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AN EVALUATION OF THE SURVEILLANCE OF COMMUNICABLE DISEASES ON THE ISLAND OF MONTSERRAT, WEST INDIES.

By

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Thesis submitted to

The Faculty of Graduate and Postdoctoral Studies

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ABSTRACT

This thesis evaluated the surveillance of communicable diseases on the island of Montserrat, and the island's preparedness to monitor emerging communicable diseases.

The evaluation consisted of a review and assessment of the activities that make up the communicable disease surveillance system, and a survey of staff within the Ministry of Health designed to determine their level of satisfaction with surveillance and their suggestions for improvement. A survey of clinical staff was also conducted to determine their awareness of the presentations and management of two emerging diseases.

The system was found to be simple, acceptable, flexible and useful. Staff reported being satisfied with most surveillance tasks. The local laboratory was found to be inadequate and the Ministry unprepared for monitoring emerging diseases.

Recommendations include continuation of the existing system, development of guidelines for contact tracing and re-assessment of the role of the laboratory. Continuing education is needed for staff and patients.

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1.0 Introduction

Epidemiology has been defined as the study of the distribution and determinants of health-related conditions or events in defined populations, and the application of this study to the control of health problems(1). Like many sciences, epidemiology and epidemiological concepts have developed from the study of the exotic or the unusual into the formulation of general principles(2).

MacMahon et al., in reporting on the historical background of these concepts suggest that the history of epidemiologic methodology is largely the history of the development of five ideas: 1) human disease is related to the environment in which we live; 2) the counting of natural phenomena may be even more instructive than the observation of them; 3) "natural experiments" can be utilized to investigate disease aetiology; 4) natural experiments occur more frequently than we think and reflect the tremendous heterogeneity of human experience; and 5) "true experiments" can be conducted on human populations in some circumstances(2). It is perhaps out of the second idea that the concept of surveillance has developed over the years to where Public Health Surveillance has come to be considered as "the epidemiological foundation for modern public health"(3).

In the Caribbean, the concept of surveillance as an important function of public health was first discussed at a meeting of the islands' Ministers of Health held in the mid 1970s. The recommendation coming out of this meeting was that there was an urgent need for a regional centre that would be responsible for monitoring adverse health events.

The Caribbean Epidemiology Centre (CAREC) came into being on January 1, 1975. The Centre's initial responsibility was to oversee the monitoring of specified communicable diseases in the twenty-one member countries and to monitor disease trends in the entire region. By the end of CAREC's first year of existence, all member states were monitoring and reporting on the number of cases of at least some of the communicable diseases in the region.

1.1 Study Objectives

This study was conducted with the overall aim of evaluating the surveillance of communicable diseases on the island of Montserrat, and determining the island's preparedness for monitoring emerging communicable diseases. The evaluation was undertaken according to the *"Draft Updated Guidelines for Evaluating Surveillance Systems"* proposed by the Centers for Disease Control and Prevention, Atlanta. The evaluation was undertaken with six objectives. These are outlined below.

1. To determine the priority setting process being used to decide which diseases are monitored.
2. To evaluate the surveillance of infectious disease on Montserrat.
3. To determine the extent to which policy makers and other health staff are satisfied with the programs employed in the monitoring of infectious diseases.
4. To determine the island's preparedness for recognizing and monitoring emerging infectious diseases.

5. To make recommendations for strengthening of surveillance of communicable diseases.

6. To pilot test the evaluation process used for the surveillance of communicable diseases, for application to other similar CAREC member countries.

To accomplish these objectives a three-stage research plan was designed, implemented and completed:

Stage I. A critical review was conducted of the programs and activities that together constitute the surveillance system for communicable diseases on Montserrat. Both local and regional and activities were reviewed in terms of structure, framework and operations. The various attributes of the system were assessed as well as its overall usefulness. This review was conducted to address objectives one and two.

Stage II. A survey of Ministry of Health employees was undertaken using the semi-structured interview procedure. Categories of staff interviewed were policy makers (Director of Health, Health Educator), and personnel involved in the daily and weekly surveillance activities (nurses, public health inspectors and physicians). The objectives addressed by this stage of the study were objectives three and five.

Stage III. A survey of physicians' and public health nurses' awareness of the presentation of certain emerging communicable diseases was carried out. This survey consisted of a self-administered questionnaire presenting hypothetical case scenarios designed to examine clinical decision-making and patient management practices. This survey was undertaken to provide information for addressing the fourth objective.

The findings from all three stages of the study served as the basis for making recommendations for improving the surveillance practices on Montserrat, and for assessing the applicability of the evaluation process to the CAREC islands, that is, objectives five and six.

1.2 Background

1.2.1 Study Area

Montserrat is one of six remaining British Dependent Territories, located in the Eastern Caribbean volcanic island chain between latitude 16° 40' N and 16° 50' N, longitude 62° 09'W and 62° 15'W. The island is roughly pear shaped, 17.7 kilometres long and 11.2 kilometres wide at its widest point, with an overall size of 102 square kilometres.

The climate is tropical, being hot and humid from May to September but more equable from October to April due to the cooling effects of consistent northeast trade winds. There is a distinct dry season form March to June and adequate rainfall the rest of the year with the period between November and February being the wettest. This climate is regarded as being generally conducive to good health(4).

After centuries of lying dormant, the Soufriere Hills volcano, located in the south east of the island, rumbled back to life on July 18, 1995. The volcano had many minor eruptions for about a year that eventually led to an evacuation of all residents from areas scientists thought would be affected by any major activity. On June 25, 1997 in its most violent eruption to date, the mountain spewed fiery gas, rocks and ash over the evacuated southern areas of the island killing nineteen people. In August of that same year another

catastrophic eruption destroyed the capital Plymouth (population estimate, 3500), when a stream of heated rocks, ash and gases, set fire to many buildings and buried most of the city. A few days later the island's lone airport was also destroyed when flows of heated gas set fire to the complex(5).

The volcanic activity has been reduced to minor eruptions, with the latest being in February of 2001. This prolonged activity of the Soufriere Hills volcano has served as a pivotal event in the life of the island and makes it almost mandatory that any discussions about population, infrastructure and activities on the island be described in terms of 'pre' and 'post volcanic crisis'.

1.2.2 Pre Volcanic Crisis

1.2.2.1 Population Demographics

Population data provided by the Department of Statistics for the decade preceding the volcanic activity show a decrease in the total population of approximately 3.5 per cent over the ten-year period (Table 1). While the rate of natural increase was positive until 1989, the population was steadily declining, indicating net migration. When the data are stratified by major age groups as shown in Appendix I, one of the more striking features is the consistently higher number of males (except for 1985) in the under 5 age group. Also, there is an obvious great number of women over 65 years of age compared to the men in the same age group. The gender difference is not nearly as pronounced in any other age group.

Table 1. Montserrat's Estimated Population by Sex 1985 - 1994

YEAR	MALE	FEMALE	TOTAL
1985	5,406	5,777	11,183
1986	5,369	5,729	11,098
1987	5,329	5,686	11,015
1988	5,307	5,624	10,931
1989	5,278	5,574	10,852
1990	5,245	5,524	10,769
1991*	5,290	5,349	10,639
1992	5,248	5,341	10,562
1993	5,227	5,254	10,481
1994	5,194	5,208	10,402

Source: Department of Statistics, Montserrat. *Census year.

The vital statistics for the pre-volcanic decade yields the crude birth and death rates provided in Table 2.

Table 2. Crude Birth and Death Rates for Five-Year Intervals per 1000 Population

YEAR	Crude Birth Rate (per 1000)	Crude Death Rate (per 1000)
1985-1989	18.6	17.2
1990-1994	11.2	12.7

Source: Department of Statistics, Montserrat.

1.2.2.2 Population Health profile

Throughout the English-speaking Caribbean mortality from communicable diseases has decreased steadily(6), and the situation in Montserrat is no different. During the 1990s, chronic non-communicable diseases have been the leading cause of death, with heart disease, malignant neoplasms, cerebrovascular disease, diabetes mellitus and diseases of the respiratory system being the five leading causes of death in persons over the age of thirty(7).

Among children under the age of five, immunization coverage for vaccine preventable disease is estimated to be near one hundred percent. Surveillance data for these diseases for the period 1990 to 1999 indicate that among children under the age of five there were three cases of suspected measles and one case of post immunization mumps reported. There were no reported cases of diphtheria, rubella, congenital rubella syndrome, pertussis, tetanus or polio over the ten-year period. Also in this age group there were many cases of gastroenteritis and acute respiratory infection none of which were fatal(7). See Appendix II for all communicable diseases reported from 1990 to 1999.

Of the diseases monitored among all age groups, the most commonly reported were ciguatera poisonings and influenza. An outbreak of Dengue occurred in 1995 with seventy-five laboratory confirmed cases, followed by two cases in 1996. There are verbal reports of more epidemiologically linked cases during this same time period but these figures were omitted from the database for reasons that are unclear.

1.2.2.3 Organisation of Health Services

Government Sector. The Health Services on Montserrat were centred around the island's lone 66 bed hospital and casualty department located in the capital Plymouth, which offered basic medical, surgical and obstetric care. Persons requiring additional care were taken by air ambulance to neighbouring islands. There was one geriatric long-term care facility with 27 beds, one dental clinic and one psychiatric clinic. Twelve health centres (one in each of the 12 major villages) completed the Government run health facilities(8). A portion of the Ministry of Health's organisational chart is shown in Appendix III.

To staff these facilities the Government employed one Director of Health Services, one Surgeon, one Physician/Specialist and three District Medical Officers. There were also one Nutritionist, one Health Education Co-ordinator, one Anaesthetist, one Nurse Anaesthetist, one Radiographer, one x-ray Technician, four Medical Laboratory Technologists, three Pharmacists, one Dental Surgeon, two Dental Nurses, one Physiotherapist, one Medical Records Officer, seventy-two Nurses in various categories, several clerical officers and an array of housekeeping and maintenance staff.

The Ministry also made arrangements for specialists in Optometry and Dentistry/Orthodontics to visit the island several times each year. These and all other

services at Government run facilities were offered free of charge to all students, persons over the age of sixty, personnel in the police and prison services, institutionalised individuals and staff of the Ministry of Health. Persons suffering from chronic or communicable illnesses also had free access to all investigations and treatments related to their conditions(8).

The Laboratory services on the island consisted of one Government run facility that offered basic services in Biochemistry, Haematology, Blood Banking, Serology and Bacteriology. The Laboratory operated under the guidance of the Laboratory Division of CAREC, which provided invaluable technical support.

The Public Health Arm of the Ministry of Health had two main branches, the Community Nursing Department and the Environmental Health Department. The Community Nursing Department was staffed by one resident Nurse in staff quarters at each of eleven Health Centres (the Plymouth Health Centre was on the hospital compound and therefore in close proximity to the Casualty Department) who operated the clinic Monday to Friday and was on call 24 hours per day. Medical Officers visited these centres on assigned days and treated patients and/or referred them to the outpatient's department at the hospital to see the Physician Specialists as necessary(8).

The Environmental Health Department consisted of four officers, who along with the Vector Control Officers dealt with health issues such as: the inspection of places where food was prepared or stored for public consumption (restaurants, abattoirs, markets); management of solid waste disposal; and the inspection of public and private buildings as a means of vector control.

The monitoring of disease on Montserrat and the authority for public health workers to take actions deemed necessary for the protection of the health and well being of all citizens were covered by *The Medical Act of 1938*, *The Public Health Act* of the *Revised Laws of Montserrat, 1942* and amending legislation such as *The Public Health Ordinance of 1981*(4). This legislation covered most eventualities like notification of births and deaths, burials, conduct of medical and nursing practice and medical notification, vaccination practices and the sale of food and beverages. Although the revised public health law was enacted some sixty years ago, over that time regulations were modified and/or added as the perceived threat to the health of the public changed. For example, at that time the greatest perceived risk to the island was from sick persons and/or infected rats arriving on the island on board ships. This led to the passing of *The Quarantine Act of 1946*, which allowed for public health officers to board any vessels arriving at Port Plymouth (by force if necessary) and for the detention of any crew, passengers and/or cargo if on inspection they seemed to pose a public health risk. The accompanying schedules made specific mention of the diseases that were most common at that time, namely plague, yellow fever, cholera, typhus and small pox.

By 1961 however, with the recognition that the vector of the yellow fever virus, was present on the island *The Mosquito Control Regulation* was enacted. This ordinance outlined not only actions and authority of the public health personnel but also responsibilities of the public in eradicating this vector.

Private Sector. The private sector's contribution to health care took the form of one health centre with specialists in Obstetrics and Gynaecology, Dermatology, and

Family Medicine. There were an additional four private family practitioners, one Dental Clinic and one Ophthalmologist on the island.

1.2.3 Post Volcanic Crisis

1.2.3.1 Population Demographics

Following the period of intense volcanic activity in 1997, many residents fled to nearby islands or to the United Kingdom as part of the British Government's voluntary relocation plan. The uncertainty regarding the re-opening of school resulted in mothers with school aged children making up most of the migrant population and reducing the number of females between 15 and 65 by almost half (Table 3). By 1998 for the first time in decades, the men over the age of 65 outnumbered their female counterparts as a result of many grandmothers travelling to England to assist in caring for the young.

Table 3. Montserrat's Estimated Population by Sex 1995 - 1999

YEAR	MALE	FEMALE	TOTAL
1995	5,158	5,166	10,324
1996*	3,781	4,086	7,867
1997	3,019	3,075	6,094
1998	1,944	1,651	3,595
1999	2,579	2,191	4,770

*Census year. Source: Department of Statistics, Montserrat.

1.2.3.2 Population Health Profile

The health profile of the population needs to be carefully assessed in light of the physical (exposure to volcanic ash), psychological and emotional stress (loss of loved ones and material possessions) that the crisis has caused. From 1995 to the present, the leading causes of mortality and morbidity remain the same as in the preceding decade with the exception of 1997 when death by natural disaster became one of the five leading causes due to the catastrophic eruption in June(4).

1.2.3.3 Organisation of Health Services

A 21 bed hospital and two Geriatric homes (built in the most Northerly village of St Johns) have replaced the abandoned medical complex in Plymouth. There is also a privately run home for the aged that benefits from certain government subsidies. The hospital, after its move during the height of the volcanic activity (in 1996) was housed in a former school building and the facilities were grossly inadequate. Subsequent refurbishing of the facility has greatly improved conditions for both staff and patients, but there is a reduction in the capacity for handling surgical and obstetric cases due to the inability to attract competent surgeons and obstetricians for long periods. This has led to an increase in the number of patients referred overseas for medical attention(4).

Some staff members who left during the initial 'panic' stage have returned, but some technical positions still remain vacant. Technical personnel from PAHO and Caribbean Community (CARICOM) member countries have come to Montserrat on short rotations to alleviate staff shortages. The number of physicians in private practice has also declined. There are two physicians still resident on the island and one who visits at regular intervals to conduct clinics.

The number of health centres was reduced to five in 1996 and to four by 1997. Despite this reduction, the community nursing staff and the environmental health officers have continued as many of their tasks as the circumstances allow(4).

Laboratory services have also been greatly disrupted. Since the onset of the crisis the bacteriology section has been closed, due to lack of space and subsequent lack of staff. Services continue in the other disciplines and the laboratory still serves as the island's only Blood Bank, with services reduced to collecting, testing and storing blood for surgical or trauma patients(4).

1.2.4 The Caribbean Epidemiology Centre

The Caribbean Epidemiology Centre (CAREC) began operating on January 1, 1975 under the administrative management of the Pan American Health Organization (PAHO). The need for such a Caribbean centre was first recognized when during 1971 and 1972 the Caribbean island of Trinidad experienced major epidemics of poliomyelitis and typhoid fever. The effects of these epidemics and the increasing regional threat of cholera, made health personnel in the English-speaking islands very conscious of the direct threat posed by communicable diseases to their populations as well as the potential threat to tourism, their major industry. The consequent need for good epidemiologic surveillance and backup laboratories was first stated by Dr Eric Williams, Prime Minster of Trinidad and Tobago, and his call for action was endorsed by the Health Ministers Conference(9;10).

In response to Dr Williams' request, the Pan American Health Organization (PAHO) sent a team of leading scientists to examine surveillance requirements in the

area. This team presented a report confirming the need for a disease surveillance centre. Subsequently, a Pan-Caribbean conference held in Jamaica in April 1974 endorsed plans for performing disease surveillance work based at the Trinidad Regional Virus Laboratory. As a result PAHO and the Government of Trinidad and Tobago signed a bilateral agreement and later PAHO signed an additional multilateral agreement with the Governments of the Commonwealth Caribbean. Together these agreements provided the structure of what was to become the Caribbean Epidemiology Centre(9;10).

The member countries of CAREC are Anguilla, Antigua & Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, British Virgin Islands, Cayman Islands, Dominica, Grenada, Guyana, Jamaica, Montserrat, Netherlands Antilles, St. Kitts & Nevis, St. Lucia, St. Vincent & the Grenadines, Suriname, the Turks & Caicos Islands and host country Trinidad & Tobago.

The Governments signatory to the agreement also consented to make quota contributions providing approximately 60 per cent of CAREC's core budget. The remaining forty per cent to come from PAHO/WHO, and the Overseas Development Ministry of the United Kingdom(10). The number of external agencies contributing to the annual budget has increased over the years to include the Canadian International Development Agency, International Development Research Centre, United States National Cancer Institute, German Technical Cooperation, French Technical Cooperation, The World Bank, Inter American Development Bank, the Netherlands Leprosy Relief Association and the European Union(10).

The Centre is a decentralized unit of PAHO/WHO and is linked with PAHO Headquarters through the Division of Disease Prevention and Control. A Scientific

Advisory Committee and Directing Council determine CAREC's priorities and programs. Representation on these governing bodies includes Ministries of Health of member countries, the University of the West Indies as well as PAHO and other external agencies. The Advisory Committee reports to the Directing Council and the Council in turn makes its recommendations to the Director of PAHO(10).

CAREC's activities are organized within two major units, the Epidemiology Division and the Laboratory Division. The Epidemiology Division's mission is to "*maintain and strengthen the practice of Epidemiology for improved policy-making, planning, implementation and evaluation of programs for the prevention and control of public health problems.*" The key activities are surveillance of communicable diseases, chronic diseases and injuries, Information Systems Development, Training, Leprosy and Tuberculosis Control and Research.

In the area of surveillance, CAREC is involved in the collection, collation and analysis of data in CAREC member countries (CMCs). CAREC's epidemiologists, in cooperation with National Ministries of Health, monitor and assess trends, identify causal relationships and assist in developing public health responses(10).

The Laboratory Division's mission is "*to strengthen National Laboratory capabilities by providing microbiology reference and referral services, training and appropriate research for surveillance and control of communicable diseases*". This division provides a reference level of expertise in areas of bacteriology, immunology, medical Parasitology, entomology and virology. Diagnostic services are also provided for some member countries that do not have access to such facilities locally(10).

1.3 Rationale for the Evaluation

Against this background of volcanic eruptions, disrupted lives, displaced persons, challenging living and working conditions and limited financial and human resources Montserrat continues to exist. The remaining population, and those who plan to return, must be assured of adequate public health services and a healthy environment in which to live. Surveillance, which is a fundamental tool of Pubiic Health, is an integral part of measuring the burden of a disease or health events, monitoring trends (including identification of epidemics), generation of hypotheses, policy decision making as well as evaluating public policy. In order to be effective, surveillance systems should be properly designed, executed and evaluated periodically(11).

Montserrat, with its re-developing health system, returning residents, migrant construction and technical workers, staff rotated on three-month contracts, and limited budget, must ensure that its surveillance needs are continually being re-assessed and activities evaluated periodically to ensure effective use of resources.

The factors that have been associated with emerging and re-emerging diseases can all be identified to varying degrees in the Montserrat situation. This underscores the need to ensure that the island is ready to identify any conditions that may be increasing in incidence, and put in place the necessary steps to prevent and reduce morbidity and mortality.

Through this evaluation I hope to provide the Ministry of Health with documented evidence of the usefulness of the existing surveillance system and to highlight its achievements as well as areas that need to be improved.

CHAPTER 2

2.0 Literature Review

This chapter provides a description of the history, impact, and widening scope of surveillance. The various approaches to surveillance and sources of surveillance data are also described. This is followed by a summary of the limited published literature on evaluation of surveillance systems. Finally, the factors associated with emerging and re-emerging communicable diseases are outlined both globally and in the Caribbean. The diseases considered to be emerging in the Caribbean are described followed by those identified as being most likely to emerge and/or re-emerge.

2.1 Surveillance

The term *surveillance* is derived from the French word meaning 'to watch over' and, as applied to public health, means the close monitoring of the occurrence of selected health conditions in a population(3). Surveillance is a fundamental tool of public health and its efficient functioning can be used for a variety of activities in the process of disease prevention. In a 1988 publication entitled *The Future of Public Health*, the Institute of Medicine listed the core functions of public health as: 1) assessment, 2) policy development and 3) assurance of the availability of services. Surveillance has been described as being intrinsic to the assessment function and essential for proper policy development and assurance of service availability(12).

In 1963, Alexander Langmuir defined disease surveillance as '*the continued watchfulness over the distribution and trends of incidence through the systematic collection, consolidation, and evaluation of morbidity and mortality reports and other*

relevant data together with timely and regular dissemination to those who 'need to know'(3).

Last's Dictionary of Epidemiology quotes Eylenbosch and Noah's 1988 definition of surveillance as the *'continuous analysis, interpretation, and feedback of systematically collected data, generally using methods distinguished by their practicality, uniformity and rapidity rather than by accuracy or completeness'*(1). While in 1992, Thacker et al defined public health surveillance as the *'ongoing systematic collection, analysis and interpretation of outcome specific health data, closely integrated with the timely dissemination of these data to those responsible for preventing and controlling disease or injury'*(13).

Throughout these definitions the writers all agree that while the practice of surveillance has evolved, the basic tenets remained unchanged. Surveillance is continuous, it is systematic and the data must be fed to those who 'need to know' in order to be useful.

The terms 'surveillance' and 'monitoring' have sometimes, but not always, been used synonymously. Epidemiologic surveillance is a monitoring process and both surveillance and monitoring feature continuous scrutiny and detection of change from expected levels. Surveillance, however, goes one step further and includes feedback and control, resulting in a monitoring and control process(14). Some writers have been careful to make the distinction between surveillance and the routine collection of health data/information (for example, registration of births and deaths and general health surveys) that are not linked to specific prevention and/or control and so are not considered to by themselves, constitute surveillance(3).

2.2 Development of Surveillance

A look at the historical development of surveillance indicates that there is some disparity in the literature regarding the first attempts at monitoring health events.

Thacker et al., trace the history of Public Heath Surveillance back to efforts to control the bubonic plague in the fourteenth century; and note the involvement of key figures such as von Lleibnitz, Graunt, Shattuck and Farr over the years(12;13). Other writers consider the recording of deaths as the oldest form of data collection for monitoring public health/surveillance. John Graunt is credited with being the first to use recorded numerical methods for this purpose as described in his treatise *National and political observations on the bills of mortality*, published in 1662(3;15). However, since the evidence suggests that Graunt's efforts saw no further application for almost 200 years, he may more appropriately be regarded as a forerunner, than a founder of surveillance.

The modern concepts of surveillance however, seem to be unanimously attributed to William Farr the Superintendent of the Statistical Department of the General Registrar's Office in Great Britain from 183[illegible] to 1879(3;12;15-18;). Farr collected, analysed and interpreted vital statistics and disseminated the information in weekly, quarterly and annual reports. He regularly contributed to medical journals and used the public press to achieve effective action(12;13).

European Governments gradually assumed more responsibility for both health care and health protection of their populations. By the 1800s a more comprehensive form of public health surveillance developed in several countries such as the system of 'police

medicine' in Germany(15). This covered school health, injury prevention, maternal and child health and public water and sewage.

In the United States of America the basic elements of surveillance can be traced back to 1741 in Rhode Island. National disease monitoring did not begin until 1850 when mortality statistics based on death registration and the census were first published by the Federal Government for the entire United States. By 1878 Congress authorized the collection of morbidity data for use in quarantine measures against cholera, smallpox, plague and yellow fever. It was not until 1925 however, that all states started participating in national morbidity reporting(12).

