Public Health Surveillance in the Pacific

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NOTE

'Pacific Community' is now the name of the South Pacific Commission (SPC). The new name became official on 6 February 1998, in commemoration of the 51st anniversary of the 1947 Canberra Agreement which originally established the SPC.

'Pacific Community' applies to the total organisation, i.e. the member governments, the Conference, the CRGA and the Secretariat. **'Secretariat of the Pacific Community (SPC)'** refers to those who provide the service to members of the Community.

Because the articles in this monograph were written before the name change, references to the South Pacific Commission have not been amended.

FOREWORD

On the eve of the twenty-first century, transportation allows increasingly rapid and easy travel throughout the Pacific and the world, assisting trade, tourism and potentially epidemic diseases alike. In order to cope with this reality, both information and resources must therefore travel faster, if we want to prevent and control such diseases.

Concerns about the quantity and quality of health information in the Pacific have been raised on many occasions by agencies such as UNICEF, WHO and the Pacific Community, as well as by health professionals from the Pacific Island countries and territories themselves. Our suggestion was to decrease the pressure on data providers by a concerted effort towards integration of regional health data requirements, as no public Health Surveillance system can be useful if not fuelled with relevant (i.e. reasonably complete, accurate and timely) health information.

In December 1995, the SPC organised the Interagency Meeting on Health Information Requirements (IAMHIR) in Noumea, New Caledonia, with the support of UNICEF and WHO. The participants were representatives of several regional agencies, universities and health professionals of SPC member countries and territories. Beyond scrutinising ways and methods to better prioritise and integrate Public health surveillance in the Pacific, participants to the IAMHIR meeting also laid down the basic principles of a public health surveillance network in the Pacific, and established a regional working group to carry on with their work. In December 1996, due to the work of the Pacific Public health surveillance Working Group, the Pacific Public Health Surveillance Network (PPHSN) was officially established.

These days the PPHSN has a voice. Since mid-April 1997, PACNET—an email and telefax supported communication network— allows an increasing number of health professionals from the Pacific Islands and the Pacific Rim to circulate critical information regarding disease surveillance and early recognition of epidemics in the region. These 150 PACNET members also exchange views on public health surveillance, and enrich each others' knowledge and understanding of emerging and re-emerging health threats. PACNET also serves to facilitate the mobilisation of the appropriate resources the Pacific Island countries and territories need for the prevention and control of communicable diseases. We believe our work through PACNET and the Pacific Public Health Surveillance Network as a whole, constantly serves the essence of surveillance: 'information for action'.

We consider the present monograph, the publication of which was decided following the IAMHIR meeting, as a fitting testimony to the group work we have carried at the past two and a half years, establishing the Pacific Public Health Surveillance Network.

Enjoy your reading, and help us to improve public health surveillance in the Pacific by sharing your views, comments and experience.

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CONTENTS

Principles of public health surveillance

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Abstract

Surveillance is a core public health activity of all nations allowing collection of standard measurable information on the occurrence of diseases and disease risk factors. The product of surveillance, surveillance data, constitutes a standardised international language of public health. Like the personal health risk appraisal, in which information about an individual's health risk factors is combined to predict future health, surveillance data provide public health workers with an assessment of the health of the community. Though the term surveillance covers a variety of different specific activities, undertaken by different types of health workers and by people not in health fields, the ultimate goal of all public health surveillance is to support public health action as fully, as specifically, and as expeditiously as possible.

Introduction

The word 'surveillance' has more than one meaning in public health. The dictionary defines surveillance as 'a close watch [kept] over someone. . . also supervision' (Hong Kong Longman Group, 1984). This is not the type of surveillance that will be the subject of most of the following discussion, although it does have public health relevance. For example, it occasionally happens that when persons or groups are suspected of incubating infectious diseases, they are placed in isolation. Contact with others is temporarily prevented while such individuals are monitored for evidence of disease onset until a safe time has passed. For example, travellers exposed to Ebola fever have been isolated and placed under surveillance by public health officials after arrival in Western nations. Here, the purpose of surveillance is obviously to prevent introduction of disease into communities without it. This type of surveillance is an important, but usually not a major activity of public health.

Another definition of surveillance suggests that it is the systematic collection, analysis, interpretation and dissemination, in processed form, of data pertaining to the occurrence of specific diseases (Evans, 1982). This is a much better definition. It describes a public health activity that is universal, ongoing, and multidimensional. It rightly suggests the need for integration of effort. But it is perhaps too limited in confining itself to specific diseases. Is it not important to conduct surveillance for disease risk factors? This may be implied by the phrase 'pertaining to the occurrence of specific diseases', but it is also true that surveillance may be conducted for general risk factors related to many diseases, not just specific ones. Hypertension and smoking come to mind. Moreover, depending on how 'strict' one wishes to keep the definition of surveillance, we may conduct surveillance of population vital events such as births and deaths, of health itself, or of utilisation of health services.

A third definition, applied specifically to disease and health, adds another important element. This definition characterises public health surveillance as the 'collection of data, the collation of data, the analysis and interpretation of those data, the dissemination of the findings and the promotion of control and preventive action' (Tyler, personal communication). The new element in this definition is an active end product: after surveillance has been undertaken, there is the expectation that something will be done with the information obtained. In recent years, some controversy has arisen in the U.S. over separation of these afferent and efferent 'arms' of public health: specifically, as to whether surveillance, *per se* should be conceptualised and undertaken as a separate public health activity, divorced from public health action. In this discussion we will try to strengthen the importance of integrating surveillance and action by claiming surveillance should not be undertaken at all unless something (public health action) will be done with the information.

Historical perspectives on surveillance

From Hippocrates' theories . . .

The ancient Greeks did not conduct disease surveillance, but they seemed to have had a clear picture of some of the principles that underlie it. Hippocrates (c. 460 B.C. – c. 377 B.C.), considered the Father of Epidemiology as well as the Father of Medicine, undoubtedly had some quantitative sense of disease occurrence in the fifth century before Christ. He did not make line lists of cases, nor did he fill out monthly tally sheets, but he did recognise the importance of variations in disease occurrence by time, location, gender, age, occupation, etc. (Hippocrates, 1978). That is, he characterised diseases in person, place and time. In recording an epidemic seen during Hippocrates' lifetime, his contemporary, the Athenian general Thucydides, had sufficient appreciation of active disease surveillance to count denominators of persons at risk, numerators of affected persons, and to calculate attack rates and case fatality ratios (Thucydides, 1977). Apparently these 'modern' approaches were so intuitive, even to ancient Greek laymen like Thucydides, that they were not considered worth writing down as principles.

Surveillance should not be undertaken at all unless public health action can be done with the information.

A few centuries later, the Romans became expert at what we might call (colloquially) 'denominator surveillance', in distinction to 'numerator surveillance'. These terms are not real scientific terms, but terms that reflect, respectively, the epidemiologic argot of 'denominator data' and 'numerator data'. Many health measures of risk are derived by dividing numerators of new cases, or of current cases, by denominators of living persons – or better yet, of living persons actually at risk of getting the disease in question. We must generally conduct surveillance to find out not only how many people are in the numerator (e.g. morbidity, mortality), but also how many are in the denominator. A population census would come under the heading of 'denominator surveillance'. The Romans were skilled census takers, though not to derive health data or improve health advances in surveillance in the millennium following the Roman era, if they occurred at all, have been largely lost. It is not until the age of the Black Death (bubonic/pneumonic plague, which became pandemic in 1348), that public health surveillance again became prominent. European city fathers quickly recognised that plague was being introduced via seaports. Venice and Ragusa were among the first port cities to put all entering ships under quarantine, typically for about 30 days. Eventually, the 30 days were extended to 40 (the term quarantine comes from the Italian word *quaranta*, which means forty).

Early quarantine was an example of disease surveillance in the limited sense mentioned above: to isolate and monitor persons who might be incubating infectious diseases, for the purpose of preventing disease introductions into disease-free populations. Ships were forced to anchor off-shore, until city officials were assured that none on board were ill. Only then could the crew disembark and the cargo be unloaded. (Ironically, despite good intentions, quarantine failed as a public health measure because infected rats on board ship, rather than infectious crew members, brought plague into the port cities). It is of historical interest to note here that acceptance of surveillance as an infection control measure by 14th century city officials seems to implies a notion of contagion, which was not to be articulated in any comprehensive manner until 200 years later, and not fully accepted for over 500 years.

. . . to the modern tools of epidemiology

Modern disease surveillance could not be undertaken until progress was made in two areas: systematic recording of population events, and better understanding of disease etiology. As European nations emerged from feudal states, systematic recording of vital events (births, marriages, deaths) became nearly universal, at first by churches, and later by governments themselves. By the 17th century local registries of vital events were commonplace in Europe. England introduced a surveillance system of weekly 'Bills of Mortality' (early death certificates), to be completed by each parish priest, in 1532, and Sweden followed suit with a registration system in 1608. Civil, as opposed to ecclesiastical, surveillance systems for vital events followed rapidly in Europe, especially in the Scandinavian countries, e.g. Finland (1628), Denmark (1646), and Norway (1685). The United States and most Pacific and Asian nations were extreme latecomers to vital registration, most not having well developed systems until the late 19th or early 20th centuries.

Epidemiologists often trace their professional origins to the avocational efforts of English tradesman John Graunt (1620–1674). In 1662, Graunt examined the Bills of Mortality to make inferences about the distribution and determinants of death in large populations, including London. In doing so, he distinguished for the first time acute and chronic diseases, and invented life table methods. Thomas Short (1690–1772) advanced Graunt's analyses in 1750 by studying geographic variation in British mortality.

Understanding disease etiology was more problematic. Before the theory of contagion became universally accepted (around 1900), miasmatism – belief that epidemic diseases result from climatic conditions that poison the air – dominated European thought. The contagion theory, proposed in ancient Greece but disbelieved for two millennia, finally began to be accepted around the same time that population data became increasingly sophisticated, supporting the development of surveillance as we know it today.

Populist public health notions, evolving in France in the late 1700s, coupled with more authoritarian public health notions in the German-speaking states, were crystallised by the industrial revolution that exploded in the first half of the 19th century. Especially in England, sanitary movements developed into systems of municipal public health, and these systems needed not only good census and vital events data, but also good morbidity data. Increasingly, such data became available.

The century bracketed by roughly 1790–1890 saw the growth, development, and sophistication of virtually all of the basic modern principles of surveillance, including attempts to standardise reporting and coding of causes of death. In the 1790s, London physician Robert Willan (1757–1812) was reporting weekly cases of specific epidemic diseases and complaining that his 'numerator' contributions were not showing up in official reports (Willan, 1801). Creation of a national mortality reporting system in 1837 revolutionised understanding of disease occurrence in Britain. Data on cause-specific mortality created a greater desire for data on cause-specific morbidity. A century after Willan's death, morbidity data systems had been greatly improved: for some well-characterised diseases, they were as complete and accurate as those in use today.

In the intervening century, concepts of public health that had grown and developed included the following: an appreciation of 'laws' of disease and mortality, medical statistics, the science of epidemiology, and articulation – by Jacob Henle (1809–1885) – of the principles for establishing infectious disease etiology ('Koch's postulates'). John Snow (1813–1858), Queen Victoria's anaesthesiologist, had scientifically demonstrated contagion and, in the process, had introduced analytic epidemiology. William Farr (1807–1883), Snow's friend, had formulated the first formal principles of disease surveillance. In establishing the London Epidemiological Society in 1849, Farr, Snow, and a small group of Londoners introduced a dramatic perceptual breakthrough: that data obtained from surveillance of diseases could produce *scientific* information leading to their prevention and control.

This was a powerful realisation whose appeal was better appreciated initially by municipal authorities than by scientists. The last half of the 19th century became an era of strong municipal public health; it was succeeded by a period (roughly 1900–1945), in which national public health systems were developed and strengthened, to be succeeded, in turn, by the current era (1945 to the present) in which international public health surveillance is slowly beginning to expand and grow.

It is interesting to observe that surveillance seems to have led the rest of public health through its successive eras of municipal, national, and international development. A good example from the current era is the way in which international surveillance of smallpox led to international cooperation in its eradication. Hopefully, eradication of polioviruses will follow in this decade or the next. For most of the world, only international efforts in HIV control, now confined largely to surveillance networking, can hope to prevent the deaths of millions more people from AIDS.

Modern surveillance is a core public health activity integrated into all levels of public health, from the local to the international, providing scientific links between disease recognition and disease control within populations.

Types of surveillance

We have already noted two general types of surveillance that have been referred to, colloquially, as 'numerator surveillance' and 'denominator surveillance'. When we use these terms, we are thinking about health event occurrence rates (e.g. disease rates) which must always have the same three elements: (1) the number of people who have, or who get the health event, (2) the number of people who are 'at risk' of having or getting the health event, and (3) a unit of time.

The two most common examples of health event rates are disease incidence rates and disease prevalence rates. In arriving at disease incidence rates, for example, we typically divide a numerator containing all persons in the population under study who get the disease, by a denominator containing all persons who could have gotten the disease (including those who actually did get it, and those who did not), and we multiply the result by some unit of time, such as 'per month', or 'during 1995'. If our population of interest is as large as a city, it is clear that we must have surveillance data concerning not only the number of people in the city who got the disease, but also on the number of people at risk. In short, we must have 'numerator' and 'denominator' surveillance data.

Surveillance seems to have led the rest of public health through its national and international development.

In practice, denominator data are usually easier to obtain by census, as actively undertaken in the community, or as estimated by statistical projections from prior censuses. 'Denominator surveillance' is thus not always considered a public health activity, and it is not dealt with in detail in this review. On the contrary, 'Numerator surveillance' constitutes a core activity of public health, and is categorised in several different ways: for example, case vs. population surveillance, active vs. passive surveillance, and sentinel vs. non-sentinel surveillance. Each of these will be discussed below.

Case surveillance

As already noted, the term 'surveillance' has multiple meanings in public health. One meaning refers not to populations, the usual clientele of public health, but to individuals or small groups of individuals within populations. In an example referred to above, we might say we are 'putting Mr Smith under surveillance while we attempt to rule out Ebola fever'. Some types of contact tracing, e.g. following up on venereal disease exposures, represent similar public health activities. These are examples of case surveillance, and while they are legitimate and important public health activities, they will not be discussed in detail here. We should note that case surveillance is always *active* rather than *passive*, meaning that this type of surveillance requires specific actions of public health workers, as opposed to merely receiving reports about occurrences of a disease and adding them to a larger data set made up of similar reports.

Population surveillance

More commonly, public health workers are concerned about surveillance in populations such as villages, cities, countries, districts, provinces, states, or nations. As above, such surveillance may be either *active* or *passive*. Departments and ministries of health normally rely on passive surveillance as their core surveillance activity. Passive surveillance data may be received by informal means such as phone calls, letters, newspaper reports, complaints, etc. But they come more often from passive surveillance systems.

Surveillance systems are systems set up for the express purpose of obtaining regular information on the occurrence of one or more diseases. A well known type of surveillance system found in most countries requires either physicians, other health providers, diagnostic laboratories, or all of these, to report all new cases of any of the diseases on a list of notifiable diseases. Most diseases on such a list are either infectious or of unknown etiology, although chronic, genetic, nutritional or occupational conditions are sometimes added.

The notifiable disease systems are passive in the sense that patients are being seen anyway, and their diseases are being diagnosed anyway. The surveillance system merely collects and centralises information that has been produced for other important purposes, especially for diagnosis and treatment. A second example of a passive surveillance system is the United States weekly influenza surveillance system. In this system, 121 pre-selected American cities report to the U.S. Centers for Disease Control and Prevention (CDC) on a weekly basis during the influenza season, all recorded deaths listing either influenza, pneumonia, or both, on the death certificate. This P&I mortality system does not intend to capture many influenza diagnoses – in fact, most cases of pneumonia and many cases of influenza listed on death certificates are NOT attributable to influenza. This passive surveillance system seeks, instead, to identify national influenza epidemics based upon the observation that only during epidemic periods do weekly P&I deaths rise statistically above background occurrence rates. Detection of a national epidemic, which occurs annually in the U.S. and most other countries, allows a prompt response to physicians and the public.

The purpose of sentinel surveillance is early warning for diseases for which public health actions may prevent epidemic spread.

Active surveillance, in distinction to the passive examples cited above, requires the physical activity of public health workers. Some ministries and departments of health conduct active surveillance, but it is more often associated with university or industry research efforts. Although active surveillance systems may be set up, most active surveillance data come from distinct studies that begin and end within a reasonably short time frame. It is thus helpful to think of *active surveillance studies*, on the one hand, and *passive surveillance systems* on the other. Examples of active surveillance studies might include study of a random sample of persons of all ages on a Pacific island to determine the prevalence rate of hepatitis B surface antigen (HBsAg) carriage, or a study of neutralising antibodies to each of the four dengue serotypes in a random sample of Hong

Kong residents. Serosurveillance, the practice of measuring antibodies to microorganisms of interest in representative population samples, is a traditional form of active surveillance. A special form of active surveillance, referred to as *sentinel surveillance*, is discussed below. The purpose of sentinel surveillance is early warning, and it is generally only undertaken for diseases that are important, and for which public health actions may prevent or limit epidemic spread. Another form of active surveillance, called screening, is generally undertaken to identify individuals with, or at risk for, specific diseases or conditions that can be prevented or treated (e.g. hypertension, tuberculosis).

Public health population surveillance

There are four generally recognised categories of public health population surveillance. These four categories reflect different activities, usually undertaken by different people, to provide data to be used for different purposes. But each of them represents, directly or indirectly, disease or other health event occurrence or the potential for disease occurrence. The four categories are: (1) vital events – mostly mortality – surveillance, (2) morbidity surveillance, (3) exposure/risk factor surveillance, and (4) health care use surveillance.

Vital events (mortality) surveillance

Mortality surveillance is most useful in wealthy developed nations where all deaths are recognised and recorded, and where diagnoses are relatively accurate. However, as all public health professionals are aware, death certificate data from even the most advanced nations are highly erroneous, especially for chronic and lifestyle-associated conditions. Mortality data are most relevant to diseases that are either uniformly or highly fatal (rabies, HIV infection), that are uncommonly missed or misdiagnosed, that are of chronic or of multifactorial etiology (e.g. cancers, heart attack, diabetes), or that may be amenable to primary, secondary, or tertiary prevention. Sources of mortality data include vital records (death certificates, fetal death certificates), data from coroners and medical examiners, hospital 'discharge' data, police data (e.g. traffic accidents, drownings), etc.

