing air strikes, and of Bosnian families preparing for another winter in besieged cities dominate the world's television and newspapers and remind us that these disasters continue to occur in the last decade of the 20th century. However, the media present only a selective, albeit dramatic, picture of the way in which these emergencies evolve and how the world responds.

Refugees are defined as persons who flee their own country because of war, violence, famine, or a well-founded fear of persecution for reasons of race, religion, or nationality.[1] Individuals who leave their homes for any of the same reasons but remain within their native borders are considered internally displaced. Refugees tend to move across borders into isolated areas and coalesce in crowded camps. Displaced persons often migrate from rural areas or small towns into larger cities where they may blend into the local population or form their own urban tent camps. Although the public health needs of these two groups may be similar, international humanitarian assistance has readier access to refugees, whose populations are more clearly defined.

Since 1990, the number of refugees and internally displaced persons has grown from about 30 million to more than 42 million.[2] A myriad of factors have been responsible for this increase. In Africa, Europe, and Asia, long-simmering ethnic conflicts have turned violent, with high civilian casualty rates, disruption of local agriculture, collapse of social order, and mass population migrations. In these complex emergencies, the precipitating causes are easier to define than to manage.[3,4]

Complex disasters, known as complex emergencies among humanitarian organisations, tend to unfold in phases with problems and priorities shifting over time. We describe here how relief efforts evolve in response to changing needs.

Complex emergencies

Complex emergences have been defined as "relatively acute situations affecting large civilian populations, usually involving a combination of war or civil strife, food shortages, and population displacement, resulting in significant excess mortality".[3] Recent examples have included northern Iraq, Somalia, the former Yugoslavia, and Rwanda—in all of which there was armed conflict with high civilian casualties. International assistance organisations that were experienced in dealing with public health outcomes such as communicable disease outbreaks now have to cope with security concerns and violence directed at both displaced civilian populations and relief workers.

The most specific health indicators of affected populations are mortality rates, and these can be used to divide complex emergencies into phases of acute emergency, late emergency, and post emergency.[5] In most developing countries, the crude mortality rate (CMR) during "normal" times is less than 2 per 1000 per month.[6] Immediately after refugee influxes in Thailand (1979), Sudan (1985), and Turkey (1991) monthly CMRs were 8·1 to 18 times higher than expected.[7] In Goma, Zaire (1994), CMRs among Rwandan refugees during the first few weeks after their migration were almost 60 times the baseline rates.[8] With the arrival of relief assistance, death rates begin to decline over the first month (figure) signalling the movement from acute to late phase. When CMRs reach those of the host country, some 6–12 months after the original events, the situation is judged stable and the post-emergency phase begins.

Acute emergency phase

An emergency may build up slowly as refugees trickle across a border in small groups over several weeks, as happened in Bangladesh in 1992. Or a particular event may trigger a massive migration such as the flight of an estimated 800 000 Rwandan refugees into Zaire in just three days in July, 1994. Irrespective of location and timing, the first few weeks of an emergency are chaotic as thousands of persons seek refuge after physical or emotional trauma. If they have trekked long distances they may already be malnourished or sick. Attempts to meet the needs of these refugees may be further