Meanwhile Lemuel Shattuck was the first to publish data that related deaths and infectious disease to living conditions. It was Shattuck who was credited with recommending standardization of nomenclature for causes of death and disease and the collection of health data including sex and age resulting in the development of the first national list of causes of death in 1893(3).

Until the 1950s, surveillance consisted of the limited function of watching contacts of persons with illnesses such as plague, small pox, typhus and syphilis. This process involved maintaining a high degree of alertness and ensuring that appropriate action was taken when indicated to reduce the spread of the disease. By 1950, surveillance activities in the United States were extended to include application to specific diseases and included systematic collection of data and their evaluation and dissemination(16).

The establishment of the United States Communicable Disease Centre in 1946 (later to be named Centres for Disease Control and Prevention) also aided the

development of surveillance. The CDC established its Polio Surveillance Unit in 1955 that resulted in great reduction in the incidence of that disease and was also very instrumental in the eradication of small pox(19).

In Canada, the federal government started collecting information on communicable diseases in 1924, under the legislative authority of the Statistics Canada Act and the Health Canada Act(20). Data on communicable diseases were collected by the Dominion Bureau of Statistics (later named Statistics Canada) until 1988 when the responsibility was transferred to the Laboratory Centres for Disease Control. Following a priority setting process held in the 1988, which assessed international considerations, incidence of the diseases, severity, preventability, risk perception and socio-economic burden; 34 diseases were recommended for national surveillance. By January 1, 2000 the number of diseases monitored had increased to 43.

As previously indicated organised surveillance developed in the Caribbean from 1975 with the establishment of CAREC. While the monitoring of communicable diseases was the Centre's initial focus, CAREC has also become involved in monitoring non-communicable diseases and injuries in the member states(10).

2.3 Impact of Surveillance

One of the major triumphs indicating the wider scope of surveillance for monitoring events other than the contacts of cases of various diseases was demonstrated in 1955 when the United States' national vaccination program was threatened. Within a few days of the start of a national vaccination program several recipients of the polio vaccine developed paralytic polio resulting in calls for discontinuation of the campaign.

Surveillance data assisted epidemiologists in demonstrating that the problem was limited to a single manufacturer, allowing the campaign to continue with a resulting dramatic decline in cases of polio in successive years(12;17). Had the surveillance program not been instituted or had it not worked efficiently, many or perhaps all vaccine manufacturers would have ceased production and the incidence of polio and associated morbidity and mortality would have probably risen to pre-vaccination levels(15;17).

Similarly, during the campaign to eradicate smallpox, the well designed surveillance systems for data collection; tabulation and routine feedback were vital to the success of the program(3). When the program began in 1967, efforts were focused on achieving high vaccination levels in countries where the disease was endemic. However, it was soon evident that a program based on surveillance to target vaccination in specific areas would be more efficient.

More recently, in 1981 shortly after the disease later to be named the Acquired Immune Deficiency Syndrome (AIDS) was recognized, national surveillance was begun in several countries. Even before the virus was isolated, surveillance data contributed to the identification of modes of transmission, population groups at highest risk of infection and, equally important, population groups not at risk(3).

2.4 The Widening Scope of Surveillance

The concept of public health surveillance has evolved over the years from prevention and control activities for acute communicable diseases to involve new areas such as chronic disease, occupational safety and health, environmental health, injuries, personal health practice and preventive and curative health technologies(12).

The development and implementation of systems for the monitoring of these adverse events pose new challenges. Chronic disease surveillance is plagued by the long latency periods and multifactorial aetiology of many chronic conditions while occupational safety monitoring has problems with the non-uniformity of reporting criteria(12). The main challenge in the public health surveillance of environmental hazards is determining which hazards warrant ongoing programs of surveillance along with the imprecise methods of measuring exposure and the complex links between exposure and outcome(12;21). The surveillance of injuries (accidental and intentional) is complicated by the interdisciplinary nature of the process required to come up with uniform definitions. The surveillance of health technologies such as drugs, devices and medical and surgical procedures used in health care is the least developed of the new applications. However efforts have faltered in the area of preventive health technologies(12).

2.5 Approaches to Surveillance

The main objective of surveillance is to collect data on the incidence and prevalence of health events. In the past, the terms 'active' and/or 'passive' have been used to describe data collection activities. An 'active approach' to surveillance is one in which the organisation conducting surveillance activities initiates procedures to obtain reports(18). These procedures may include regular telephone calls or visits to physicians' offices or hospital records departments. A 'passive approach' on the other hand, exists when the organisation conducting surveillance does not contact potential reporters but rather leaves the initiative for reporting to them(18).

The impracticality of a surveillance system being either totally active or totally passive has resulted in varying combinations of the two approaches; the result has been systems with such cumbersome names as 'modified active', 'stimulated passive' and 'combined active/passive'. Not surprisingly the use of these broad categories has declined in recent years with the concepts being described as 'useful, but insufficient for describing surveillance'(18).

Once the decision to monitor health events has been made, perhaps of equal importance to who initiates data collection is the actual source of the data. These sources vary depending on the objectives of the system, the characteristics of the population being studied, and the resources the system has at its disposal.

2.5.1 Laboratory Based Surveillance

The use of diagnostic laboratories as the basis for surveillance has proven to be highly effective in some countries. This approach has the advantage of being able to identify patients seen by different physicians, particularly if laboratory services are centralized. This method does not however, provide much information on epidemiological or clinically important patient characteristics.

2.5.2 Sentinel Surveillance

Sentinel surveillance consists of a select group of physicians or clinics that agree to report on specific disease(s). These systems are very useful for monitoring health occurrences where complete case counting is not necessary or feasible, and have been used with considerable success in monitoring annual incidence of influenza in several countries(22). Sentinel sites can play a role when resources are limited by allowing for

more experienced and dedicated personnel to collect information on more diseases and/or more information about each case.

The data collected from these sites are not always representative of the population but the data are available in a timely manner at relatively low cost, as the data are usually collected on a weekly basis via telephone, facsimile or electronic mail.

2.5.3 Registries

Registries are listings of all occurrences of a disease or categories of a disease, within a defined area(3;18). Registries tend to collect very detailed information and are therefore useful sources of data for epidemiologic investigations once the important issue of patient confidentiality is satisfactorily addressed.

2.5.4 Surveys

A survey has been described as a system for collecting information to describe, compare, or explain knowledge, attitudes and behaviour(23). As such, periodic or ongoing surveys can be invaluable sources of data since they may describe behaviours associated with disease, personal attributes that affect disease risk, knowledge and attitudes that influence health behaviours, use of health services and self-reported disease occurrence.

2.5.5 Information Systems

Large databases collected for general, rather than disease-specific purposes, are known collectively as information systems(18). Examples include hospital discharge records and the records of insurance companies. While the data were not collected specifically for surveillance purposes, these databases contain a wealth of information that can be applied to the surveillance of specific conditions. This information must

however be used and interpreted cautiously since the quality of the data may not be at the level that is usually required for epidemiologic research.

2.5.6 Record Linkages

The increasing versatility of computer software has provided another source of data for surveillance. It is now possible to link records from different sources and thus increase their usefulness for surveillance. Record linkages may also be very useful in estimating the total number of events in a target population and thus the completeness of each set of records. By comparing surveillance data to other data sources, the number of cases detected by both systems and by one but not the other can be directly measured.

2.6 Uses of Surveillance

The approaches to surveillance differ from one country to another and even within the same country from one level of the public health system to another. The basic applications of surveillance however, tend to be universal. Some of the common uses of surveillance include:

1) Monitoring Trends

Systematically collected data on health events can be very useful for identifying trends and changes in these trends. Sudden adverse changes can be useful for stimulating quick actions to investigate the reasons for the change and to determine the best way of dealing with the situation. The monitoring of trends is also crucial for the detection of epidemics, or signalling the advent of new or re-emerging health concerns.

2) Descriptive epidemiology

Information on the demographic characteristics of individuals with specific problems allows for identification of groups at highest risk of disease. Other data gathered can be useful in suggesting aetiology or modes of transmission. The application of this was cited earlier in the identification of risk factors and modes of transmission associated with Human Immunodeficiency Virus (HIV) even before the virus was identified.

Surveillance data are also useful for describing the geographic location of highest rates of specific disease. Information such as this may document the need for research into risk factors associated with those locations and strengthening screening and preventive efforts where possible. The seasonal or other time factors associated with health events can also be deduced from surveillance data. This information can be crucial to the prevention and reduction of adverse health events.

3) Guide actions in cases of public health concern

Surveillance is an important component in the delivery of preventive and therapeutic services. This is very readily seen in monitoring infectious diseases where interventions are based on known modes of disease transmission and therapeutic or prophylactic interventions are available. Thus surveillance not only provides data for health planners but if these data are used at the community level they will also serve to initiate individual preventive actions.

4) Stimulation of research ideas

While surveillance data are useful for comparisons among different groups (e.g. age, gender) of persons with a disease, these data alone do not provide a comparison

group of individuals without the health problem in question. Surveillance data can however provide important clues for further investigation and identify individuals who may be subjects in specific research projects.

5) Evaluation of interventions and policy

The role of surveillance in assessing the impact of an intervention may be as simple as demonstrating changes in disease trends following the intervention. By monitoring the numbers or rates of health events before, during or after an intervention, surveillance data may provide a relatively inexpensive assessment of the impact of the intervention.

2.7 Evaluation of Surveillance Systems

The United States' Centers for Disease Control (CDC) recommends that all "public health surveillance systems be evaluated periodically in order to promote the best use of resources by ensuring that problems of public health importance are under surveillance, that surveillance systems operate efficiently, and that information provided by surveillance systems is useful for public health practice"(11).

Klauke(24), sees the evaluation process as consisting of two levels. In the first level (external evaluation), the public health importance of health events relative to other events along with the feasibility and costs of conducting surveillance is assessed. The second level involves evaluating the operations in order to increase the system's utility and efficiency. This type of evaluation may also compare two or more systems involving the same health event(s). The system is examined in order to determine whether its stated objectives are being met and whether it serves a useful public function.

Despite an extensive electronic and manual search of the literature only four published reports of evaluations were found (See Appendix IV for search strategy). In two of the selected articles the writers were more concerned with evaluating the merits of one approach to surveillance compared to another rather than simply evaluating the system. In the other two accounts only one attribute of the surveillance systems was assessed. The failure to locate evaluation reports may not be due to the lack of evaluations being conducted but rather to the fact that the probability of getting these reports published is not very high.

In a 1985 study entitled *"Evaluation of an Active Surveillance System"* conducted in New York City, Chamberland et al.(25), compared active, modified-active and passive surveillance systems at various city hospitals. The attributes evaluated were completeness and timeliness of case reporting. Their results indicated that the reporting of cases is timely and case reporting is sufficiently consistent and complete for accurate analysis of disease trends. Also, the institution of active and modified-active surveillance had a major impact on reporting of AIDS cases per year when compared to passive surveillance.

Similarly, in a 1986 *"Controlled Trial of Disease Surveillance Strategies"*, Thacker et al.(26), attempted to assess the completeness, timeliness and representativeness of passive notifiable disease reporting and to determine what impact active telephone and mail contact has on the quality of disease surveillance. Their results indicated that among physicians, when active phone surveillance was utilized the rate of reporting was 4.6 times the rate of those in the passive surveillance (control) group. The rate of reporting was also significantly higher in the active mail-out group than in the

passive surveillance group. Active surveillance was also important in increasing the representativeness but did not seem to improve the timeliness of reporting.

More recently, surveillance activities were evaluated in two articles published in the CDC's Morbidity & Mortality Weekly Reports, namely, Chlamydia infections in the United States(27) and Infectious Disease Surveillance in Uganda(28). In the United States, reports to CDC had indicated a twofold increase in the rate of chlamydia infection from 1987 to 1991; the evaluation was mainly conducted to ensure accuracy of reporting. The results showed that this increase did not represent a doubling in prevalence or incidence during this time period but instead the increase resulted from the increase in the number of states with legislation mandating reporting of chlamydia. In Uganda the evaluation was conducted to determine the performance and support of surveillance conducted at health facilities. The results indicated that while health facilities had basic resources, they lacked the capacity to confirm priority diseases as well as to respond rapidly to outbreaks.

While no reports of formal evaluations of the surveillance of communicable diseases on various Caribbean islands have been published, there have been 'reviews' of the activities in various islands. In 2000 for example, surveillance systems were reviewed in seven member countries. The systems in Trinidad & Tobago, Jamaica and St Lucia were reviewed as part of a Physician-based Sentinel Surveillance Project, while a Suriname review was focused on vector-borne diseases. General reviews were conducted in the British Virgin Islands, St. Vincent and the Grenadines and Anguilla(29).

No record was found of an evaluation of the surveillance system on Montserrat.

2.8 Surveillance of Emerging Communicable Diseases

Emerging diseases have been defined as *"diseases for which the incidence has increased in the past two decades, or threatens to increase in the near future"*(30;31) while re-emerging diseases are *"those diseases which are known and reappear after a decline in incidence"*(30). Alternately, the two groups of diseases have been combined and defined as emerging *"if they have newly appeared in the population, or have existed but are rapidly increasing in incidence or geographic range"(32).*

Recent estimates suggest that in the last two decades alone, at least twenty-nine new micro-organisms linked to emerging communicable diseases have been identified(30) and in the same period plague, diphtheria, Dengue fever, yellow fever, cholera and meningococcal meningitis are re-emerging as public health problems.

Surveillance has been described as the most important tool for determining which communicable diseases are emerging(31). In a report prepared for the CDC, Bryan and colleagues suggest that timely recognition of emerging diseases requires early warning systems to detect problems before they develop into public health crises(30). The ability to detect what is 'new' depends on the capacity to identify and monitor the routine as well as the unusual; and therefore the existence of an effective surveillance system.

2.8.1 Factors Associated with Disease Emergence and Re-emergence

Stephen Morse(32), in his paper *"Factors in the Emergence of Infectious Diseases"* describes the emergence of diseases as a two step process including the introduction of the agent into a new host population (whether the pathogen originated in the environment, another species or as a variant of an existing human infection), followed by the establishment and further dissemination within the new host population (adoption).

If we consider this two-step process, or some variant of it to hold true, then whatever its origin a disease will emerge once it reaches a new and/or susceptible population. The existing literature on emergence of communicable diseases tends to list six major factors as contributing to communicable disease emergence by promoting one or both of these steps(32;33). These factors are 1) ecological changes and agricultural development; 2) human behaviour; 3) international travel and commerce; 4) technology and industry; 5) microbial adaptation and change; and 6) breakdown in public health measures.

Ecological Change and Agricultural Development

One of the most frequently identified factors in disease emergence and re-emergence is ecological change especially those due to agricultural development. Ecological factors usually encourage emergence by putting humans into contact with a natural reservoir or host for an infection that was always present. Examples of these effects at work are seen in the reforestation of lands in the United States and Europe, which increased the deer and deer tick populations and consequently led to increased exposure to Lyme disease. Similarly when integrated pig-duck farming was started in China this practice appears to have resulted in antigenic drift among viruses of these two species, and transfer of the 'new' virus resulted in influenza pandemics(32).

Human Demographics & Behaviour

The changes in human demographics and behaviour are often important factors in disease emergence. As the age distribution of populations change, the health picture of that population can also change. Countries with large populations of persons of advanced age can see the emergence of the so called 'old age diseases.'

As populations grow they also place a strain on infrastructure such as water distribution systems and waste disposal. The inability to cope with the increasing demand sometimes results in the complete breakdown of services and this allows for the proliferation of rodents and other species, which act as vectors for many deadly infections(32).

Human behaviour can also affect disease spread as evidenced by the resurgence of sexually transmitted diseases following the 'sexual revolution' of the 1970s in the United States(30).

International Travel and Commerce

Wilson, in writing on Travel and the emergence of infectious diseases describes travel as a potent force in the emergence of these diseases(33). The current volume, speed and reach of travel have resulted in the ability to move microbes around the globe in an unprecedented manner. Organisms that survive primarily on the human host and are spread through sexual contact, droplet nuclei and close physical contact can be readily carried to any part of the world (e.g. AIDS, Tuberculosis, Measles). Organisms that have animal hosts, environmental limitations, arthropod vectors or complicated life cycles tend to be more difficult to 'transplant' to other areas(33).

The spread of microbes by travel and commerce however is not a new phenomenon. For example, the introduction of the bubonic plague into Europe can be traced to the silk route between Asia and Europe; and the movement of slaves brought yellow fever and its vector to the New World in the sixteenth century(32). In recent times the movement of microbes has continued but at a much faster rate. Mice have carried Hantavirus to several places, and mosquitoes have been introduced into the

western world via sea vessels and it has been demonstrated that mosquitoes can survive on international flights in the cabin and in wheel bays of Boeing 747B aircraft. Airplanes have also carried infective mosquitoes that caused human infection outside malaria-endemic areas(33).

The consequences of movement are varied. When people go on vacation, business trips or migrate they carry with them their genetic make up, their accumulated immunological experience, pathogens in or on their bodies and may also transport disease vectors on them or in their luggage(33). People also take their habits and behavioural patterns with them when they travel and this in turn affects the rate at which any introduced pathogen can be established in the new location. Sometimes the vehicle of transportation is the site or even the source of an outbreak. During travel, persons are enclosed for hours or days usually at close proximity. The temporary shared space may be the site of dissemination of microbes; the newly infected passengers are then discharged to move on to their varied destinations, which with the right conditions facilitates further spread(33).

The movement of commercial products also provides an avenue for the spread of microbes. The movement of food and other supplies via aircraft and sea vessels allows for the introduction of microscopic and macroscopic life forms, many of which may cause disease(33). The transportation of animals also increases the introduction of zoonoses. The globalisation of markets allows for the movement of fruits and vegetables from many destinations which may not necessarily share the same agricultural and health policy guidelines and this can cause the transfer of once remote microbes into new geographical locations. Recent examples have been: the introduction of Vibrio cholerae,

the causative agent of Cholera, into South America via cargo ships; and the introduction of the Aedes albopictus mosquito into the United States shipped inside used tires, both from Asia.

Technology and Industry

In modern society advances in technology and industry are taken for granted. These advancements are both advantageous and risky since they sometimes start a chain of events that leads to the emergence of adverse health events. The advances in the food production industry have allowed for production of large volumes at high speed, however this ability to mass-produce using new technology is highly implicated in the emergence of bovine spongiform encephalopathy (BSE). This disease emerged in Britain in the 1990s due to a likely interspecies transfer of scrapie from sheep to cattle that occurred when 'advances' in rendering processes led to incomplete inactivation of scrapie agent in sheep by products fed to cattle(32).

Similarly, our technological advances have provided the ability to separate and transfuse several blood products and other organs thereby improving longevity and quality of life of many persons. These same advances have also resulted in the inadvertent spread of pathogens such as Hepatitis B and C and HIV(32).

Microbial Adaptation and Change

Microbes are resilient, adaptable and constantly changing. They have short life spans, which allow rapid genetic change and therefore facilitate the emergence of previously unknown illnesses. The example of influenza has already been offered, but the influenza virus is perhaps the most classic example of high mutation rates yielding new variants and allowing for the re-infection of previously infected persons because the

altered antigen is not immediately recognized by the immune system. On rare occasions the emergence of new variants results in a new expression of disease. The 1990 epidemic of Brazilian purpuric fever associated with a newly emerged variant of Haemophilus influenzae biotype aegyptius is another example of this phenomenon(32).

Breakdown of Public Health Measures

The breakdown of public health measures is an important contributing factor in the emergence and re-emergence of diseases. It is ironic that whenever public health interventions and programs are successful in preventing and reducing disease, the tendency is to become so complacent that the measures are allowed to lapse and the result is a resurgence of the health events for which the prevention was implemented in the first place. Cholera, for example, emerged in South America in the 1990s for the first time this century. The rapid spread of the disease has been linked to the failure of health authorities to ensure the adequate chlorination of the water supply and the un-supervised sale of sliced fruit by street vendors(32;34).

2.8.2 Disease Emergence in the Caribbean

As with the rest of the world, the Caribbean Region has undergone several transitions in the post world war years. These transitions have been most evident in the demographics of the region, social and lifestyle practices, and the overall morbidity and mortality profile of the population. The region has had its triumphs with the control and prevention of communicable diseases that in many ways surpassed other areas in the 'developing world'. Today the region boasts such achievements as the elimination of the indigenous transmission of measles and polio since 1991(9). By the 1980s the leading causes of death were chronic, non-communicable diseases such as heart disease and

cancers, reflecting the changing demographics of the islands and the success of the Expanded Program on Immunization and improvements in sanitation and the water supply(6).

However, by the late 1980s, mortality from communicable diseases started to rise particularly linked to the HIV/AIDS epidemic. Today, while non-communicable diseases are still the overall leading causes of death, HIV/AIDS is now the leading cause of death among men 15-44 years old(6). When one looks at those diseases considered to be emerging and/or re-emerging, the region is presently greatly affected by HIV and Dengue fever, while tuberculosis is on the increase. The region is also at increased risk of Cholera and Yellow fever, which have both re-emerged in several Latin American countries(6).

2.8.2.1 HIV/AIDS

The rate of HIV infection in several countries places the Caribbean second to sub-Saharan Africa in terms of HIV prevalence and incidence(6;35). The United Nations Programme on HIV/AIDS (UNAIDS) estimates that there are 360,000 adults and children living with HIV/AIDS in the Caribbean(6;35).

Human behaviour is one of the main factors influencing the AIDS epidemic in the region. Dr JP Figueroa, the Chief Medical Officer in Jamaica's Ministry of Health, suggests that poverty, illiteracy, social deprivation, gender imbalance, sexual abuse and violence against women all contribute to the spread of the disease(35). He further states that social stigma and discrimination against persons living with AIDS drives the epidemic underground by discouraging persons at risk from seeking services and preventing persons with AIDS from being open about their condition. In a 1995 study of

Attitudes toward AIDS conducted among medical students at the Cave Hill Campus of the University of the West Indies, Barbados, researchers found "students were not comfortable with issues related to homosexuality" and concluded that "there is a distinct possibility that biases and misperceptions are at risk of being carried over into clinical practice"(36). If persons in the medical profession are unwilling to treat certain patients then this does not augur well for the containment of the HIV epidemic in the region.

Studies conducted on several islands have shown that the main risks associated with the early stages of the epidemic are early age of sexual activity, frequent partner exchange, multiple partners, prostitution, drug abuse and high rates of other sexually transmitted diseases(9;35;37). However, it is important to note that in recent years the sero-prevalence is increasing not only in the traditional high-risk groups (prostitutes, promiscuous youth, homosexuals, intra-venous drug users) but also in the general population as well. Further work needs to be done to determine the reasons for this trend.

The treatment seeking behaviour of patients and persons at high risk for HIV is also an important contributing factor. While the failure to seek treatment from fear of discrimination is a reality there is also the tendency for persons, particularly from rural areas, to seek the advice and care of traditional healers and medicine men. In a paper recently published in the West Indian Medical Journal, one writer claims that more individuals are opting for alternative therapies because they have become dissatisfied with conventional medicine, while others claim that traditional medicine addresses emotional aspects of ill health and has a spiritual dimension that is not seen as pertinent in orthodox medicine(38). The impact that this type of treatment has had on the prevalence of HIV in the region needs to be more adequately assessed.

2.8.2.2 Tuberculosis

The re-emergence of tuberculosis (TB) as an important cause of morbidity and mortality has been an alarming but interesting occurrence. In the Caribbean, TB was on the decline like many other communicable diseases. From the early 1990s TB incidence began to increase to where there were nearly 600 excess cases of TB reported in 1999 when compared to the average number of cases reported in the late 1980s(6). A closer look at the situation shows that some countries in the region have had consistently higher rates in the last few years while others have had significant outbreaks from time to time, with the two most recent being in 1999(6). Fortunately, the multi-drug resistance that is being seen in many parts of the world does not yet appear to be a problem

The re-emergence of TB is often thought to be related to the on-going AIDS epidemic and in the Caribbean this is also true. However, a 1993/94 CAREC survey of national TB programs showed that the infrastructure had weakened in many ways(6). Most of the trained staff has left the region or been transferred to other areas, and the high level of funding and political will had waned significantly. One can only hypothesize that the latter was a consequence of the common perception that we had 'conquered' TB.