Edgar Lee Master's *Spoon River Anthology*, a set of poems from fictional tombstones in a single cemetery, might be considered a culturally-refined example of mortality data (Masters, 1928). In recent years, historical epidemiologists have actually learned much about disease occurrence in previous centuries by analysing burial records for excess burials as a marker for epidemic occurrence (Hope-Simpson, 1986). Among other vital events, births themselves may be treated as population surveillance data. That most births produce normal infants lends a positive dimension to surveillance, so frequently associated with frightening diseases. Birth certificates and other birth event data may nevertheless be surveyed for unfortunate outcomes such as major birth defects.

Morbidity surveillance

Morbidity surveillance, a major activity of most health departments and ministries, seeks to detect the occurence of specific conditions that may be fatal. In developed nations, morbidity data for infectious diseases generally come from passive morbidity surveillance systems (notifiable disease systems). The list of notifiable diseases often exceeds 50, and may approach 100. What a disease has to 'do' to get on a notifiable diseases list is discussed below. Other sources of morbidity data include hospitals (e.g., discharge data, infection control data), clinics, physicians' offices, laboratories, schools, industries, the military. Data can be actively obtained from community surveys, serosurveys, or surveys of indirect indicators of disease occurrence (e.g. pharmacy prescriptions of diphenoxylate as an indicator of gastrointestinal disease occurrence, or of levodopa/ carboxydopa as an indicator of Parkinson's disease).

Exposure/risk factor surveillance

Exposure/risk factor data usually come from active surveillance studies, or from screening programmes. Exposure surveillance is conducted either to identify population risk by studying past disease experience (e.g. dengue serosurveys), to identify persons with, or at risk for disease (e.g. screening, such as screening for tuberculin positivity or HBsAg positivity, or genetic screening for sickle trait) to gain indirect information on actual disease occurrence by proxy (e.g. pharmacy surveillance for disease-specific medications, as cited above). This type of surveillance can be useful for early warning (e.g. serologic surveys of sentinel pigs for infection with Japanese encephalitis virus, of *Aedes* mosquito pools for dengue virus positivity and of neighborhoods for *Aedes* larval indices, for hazards exposures in environmental health), or for understanding vector and reservoir dynamics (e.g. studies of wild animals in areas that are not rabies-free). Long-term 'banking' of serums to study diseases that may emerge in the future is an important public health surveillance activity that has been poorly-supported in recent years.

Utilisation surveillance

A final category of surveillance, surveillance of health services provided or utilised, may yield indirect measures of disease occurrence (e.g. hospital admissions, hospital censuses, hospital bed vacancies) or disease severity (e.g. utilisation of programmes for disabled children), and also obviously assists health officials in planning for and securing funds for delivery of primary services.

Why do we surveil?

That surveillance activities constitute such a large part of public health practice must be a clue to their importance. We have actually already examined (above) many of the reasons why we surveil ('surveil' is the correct, if rarely used, verb form of 'surveillance'). The following list was suggested by some of the author's public health experiences surveillance data. Why do we surveil? There are many reasons.

1. *Case finding.* Example: one of the reasons we conduct surveillance for HBsAg positivity is to find positive persons who may need to be monitored for liver cancer risk, counselled about actions to reduce transmission, or, in the case of pregnant women, to intervene medically to prevent transmission to their newborns.

2. To get the flat part of the epidemic curve. Example: in order to identify an increase in P&I mortality during the influenza season, we need to monitor P&I mortality continually, especially during the non-influenza seasons of late spring through early fall. As epidemics are defined as increases in occurence beyond background level, they cannot be identified unless the background level is known.

3. To identify epidemics and document their termination. Example: related to the item immediately above, once the background rate of occurrence is established, epidemics can be identified and action taken. A good example of this is recognition in 1981 of an epidemic of immunosuppression (later found to be caused by a new disease, AIDS), based on an epidemic of requests to CDC for the anti-*Pneumocystis* drug pentamidine.

4. To monitor disease trends. Example: in the pre-vaccine era, measles was characterised as being epidemic in large populations in cyclic patterns of winter increases occurring every two to three years, while rubella exhibited epidemic cyclicity at six- to seven-year intervals. Identification of secular trends in the occurrence of many diseases allows us to predict epidemics, and also increases epidemiologic understanding of diseases.

Identification of secular trends in the occurrence of many diseases allows us to predict epidemics.

5. *Surveillance-response triggering.* Example: detection of increasing incidence of tuberculosis in the U.S. is allowing national, state, and local health agencies to revitalise tuberculosis programmes to find and treat persons with inactive, active, and drug-resistant tuberculosis.

6. Determining incidence and prevalence rates. Example: identifying 200 new cases of tuberculosis per year in a state of one million persons allows calculation of a crude incidence rate of 20 cases per 100,000 persons per year, a high rate of occurence compared with many other states.

7. To define the magnitude of the problem. Example: in the tuberculosis example above, incidence determination allows state health officials to compare the magnitude of their tuberculosis problem with those of other states, with their own data from earlier times (e.g. the pre-treatment era that ended in the early 1950s), or to compare tuberculosis incidence with the incidence of other important diseases that require public health action.

8. Planning and resource allocation. Example: identification and characterisation of epidemic tuberculosis allows health planners to increase tuberculosis control staff and to submit budget requests to fund expanded activities. It allows health officials to prioritise health problems and commit limited resources more appropriately.

9. To provide descriptive epidemiology ('person, place and time'). Example: in one American city, studies showed that newly identified cases of tuberculosis tended to be found in middle-aged HIV-positive men in a blighted inner city area where drug abuse was rampant.

10. To generate research information. Example: much of the early information on Kawasaki disease, a condition of unknown etiology, arose from national surveillance in the U.S., which identified outbreaks and case reports; the case reports were combined and compared to create a more specific picture of this allegedly-rare syndrome. (Ironically, surveillance data gradually revealed that Kawasaki disease is relatively common).

11. To identify new diseases. Examples: disease surveillance systems for measles have routinely identified epidemic dengue in areas where it is not expected to occur. Hantavirus pulmonary syndrome, a previously unrecognised syndrome, was discovered through surveillance systems that identified rare cases of unexplained deaths dispersed across wide geographic areas. Acute hemorrhagic conjunctivitis (apparently a genuinely-new disease caused by the emergence of two different enteroviruses around 1970, in Africa and in Asia) was identified by surveillance systems.

12. To identify risk factors and obtain clues to disease etiology. Example: the etiology of Lyme disease was suggested by surveillance data on geographic occurrence that corresponded to vector tick and reservoir deer and mice distributions. The causative agent was later identified in ticks.

Lists of notifiable diseases have tended to expand in the past three decades.

13. To assure the public. Example: during the hantavirus pulmonary syndrome outbreak in the Southwestern U.S., in the summer of 1993, surveillance data were regularly presented to the press and public to provide assurance about the nature, scope, and extent of the epidemic.

14. To obtain data for grants and reports. Example: this use is so familiar to everyone in public health that no examples are needed. Of course, writing reports and grants is not a reason that surveillance should be undertaken; it just seems that way to those who have to write them.

15. To practice vigilance. Example: to recognise emerging infectious diseases, surveillance systems must be 'up and running', and the people who run them must be alert. The word 'practice' is used not in the sense of 'to conduct' or 'to carry out', but in the literal sense of 'practicing', as in practicing the piano in order to play Ives' Second Sonata. Public health vigilance is a skill that must be continually practiced if it is to be successful.

How are the diseases selected for surveillance ?

Lists of notifiable diseases have tended to expand in the past three decades, as more diseases have been discovered, and more effective public health programmes have been set up to deal with many of the old and new. Some official organisations, such as the U.S. Association of State and Territorial Epidemiologists, have worked against mission creep, realising that in public health, mission creep is rarely matched by budget creep. Many epidemiologists dream about shorter lists of notifiable diseases; this, coupled with concern about emerging infectious diseases, is prompting a closer look at some of those that emerged and devolved long ago, and real attempts at streamlining (CDC, 1991). In this climate, it is appropriate to ask for what diseases should precious public health resources – personnel, budgets, time – be spent in surveillance? Below are ten suggested criteria for deciding which diseases should be surveilled.

1. *Common.* Examples: varicella, streptococcal diseases. In the modern era, commonality is becoming a less important reason for surveillance.
2. *Important.* Examples: anthrax, dengue, leprosy, plague.
3. *Serious (fatal or causing severe disease).* Examples: rabies, legionellosis.
4. *Detectable (by routine means).* Examples: acute bacterial conjunctivitis, encephalitis, hepatitis.
5. *Intervenable (intervention possible in identified 'at risk' population).* Examples: tuberculosis, measles.
6. *Controllable.* Examples: poliomyelitis, measles (eradicable); rubella (preventable); influenza, tuberculosis (amenable to public health control efforts).
7. *Researchable (subjects of interest for applied and public health research).* Examples: influenza, dengue, legionellosis.
8. *Occuring in important sentinel or amplifying populations.* Examples: HIV in injecting drug users and commercial sex workers.
9. *Public interest.* Examples: Lyme disease, rabies.
10. *Of unknown cause.* Examples: Kawasaki disease, Reye syndrome.

Conclusion: the surveillance wheel

Surveillance is a core activity of public health. Surveillance data are mostly 'numerator data', collected passively by governments or large organisations, or actively by individuals. This activity allows us to understand, describe, and predict disease occurrence, anticipate and prevent morbidity and mortality, and optimise health expenditure decisions.

Good surveillance provides us with a community health risk appraisal, analogous to the value of personal health risk appraisals, as they are commonly used in the practice of preventive medicine with individual patients. Surveillance is the beginning of a circle that rotates from individual occurrences (e.g. diseases) to public health action.

The surveillance-response circle turns continually, like the wheels of a public health engine, in a cycle of surveillance, to data collection, to analysis, to decision, to action (response), to evaluation (CDC, 1988) and to new surveillance.

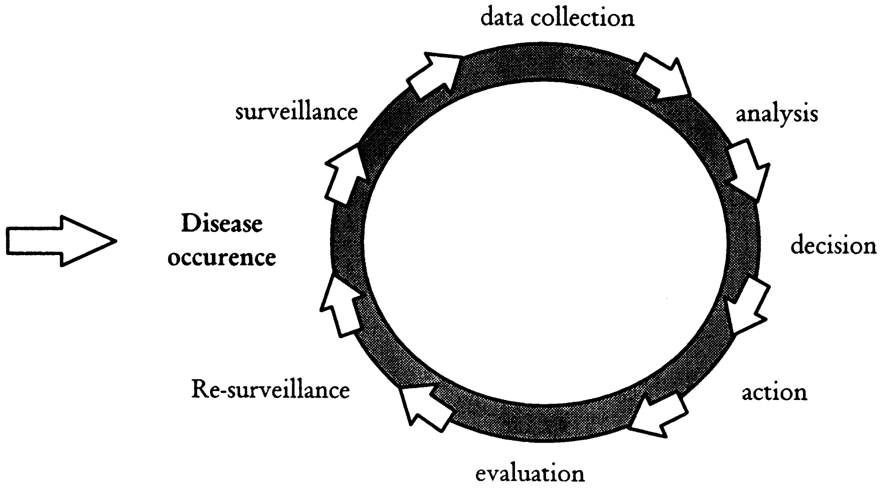

Figure 1. The Surveillance Circle or Wheel

Like the wheels of a public health engine, it turns continually in a cycle that begins with surveillance and leads to data collection, analysis, decision, public health action, and to evaluation of the results of action, which constitutes 're-surveillance', bringing the surveillance wheel full-circle.

To improve surveillance, it helps to think backwards, starting with the response, or with the possible response options, working back to the decisions that would lead to the response, back further to the analyses that would lead to the decision, and back even further to the data needed to perform the analyses. These, and only these, are the data to be collected.

As ontogeny is said to recapitulate phylogeny, so does the practice of public health surveillance recapitulate the essence and evolution of public health.

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The case for a Pacific Public Health Surveillance Network

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Abstract

In this age of jet travel, few places on the globe, few people, and fewer pathogens are more than one or two days away from any other. This shrinking world, coupled with the rise of megacities, dramatic changes in the ecosystem, and evolutionary pressures on organisms of all kinds, has led to an explosion of newly-emerging diseases and the re-emergence of old disease foes. To cope with such threats, our best defense is an early warning system based on principles of public health surveillance, and a timely and appropriate response. Early epidemic warning is only one of several reasons for further developing communications networks among health professionals in the Pacific. The great distances of the Pacific, the limited access to information, and the traditionally expensive or slow communications of the region can hinder the otherwise committed work of public health and clinical staff. The advent of inexpensive and rapid communications using e-mail and, when prices fall, Internet, allows health workers to more freely share knowledge and experiences, to gain an entry point to the ever-advancing world of public health and medicine, to access Pacific data and information, and to provide to one another a mutual resource and support network.

Introduction

It's a small world. We say this from our human perspective, but it's a small world for viruses, bacteria, and parasites too. Our microbial companions accompany us wherever we go, as we crowd into urban areas, board jets at airports, mill around at bars and sports stadiums, and generally mix ourselves up all over the world. The social and cultural changes for humans in the 20th century have been profound. We increasingly recognise that the changes for microbes have been profound, too.

Perhaps the two most significant contributors to this phenomenon are the massive shift of population from rural and relatively-isolated communities to urban areas; and the replacement of international ship travel for a select few by international jet travel for millions.

The population shift to high density areas has resulted in many more opportunities for viruses and bacteria to pass from one person quickly to many others. If you are a virus, the city is the place to meet people. The situation is worsened by the pressure on water supply and sanitation systems and by crowded living conditions.

The age of jet travel has enabled the viruses and bacteria of the world to reach new and distant places while they are still fresh and eager to make new acquaintances. It is a truism that a person can be infected on one side of the world, board a plane while in an early and yet healthy stage of incubation, and step off hours later on the other side of the world, a few hours or days before the incubation period ends. The virus or bacteria presents itself by the millions once again to the outside world, half a world away. In 1996, there are few places on the globe, and few people, and few viruses and bacteria, more than one or two days from any other. The age of the ship as a sort of floating quarantine station is long gone.

These realities, coupled with dramatic changes in the ecosystem, evolutionary pressures on organisms of all kinds, war, millions of refugees, poverty, a rapidly growing world population, and a host of other factors, are the backdrop and the basis for a new branch of public health: that devoted to newly emerging and re-emerging infectious diseases.

But it is not only infectious diseases that demand our attention. In many countries, including those of the Pacific, the latter half of the twentieth century has brought other kinds of epidemic diseases: heart disease, diabetes, excessive alcohol use, motor vehicle accidents, obesity, hypertension. These epidemic diseases may not be contagious, but they are certainly spreading. In many of the Pacific Island countries, non-communicable diseases are overtaking communicable diseases as causes of morbidity and mortality, or have already done so, at least in the adult half of the population.

Fortunately we have developed many tools to combat these threats to health. Our understanding of the risk factors for diseases, and their transmission, distribution, and prevention, has increased tremendously in a few decades, as has our arsenal of vaccines, pharmaceuticals, and other interventions, and our ability to diagnose, characterise, and implement specific control measures for an epidemic. Although it often seems the diseases are winning anyway, we can only imagine how much worse things might be were it not for advances in public health.

The concentration of money, laboratories, information, and training in a small number of relatively wealthy countries creates a resource imbalance; yet the public health challenge is universal.

The resources to fight these battles are not nearly so evenly distributed around the world as are the people and the microbes involved. The concentration of money, laboratories, information, and public health training in a small number of relatively wealthy countries creates a resource imbalance; yet the public health challenge is universal. Some things must be shared.

In the Pacific the cities are smaller, the distances are greater, and the wars are more verbal than military, but this global situation affects our part of the world too. The Pacific Island countries also present their own set of challenges: widely scattered populations, many ethnic groups and languages, expensive and often unreliable communication and transportation links, limited funds for public health leading to inadequately developed public health infrastructures, insufficiently-accurate data for decision-making, limited laboratory capabilities, and few human resources at technically-skilled levels. Public health staff who face these barriers often work in isolation, with very limited access to an intellectual or resource support network. The individual efforts are often impressive, but the capacity to have a positive impact beyond a very local area is constrained by all of the above factors.

A public health surveillance network

How could a network help, and how might it function? Although there have been many *ad hoc* or short-term responses, such as external support in time of public health crisis, and although there are agencies, like the World Health Organization and the South Pacific Commission, which provide ongoing technical support on request, there has never been a concerted long-term effort to establish a Pacific-wide, country-based support network and response capability. Establishing a network of people, linked by computer, would allow members to pool their knowledge and experiences, and to draw on the intellectual resources of the group as a whole. The existing, largely untapped technology is more than adequate to allow each member of a network to have ready access to the world of public health knowledge and information – to search the literature for answers to specific questions, to take advantage of the published and unpublished experiences of others in dealing with public health problems, and to share one's own experiences and lessons.

Principles

Although it is difficult to predict the evolution of a multipurpose, multifocal network, we can discuss a few basic principles. First, the membership should be open and accessible to all interested parties. The more people involved, and the more countries involved, the greater the possible wealth of shared information. Second, the locus of 'control' should be decentralised, allowing all participants a democratic opportunity to inform and shape the network and to communicate without external control. A network should primarily be individual- and country-based, rather than regionally- or 'externally'- driven. Third, while the members define a network, it still requires a secretariat, a central clearinghouse for issues or information that require either consensus, or a unified regional perspective. The secretariat function could rotate or could be agreed upon to reside in a permanent location.

Functions

There are many potential functions of a network. A very important one is to reduce the isolation in which many Pacific public health professionals work. The capacity to quickly and inexpensively communicate with colleagues can ease this substantially. Even to be a passive observer of communications among others is educational, even liberating. An important purpose of such an initiative is to build the links among health statisticians, epidemiologists, public health professionals, and other interested persons, in an information-sharing and support network. This may be accomplished by e-mail, perhaps with an electronic bulletin board, and, as things evolve, with teleconferencing and videoconferencing. ProMED[1] is a useful global example of informal networking among professional colleagues.

A second purpose is for data transfer, particularly for disease surveillance. Regional sharing of information is currently accomplished by reports sent by mail or fax to regional agencies, with summaries returned at intervals by mail. This is slow and incomplete. There is little sharing of disease notification data directly between countries. Electronic formats could standardise, streamline, and broaden this communication.