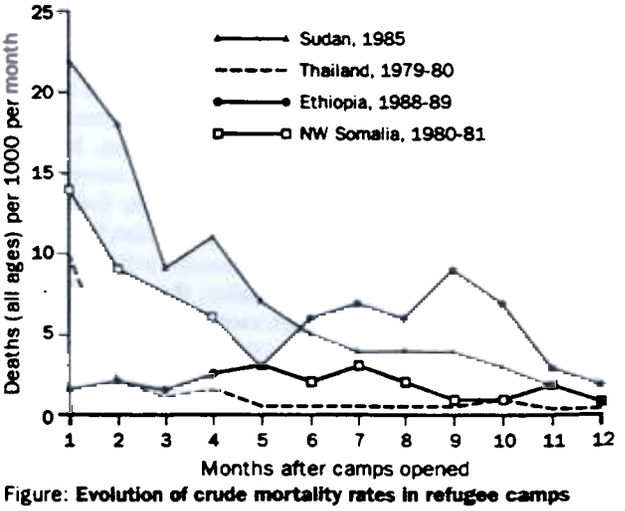

Figure: **Evolution of crude mortality rates in refugee camps**

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	Acute emergency	Late emergency	Post emergency
Time frame	0–1 months	1–6+ months	>6 months
	High CMR High CFR Outbreaks of communicable disease Malnutrition	Declining CMR	
Priority needs	Food Water/sanitation Shelter	Security Fuel Improve basic needs	Expand self-sufficiency
Public health interventions	General ration/?selective feeding Measles immunisation HIS Primary care clinics+outreach and ORT centres	Train community health workers Standardise treatment protocols Expand HIS Develop rational drug supply Begin MHC, STD programmes	Develop TB, mental health programmes Expand MHC, STD programmes

HIS=health information system; ORT=oral rehydration therapy; MCH=maternal and child health; CMR=crude mortality rate; CFR=case fatality rate; STD=sexually transmitted disease.

Table: **Phases of a complex emergency**

complicated by security concerns, logistic and resource constraints, and lack of coordination among relief organisations.

Health profile

The debilitated condition of many refugees on arrival, crowded camp conditions, and difficulties in providing even basic requirements to thousands of families all contribute to the excess death rates. Children under 5 years of age, and particularly infants under 1, have the highest mortality and morbidity, but all age groups are affected.[9] In developing countries five conditions—malnutrition, diarrhoeal diseases, measles, acute respiratory infection, and malaria—consistently account for 60–95% of deaths during the emergency period.[7] By contrast, in eastern Europe and the former Soviet Union, the most critical health factors were the chronic diseases prominent before the conflict. War-related trauma contributed substantially to death rates in Bosnia,[10] Somalia,[11] and Afghanistan.[12] By disrupting antenatal care and vaccine campaigns, violence in these areas also increased perinatal mortality rates and measles deaths.

Major outbreaks of communicable diseases with high case fatality rates (CFRs) are common in emergency settings, particularly in developing countries. Raised CFRs are often associated with a high prevalence of acute malnutrition, especially among children under 5,[7] which may in turn be related to food shortages, problems with food distribution, or a high incidence of communicable diseases such as diarrhoea or measles.

Priorities

In addition to protection from conflict, priorities for refugees during the first weeks of a complex emergency are food, water, and shelter. Arriving in a foreign territory with no independent means of support, they are almost totally dependent on assistance from the local host government or relief agencies. In the first few days after arrival, refugees are often moved into makeshift camps, both to isolate them from the local population and to improve logistics for distribution of relief supplies. Because large densely populated camps are associated with high mortality, the aim is to create camps of under 10 000 inhabitants;[13] however, they commonly range in size from 20 000 to well over 100 000 people and tend to be located in remote areas with poor access for relief agencies. Until plastic sheeting and other construction materials arrive (which may take weeks), refugees either survive in the open or make shelters from whatever is available locally.

Again, for days or weeks they may have to forage for food. The World Food Programme—the United Nations organisation responsible for procuring and transporting food in such emergencies—will probably begin by supplying high-protein biscuits. Usually within the first week, the ration is expanded to include grain, beans, and oil which provide minimum caloric needs. Food is distributed through a system established by refugee leaders, but relief agencies try to include women refugees in the process to ensure equitable distribution. It has been customary, early in the emergency, to establish supplemental feeding centres for malnourished children and pregnant women. Therapeutic feeding programmes are critical for the most severely malnourished, but many relief agencies now seek to improve the general ration as quickly as possible, so as to address the needs of more moderately malnourished children.[14]

Water tends to be more problematic than food. Adequate quantities of relatively clean water are preferable to small amounts of high quality water. Until relief agencies can organise well-digging or transport of chlorinated water, refugees must often walk great distances for their supplies. Provision of buckets with lids to each family and then chlorinating each bucket at the distribution source is labour-intensive but has proved an effective prevention step that can be instituted early in an emergency.[15] During this phase latrine construction begins, but initial sanitation measures may be nothing more than designation of defaecation areas in each camp.