The overall population of the Caribbean has doubled in the last fifty years but the proportion of the population aged less than fifteen years has been declining while the population aged sixty years and over, has been increasing(6). This change in demographics and the movement towards urban centres has provided ample opportunity for TB to re-emerge and could be important contributing factors to the resurgence of TB.

2.8.2.3 Dengue fever

During the 1950s and 1960s with the help of the PAHO most countries in the Americas successfully reduced or eliminated the Aedes aegypti mosquito, the principal vector of Dengue and urban yellow fever. The re-introduction and proliferation of the vector and consequent return of Dengue fever to the Caribbean and Latin America has been quite intense resulting in high morbidity and significant mortality in the last decade. In 2000 there were Dengue fever outbreaks on several islands and an outbreak of Dengue Haemorrhagic fever on the island of Trinidad, which resulted in three deaths out of five reported cases of Dengue shock syndrome(39).

The re-emergence of Dengue in the region is mainly due to the breakdown in public health measures and the subsequent failure to maintain vigilance in mosquito control programs(40). On some islands the number of public health inspectors is insufficient to allow for the adequate implementation of vector control measures.

Human demographics and behaviour are also major contributing factors, as the larger urban centres tend to be ideal breeding areas for the vector. As more and more young persons move to urban cities there is increasing strain being placed on water and sanitation services and the formation of areas where low-income earners live together in cramped conditions. The resulting storage of water for domestic use and inadequate facilities for the disposal of solid waste, result in the indiscriminate dumping of refuse which provides breeding sites for disease carrying mosquitoes.

The adaptations of the Dengue virus and its vector have also contributed to the epidemics being experienced in the Caribbean. The virus has evolved to where it is now very competent at multiplying within the vector and the human host, thus ensuring its

survival. The main mosquito vector has also evolved in ways that ensure its ability to survive by gradually developing resistance to many insecticides and adapting to living close to humans thus ensuring the availability of a supply of blood for the development of its eggs. The female mosquito has also become very efficient at transmitting the virus through its silent, rapid attack strategy and during probing and feeding and can also transmit the Dengue virus to her eggs, increasing the likelihood of transmission.

2.8.3 Imminent Threats

Throughout the Americas several diseases have emerged in the last decade that have not yet affected the Caribbean. However, our proximity and increasing trade and travel among the nations increase the risk of transfer of diseases from one area to another. The diseases seen as posing an immediate threat are Cholera, Malaria, Yellow Fever and more recently West Nile fever(6).

2.8.3.1 Cholera

Following a 90 year absence from the Americas, Cholera was re-introduced into Peru in January 1991. Since then more than one million cases have been reported in 20 countries in the region. The organism that causes cholera is thought to have been introduced into South America in bilge and sewage of cargo ships from Asia(32). There is no reason to believe that history will not be repeated given the increased shipping links between the Caribbean and South America. It is imperative that we enhance surveillance and investigation of any suspected Cholera in the region.

2.8.3.2 Malaria

Malaria, considered by some to be the most important vector borne disease(6), is endemic in Guyana, Haiti, Dominican Republic and several countries in Central America.

While the rest of the islands are considered 'malaria-free', the Anopheles vector is widely distributed. In recent years there have been cases of falciparum malaria in Barbados and St Lucia that were imported from Guyana (two of which proved fatal). Field investigations showed that one case resulted in local transmission due to the presence of the Anopheles vector(6). The presence of the parasites in the region and the ubiquitous nature of the vector make the likelihood of this disease re-emerging very high. There is a great need for heightened suspicion and investigation of all suspected cases throughout the Caribbean.

2.8.3.3 Yellow Fever

The last reported case of yellow fever in the Caribbean occurred in Trinidad in 1979(6). However, the fact that the vector mosquito is found in every island throughout the region makes it imperative that we try to keep the virus out of the area. As recently as November 1999 there were several reported cases of slavic Yellow Fever and associated deaths in Venezuela, and in 1998 in Brazil and French Guyana(41). As far as the rest of the Caribbean is concerned the frequent movement of cargo and people between central and South America increase the chances of significant re-emergence of this deadly virus.

2.8.3.4 Poliomyelitis

As a direct result of the Expanded Program on Immunization that saw the immunization of millions against a variety of vaccine preventable illnesses, polio transmission in the CAREC member countries has not been observed since 1991(9). The recent reports of paralytic polio in Haiti and The Dominican Republic (which are not CAREC member countries) between July and December 2000 have caused some concern throughout the Caribbean. The outbreak is attributed to a derived strain of the oral polio

vaccine that is thought to have been replicating for a prolonged period in an immunodeficient individual, or circulating for a while in an area where vaccination coverage is very low, resulting in genetic changes(42).

The Chairman of PAHO's Technical Advisory Group sees this outbreak as a "reminder to those of us in polio-free areas of the need to maintain high coverage with polio vaccine until polio eradication has been achieved"(42). The outbreak also serves as a reminder of the need for immediate investigation of any case of acute flaccid paralysis.

2.8.3.5 West Nile Fever

The outbreak of West Nile Fever in the New York metropolitan area in 1999 created much concern in the Caribbean. Reports coming out of PAHO state that the way in which the virus was introduced into the Americas has not been determined, but that migratory birds may be the principal introductory host(43). In a paper entitled Migratory Birds and Spread of West Nile Virus in the Western Hemisphere researchers at the United States' CDC report that approximately 70 species of birds pass through New York and fly south to their wintering grounds on Caribbean islands or in South America(44). Infected birds therefore have the potential to reach the Caribbean, and this can result in the local mosquitoes and subsequently humans becoming infected.

CHAPTER 3

3.0 Methods

3.1 Stage I – Evaluation of the Surveillance System

The importance that the international community places on the proper evaluation of surveillance systems is perhaps demonstrated by the availability of evaluation guidelines published by such renowned organisations as the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC). The objectives of this review were twofold: first to determine the priority setting process being used to decide which diseases are monitored and second to evaluate the system being employed.

3.1.1 Evaluation Guidelines

The evaluation of the surveillance of communicable diseases on Montserrat was undertaken using the *Updated Guidelines for Evaluating Surveillance Systems(11)* produced by the CDC, in January 2000. This document was based on CDC's *Framework for Program Evaluation in Public Health*, and was developed with the understanding that all tasks may not be appropriate for the evaluation of all surveillance systems.

The tasks recommended for evaluating surveillance systems are summarised in Table 4.

Table 4. Recommended Tasks for Evaluating a Surveillance System

Task A Engage stakeholders	Engage all levels of government, public and private practitioners, and any other group who may be interested in using the findings of the evaluation early in the process.
Task B Describe the system to be evaluated	Describe operation of the system and resources used to operate the system. Describe public health importance of events under surveillance.

Task C Focus the evaluation	Decide which attributes are most important for this particular system and determine the specific purpose of the evaluation.
Task D Gather evidence on the system's performance	Describe actions taken as a result of data from the system, also list anticipated uses. Indicate usefulness – detects trends, detects diseases of public health importance, detects epidemics, provides morbidity and mortality estimates, stimulates research, identifies risk factors, permits assessment of interventions, leads to improved clinical practice? Describe attributes – simplicity, acceptability, representativeness, timeliness, sensitivity, flexibility
Task E Justify and make conclusions and recommendations	Address issues of modification and/or continuation of surveillance. State whether system is addressing an important public health problem and is meeting its objectives.
Task F Share lessons learned	Make deliberate efforts to ensure that the findings of the evaluation are disseminated appropriately. Tailor communications to suit the various audiences.

Source: Guidelines for Evaluating Surveillance Systems, CDC, 2000.

3.1.2 Review of Surveillance

I conducted the evaluation during the period of November 20, to December 31, 2000. Most of this time was spent engaged in various steps designed to complete tasks B, C and D. The information was gathered mainly through one of five ways.

1. Interviews with Senior Health Staff

    - The Director of Health, Community Nursing Manager and the Principal Environmental Health Officer were interviewed during the first week of the evaluation. The respondents were each asked to describe the various

tasks involved in the surveillance of communicable diseases, and to suggest which staff members would be best able to describe specific tasks most clearly,

- follow up discussions were held with the Nursing Manager (twice) and Environmental Health Officer (once) to clarify activities observed during the evaluation period.

2. Locating and reviewing surveillance files and reports generated by the epidemiology unit at CAREC and the Ministry of Health, as well as policy documents;
    - after obtaining written permission from the Director of Health I was accompanied by the CNM to the Ministry of Health where she directed me to where the surveillance related material could be found,
    - the files were reviewed for the purpose of confirming the accounts of reports generated and policy changes staff referred to during the interviews.
3. Observing various staff members as they carried out their daily tasks;
    - initial observations were made by visiting the various health centres on pre-arranged days; several follow up visits were done without warning the staff of the impending visit.
4. Reviewing surveillance guidelines, protocols and case definitions presented in the *Caribbean Communicable Disease Surveillance Manual for Action.*
5. Reviewing available vital statistics and census reports from the Department of Statistics.

The organisation structure, functional framework and activities of Montserrat's surveillance system are outlined in Section 4.1 of Chapter 4. My assessment of some of the system's attributes is also presented.

3.2 Stage II – Interviews with Ministry of Health Staff

The second stage of the study consisted of a survey of eligible staff employing a semi-structured interview process that was designed to determine the extent to which staff was satisfied with the existing surveillance system and to provide them with an opportunity to suggest ways by which it could be improved.

3.2.1 Design

After reviewing the possible options for collecting survey data it was decided that a descriptive survey would be most appropriate design, utilising a survey interview. As described in The Survey Kit: How to Design Surveys(45), "surveys are systems for collecting information to describe, compare and predict attitudes, opinions, values, knowledge and behaviour." Survey interviews are described as "purposeful conversations in which one person asks prepared questions (interviewer) and the other answers them (respondent)."

3.2.2 Data Collection Instruments

Two semi-structured interview schedules were developed, one for Ministry Staff involved in health policy formulation and the other for Technical Staff who were actively involved in some surveillance related activity. I developed both schedules with the expert guidance of Dr Ian Graham of the Loeb Research Institute of the Ottawa Hospital.

The items included in the schedules were formulated using the "Checklist for Deciding the Survey Context", "Guidelines for Asking Survey Questions" and "Checklist for Deciding between Open and Closed Questions" suggested by Fink(45;46) in the *Survey Kit*. The schedules, Checklists and Guidelines are attached in Appendix V.

The main steps followed in the development of the schedules were as follows:

1. review of each objective and compilation of a list of 'things I need to know' in order to achieve each objective;
2. preparation of first draft of schedules following guidelines and checklist regarding types and structure of questions;
3. review of first draft by an expert in field of survey methods;
4. revised schedules as per advice of expert resulting in second draft;
5. pre-test second draft;
6. final schedules.

3.2.2.1 Instrument Reliability

The error encountered in survey research is comprised of two components: random error and systematic error, i.e. bias(47;48). Random errors include the numerous mistakes encountered in making a measurement due to inattention, tiredness or mechanical inaccuracy. Reliability is concerned with error in measurement, and has been defined as the "proportion of observed variation that reflects actual variation in the population"(48). Two types of reliability have been described: whether there is variation between measurements by different raters (inter-rater agreement or observer variation) and whether the same result is obtained when the same rater makes a second assessment with the instrument (stability, test-retest reliability and repeatability).

For this study all of interviews were conducted by the same individual, so concerns were solely with inter-rater variation. The traditional approach for assessing test-retest reliability includes administering the instrument to the same population at two different points in time. Since the population available for pre-testing the questionnaire was very small and time was limited, using this procedure would most likely result in a 'practice effect' which is often associated with this form of reliability testing and stems from respondents answering based on their memory of what they answered the first time. Alternatively the stability of some items in the interview schedules was assessed by including duplicate versions of the items designed to gather information about the same aspect of the staff's opinion of surveillance. The responses were assessed during the pre-testing of the schedules and deemed to elicit a consistent theme of responses.

3.2.2.2 Instrument Validity

The degree to which a survey instrument measures what it sets out to measure is known as validity(47;48). The four ways in which validity of an instrument can be considered are: face, content, criterion and construct.

The schedules used in this study were assessed for face and content validity; the former with the assistance of members of the faculty of the Department of Epidemiology and Community Medicine and the latter by an expert review of the draft instrument.

Criterion validity is a measure of how well the results obtained in using an instrument compare with those of an acknowledged "gold standard" measure of the same outcome. Criterion validity is assessed in two ways: concurrent and predictive validity depending on whether the criterion refers to a current or future assessment(48). A gold standard measure of staff satisfaction could not be determined.

Construct validity has been described as one of the most challenging ways of assessing a survey instrument(47;48). It is frequently seen as a measure of how well the instrument performs in a variety of settings and populations over years. For the purposes of this evaluation this form of assessment was not feasible.

3.2.3 Survey Population

To be considered eligible for inclusion in the survey, staff had to meet certain criteria. The individual had to be employed by the Ministry of Health during the period November 15, 2000 to January 15, 2001 and either: be involved in health policy decision-making or in providing advice for formulation of policy; or be involved in at least one surveillance related activity within the Ministry.

A list of persons fitting these criteria was obtained through conversations with the Director of Health. Together, we identified fifteen individuals as being suitable to take part in the survey (Table 5).

Table 5. Staff Selected to be Interviewed Based on Inclusion Criteria

Technical Staff	Policy Makers/Advisors
District Nurses (4)	Permanent Secretary Health (1)
Family Nurse Practitioner (1)	Director of Health (1)
Senior Environmental Health Officer (1)	Community Nursing Manager (1)
Senior Laboratory Technologist (1)	Principal Environmental Health Officer (1)
Physicians employed by Government (2)	
Physicians in Private Practice (2)	

Of the fifteen staff members who met the inclusion criteria twelve interviews were conducted. One district nurse and one physician left the island on vacation leave during the evaluation period and the substantive Permanent Secretary was transferred to another Department just prior to the commencement of the study. His successor had not yet been appointed, and the officer who was acting in the post was deemed not sufficiently cognizant of the system to be interviewed.

3.2.4 The Interviews

To sensitise persons to the ensuing interview, the Director sent a memorandum to all the relevant staff informing them of the ongoing evaluation and soliciting their support. The staff was subsequently contacted by telephone and an appointment was made for the interview at a date and time convenient to both parties.

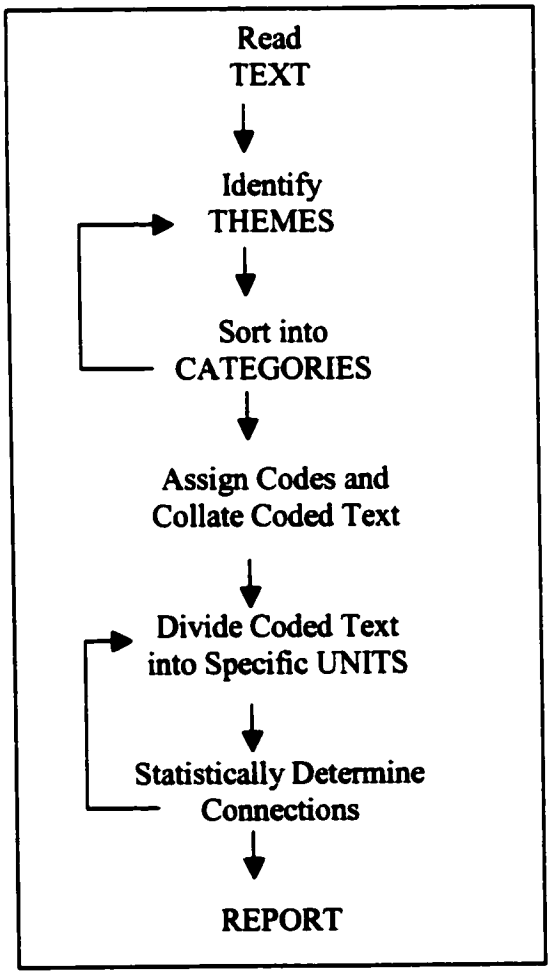
Both categories of staff were questioned using an in-person interview, all of which were conducted by the author. Each interview was conducted at the respondents' usual place of work and the average time for the completion was thirty-five minutes. Prior to the interview each respondent was given an Information Sheet and Consent Form, which they were invited to read (Appendix V). The respondent signed the accompanying consent forms once he/she understood the purpose of the exercise and agreed to be interviewed. Since most respondents were uncomfortable with the idea of having their responses recorded on audiotape the responses were recorded in note form.

3.2.5 Response Analysis

Several strategies exist for basic content analysis of text obtained through open-ended interviews. For this study, the approach utilized was one of four described by Crabtree and Miller(49).

The procedure included transcribing the text of all the interviews, reading the text and searching for "themes" (statements that describe something or explain why something happens or what it means) based on a pre-designed codebook. These themes were then sorted into categories and manipulated statistically. This *quasi-statistical analysis technique* is described as being at the objective extreme of the continuum of qualitative analysis techniques. This approach is described as being "more objective, scientific (valid, reliable, reproducible, accurate and systematic) and standardized (procedural and mechanical) than the other 3 approaches of *Template Analysis Style, Editing Analysis Style and Immersion/Crystallization Analysis Style.* The analysis of all the text was done by the author, using the steps outlined in Figure 1.

Figure 1. Steps Involved in Quasi-Statistical Analysis



The codebook used consisted of four codes with each code representing one of the important categories, each linked to one of the objectives of the survey. All responses indicating satisfaction with surveillance activities received the same code, which differed from the code given to those responses indicating dissatisfaction. For those responses addressing recommendations and those providing examples of usefulness of the system the third and fourth code were assigned respectively. The text was divided into four sections based on the codes. Within each coded section, specific units were then identified. For example in the category addressing dissatisfaction, specifically which surveillance related activities the respondents were dissatisfied with and in what proportions. The findings of this analysis are reported in section 4.2.

3.3 Stage III – Survey of Nurses and Physicians

3.3.1 Design

The surveillance of any health event is dependent, among other factors, on the health care providers' ability to identify the event in question. This stage of the study was designed to determine the level of awareness of physicians and nurses of the presentation of certain emerging communicable diseases. A cross sectional survey design was employed using an unsupervised, self-administered questionnaire.

The diseases chosen to be included in the survey were Dengue fever and its complications of Dengue Haemorrhagic fever and Dengue Shock Syndrome, as well as West Nile fever. These diseases were chosen based on the desire to include one disease that has emerged and is already well established in the region and for which there are clearly outlined protocols and prevention activities in place. Dengue fever fits this

criterion and the fact that Dengue can present with varied symptoms and has the potential for devastating complications enhanced its importance and selection. The second disease had to fit the criteria of a newly emerging disease that has not yet reached the region but has the potential to do so in the not too distant future. The alarming trend of cases of West Nile fever in humans and the isolation of the virus from birds on the eastern coast of the United States compounded with the migratory habits of birds and humans towards warmer climates makes this disease a natural choice.

3.3.2 Data Collection Instruments

A questionnaire based on hypothetical written case scenarios was developed for use in the survey. The case scenarios, which included typical and atypical presentations of Dengue fever, Dengue Shock Syndrome and Dengue Hemorrhagic Fever, along with typical presentations of West Nile fever. Each scenario was developed in consultation with Dr Ann Jolly of the Division of Infectious Diseases, Health Canada, and Dr Joseph Losos of the Department of Epidemiology and Community Medicine, of the University of Ottawa, both of whom have experience and expertise in communicable disease presentations and epidemiology. Information included in the case histories was obtained from WHO's Fact Sheets on the various diseases and The Manual for Control of Communicable Diseases.

The questionnaires were divided into two groups (A and B) based on the questions asked in relation to the case scenarios. This decision was taken after pre-testing of the questionnaire indicated that some of the terminology was inappropriate for Public Health and District Nurses. The questionnaire that was generated for the Nursing Staff, Questionnaire A, (see Appendix VI) consisted of five scenarios: two cases of

classic Dengue fever; one case of atypical Dengue fever; one case of West Nile fever; and one case of influenza. Questionnaire B was designed for the Physicians and Family Nurse Practitioner and consisted of six scenarios: one case of Classic Dengue fever; two cases of atypical Dengue fever; one case of Dengue Haemorrhagic fever; and two cases of West Nile fever (Appendix VI).

The following list outlines the steps taken:

1. review of facts regarding emerging communicable diseases;
2. review of Caribbean data to ascertain which of these diseases pose a current threat, and which are most likely to pose a threat in the near future;
3. selection of diseases to include in questionnaire;
4. review case histories in various communicable diseases to become familiar with information usually included;
5. first draft of 10 scenarios;
6. review of drafts by experts in communicable disease, public health and physician;
7. revision of some of the scenarios as per the advice of experts;
8. pre-test questionnaire;
9. division of questionnaires into Groups A and B and the alteration of questions included in Group A intended for Nurses;
10. review of questionnaires by Public Health Official;
11. final questionnaire.

3.3.3 Survey Population

To be considered eligible for inclusion in the survey staff had to meet pre-determined criteria. Each individual had to be a registered Family Nurse Practitioner, Public Health Nurse or Physician practicing on the island of Montserrat during the period November 15, 2000 to January 15, 2001; or be a registered Nurse assigned to one of the four public health centres operating on the island. A total of nine questionnaires were delivered to the different categories of staff (Table 6).

Table 6. Staff Selected to Participate in the Survey Based on Inclusion Criteria

Questionnaire A	Questionnaire B
District Nurses (4)	Physicians employed by Government (2)
	Physicians in Private Practice (2)
	Family Nurse Practitioner (1)

3.3.4 Implementation of Survey

The questionnaires were hand delivered January 4 and 5, 2001 to the various places of work of eight of the respondents. The delivery on January 5, was at the home of one nurse who had not been at her usual place of work as she was home on sick leave. Each questionnaire was delivered with an accompanying covering letter and an addressed postage paid envelope in which the completed instrument should be returned.

Scheduled follow-up contact was made via telephone calls at 10, 15 and 20 days after questionnaire delivery. One final phone call was made at the end of January, to the

physicians in the survey requesting that they return the completed questionnaires if they had not already done so.

The completed questionnaires were reviewed and coded manually. The resulting descriptive statistics are presented in Section 4.3.

CHAPTER 4

4.0 Results

The results of the three stages of the study are presented in this chapter. First, the activities and personnel involved in surveillance of communicable diseases are outlined and the system's attributes assessed based on available documents and interviews with relevant staff. This is followed by the results of the interview and questionnaire surveys conducted among various categories of staff within the Ministry of Health, Montserrat.

4.1 Stage 1 – Review of Surveillance on Montserrat

4.1.1 Guidelines

The surveillance of communicable diseases in the 21 member countries of CAREC is carried out according to guidelines provided by the Centre. In 2000, CAREC produced a document entitled "*Caribbean Communicable Disease Surveillance Manual for Action*" which was made available to all members. This manual was developed by the epidemiology division "to be a reference document to enhance member countries capacity to undertake communicable disease surveillance and outbreak investigation" and also "to provide regional standards for surveillance and serve as a basis from which national standards could be established"(50).

The Communicable Disease Surveillance Manual for Action lists the three essential components and requirement of an efficient communicable disease surveillance system as an organisational structure; a functional framework; and operational steps.

Surveillance of communicable diseases as practiced on Montserrat follows these basic guidelines with minor alterations due to the unique nature of the island's size, population and present circumstances.

4.1.2 Organisational Structure

The Organisational structure has three clearly defined levels: the Community level, the District and the National and Regional levels combined. Each level has clearly defined responsibilities and channels of communication. Figure 2 shows the structure of Montserrat's surveillance system, which is derived from the generic structure suggested by CAREC.

4.1.3 Functional Framework

This framework outlines the primary focus of each level of the surveillance system along with personnel needed and their activities in routine and outbreak situations (Table 7). The table indicates the framework that has been designed specifically for Montserrat by adjusting the generic model designed by CAREC for the entire region.

The existing system has been observed to operate with the recommended foci and tools in carrying out routine and outbreak activities. In the area of operating personnel there are just enough physicians to operate at Level 1, so that if one goes on leave or resigns there is an immediate shortage. The laboratory was found to be deficient in its ability to carry out the routine testing of specimens.