[1] ProMED is a world wide public health surveillance network, based on the E-mail.

A third important function if that of an early warning system. A specialised aspect of disease surveillance generally, this would address the concerns raised in the opening paragraphs of this paper. The recognition of, and response to, periodically-introduced diseases in the Pacific, such as cholera, dengue, or measles, has frequently been accomplished in national isolation. The South Pacific Commission in particular has done a commendable job for many years in summarising and redistributing the information they receive, but the timeliness, accuracy, and distribution of the summary data suffer from constraints inherent in the system. An electronic network could substantially reduce this problem, and allow at least the possibility of preventive action.

A fourth possibility is to harmonise regional data collection and dissemination – to reduce the burden of duplicative or low priority data demands; to facilitate the ability of regional agencies and countries to collaborate in collecting, sharing, and using data; and to 'speak the same language' in the development and provision of health indicator and other information. Related to this is the development of centralised databases, stripped of individual identifying information, and accessible to all authorised users. An obvious example is Pacific Island demographic data, disaggregated when possible, and made available, officially, by national offices of statistics, health statistics, or census. Once appropriate agreements and safeguards are in place, all authorised users who need demographic data would have electronic access to an officially-sanctioned and standardised source. Such databases could be developed also for monthly notifiable disease data, nutritional data, health workforce information, results of surveys, and many other purposes.

Establishing a network would allow public health professionals to pool their knowledge and experiences.

A fifth purpose of a network is that of technical support. It would allow public health professionals in the Pacific to share their personal stores of knowledge and information with others, and to draw on the experience of their colleagues, by providing a forum for easily and quickly asking questions and receiving answers. Because of the current state of e-mail and Internet connections, such two-way communication and support can just as easily extend beyond the Pacific, to draw on the support and expertise of people anywhere in the world who have information relevant to the problems of the Pacific. In linking the scattered, individual voices of public health in the Pacific, a few other benefits may be expected – from unity comes strength. A network of professionals, clearly and effectively addressing public health problems, is more likely to attract the support of others: support for outbreak investigation and control, for important health surveys and operational research, for disease control initiatives, for the development of public health infrastructure, and for other activities for which resources are scarce in the Pacific. Two important areas that require substantial support and lend themselves to a (Pacific) regional approach are training in public health sciences, and public health laboratory support. Both of these are generally weak, and would benefit from carefully-developed regional planning.

The above functions can be achieved in the Pacific by exploiting the data transport mechanism supplied by the Internet, now commercially available in several Pacific Island countries. For those not yet served by the Internet, remote access via telephone lines or

PEACESAT is a tested valid alternative. In particular, networks based on the Internet offer these services:

- E-mail: To exchange electronic mail between and among users;
- Newsgroups: To establish dialogues among users on any topic. Any user can start a 'thread' by posting a question and can receive answers from experts located anywhere in the world. Active newsgroups can provide a comprehensive understanding of almost any topic;
- FTP: To transfer data files;
- World Wide Web: To dynamically and interactively share documents, photographs, and graphics, and to distribute databases.

Conclusion

The time is right for a Pacific regional public health surveillance network. Data demands on public health workers are great, yet the lack of timely and accurate information is bemoaned by many; the capacity to interpret and act on data is sadly deficient; and the work that is done by public health professionals, while often commendable, is done in isolation and with very limited access to support. Yet the technology to address many of these issues is available and affordable; and support exists or could be tapped if common cause and solidarity is established. We have the concept, the models, and the means; with the motivation we can make this happen.

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The availability and quality of health indicators in the South Pacific

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Abstract

The availability and quality of health indicators in the South Pacific varies considerably throughout the region. This variation occurs both between indicators and between countries and territories. This paper examines the availability, timeliness and quality of health indicators. Source of data is instrumental in determining all three characteristics. There is a need for greater priority within the health service environment on the production of indicators. Efforts to improve availability and quality should include a review of data needs, the redesign, as appropriate, of the systems and instruments of data collection and management, and greater communication with other producers of health-related data.

Introduction

Health indicators represent a wide range of variables concerned with the health of the population, mortality and fertility, access to services, and the extent to which services provide complete coverage of the population. The sources of health data include health service delivery records, health surveys, the population census, vital registration and public works records, though not all countries and territories in the South Pacific use all of these sources.

This paper assesses the availability, timeliness and quality of a selection of health indicators, concentrating on maternal and child health. It is based on a detailed report, 'A Compilation of data relating to the welfare of children in the South Pacific and an assessment of the availability and quality of such data', written by the author for UNICEF in April 1993.[1] While small changes in data collection practices may have occurred in some countries and territories since the report was written, the overall picture presented by these 1992 data will be largely representative of the current situation.

The availability and timeliness of the indicators is shown in Tables A1 to A4, which relate to maternal and child health.

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[1] The data cited in the report were partially obtained during visits (for a different purpose) to 15 countries in late 1992, with updates and additional data from primary sources incorporated as available from the South Pacific Commission, the author's own collection of documents, and the Islands/Australia Program of the National Centre for Development Studies, Australian National University. Secondary sources were not used.

Table A1. Year of most recent available indicator, maternal health

Country	Total fertily rate			Contra-ceptive use rate	Attending prenatal care	Access to referral facilities	Births attended by trained personnel	Maternal mortality	Tetanus Immu-nisation of pregnant women	Cases of neo-natal tetanus	Anaemia among women by status				Low birth weight	Number of entries
	total	teenage	40+								all	pregnant	lacting	other		
American Samoa	80	80	80	..	..	..	..	..	..	..	..	..	..	..	86–90	4
Cook Islands	86–87	86–87	86–87	91	..	..	91	86–90	..	..	..	..	..	..	91	7
FSM	85–89	..	..	..	82–88	..	89	86–91	..	..	87–88	87–88	87–88	87–88	90	9
Fiji	86	86	86	89	86	86	89	86	..	..	80	..	..	..	91	10
Guam	89	89	89	..	89	89	89	87–89	..	..	..				89	8
Wallis et Futuna	90	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
Kiribati	90	..	..	90	..	..	88	90	..	..	..	..	..	..	90	5
Marshall Islands	88	88	88	92	..	..	..	90	..	..	..	91	91	91	89	9
Nauru	83	83	83	..	..	..	91	..	..	..	..	..	..	..	..	4
Niue	88–91	..	..	90	..	..	90	..	..	90	87	87	87	87	90–91	9
NMI	80	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
Nouvelle Calédonie	89	89	89	88	88	..	88	91	..	..	..	88	..	..	88	9
Palau	76–80	76–80	76–80	88	88	..	90	..	..	88	..	..	..	..	91	8
Papua New Guinea	80	80	80	86	89	..	91	87	89	..	..	..	..	..	82–83	9
Pitcairn	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0
Polynésie française	90	..	..	82	91	92	91	84–90	92	91	..	91	..	..	90	10
Solomon Islands	87–89	87–89	87–89	90	89	..	88	91–92	89	89	..	89	89	89	80–88	13
Tokelau	82–85	..	..	..	..	..	89–91	..	..	88	..	..	..	..	87–89	4
Tonga	85–86	85–86	85–86	90	91	..	91	91	89	..	..	86	86	86	..	11
Tuvalu	90	90	90	90	90	92	90	82-90	90	..	..	..	..	..	90	10
Vanuatu	89	89	89	91	88	..	90	86-89	88	..	..	83	..	..	86–89	10
Western Samoa	90	..	..	91	90	..	90	88-90	..	..	..	..	..	..	..	5
Number of entries	21	13	13	14	12	4	17	14	6	5	3	8	5	5	16	

Table A2. Year of most recent available indicator, child mortality and nutrition

Country	Infant mortality rate		Under five mortality rate		Breastfeeding at		Weight for age (0–4 yrs, <80%)	Height for age (0–4 yrs, <90%)	Weight for height (0–4 yrs, <80%)	Vitamin A defiency	Number of entries
	c.1980	latest	c.1980	latest	4 mths	12 mths					
American Samoa	78–82	86–90	..	86–90	..	..	..	..	..	..	3
Cook Islands	79–81	90	..	90	..	..	89	89	89	..	6
FSM	..	85–89	..	85–89	87–88	87–88	87–88	87–88	87–88	87	8
Fiji	76	86	76	86	..	..	80	..	80	..	6
Guam	79–83	89	79–83	89	..	..	..	..	..	..	4
Wallis et Futuna	74–78	88	74–78	..	..	..	..	..	..	..	3
Kiribati	85	90	78	90	..	..	90	90	90	89	8
Marshall Islands	80–84	88	..	88	91	91	91	91	91	91	9
Nauru	76–81	..	76–81	..	..	..	..	..	..	..	2
Niue	76–80	86–90	..	86–90	87	87	87	87	87	..	8
NMI	80–85	87	79–81	..	..	..	..	..	..	..	3
Nouvelle Calédonie	81–83	90	..	91	88	88	88	88	88	..	8
Palau	80	90	80	90	..	92	..	..	..	..	5
Papua New Guinea	80	..	80	..	..	82–83	82–83	..	82–83	..	5
Pitcairn	..	..	..	..	..	..	..	..	..	..	0
Polynésie française	83	90	..	90	92	92	..	92	92	..	7
Solomon Islands	76	86	76	86	89	89	89	89	89	..	9
Tokelau	..	85–89	..	85–89	..	..	..	..	..	..	2
Tonga	75	84	75	84	86	86	86	86	86	..	9
Tuvalu	79	91	79	91	..	91	..	..	..	91	6
Vanuatu	67–79	85	..	85	83	83	83	83	83	..	8
Western Samoa	82–83	87	82–83	87	..	88	80	..	..	..	6
Number of entries	19	19	12	17	8	12	12	10	12	4	

Table A3. Year of most recent available indicator, child immunisation

Country	Fully immunised at 1 year against				Cases in total population of				Deaths at 0–4 years from				Number of entries
	Measles	Polio	DPT	TB	Measles	Polio	Pertussis	TB	Measles	Polio	Pertussis	TB	
American Samoa	..	..	..	..	90	90	90	90	..	..	..	..	4
Cook Islands	90	90	90	90	89	..	89	89	89	89	89	89	11
FSM	90	90	90	90	90	90	90	90	89	89	89	...	11
Fiji	90	90	90	90	86	86	86	86	..	..	..	..	8
Guam	..	..	..	..	..	..	..	..	89	89	..	89	3
Wallis et Futuna	..	..	..	..	..	..	..	88	..	..	..	..	1
Kiribati	90	90	90	90	88	..	..	88	..	..	..	..	6
Marshall Islands	90	90	90	90	..	..	..	..	..	..	..	86	5
Nauru	..	..	..	..	..	..	..	..	..	..	..	..	0
Niue	90	90	90	90	90	90	90	90	90	90	90	90	12
NMI	..	..	..	..	..	..	..	..	..	..	..	..	0
Nouvelle Calédonie	88	88	88	88	91	91	91	91	91	91	91	..	11
Palau	92	92	92	92	88	..	..	88	88	88	88	88	10
Papua New Guinea	89	89	89	89	89	89	89	89	89	..	..	89	10
Pitcairn	..	..	..	..	..	..	..	..	..	..	..	..	0
Polynésie française	90–91	90–91	90–91	90–91	90	90	90	90	90	90	90	90	12
Solomon Islands	90	90	90	90	89	..	89	89	..	..	..	..	7
Tokelau	91	91	91	91	88	88	88	88	88	88	88	88	12
Tonga	90	90	90	90	89	89	89	89	89	89	89	89	12
Tuvalu	90	90	90	90	90	90	90	90	90	90	90	90	12
Vanuatu	91	91	91	91	88	..	88	88	..	..	..	..	7
Western Samoa	90	90	90	90	90	90	90	90	..	..	..	..	8
Number of entries	16	16	16	16	16	11	14	17	11	10	9	10	

Table A4. Year of most recent indicator, child morbidity and mortality

Country	Cases of acute respiratory infection		Deaths at 0–4 yrs from acute respiratory infection		Cases of diarrhoea		Oral rehydration therapy use	Deaths at 0–4 yrs from diarrhoea		Number of entries
	< 1 year	1–4 yrs	< 1 year	1–4 yrs	< 1 year	1–4 yrs	rate	< 1 year	1–4 yrs	
American Samoa	..	..	..	..	..	..	..	..	..	0
Cook Islands	..	..	89	89	89	..	..	89	89	5
FSM	..	..	89	..	..	..	..	..	..	1
Fiji	..	..	..	..	86	..	..	..	..	1
Guam	..	..	89	89	..	..	..	89	89	4
Wallis et Futuna	..	..	..	..	..	..	..	..	..	0
Kiribati	..	..	..	..	..	..	..	..	..	0
Marshall Islands	..	..	86	..	..	..	..	86	..	2
Nauru	..	..	..	..	..	..	..	..	..	0
Niue	..	..	90	90	..	..	..	90	90	4
NMI	..	..	..	..	..	..	..	..	..	0
New Caledonia	91	91	..	..	91	91	..	..	..	4
Palau	..	..	88	..	..	..	..	88	..	2
Papua New Guinea	..	..	89	89	..	..	..	89	89	4
Pitcairn	..	..	..	..	..	..	..	..	..	0
Polynésie française	..	..	90	90	90	..	..	90	90	5
Solomon Islands	89	..	..	..	89	89	..	..	..	3
Tokelau	..	..	88	88	..	..	..	88	88	4
Tonga	..	..	89	89	89	..	..	89	89	5
Tuvalu	90	90	90	90	90	90	..	90	90	8
Vanuatu	..	..	88	88	88	88	90-91	88	88	7
Western Samoa	..	..	..	..	90	..	84-85	..	..	2
Number of entries	3	2	12	9	9	4	2	11	9	

The availability of indicators is variable

Availability is seen in the column and row 'totals' of Tables A1 to A4. Column totals give the total number of entries for each indicator. Row 'totals' give the total number of entries for each country and territory. It is seen in Table A1 that the availability of indicators on maternal health ranges from complete coverage (for one indicator only, the total fertility rate) to poor coverage for such indicators as access to referral facilities for high-risk pregnancies, tetanus immunisation, and cases of neonatal tetanus. For indicators on child health, seen in Tables A2 to A4, availability is equally variable: indicators of infant and child mortality are almost complete, but indicators of vitamin A deficiency, oral rehydration therapy use rate, and the incidence of infectious diseases amongst infants and children aged 1–4 are largely unavailable.

In general, the availability of indicators depends on their source. The indicators that are more widely available are the few that can be obtained from more than one source. Clearly, if there is more than one possible source for a data item, its availability is likely to be better than if there is only one possible source. For certain indicators, health service statistics may be supplemented by data from other sources, most notably the population census. Indicators that are often obtained from population censuses in the Pacific context include access to safe water, access to adequate sanitation and various demographic measures (including the total fertility rate, infant and child mortality rates, and life expectancy). Good coverage of these items in the population census stems partly from the fact that the population census is available in a somewhat standardised form throughout the region.

Indicators obtainable only from health service statistics are less widely available. These include contraceptive use rates, antenatal care attendance rates, births attended by trained health personnel, infant and maternal immunisation rates, the incidence of low birthweight, and cases of morbidity and mortality by cause. Indicators of morbidity and mortality by cause are more widely available for the total population than implied by the indicators for children (seen in Tables A3 and A4).

Indicators obtained only from nutrition surveys are less widely available than those obtained from health service statistics, since only about half of the countries and territories in the region have undertaken such surveys. The tendency to concentrate on child health in relation to nutritional status is seen in the greater availability of indicators pertaining to children than to women, and of those pertaining to pregnant and lactating women than to all women.

The availability of indicators requiring more specialised surveys is poor in regional terms due to the infrequency of such surveys. The availability of data on special health problems must, however, be seen in the context of the need for such data. Some indicators are unavailable because the health problem is deemed not to exist and the indicator is thus 'not applicable' in the context of that particular country and territory. An example is seen in the case of indicators of vitamin A deficiency in countries and territories with good food-crop production: the deficiency does not exist to any great extent and so surveys aimed at its measurement have not been carried out. Given the expense and burden of conducting the special surveys that are required to produce these indicators, their selective undertaking is warranted. Clearly only data that are needed should be collected.

Further situations in which data are unavailable due to their being 'not applicable' occur where the medical condition or practice in question does not exist. Thus, where an infectious disease does not occur in a country and territory, the relevant indicator may not be reported (although WHO and/or SPC require most infectious diseases to be reported, in which case reports of non-occurrence are expected). Similarly, in the case of BCG vaccination (against tuberculosis), data are unavailable in the American territories (see Table A3) because the USA does not use this vaccine.

In other cases, data are unavailable because the indicator is obvious in the context of a particular country and territory. An example is seen in indicators on access to health services and access to referral facilities for high-risk pregnancies in countries which constitute a single small island, such as Nauru or Niue, where everyone has the same access to public facilities. Again, explicit data requirements would result in such cases being reported as 100 per cent, rather more informative than data unavailability.

The timeliness can be improved

There is a clear need to improve the timeliness of health service indicators in most countries and territories in the region.

The timeliness of indicators is seen in the body of Tables A1 to A4 which gives the most recent year, as of 1993,[1] for which each indicator is available for each country and territory. In general, indicators obtained from surveys and population censuses are less timely than those obtained from health service records. Of the 11 national nutrition surveys covered in the Tables, four occurred in the period 1980 to 1983, although at least one has now been updated, and the remainder occurred in 1986 or later. Of the other surveys covered, all are for 1987 or later. Population censuses are, on the whole, taken at regular intervals in the Pacific, but in some cases the interval is as long as 10 years. With typical delays in processing, this results in data being considerably out of date.

Though more timely than those obtained from surveys and censuses, indicators obtained from health service records are by no means as timely as their annual production schedules would imply. Tables A1 to A4 show that current indicators are only as recent as 1986, though morbidity indicators refer to 1988 or later and immunisation indicators to 1989 or later. Indicators for 1991 or 1992 are rare, indicating that most published indicators are at least two years out of date. There is a clear need to improve the timeliness of health service indicators in most countries and territories in the region.

The quality of indicators relies on the sources

Quality refers to the accuracy and reliability of the indicators. A lack of accuracy has several potential causes. One such cause is incomplete coverage of the population at risk: for example, mortality indicators based on hospital deaths omit a large proportion of deaths, morbidity indicators based on hospital morbidity omit private patients, and

[1] Notable improvements in availability since 1993 include a national nutrition survey in Fiji, a demographic and health survey in Papua New Guinea, and a fertility and family planning survey in the Republic of Marshall Islands, among others.

maternal care indicators refer only to those pregnant women who attend antenatal clinics.

