2. Jamaica

Floods, June 1979

1. BACKGROUND INFORMATION (48-50)

Jamaica is one of the most densely populated countries in the world with a population density of over 195 people per km^2. On arable land this comes to more than 1,000 per km^2. The total population numbers around 2,200,000 of which close to half is younger than 15; 39% of these live in towns of 1,000 or more (1970). Jamaica lies in the Caribbean sea to the south of Cuba and to the east of Hispaniola (Haiti and Dominican Republic).

The original inhabitants of Jamaica were Arawak indians. Presently the Creole population (African and African-mixed) accounts for 90-95% of the population. Caucasian, Chinese, Eastindian and mid-Eastern communities make up the remaining 5-10%.

Administratively Jamaica is divided into parishes, with parish councils administering local affairs (Figure 12). For preventive health purposes a parish Medical Officer of Health is in charge of parish affairs.

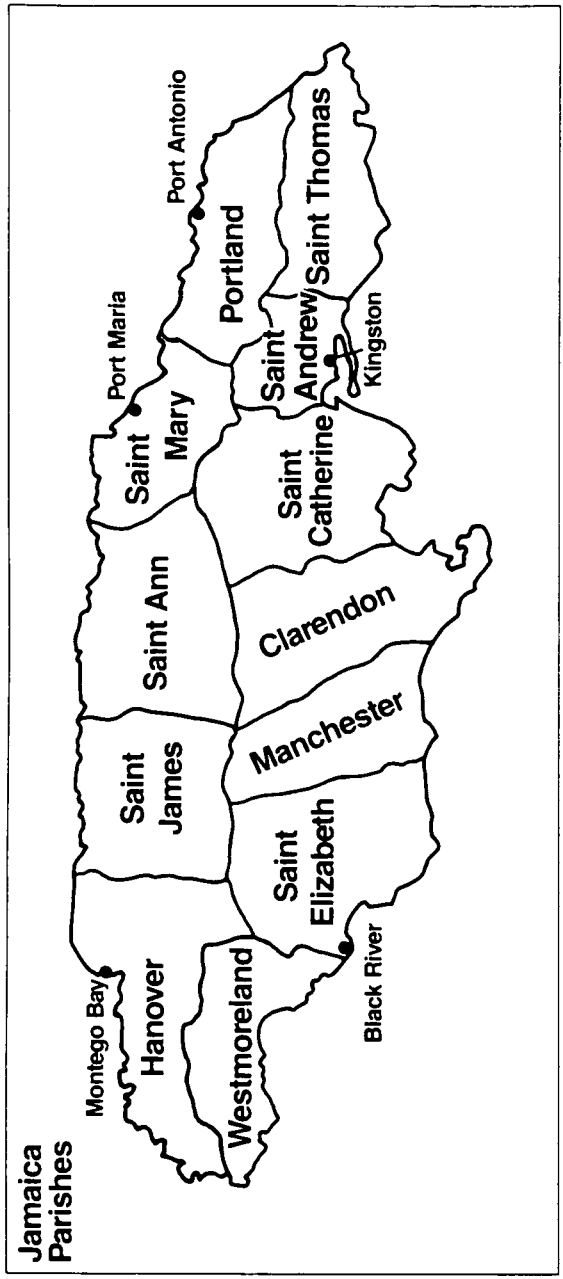
The economy is dominated by bauxite mining, manufacturing and tourism. The Gross National Product (1978) stood at US$ 921 per capita. Vital statistics were as follows :

Crude Birth Rate	(1976)	29/1000
Crude Death Rate	(1976)	7/1000
Infant Mortality Rate	(1976)	22/1000 live births
Life expectancy at birth	(1979)	70.6 years
Literacy rate	(1976)	86/100

The mortality pattern is rapidly becoming similar to that found in developed countries. One report states, however, that malnutrition contributes directly or indirectly to 60-85% of deaths among children six months to two years old. Malaria was eradicated from the island in the 60's.

Immunization programs had been carried out against diptheria, polio, tetanus and whooping cough but with a coverage of only around 30% (1978) in infants before one year of age. A massive epidemic (20% attack rate) of dengue type 1 struck in 1977-1978 and *Aedes aegypti* remained abundantly present. A large typhoid outbreak (97 confirmed cases) occurred late 1978 in one of the western parishes.