Figure 2. Organisational Structure of the Communicable Disease Surveillance System

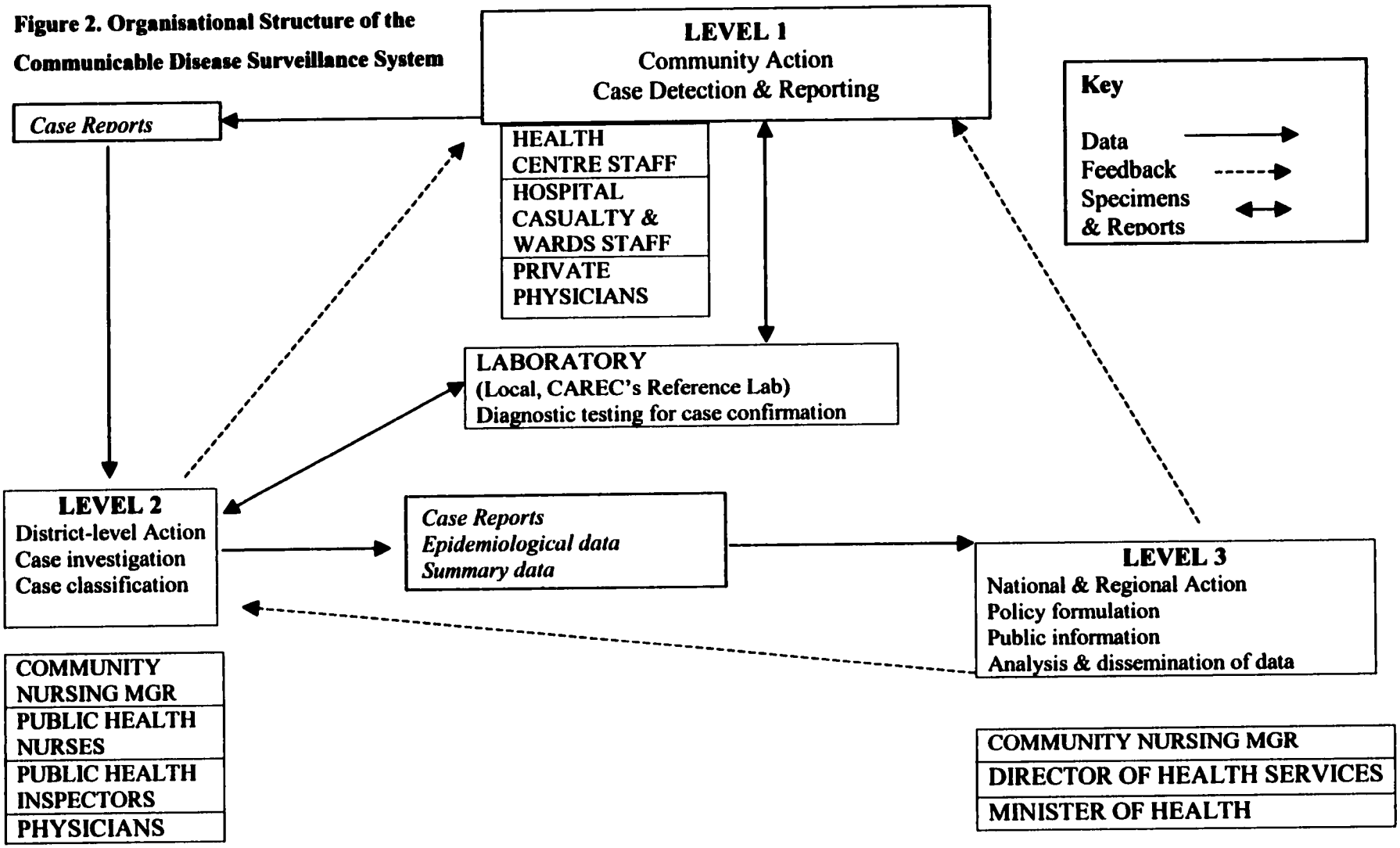


Table 7. Functional Framework Outlining the Primary Focus of the Three Levels of the Surveillance System

System Level	Surveillance Node	Primary Focus	Operating Personnel	Routine Activities	Tools Needed	Outbreak Control Activities
Level 1	District Health Centres	Community Health service	Nurses, Physicians	Routine surveillance, Case detection and reporting, Health education, Immunization	Case definitions; Disease fact sheets; Reporting, specimen referral and case investigation forms; Specimens collection kits and instructions	Specimens collection and referral, Case investigation, Case searches, Mass immunization
Level 1	Hospital and Casualty	Curative medicine	Physicians, Nurses, Infection control officer	Case detection and reporting; Case investigation; Specimen collection & referral; Clinical management	Case definitions and detailed clinical profiles; Reporting, specimen referral & case investigation forms; Specimen collection kits	Specimen collection and referral with necessary data; Case investigation
Level 1	Physicians' offices	Curative medicine	Physicians	Case detection & reporting; Clinical care and referral; Specimen collection	Case definitions and detailed clinical profiles; Reporting forms & specimen kits	Specimen collection and referral with necessary data

System Level	Surveillance Node	Primary Focus	Operating Personnel	Routine Activities	Tools Needed	Outbreak Control Activities
Levels 2 and 3	District and National Health Authority	Community and National health management	District Nurses, Medical officers, Community Nursing Manager, Snr. Public Health Officer, Director of Health, Minister of Health	Receipt of reports and tabulation of data; Management of case investigation and active case search; Supply of disease information and specimen kits to Level 1; Monitoring and feedback of disease trends; Assessment of resource needs; Sourcing of funds and personnel; National policy	Case definitions; Disease fact sheets; Case investigation, specimen referral forms; Population data; Epidemiological information; District Maps; Specimen collection supplies for distribution; Outbreak investigation guidelines; Epi-analysis software; National disease situation data; WHO reporting requirements	Epidemiological investigation; Containment activities like immunisation and vector control; Estimation of resources needed; Procurement and channelling of resources; Dissemination of action plan and monitoring of implementation; Liaison with sources of funding; Community awareness; International and regional reporting
Laboratory	Local and CAREC's reference lab	Diagnostic testing on clinical material	Lab Technologists Clerical staff	Provision of information on specimen collection and transport; Testing, reporting; Referrals to reference lab	Technical information on specimen referral; Latest lab techniques and kits; Reagents and equipment; Reliable means of transporting specimens to reference lab	Receipt of specimens and testing by appropriate methods; Communication with reference lab regarding samples sent & results; Prioritisation of tests

4.1.4 Operational Steps

The operational steps involved in local surveillance are case detection, case investigation and confirmation and desired public action. At the beginning of the study I reviewed *The Caribbean Communicable Disease Surveillance Manual for Action*, then I observed the relevant staff and interviewed them to determine whether their actions resembled those outlined in the Manual. Following is an account of the responses received and observations made as staff went through the various operational steps.

4.1.4.1 Case Detection

Presentation. Based on the way in which the health care system is set up, a patient may seek attention at one of three points, District Health Centre, Private Physician's office and/or Casualty Department of the Glendon Hospital. If the signs and symptoms with which the patient presents are suggestive of a communicable disease or syndrome, the actions outlined in the Communicable Disease Action Manual are followed. At the Health Centres the patient is either listed as a suspected case of disease X or referred to the casualty department for further assessment. At the other two points of care, the patient is listed in the records, the necessary clinical assessment is done and appropriate specimens are collected and sent to the Laboratory for testing. Laboratory reports are sent back to the point at which the patient was seen unless other instructions are given.

Reporting. The task of actively collecting case reports is the responsibility of the Community Nursing Manager (CNM) who is also responsible for collating the cases and submitting a report to CAREC.

In the case of Class I diseases, (yellow fever, cholera, plague) or measles the Staff has been instructed to report suspicious cases to the CNM before the close of the clinic on

the day of the patients' visit. If the confirmation comes from the Laboratory, the report should be sent back to the nurse of physician who requisitioned the test and /or the Community Nursing Manager.

For all other diseases the CNM telephones the senior nurse at each health centre as well as the offices of the private physicians once per week (usually Monday mornings) to enquire whether they had treated any suspected and/or confirmed cases of each disease on her list of diseases under surveillance. During these conversations she enquires about what (if any) steps have been taken to confirm suspected diagnoses. Later that same morning she visits the Hospital compound where she reviews admissions records for the three wards and the attendance records of the Casualty Department. Any recorded suspected and/or confirmed case of communicable disease is noted along with basic contact information for outpatients.

The final step in case collection involves a visit to the Laboratory. With the assistance of the laboratory staff she ascertains the nature of, number of and results of any screening and/or confirmatory test done for communicable diseases during the preceding week. This information supplied by the Laboratory staff does not allow patient identification but does include the source of the request for the investigation. This information can then be used to verify reports submitted by each reporting point since this Laboratory is the only one on the island and must be used by all physicians and clinics.

The CNM collates the data gathered from the various sources and submits her report. One copy of the report is faxed to the Epidemiology Unit of CAREC and another is filed in the local Ministry of Health.

CAREC requires all member countries to submit their communicable disease reports by mid-day Wednesday of each week. A review of the facsimile transmittal forms and the log book which records all outgoing reports indicate that the reports from Montserrat are usually sent to CAREC on Mondays, well ahead of the deadline.

4.1.4.2 Case Investigation

The task of case investigation is occasionally carried out by the attending physician; but more usually by the district nurse/ public health nurse and environmental health inspectors. Case investigation is aided by disease investigation forms prepared by CAREC and provided in the Surveillance Manual.

4.1.4.3 Case Confirmation

The surveillance system recognizes three means by which the existence of a case of communicable disease is confirmed. These are: 1) clinical confirmation; 2) epidemiologic confirmation and 3) laboratory confirmation. However, what was observed was a tendency to favour laboratory confirmation over the other two options.

Clinical confirmation Clinical confirmation is based on the accurate use of the prepared case definitions and is usually employed when the disease symptoms are highly specific or when laboratory services are inadequate(50).

This type of confirmation was frequently observed (especially in diagnosis of sexually transmitted diseases) since the disruption of laboratory services caused by the volcanic crisis has resulted in the unavailability of basic bacteriological services.

Epidemiologic confirmation Epidemiologically linked confirmation is based on the presentation of a clinical case that is linked in time, place or circumstances to a laboratory confirmed case. This confirmation requires careful investigation and

recording of travel and exposure history as well as careful analysis of all epidemiologic data(50).

There were very few cases of epidemiologically linked cases reported, for any disease monitored. This was despite the recommendation to utilise this method in the recent outbreaks of Dengue fever, after the first few cases had been confirmed by CAREC's laboratory.

Laboratory confirmation This type of confirmation is based on the results of pre-determined laboratory procedures /tests which have been tried and proven to clearly distinguish the presence or absence of specific diseases(50). CAREC recommends that the following factors be taken in to consideration when submitting specimens for diagnostic testing:

1. Specimens are appropriate for the disease suspected. Since most specimens must be transported to CAREC they must be properly stored and transported in order to be considered appropriate.
2. The availability of all relevant clinical and epidemiologic history, which may prove useful in interpreting test results.
3. There is prompt reporting of results through pre-ordained channels.

4.1.4.4 Public Health Action

Reports of all cases of confirmed communicable diseases form part of the *Quarterly Health Report* prepared by the CNM and reviewed by the Director of Health Services and other senior public health staff. In theory, these figures along with related issues such as cost and preventability should be used to aid the decision making process when the allocation of the Ministry's budget is being considered. The figures are also

supposed to be used by the Government's Health Education Coordinator to decide which areas should be targeted for public awareness campaigns and also as an approximate measure of the effect of these campaigns. Regionally, these reports along with CAREC's Expanded Programme on Immunisation (EPI) Reports that provide the Communicable Disease figures for the 21 member countries are used by PAHO and regional Governments to decide on which diseases CAREC member countries should focus.

The review of Ministry of Health files revealed copies of past Quarterly Health Reports as well as regional reports highlighting various communicable diseases and their impact on the population. However, no empirical evidence was found of the surveillance data being used to influence the allocation of the Ministry's budget.

4.1.5 Reporting of Disease Syndromes

In an attempt to address the problem of the insufficiency of local laboratories CAREC recommends that all member countries use the system of syndromic disease reporting proposed by the World Health Organization. Syndromic notification should then be followed by disease specific information as soon as it becomes available. It is surmised that the syndromes presented in Table 8 can be easily recognized and promptly reported alerting the public health system to the possibility of one or more diseases(50).

Syndromic reporting was especially recommended for the reporting of some STDs given the unavailability of laboratory services on Montserrat and the difficulties involved in transporting genital swabs to CAREC. The reporting of genital discharge syndrome and the collection and transport of specimens to CAREC are both grossly inadequate and give no indication of the level of the STD problem on island. (Conversation, Ministry of Health Official).

Table 8. Characteristics of Specific Diseases Associated with Syndromes

SYNDROME	CHARACTERISTICS	SELECTED DISEASES WITHIN THESE SYNDROMES
1. Febrile systemic disease	Sudden onset of fever, headache, muscle and joint pain; occasionally gastrointestinal symptoms; may be biphasic or recurrent	Brucellosis, Dengue fever, Leptospirosis, Malaria, Typhoid Fever
2. Fever with rash	Onset of fever and systemic symptoms: generalised eruption (macular, popular, vesicular) or mucous membranes	Dengue fever, Measles, Rubella
3. Fever with respiratory symptoms	Fever with laryngitis, pharyngitis, cough, thoracic pain, pulmonary oedema, fatigue, purulent or blood-stained sputum	Diphtheria, Hantavirus pulmonary syndrome, Legionnaires' disease, Pertussis, Pneumococcus infection, Plague, TB
4. Gastro-intestinal symptoms with or without fever	Nausea, vomiting, abdominal cramps, diarrhoea with or without mucus or blood	Cholera, Food borne illness, Gastroenteritis, Salmonellosis, Shigellosis
5. Fever with jaundice	Acute or insidious onset of fever, headache, backache, anorexia, malaise, fatigue, nausea, abdominal pain or discomfort, vomiting, jaundice	Leptosiprosis, Viral hepatitis, Yellow Fever
6. Fever with haemorrhagic symptoms	Onset of fever with systemic symptoms; second phase after 3-5 days with cutaneous bleeding; internal bleeding, jaundice, shock	Dengue Haemorrhagic fever, Leptospirosis, Yellow Fever
7. Fever with neurological symptoms	Fever with systemic symptoms, headache, vomiting, neck stiffness and/or pain; confusion, disorientation, anxiety, hyperactivity, tremors, spasticity, convulsions, coma	Meningitis/Encephalitis, bacterial or viral, Poliomyelitis, Rabies, Tetanus
8. Genital discharge or ulcer	Urethral or vaginal discharge, itching, burning, dysuria, genital or perianal ulcers in males or females, papule, bubo, skin rash	Sexually transmitted diseases including Chlamydia, Gonorrhoea, Syphilis, Herpes

Source: Caribbean Communicable Disease Surveillance Manual.

4.1.6 Special Surveillance - Measles

As part of the Caribbean's contribution to PAHOs goal of measles elimination by the year 2000, the Director of CAREC presented a proposal for the elimination of indigenous measles transmission in the English speaking islands and Suriname by 1995. The proposal was accepted in 1988 and by 1991 was ready to be implemented. In May of that year, in a strategy known as the "Big Bang" vaccination campaign, over 2 million children (92% of the target population of 1 – 14 year olds) were vaccinated in nineteen countries, including Montserrat(9). Another important part of the strategy has been the maintenance of high immunization rates over the last decade and active surveillance and investigation of all suspected cases.

The purpose of measles surveillance has been described as "the rapid detection of measles virus circulation through identification of every case"(50). Health workers throughout the region have undergone extensive training in an effort to keep interest in the campaign high on their list of priorities.

4.1.6.1 Case Definition

The case definition for measles is: any person with fever and a maculopapular rash or any person in whom a clinician suspects measles infection(50).

4.1.6.2 Case Investigation

Suspected measles is immediately reportable (within 24 hours) to the Community Nursing Manager who initiates standard case investigations within 48 hours of notification. This investigation includes the collection of demographic and clinical information as well as collection of a blood sample. The blood is immediately sent to

CAREC where the ELISA Measles IgM test is done. The test results are reported to the sender within three days of receipt.

The implementation of various aspects of this protocol was observed at one public health centre during the evaluation period. The nurse was observed collecting demographic data from the mother of a child presenting with a skin rash and fever along with a blood sample to be sent to the CAREC laboratory. Also, several reports submitted to the Ministry following the investigation of suspected measles in the preceding eleven months were reviewed, which all seemed to indicate that the protocol had been followed.

4.1.6.3 Public Health Action

A confirmed case or cluster of cases is identified as imported or indigenous based on the investigation results. All contacts of the case(s) are checked to ascertain their immunization status and if necessary 'mop up' immunization is carried out. It should be noted that there has not been a confirmed case of indigenous measles on Montserrat in the last ten years.

4.1.6.4 Monitoring

The quality of measles surveillance is assessed periodically. The indicators used by CAREC include information such as the proportion of reporting sites that report each week and the proportion of sites reporting at least one suspected measles case per year. Information is also collected regarding the proportion of cases investigated within 48 hours of notification, the proportion of cases with adequate specimens or epidemiologic linkage to a laboratory confirmed measles cases and the proportion of total laboratory confirmed cases with source of infection identified. The target proportion for all these indicators is eighty percent.

Montserrat was found to be compliant with the measles surveillance protocol. There was evidence of several copies of completed case investigation forms indicating the actions taken for investigation of rash-like illnesses. These were all confirmed by the relevant laboratory records.

4.1.7 Structural Support for Surveillance

While the effectiveness of surveillance depends on the various attributes of the staff and the Organisational Structure, the ultimate objective of disease prevention and control cannot be realized without structural support. This support has traditionally taken the form of intra and intersectoral collaboration involving the Public Health Department of the Ministry of Health, the other Departments of the Ministry of Health and the Ministry responsible for Legal Affairs.

4.1.7.1 Legal Support

The Public Health Act (see Section 1.2.2.3) has been in place throughout recent memory. Various amendments have been made to the Act over the years mostly as a result of emerging public health issues and the need to have the legal authority to protect the public's well being. For example, the Public Health Collection & Disposal of Refuse Regulation, which was enacted in 1996, included an article that dealt with litter prevention as well as the prevention of the abandonment of vehicles in public places. This article was thought to be necessary since the mass evacuation of residents brought on by the volcanic crisis has resulted in the abandonment of numerous vehicles on vacant lots and beaches. Public health officials reacted to the need to stop this practice, which was both unsightly and unhealthy since these abandoned vehicles were creating new breeding sites for mosquitoes.

Despite its usefulness, several public health employees described many of the existing articles as being difficult to interpret and the penalties not severe enough to act as significant deterrents.

4.1.7.2 Does Surveillance Influence Policy?

The Westminster System of Government, which exists on Montserrat, is patterned after that of our 'colonial heads' in Britain. Under this system elections are constitutionally due every five years and the political party that wins a majority of the seven seats in Parliament forms the Government. The Chief Minister (head of that party) appoints four of the elected members to one of four portfolios. In many cases the elected member who is appointed to the Ministry of Health has had no special training in health matters and certainly not in matters pertaining to public health. This Minister's responsibilities are not limited to the Ministry of Health but also include responsibility for Education, Social Services and Ecclesiastical Affairs. To compound this, there is only one Minister of Health in our modern political history that served in that position for two consecutive terms(51). The Minister of the day is therefore heavily reliant on the advice of the Director of Health Services and other technocrats when dealing with matters relating to public health.

Consequently, the policy regarding matters concerning communicable disease monitoring, prevention and control has been to adhere as much as possible to the advice and guidance provided by CAREC. CAREC's main decision-making body is the Scientific Advisory Committee that has a representative from Ministries of Health of member countries on a rotational basis. The other important decision making group is the Directing Council, which also has members from various islands and the scientific

community of the University of the West Indies. This arrangement allows for staff from Montserrat to take part in the major decisions at CAREC and consequently there is a high level of acceptance of CAREC directives within the Ministry of Health.

4.1.8 Diseases and Conditions Under Surveillance

CAREC's Epidemiology Division, on the advice of the Scientific Advisory Committee, decides which diseases are of importance for the Caribbean and therefore should be added to the list. The diseases monitored can be arranged into six categories.

a) **Diseases subject to the International Health Regulations**

Cholera, plague and yellow fever

b) **Diseases under international surveillance**

AIDS, malaria and influenza

c) **Diseases of the Expanded Programme on Immunization**

Tuberculosis, diphtheria, pertussis, tetanus, poliomyelitis, measles, mumps, rubella and congenital rubella syndrome

d) **Diseases of interest in the Region of the Americas**

Meningococcal infection (Neisseria meningitidis), leprosy, Dengue fever, Dengue haemorrhagic fever/Dengue shock syndrome

e) **Diseases of interest in the Caribbean**

Typhoid fever, food borne illness, viral hepatitis A and B, rabies in humans, Leptospirosis, salmonellosis, shigellosis, gastroenteritis, sexually transmitted diseases and viral meningitis/encephalitis

f) **Other diseases of potential concern**

Legionnaires' disease, Hantavirus syndrome and human brucellosis

Locally, various diseases are occasionally monitored if they are considered to be a threat to the population. In the last year cases of acute haemorrhagic conjunctivitis, and chicken pox were added to the list. A list of all the diseases monitored, their classification and the steps to be taken in reporting them is presented in Appendix II.

4.1.9 Attributes of the Surveillance System

4.1.9.1 Usefulness

A surveillance system is considered to be 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(11). In assessing the usefulness of a particular system it is usually helpful to examine the stated objectives and then to assess the degree to which surveillance related activities achieve any or all of these objectives. Secondly the system's impact on policy decisions and disease control measures may also be used as indicators of its usefulness.

The Guidelines for Evaluating Surveillance Systems also suggest that a surveillance system may be considered useful if it addresses at least one of the following issues: detects trends; detects diseases of public importance in a timely way to permit accurate diagnosis, treatment, and handling of contacts; detects epidemics; provides estimates of the magnitude of morbidity and mortality of health events; stimulates research intended to lead to prevention or control; identifies risk factors; permits assessment of effects of control measures; leads to improved clinical practice.

4.1.9.1.1 Objectives

The review of available surveillance related documents and interviews with various members of staff in an attempt to determine the objectives of surveillance on

Montserrat did not yield any concrete list of objectives. While members of staff were aware that surveillance was on going they did not recall ever seeing a list of objectives nor did they know where such a list could be found. Most technical staff indicated that they thought the main objective of surveillance was "*to identify problems early in order to prevent* large *epidemics.*" One Ministry of Health official indicated that since surveillance was carried out following strict guidelines set out by CAREC there was no need for Montserrat to establish its own objectives but that the objectives of the regional body were adopted as the national objectives for communicable disease surveillance.

4.1.9.1.2 Impact

In his book *Epidemiologic Methods for Health Policy,* Spasoff quotes Ruwaard's definition of health policy as "the actions of government and other players which are aimed at maintaining and improving the population's state of health"(52). If one adopts this definition then one can assess the impact that data collected through surveillance activities have on the actions of the local government's decision making, aimed at improving the population's health.

The destruction of important files (by volcanic activity) that may contain documented evidence of actual examples, as well as the absence of long-serving staff members who may remember important policy decisions, hindered the collection of evidence in this aspect of the evaluation. However, the two most recently documented examples are the development of a *Plan for the Prevention and Control of Dengue fever* in 1996 and the actions taken following the detection of an outbreak of *Chicken Pox* in 2000.

Dengue fever Following the detection of an outbreak of laboratory confirmed cases of Dengue fever in 1995 and 1996 and the analysis of the vector situation on the island, the Ministry of Health realized that there needed to be a change in policy regarding the approach to prevention and control of this disease.

A plan aimed at eliminating the risk of the spread of Dengue and Dengue Haemorrhagic fever was prepared by the Environmental Health Department. The main strategy was the sustained reduction of the mosquito vector Aedes aegypti index to 1% or below. The task force set out to accomplish this goal by translating it into six objectives which were all aimed at eliminating the vector and its breeding sites. A policy decision was taken to "*change the strategy of heavy dependency on the use of insecticides and channel the resources into education programs for the public as well as the Department's staff.*"(Interview, Director of Health) A copy of a draft of the Plan is attached in Appendix VII.