Under-reporting is also a significant cause of inaccuracy: in maternal mortality rates, for example, it arises from misdiagnosis of the main cause of death when not directly involving childbirth, and in some cases from under-reporting of deaths *per se*. Over-reporting may also occur, as for example in contraceptive use rates where use is not efficient, and in oral rehydration therapy use rates where distribution does not necessarily indicate use.

Inconsistencies arise from poor definition, or from poor application of definition, for example in relation to the limits and ages for nutritional indicators involving weight and height, or in relation to age of infant for prevalence of breastfeeding. Difficulties in operationalising data requirements also give rise to inaccuracy in certain indicators and render service statistics less than straightforward. For example, ascertaining the tetanus immunisation rate among pregnant women requires knowledge of the population at risk of tetanus, a quantity which is difficult to measure because some women will already have been received by prior immunisation in an earlier pregnancy and may require only a booster or no further immunisation at all.

The reliability of indicators is related to the use of sampling and to population size. Where surveys are concerned, small samples will lead to large margins of error, while fieldwork problems may lead to bias. Small population size also results in significant fluctuation in annual rates. Finally, where migration is high and population size small, changing population base may result in significant bias, as for example in the estimation of the measles immunisation rate, for wich the one-year time lag between birth and immunisation results in the denominator being the number of births rather than the number of infants aged 12 months. Clearly context is instrumental in determining the quality of indicators. Knowledge of context is thus essential in their interpretation.

Very few, if any, indicators can be labelled of good quality in the region as a whole. On the other hand, very few if any are of poor quality throughout. Most of the indicators shown in Tables A1 to A4 can best be described as of variable quality, that is ranging from poor to good depending on the country and territory, with the remaining indicators being generally adequate throughout the region. Table 5 divides the indicators covered in Tables A1 to A4 into variable and adequate quality. The number following each indicator is the number of countries and territories that provide that indicator (taken from Tables A1 to A4).

It can be seen that, in general, those indicators that are of adequate quality are also those that are more widely available, whereas those that are of variable quality tend to be the indicators that are less widely available, though exceptions occur. In general, the indicators that are of adequate quality are those that are concerned with women's reproductive roles, including care of the infant. Maternal and child health services thus produce consistently better indicators than other sources. Access indicators, obtained from the population census or service provider, also fall into this category. Where more than one source is available, scope clearly exists not only for better quality but for checks to be made on quality.

Table 5. Quality of maternal and child health indicators

Number following each indicator is the number of countries and territories that provide that indicator.

Variable quality	Adequate quality
Access to referral facilities in pregnancy (4)	Contraceptive use rate (14)
Pregnancy tetanus immunisation rate (6)	Prenatal care attendance (12)
Maternal mortality rate (14)	Births attended by trained personnel (17)
Anaemia by pregnancy status (5–8)	Cases of neonatal tetanus (5)
Weight for age (0–4 yrs) (12)	Low birth weight (16)
Height for age (0–4 yrs) (10)	Breastfeeding at 4 mths, 8, 1 yr (12)
Weight for height (0–4 yrs) (12)	Measles immunisation rate (1 yr) (16)
Vitamin A deficiency in children (4)	Polio virus immunisation rate (1 yr) (16)
Cases of measles (16)	Diphteria-Pertussis-Tetanus immunisation rate (1 yr) (16)
Cases of poliomyelitis (11)	BCG immunisation rate (1 yr) (16)
Cases of pertussis (14)	Access to safe water (21)
Cases of tuberculosis (17)	Access to adequate sanitation (20)
Deaths from measles (11)	Access to health services (15)
Deaths from tuberculosis (10)	Access to electricity (19)
Cases of acute respiratory illness (<1 yr) (3)	
Cases of acute respiratory illness (1–4 yrs) (2)	
Deaths from acute respiratory illness (<1 yr) (12)	
Deaths from acute respiratory illness (1–4 yrs) (9)	
Cases of diarrhoea (<1 yr) (9)	
Cases of diarrhoea (1–4 yrs) (4)	
Deaths from diarrhoea (<1 yr) (11)	
Deaths from diarrhoea (1–4 yrs) (9)	

The context is essential

It is clear from the above assessment of availability, timeliness and quality of health indicators that the context of the country and territory in question is an important consideration. While all indicators should be produced as accurately, completely and unambiguously as possible, their use and interpretation cannot be divorced from the context in which they apply. The importance of context is clearly seen in the above discussion of indicators that are 'not applicable'. It is also important in such indicators as access to health services, where terrain and method of transport are mediating factors, and in morbidity and mortality indicators, when coverage by health services is not complete.

Context is also important when making and interpreting comparisons between countries and territories. For example, access to referral facilities for high-risk pregnancies is 100 per cent in both Niue and Tuvalu. In Tuvalu, this is achieved by bringing all outer island women expecting their first birth as well as those with known potential complications, to the main island of Funafuti to give birth in the hospital, whereas for Niue the indicator merely reflects the country's single-small-island geography.

The context in which data are collected is particularly important in relation to quality: the user must assess the extent of under- and over-reporting, whether reporting of such variables as age (used to define the relevant group, such as infants less than one year) is accurate, and the quality of record-keeping. Knowledge of the context in which different subgroups of the population live will also give the user some idea of the likely variability in indicators presented only at the national level. Context is also important in relation to assessing the reliability of indicators that suggest significant change over time: rapid changes would not be expected in larger and remotely-scattered populations, but are perfectly possible in small single-island populations where health interventions are much easier to implement.

Improving the indicators

The fact that the quality of the health indicators obtained from health service statistics can at best be labelled adequate suggests that there is room for improvement. Some indication of how this might be achieved can be gained from examination of those areas where quality is higher than average. One such area, already noted, is maternal and child health. It is likely that the higher quality of such indicators stems mainly from the repeat visits required in antenatal and postnatal care, which afford the time and opportunity to obtain information and fill in gaps. Probably also instrumental are the facts that women aged 15–49 (as opposed to the elderly for example) are the providers of maternal and child health information and that they have an interest in providing accurate information in order to receive the best care. It is also the case in some countries and territories that maternal and child health services have received priority over other health care services.

In Tonga efforts to explain to health-care personnel the value of data and accurate recording resulted in improvements in the quality of indicators.

It is also informative to compare health service statistics with the population census, which generally achieves good quality in those indicators that it covers. The population census is an activity in itself; in one sense it is an end in itself; it is managed and undertaken by statisticians and demographers whose main role is to carry out such activities; it is accorded a high priority by those involved; the enumerators are trained for the fieldwork and this is their sole occupation during that time. The nature of the collection of data through the population census is in marked contrast to the record-keeping basis of health service statistics. The main role of the health service is to provide health care; the production of statistics is a secondary activity which is not always accorded a high priority by those managing the health service (admittedly with scarce resources). At service delivery, record-keeping is secondary to the primary role of health care provision and again may not be accorded a high priority; health-care personnel may neither be adequately trained in record-keeping nor appreciative of its value. The importance of the latter factor has been demonstrated in Tonga where efforts to explain to health-care personnel the value of data and accurate recording resulted in improvements in the quality of indicators.

If the availability, timeliness, and quality of indicators are to be improved, the production of health indicators must be accorded greater priority within the health service. This involves making resources available to improve health data management units through the expansion and training, as necessary, of personnel and through upgrading of the systems involved. Such systems include the channels and means of communication for transmitting data from often remote rural areas to the central data management unit as well as the processing of the data. This would not only result in more efficient systems, thereby increasing timeliness, but would also improve the quality of the indicators.

A review of health information needs would serve as a useful first step towards improvement: the revision of data needs would serve both to improve availability in cases where data are not already collected and to make resources available for producing those indicators that are required in cases where hitherto available indicators are no longer required. In defining data needs for the region as a whole, and where indicators are not required universally or regionally, explicit identification should be made of those countries and territories that are required to produce such indicators. This would allow for a distinction to be made between those countries and territories for which the required indicators are not available and those for which the indicators are not required.[1] Equally, there is a need to stress the importance of differentiating between reports of zero and not reporting (blank), since the latter may be interpreted to mean zero in cases where the data are in fact unavailable, especially where blanks are also used in true cases of unavailability.

The quality and availability of indicators would also be improved by the redesign, as necessary, of the instruments used for record-keeping. This would be necessitated by the respecification of data needs, but it would also be a useful exercise in itself. Many data-collection forms could be rendered more user-friendly by their redesign using the modern formatting capabilities now available. Forms should also be designed to be as efficient as possible, requiring a minimum of time to complete and leaving no room for ambiguity. It is the responsibility of those concerned with the collection of health data to minimise the burden of record-keeping on health-care personnel. It is also important that health-care personnel be trained in the use of new forms. The redesign of forms should always be coordinated with the computer system used to process the data.

Where computerisation has not yet taken place, its introduction should be regarded as a priority. Once systems are fully operational, computerisation assists timeliness and allows for greater detail of tabulation. Computerisation can also be used to improve the quality of the data through the use of internal consistency checks. It is imperative that computer systems be designed by or in consultation with health management personnel, so as to avoid the sort of inappropriate classification locked into some of the systems already designed by computer consultants with no knowledge of the subject matter. It is also imperative that appropriate software is used, with custom-designed data entry incorporating checks on ranges and inconsistencies, and with flexibility of tabulation. Adequate training is also a necessity.

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[1] There is also a need to be explicit about which globally-recommended indicators are not applicable to the South Pacific as a whole and for this to be made clear in Asia–Pacific and global compilations. The distinction is important since poorly-understood international compilations are the source of much misinformation. Indicators that have been identified as desirable, on a global level, and which are not available in the Pacific, include deficiency in vitamin A amongst women and deficiency in Iodine amongst both women and children.

One of the reasons why some indicators are unavailable or inaccurate stems from the fact that they relate, by definition, one data item to another; in other words they are rates or ratios. In some cases, the two data items required can be provided by health service statistics, such as in the case of the infant mortality rate, which relates deaths at ages less than one year to births. In many cases, however, rates and ratios are expressed in relation to the population, or part of it. For example, the contraceptive use rate requires knowledge of the number of women of reproductive age in the population at large. Such information is rarely available except for the year of the population census (or a large-scale survey from which population estimates can be made). Health statisticians are thus obliged either to use population data for the census year or to make estimates, sometimes with inadequate knowledge of the process involved. Estimates of the population and its structure are made available through the population projections that are invariably produced following a population census. However, such projections are rarely made available in the detail that is required for health statisticians and planners to effectively make use of them. There is a need, therefore, to impress upon national statisticians and planners that detailed population projections are required for each year after the census. The detail required includes single years of age for children and five-year age groups for adults, for each sex at both national and subnational levels. This is especially important where census intervals are lengthy.

Finally, the timeliness and availability of indicators currently obtained through sample surveys could be greatly improved if this traditional method of data collection, which often involves lengthy delays in data processing, were replaced to a large extent by surveillance and ongoing monitoring systems and by rapid appraisal techniques. Such techniques might also increase the quality of data since there would be less reliance on enumerators and more reliance on health personnel.

Conclusions

Efforts to improve the quality and availability of health indicators should begin with a review of data needs. On the basis of this, the systems and instruments used within health departments and ministries to meet those needs should be reviewed and redesigned as appropriate. This would involve the adoption of computerised data management systems in coordination with the redesign of data collection forms, as well as the improvement of communication systems to reduce delays in obtaining data from rural areas. Training should be provided at all stages. Greater communication and collaboration with other producers of health-related data, such as those concerned with the population census, should also be encouraged to facilitate the sharing of appropriate population data. Finally, a basic and essential requirement for such efforts to be effective is for greater priority to be accorded within health departments and ministries to the production of health indicators.

Harmonisation of regional health data: requirements in the Pacific

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Abstract

Twenty-two Pacific Island countries and territories (PICTs) receive various levels of technical assistance, training and financial support from international, regional and national agencies. To support the different aspects of these activities, the agencies currently request health data from the PICTs on a systematic basis in two major fields: health programme monitoring and disease surveillance. There is currently little consultation or integration between agencies. Communication exists mostly in terms of the exchange of various types of processed information such as reports, circulars and other publications.

The Inter-agency Meeting on Health Information Requirements in the South Pacific took place in December 1995 in Noumea, New Caledonia, to discuss the potential for more integration and cooperation in order to ease the pressure on the data providers (the countries) and to improve the relevance, quality and timeliness of regional health information in the Pacific. As part of the effort to deal with the problems of both the pressure on data providers and the low quality and availability of good health information, methodological tools for evaluating both health indicators and diseases subject to surveillance have been developed in order to ascertain those most suitable for public health surveillance. Finally, looking forward to the establishment of a Pacific Public Health Surveillance Network, important perspectives are outlined.

Introduction

Public health surveillance typically differs from other sources of health data such as epidemiological studies, health surveys or administrative records in terms of data collection method, mode, volume and frequency; reporting procedures and channels; type of data analysis and information dissemination; and costs and human resources involved (Thacker, 1989 and Stroup, 1992). 'It is the ongoing collection, analysis and interpretation of health data, closely linked with the timely dissemination of these data both to those providing the data and to those who can apply the data to control and prevention programmes' (Thacker, 1989). In that regard, the complementary links existing between the potential sources of health information (e.g. epidemiological surveys cross-checking the validity of surveillance data) are of great importance. These links must be developed to enhance the decision-making process in public health spheres. This article focuses on the selection of a set of core indicators that could ideally be used at both regional and in-country levels, for the ongoing measurement of the health status of Pacific Island populations, and the relevant decision-making based on such information.

In the Pacific, several international, regional or national agencies (with a regional interest, e.g. the US Center for Disease Control and Prevention, or CDC) request health data from the Pacific Island countries and territories on a systematic basis, in two major fields: health programme monitoring and disease surveillance. These above organisations are bound to the monitoring of public health programmes in various aspects of technical assistance, training and financial support. Three agencies are also conducting disease surveillance activities: CDC, the World Health Organization (WHO) and the South Pacific Commission. These activities produce an ongoing quest for health information.

There is currently little consultation and integration in the planning and implementation of the regional public health surveillance activities.

However, there is currently little consultation and integration in the planning and implementation of the regional public health surveillance activities. Communication does exist, taking place mostly in terms of exchange of processed information, for example reports and feedback materials between the PICTs and the various individual agencies, and information bulletins, circulars or similar publications, mostly between agencies. Nevertheless, there is nothing like a planned regional public health surveillance system, or network.

This lack of coordination has harmful subsequent effects. The successful practice of public health surveillance is based on sound decisions, and these are possible only when decision-makers have accurate, timely and relevant information. Concerns about the current quantity and quality of health data requirements at the regional level have been raised on many occasions by agencies such as UNICEF, WHO and SPC, as well as by health professionals from the Pacific Island countries and territories themselves. PICTs representatives complained unanimously about the volume of the demand for health information, partly due to duplication in the requests, and asked the agencies to increase the level of integration and coordination of their data needs and requests.

On the other hand, the agencies stressed that it was rather disappointing not being able to properly monitor the development of key public health programmes at both national and regional levels (e.g. in the fields of immunisation, environmental health, etc.) nor progress towards regional public health goals, such as the reduction of measles mortality or rate of low birth weight, because regional public health surveillance was not sound enough.

Therefore, our two main suggestions aimed to decrease the pressure on data providers by making concerted efforts towards integration of regional health data requirements, as no public health surveillance system can be useful if it is not fueled with relevant (complete, accurate and timely) health information. The SPC Community Health Programme took up the challenge of finding ways to reconcile these approaches. It was a concern and a challenge for anybody involved in health-related development in the Pacific.

In December 1995, the South Pacific Commission organised the Inter-Agency Meeting on Health Information Requirements (IAMHIR) in Noumea, New Caledonia, with the support of UNICEF and WHO. The participants were representatives of several regional agencies and health professionals of Pacific Island countries and territories. The IAMHIR meeting aimed to establish the basic principles of a public health surveillance network in the Pacific. The foundations of this network are described hereafter.

The Pacific scene of health status indicators

Reviewing the available information from most of the international agencies involved in the region, we have compiled a listing of 178 indicators 'required' for the monitoring and evaluation of the health status of the Pacific Island populations. Their distribution in the various fields covered is listed in Table 1. To limit the scope to a manageable level, the indicators concerning provision of health care (e.g. health infrastructures, personnel), health expenditures and health policy were not considered. Nevertheless, we do not underestimate their potential usefulness, since sound public health surveillance can lead to relevant changes in public health policies. These changes can themselves be significant, and therefore deserve appropriate measurement. In addition, if not directly connected to health activities, indicators related to socio-economic and education sectors have not been considered either.

Table 1. Health status indicators in the Pacific – subject areas

Subject	Number of indicators	Requested by more than one agency	Percentage of indicators requested by more than one agency
Communicable diseases	67	28	42
Demography and population	19	10	53
Maternal and child health	25	9	36
Non-communicable diseases, injuries and violence	18	7	39
Nutrition	18	5	28
Health status/general	14	3	21
Environmental health and social conditions	17	3	18

Among the indicators listed, 65 out of 178 (37 %) are requested by more than one agency, and about 10 % requested by three or more. Multiple demand varies according to different areas. Looking at the whole pool of indicators, it appears that not all are specific for a single health event. In 13 instances a single public health problem or field of activity (e.g. low birth weight, obstetric care, vitamin A deficiency, access to safe water) is measured in different ways. The usual purpose of these different measurements is to refine the analysis, using disaggregated data. Depending on the topic, two, three or up to five distinct indicators are used. Sometimes definitions are vague, only slightly different, and do not really bring in new elements to analyse. Altogether, these represented 36 individual indicators (20% of the total).

At this stage, the data providers' point of view deserves to be considered. There is little doubt that when differences in measurements are not expressly meant to increase the understanding of common public health problems (such as anaemia, vitamin A deficiency or low birth weight), they can easily cause confusion at data collection levels, and beyond. The 178 health status indicators cover a rather wide range of data and data collection vary significantly depending on data sources, purpose and mode of collection, specificity of the information wanted, frequency and type of analysis required, expertise and resources necessary. As a result, not all data 'required' are amenable to public health surveillance.

The ultimate selection of indicators would be based on the national, local priorities and on the objectives of the surveillance.