Figure 12


Jamaica Parishes
Montego Bay
Hanover
Westmoreland
Saint James
Saint Ann
Port Maria
Saint Mary
Port Antonio
Portland
Saint Thomas
Saint Andrew
Kingston
Saint Catherine
Clarendon
Manchester
Saint Elizabeth
Black River

88% of the population was considered to have access to potable water (1977). There were 3.6 hospital beds per thousand population in 1979. A network of health centers and dispensaries throughout the island supplements hospital services. In the Montego Bay area a 400-bed regional hospital was completed in 1974 and provided specialized services for the five Cornwall County Parishes. A serious health manpower shortage existed in Jamaica at the time of the disaster, mostly in the category of physicians and trained nurses.

Jamaica had previous disaster experiences: in 1907 the capital was extensively damaged by an earthquake; the previous capital, Port Royal, was destroyed by an earthquake, fire and tidal waves in 1692; a hurricane hit the capital in 1951, and floods are frequent during the rainy season. Jamaica lies at mid-center of southern hurricane tracks and is frequently struck by storms between August and November.

1.1. THE FLOODS

On the 12th of June, after five months of above-normal rainfall in Western Jamaica torrential and sustained showers associated with a tropical depression flooded the already saturated areas. This resulted in forty-two deaths (31 of them in one parish in Westmoreland) and extensive damage to infrastructure. Nearly 160,000 people were estimated to be affected. Up to 40,000 were reported homeless and another 50,000 experienced severe losses. At one point the damage was estimated at 114 million Jamaican Dollars (= 60 Mill. US$).

Most affected were water supply systems, roads, bridges, houses, agricultural crops and livestock in the parishes of Westmoreland, Hanover, St. Elizabeth, St. James and Trelawny (see map) (Cornwall county parishes). Westmoreland was the worst hit area. The total population in this area is around 350,000. After the first impact the floods started to recede except in a few areas where they would remain for several weeks. Immediately following the first impact a small number of evacuation centers (nineteen later reduced to seven) were set up for people who could not find refuge with relatives. These were disbanded as soon as the floods started to recede and people went back home.

There was serious concern in Jamaica at the time about the risk of epidemics. Floods had washed out everything in many places, including sewerage pits (pit latrines) and graveyards. There had been electricity

problems, a sewerage plant had been flooded and water supply systems were affected. This also occurred in an area where an extremely large outbreak of typhoid was seen only 6 months earlier. This outbreak had been ascribed to a breakdown of the water supply with people turning to alternative water sources.

Since flood water could have been contaminated in many ways and people had no choice but to have repeated contact with this flood water, the public was also very concerned. Despite considerable pressure from the public and politicians no mass immunization campaign against typhoid was undertaken. In making this decision the advice of national and international epidemiologists was accepted. Public concern was partially addressed through the massive distribution of water purification tablets.

2. SURVEILLANCE SYSTEM

One week after the impact a CAREC epidemiologist was requested to assist the national Jamaican epidemiologist with the development of an effective disease surveillance system in the areas affected by flooding. First a rapid situation survey was undertaken to assess existing damages (including health infrastructure) and ascertain if certain disease problems had arisen. Second, a surveillance system was set up in the Cornwall Regional Hospital, little affected by the floods.

The surveillance system was based on an analysis of high risk diseases and high risk areas. It used available records such as the typhoid register and mapping of flooded areas. While the entire area would be kept under surveillance special attention was given to the risk areas identified (mostly in Westmoreland). Two diseases were considered to be especially troublesome--typhoid and leptospirosis. Dengue would be added to this list later.

An operations center was established in the Hospital with a large map of the Western Region. The following information was registered and updated daily:

- Operative health centers and hospitals.
- Inoperative health centers and hospitals.
- Inoperative water systems.
- Areas originally flooded, with pins indicating which areas were still flooded.
- Risk areas for typhoid.
- Risk areas for leptospirosis.

Besides this, a similar system to the one described for St. Vincent was proposed for surveillance in the evacuation centers. Also all health centers were requested to report daily all cases of fever, jaundice and gastroenteritis seen in the health center. Any unusual situations, including any case of typhoid, leptospirosis or dengue had to be communicated immediately through whatever means. The cooperation of the senior public health nurses in each parish was obtained and they would pass on the instructions to the nurses-in-charge of the health centers.

At the hospital the surveillance staff personally surveyed daily out-patient visits and in-patients.

Twice weekly a meeting was held of senior parish staff to review the situation. Surveillance and disease control data were discussed at this meeting. The meetings were also attended by staff of the environmental control unit of the Ministry of Health. In this way an eye was kept on the environmental conditions in the disaster area.