This change in policy was visible in the increased frequency of town-hall meetings, educational promotions in the media, increased visits to schools by environmental health inspectors and mounting of a poster campaign. The number of vector control officers was increased along with the frequency of inspection of public and private premises.

Crucial to the success of the new strategy was the enactment of the Public Health Collection and Disposal of Refuse Regulations, 1996 that came into force on November 1, 1996. This regulation was made under Section 8 of the Public Health Ordinance of 1981, which had previously addressed the issues of keeping one's property clear of possible mosquito breeding sites, and the access of Public Health Inspectors to public and

private property for the purpose of identifying such sites. One article included in the 1996 regulation at the recommendation of the Environmental Health Department made it an offence *"to place or cause to be placed into any street, beach, premises or ravine any disused vehicle or disused appliance."*

Chicken Pox One recent example of how the data collected through surveillance was used to affect one short-term policy decision within the Ministries of Health and Education was seen during the Easter season of 2000. In April, the CNM received reports of suspected cases of chicken pox among children from two of the four Health Centres, all within the same week. A quick investigation revealed that all of the affected children had attended either an Easter picnic or a birthday party held two days apart. The investigators were able to trace the source of the outbreak to a family that had come from Britain to spend Easter on Montserrat. Two members of the family were 'recovering from chicken pox' and had attended both the party and the picnic. (Interview with Ministry of Health Official)

A meeting was immediately convened to discuss the matter and decide on a plan of action. Several opposing views were expressed on how to deal with the situation. One district Medical Officer thought it would be better to allow as many children as possible to be exposed to the virus, become infected and then they would no longer be susceptible. However, the others noted that several adults were also coming down with the disease as a result of their children's illness and this was affecting the already reduced work force. There were concerns expressed that if the outbreak was allowed to continue unchecked the island could be brought to a standstill by a disease as nondescript as chicken pox.

The option of excluding persons with the disease from school and work was already being practiced but was not thought to be very effective since persons are already infectious three days prior to the onset of the characteristic chicken pox rash. It was decided that the best way of containing the outbreak would be to reduce the organized assembling of large groups of people such as at school and workplaces. The Public Health Department of the Ministry of Health therefore recommended that the start of all schools following the Easter vacation be delayed by one week in order to break the transmission cycle. The Minister of Education, Health and Community Services and the Directors of Health and Education adopted the recommendation and an announcement was made in the media extending the Easter vacation by one week. The Memorandum from the Community Nursing Manager to the Director of Education prompting this action is attached in Appendix VII.

The examples of the change in approach to Dengue fever prevention and the early identification of an unusual number of cases of chicken pox previously given indicate that the surveillance system is able to detect epidemics and to do so in a timely way permitting accurate diagnosis and handling of contacts. In both examples the CNM was able to detect a change in the usual trend and to raise the alarm so that the relevant steps were taken. It is also important to note that with the implementation of the control measures the continuing surveillance was able to demonstrate the number of incident cases returning to the expected levels for the population. Other outbreaks detected by the surveillance activities were acute haemorrhagic conjunctivitis in 1990, 1991, 1998 and 1999.

In the area of detecting trends and signaling changes the example of influenza may be cited. Weekly reports of influenza cases for the last two years show a seasonal trend, with most of the cases occurring between November and February each year. These data have been used by Public Health officials in arguing for the introduction of the influenza vaccine as part of the routine immunisation schedule. However, policy makers have used the same data to indicate that the number of cases per year is insufficient to justify the introduction of the vaccine.

Recently, there has been an increasing call for further analysis of influenza data to determine the age distribution as well as the health outcome of cases. Given our present situation where we have an ever-increasing number of elderly persons living in long-term care facilities, the probability of a devastating outbreak is quite high.

4.1.9.2 Other System Attributes

4.1.9.2.1 Simplicity

The surveillance system that monitors communicable diseases on Montserrat (outlined in Section 4.1.4) is a simple one despite involving activities that take place at local and regional levels.

At the national level Staff reported that the activities can become quite hectic during an outbreak situation, but on a routine basis they are usually quite straightforward and easy to execute. The reporting sites are all easily accessible by telephone, and since the CNM who actively collects data from the hospital departments and the laboratory is a senior public health official, privacy issues are not major barriers. Should problems develop with the telephone access, the distance between the Salem Health Centre and the

St Johns Hospital (the two points furthest South and North respectively) can be traveled in thirty-five minutes.

The CNM is involved at all three levels of the system (figure 2); she collects data at Level 1, oversees or conducts case investigations and contact training at Level 2 and is involved in dissemination of information and offers advice on policy issues at the third level. This allows her to have first hand knowledge of all aspects of surveillance as well as include several checks along the way to avoid duplication of data, which has happened in the past. She reports that the weekly collection of cases an average of 1½ to 2 hours from the initiation of her first telephone call to the time when the data are sent to CAREC via facsimile. (Interview, Community Nursing Manager)

The staff training required for adequate functioning of the local surveillance activities is diagnostic and patient management skills attainable at any accredited Medical School and School of Nursing. The Nursing Manager/Epidemiologist, Public Health Nurses and Environmental Health Officers are trained in basic epidemiology and outbreak investigation skills. The Laboratory Technologists employed are fully trained and certified in the proper handling, storage and transportation of diagnostic specimens. Based on their qualifications to hold their various jobs, personnel involved in surveillance activities usually do not require much extra training except to become familiar with the specific steps outlined in the protocols for case confirmation and contact tracing. The ease with which staff can become familiar with regionally accepted protocols has been greatly improved with the publication of the *Caribbean Surveillance Manual for Action* by CAREC. Data collection forms have evolved over the years and are now in the opinion of those staff members interviewed "*not difficult to complete.*"

One area that could add to the complexity of the system is the analysis of the collected data. At present very little is done in terms of data analysis locally, but if the figures seem higher than expected then staff meetings are called to discuss the situation and to initiate steps to deal with the situation and/or to seek advice from CAREC.

4.1.9.2.2 Flexibility

Flexibility is a difficult attribute to measure. When referring to surveillance systems it is a measure of how the system can adapt to changing information needs or operating conditions with little additional cost in time, personnel, or allocated funds. Flexible systems can accommodate new diseases and health conditions, changes in case definitions and variations in funding or reporting sources (11).

The surveillance of communicable diseases on Montserrat has undergone several changes in the last five years, although not necessarily those suggested by the CDC. In the area of changing information needs the data collection forms have been adjusted over the years, mostly due to complaints and feedback from personnel in CAREC member countries. These forms have been incorporated into the surveillance related activities and have been widely accepted.

The introduction of HIV/AIDS surveillance and syndromic reporting has also challenged the system's flexibility. The advent of AIDS and its inclusion in the list of diseases being monitored did not cause any major problems for the system despite the additional funding required for procurement of Test Kits. There was a transition period during which the local laboratory performed only screening tests and positive or indeterminate samples were sent to CAREC for confirmation. With time the local health budget was able to absorb the additional cost. In terms of laboratory staff requirements,

the HIV screening test kit involved the utilization of techniques and principles with which they were already familiar. Additional training requirements for other health staff were minimal and consisted of occasional workshops to sensitise them to the presentation and management of the disease. It should be noted that due to the social stigmas attached to HIV/AIDS infection, surveillance of this disease has introduced privacy issues that had never been major problems before.

In the area of syndromic reporting the progress has been slow since most physicians are reluctant to report certain diseases without laboratory confirmation. However, the disruption of the laboratory services by the volcanic crisis has forced the issue since there was no alternative but to report sexually transmitted diseases (STDs) as urethral discharge syndromes, as the relevant specimens are not as easy to transport as serum. Reports from senior public health officials suggest that while they are aware that there is significant under-reporting of all STDs, the number of reports seem to be steadily increasing.

In the area of operating conditions, there was a period between mid 1995 and 1996 and again in the summer of 1997 when the volcanic situation was most uncertain, and there was a rapid turnover of health staff and surveillance activities were temporarily suspended. At the first sign of normalcy the District Nurses resumed the data collection and the limited contact tracing that the situation allowed. Also during this period the nurses and environmental health officers made daily visits to shelters where displaced persons were living in cramped quarters in an effort to identify the early signs of any pending outbreaks. Due to the high rate of vaccine coverage on the island, the efforts

were mainly focused on those diseases not covered such as diarrhoeal and respiratory tract illnesses. (Conversation, Senior Public Health Inspector).

While these changes were forced on the system by an act of nature it is perhaps testament to the system's "flexibility" that the nurses and public health inspectors who make up the nucleus of the surveillance staff were able to adjust their surveillance related activities to deal with the changing needs of the population while maintaining vigilance over public health matters.

4.1.9.2.3 Acceptability

The attribute of acceptability reflects the willingness of individuals and Organisations to participate in surveillance activities(11). There are two levels at which one needs to assess acceptability: at the level of the individuals with the conditions being monitored (the patient); and at the level of the health care provider both in private and government practice.

At the patient(s) level, acceptability is not always easy to measure. Usually, patients are quite willing to accept the idea of providing information necessary for contact tracing. While they may not understand all the concepts and possible applications of surveillance, they are usually willing to co-operate if they are made to understand that the information they give will help their loved ones and will also sometimes prevent the re-infection of themselves. Unfortunately, the small size of the population and the fact that the patient and the caregiver may know each other socially sometimes makes patients reluctant to provide information when faced with a disease to which social stigmas are attached. (Interview, Public Health Official).

At the other level of the system there is high participation among the public and private sector. The district and public health nurses do not pose a problem since they accept surveillance as part of their job. There were difficulties with physicians who are in private practice when they were first asked to submit their weekly reports, since the system has been changed so that reports are actively sought via telephone conversations the participation has improved to where all practitioners on island provide the necessary information as requested.

4.1.9.2.4 Timeliness

Timeliness reflects the speed or delay between steps in a surveillance system. There is always a need for timely response in a surveillance system but the amount of time that can reasonably be allowed to pass between individual steps depends on the nature of the event under surveillance as well as the objectives of the system(11). It should be noted that the factors affecting the time lapse between the various steps of a surveillance system vary from the patient's recognition of symptoms, patient's likelihood to seek medical care, the physician's diagnostic and case management ability, to the speed with which diagnostic services are available.

Time and resource constraints of this evaluation did not allow for the survey of a representative sample of the population to determine their ability to recognize symptoms of various communicable diseases and/or their care seeking practices. However copies of public awareness information brochures, posters and media campaign information were reviewed which documented the Ministry of Health's efforts to provide information to the public (through its Health Education Unit) on common communicable diseases and the associated signs and symptoms. It was also evident that at the first signs of an

outbreak or at the start of the 'flu season' or rainy season when mosquitoes are most abundant, the frequency of public awareness messages are usually stepped up in an effort to increase the public's knowledge.

At the various points of entry into the system there are complaints of long waits and there is the persistent problem of reduced services at the island's lone medical laboratory, along with the reduction of the number of physicians available for consultations. However, once the patient enters the system (i.e. has a consultation with a health care provider) and there is a provisional diagnosis of a communicable disease, subsequent activities appear to be conducted in a timely manner. The system has evolved over time to the point where cases are actively collected on the same day of each week, CAREC's laboratory division ensures reliable access to diagnostic services that are outside the scope of the local laboratory, and the utilization of telephone, facsimile and other modern communication services allow for the rapid transfer of data.

4.2 Stage II – Interviews with Ministry of Health Staff

These interviews were conducted to address the first three study objectives, in particular the third objective. The primary aim was to allow technical members of staff to express their level of satisfaction with the activities in which they were involved that form part of the overall surveillance system for communicable diseases. Secondly, Policy Advisors were asked to indicate what they knew about the priority setting process for diseases monitored by their Ministry; and finally, an attempt was made to confirm the findings of the review of the local surveillance system by asking both categories of staff

to share examples of the surveillance related activities being useful to the practice of public health on the island.

4.2.1 Survey population

A total of twelve persons were interviewed, of whom three were policy advisors. The survey population consisted of five males (42%) and seven females (58%). Most of the interviewees were long time employees of the Ministry of Health, having served for a minimum of ten years. The exceptions were the Director of Health, who was nearing the end of a two-year contract, and two District Nurses, one of whom had migrated from another Caribbean island and the other had recently returned to Montserrat after practicing in Britain for many years.

4.2.2 Satisfaction Measures

The discussions generated by the interviews indicated that staff in both categories considered the surveillance of communicable diseases to be a useful and important function of public health. All respondents viewed the local surveillance system as a simple one, regarding the time he/she spent on activities such as diagnosis, contact tracing, data collection and transmission, and dissemination of information as being 'adequate' for the functioning of the system. In considering data analysis, one respondent felt that she did not spend enough time on this task. This was in contrast to the others who either felt this question was not applicable to them or that the time they spent on this activity was sufficient.

When asked to indicate the surveillance related task that they most liked and the one they least liked, more than half of the respondents were reluctant to name any task, preferring to state that they had no particular preference nor dislike but saw each task as part of their function as public health employees. Of the proportion of respondents who had preferences, tasks that allow interacting with patients (mainly diagnosis) were the most popular choices while completing case investigation forms was the activity most frequently identified as being least liked.

The majority of the staff indicated that their most challenging activity was contact tracing (75%) and this was mainly due to patients' failure to understand the importance of giving accurate information when dealing with sensitive health issues. The remaining respondents indicated that their most challenging task did not involve dealing with patients but with other health staff. Some physicians were thought to be difficult to deal with for some routine surveillance activities such as completing relevant forms that are vital to case investigation and the interpretation of laboratory results.

Despite the challenges associated with surveillance and some staff disliking individual tasks, most of them did not identify a task they wished was not their responsibility. There was one exception to this in the person of a physician who expressed the desire to see the paper work become the responsibility of someone else.

When asked what, if anything, they would like to change about the way in which surveillance was being conducted there was no consensus of opinion. Answers varied from improving the capacity of the local laboratory, to issues of education about the importance and process of surveillance among the public as well as public health and

other staff within the Ministry of Health. Respondents felt that it was important to improve the awareness of the public and health staff in order to improve the practice of surveillance and reduce the difficulties associated with case investigations and contact tracing.

In the area of respondents' satisfaction with the degree of feedback they obtained from local and regional sources, there was a general feeling that there was adequate feedback from the regional surveillance headquarters (CAREC) but not always from the local Ministry. Most respondents were able to name the regional bulletin that CAREC produced on a monthly basis and reported reading it from time to time, while several were also aware of other publications that came less frequently. However, there was concern raised by two respondents that staff at the various districts was sometimes unaware of what was happening in other districts just a few miles away. It was felt that the enthusiasm with which data were sent to CAREC was not reflected in local circulation of the same data.

4.2.3 Priority Setting

The three policy advisors who were interviewed all agreed that the diseases being monitored were mainly determined by the recommendations of CAREC. The two locally engaged staff members pointed out that since Montserrat was represented on the Directing Council of CAREC these representatives were able to take to Council meetings concerns of the local health staff regarding surveillance issues. It was felt that through this route local staff were able to affect the process by which diseases were considered part of the list of priority diseases to be monitored.

4.2.4. Usefulness of Surveillance

The usefulness of the local surveillance system was assessed as previously done by looking for evidence of the system's ability to do at least one of the following: indicate the effectiveness of control programs; detect trends and/or changes in disease occurrence; detect diseases in a timely manner; detect epidemics; estimate amounts of morbidity and mortality in a population or identify risk factors for the diseases being monitored. Among the twelve persons interviewed various examples were recalled of the system's ability to accomplish four of the six tasks.

In both the detection of epidemics and in indicating the efficacy of control programs the example of Dengue fever was most frequently given. Respondents indicated that the detection of epidemics of Dengue fever in the recent past and the subsequent reduction of the number of cases following vector eradication interventions clearly demonstrated the ability of the surveillance system to address these issues. The detection of trends in disease occurrence was thought by most respondents to be most clearly seen in the surveillance of influenza. The surveillance data shows a clear seasonal trend with most of the cases coinciding with the northern hemisphere's winter season. A few of the respondents reported that the early detection of diseases by surveillance related activities was demonstrated by the detection of a recent outbreak of chicken pox. It was felt that early detection and case investigations led to the isolation of those exposed and the rapid containment of the outbreak.

When asked to provide examples of how surveillance activities were able to provide estimates of illness and/or deaths as well as allowed for the identification of risk

factors, most respondents could not. Four respondents were sure that the system allowed for the estimation of amounts of illness but could not provide concrete examples while none of the twelve were able to suggest ways in which the system had identified risk factors.

4.3 Stage III – Survey of Nurses and Physicians

This survey was conducted as part of the assessment of the island's preparedness to recognize and monitor emerging communicable disease. Questionnaires containing hypothetical scenarios representing cases of Dengue fever, Dengue Haemorrhagic fever, West Nile fever and Influenza were prepared and delivered to the respondents who were asked to indicate their diagnosis (suspicions in case of Nurses) and to indicate what steps they would take to further diagnose and/or manage the patient.

On clinical presentation alone these three diseases cannot always be distinguished from each other or other acute febrile infections. This was taken into account when the answers provided in the questionnaires were being analysed. An answer was considered to be correct when it agreed with the disease the scenario had been pre-determined to represent. Agreement between response and pre-determined diagnosis was assessed based on the response offered as the primary diagnosis as well as the differential diagnoses/other possible illnesses categories offered.

4.3.1 Survey Population

A total of nine questionnaires were hand delivered, four type A to four District Nurses, and five type B, one to the Family Nurse Practitioner and the others to the four Physicians on the island at the time. Of these, a total of six were completed and returned

for an overall response rate of 67%. Three of the four type A questionnaires were returned (75%) and three of the five type B questionnaires (60%).

All of the completed questionnaires were returned within ten days of being delivered. Despite several follow up calls none of the outstanding three questionnaires were received by the January 31, 2001 deadline.

4.3.2 Responses

Questionnaire A. The level of accuracy for the two cases of classic Dengue fever was 33% for Case I and 100% for Case III (Table 9). The cases of atypical Dengue and West Nile fevers were missed by all the respondents while the influenza case was correctly identified by one respondent.

All of the respondents indicated an initial suspicion of measles for the missed case of Dengue fever, while two out of three suspected allergic reaction and meningitis to be the cause of the presentations designed to depict an atypical case of Dengue and West Nile fevers respectively.

The pattern of referral was similar for all nurses. In every case presenting with fever, the responses indicated that attempts would be made to reduce the temperature, treat the pain and refer the patient to the District Medical Officer or the Emergency Department as soon as possible.

It should be noted that even when the diseases suspected were not in agreement with the pre-determined diagnoses, epidemiological information such as contacts, travel history, immunization status were always among the information that staff thought would

be useful in managing the patient. Most respondents indicated the need to visit the home of the patient in order to determine the living conditions as well as the health status of other family members.

Table 9. Diagnostic Accuracy of Responses for Questionnaire A

Pre-Determined Diagnosis	Number of Questionnaires Completed	Percent of Primary Diagnosis Agreement	Percent of Primary and Differential Diagnosis Agreement
Dengue fever (classic)	3	0 %	33.3%
Dengue fever (atypical)	3	0 %	0 %
Dengue fever (classic)	3	100%	100%
West Nile fever	3	0 %	0 %
Influenza	3	33.3%	66.7%

Questionnaire B. When the primary diagnosis was used as the only measure of accuracy, none of the cases was diagnosed with 100% accuracy (Table 10). However, when all differential diagnoses were considered the case of Dengue Haemorrhagic fever was diagnosed by all respondents while the case of classic Dengue fever was correctly diagnosed by two of the three respondents (67%).

The level of accuracy was much lower for both cases of atypical Dengue fever with only one respondent thinking that Dengue was a possible cause of either illness. There was also low-level accuracy of diagnosis (33%) of the case of West Nile fever. One respondent offered the correct disease as the primary diagnosis while the other two did not include it as either their primary or differential diagnoses.

The cases of West Nile fever were most likely to be diagnosed as meningitis while one case of atypical Dengue fever was unanimously thought to be a fungal skin condition.

Table 10. Diagnostic Accuracy of Responses for Questionnaire B

Pre-determined Diagnosis	Number of Questionnaires Completed	Percent of Primary Diagnosis Agreement	Percent of Primary and Differential Diagnosis Agreement
Dengue fever (classic)	3	66.7%	66.7%
Dengue fever (atypical)	3	0%	33.3%
Dengue fever (atypical)	3	33.3%	33.3%
Dengue Haemorrhagic fever	3	66.7%	100%
West Nile fever	3	33.3%	33.3%
West Nile fever	3	0%	0%

There was very little difference in the pattern of investigative procedures indicated by the three respondents. The investigations that were reported as being most likely to be ordered were serological investigations for the presence of antibodies to the causative agent for the disease suspected. Where skin conditions were suspected, the relevant cytological examination of skin scrapings would be requested.

The responses regarding additional information which may be useful in the management of the cases were very similar for two of the three respondents. Basic information required included immunization status, travel history and number of similar illnesses among immediate relatives or other contacts. The other respondent seemed to have mis-interpreted the question and for each case gave a list of preventive measures, including advice he/she would offer to the patient to help contain the spread of the disease diagnosed.

The specialists most likely to be consulted were Internists and Infectious Disease Specialists. One respondent indicated that only the case suspected to be Dengue Haemorrhagic fever would be referred to a specialist. He/she felt that the other three cases did not warrant referral even though for one case of atypical Dengue the primary diagnosis offered was Dengue Haemorrhagic fever. The reported frequency with which these specialists were named is indicated in Table 11.

Comparison between the responses the two categories of staff offered for the first two scenarios (only ones common to both questionnaires) revealed different tendencies. Two of the three physicians diagnosed the atypical case of Dengue fever as fungal skin conditions while the nurses were more likely to suspect some sort of allergy. Most

physicians correctly identified the case of classic Dengue fever while the nurses unanimously suspected measles.

Table 11. Reported Frequency of Referral to Specialists by Simulated Cases

Specialist Named	Dengue Cases (n=12)*	West Nile fever Cases (n=6)**
	Frequency	Frequency
Infectious Disease Specialist	3	3
Internist	3	3
Paediatrician	2	0
Dermatologist	2	0
Allergist	1	0
Nephrologist	1	0
Ear Nose & Throat Specialist	0	1
Neurologist	0	1
Virologist	0	1
No Referral Necessary	3	0

*4 Dengue scenarios by 3 responding physicians
**2 West Nile fever scenarios by 3 responding physicians

CHAPTER FIVE

5.0 Discussion

5.1 Stage I – Evaluation of Surveillance on Montserrat

5.1.1 Organisational Structure

The review of the surveillance of communicable diseases on Montserrat has revealed an organisational structure that consists of three clearly defined levels that function both as individual units as well as a coordinated system that detects, monitors and reports on the occurrence of specific diseases in the population. The channels through which data and information flow from one level to another are also very clearly defined.

Perhaps one of the structure's greatest strengths lies in the fact that various categories of staff operate at more than one level increasing the chances for the adequate exchange of information and transparency in the system. This feature has the effect of reducing the number of staff required for the various levels of the system to function adequately and this in turn reduces the cost and overall complexity of the system.

5.1.2 Operational Steps

5.1.2.1 Case detection

The recent publication of the *Caribbean Communicable Disease Surveillance Manual for Action* has greatly improved the efficiency and ease with which the various operational steps involved in disease surveillance can be carried out, particularly in the area of case detection and investigation. The *Manual* contains clear, concise steps for public health practitioners to follow in the detection and investigation of a variety of diseases. Case definitions have been described as one of the most important tools of

surveillance(50), and the *Manual* contains the definitions for suspected, laboratory confirmed and epidemiologically confirmed cases of all the diseases being monitored. Case investigation forms are also included in the *Manual* and are routinely copied and circulated to the various care providers. The availability of the definitions allows physicians and nursing staff to have a uniform approach to case detection and investigation procedures, while the case investigation forms facilitate the proper collection of data for interpretation of laboratory reports and tracing of patient contacts. This augurs well for the specificity of the cases detected by the system, although the measurement of this attribute was thought to be outside the scope of this evaluation

Due to the cost involved in procuring extra copies of the *Manual* there is only one available within the Ministry of Health. However, the CNM assured me that the various clinics have access to adequate supplies of case investigation sheets and definitions of important diseases. This practice is not ideal since there is always the danger of missing cases of diseases not viewed as important due to low levels of suspicion and the unavailability of case definitions when needed.