The objectives of the IAMHIR meeting were to select a core set of health indicators relevant to public health surveillance. The first step we suggested was to look more closely at the set of 65 indicators used by more than one agency at the regional level, because a strong common demand certainly reflects a similar interest for certain indicators. Since this group of indicators represents overlapping data requirements, harmonisation and integration would contribute to alleviating the current pressure on the actual data providers.

To facilitate the evaluation of the indicators, we have developed two distinct methodological tools: (1) to appraise whether or not it is appropriate for a disease to be subject to surveillance, compared to other candidates; and (2) to determine whether a given indicator is relevant and useful for public health surveillance. The ultimate inclusion of the selected indicator into a regional core set of criteria, and the definition of the set itself, would be based primarily on the PICT's national priorities, the objectives of the surveillance, and on a comparative analysis of the diseases and other indicators.

The methodological tools

Selection of diseases subject to surveillance

The highest number of multiple demanded indicators is in the field of communicable diseases, representing 42% of the total pool of indicators used at the regional level to monitor communicable diseases. It essentially covers the incidence and mortality of 14 diseases, out of 21 monitored altogether at regional level. Communicable disease control and prevention, especially including Expanded Program on Immunization target diseases, has historically been attached to public health surveillance. Even though health is not merely the absence of disease, the burden of diseases, communicable or not, on the Pacific communities remains considerable, and a large majority of public health programmes aim at prevention and control of diseases. For these reasons, we decided that disease surveillance, although included in the core set of indicators, deserves to be approached separately.

A system based on a series of scored criteria was developed, to evaluate the relevance of a disease, condition or syndrome to be subject to public health surveillance. It is essential for such a priority-setting system that objectives would be first clearly defined, so that criteria for selection flow consistently. Our chief concern regarding the selection of any indicators is usefulness at both national and regional levels. Therefore, we defined the following objectives:

— to provide estimates on the incidence and mortality of diseases, conditions or syndromes under surveillance;

— to monitor trends in the diseases, conditions or syndromes under surveillance, and to detect changes indicating potential needs for appropriate action;

— to properly identify outbreaks for timely investigation and control; and

— to allow for the assessment of the effect of disease control measures, providing relevant information for re-programming more appropriately-focused public health interventions.

After drafting a theoretical model, we pre-tested its pertinence, feasibility and acceptability at the country level, with the active collaboration of the Health Services of New Caledonia. We chose the list of notifiable diseases currently used in the territory, which was scheduled for revision. The proposed objectives were found acceptable. The pre-test allowed us to refine the number, definition and grouping of the selection criteria:

International context

1. Surveillance interest for WHO and EPI (Expanded Programme on Immunisation) target diseases
2. International health regulations

Frequency and severity

3. Incidence
4. Hospital costs
5. Mortality
6. Case-to-death ratio[1]
7. Socio-economic impact (mainly absenteeism from work and long-term disability)
8. Risk perception (public, decision-makers, media, health personnel)

Communicability and potential for epidemics

9. Communicability
10. Epidemic potential
11. Vaccine preventability

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[1] Subsequently withdrawn, as possibly derived from incidence and mortality.

Operational interest

12. Necessity for immediate action
13. Usefulness as a health indicator
14. Amenable to public health measures[1]
15. Priority status (with decision-makers)
16. Ease of diagnosis

Some of the definitions (see Annex 1, p. 44), and the disease surveillance method drew upon a Canadian experience in setting priorities for communicable disease surveillance (Carter, 1992 and Wetterhall, 1992). If any of the diseases met either of the first two criteria (Surveillance interest for WHO and EPI target diseases, international health regulation), they were automatically included in the set subject to surveillance. The rest of the criteria have been rated either on a scale of 0–2 (criteria nos. 3, 5–9, 11, 13, 15, 16), or 0–5 to increase their relative weight, for those criteria found to be critical to the objectives of the surveillance system (criteria nos. 4, 10, 12, 14)[2].

All diseases proposed for surveillance (in practice, those already included in the regional and national surveillance systems, plus any additional requests) can be evaluated according to all criteria, then ranked according to their total score. More important than the absolute score is the relative ranking of the diseases. The cut-off point for recommending that a disease be included in regional/national surveillance, though crucial, remains based on a balance between information needs and resources available. In pre-testing on New Caledonia's list of notifiable diseases, we agreed to a cut-off of 15 points.

It is not our intention to claim that this scored system of selection would be in any way fully objective. Subjectivity interferes on many occasions: in the score given to diseases for every criteria, in the different weights given to the criteria, in the choice of the cut-off point, even in the choice of diseases proposed for evaluation. We nevertheless believe that it provides an original and reliable standardised method, with enough flexibility for use at both national and regional levels. Moreover, it provides plenty of opportunities for ongoing refinement and improvement, through field epidemiology studies and hands-on training.

The epidemiological transition from a prevailing pattern of communicable to non-communicable diseases, mostly in terms of mortality, has been extensively described and documented in the Pacific since the early 1980s (Taylor, 1989). However, currently existing surveillance systems favour communicable diseases over lifestyle-related pathologies. To our knowledge, with the exception of cancer registries, none of the existing regional disease surveillance systems include non-communicable diseases (or NCDs), such as diabetes mellitus, cardiovascular diseases or asthma. Can NCDs be assessed in the same manner as communicable diseases, using the same tools? Nothing in the disease surveillance system's objectives precludes such an approach.

Selection of health indicators for public health surveillance

The method proposed for the determination of health indicators is based on the same scored framework used to select diseases subject to surveillance. The criteria are chosen

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[1] Eventually determined as the first criteria to be considered.

[2] The scoring system has since been simplified and all criteria are scored on the same scale. After several field applications of the method, the relative weight of criteria appeared to have no effect on the relative ranking of the disease.

according to the objectives of public health surveillance, bearing in mind basic principles such as acceptability and affordability at national and regional levels (see Annex 2, p. 45).

We believe a standardised method is essential to identify a consistent set of indicators which will ensure the following: (1) national and regional standards for public health surveillance through reference tools and guidelines; (2) flexibility to allow different communities to decide on target levels tailored to their specific situation and priorities; (3) public health surveillance to be planned and operated at the operational level, in harmony with regional data requirements; (4) better planning of resources for complementary health information activities that are not appropriate for public health surveillance, or more specifically of the needs of certain programmes or agencies (e.g. management programme information systems, focused epidemiological studies, programme-specific cross sectional surveys).

In developing this part of our proposed method, we referred to a CDC experience identifying a set of 18 health status indicators for public health surveillance in the United States (Stroup, 1992). To allow for a comprehensive measure of community health, the set of relevant selected indicators should include general measurements of community health such as overall morbidity, mortality and disabilities, and specific measurements of community health related to identified priority public health problems. This set, or one derived subset of measurements, has to be consistent in-country (PICTs) and at regional levels. The series of 10 selection criteria we retained emphasise consistent characteristics. They have been grouped into three categories:

The criteria are chosen, bearing in mind basic principles such as acceptability and affordability at national and regional levels.

Acceptability / availability

1. Appropriate for surveillance (ongoing process)
2. Data readily available at country level
3. Data source

Validity

4. Estimated accuracy
5. Validity in small population

Overall relevance

6. Purpose for being requested
7. Usefulness in decision-making
8. Possible use at country level
9. Specific interventions implied (if changes are detected)
10. Outcome oriented

Each of the categories would be summarised by a score 0–5, and therefore each of the indicators would be rated on a scale 0–15. At this point we must bear in mind that a core set of health indicators should include some of the disease surveillance indicators identified, together with other measures of the health status of the Pacific Island communities.

Perspectives

In looking forward to establishment of a regional surveillance framework and network for the Pacific Island countries and territories, there are a few basic principles that should be discussed.

Foundations

By definition, before becoming regional health data, all data are national health data. The only reason a country or territory would be able to sustain the necessary efforts to collect, analyse, interpret and disseminate health data is because national health professionals and decision-makers are convinced of the usefulness of these data for their own use.

By definition, before becoming regional health data, all data are national health data.

The second important point is that a regional initiative must be regional in approach, and as comprehensive as possible. A regional surveillance framework must be planned in concert with all interested bodies, managed and implemented in collaboration, and monitored and evaluated with a common concern for ongoing improvement of regional public health surveillance. Finally, isolated, sectoral or opportunistic activities have little chances of having a significant impact on the health of Pacific Island populations, whether in public health programmes or public health surveillance systems.

Through the IAMHIR meeting, and by proposing methods and tools for a common approach to public health surveillance at national and regional levels, the aim of the SPC Community Health Programme w as to contribute to a concerted approach to regional surveillance. Within a framework, a network may flourish and activities be integrated. Within a network, activities may be expanded and regional surveillance may become real. With both a framework and a network, public health surveillance in the Pacific becomes sustainable.

Actions

Towards the establishment of a regional public health network, three type of actions have to be promoted.

1. Keep the momentum going

It is crucial to keep the momentum going. Pacific Islands countries and territories have to be more thoroughly consulted. A Pacific surveillance framework could be developed by building on the (adjusted) standardised methods and tools discussed at the IAMHIR meeting. In order to coordinate subsequent public health surveillance activities, a working group on public health surveillance in the Pacific was established at the IAMHIR meeting, and named Pacific Public Health Surveillance Working Group (PacPHSWG). It is composed of 10 people, with a mixed representation from PICTs and agencies who meet regularly (twice a year) to continue the work started in Noumea.

There are many possibilities for refining and improving the proposed methods. The baseline information necessary for using accurately some of the selection criteria applied to diseases and indicators is currently rather poor. It is important to fill this gap. A number of small-scale field epidemiology projects could be planned for and implemented in Pacific Island countries and territories. These PICTs would also participate in refining both national and regional data (e.g. studies on the sensitivity and specificity of an indicator or disease (case) definition; incidence and mortality of tuberculosis; incidence and hospital costs incurred by rheumatic fever; frequency, mortality and hospital costs incurred by complications of sexually transmitted diseases).

In summary, we should endeavour to keep the communication and collaboration between parties and the ongoing work needed to improve regional surveillance (planning, implementation, coordination and evaluation).

2. *Build on opportunities*

Based on a defined framework, and taking advantage of a concerted approach, public health surveillance activities may expand in a more consistent and useful manner: the experience acquired in surveillance efforts in some parts of the Pacific may be usefully applied in others, findings from a field study carried out in one of the PICTs could complement the information gathered in others, and the skills acquired by some Pacific Islanders may be used in other Pacific countries or territories. Exchanging information and skills would create a useful network.

Telecommunications technologies have evolved rapidly during the past ten years. Some of the most modern means are readily available in the Pacific. We strongly believe computer networking would enhance the information exchange in regional public health surveillance. Provided their use is properly planned, resources such as the Internet, and other telecommunication networks currently in use throughout the Pacific (e.g. PEACESAT, PACTOK), provide an invaluable opportunity for supporting the networking of information.[1]

Against the background of a sound framework and regional network, with reference methods and tools available in-country and regularly improved, the development of a field epidemiology training programme could reasonably be explored, in association with national and regional health training institutions (e.g. the Fiji School of Medicine, the University of Auckland Department of Community Medicine and the National Center for Population Health of the Australian National University). The development of a 'Pacific Field Epidemiology Training Programme' would greatly contribute to make national and regional surveillance sustainable.

3. *Secure financial and institutional support*

Although meant ultimately to generate savings by avoiding certain aspects of health expenditure and improving efficiency of health programmes, public health surveillance has a cost. This might be viewed as a serious obstacle, in particular when starting up surveillance activities at the country level.

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[1] To initiate such a move, all members of the PacPHSWG committed themselves at the IAMHIR meeting to endeavour to access, and use, the electronic mail technology to support distance collaboration within the group.

The Pacific public health surveillance group could play an essential role in preparing and submitting appropriate project proposals to institutional donors. We believe funding proposals issued by a consortium of international agencies and Pacific Island countries would be very strong ones, as aid donors should be appreciative of the coordinated efforts put into the planning, implementation and evaluation of regional projects. These proposals could be seen as even stronger if they associate national and/or regional training institutions such as the Fiji School of Medicine, or the University of Auckland Department of Community Medicine.

Conclusions

The IAMHIR Meeting was the first step in a long process ultimately aiming at the establishment of a Pacific Public Health Surveillance Network (PPHSN). Five operational strategies developed within the SPC have now been adopted in order to guide the development of the network:

— harmonisation of health data needs and development of adequate surveillance systems, including operational research;

— development of relevant computer applications;

— providing field epidemiology and public health surveillance training;

— promoting the use of E-mail, opening the Network to new clients, new services and other networks; and

— publication of health information bulletins, technical studies, applied research findings and information on resources available in the network.

Data harmonisation efforts we initiated in December 1995 have now been on trial in the field in four Pacific countries and territories. The validation of the proposed method – now called PacSel – by the PacPHSWG, led to the identification of a sub-set of 88 indicators relevant to public health surveillance, out of the 175 originally reviewed. Furthermore, these 88 remaining health indicators could be broken down into three groups of varying priority: high (33), medium (32) and low (23). These findings validated the relevance of PacSel as a method able to establish priorities in public health surveillance, and ultimately releasing pressure from the data providers.

In refining the available surveillance information, operational research activities started in 1997, focussing on dengue fever field diagnostic capabilities. More thoughts have been put into the concept of an innovative regional training programme in public health surveillance and field epidemiology. A feasibility study has recently been completed in this field. An e-mail (and fax) listserver called PACNET was launched in April 1997 to become the 'voice' of the Pacific Public Health Surveillance Network. PACNET's present focus is on 'early warning', allowing the networking of individuals (PICTs' health professionals and other surveillance-related specialists), information and resources, in order to facilitate the early diagnosis, and better prevention and control, of outbreaks of communicable diseases in the Pacific.

The progress towards the development of the Pacific Public Health Surveillance Network has come a long way since December 1995, due the collaborative efforts of the members of PacPHSWG. This group is now called the Coordinating Body of the Pacific Public Health Surveillance Network, and the South Pacific Commission is its official focal point.

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ANNEX 1

Definitions of the selection criteria for diseases under surveillance

Criteria	Scale	Definitions
International context		
1. Surveillance interest for WHO and EPI target diseases	x	The 6 Expanded Programme on Immunisation diseases and the 5 diseases recommended by the 22nd World Health Assembly (louse-borne typhus, influenza, louse-borne relapsing fever, polio, malaria) are automatically included.
2. International Health Regulations	x	Cholera, yellow fever and plague are all subject to the International Health Regulations, and all countries must report any cases of these diseases. These diseases are automatically included.
Frequency and severity		
3. Incidence	0–2	Based on reported numbers of cases, the diseases are divided into 3 categories and given 0, 1 or 2 points.
4. Hospital costs	0–5	Meant to be a surrogate for morbidity, this criterion implies a subjective assessment of severity, as indicated by hospital costs (for example, length of time in hospital for an 'average' case)
5. Mortality	0–2	If available, the number of deaths due to a condition (averaged over 5 or more years); diseases are divided into 3 categories as for incidence.
6. Case-to death ratio	0–2	To measure the lethality of a disease; how many of the cases result in death. For example, AIDS would be 100% (i.e. 2 points); conjunctivitis would be 0% (i.e. 0 points).
7. Socio-economic impact	0–2	To measure the impact of the disease on society. This criterion takes into account the impact of absenteeism from work, long term disability and other non-hospital costs.
8. Risk perception	0–2	The perception of the public, decision-makers, media and health personnel on the importance of the disease.
Communicability and potential for epidemics		
9. Communicability	0–2	How easily a disease is transmitted person-to-person, airborne, vector borne, feco-oral contact (e.g. AIDS would score 1 – the virus is fragile and requires sexual contact; influenza would score 2 – person-to-person transmission is very easy).
10. Epidemic potential	0–5	If the disease has the potential for epidemics, including with regards to immunisation coverage (e.g. AIDS and influenza both have a potential for outbreaks or epidemics and would both get a score of 5).
11. Vaccine preventability	0–2	Takes into account the availability of a vaccine, as well as its efficacy and whether or not it is widely recommended for use (e.g. though a vaccine exists for cholera, it is rarely used because of low efficacy; it would be scored 0).
Operational interest		
12. Necessity for immediate action	0–5	Do health officials need to investigate and act immediately on the report of a single case to prevent further transmission? Includes effectiveness of contact management.
13. Usefulness as health indicator	0–2	Do cases of this disease indicate a deficiency or a gap in the health care system? For example, cases of measles (especially an outbreak) may indicate low immunisation coverage or a 'broken' cold chain.
14. Amenable to public health measures	0–5	Can the occurrence of the disease be affected by public health measures?
15. Priority status (with decision-makers)	0–2	Is the disease a priority with national health care decision makers?
16. Ease of diagnosis	0–2	Ease of diagnosis; for example, are sophisticated lab tests necessary or is the clinical diagnosis clear enough?

Definitions of the selection criteria for health indicators

Selection criteria for health indicators	Definitions
Acceptability/availability	
• Ammenable to public health surveillance	Extent to which the indicator is amenable to public health surveillance; i.e. systemic and ongoing collection and analysis.
• Data readily available	Are the numerator and denominator both currently readily and easily available at the country level?
• Data source	Where do the data come from (e.g. census, vital statistics, health records, clinics, laboratories)?
Validity	
• Accuracy	The degree to which the indicator represents 'the true value of the attribute being measured'.
• Validity in small populations	Does the indicator provide a valid measurement for small populations (not largely influenced by random variation) as are found in the Pacific region (e.g. maternal mortality for population below 500,000)?
Overall relevance	
• Purpose for being requested	
• Usefulness at country level	Is the definition useful for planning and evaluation of health care programmes and activities at the country level?
• Usefulness at regional level	Is the definition useful for planning and evaluation of health care programmes and activities at the regional level?
• Implies specific interventions?	Do changes or patterns in trends indicate a need for response, and will the results of that response show up in the indicator?
• Outcome oriented?	To what degree does the indicator measure outcomes rather than processes?