The one public health activity under surveillance consisted of the distribution of water purification tablets.

Routine surveillance of infectious diseases also continued as usual in these areas. We had to realize however this had not been adequate in several places for several months or years.

3. RESULTS AND ANALYSIS

3.1. SYSTEM

In the entire surveillance operation very few reports came in. Also very few records were kept. Therefore, the following analysis will be mostly a qualitative one.

Most flood waters had retreated about one week after onset. As flood waters retreated, normal activities resumed in most places. In this way the intensive surveillance system was stopped (or never started) in these places. In practice the entire surveillance system functioned for about one month after which it was discontinued. During this entire period at least one person from the national Epidemiology Unit remained constantly present in the affected area.

Formal reporting proved very difficult. A minority of centers and/or parish headquarters reported and even then only after repeated phone calls and personal visits. This could at least partly be explained by the rather large delay in starting intensified surveillance.

The main value in the surveillance system could be considered to be that it existed: if something serious occurred people knew where to report and ask for assistance. For the routine collection of reports however, it was not very successful. Little value can be given to the accuracy of the reported numbers. The effort of installing emergency surveillance in four different parishes with a population of almost 350,000 people covered by almost one hundred different health centers with varying communication facilities was most certainly very much underestimated at the time.

3.2. RESULTS

First of all no outbreak of infectious diseases of any importance was recognized during this period. One outbreak of fish poisoning possibly related to disaster-induced changes in marine ecology was described elsewhere.[51]

The evacuation centers were visited daily by a public health nurse. After 15 days only one of them had reported any communicable disease (three cases of gastroenteritis). At this date, the number of centers had already dwindled to six, with a total population of 319. Whatever reports were received from these centers later were included in the health center surveillance reports. From informal contacts with the nurses who visited these centers we knew no outbreaks occurred there.

Despite the poor reporting two surveillance reports were issued on health center surveillance,[52,53] one in early July and one in mid-July. Each covered approximately 10 days. The purpose was threefold:

- To give feedback to decision makers and to people at the reporting level.
- To strengthen the surveillance system by showing that the information was being used.
- To contradict rumors that circulated in the public and in the media about epidemics in the affected area.

As in St. Vincent, the figures were mainly used to detect outbreaks and not so much for statistical analysis. No baseline data to compare with were available. Thus, the criteria against which they were analyzed had to be constructed as follows:

The absolute number of cases reported was set against the population size, the number of units that were supposed to have reported and the health facilities available in that region. It was attempted to determine if the number was "reasonable," that is, if the normal facilities could cope with this load.

Time trends were analyzed to see if increases occurred. Pseudo-increases due to better reporting were to be excluded.

The geographical location of cases was investigated to determine if clusters occurred.

A few pseudo-epidemics were seen, with a striking increase in the number of cases reported from one center or parish for one or more days. When investigated, these could all be ascribed to artefacts of intensity of surveillance. For example from June 23 to 25 high numbers of cases of gastroenteritis were reported for Westmoreland. These were all associated in time with the visit of an epidemiologist to that area and the active search for cases he initiated. Similarly, other temporary increases could be explained through abrupt surveillance activity. One decided to phone several health centers on one day to find out what they were seeing. Most of the time this enthusiasm had disappeared one day later. The number of cases reported decreased correspondingly.

It cannot be stated if more or less infectious disease occurred following the disaster. We can only say that no geographic clustering of reported cases occurred, no consistent time trends were observed and the treatment facilities could easily cope with the case-load. An outbreak of skin rash was reported but never investigated. It consisted of 16 cases in one day and was said to be associated with water contact.

4. SPECIFIC SURVEILLANCE

4.1. DISEASE-SPECIFIC SURVEILLANCE for typhoid, leptospirosis and dengue failed to reveal any confirmed cases of dengue or leptospirosis in the affected areas. Considerable assistance had been given to provide

adequate diagnostic facilities for these two diseases. In fact this could have resulted in a pseudo-outbreak since it would have been possible to confirm more cases than in normal times.

Following the same rains a leptospirosis epidemic with 30 cases was reported from another Jamaican parish where no flooding occurred. The typhoid situation will be discussed later under routine surveillance results. In the worst affected parish not a single case of typhoid was reported in the months following the flood.