5.1.2.2 Case Confirmation

In the area of case confirmation, the insufficiency of the local medical laboratory continues to be a cause for great concern. The regional reference level laboratory at CAREC however, adequately compensates for the diagnostic deficiencies of the local service. The regional laboratory provides diagnostic services in serology, parasitology, virology, and haematology for isolated cases as well as in outbreak investigations. The system by which samples are sent to the CAREC laboratory consists of a strict protocol for the collection, handling and shipping of biologic specimens to CAREC.

Arrangements have been made for the timely transport and pick up of specimens as well as the notification of CAREC staff of the expected arrival times of specimens and the class of disease suspected. This is all in an effort to enable the safe and speedy transfer of samples and return of results. However, reality does not always conform to theory and the system is periodically plagued with delays caused by factors that vary from the occasional incomplete case investigation form and incomplete customs documents to delayed and/or cancelled flights, sometimes at the most inopportune times. Despite these problems the physical isolation of diagnostic laboratory services from the rest of the operational steps does not appear to have any major negative impact on surveillance.

5.1.2.3 Case Reporting

The data on the number of cases suspected or confirmed in a week are actively collected by the Community Nursing Manager (CNM) at the same time every week. This practice increases the chance of accurate reporting, as has been demonstrated in several studies conducted to compare various data collection approaches(26;53;54). Thacker and associates were able to demonstrate a reporting rate of almost five times that of the control group when active telephone surveillance was utilised in a 1985 study(26). There is no reason to believe that the system on Montserrat does not yield the high level of reporting normally associated with this approach to surveillance.

Although the constancy of the telephone call is an excellent feature of the system it also has the potential to do harm. The CNM related several stories of telephoning some physicians who on recognising her voice immediately said, "I have nothing to report". However, when she would go through the list of diseases by name then the response would change to for example: "oh yes, there was one case of suspected measles in a three

year old." A subsequent visit to the laboratory would confirm that the particular doctor had indeed referred a three-year-old male patient from whom a serum specimens had been sent to CAREC for the confirmation of the presence of measles antibodies. There were also tales of physicians paying very little attention to her questions but preferring to use the time to raise other totally unrelated issues. These examples highlight the propensity for the phone calls to become such a part of the routine weekly activities that eventually they are no longer taken seriously; on the other hand the ability of the system to allow for the validation of reports is also clearly demonstrated.

5.1.3 Special Surveillance

The reporting of a set of disease symptoms or 'syndromic reporting' has been introduced into the local surveillance system. While there are eight disease syndromes suggested by CAREC the local system seems to have only come to terms with two, the reporting of *"genital discharge or ulcer syndrome"* (Syndrome 8) and *"fever with rash syndrome"* (Syndrome 2). The level of suspicion and reporting of Syndrome 2 is high particularly among nursing staff at the moment, for reasons that will be discussed elsewhere in this report; the level of reporting of Syndrome 8 is still unsatisfactory.

This type of reporting is also viewed as an alternative system to be used where medically trained health workers and adequate labs are not available to support specific disease reporting(50). In theory, it would appear that syndromic reporting is the solution to what is arguably the greatest challenge of the surveillance system, the lack of adequate local laboratory services.

However, there has been a stated reluctance of many physicians over the past to report on diseases that have not been confirmed by laboratory investigations except in the

case of an on-going outbreak when epidemiological confirmation is used. This is a major obstacle since it affects the acceptability of surveillance activities and will continue to do so until staff can be convinced of the new approach's merits. Local and regional pundits, with whom I tend to agree, attribute this unhurried movement towards the reporting of syndromes to the fact that most of the physicians whom our present situation forces into working as District Medical Officers are not sufficiently trained in the principles and practices of public health and are therefore operating outside of the realm of their expertise.

Measles has been targeted as another disease for special surveillance attention. In his 1999 Annual Report the Director of CAREC reported that the success of the immunisation program and intense surveillance had resulted in the elimination of the indigenous transmission of measles since 1991(9). Surveillance figures for 1999 indicate that there were two suspected cases of measles identified on the island of Montserrat both of which were investigated and neither of which was found to be measles. For the region CAREC reports that among 311 suspected cases, 24(8%) were confirmed as rubella, 28(9%) confirmed as Dengue and 259 or (83%) were neither measles, rubella nor Dengue cases(6).

While my innate scepticism originally questioned the accuracy of these figures, my personal observations have left me with the opinion that if there is but one aspect of the entire surveillance system that works, it is that aspect which seeks to identify and monitor the presence and transmission of the measles virus in our population. I was able to observe an almost obsessive tendency to investigate any rash-like illness particularly among children. The heightened sense of suspicion surrounding measles was also

inadvertently demonstrated in the results of the survey conducted in the third stage of this evaluation when nurses presented with a case scenario designed to depict a case of classic Dengue fever, unanimously suspected measles. (See section 5.3).

5.1.4 Structural Support

The legal support for the practice of surveillance has been demonstrated by the various amendments made over the years in response to the evolving challenges. The existence of the appropriate legislation however, does not always ensure the enforcing of that legislation, and this is usually the case on Montserrat. The public health laws appear to be either 'unclear' regarding what can be done for certain infringements or else the steps involved in dealing with persons who fail to comply are so tedious and complicated that public health officials are more likely to try other methods of persuasion than to take legal action. This could also be due to the discomfort involved in initiating litigation procedures in such a small society where chances are the accused may be your next-door neighbour or your 'third cousin on your mother's side.'

5.1.5 Usefulness of the System

The inability to locate any documented objectives of surveillance related activities on Montserrat was the most disturbing finding in this review. Many of the individuals interviewed made quite credible attempts to offer a list of objectives but this could not compensate for the lack of a formal list. It seemed surreal for a system with meticulously outlined operational steps, guidelines and protocols not to have a similarly outlined list of aims and/or objectives. One can only speculate that the list was available at some point but had been misplaced in one of the several moves during the preceding five years.

An important aspect of the evaluation of any surveillance system involves the assessment of how well the system fulfils its stated objectives(11;22;55). That assessment could not be done in relation to the surveillance of communicable disease on Montserrat, but the evaluation was focused on the impact which could be demonstrated on health policy, along with other important attributes.

Although the CDC guidelines for evaluating surveillance system indicates seven attributes that may be assessed in evaluating surveillance systems, the authors of that document were careful to point out that since every system was different some attributes may be more important to one system than others. It was also indicated that the presence of a particular attribute often came at the expense of another, and the attributes that were considered most important depended on the objectives of the surveillance activities. In the absence of such objectives the attributes of simplicity, flexibility, acceptability and timeliness were selected for review. The first three were selected based on the available literature that indicates that these are the attributes believed to be the most useful for public health practice(44,54), while timeliness was included at the suggestion of Ministry of Health officials. The other attributes were deemed to be outside the scope of this evaluation.

5.1.6 Strengths and Limitations of the Review

The support of the local Ministry of Health officials and the small size of the number of persons involved in surveillance related activities, made the implementation of this review an agreeable task. The support for the evaluation was evidenced by the efforts made by the Director of Health and the Permanent Secretary to inform their staff of the

impending review and the fact that I was allowed access to the various files and documents (when available) to verify the anecdotal reports provided by several members of staff.

Without exception, those persons approached to be interviewed and/or observed were willing to assist the evaluation process and even offered suggestions for finding information that they could not supply. The willingness of staff to be part of the evaluation process suggests that the information provided reflects a true account of their surveillance related tasks, as they understand them to be. However, there is also the issue of social response bias, which occurs when persons interviewed provide the answers they think make them appear in the most favourable light. The desire to ensure that their jobs appear to be important and well executed may have affected the respondents' answers.

One of the main constraints affecting this review was the lack of time. The initial six week-period allotted for the review was sufficient for the observations and interviews planned but proved inadequate for follow-up interviews. The Christmas holidays that fell within the review period reduced the actual time available, in particular for follow-up interviews many of which had not been anticipated but were necessary to clarify issues raised by the activities observed. Fortunately again, the respondents were very accommodating and agreed to answer follow-up questions.

The restrictions of time and other resources also affected the number of system attributes that could be measured. The sensitivity, predictive value positive, and representativeness of the system were not assessed. However, it should be noted that the omission of these attributes is in no way an indication of the degree of importance

ascribed to them but rather a result of the lack of resources. It would in fact be quite useful to measure these attributes since the presence of each of them would prove to be useful particularly in the areas of identifying outbreaks, focusing of limited resources for control and prevention, and the identification of epidemiologic characteristics of health events in the population(11).

Another limitation of this evaluation was the failure to estimate the cost incurred as a result of the daily operation of the surveillance system. Klaucke(55), in describing the evaluation of public health surveillance, lists the estimation of the cost of the system among five steps that evaluations should include. The costs associated with communicable disease surveillance are both direct and indirect. Cost evaluation or cost-benefit analyses were not carried out as it was felt that the time and resources available for this study were insufficient for this type of undertaking.

The guidelines proposed by the United States' CDC and employed in this evaluation provide a clear, logical framework through which the system's attributes could be measured. There were however, some aspects of surveillance that could be assessed in an attempt to measure the usefulness of the system, but were omitted from the CDC guidelines. A more comprehensive evaluation and perhaps more useful report could have been generated by considering the following factors (not recommended by the CDC): the ability of the system to monitor risk factors as early warning systems for communicable disease outbreaks (e.g. mosquito indices, water quality); and factors that affect communicable diseases (sanitation, overcrowding, housing).

5.2 Stage II – Interviews with Ministry of Health Staff

The use of interviews in the collection of qualitative data has been well described(49;56-59). Interviewing along with observation and recordings are regarded as acceptable techniques for collecting qualitative data, with the decision to interview, observe or record being dependent on the subjects being studied as well as the circumstances in which the research is being carried out. Crabtree and Miller(49), suggest that interviewing works well with physicians and nurses and this was found to be true in this study, evidenced by the fact that all the nurses and physicians approached, agreed to be interviewed and all the questions posed were answered. There is therefore no reason to suspect that the responses given do not accurately represent the feelings of the respondents.

5.2.1 Staff Satisfaction

The high levels of satisfaction the respondents expressed with the way in which surveillance is being conducted, along with the general feeling that the system was not only necessary but also very useful, is an encouraging finding for those who are charged with planning and overseeing these activities. The fact that several persons indicated that their most enjoyable tasks were those that allowed them to interact with the patients was also a significant finding since this is a very important aspect of public health practice.

The task that the majority of staff identified as being most challenging was contact tracing, a crucial step in the control of communicable diseases. This finding is not totally unexpected and may be due in part to the fact that the patients and the health care provider usually know each other socially. Patients are not always keen on reporting

high-risk behaviours to friends and/or relatives particularly when those behaviours have social stigmas attached. Similarly, some health workers are themselves reluctant to ask questions that may cause the patient any embarrassment.

Secondly the lack of clear guidelines for contact tracing may also be a factor. While the surveillance manual has all the relevant forms for case investigation and the protocol clearly states that contacts should be traced and treated (where necessary), the actual steps to be taken in tracing these contacts are not clearly outlined

The other major challenge reported by several respondents was dealing with other health care providers particularly in getting them to complete the relevant forms for submitting with diagnostic specimens. This finding is not unique to Montserrat, and reports produced by CAREC's laboratory division have indicated a number of inadequate specimens and incomplete forms submitted by individual islands. This may be attributable to the failure of some staff members to comprehend the importance of patient information in the interpretation of laboratory results.

The issue of sharing of information among the various districts on the island was raised by two respondents, who both expressed the view that all the information was being reported vertically but there was no horizontal sharing. These comments confirmed earlier observations made, where there was very little evidence of information being shared among reporting sites unless there was an outbreak being investigated. While the reasons for this are unclear, it seems that this situation could very easily be remedied.

5.2.2 Priority Setting

The process by which diseases were selected for surveillance was another aspect that seemed unclear to several persons. While the lack of knowledge regarding the process is undesirable, this does not appear to affect the acceptability of the system as evidenced by the high participation rates.

The regional organisation CAREC is charged with maintaining and strengthening the practice of epidemiology for the prevention and control of public health problems. One of the ways in which it strives to do this is by monitoring and assessing trends and assisting local ministries of health in developing public health responses. The *Surveillance Manual* contains a list of diseases being monitored and basic justification for the diseases being on that list.

The monitoring of the cases of chicken pox, discussed in Section 4.1.9.1.2 and confirmed by the interviewees, provides evidence that while CAREC gives directives on which diseases are monitored the local staff can indeed give priority to diseases that are of interest to the health of the island's population. Chicken pox is not included on the list of diseases required by CAREC but staff took the initiative to monitor the cases and their contacts and to take action to protect the health of the public.

5.2.3 Usefulness of Surveillance

The respondents' ability to identify the surveillance system's usefulness by citing examples to fulfil several of the requirements stipulated by the CDC suggests that the system in not only useful but is seen to be useful by those involved in its day to day

operations. This is very important since it may be the only source of inspiration on those days when the works seems most challenging.

5.2.4 Strengths and Limitations of the Interviews

The form of questions used in this survey (open-ended) allowed respondents the freedom to express their views regarding the various activities in which they were involved. While there was freedom to share their views, the semi-structured nature of the interview process also allowed for a certain amount of interviewer control over what issues were discussed. This process had the advantage of resulting in responses that dealt directly with the issues that had been identified prior to setting the objectives of the study.

The major disadvantage associated with the use of interviews is that there are very limited ways by which to determine the validity of the responses provided. In some studies it is possible to conduct an audit of patient charts and files and compare this to responses or to observe the actions and compare them to the reported actions. In this study limited time and other resources did not allow for reviews of patient charts, however, where possible the staff was observed engaged in the activities they reported doing. Unfortunately there is no way of knowing if the vigilance observed was a normal feature of surveillance or if this was just due to the ongoing evaluation. Reports from CAREC regarding timeliness and completeness of reports seem to suggest that the former is the case rather than the latter.

The fact that all of the interviews were conducted by a single investigator eliminated concerns about inter-observer variation, however this same feature increased the chances of other forms of measurement error, particularly in the qualitative analysis

of the interview data. The utilisation of more than one content analyst may have resulted in further analysis of the data and possibly the extraction of more themes.

5.3 Stage III – Survey of Nurses and Physicians

5.3.1 Response Rate

The response rate in this survey was somewhat disappointing, especially given the fact that most of the respondents were very familiar with the ongoing evaluation. Despite promises to complete and return the questionnaires only six completed questionnaires were returned. The reasons for this rate of response are not clear, it is possible that some respondents intended to complete the questionnaire but procrastinated and eventually decided it was too late. Another possibility is that since most of those to whom questionnaires were distributed had already been interviewed and/or observed just a few weeks earlier they may have simply grown tired of taking part in the evaluation.

5.3.2 Responses

Questionnaire A. The accuracy of the diagnoses offered for the cases of Dengue fever was not only disappointing but also alarming. Dengue fever has become an important disease in the Caribbean and as such the level of suspicion is expected to be high. In the absence of Dengue as the primary diagnosis, inclusion in the differential diagnoses would be acceptable since it would suggest that the case would at least be investigated. The results suggest that only the classic presentation of Dengue would be recognised and immediately raises the question of how many cases of Dengue fever are missed each year.

The failure to identify the cases of Dengue may have been due to the inclusion of the skin rash that many persons still do not associate with Dengue. In people with dark skin the maculopapular rash associated with Dengue is not always visible and perhaps the respondents interpreted the rash described in the simulated cases to be the clear distinct rash that care providers have come to associate with food allergies.

The other important thing to note about the missed case of Dengue is that the nurses unanimously suspected that the case represented measles, and outlined the steps suggested by the *Surveillance Manual* for measles investigation. This finding is not surprising since as indicated before, measles has been targeted throughout the region for special surveillance. All public health personnel have been trained (and retrained) to recognise and investigate any rash-like illness and to do so within twenty-four hours. While this finding does not augur well for Dengue surveillance it certainly highlights the success of the increased measles awareness and surveillance campaign. It would be ideal if the efforts put into measles elimination and surveillance and the success to date could be emulated in dealing with the elimination of Dengue fever.

The failure to suspect the case of West Nile fever is not as alarming since that disease has not yet been identified in the Caribbean. This finding does however highlight the need for local staff to keep abreast of what is happening in the realm of emerging and re-emerging diseases. The presence of this disease in the eastern United States should serve as a warning to health care providers in the islands; and it is therefore not unrealistic to expect nurses to at least include this disease in a list of possible diseases.

Questionnaire B. The results of this survey were equally disappointing for the cases of Dengue fever presented. The respondents suspected Dengue Haemorrhagic fever but mostly missed the cases of atypical Dengue. Again, the skin rash may have served as a decoy causing the respondents to think the case represented an allergic skin condition.

The tendency to suspect measles when presented with a case of Dengue with a skin rash was not demonstrated by this group and this is probably due to the fact that at least two of the four physicians surveyed had not had the benefit of the extended measles awareness campaign. As previously indicated there has been a rapid turn over of medical staff following the onset of volcanic activity and the two physicians employed in the Government service during the evaluation period were not only recent employees but were from outside of the Caribbean region.

The level of suspicion was not very high for West Nile fever either. This finding is undesirable among physicians and when combined with the results of the survey of nursing staff suggests that the area of emerging diseases needs to be addressed urgently. Given the frequency and range of modern travel, the likelihood of a visitor or returning resident presenting with West Nile fever is not low; and these results raise the question of the probability of accurate diagnosis and timely treatment. Further, the inability to suspect this disease that has recently been in the news and highlighted by CAREC, raises the important question of our ability to suspect the presence of other emerging diseases.

In general the failure of respondents to suspect the diseases presented make the likelihood of diagnosis and reporting very slim since the investigations requested are

usually specific for the suspected diagnosis. There is however another chance for the correct condition to be diagnosed if adequate patient information is submitted to CAREC along with the correct specimens. In the event of a negative result for the test requested, at the discretion of the Management of CAREC's Laboratory and Epidemiology Divisions, additional tests are performed in an effort to eliminate diseases that are indicated by the clinical and epidemiologic information provided. This improves the chances of laboratory confirmation and further highlights the necessity for submitting all relevant patient information.

5.3.3 Strengths and Limitations of the Survey

In the writing of these questionnaires, lists of test and/or specialists from which respondents could just tick their choices were deliberately not included used in order to avoid the 'cueing effect' that is associated with this practice. Steps were also taken to ensure content and face validity of the instruments.

The interpretation of the survey was limited by the fact that the use of simulated cases is dependent on the assumption that the responses provided closely agree with the responses in actual clinical encounters. In a 1990 review of eleven published studies that compared responses to written case simulations with actual behaviour, researchers found "no clear consensus emerged on how well responses to written case simulations perform as proxy measures of actual judgements and behaviours"(60). Despite this, case simulations continue to be considered as effective research instruments for eliciting attitudes and beliefs; evaluating the recall and application of knowledge(61); and assessing patient and physician decision making(62;63). Similarly in this study there is

no reason to believe that the responses do not correctly reflect how the physicians and nurses would act if presented with these cases in reality.

5.4 Integration and Dissemination of Findings

Although this study was conducted in three stages and each stage had its own specified objectives there was the opportunity to confirm findings from one stage with the findings of one or both of the other stages.

The evaluation of the usefulness of surveillance activities as suggested by the CDC guidelines yielded the same results when observations were made by the author as part of the review of the system, as when health workers were interviewed and asked to supply examples from their own experience. Similarly, when my search through the files and records did not reveal any documented evidence of the system's objectives, I turned to the staff in hope that they would be able to direct me to where the relevant documents could be found. Interviews with all available staff failed to provide the elusive list leading me to conclude that surveillance was being conducted without the benefit of stated objectives to govern every day activities.

In determining the priority setting process and the level of satisfaction staff felt with their surveillance related tasks, the direct observations and responses again seemed to corroborate each other. Staff expressed the opinion that the responsibility for determining which diseases are monitored lies with CAREC and there is limited local input. Research of the available literature and documents indicated that this was in fact the process that existed. The staff expressed high levels of satisfaction with their various tasks except in the area of contact tracing, which many of them found to be extremely

challenging. The review revealed that contact tracing is one of the few areas where specific guidelines are not available for the staff to follow. These two findings may have occurred by coincidence but it is much more likely that they are the outcome of the same deficiency in the system being highlighted by two independent means.

Finally, the review of the system clearly demonstrated a deficiency in the laboratory's capacity to deal with the present disease burden and the diseases presently emerging in the region. The findings of the third stage of the study also demonstrated a deficiency of the diagnostic capacity of the system. While the review highlighted the need for improved laboratory infrastructure and the survey highlighted the need for staff education, they both address the island's preparedness to recognise and monitor emerging communicable diseases.

The final task in the evaluation of a surveillance system is the dissemination of the findings of the evaluation(11). The findings of this study will be disseminated using a staged approach as follows:

1. A copy of the findings will be submitted to the Director of Health Services and an opportunity will be sought to discuss the findings and recommendations with him.
2. The Director's permission will be sought to share the findings with staff throughout the Ministry of Health.
    - Special meetings will be set up with the public health staff to discuss the findings and to map out the steps needed to implement those recommendations that are accepted.

- Where the recommendations are not acceptable to the staff, further discussions will be held to explore ways of addressing the systems shortcomings.

3. The results of the evaluation will be submitted to the Management of the Caribbean Epidemiology Centre, along with comments on the local reaction to the report.

CHAPTER SIX

6.0 Conclusions and Recommendations

This study was undertaken with six objectives as outlined in Section 1.1. Corresponding to the first four objectives the following conclusions have been made:

1. Priority Setting
   - The Scientific Advisory Committee of CAREC in collaboration with PAHO makes most decisions regarding which diseases are monitored on Montserrat. Local health personnel make recommendations to the Committee, and initiate the monitoring of specific diseases based on their own public health concerns.
   - Diseases monitored receive priority status based on whether they can be categorized as being: 1) subject to International Health Regulations and Surveillance; 2) important to the health of the people of the Caribbean and the Americas; and 3) important to the health of Montserrat's population.
2. Communicable Disease Surveillance
   - The surveillance of communicable diseases on Montserrat is a useful activity.
   - The system's usefulness has been demonstrated by its ability to detect trends, detect diseases of public health importance, detect epidemics and provide mortality and morbidity estimates for some communicable diseases.
   - The system employed for surveillance has several desirable attributes. It has been demonstrated to be simple and flexible; most of the tasks involved are acceptable to both patients and staff and can usually be completed in a timely manner.
   - The surveillance activities do not usually include collection or analysis of data on risk factors for the diseases being monitored.

- The existing surveillance system has no stated objectives against which its usefulness can be assessed.
- The local laboratory is extremely deficient in equipment and its role in the surveillance of communicable diseases is more that of a 'specimen transfer centre' than a diagnostic laboratory.
- The surveillance system does not provide reliable estimates of the prevalence of sexually transmitted diseases on the island.

3. Staff Satisfaction
   - Staff involved in the surveillance of communicable diseases and those charged with making health policy decisions regard the surveillance system as being useful and important. Both categories of staff are satisfied with the way in which most aspects of surveillance are being carried out.
   - All of the health personnel interviewed expressed dissatisfaction with the way in which contact tracing is carried out.
   - Most of the staff interviewed regard the laboratory services as being unacceptable.
4. Emerging Communicable Diseases
   - The Ministry of Health is not sufficiently prepared for the management of the surveillance of emerging communicable diseases.
   - At the decision making level there is no knowledge of regional plans to address the emergence of communicable diseases and no local plans have been formulated to address this issue.
   - There is a low level of suspicion regarding West Nile Fever among those nurses and physicians surveyed.

- There is also a low level of knowledge regarding the presentation of atypical cases of Dengue Fever among the same group.

The fifth objective of this study was to make recommendations for improving the surveillance of communicable diseases. The recommendations presented are based on conclusions drawn as a result of the evaluation carried out as well as responses to questions posed to Staff within the Ministry of Health. The recommendations are presented according to the operational steps (case detection, case confirmation and public action) that they are intended to improve; as well as recommendations for improving the overall administration of the system.