Data requirements in an existing regional surveillance network

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Abstract

Surveillance and control of communicable diseases in Australia received a boost with the formation of a national network in 1990. Its members now include representatives from each of the six States and two Territories, the Federal Government, New Zealand, and experts in a range of disciplines. Members share their experiences and expertise with surveillance data and other issues relevant to the control of communicable diseases in fortnightly teleconferences, and at face-to-face meetings. Each State or Territory has agreed to the surveillance of a list of 44 communicable diseases. The regions collect a minimum dataset on each person with a notifiable disease, and submit each fortnight's data to the Network secretariat in Canberra; the data are then published in the Communicable Diseases Intelligence, *which is distributed around the country each fortnight. Thus members from the States and Territories with relatively autonomous health systems have participated in the establishment of, and contribute actively to, the regional surveillance system. The same model could be adapted for coordinating similar international activities in the Pacific Region.*

Introduction

Could the regional communicable diseases surveillance network now operational in Australia be adapted as a model for disease surveillance in the Pacific region? Australia has six States and two Territories, each of which has its own health administration, health budget, and its own communicable diseases section responsible for surveillance and control. The Communicable Diseases Network of Australia and New Zealand (CDNANZ) was formed in 1990, and serves as a platform for sharing information on these activities. It has a representative from each State and Territory, the Federal Government and New Zealand, and experts in a range of disciplines including microbiology, epidemiology, infectious diseases and veterinary medicine.

Until this network was established, the only form of regular communication was the publication of fortnightly notifiable diseases data submitted by each region, and a national meeting once or twice per year between Heads of Communicable Disease Control Branches of each State or Territory. The regions shared little other information on surveillance with each other, and there was considerable duplication of effort in planning and revising surveillance and control activities. In 1991, the CDNANZ revised the surveillance programme for the country. Thereafter, collaboration between the members and selected experts from around the country improved by a quantum leap; a new national strategy has just been developed under the auspices of the Network to map out future directions and priorities for communicable disease control.

Thus members of the Network who came from relatively autonomous health regions, share a common vision on the usefulness of surveillance data, and on how information and expertise from around the country can be mobilised to improve the health of all Australians. As such, this model of a regional surveillance system can be adapted for coordinating similar activities between countries in the Pacific Region.

The diseases included for surveillance

We selected a list of 44 communicable diseases, based largely on relatively crudely determined criteria, such as the public health importance of the disease and historical experience in the value of surveillance for the diseases. There are minor variations in this list of diseases between regions, based on local needs. Some regions consider this list to be too long for every health practitioner to notify. Hence there is a shorter list of diseases that the general practitioner has to notify, and this is based mainly on clinical criteria for which a laboratory test is usually not required. There is also a list of diseases for hospitals and for laboratories to notify.

A short list of notifiable diseases would help to ensure a high level of compliance and accuracy in reporting.

There is often a tendency to select a long list of diseases to satisfy the needs of a large number of agencies; this temptation should be avoided. Resources for collecting and analysing the data will always be limited, and we must be selective about the conditions we want to maintain under surveillance. The aim is to have a short list of diseases to help ensure a high level of compliance and accuracy in reporting from the notifier.

Surveillance definition for the diseases

It took considerable debate to reach consensus on the surveillance definition for each of the diseases. There are still some minor regional differences in how the definitions are applied. For each definition, we considered clinical criteria, and coupled them with laboratory confirmation and/or epidemiological information about the disease in the region.

We collect data on the disease and demographic characteristics of the patient. The former include the type of disease, the onset and the notification date, and whether the disease was laboratory-confirmed. The latter includes age, sex, whether the person was an Aboriginal Australian, and usual place of residence identified by postcode and State.

One way to determine how much data to collect may be by considering the person who would be completing a notification form, and asking the question: How likely is it that the person would provide the details, and how accurate is the information likely to be? The fewer details required, the more likely that the notification form will be completed. However, for some selected conditions, we may need more information for a better public health response at the local level, e.g. for meningococcal disease, since such conditions need an immediate response to control the disease locally.

Data collection and record

The notifier completes a prescribed notification form, or for some conditions (e.g. measles) reports it immediately by telephone to the local public health unit, which in turn should take timely and appropriate action. The details of the notification are transcribed on a computerised database that is forwarded to the regional or State/ Territory communicable diseases centre at regular intervals. From there, the database is forwarded to the CDNANZ database in Canberra at fortnightly intervals, where it is incorporated into the national database.

These data transfers can be completed on floppy disc or directly by electronic communications. The most popular package for recording and storing the notification details at the level of the local and regional public health unit is EpiInfo (a word processing, database and statistics system for epidemiology on microcomputers; Centers for Disease Control and Prevention, Atlanta, Georgia, USA). This software package, which is in the public domain, is also used for data collation and analysis by the CDNANZ secretariat in Canberra.

Treatment of the surveillance data

Surveillance data have to be analysed, interpreted and translated into information for decision-making and action. Meaningful data have to be distributed to the data providers, and the people who can take action to control and prevent the disease. Every fortnight, members of the CDNANZ confer through a telephone link-up across the country. These teleconferences provide a forum to discuss disease outbreaks, to share other information on communicable diseases, to share resources and expertise and, when indicated, to coordinate investigations and control activities across the country.

Selected data and information from the surveillance system are published and disseminated in the fortnightly issues of the Communicable Diseases Intelligence, a publication of the communicable diseases section of the federal health department.

Training in disease surveillance and control activities

At the time the CDNANZ was formed, the National Centre for Epidemiology and Population Health at the Australian National University in Canberra started a masters level course in applied epidemiology to enhance communicable disease surveillance and control across the country. The course is a full-time two-year programme. It differs from the conventional MPH programme in that the sterile lecture room is replaced by active student involvement in the day-to-day activities of a public health unit. This model of learning-by-doing (or learning through service) has gained a high level of acceptance in Australia.

Conclusion

We have had our share of teething problems in establishing and maintaining the surveillance system and the network. The system includes data collation from eight regions, and data analysis and interpretation must be encouraged along the way, i.e. from the level of data collection to the point of national collation. The surveillance loop that includes information for decision-making is completed in several ways: when immediate and long term control plans are revised or implemented at the regional and/ or national level, the information is shared at fortnightly teleconferences of the CDNANZ, through the *Communicable Diseases Intelligence*, at conferences and through peer-reviewed publications.

Our regional network experience teaches us:

- to start with a system that is simple, practicable, and acceptable to workers at all levels of the surveillance loop, and most importantly, at the level from where the notification first occurs;
- to identify useful applications of surveillance data at each point in the loop;
- to show the applications and the impact on health to the participants in the scheme and to stakeholders; and then
- to pause, reflect and evaluate the system, and build on its strengths.

Development of health information systems in the era of technological tools: a country perspective

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Abstract

In developing any information system, whether it be local, regional, or international, we must keep in mind the numerous contributing factors that may make a system reliable, sustainable and practical. One must start from the source of data, which in most cases in the Pacific Islands is the community health worker, and consider all aspects of information system development, including, sectors other than health. It is important that national planners and information specialists be aware of all of the factors responsible for accurate, reliable and sustainable information systems. Only nationals can have a say in the design of an appropriate system for their country and territory. The importance of human resources development, including the training of health care workers at all levels deserves to be emphasised in basic public health. A well designed and reliable health information system, making the most of current technology, is a crucial element in ensuring a reliable local, national and international information network to monitor diseases and conditions of public health importance.

Introduction

This paper is meant to raise several issues of concern in health information system development in countries and territories as experienced by the author. Some of these issues may need to be addressed at the local level to ensure a development of sound health information systems that are sustainable and appropriate to the individual countries and territories. In highlighting areas of concern the paper also aims to facilitate debate on some of the issues in order to enhance the development of health information systems which are able to respond to local community needs, and to country, regional and global needs.

Given the complexities of the world we live in, how can one expect to develop a health information system which respects individual country needs while meeting regional and global needs of public health surveillance? Surveillance should not only be seen from the disease perspective of trends analysis and epidemic control, it should be seen as a health management tool available to managers to assess quality of care and overall quality of life of individuals and communities. Therefore, in designing surveillance systems, one should bear in mind the multiplicity of factors that may affect the ways in which surveillance systems are developed in the context of information system management. Designs of most comprehensive health information and surveillance systems attempt to achieve:

- a system required by donor agencies to evaluate the outcomes of their investment;
- a system to measure the outcome of interventions;
- a system to keep track of particular diseases of public health importance;
- a system to provide and exchange health information between and within countries on important diseases and conditions of public health importance; and
- a system to measure the overall quality of life of individuals and communities.

The first of these objectives is not a matter for discussion in this paper. However, it is worth noting that, existing systems are often compromised due to project requirements which tend to develop individual systems that often duplicate and are often difficult to co-ordinate with existing systems. The requirements of projects (often externally driven) to develop individual information systems to measure the outcomes of individual projects often do not make serious attempts to improve or integrate with existing national health information systems.

The issues

In order to reflect the needs of the countries and territories, the areas of concern which managers of health information systems may overlook in their design and development have to be discussed.

Available technology

Health information system managers are often focused on the health network and do not look at other areas of technological development in their countries. In this age of changing technology it is important that information co-ordinators and planners within countries and territories keep updated about broader developments in technology.

Telecommunications institutions, mapping bureaus, oceanographic survey institutions, and space technology (in more developed countries), are examples of sectors which could be consulted in the development of mechanisms for public health information. Managers should feel fortunate in having access to the 'know-how' of modern science and technology in picking and choosing the most appropriate tools for development of an information system. It is important that an appropriate choice is made, as it could well determine sustainability. This is particularly important when there are vast technologies to choose from and there is a fast turn over of new technology. A software available today may quite well be outdated in one year, or a computer purchased today may not be compatible two years on, dependent on the phasing out of older and development of newer and more efficient technology.

Central planning data systems

Health planners and information experts should also be familiar with their respective central planning offices. This is vital to development of health information systems whose functions are in line with national goals and objectives, and is particularly important in the small island countries where there is already limited manpower and resources.

Development and design of any information system should involve peripheral health workers.

National planning offices often have information on census data, economic development indicators, education enrolments, birth registries, developmental projects and other development initiatives that may impact on the health of individuals and communities. Familiarity with these will enable health planners and information officers to develop health information initiatives that take into account other factors in the measurement and monitoring of the quality of life of individuals and communities.

Intra-sectoral systems

It is also important that managers and planners of health information be aware of public health information-generating institutions and mechanisms within the health sector that could be used for surveillance purposes. Examples of these include:

a) existing laboratory and diagnostic facilities;
b) pharmacies and drug distribution systems;
c) out-patient attendance;
d) death certificates;
e) hospital-based data; and
f) reports of existing research findings and surveys.

Often managers of information systems lack the capacity to co-ordinate information from each of these different health sections. Planning sections within the health sector need to have a role in development and design of integrated information systems. Staff in this section should therefore be trained and equipped to develop good surveillance systems.

Selection of indicators

In a broad sense, health indicators fall into the following five categories (Vaufhan, 1989): health policy, social and economic development, population, provision of health care, and health status. When determining specific indicators for collection and monitoring, it is important that health planners and information specialist have an overall picture of indicators in mind. This is important to ensure the development of an integrated information system which reflects the needs of the community and those of national development. This is often not the picture brought by short term consultants who visit countries for short periods of time. It is therefore in the interest of national health planners and information specialists to guide visiting technical experts in addressing overall pictures of health information development and management in light of other sectoral developments.

Standardisation

Standardisation can apply to numerous aspects of information system development, and at numerous levels of the system. Among the most important ones are: computer hardware and software, transport mechanisms, indicators required for measurement, case definition of diseases being measured, and terminology. Each of these should be kept in mind when considering standardisation of any information system. Standardisation is essential in making comparisons between localities within countries, between regions and between countries, resulting in improvement in the quality of data being gathered at all levels of the information system.

Simplification

Most peripheral health workers may not be well informed about issues of public health and the need to collect reliable data. Tradition has it that community health workers usually focus on curative health care, resulting in little or no time given to checking the accuracy of data or completing complicated notification forms. Data collection is of secondary importance to health workers faced with sick children and adults attending clinics needing prompt attention and treatment. The notion of community diagnosis takes second place in such instances.

In the case of reporting of particular disease conditions, peripheral health workers rely on syndromic diagnosis and management of diseases. Although more work needs to be carried out in the Pacific region on the specificity and sensitivity of syndromic reporting, it is important to keep in mind that reports of certain diseases are often syndromic and dependent on the clinical competence of individuals observing and diagnosing them. This calls for development of simple guidelines to enable accurate collection of numerator data required for surveillance in a rural community. The design of tools to collect data, such as forms, cards, fax messages, computer programmes and reporting lines of communications should also be simple.

The role of donor agencies and consultants

Donors and project design experts often focus attention on individual projects and especially upon outcome indicators of the project rather than the total picture of the country's status of development. Health consultants often focus on the health sector and often lack the capacity to create linkages with other government sectors within the country. It is therefore important that managers within the country play a proactive role in the design, development and implementation of any health information system so that it will be sustainable even if the project comes to an end.

Consultants and donors need to be aware of the overall status of development of the particular needs of countries before venturing into development of information systems for individual projects that may turn out to be counterproductive in the long run. Wider consultations also need to be made between different sectors of government. We believe this can be best facilitated by counterparts in countries who should have the knowledge of the different relevant sectors in countries.

The need for country action

There is therefore a need to establish a clear link between health ministries and ministries of central planning and statistics in most countries and territories of the region. Denominator surveillance information is usually available from census offices, which are often located in central planning. Health planners and information co-ordinators should strengthen the link with central planning. Such linkages will ensure accurate and consistent denominator data for the calculation of standard rates which will assure reliability when comparing rates between communities and countries.

It is important that information needs meet those of the peripheral health personnel and that they are trained to visualise the importance of health data and the need to collect it. Development and design of any information system should involve peripheral health workers. In a sense, we believe in the bottom-up planning approach in the development of information systems. This means eliciting the involvement of peripheral health staff right from the start of any initiatives to develop an information system.

In planning to set up information networks it is also important to make an assessment of overall communications networks in a country or territory. One may frequently be surprised to find what other sectors of development have to assist in development of health information systems. An example would be to collaborate with telecommunications institutions to enhance use of modern technology in communication to facilitate health information system networks.

We have the opportunity of learning from accumulated knowledge of major diseases and their aetiologies. It is important that health planners and information experts be made well aware of the important disease and conditions of public health importance in their countries. Human resource development and training in community diagnostic techniques and public health surveillance for community health workers, nurses, and medical students should prove to be a challenge for any health institution geared towards preventive health. At the national level, public health training focusing on epidemiology and integrated public health management should be a challenge for health decision-makers.

A more proactive role needs to be taken by planners in negotiation of projects funded by donors. This would ensure that the donor and the country reap the fullest benefits of the project.

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Strengthening health information and surveillance systems in the Federated States of Micronesia

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Abstract

Many people have made considerable efforts to collect and report health data in the Federated States of Micronesia (FSM), yet the results of these public surveillance efforts are considered inadequate. An organised approach to identifying problems and constraints, assessing priorities, and defining policies, procedures and responsibilities holds the best promise for improving surveillance and health information.

Introduction

Many health programmes have been undertaken in FSM, but despite good intentions and hard work, evaluation of these programmes remains exceedingly difficult. At the same time, new disease outbreaks and other health concerns are under-reported, inconsistently reported, or not reported at all. In short, the public health surveillance system is in poor health.

There are many reasons for the poor health of the surveillance system in FSM. These include complicated reporting procedures, lack of standardised forms, untrained personnel, lack of responsible supervision, multiple health providers and programmes, politics, lack of co-ordination between involved agencies, and public ignorance. All of these factors contribute to the current malaise.

The real victim, however, is the health of the people in FSM. Without appropriate, complete, and readily available surveillance data, disease trends cannot be reported, potential epidemics cannot be averted, the efficacy of health programmes cannot be assessed, health priorities cannot be established, and limited resources – medical, financial and personnel – might be wasted or misallocated.

While this surveillance system 'illness' is serious, the potential for recovery is good. But the remedy will require heavy doses of self-help and disciplined adherence to a plan of rehabilitative therapy. While no claim is made for an excellent 'miracle cure', a surveillance policy that simplifies, streamlines, co-ordinates, and ultimately strengthens the health information and reporting system is not unobtainable. What follows is not a panacea, but a **plan of action** characterising the type of improved surveillance system that could be established in the FSM. The State and National Governments would have to join together to realise this 'cure', thereby improving the health of the real patient – the people of FSM.

Sources of health information

The major sources of health information in the FSM include: notifiable disease reports, hospital inpatient records, birth and death certificates, hospital outpatient encounter forms and registers, public health records and reports, and community health centre and dispensary records.

Notifiable diseases

When a suspected case of any notifiable disease is first detected, it is reported to the health statistics office of the state (Chuuk, Kosrae, Pohnpei, or Yap) for appropriate action. In addition, those notifiable diseases listed under Category A (urgent notifiable diseases) must be reported immediately to the FSM Headquarters. Each State reports routine notifiable diseases to the FSM National Health Statistics Office (NHSO) every month by fax or written form. The NHSO in turn informs all appropriate international agencies, such as WHO, SPC, and CDC.

Many people have made considerable efforts to collect and report health data in FSM, yet the results of these public surveillance efforts are considered inadequate.

Hospital inpatient records

These records are kept by the medical records specialists or technicians in each state and are reported to the NHSO annually. Hospital discharge diagnoses are recorded by physicians on the face sheet of each patient's discharge record, are coded according to the International Classification of Diseases, and entered into computer databases. At the end of each year these are forwarded to the NHSO for editing, analysis, and compilation. The edited databases in standardised format are sent back to each State for storage and use by health programme managers, administrators, health planners, and physicians.

Births and deaths certificates

Birth and death information from hospitals is recorded on the face sheet of the discharge record, and on a standardised birth or death certificate by the attending physician, or by the medical statistician and reviewed by the attending physician. Births and deaths outside the hospital are reported on a worksheet and then transferred to the standard certificates, with cause of death entered by the chief of staff based on available clinical history. These are reported to the NHSO quarterly. Deaths caused by Category A notifiable diseases are reported immediately by fax or telephone to the FSM National Headquarters.

Hospital outpatient encounter forms and registers

Information is recorded on the patient's chart, and key data, including diagnoses, are noted on an encounter form. Yap and Chuuk are still using a standardised prescription form in place of an encounter form, which summarises diagnosis and treatment for each patient. The diagnosis tally is recorded on a tally form, which is used to tabulate the oupatient diagnoses by diseases. Notifiable diseases are tabulated at the same time, and those in Category A should be verified by a doctor and reported urgently. Others are sent to the NHSO on the monthly Notifiable Diseases report form. Kosrae and Pohnpei States use an encounter form completed by the physicians and sent to the medical record office for computerisation and analysis.