Public health interventions

Beyond providing immediate needs, the traditional focus of humanitarian agencies has been on curative care. Tent clinics staffed by expatriate clinicians with very rudimentary facilities and limited drug supplies are early high-profile interventions. However, the complex emergencies along the Iraq-Turkey border[16] in 1991 and in Goma[8] in 1994 reinforced the lesson that equally important in the emergency phase are public health measures such as the deployment of community outreach workers and establishment of oral rehydration therapy outposts. Another critical community intervention is measles immunisation. Experience in Sudan and elsewhere has amply demonstrated the need for measles immunisation, along with vitamin A supplements, in all children between 6 months and 5 years of age even before any cases of measles have been identified.[17] In the past 5 years relief organisations have recognised the importance of a standardised health information system to track disease patterns. Epidemiologists now routinely establish

basic mortality and morbidity surveillance systems and conduct nutrition surveys during the acute phase to assess programme effectiveness and the need for further public health interventions.[18] During this phase, epidemiologists also develop contingency plans in case of epidemic disease such as cholera or dysentery. All of these public health interventions need to focus on the most vulnerable groups in the population, including unaccompanied children.

Organisation

If the host country's ministry of health is operational, health programmes for refugees and displaced people should conform to local guidelines and make use of local facilities, especially hospitals, as long as this does not overtax their capacity. UN and humanitarian agencies usually hire programme and administrative staff within the community, but it is important not to take health professionals away from the local health system.

The task of coordinating international emergency efforts usually falls to UN agencies—the Office of the United Nations High Commissioner for Refugees in refugee settings, or the UN Department of Humanitarian Affairs or the United Nations Children's Fund when the emergency involves displaced persons. However, the quality of coordination and leadership provided varies considerably. Other specialised UN agencies such as the World Food Programme and the World Health Organization participate in their specific areas of responsibility—principally coordination and technical support.

Programme administration and implementation is primarily the task of non-governmental organisations (NGOs) and other voluntary agencies such as the International Committee of the Red Cross. The number of NGOs can vary from less than a dozen to well over a hundred, depending on need, location, and media attention. They differ greatly in size, technical expertise, resources, and willingness to interact. The larger NGOs tend to focus on special areas such as food distribution (eg, CARE), water/sanitation (Oxfam), and primary health care (Médecins sans Frontières). Although cooperation between NGOs is generally good, late arrivals on the scene struggle to find their niche. Despite daily coordination meetings of UN agencies and NGOs to exchange information and develop plans of action, overlaps and gaps in services can arise because individual and group responsibilities are unclear. Great efforts are needed to define those roles.

During the early phase of an emergency, work schedules of 18–20 hours a day, 7 days a week are common as NGOs scramble to set up support for their own staff and begin assisting the refugees. Living conditions for expatriates may be little better than those of the refugees, and staff must compete for scarce vehicles and communications equipment. Difficulties with the overall coordination of humanitarian agencies and the lack of personnel standards in these groups continue to plague relief efforts, especially during the acute emergency phase. A possible solution is the establishment of an international task force that could lead a coordinated response; however, serious questions remain about the exact role, cost, and control of such a task force and more attention is now being paid to strengthening the expertise, training, and logistical support of existing agencies.

Recent complex emergencies have involved two new international participants—the military and the media. International military forces can offer logistics, public health programmes, and security. However, the ambiguity of the military's role in Somalia and Bosnia has led to disastrous consequences and the exact role for these forces in complex emergencies is still being defined.[4] The media play a similarly high profile role and may be initially responsible for focusing the world's attention on a particular situation. Journalists have even outnumbered relief workers in the early days of some emergencies, but media attention tends to wane after the early days of a relief operation.