Case Detection

- I recommend that the Ministry invest in the procurement of additional copies of the *Caribbean Communicable Disease Surveillance Manual for Action.* Each health centre and physician on the island should have their own copy of this manual. This will serve to increase the likelihood of uniformity of reporting and ensure constant availability of case definitions, case investigation forms and disease investigation protocols.
- The Health Promotion Unit should work more closely with the public health division to ensure that the public is well educated about communicable diseases of public health concern. This will improve the chances of persons recognizing certain symptoms and seeking medical attention since the care seeking tendency of a population is an important determinant of the ability of the system to detect diseases prevalent in that population.

- In the area of case reporting, the laissez-faire attitude demonstrated by some physicians needs to be addressed. Given the reality of our situation in which the ministry is not able to attract staff with the desired qualifications for working in the public health division, there is the need for regular training workshops involving all clinical staff. Workshops and seminars are already a regular feature within the Ministry and so it should not be difficult to focus specifically on public health issues such as the importance of complete and accurate reporting and the importance of taking proper case histories including epidemiologic information. Members of staff also need to be educated regarding their public health responsibility and the benefits of accurate and complete reporting of cases.

Case Confirmation

- The role of the laboratory in case confirmation needs to be reviewed. While most persons interviewed expressed the view that the laboratory needs to be equipped to perform more diagnostic tests, this needs to be carefully assessed before large sums of money are used to buy equipment and reagents that then remain unused. The reality is that the demand for most tests is low, and the island's ability to retain well-trained laboratory staff is tenuous at best.

  I therefore recommend that a study be carried out to determine the feasibility of, and benefits to be derived from performing basic serological and bacteriological testing locally and sending the more sophisticated tests to CAREC; versus equipping the local laboratory to perform a wide range of diagnostic tests. As the population grows then a reassessment of its needs can be carried out at a later date.

Public Health Action

- I recommend that the legal support for surveillance be enhanced. Where applicable, legislative reform is necessary to make the laws easier to interpret and penalties easier to enforce. The penalties should also be brought up to date, as many of the fines date back several decades and are so low that they do not act as a significant deterrent. I further recommend that when public health issues are addressed in the media the consequences associated with the failure to comply with the relevant laws be included in the information provided.
- The availability of surveillance data to all staff within the Ministry as well as to the public needs to be reviewed. The access local personnel have to the regionally generated reports has been documented, but their access to the local information is unclear.

  I recommend that the locally collated reports be routinely circulated within the Ministry and during outbreak situations to the public. This will serve to increase awareness of the communicable disease situation on the island and may even inspire non-compliant patients to comply with counsel of health care providers.
- The problems associated with contact tracing need to be urgently addressed. I recommend that a 'brain-storming session' be held involving personnel from all levels of the ministry and other sectors so that concerns can be discussed and recorded. The process should then be repeated at the community level in the form of town hall meetings, where residents would be allowed to air their concerns about sharing information with health care providers. The advice and expertise of CAREC should be sought when the documented results of the discussions are

used to formulate guidelines for contact tracing. These guidelines should then be made available to all the relevant staff.

Administration

- The existing surveillance system should be retained.
- I recommend that a National Epidemiologist be employed. The jobs of Community Nursing Manger and Epidemiologist are quite distinct and the interest of the public's health may be better served if the post was established with the following responsibilities:
    - management of the communicable surveillance activities on island and analysis and monitoring of data generated;
    - initiation of changes in the existing system aimed at collecting data on various risk factors, and implementation of on-going monitoring system;
    - involvement in the planning and organisation of the proposed surveillance system for chronic diseases;
    - supervising and playing an active role in outbreak investigations and general field epidemiology activities, as well as the planning and evaluation of interventions;
    - act as a liaison between technical staff and policy makers as well as local and regional staff on matters of public health concern.
- A list of clear and concise objectives for the surveillance of communicable diseases needs to be developed. These objectives should be carefully formulated with the input of local and regional staff and should take into account the present state of surveillance on the island as well as the challenges anticipated with the

rebuilding of the health care system. The resulting document should be distributed at all levels of the Ministry of Health.

- The need to use all of the data that are collected makes it imperative that local infrastructure be improved to allow for the analysis of data beyond the generation of simple descriptive statistics.

  I recommend that the ministry seek technical assistance for training of local staff to handle the statistical analysis of surveillance data. Funding also needs to be obtained for the procurement of software to facilitate more in depth analysis of the data. This will facilitate the identification of risk factors that may be unique to the island's circumstances and further increase the usefulness of the surveillance data.

- Periodic audits of patient charts and/or data collection forms should be carried out in an effort to monitor the quality of the data being sent to CAREC and utilised for generating reports and tracing contacts.

- The Ministry of Health needs to initiate discussions with PAHO and/or CAREC regarding the monitoring of emerging communicable diseases. Ministry officials need to avail themselves of all opportunities to learn about the problem and take purposeful steps towards becoming prepared to deal with the eventuality of the arrival of these diseases.

The completion of this evaluation and the recognition of its strengths and weaknesses have allowed for certain conclusions to be made regarding the processes utilised. Pursuant to the fulfilment of the sixth objective, the following appraisal of the evaluation approach is offered:

Stage I – Review and Assessment of the Surveillance System

The CDC's Guidelines for Evaluating Surveillance Systems recommend six tasks that should be completed when evaluating surveillance systems (Table 4). All of the tasks were completed with the exception of the dissemination of the report, which will follow shortly. The completion of these tasks was possible due to the willingness of the local and regional staff to have the system assessed and to take part in the evaluation process. The process was also aided by the availability of the data needed to assess the operations and usefulness of the existing surveillance system as well as to provide evidence of the actions taken as a result of data from the system.

I recommend that these surveillance guidelines be utilised for similar evaluations but with the following adjustments:

- for each system to be evaluated, the objectives should be reviewed and the attributes deemed most desirable to help achieve the stated objectives be assessed;
- the evaluators should consider including the assessment of the system's ability to monitor risk factors for the diseases of interest to the islands. These could include (but not be limited to), water quality and its impact on cases of gastroenteritis, and mosquito indices and the effect it has on the prevalence of dengue fever;

- the evaluators should allow a longer time period for the observation and interviewing of staff;
- if possible, observations should be made by more than one trained investigator so that several activities can be observed at the same time.

Stage II – Interviews with Health Staff

The evaluation of the way in which staff view the existing surveillance system was ascertained with the use of the semi-structured interview process. This approach was found to be an effective means of getting the staff's opinions as well as of corroborating the findings of the review.

Among the lessons learned were that staff do have suggestions for dealing with issues related to their work; and that they will offer their opinions if asked. The use of face-to-face interviews as an important evaluation tool for similar populations is highly recommended. From the results of this pilot the following changes are suggested before the approach is repeated:

- questions dealing specifically with the issues most frequently raised such as contact tracing, patient and staff education and non-compliance, laboratory sufficiency, would be included in the interview outline. These questions would be open ended, allowing the respondents more freedom to express their opinions on the subject(s);
- incorporate an audit of a random sample of patient charts and/or surveillance report files into the evaluation process. This will serve as a measure of verifying the reports offered by the interviewees.

Stage III – Survey of Nurses and Physicians

The survey of the clinical staff utilizing hypothetical cases was able to indicate the lack of knowledge about the presentations of the diseases depicted. This was in keeping with the objective of this stage of the study. The further use of this approach to assessing diagnostic and management practices is recommended, but it would be advantageous to assess the correlation between the clinicians' stated actions and what they do in reality.

In conclusion, the three-stage process used in this evaluation has been demonstrated to be practical and conducive to completion with limited financial and human resources. I recommend this approach for application to other CAREC countries with similar resource limitations. As we anticipate the implementation of these recommendations and other changes that occur due to the rebuilding of Montserrat's health system, I further recommend that this approach be repeated in re-evaluating the local surveillance system in the future.

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APPENDIX I

Island Demographics

Montserrat's Population Estimates by Sex and Major Age Groups 1985 – 1994.

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Under 5	**1,116**	**1,179**	**1,133**	**1,078**	**1,022**	**935**	**990**	**885**	**899**	**886**
Male	540	596	574	565	553	520	470	456	459	457
Female	576	583	559	513	469	415	430	429	440	429
5 - 14	**2,364**	**2,283**	**2,260**	**2,241**	**2,235**	**2,248**	**1,890**	**1,929**	**1,938**	**1,925**
Male	1,191	1,132	1,112	1,099	1,096	1103	968	991	1007	994
Female	1,173	1,151	1,148	1,142	1,139	1145	922	938	931	931
15-64	**6,172**	**6,106**	**6,107**	**6,121**	**6,112**	**6,149**	**6,408**	**6,344**	**6,278**	**6,222**
Male	3,065	3,037	3,046	3,060	3,057	3077	3246	3215	3186	3165
Female	3,107	3,069	3,061	3,061	3,055	3072	3162	3129	3092	3057
65+	**1,531**	**1,530**	**1,515**	**1,491**	**1,483**	**1,437**	**1,441**	**1,404**	**1,366**	**1,369**
Male	610	604	597	583	572	545	606	586	575	578
Female	921	926	926	908	911	892	835	818	791	791
Total	**11,183**	**11,098**	**10,015**	**10,931**	**10,852**	**10,769**	**10,639**	**10,562**	**10,481**	**10,402**
Male	5,406	5,369	5,329	5,307	5,278	5245	5290	5248	5227	5194
Female	5,777	5,729	5,686	5,624	5,574	5524	5349	5314	5254	5208

Montserrat's Population Estimates by Sex and Major Age Groups 1995 to 1999

	1995	1996	1997	1998	1999
Under 5	**859**	**635**	**389**	**210**	**389**
Male	435	333	240	116	228
Female	424	302	149	94	161
5 – 14	**1,903**	**1,493**	**1,359**	**776**	**913**
Male	990	770	721	433	525
Female	913	723	638	343	388
15 – 64	**6,215**	**4,625**	**3,331**	**1,940**	**2,798**
Male	3,164	2,177	1,598	1,039	1,485
Female	3,051	2,448	1,733	901	1,313
65+	**1,347**	**1,114**	**1,015**	**669**	**670**
Male	569	501	460	356	342
Female	778	613	555	313	329
Total	**10,324**	**7,867**	**6,094**	**3,595**	**4,770**
Male	5,158	3,781	3,019	1,944	2,579
Female	5,166	4,086	3,075	1,651	2,191

Source: Department of Statistics, Montserrat.

APPENDIX II

Communicable Diseases

Communicable Diseases Reported to CAREC from Montserrat, 1990 – 1999

Disease	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Cholera	0	0	0	0	0	0	0	0	0	0
Plague	0	0	0	0	0	0	0	0	0	0
Yellow Fever	0	0	0	0	0	0	0	0	0	0
AIDS	NA	NA	NA	NA	NA	1	0	0	2	3
Malaria	0	0	0	0	0	0	0	0	0	0
Influenza	86	19	158	113	66	73	90	NA	36	99
Tuberculosis	0	1	0	0	0	2	0	0	2	2
Diphtheria	0	0	0	0	0	0	0	0	0	0
Pertussis	0	0	0	0	0	0	0	0	0	0
Tetanus	0	0	0	0	0	0	0	0	0	0
Neonatal Tetanus	0	0	0	0	0	0	0	0	0	0
Poliomyelitis	0	0	0	0	0	0	0	0	0	0
Measles	0	0	0	0	0	0	0	0	0	0
Rubella	0	0	0	0	0	0	0	0	0	0
Congenital Rubella	0	0	0	0	0	0	0	0	0	0
Meningococcal infection	0	0	0	0	0	0	0	0	0	0
Leprosy	0	0	0	0	0	0	0	0	0	0
Dengue Fever	0	0	0	0	0	75*	2*	0	0	0
Dengue Haemorrhagic Fever /Shock Syndrome	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Typhoid	0	0	0	0	0	0	0	0	0	0
Gastroenteritis(<5yrs)	98	68	88	79	57	34	42	19	29	8
Viral Hepatitis A	0	0	0	0	0	4	1	0	0	0
Viral Hepatitis B	NA	NA	NA	NA	NA	13	6	9	5	9
Viral Meningitis	0	0	0	0	0	0	0	0	0	0
Rabies (in humans)	0	0	0	0	0	0	0	0	0	0
Leptospirosis	0	0	0	0	0	0	0	0	0	0
Salmonellosis	0	0	0	0	0	1	0	0	0	0
Shigellosis	0		0	0	0	0	0	0	0	0

Source: Epidemiology Division, CAREC

NA: Not Available

* : Laboratory confirmed cases only

Communicable Diseases Monitored but Not Required by CAREC

DISEASE	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Haemorrhagic Conjunctivitis	199	69	0	0	0	0	0	0	188	17
Chicken Pox	NA	NA	NA	NA	NA	5	5	0	5	6

NA: Not available

Source: Epidemiology Division, CAREC

Diseases Monitored and Practical Steps Involved in Reporting

Class 1 - Case report universally required by International Health Regulations or as a disease under surveillance by WHO.

An obligatory case report should be made by level 1 to level 2 by telephone, facsimile or other rapid means within 24 hours. Level 2 forwards the initial report to the national level by the most expeditious means. On confirmation of the case the national authority reports to the WHO according to the International Health Regulations or standard format.

Class 2 – Case report regularly required wherever the disease occurs.

A case report is made by level 1 to level 2 by phone, facsimile, or other rapid means within 24 hours. The first recognized case should be reported within 48 hours by the most rapid means to the national level. Subsequent cases will be reported weekly by level 2 to the national level.

Class 3 – Selectively reportable in recognized endemic areas.

A case report is made by level 1 to level 2 within 48 hours. Reports should be forwarded by level 2 to the national level collectively by mail weekly or monthly.

Class 4 – Obligatory report of epidemics

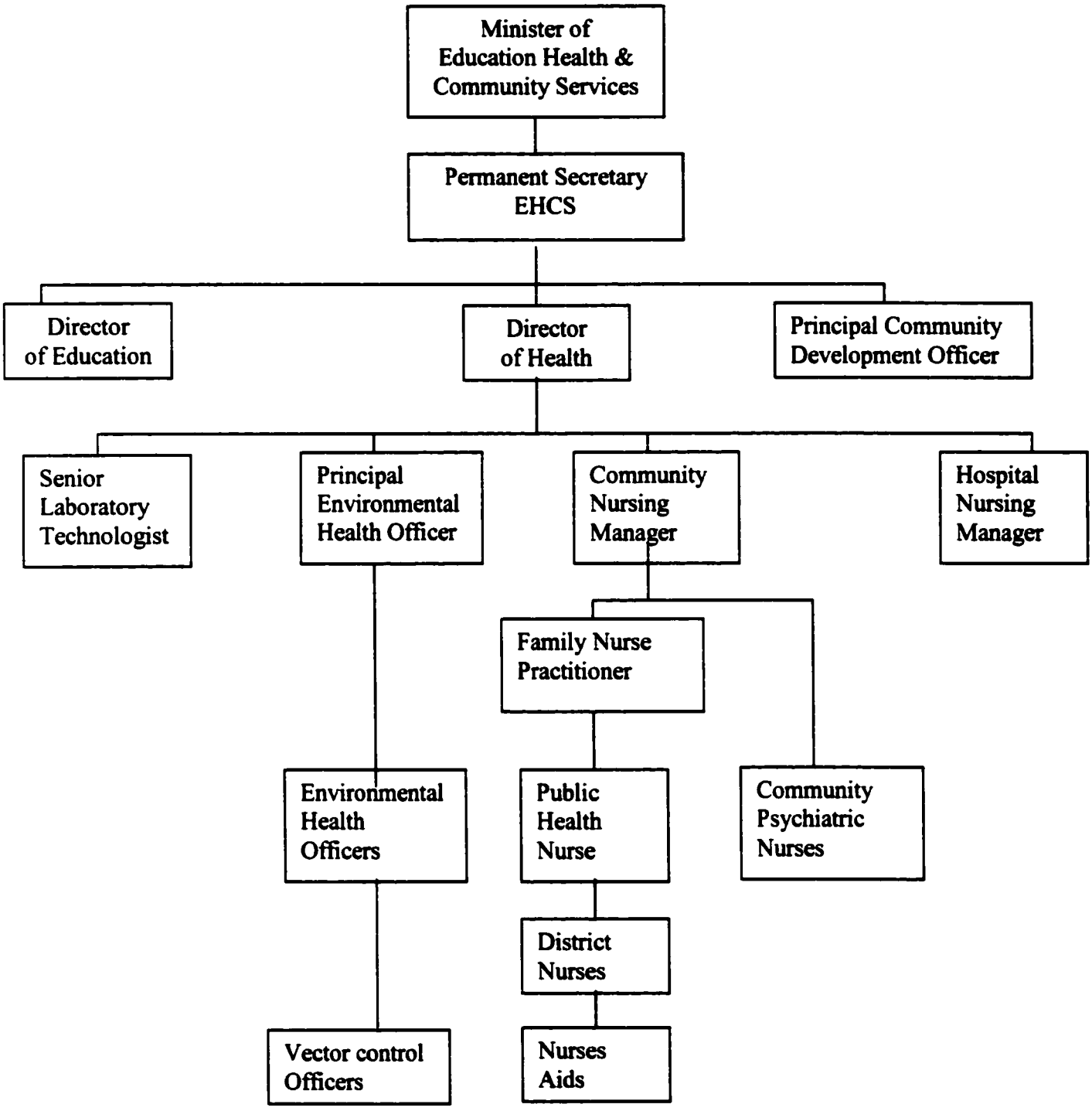
No case report is required. Outbreaks are promptly reported by level 1 to level 2 by the most rapid means. These are forwarded by level 2 to the national level by phone or facsimile. Only numbers of cases are required, with relevant epidemiological data.

Source: Caribbean Communicable Disease Surveillance Manual for Action

APPENDIX III

Organisational Chart

Selected Portion of Ministry of Health's Organisational Chart.



APPENDIX IV

Literature Search Strategy

Search Strategy

Electronic Search

Bibliographic databases searched:

- Medline 1966 - 2000 and HealthSTAR 1975 - 1986

  Keywords used in search: *'surveillance,' 'evaluation,' 'evaluation of communicable diseases,' 'evaluation of infectious diseases,' 'passive surveillance' and 'active surveillance.'*

- SocioFile 1974 - 2000

  Keywords used in search: *'evaluation,' ' program evaluation,' 'medical program evaluation'*

The articles located through this search strategy were read and those that fit the criteria of reporting on the evaluation of the surveillance of communicable disease(s) were selected.

Manual Search

Searches were done of the bibliographies of the following:

- The articles selected from the electronic search
- Text books that have Surveillance/Public Health Surveillance as their subject matter
- Text books that contain chapters that address surveillance and/or the evaluation of surveillance systems

Any reference cited which contained any of the 'key words' listed above was collected and the abstract/article read. The final selection was done based on the same criteria as above.

APPENDIX V

Interview Information

INFORMATION SHEET & CONSENT FORM

EVALUATION OF THE SURVEILLANCE OF INFECTIOUS DISEASES ON THE ISLAND OF MONTSERRAT, BRITISH WEST INDIES.

Background: This study is being undertaken in partial fulfilment of the requirements of the Department of Epidemiology & Community Medicine for attaining a Master of the Science Degree in Epidemiology.

Purpose and Description of the Study: Surveillance is a fundamental tool of Public Health and its efficient functioning can be used for a variety of activities including measuring the burden of a disease or health event, monitoring trends (including identification of epidemics), generating hypotheses, policy decision-making as well as evaluating public policy. In order to be effective, surveillance systems should be properly designed, executed and evaluated periodically. The main purpose for evaluating surveillance systems has been described as "*to promote the best use of public health resources by ensuring that problems of public health importance are under surveillance, that surveillance systems operate efficiently, and that information provided by surveillance systems is useful for public health practice.*"

The evaluation will be conducted by asking questions about how Staff who come into contact with the Ministry of Health's surveillance system view the organization, operation and impact of the programs and events which together constitute the surveillance system for infectious diseases on Montserrat.

Procedures: In this study all Public Health Staff who are involved in surveillance are being asked to participate in a face-to-face semi-structured interview. The interview should take approximately one hour, and will take place at a time and location convenient to you. You may refuse to answer any question(s) that you do not feel comfortable answering. All questions and responses will be recorded by handwritten notes and on an audiotape.

Confidentiality: All of the information gathered will be kept confidential. No one within the Ministry of Health will have access to your responses; access will be restricted to the Interviewer and Supervisor at the University of Ottawa. You will be given a unique ID number and this

will be used in the analysis of the data. Your responses will be analysed and included in the report, but you will not be identifiable in any report or presentation resulting from this study without your written consent.

Participation: Your participation in this study is completely voluntary. At anytime during the interview you may refuse to answer any question or to discontinue the interview. Your participation (on non-participation) will have no impact on your job status within the Ministry of Health.

Answers to Questions: If you have any questions regarding this study, you may contact:

Dr. George Wells
Professor & Chairman
Department of Epidemiology & Community Medicine
Room 3227A,
451 Smyth Road, Ottawa Ontario. K1H 5M8

Tel: (613) 562 5800 ext. 8159

I have read this Information Sheet and have had the opportunity to ask my Interviewer any questions I had about the study.

A copy of the Information Sheet/Consent Form will be provided to me should I want to review the information at a later date, if I need to contact someone about the study or my participation in the study, or simply for my records.

I agree to participate in this survey. If at any time during or after the interview I decide to withdraw my consent, I may do so.

_____ _____

Date Signature of Respondent

_____ _____

Date Signature of Interviewer

INTERVIEW SCHEDULE ONE

(Structured Interview for Health Policy Advisors and Senior Public Health Officials)

1 The Ministry of Health has been involved in monitoring infectious diseases for over 20 years.

i. What has determined which diseases do and do not get monitored over the years

ii. To what extent is disease monitoring influenced by the advice of agencies such as the Pan American Health Organization (PAHO) and the Caribbean Epidemiology Centre (CAREC)?

iii. To what extent is disease monitoring influenced by advice of staff in the Public Health Division of the Ministry of Health?

2 A lot of time and effort has been spent on surveillance activities over the years.

i. What sort of feedback do policy makers/advisors like you receive from surveillance activities?

ii. Is it adequate?

iii. How does the information you receive (e.g. Annual Health Reports) influence your decisions (or advice to decision makers)?
Can you site any examples of this happening over the past five years?

iv. Do you feel that the results justify the resources invested?

3 In recent years the Ministry of Health has focused on Primary Health Care and the prevention and control of many infectious and preventable diseases. Measures have been put in place to prevent and reduce the incidence of diseases such as Dengue fever and HIV/AIDS. Can you recall any examples of how surveillance as it is practiced on Montserrat has:

i. Been useful in indicating the extent to which these control programs have worked?

ii. Allowed for the detection of trends/changes in the occurrence of specific diseases?

iii. Allowed Health officials to detect diseases in a timely manner, so that patients and contacts can be traced and treated?

iv. Been useful for detecting epidemics?

v. Provided estimates of the amount of illness and death due to specific diseases?

vi. Allowed for the identification of risk factors for any disease of public health importance.

4 In June 1995, PAHO convened a meeting to discuss strategies for prevention and control of emerging infectious diseases. (Emerging diseases are those whose incidence has increased dramatically in the past two decades such as AIDS and Ebola). The major goal identified by this meeting was the "strengthening of regional surveillance networks."

i. Did the Ministry of Health participate in this meeting?

OR

ii. Is the Ministry of Health aware of this call for increased vigilance in disease monitoring?

iii. Are there any plans for increasing resources allocated to public health surveillance?

iv. Has there been any change in the Ministry of Health's policy with a view to strengthening surveillance?

5 The volcanic crisis has resulted in the disruption of public health measures on the island. This is one of the main factors associated with emerging and re-emerging diseases along with changing population demographics, changes in land use and international travel and commerce – all of which may be identified in our present situation.

i. Are there any plans to focus on the surveillance of emerging diseases (other than HIV/AIDS) and to prepare for their prevention and control?

ii. What are these plans?

6 Does the rebuilding of the Health Care Services on Montserrat require the rebuilding of health promotion activities such as surveillance?

7 What if anything would you change about surveillance activities on Montserrat?

INTERVIEW SCHEDULE TWO
(Structured Interview for Technical Staff within the Ministry of Health)

1 The Ministry of Health has been involved in monitoring infectious disease for over 20 years. A lot of time and effort have been spent on surveillance related activities.

i. Is surveillance an important public health function?

ii. Do the results of surveillance justify the time and effort invested?

iii. As a public health worker do you receive adequate feedback from policy makers regarding reports you submit based on your surveillance activities?

iv. How useful are the surveillance activities? Why?