Public health clinic records and reports

These encompass specific health programmes such as tuberculosis, leprosy, sexually transmitted diseases, immunisation, non-communicable diseases (diabetes, hypertension, etc.), nutrition, prenatal, postnatal, family planning, school health, family health, substance abuse and mental health. Most of these programmes are funded by the US Government, and to be funded must meet specific reporting requirements. In addition, there may be reporting requirements to international agencies. Most of the public health and clinic staff are nurses, who also do data collections, analysis and recordings, and reporting for the state and to the national programmes co-ordinators. The programmes are vertically oriented, with separate funding but overlapping goals and objectives. The integrated production of health indicators rests on the co-ordination of these programmes, but collaboration and communication are often lacking. Programmes generally have their own recording and reporting mechanisms.

Dispensary and aidpost records and reports

Information recorded on a daily worksheet form includes the patient's name, age, sex, signs and symptoms, and treatment given. The daily worksheet form is sent to the central hospital, the Primary Health Care or the Dispensary Office located at the central hospital, which monitor activities and reasons for visits. Notifiable diseases are not extracted from this source of information. Morbidity and mortality information from this source is not included in the reports to regional and international agencies. Information on vital registration, environmental health, and health education and health promotion activities is not kept at the dispensaries. No community health profiles were available in the dispensaries at this time.

Problems and constraints

There are several constraints to an effective health information system in FSM. First of all, the surveillance policies and principles are not well defined, neither are the responsibilities for reporting, interpretation, and action. The health information infrastructure is not well developed. The staff are inadequately trained, and skilled staff are few in number. The capacity for accurate diagnosis and effective action is often inadequate.

The importance of recording and reporting and the use of health information is not fully appreciated by all health care providers. Diseases treated at the dispensary or community level are not included in the monthly reports sent to the National Health Statistics Office. Rapid reporting of outbreaks has been lacking, and action delayed or inadequate. Timely feedback is also lacking, and replaced by time-consuming urgent requests for information. Requests for health indicators or other data are not co-ordinated.

The data needs of health programmes often change, inhibiting standardisation of data input and ouput. Consultants and experts propose different remedies of improvement, slowing progress in any single direction. Users may have unrealistic expectations of the capabilities of computers to compensate for problems with data collection, quality and timeliness.

Many of these above constraints contribute to under-reporting of required data, and thus to even less use of the data.

The goals

The public health surveillance system in FSM can be revitalised by achieving the following goals:

- Provide health decision-makers and programme managers, at state and national levels, with valid and timely information on morbidity and mortality related to selected communicable diseases.
- Establish a clear procedural mechanism for disease prevention and control, based on disease surveillance ‘information for action’.
- Organise an institutional framework for health information and disease surveillance, in order to ensure both consistency and continuity.
- Yield monthly feedback on services utilisation of health facilities to health administrators.
- Prepare an annual digest of health statistics, and distribute it to states and national health officials.
- Provide training to those who use health information.
- Assist the FSM States in establishing community health profiles on appropriate and useful health indicators in each island’s community for proper use and actions.
- Encourage use of standardised health data for internal operation and management of the health facilities.
- Develop improved methods of cost accounting, for improved financial management of health services.
- Strengthen data collection and analysis for the monitoring of health status and the effectiveness of policies, procedures and protocols for action.
- Support decision-makers in shaping health policies to meet the goals and objectives of Health for All by the Year 2000.
- Enhance appreciation of the importance of health information and public health surveillance.
- Improve infrastructure at the national, state and community levels.
- Designate focal person at state level in all four States to co-ordinate and oversee all aspects of public health surveillance.

Activities

The following are some proposed initial activities to meet these goals:

1. Establish a national committee on health information.
2. Establish a working group on notifiable disease surveillance at national and state levels.
3. Develop a priority list of notifiable diseases, and a list of core health indicators.
4. Determine data sources, flow, and responsibilities for action for each notifiable disease and incorporate these in national protocols.
5. Train the health personnel involved in notifiable disease surveillance.
6. Implement and evaluate the revised notifiable disease surveillance system.
7. Produce, in standardised format, summaries of hospital utilisation, inpatient discharge diagnoses, and other priority indicators, and distribute to senior health and other officials, and to community leaders.
8. Produce fact sheets and media information on public health problems to promote public awareness.

An organised approach to identify problems and constraints, assessing priorities and defining policies holds the best promise for improving the surveillance and health information system in the Federated States of Micronesia.

Notifiable Disease Surveillance in Fiji

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Abstract

Fiji's Ministry of Health provides free or very low cost health care, including primary and preventive care, to a large proportion of the population. Efforts have been made to strengthen these services through improving information and planning systems, including disease surveillance. The issues can be grouped into eight points, all related to inadequacies between the current surveillance system and Fiji's public health reality in terms of epidemiology, equipment, and financial and human resources. Deeper socio-economic changes like the emergence of a private sector in the health care system are also considered. This paper also proposes some actions to improve the existing Notifiable Disease surveillance system.

Introduction

Fiji is a South Pacific Island nation with a population of roughly 800,000, spread over nearly 300 islands. Fiji's three largest islands of Viti Levu, Vanua Levu and Taveuni hold nearly 95 per cent of Fiji's population. The population is divided roughly evenly between indigenous Fijians and Indo-Fijians. There are also small minorities of ethnic Chinese, Europeans and other Pacific Islanders. Fiji's Ministry of Health provides free or very low cost health care, including primary and preventive care, to a large proportion of the population. In recent years, Fiji has made efforts to strengthen these services through improving information and planning systems, including the Notifiable Disease system for disease surveillance.

Fiji faces a number of problems in carrying out adequate disease surveillance and response. These can be grouped into eight basic areas.

1. An outdated notifiable disease list
2. Lack of standard case definitions
3. Under reporting and late reporting of data
4. Lack of clearly defined public health actions to be taken
5. Lack of resources to take action
6. Lack of feedback to field officers from supervisory and statistics units
7. Notifiable disease data is considered to be unreliable
8. Lack of reporting compliance by private doctors

Outdated notifiable disease list

Fiji currently requires weekly reporting of 46 diseases by all medical officers within the Ministry of Health, and private practitioners. Table 1 shows the list of Notifiable Diseases that are currently reported on a weekly basis by all doctors at Ministry of Health facilities. The list includes several diseases which would be more appropriate for laboratory reporting including encephalitis, influenza, and Ross River fever, Amoebiasis, Salmonellosis, Leptospirosis, Shigellosis, Meningitis, Syphilis, Paratyphoid and Typhoid fevers. Laboratory reporting needs to be more systematically integrated into the notifiable disease reporting system. It also includes in the urgent category of reporting several diseases that are rare in Fiji, including yellow fever, malaria and plague, and which need to be reported urgently only when seen, rather than on a routine basis. The list also includes smallpox, which has been eradicated globally.

Further it contains some case definitions that are not appropriate. For example, infectious diarrhoea is reported only for those under two years of age on the current list, while the under-five age-group is the target group for interventions. The list also lacks certain conditions that have emerged as important conditions of public health concern, including malnutrition, acute respiratory infections and otitis media in children under five, and automobile accidents. Diabetes is also under consideration for inclusion on the list to monitor this serious emerging disease burden. A review of the list has begun with a view to creating a more appropriate list based on possible public health actions and the surveillance priorities of the various diseases for Fiji.

Table 1. Notifiable Diseases reportable in Fiji under Public Health Ordinance, Cap. 91[1]

Category A. Diseases to be notified immediately (by telephone or telegram)

- Acute Poliomyelitis:
  - (a) Paralytic
  - (b) Non-paralytic
- Cholera
- Diphtheria
- Food Poisoning (chemical or bacteriological)
- Enteric Fever:
  - (a) Typhoid Fever
  - (b) Paratyphoid Fever
- Plague
- Smallpox
- Typhus (state type)
- Yellow Fever

Category B. Diseases to be notified weekly in detail (names, addresses, ages and races required)

- Anthrax
- Brucellosis (including undulant fever)
- Dysentery
  - (a) amoebic
  - (b) bacillary
- Encephalitis
- Infective diarrhoea or enteritis under 2 years (severe or moderate infections)
- Infective Hepatitis
- Leprosy
- Leptospirosis (Weil's Disease)
- Malaria
- Puerperal Pyrexia (include Puerperal Fever)
- Relapsing Fever
- Rheumatism (Acute)
- Tetanus
- Tetanus neonatorum
- Tuberculosis
  - (a) pulmonary
  - (b) other than pulmonary
- Venereal Diseases:
  - (a) Gonorrhoea
  - (b) Granuloma
  - (c) Venereum
  - (d) Ophthalmia neonatorum
  - (e) Lymphogranuloma inguinale
  - (f) Soft chancre
  - (g) Syphilis (state type)
  - (h) Venereal warts
- Yaws

Category C. Diseases to be notified weekly by numbers, race and sex only (names and addresses not required)

- Chicken pox (Varicella)
- Dengue Fever
- German Measles
- Infective diarrhoea or enteritis under 2 years (mild infections)
- Influenza
- Measles (Morbilli)
- Trachoma
- Whooping Cough (Pertussis)

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[1] Source: Ministry of Health, Notifiable Disease reporting form.

Problems with case definitions

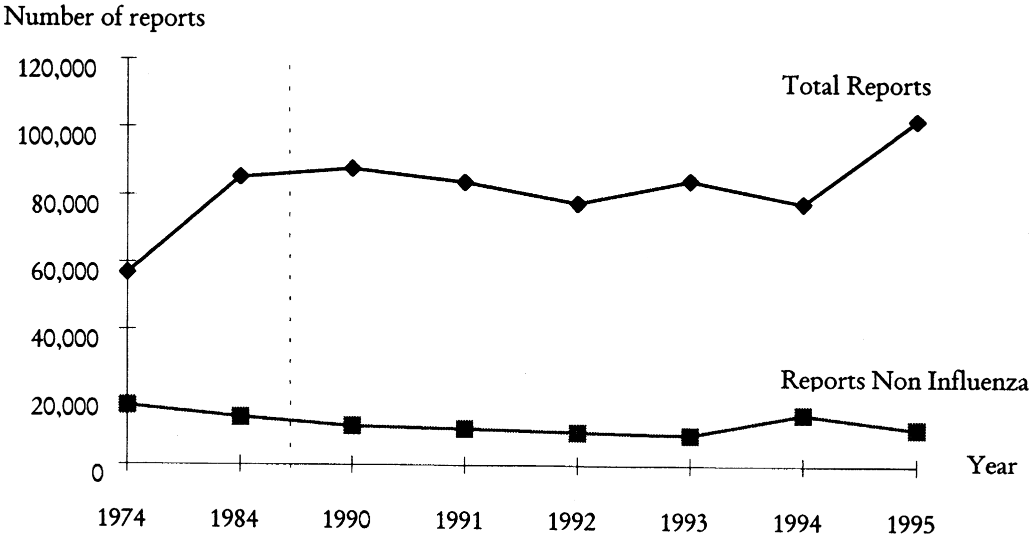
There is often confusion with case definitions in Fiji, due in part to a lack of specific written case definitions for each disease. Laboratories are not currently directly involved in the notifiable disease system. An example is influenza, which is used as an all purpose designation for various viral syndromes, including the common cold, sinus infections and other conditions for which little or no practical public health response is needed. Figure 1 shows a comparison of reported diseases which are classified as influenza with those which are not. As can be seen, only roughly one fifth of all diseases notified each year are classified as something other than influenza. Diagnosis of influenza is made on a clinical basis by epidemic characteristics, but laboratory confirmation is required to accurately diagnose the sporadic cases typically reported in Fiji throughout the year. The result is that the surveillance system is overwhelmed with data on diseases for which no practical response can be made.

Some doctors hesitate to report conditions for which there are public health implications, such as dengue fever, for fear of raising unnecessary alarm.

There is a tendency for doctors to hesitate to diagnose and report conditions for which there are public health implications, such as dengue fever, for fear of raising unnecessary alarm. A lack of laboratory diagnostic tools and a laboratory reporting system both contribute to this problem. The emphasis on development of the disease surveillance system should be on reporting suspected cases even if they later prove to be false. An important reason for having a disease surveillance system is to ensure that all suspected cases of diseases with serious public health implications be investigated immediately. The emphasis up to this time has been on reporting only after the proper diagnosis has been confirmed. For example, tuberculosis cases are tallied into official reports to programme managers and international organisations only after they have been admitted by the tuberculosis hospital. This may be several weeks after the suspected case has been initially identified, and by this time the opportunity to make an appropriate response to control further spread will have been lost.

In general, the ability to respond to outbreaks of disease often depends on programme managers at national or district level to mobilise the necessary resources. The time between diagnosis and reporting to the appropriate public health authority may be several weeks, due to the lack of appropriate systems for handling data at district level and national levels capable of providing timely or readily disseminated information.

Figure 1. Total number of reports for notifiable diseases, and the number that are not for influenza, Fiji, 1974, 1984, 1990–1995[1]



Problems with data reporting

Under-reporting of notifiable disease data is a problem in Fiji. Between 6 January and 31 August of 1996 (a period of 35 weeks), only 57 per cent of weekly notifiable disease reports had been received nationwide out of 2,905 reports which were due from 83 stations. Under-reporting was measured at about 40 per cent on the largest island of Viti Levu, 44 per cent in Vanua Levu, and 66 per cent in the outer islands, which include the Lau and Lomaiviti groups and Rotuma. Data is also not closely linked with other data sources, including Hospital Discharge and community-based data. This makes the outcomes of many cases, including death, hospitalisation, or transfer to other facilities difficult to track. The timeliness of reporting is also a problem – some stations submit reports late, and even when they are on time, there is often little feedback provided to district managers. Copies of reports are sent to subdivisional and divisional medical officers for action, but this data is not analysed by computer, and in general is used to varying degrees by different managers at divisional and subdivisional levels. The data is often not used effectively at this level for various reasons.

In addition to the problem of under-reporting from the field, there is very little, if any, feedback going to the field from the central statistics unit and local supervisors, which makes action based on information difficult, and serves to discourage reporting by many in the field. In practice, there is no single national level coordinating body responsible for responding to or investigating disease outbreaks. Frequently, the news media is the first to identify epidemics or epidemic threats and report them to the public. Recently, the Ministry has been more active in notifying the media of disease threats, and in providing information to inform the public regarding possible public health responses. Recent epidemics of conjunctivitis and influenza type B were reported in local

[1] Source: Ministry of Health, Fiji, Office of Medical Statistics, Health Status Report, 1996.

newspapers and television news along with information on prevention and treatment provided by the Ministry of Health.

Lack of guidelines for public health action

The need for public health surveillance and response has not traditionally been emphasised within Fiji's medical education system. There is a lack of standard accepted action with regard to most of the notifiable disease conditions, and this results in an approach to public health interventions that is often *ad hoc*. Contact tracing programmes are not systematically done for such conditions as sexually transmitted diseases and more serious contagious diseases such as typhoid fever. A publication was produced roughly 30 years ago (when the current notifiable disease system was adopted) that listed procedures for diagnosis and reporting, and actions to be taken for all of the notifiable diseases, but this manual has been out of print for a long period. There is a need for guidelines on appropriate public health actions to be taken once a condition has been identified. The guideline should also help to plan for the necessary resources to take those actions.

Lack of resources allocated for public health action and intervention

There are often insufficient resources made available to conduct surveillance and disease control activities. One case that has been noted anecdotally is the case of Tuberculosis on an outer island. The community on the island has been suffering from a high long-term prevalence of tuberculosis (2.6 new cases per 1000 per year) equal to ten times the national average incidence of 0.28 new cases per 1000 population per year. District medical officers have recognised the need for a mass screening and case investigations to identify cases. So far, the resources to carry out this type of intervention have not been allocated, and the island continues to suffer from a disproportionately high number of new tuberculosis cases every year as infectivity remains uncontrolled.

Data is considered to be unreliable

Due to the problems above, a downward spiral is occurring in Fiji, where lack of feedback and constraints on action lead to under-reporting, which leads to low data quality and questionable reliability (see Figure 2). Notifiable disease data are often reported late, and often epidemics and outbreaks are recognised only after they have partially or fully run their course. For example, data on suspected cases of tuberculosis and leprosy are officially reported only once they have been confirmed through diagnosis by special public health programmes. By this time, any undiagnosed carriers from communities where the infected person originated may have already had the opportunity to spread the disease further. There is often a slow or negligible response from supervisory bodies, due at least in part to a lack of accepted response guidelines and protocols, in addition to resource constraints.

Figure 2. The 'downward spiral' of Notifiable Disease reporting in Fiji

A lack of feedback from the central statistics unit leads to reduced reporting from the field, which leads to poor data quality. The cycle thus continues in this downward fashion, and has led to a current rate of 57 per cent reporting from the field.

Lack of reporting by private doctors

An important factor hampering notifiable disease surveillance is the lack of reporting by private doctors. Out of just over one hundred private doctors in Fiji, only two have provided data in recent years on a regular basis. With a current expansion in private practices, and increased use of private services, the current level of notifiable disease under-reporting can be expected to increase. The Fiji Government needs to look at ways to increase compliance with reporting of notifiable diseases from private doctors in order to improve coverage and increase the accuracy of public health surveillance data.

Plans to develop an action-oriented notifiable disease system

The current initiatives to improve Fiji's health information system will focus on improving the Notifiable Disease surveillance systems:

1. Revising the notifiable disease list based on disease priority, and producing clearly-defined guidelines for disease recognition, reporting, and public health action. This will be accompanied by appropriate legislative changes.
2. Educating practitioners, including nursing staff, in the proper reporting and action steps based on developed guidelines.
3. Increasing compliance rates for notifiable disease reporting within the Ministry of Health and for private doctors.
4. Increasing feedback to field officers from supervisors, including a national disease surveillance and response coordinating body.
5. Increasing local interpretation and use of notifiable disease data.
6. Increasing local capacity to take public health action, when warranted, to halt the spread of disease.

7. Using notifiable disease data to guide preventive activities.
8. A stronger partnership with the local news media, who is generally in the best position to disseminate the data, and possible public health measures that can be taken by the community.

Fiji will strive to rethink and rejustify its disease surveillance system, as the current system is data-oriented, and not geared toward quick response to communicable disease conditions. As Fiji moves to develop its disease surveillance system, it will focus on creating a more action-oriented, decentralised system.