4.2. HOSPITAL SURVEILLANCE (outpatients and inpatients) was done on an informal basis. No records were kept. Unusual occurrence of infectious disease was not documented. There was an apparent increase in the number of patients with centipede bites. No similar impression existed for snake and/or dog bites, which have been reported for other flood and/or disaster situations. In fact, very few snake bites were presented for treatment during this period.

4.3. ENVIRONMENTAL HEALTH ACTIVITIES focused on water and food quality. A major health hazard presented itself in the form of flood-damaged foods. They were presented as disaster sales at discount prices. Flood-damage was suffered directly (e.g., flour, sugar) or indirectly through the power failure following the floods (e.g., meat, milk, etc.). Vigorous and rapid action by the food-quality and/or public health inspector was necessary to condemn these supplies and counteract this dangerous practice.

4.4. WATER SUPPLIES for the parishes are served by numerous small water systems (more than one hundred). This limits the health hazards associated with defective water systems to small population groups. In a summary on the status of water supply in the affected parishes presented by the Enviromental Health Department the three major deficiencies found were:

a. Poor disinfection practices (sometimes related to unavailability of chlorine).
b. Lack of proper protection of sources.
c. Absence of sanitary conveniences for the water operators.

These were known to have been in existence long before the floods and bore no relation to the floods at all.

Of the 95 water supply systems visited after one month only 14 were not yet working (15%). There was reason to think that normally the percentage of water supply systems out of operation is higher. Still 9/14 defective systems were located in Westmoreland and constituted 40% of the systems there. Because of concern about the quality of water a massive health education program was started to promote the use of safe drinking water. Leaflets were distributed (see copy), and the Division of Health Education of the Ministry of Health made this issue a main task. A massive distribution program for water purification tablets was started. This was also propagated and monitored by the Health Education Department.

Theoretically, chemical water disinfection is adequate to assure water quality when boiling water is impractical or impossible. A number of conditions have to be met however, among them we can cite the following:

a. The tablets need to be available at the time they are needed, which is the days when water quality can be assumed to be poor--the first few days following the disaster.
b. People need to know how to use them, and they need to be willing to use them.
c. People need to have adequate receptacles in order to allow adequate dilution.

In Jamaica at least the first two conditions were not met.

a. Nine days passed before the tablets were available at the distribution center in the parish. This was still one step removed from reaching the household level.
b. A massive health education effort was mounted to explain the proper use of the tablets. It is not known in how far this was effective in convincing people to use them or in teaching them how to use them. Anecdotal information exists to the contrary: one reported incident involves people in leading positions in the community (teachers) that refused to use the tablets since they represented chemical pollution of the water (sic). Another common story was that people would use the tablets for bleaching clothes. It was later found that in some batches other tablets with higher chlorine content than the water purification tablets were erroneously

distributed. Finally, the rapid decoloration of the tablets when exposed to air also induced wastage and large amounts had to be discarded.

An analysis of the routine surveillance results as reported to CAREC shows that no increase was detectable up to one year later for typhoid, gastroenteritis, influenza, diptheria, tetanus, meningococcal infections, measles, dengue, malaria and tuberculosis. No data are available for syphilis and gonococcal infections.

The only possible effect involved a cluster of 8 infectious hepatitis cases during the week ending 7th July 1979, i.e. three weeks after the floods. Eight cases were about 5 times the normal number of cases reported per week during the first 23 weeks of the year. The figure still only amounts to an extrapolated yearly incidence of 20 per 100,000 population, a normal figure in the USA where it is thought to represent 10% of all hepatitis cases.(54) After the first twelve weeks hepatitis incidence was reported below its usual level, as was the case for all other diseases under surveillance.

Typhoid deserves special mention since this was a disease of particular concern in Jamaica. This concern repeatedly has prompted mass immunization campaigns in other countries. In Jamaica, no mass vaccination campaign was started despite considerable public and political pressure. Instead, it was decided to strengthen surveillance and if necessary to control outbreaks. This was all in accordance with the most recent technical concepts of typhoid fever control. The weekly number of typhoid cases reported for the entire country dropped by 50% in the 29 weeks following the disaster. The total number of cases reported for 1979 (140) was lower than both the preceding year (1978: 223 cases) and the following year (1980: 163 cases).

Also, the distribution of these cases showed a smaller percentage than normal was reported from the affected parishes: 4% in 1979 against 12-14% in 1977-1980.(55)

Surveillance bias cannot be discounted in these numbers. Still these decreases were noted while the general public and the health authorities were afraid of a typhoid outbreak and more active surveillance for this disease was instituted.