2 In recent years the Ministry of Health has focused on Primary Health Care and the prevention and control of many infectious and preventable diseases. Measures that include surveillance have been put in place to prevent and reduce the incidence of these diseases.

Could you tell me whether you **strongly agree, agree, disagree or strongly disagree** with the following statements or **(don't know/or have no opinion)** on each statement:

{*Card with the responses will be provided to the interviewee*}

Surveillance activities have:

vii. Been useful in indicating the extent to which these control programs have worked?

viii. Allowed for the detection of trends/changes in the occurrence of specific diseases?

ix. Allowed Health officials to detect diseases in a timely manner, so that patients and contacts can be traced and treated?

x. Been useful for detecting epidemics?

xi. Provided estimates of the amount of illness and death due to specific diseases?

xii. Allowed for the identification of risk factors for any disease of public health importance.

{*Where the respondent agrees with the statement he/she will be asked to site any examples, which they can recall}*

3 As a Public Health Worker you have been involved in various surveillance activities. Disease surveillance in the region differs in objectives, perception and complexity. It has been suggested that surveillance systems should be as simple as possible while still meeting their objectives.

i. What are the objectives of infectious disease surveillance on Montserrat?

ii. Would you describe surveillance activities on Montserrat as simple? Why?

iii. Could you indicate whether you think the time you spend on the following activities each month is **Too much, Adequate or Not Enough**.

- Diagnosis and contact tracing
- Data collection
- Data transmission
- Editing and analyzing data
- Disseminating data/information

iv. Of the surveillance related activities in which you are involved which do you like least? Why?

v. Of the surveillance related activities in which you are involved which do you enjoy most? Why?

vi. What is the most challenging of all your surveillance related tasks? Why?

vii. Are there any surveillance activities that you wish were not your responsibility? Why?

5 In June 1995, PAHO convened a meeting to discuss strategies for prevention and control of emerging infectious diseases. (Emerging diseases are those whose incidence has increased dramatically in the past two decades such as AIDS and Ebola). The major goal identified by this meeting was the "strengthening of regional surveillance networks."

v. Did the Ministry of Health participate in this meeting?

OR

vi. Is your Department aware of this call for increased vigilance in disease monitoring?

vii. Has the Ministry of Health taken any steps to increase resources allocated to public health surveillance or to focus on emerging infectious diseases?

6 The volcanic crisis has resulted in the disruption of public health measures on the island. This is one of the main factors associated with emerging and re-emerging diseases along with changing population demographics, changes in land use and

international travel and commerce – all of which may be identified in our present situation.

iii. Are there any plans to focus on the surveillance of emerging diseases (other than HIV/AIDS) and to prepare for their prevention and control?

iv. What are these plans?

7 What if anything, would you change about the way in which surveillance is carried out on Montserrat?

8 Do you have any suggestions for improving the surveillance activities on Montserrat?

Survey Guidelines

Checklist for Deciding the Survey's Context

- ✓ Identify the survey's specific purposes.
- ✓ Clarify the terms used to state the survey's purpose.
- ✓ Be sure to have the specific objective of the survey in place.
- ✓ Know the respondents.
- ✓ Carefully match what you need to know against the time you have to find out.
- ✓ Remember that questions are asked in a social, cultural and economic context.

Guidelines for Asking Survey Questions

- ✓ Ask purposeful questions.
- ✓ Ask concrete questions.
- ✓ Use time periods that are related to the importance of the question.
- ✓ Use conventional language.

  Use complete sentences.

  Be careful of slang and technical expressions.
- ✓ Use loaded questions if necessary, but be cautious.
- ✓ Avoid biasing words and phrases.
- ✓ Avoid two-edged questions.
- ✓ Avoid negative questions
- ✓ Have questions reviewed by experts.
- ✓ Have questions reviewed by potential respondents.

Source: How to Ask Survey Questions, 1995

Checklist for Deciding Between Open and Closed Questions

	✓ If yes, use OPEN	✓ If yes, used CLOSED
Purpose	Respondents' own words are essential	You want data that are rated or ranked and you have a good idea how to order the ratings in advance.
Respondents' characteristics	Respondents are capable of providing answers in their own words. Respondents are willing to provide answers in their own words.	You want respondents to answer using a pre-specified set of response choices.
Asking the question	You prefer to ask only the open question because the choices are unknown.	You prefer that respondents answer in their own words.
Analysing the results	You have the skills to analyse respondents' comments even though answers may vary considerably.	You prefer to count the number of choices.
Reporting the results	You provide individual or grouped verbal responses.	You will report statistical data.

Source : The Survey Kit, 1995

APPENDIX VI

Survey Questionnaires

Covering Letter for Survey Questionnaire

Glendon Hospital
St Johns
MONTSERRAT

January 3, 2001

Dear Doctor

I am presently on leave from the Laboratory Department of the Ministry of Health and pursuing a Master of Science Degree in Epidemiology at the University of Ottawa.

For successful completion of this program the Department of Epidemiology and Community Medicine requires each student to complete a Thesis that offers the opportunity to work on a topic demonstrating skills in applying epidemiologic concepts and methods to addressing health related questions. For my thesis I am conducting an *Epidemiological Evaluation of the system used for the surveillance of infectious diseases on Montserrat with special focus on our ability to monitor emerging infectious diseases.*

Reviews of the reports coming out of WHO meetings convened to deal with the increasing threat of emerging diseases; as well as conversations with personnel at the Caribbean Epidemiology Centre (CAREC) have highlighted the need for assessing regional and local capacities for monitoring these occurrences.

It is my belief that this project would not only be useful for the completion of my program but also benefit the Ministry of Health as we strive to improve and maintain the health status of the people of Montserrat.

I am therefore requesting your assistance in completing the attached questionnaire. Please note that the questionnaires are to be completed anonymously; and the completed questionnaires will only be used for the purposes of this exercise and then destroyed.

Looking forward to your cooperation.

Sincerely

DOROTHEA L HAZEL
Graduate Student

QUESTIONNAIRE A

SURVEY OF THE MANAGEMENT OF SELECTED EMERGING INFECTIOUS DISEASES

Enclosed are 5 case scenarios describing various presentations of selected communicable diseases. Please review the cases and answer the question on diagnosis and patient management.

Responses will be kept confidential and no personal identification is required.

Please return your completed questionnaire in the enclosed pre-paid, addressed envelope.

****

CASE 1 "CLASSIC DENGUE FEVER"

A 3 year-old child presents with fever, headache and complaints that "her eyes hurt." Her mother gives a two-day history of fever, headache and irritability. On examination, the patient has a temperature of 103°F and a maculopapular rash over most of her body.

Based on the information provided state your initial clinical impression and any other possible reasons for this illness.

Initial suspicion:

Other possible illnesses:

a)

b)

In relation to the management of this case, what (if any) steps would you take?

a)

b)

c)

d)

What other epidemiologic or patient information would you find useful in managing this patient?

a)

b)

c)

CASE 2 "ATYPICAL DENGUE FEVER"

A 10 year-old girl presents with fever and upset stomach. Her mother admits that the child had a rash and as a result had been irritable for about a week, but since the symptoms looked like those she had seen in children diagnosed with measles last year; she had treated her with some leftover calamine lotion. She further states that the lotion had worked since the rash had cleared up but a 'new rash' had subsequently started and she was now at the clinic seeking 'more lotion'. On further questioning you learnt that no one at home, or at the child's School had recently been suspected of having and/or diagnosed with measles. It is the middle of the school term and the child has not travelled outside of Montserrat for at least six months. The child's immunization record shows that she had all recommended vaccines and she has no history of vaccine preventable illnesses.

On examination a confluent rash with round areas of normal skin was found on the child's skin and she has a temperature of 99°F. No other physical abnormalities were found.

Based on the information provided state your initial clinical impression and any other possible reasons for this illness.

Initial suspicion:

Other possible illnesses:

a)

b)

In relation to the management of this case, what (if any) steps would you take?

a)

b)

c)

d)

What other epidemiologic or patient information would you find useful in managing this patient?

a)

b)

c)

d)

CASE 3 "CLASSIC DENGUE FEVER"

A 41 year-old man presents with complaints of severe frontal headache, severe muscle and joint pain for four days. He also complains of feeling increasingly weak over the last 24 hours. The patient lives in the Gerald's area less than 200 meters from the Gerald's Park Pond. The patient has been in good health all his life and cannot recall ever feeling this sick.

On examining the patient you find him to be in good physical condition, he has no signs of a skin rash or any other physical abnormality.

Based on the information provided state your initial clinical impression and any other possible reasons for this illness.

Initial suspicion:

Other possible illnesses:

a)

b)

In relation to the management of this case, what (if any) steps would you take?

a)

b)

c)

d)

What other epidemiologic or patient information would you find useful in managing this patient?

a)

b)

c)

d)

CASE 4 "WEST NILE FEVER"

A 27 year-old graduate student presents with fever, headache, and complaints of "aches all over her body." The patient reports that she returned from spending the summer in the United States with the 'flu' 8 days ago and has been treating herself with an over the counter remedy. She now complains of severe headache and neck stiffness and a sore throat. On further questioning you learn that while in the United States she had spent most of her time in Queens, in the State of New York.

On examination, the patient is found to have a temperature of 103°F, muscle weakness and swollen lymph glands.

Based on the information provided state your initial clinical impression and any other possible reasons for this illness.

Initial suspicion:

Other possible illnesses:

a)

b)

In relation to the management of this case, what (if any) steps would you take?

a)

b)

c)

d)

What other epidemiologic or patient information would you find useful in managing this patient?

a)

b)

c)

d)

CASE 5 "INFLUENZA"

A 66 year-old male patient is seen at the district clinic. The patient complains of severe headache, body aches and feeling very tired. The patient reports that he has been sick for at least two weeks and in the last two days he is feeling worse.

Based on the information provided state your initial clinical impression and any other possible reasons for this illness.

Initial suspicion:

Other possible illnesses:

a)

b)

In relation to the management of this case, what (if any) steps would you take?

a)

b)

c)

d)

What other epidemiologic or patient information would you find useful in managing this patient?

a)

b)

c)

QUESTIONNAIRE B

SURVEY OF THE MANAGEMENT OF SELECTED EMERGING INFECTIOUS DISEASES

Enclosed are 6 case scenarios describing various presentations of selected communicable diseases. Please review the cases and answer the question on diagnosis and patient management.

Responses will be kept confidential and no personal identification is required.

Please return your completed questionnaire in the enclosed pre-paid, addressed envelope.

****

CASE 1 "CLASSIC DENGUE FEVER"

A 3 year-old child presents with fever, headache and complaints that "her eyes hurt." Her mother gives a two-day history of fever, headache and irritability.

On examination, the patient has a temperature of 103°F and a maculopapular rash over most of her body. Blood investigations were ordered and the results indicate a moderate leucopenia and thrombocytopenia.

Based on the information provided state your initial clinical impression (primary diagnosis) and not more than three differential diagnoses in descending order of likelihood.

Primary Diagnosis:

Differential Diagnoses:

a)

b)

c)

In relation to this case, assuming that you have access to appropriate investigative procedures, what investigations would you request? Please list these in order of importance.

a)

b)

c)

d)

What other epidemiologic or patient information would you find useful in managing this patient?

a)

b)

c)

d)

Assuming the availability of Specialists in various fields of medicine, would you refer this patient to another physician? If yes, what service(s) would you suggest?

Yes _____ No _____

a)

b)

c)

d)

CASE 2 "ATYPICAL DENGUE FEVER"

A 10 year-old girl presents with fever and upset stomach. Her mother admits that the child had a rash and as a result had been irritable for about a week, but since the symptoms looked like those she had seen in children diagnosed with measles last year; she had treated her with some leftover calamine lotion. She further states that the lotion had worked since the rash had cleared up but a 'new rash' had subsequently started and she was now at the clinic seeking 'more lotion'. On further questioning you learnt that no one at home, or at the child's School had recently been suspected of having and/or diagnosed with measles. It is the middle of the school term and the child has not travelled outside of Montserrat for at least six months. The child's immunization record shows that she had all recommended vaccines and she has no history of vaccine preventable illnesses.

On examination a confluent rash with round areas of normal skin was found on the child's skin and she has a temperature of 99°F. No other physical abnormalities were found.

Based on the information provided state your initial clinical impression (primary diagnosis) and not more than three differential diagnoses in descending order of likelihood.

Primary Diagnosis:

Differential Diagnoses:

a)

b)

c)

In relation to this case, assuming that you have access to appropriate investigative procedures, what investigations would you request? Please list these in order of importance.

a)

b)

c)

d)

What other epidemiologic or patient information would you find useful in managing this patient?

a)

b)

c)

d)

Assuming the availability of Specialists in various fields of medicine, would you refer this patient to another physician? If yes, what service(s) would you suggest?

Yes _____ No _____

a)

b)

c)

d)

CASE 3 "ATYPICAL DENGUE FEVER"

A 10 year-old boy presents with a five-day history of headache, retro-ocular pain, arthralgia and myalgia. His mother reports that he 'looks much better than he did a few days ago' but he is weak and always tired.

On examination he is found to have a mildly elevated temperature and slight myalgia but an otherwise satisfactory general condition. There is no sign of a skin rash. The only abnormality found in his lab investigations was microscopic haematuria.

Based on the information provided state your initial clinical impression (primary diagnosis) and not more than three differential diagnoses in descending order of likelihood.

Primary Diagnosis:

Differential Diagnoses:

a)

b)

c)

In relation to this case, assuming that you have access to appropriate investigative procedures, what investigations would you request? Please list these in order of importance.

a)

b)

c)

d)

What other epidemiologic or patient information would you find useful in managing this patient?

a)

b)

c)

d)

Assuming the availability of Specialists in various fields of medicine, would you refer this patient to another physician? If yes, what service(s) would you suggest?

Yes _____ No _____

a)

b)

c)

d)

CASE 4 "DENGUE HAEMORRHAGIC FEVER"

A 32 year-old male presents at the Casualty Department with a four day history of fever, severe headache and arthralgia. The patient reports that his symptoms are worse at night. During the last 6 hours he has felt progressively worse and started vomiting and he now complains of intense abdominal pain. The patient had a history of returning 10 days ago from representing his Ministry at a workshop held in Guyana. He recalls having a similar illness about a year ago during an outbreak of dengue fever but says this time he feels much worse.

On examination, the patient is found to have a fever of 104°F and a large unexplained bruise. He has no knowledge of the cause of the bruise and cannot recall any incident that would have resulted in such bruising. His blood pressure is slightly low and his abdomen is tender. Since arriving in Casualty he has vomited twice and has displayed alternate bouts of shivering and restless.

Based on the information provided state your initial clinical impression (primary diagnosis) and not more than three differential diagnoses in descending order of likelihood.

Primary Diagnosis:

Differential Diagnoses:

a)

b)

c)

In relation to this case, assuming that you have access to appropriate investigative procedures, what investigations would you request? Please list these in order of importance.

a)

b)

c)

d)

What other epidemiologic or patient information would you find useful in managing this patient?

a)

b)

c)

d)

Assuming the availability of Specialists in various fields of medicine, would you refer this patient to another physician? If yes, what service(s) would you suggest?

Yes _____ No _____

a)

b)

c)

CASE 5 "WEST NILE FEVER"

A 27 year-old graduate student presents with fever, headache, and complaints of "aches all over her body." The patient reports that she returned from spending the summer in the United States with the 'flu' 8 days ago and has been treating herself with an over the counter remedy. She now complains of severe headache and neck stiffness and a sore throat. On further questioning you learn that while in the United States she had spent most of her time in Queens, in the State of New York. On examination, the patient is found to have a temperature of 103°F, muscle weakness and swollen lymph glands.

Based on the information provided state your initial clinical impression (primary diagnosis) and not more than three differential diagnoses in descending order of likelihood.

Primary Diagnosis:

Differential Diagnoses:

a)

b)

c)

In relation to this case, assuming that you have access to appropriate investigative procedures, what investigations would you request? Please list these in order of importance.

a)

b)

c)

d)

What other epidemiologic or patient information would you find useful in managing this patient?

a)

b)

c)

d)

Assuming the availability of Specialists in various fields of medicine, would you refer this patient to another physician? If yes, what service(s) would you suggest?

Yes _____ No _____

a)

b)

c)

d)

CASE 6 "WEST NILE FEVER"

A 47 year-old seasonal farm worker is brought to the emergency room by his neighbour with high fever and convulsions. The patient is disoriented and unable to give any useful information. The neighbour reports that he had returned from North America where he had been employed in the 'seasonal farm worker program'. Following his return he was heard to complain of headache and severe back pains. He thought he may have hurt his back picking fruit and promised to visit the Doctor if the pain persisted. When he had not been seen for several days the neighbours went to visit, found him in his present state and brought him to the emergency room. The neighbour is not sure, but he **thinks** he was in Florida and that he had visited his sister in Boston the week prior to his return to Montserrat.

Examination of the patient reveals a temperature of 104°F, swollen lymph glands and a rash over most of his body. His blood pressure is normal but his reflexes are slow and there is marked muscle weakness in his lower limbs.

Based on the information provided state your initial clinical impression (primary diagnosis) and not more than three differential diagnoses in descending order of likelihood.

Primary Diagnosis:

Differential Diagnoses:

a)

b)

c)

In relation to this case, assuming that you have access to appropriate investigative procedures, what investigations would you request? Please list these in order of importance.

a)

b)

c)

d)

What other epidemiologic or patient information would you find useful in managing this patient?

a)

b)

c)

d)

Assuming the availability of Specialists in various fields of medicine, would you refer this patient to another physician? If yes, what service(s) would you suggest?

Yes _____ No _____

a)

b)

c)

d)

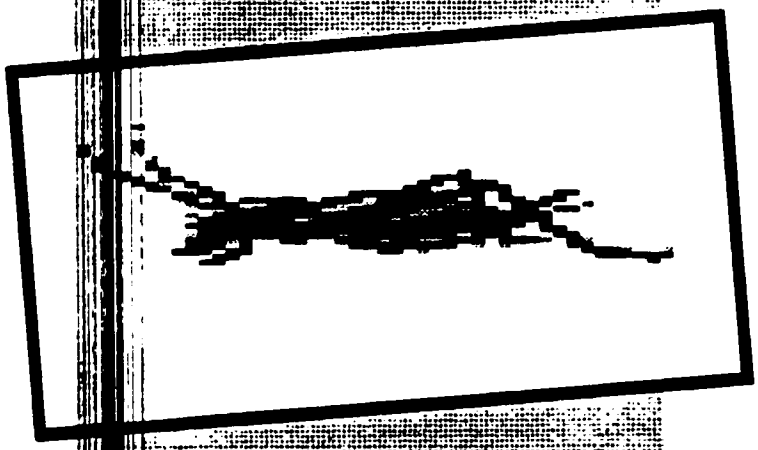
APPENDIX VII

Evidence of Policy Changes

FIRST DRAFT

Note: Actual photocopy
of the first draft.

A PLAN FOR THE PREVENTION & CONTROL



OF DENGUE FEVER

In
Montserrat

Produced by
The Environmental Health Department
Brades
Montserrat

TABLE OF CONTENTS

PAGE NO.

INTRODUCTION

Over the past two decades, Dengue has become endemic in several islands of the Caribbean. There have been several explosive outbreaks of classical dengue in many of the larger islands of the region.

The re-infestation of the Caribbean Islands with the Aedes aegypti mosquito after been declared eradicated in the 60's make each island a receptive area for a dengue epidemic.

There are several other factors that must be borne in mind in order to be able to develop a plan for the effective prevention and or control of dengue, these are:-

- Vertical government administered programmes with heavy dependency on the use of insecticides have failed.
- The Vector has developed resistance to all of the traditional insecticides and is becoming resistant to the new products at an extremely fast rate.
- Another very efficient vector of the disease Aedes Albopictus is in the Americas and it would only be a matter of time before the islands become infested.
- An epidemic of classical dengue could deliver a devastating blow to our economies and to our tourist industry in particular.
- The emergence of dengue haemorrhagic fever will create a major challenge for our medical staff and exert enormous burden to bear on our medical facilities.

THE PROBLEM

There is no record that the island had experience any explosive dengue epidemic in the distant or recent past. Therefore, the herd immunity to dengue would be low.

The regularly recorded high Aedes aegypti house indices coupled with low herd immunity set the stage for an explosive outbreak if and when the disease is introduced into the island.

A situation that could exacerbate the problem is the absence of trained staff and appropriate medical resources to deal with Dengue Haemorrhagic Fever, which has become a common sequel of most of the recent dengue outbreaks in the region.

Given the seriousness of the problem and the potential for an explosive dengue epidemic with possible complication of Dengue Haemorrhagic Fever, it is imperative that a plan be drawn up for the prevention and control of Dengue and Dengue Haemorrhagic Fever.

The Ministry of Education, Health and Community Services through the Environmental Health Sector will be the lead agency. However other ministries will have a role to play if the plan is to succeed.

GOAL:

Eliminate the risk of the spread of dengue and dengue haemorrhagic fever, through a sustained reduction of the Aedes aegypti house indices to 1% or below.

OBJECTIVES

- Establish a cadre of well-trained highly motivated inspectors.
- Improved data collection analysis and recording.
- Sensitization of the community of their role in an integrated pest control programme.
- Active participation by the community realized.
- Inter-sectoral co-operation established.
- Appropriate training for all levels of health staff secured.

STRATEGY FOR IMPLEMENTATION

- Conduct refresher course for ~~old~~ ALL inspectors and initial training for new inspectors.
- Establish clearly defined boundaries for each locality.
- Produce maps of each locality.
- Conduct a comprehensive survey of the occupied area of the island and collect base line data. Entomological survey to Cook Hill etc
- Develop a community health education programme for integrated pest control. – clean up
- Organize training for doctors, nurses and laboratory technologists in clinical diagnosis, laboratory techniques and case management of dengue and dengue haemorrhagic fever.
- Ongoing entomological surveillance to establish current Aedes aegypti indices and investigate the presence of other vector eg (Aedes Albopictus).
- Improvement in environmental sanitation in order to eliminate sources of breeding.

SUSPICION OF CASE OF DENGUE ON CLINICAL EVIDENCE

ACTIVITIES

- Any evidence of suspected dengue should be reported to the Environmental Health Office.
- Investigation of the case by community nurse and environmental health officers.
- Serological examination to confirm or disprove suspected case by the lab.
- Vector Control Inspectors to carry out inspection of the dwelling and work place of each case to a radius of 100m Perifocal treatment followed by thermol fogging would be carried out if Aedes aegypti is found.
- Close monitor of all case and suspected case for any signs of haemorrhagic manifestations.

1068

25 APR 2000

MONTSERRAT, W.I.

MEMORANDUM

TO: Director of Education **DATE:** 20 April 2000

FROM: Community Nursing Manager **REF:** MEHCS/H/6/12

INCREASED NUMBER OF CHICKEN POX CASES

The Ministry of Health has observed that there is a gradual increase in the number of cases of Chicken Pox island-wide, with both adults and children including infants under one year being affected.

About the Disease

Chicken Pox is one of the most readily infectious communicable diseases and can be transmitted from person to person through:

(a) direct contact such as touching;
(b) inhalation of the virus when an infected person speaks, sneezes or coughs.

Incubation Period

This is from the time the disease organism enters the body until the first signs and symptoms appear. This is usually between 2 – 3 weeks.

Period of Communicability

This is the period when an infected person can pass on the disease. This is three days before rashes appear and five days after the rashes appear.

Signs and Symptoms

- Sudden onset of fever
- Loss of appetite, headache, and tiredness
- Blotchy skin rash develops 4 – 5 hours later and 3 – 4 days later the rashes are filled with body fluid
- Severe itching
- The rashes occur in successive crops with several stages of maturity present at the same time and eventually spread to all parts of the body

Susceptible

All persons are at risk of getting the disease.

Prevention and Control

Since a virus causes the disease, there is no specific cure. Children who are infected should be excluded from school for least one week after rashes are seen.

Since there have been reported cases from both primary and nursery school children, it is advisable that school be closed for at least another week to prevent further outbreak.

Deareen Silcott