Late emergency phase

The steep decline of crude mortality rates that occurs during the acute emergency phase is followed by a more gradual decrease over the next 6 months or longer. Even in this late emergency phase mortality may temporarily increase, as happened in Ethiopia when a previously well nourished population received an inadequate food ration (figure).[19] With equitable distribution of an adequate food ration, malnutrition usually decreases in this period, but it may persist in certain groups. If the general food ration has been incomplete, micronutrient deficiencies such as scurvy appear during this phase.[20] The predominant causes of mortality and morbidity continue to be malnutrition, diarrhoeal diseases, measles, acute respiratory infection, and malaria.

The goal during this phase is to bring the main relief programmes up to standard levels. Rations should reach at least 1900 kcal per person per day (some argue for a minimum of 2100 kcal) plus the recommended daily allowances for all essential micronutrients;[21] water quantities should be 15 L per person daily;[13] at least one pit latrine should be provided for every 20 people;[13] measles immunisation coverage should be better than 80%;[17] and soap (200 g per week for a family) should be part of the general ration. Paradoxically, as these basic needs are addressed, both refugees and relief workers become increasingly anxious about personal safety. Locally consumed resources such as wood for cooking fires become scarce and refugee families must search further and further from their camps.

Relief interventions now focus on public health programmes rather than acute needs. Community health worker programmes are formalised and local refugees are trained to provide basic clinical and prevention services, including those for maternal and child health, mental health, and sexually transmitted diseases/HIV. UN agencies and NGOs endeavour to standardise programme practices—eg, developing a rational drug supply system and common treatment protocols. In addition to the basic mortality and morbidity information that was the core of the health information system in the acute emergency, in the later phase the system includes process indicators such as ration content and water quantity that can be used to evaluate public health interventions. For example, when surveys in Goma revealed that children in female-headed households were much more vulnerable to malnutrition, the food distribution system was changed.[8]

Although specific international inputs may be necessary for the development of new public health programmes, the emphasis during the late emergency phase is on identifying resources from within the refugee population. NGOs focus more on bringing in trainers and those with specialised skills. The number of NGOs on the scene may

well decline as the most acute needs are met. For the remaining NGOs, roles are clarified and coordination meetings become less frequent.

Post-emergency phase

The health profile of the refugee camps begins to mirror that of a typical village as the CMR approaches baseline for the refugee population or the host country. Although acute communicable diseases remain the primary cause of illness, chronic diseases such as tuberculosis and mental illness become proportionally more prominent.

By this phase, refugee camps are becoming settled communities and basic programmes need to be complemented in ways that will increase their effectiveness and make the refugees as self-sufficient as possible—for example, by providing fuel-efficient stoves, grinding mills, and seeds for local gardens. Basic public health programmes are expanded to develop comprehensive and specific strategies for maternal and child health, family planning, and control of tuberculosis and sexually transmitted diseases.

NGOs may be offering further training and back-up, but by this stage the refugees provide much of their own health care. The emphasis of humanitarian assistance shifts from relief to development, and NGOs and UN agencies (such as the United Nations Development Programme), with a more developmental focus come on the scene. NGO staff at this point include more administrators, trainers, and development experts than direct care providers.

Conclusion

The political, environmental, cultural, economic, and public health context make each complex emergency unique. The exact series of events is therefore unpredictable, but certain patterns unfold and the duration of the acute emergency phase can be shortened by timely public health interventions (table).[5] These include: food rations with adequate calories, equitably distributed; relatively clean water in sufficient quantities; medical care, with a focus on outreach efforts (eg, oral rehydration centres), and prevention (eg, immunisation); and a basic health information system. As mortality declines, these interventions can be formalised and expanded.

The need for international health care workers likewise evolves, and interventions must be geared to the health profile of the population at the time. To provide useful assistance in complex emergencies, clinicians and public health workers require training in the principal diseases encountered. In addition, all national primary health care programmes should incorporate emergency plans that quickly provide access to local resources.

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