Selection of priority health indicators in New Caledonia

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Abstract

The restructuring of New Caledonia's health information system included measures designed to allow selection of priority health indicators, as part of public health surveillance in particular. These changes are the result of both a number of observations which revealed the need for reforms, and the new requirements of public health and information needs in the Territory.

Work undertaken at the territorial level, which was then refined in joint discussions with SPC, made it possible to clearly define the objectives assigned to the health information system and to approach practitioners for them to apply the health indicator selection methods.

Review of the two selection methods proposed by SPC yielded pertinent information and produced an overall overview of the surveillance system and the indicators' utility. These methods proved to be an excellent communication tool between professionals. These discussions led to better structuring of the various stages of development of the health information system for the future years. Gradual implementation of these changes, the combination of information and action at various levels and the guarantee of the confidentiality of data are particularly emphasised.

Introduction

The selection of priority health indicators in New Caledonia is one of the various initiatives designed to improve the health information system. There are many similarities between measures taken in New Caledonia and the actions implemented in Pacific Island countries and territories by the South Pacific Commission, whose ultimate aim is to make health information systems more effective.

Discussions begun at the end of 1995, involving WHO and SPC in the revision of priority health indicators, which paralleled the concerns of New Caledonian health institutions. There were several common issues. What is the ultimate reason for gathering data? Are they useful for deciding on activities to be implemented in the area of public health? Are the indicators chosen legitimate with regard to the workload imposed on data collectors? Do they correspond to the Territory's public health priorities? And finally, are communication skills suitable? In the Territory, several steps have been taken to adapt the health information system to the new priorities set in 1993 by the Territorial Congress. Discussions covered, in particular, the use of criteria or methods for selecting public health indicators as well as the steps needed to adapt public health surveillance to Territorial health policies. At the same time, networking and information sharing projects were initiated among the various territorial health administrations, public agencies (hospitals, New Caledonian Pasteur Institute) and private-sector physicians. The merit of this reform lay in information-sharing at several different levels, i.e. notification, transmission and analysis of data, use of the results and actions undertaken 'in the field' as part of disease prevention and control programmes. Moreover, the accessibility of new communication technology served as an additional source of motivation.

The New Caledonia health information system was, therefore, at a cross-roads when the South Pacific Commission Community Health Programme proposed holding joint discussions on priority health indicators. The time had come for the Territory's internal reforms to become part of a regional process.

New Caledonia's health information system at the cross-roads

Background

Statistics of territorial importance have been under the jurisdiction of the territorial authorities since 1988. It is on this institutional basis that the Territory's health administration, the Territorial Health and Social Affairs Department (DTASS), has gradually gathered, analysed and produced various health information media. A report entitled Health Situation in New Caledonia is published annually along with a review covering the three usual fields of health systems, i.e. community health status, the health system and its activities and health expenditures. In addition, various complete or sectoral reviews of the health information system were carried out from 1994 onwards. These included reports on tuberculosis, leprosy, rheumatic fever, HIV infection and sexually-transmitted diseases, which were prepared by WHO consultants. An audit of the territorial health information system was also undertaken by a member of the French National School of Public Health.

In the area of early warning or monitoring measures, the surveillance of diseases such as collective food poisoning, STDs, leptospirosis, dengue fever, tuberculosis, rheumatic fever and HIV infection, is carried out by the Inter-institutional Epidemiology Committee. Its task is to improve data collection and communication methods (for example, reports on notifiable diseases are made weekly), regularly return local monitoring reports and sensitise doctors in all sectors (private and public).

From the data provided, strengths were identified but areas of weakness were also revealed. For example, observations by private physicians in the greater Noumea area were under-represented in the health information system even though this area (i.e. the communes of Noumea, Dumbea, Paita and Mont-Dore) accounts for some 60 per cent of New Caledonia's population. In addition, the health information system lacked adaptability, responsiveness and decision-making value, particularly in the area of public health surveillance. This implied a need for a re-organisation of the disease notification system and the choice of diseases for surveillance.

Other gaps were detected in the various fields of observation. In some sectors, developments are taking place, e.g. data on hospital patients, diseases treated and their degree of complexity, information on medically-evacuated patients, acute rheumatic fever surveillance, the extent of alcoholism, the Cancer Registry, child health, data on long-term illnesses (provided through the annual treatment guidelines and the annual case note summaries made by the referring physician).

In other areas which are still undeveloped, tools to determine the frequency and follow-up of non-communicable diseases (diabetes mellitus, hypertension, myocardial infarction, asthma), use of hospital emergency services and perinatal observation must be implemented.

Finally, various aspects of the organisation and management of the health information system are currently inadequate. Several measures should allow more efficiency:

- Formally establish the functional relationships and roles of DTASS's partners, i.e. New Caledonia Pasteur Institute, the Territorial Hospital, CAFAT (social welfare agency), and ITSEE (Territorial Institute of Statistics);
- Establish or update protocols for each system, including operating instructions;
- Develop the technical abilities of each person concerned in the system;
- Improve feedback arrangements and frequency through use of various forms of rapid communication.

Use of new information technologies (such as remote processing) is particularly important for the transmission and management of health data, and for feedback of the results.

Public health policies in New Caledonia

Since 1991, the Territorial Congress has gradually introduced a regulatory framework for health statistics. Such statistics fall under the jurisdiction of DTASS, which, in particular, is responsible for implementing collection of data of territorial interest from health professionals. In 1993, new objectives for public health policy were set out by the Congress. This policy has three main thrusts.

The first covers health promotion and prevention with nine priority areas, these being: AIDS and STDs, alcoholism, vaccinations, hypertension, diabetes mellitus, rheumatic fever, cervical cancer screening, tuberculosis and the proper use of medications. Dengue fever was also added to these nine priorities.

The health policy's second thrust is the production of a medical master plan for controlling health expenditures in the public and private sectors. Finally, the last strategy covers planning for the health system and health organisation arrangements, discipline by discipline, with co-ordination and complementarity between political and territorial agencies and between public and private facilities.

A new definition was given to the concept of communicable disease surveillance, with the emergence of the concept of public health surveillance. Shared management of communications networks by public-sector physicians (doctors from social security medical centres, hospital doctors) and those from the private sector has been planned. In this area, use of new information technologies (such as remote processing) is particularly important for the transmission and management of health data, and for feedback of the results. Another development is the involvement in regional dynamics initiated by the South Pacific Commission to reform the common components of health indicators, in conjunction with other Pacific Island countries.

In order to come into line with health policies, work was undertaken in New Caledonia, both with institutional partners (the Provinces, the Noumea Territorial Hospital, the New Caledonia Pasteur Institute, private sector physicians) and with SPC's Community Health Programme. This involved various health information systems and thus several health indicator fields, with the priority given to communicable disease surveillance.

Work carried out in New Caledonia

Work carried out in New Caledonia is initiated and co-ordinated by the Territorial Health Inspector's Office with the support of the Inter-institutional Epidemiological Committee. The work involves adapting surveillance to public health priorities. It takes into account the Territory's special circumstances, i.e. the diverse nature of health facilities and social welfare protection measures.

Health information system objectives

The health information system's three objectives stem from territorial health policy priorities. They involve regular appraisal of the health situation in the community, and facilitating decision-making in this area by providing pertinent indicators of trends shown by diseases and the community groups affected, as well as diseases liable to develop into epidemics. In this endeavour, public health surveillance comprising gathering, analysis and constant (routine) interpretation of data is the underlying concept.

As for communicable diseases, such as dengue fever or influenza, improvement of the health surveillance system also included implementation of action procedures, rendered complex due to the lack of connections between institutional and professional entities concerned.

The second objective: the health information system must respond to the new directions selected in order to follow programme activities, determine their efficiency, and assess and adjust their performances. The field of communicable diseases accounts for a major proportion of these priorities, i.e. protection against infectious diseases through vaccination, rheumatic fever, tuberculosis, STDs and AIDS, and dengue fever. Here again, public health surveillance is a key factor. Indicators relating to activity, diseases treated by health services and the quality of service are essential in order to gauge the response provided by health services or to identify new needs (e.g. in the area of perinatal care).

The final objective of health information systems covers medicalised control of costs engendered by health care, especially those linked to the consumption of medical care and products.

Internal achievements

An initial series of measures concerned sexually transmitted diseases (STDs), large-scale cases of food poisoning, dengue fever and notifiable diseases. An effort to educate and inform all private and public sector physicians (350 practitioners) was undertaken by means of newsletters containing general information and an analysis of health statistics. In order to improve data collection, a free fax number and answering machine were made available. In this area, a computerised surveillance system of activities in the dispensaries of the Northern and Southern Provinces, known as EPITARIF, made it possible to obtain data transmission on diskette for those diseases subject to weekly surveillance.

A second set of tasks involved the methodological tools used to determine priority notifiable diseases. Despite certain weaknesses, this process did provide useful revelations. However, the orientations it revealed must be verified by all parties, especially at the political level.

Analysis was based on a list of notifiable diseases (7 international early-warning diseases, 23 diseases including 8 with specific printed reporting forms, 14 STDs including 5 forms of syphilis) and diseases reported on grouped weekly forms (13 diseases or syndromes). It appeared that collection and validation of data on STDs was complex and that surveillance by sentinel doctors was preferable.

As for child health surveillance, conjunctivitis was eliminated from the list of notifiable diseases, otitis was considered too vague and replaced by purulent otorrhea. On the other hand, acute diarrhoea in children under 5 was retained. As for acute respiratory complaints, these were limited to acute bronchitis or cases of hospitalisation.

A third series of discussions covered management of data in real-life situations during epidemics in the Pacific, such as the 1996 flu epidemic which was first announced on the Pro-MED network. Events showed that, on the Territorial level, there was slow notification of diseases, and alerts were sometimes given by the media. Other weaknesses were revealed, like a lack of surveys around belatedly-reported cases of collective food poisoning, and the difficulty of taking appropriate action for isolated but repeated cases of scarlet fever in some areas. In these circumstances, the need for reform was reinforced by the health surveillance system's poor performance as an early-warning system, or as a way of introducing sentinel surveillance, or as a basis for action.

The need for reform was reinforced by the health surveillance system's poor performance as an early-warning system.

However, it is possible to make improvements. The mobilisation and management following the onset of the Type-III dengue fever epidemic which hit New Caledonia in 1995 and 1996 had positive repercussions. Following this, rapid intervention (e.g. insecticide spraying, outbreak area surveys) and in-field investigations put an early stop to an outbreak of Type-IV dengue fever. This progress was obtained by integrating surveillance in an ordered series of field actions, including outbreak area surveys.

The Territory's other internal achievements included the implementation of surveillance through a network of sentinel doctors (RMS) and a territorial remotely-processed health information network (RTTIS). These two tools respond well to circumstances in the Territory. The sources of health data are divided geographically between the three provinces (Northern, Southern and Loyalty Islands) and functionally between the hospitals, laboratories and social welfare agencies. Moreover, the greater Noumea area, which represents 60 per cent of the Territory's population, is also covered by private sector physicians.

The creation of a network of sentinel doctors began in 1995 in response to a need to provide dengue fever surveillance through the New Caledonia Pasteur Institute. However, this network was specialised and tied to a reference laboratory. At the beginning of 1996, the representatives of private general practitioners met to initiate steps to improve the computerisation of the medical records and facilitate the collection and transmission of information on notifiable diseases or diseases kept under surveillance.

At the end of the test, it appeared that the multiple criteria method constituted an excellent approach in the Territory, provided that the purpose of the surveillance be defined from the outset.

The RTTIS network was set up over a number of stages:

— Education of public-sector partners and private-sector doctors resulting in the adoption of a common computer system for managing and transmitting information.

— Staff training at the Territorial Health and Social Welfare Department.

— Analysis of the configuration of the Territorial Medical Inspection Department computer system and networking of work stations.

— Budgetary reprogramming, in particular with the WHO Regional Office in Manila and the representative in Fiji which provided financial support for this project.

— Implementation of the first phase of the network (transmission, extraction, analysis) with the participation of a technical adviser from WHO.

Co-operation with SPC

Similarities with other Pacific Island countries

The plan to create a Pacific Public Health Surveillance Network and select priority indicators contains strategies similar to those used in the unavoidable reform of New Caledonia's health information system:

— Manage common information between the regional and national levels or between the territorial and provincial levels, taking into account devolved responsibilities, workloads and data transfer media.

— Mobilise information-providers around these methods by targeting common objectives which could be local, national and regional priorities.

— Respect workloads, and the introduction of methods designed to reduce pressure on data-providers and facilitate data transmission.

— Maintain awareness of the usefulness of data compilations and their orientations so as to act at the local level to involve all data providers.

— Make the system interactive.

An instructive pre-test

As part of the preparations for the Inter-Agency Meeting on Regional Health Information Requirements, we began testing a multiple-criteria method (PacSel), formulated by the SPC from American and Canadian experiments.[1] This method of selection was based on using a series of criteria determined by the surveillance objectives. Each of the criteria was given a weight according to its importance (e.g. international context, epidemiological potential, severity and frequency, etc.). By using this set of criteria, a total score is attributed to each disease or syndrome, thereby allowing diseases to be classified. Inclusion on the list of diseases under surveillance depends on a threshold value set in line with local health policy objectives and resources.

A pre-test was carried at the end of 1995. Using a few notifiable diseases and diseases kept under surveillance, it appeared to be fairly easy to prioritise diseases even if the respective weighting or definition of the criteria need clarification or discussion depending on the professional using the method.

In this way, the highest scores were obtained for diseases such as dengue fever, collective food-poisoning, pulmonary tuberculosis, influenza, rheumatic fever, cerebral-spinal meningitis, diarrhoea in children under 5, HIV infection. Other diseases had very low scores, e.g. conjunctivitis, amibiasis, salmonellosis (other than typhoid), otitis, latent primary tuberculosis infection, other forms of meningitis. Other diseases such as STDs and hepatitis had variable scores depending on their form. Chlamydia infection had a very low score as did genital herpes, condyloma and trichomoniasis. However, recent symptomatic syphilis, and especially urethral discharges scored highly. As for hepatitis, hepatitis B had a high score, taking into account the participation of the laboratories. Finally, rare diseases such as botulism, meningitis due to haemophilius influenzae B, and measles, had variable scores, depending on the weighting given to various criteria.

At the end of the pre-test, it was apparent that the multiple criteria method, although subject to discussion at several levels, constituted an excellent approach in the Territory, on the condition that the purpose of the surveillance of any given disease be defined from the outset.

Application in real-life situations

At the end of 1996, the PacSel selection method was the subject of a series of workshops for health professionals in New Caledonia. This involved carrying out a critical review of the methodology, learning how to use this tool and developing a draft list of diseases based on their importance in the Territory. The following elements were highlighted:

- The need to define routine surveillance as compared to surveys.
- The difficulty of using the method for public health surveillance, if the objectives are not clearly defined.
- The need to better define selection criteria, particularly those concerning the operational context and the borderline between criteria.
- The need to discuss weighting of criteria or explain their scores: what were the results of using uniform scoring?
- The importance of using this method with a panel of professionals representing different categories or collection points. In fact, some criteria are scored higher when weighting is done by a specialist who is particularly interested in the disease.

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[1] Read the article 'Harmonization of regional health data needs in the Pacific' by Yvan Souares.

- The difficulty of integrating so-called exceptional illnesses or diseases which have become rare through vaccination (e.g. measles).
- Taking into account criteria such as the cost of surveillance of a disease and the availability of data. Extra criteria might be used for the operational phase.

Applying the method to notifiable diseases

The use of the tool by two groups on various target diseases revealed a need for discussions, either criterion-by-criterion to harmonise the score, or after scoring each disease. The first method makes possible detailed discussion on the disease and more fruitful exchanges on the surveillance system, but it does take longer.

The political priorities in public health must be clearly defined. This involves undertaking efforts to clarify the orientations chosen and to strengthen the educational aspects of data transmission.

The tests on STDs were carried out using weighted and non-weighted criteria. The results gave very similar scores and ranking. A syndrome-based approach would appear appropriate.

The notion of threshold was not discussed during the work. However, it appeared that weighting could be a means of helping bring about agreement in a group on giving a relative importance to certain criteria. We carried out a simulation and the results obtained by two working groups are using changes in the weighting given to criteria (all scoring 5) or by reversing the importance of two criteria, i.e. communicability and epidemic potential. The order of the various diseases remained stable.

Applying the method to health indicators

This initially involved choosing the criteria and their relative weighting for the selection of public health indicators. Two criteria emerged as priorities: usefulness, which includes the potential impact of actions and the perceived importance and feasibility, which includes availability, acceptability and data transfer methods.

In a second stage, the multiple criteria method was used to select indicators from a limited series. During the workshop, it appeared necessary to go through a preliminary phase of criteria selection. This step made the process longer and more complicated, but also ensured better ownership of the method by those who use it as well as better understanding of the method on their part. The objectives of the indicators were then defined as part of the priority programme. This made it possible to reduce scoring differences. For example, for measles, some participants felt that simple cases of measles would not be as reliably notified on a routine basis as deaths, verifiable through death certificates, or even better, through hospital registers, while others considered that the number of notified cases should responded to the objectives of surveillance action.

Use of the method tested did, however, allow indicators to be sorted and eliminate those which appeared redundant or inadequate. Those which could be deduced from routine records were also eliminated.

Use of the method as tested in a real situation demonstrated the need to widen the process to include all participants in the concerned system. Finally, experience acquired with this selection system at national and international levels must be taken into account.

Information obtained

About the method

All this work led to recommendations about using the PacSel multiple-criteria selection method. We felt that one of the prerequisites was to determine priorities defined by public health policy orientations or decisions. From these priorities, objectives can be determined, along with the purpose of the surveillance and the indicators selected.

Moreover, the proposed criteria must be set out in a detailed manner so that users can learn how to use them. They will then be able to weight them differently depending on their objectives. It is vital that all those partners who are or will be involved in the surveillance or transmission of data be involved, so as not to impose a health information system on them, but rather to rally them around a common project.

The proposed method is an analysis tool that permits the identification of gaps, while at the same time making the health information system less unwieldy, and proposes priority indicators and collection methods to be implemented. This method can be implemented at various levels, and makes it possible to classify special interests (e.g. site, clientele). It also makes it possible to clarify local and national functions by identifying common priorities. Finally, it represents a negotiation and communications tool between health professionals (use of a common language and methodology).

About the process

Bringing about a reform of the health information system (public health surveillance and priority indicators) requires that several parameters be taken into account from the very outset of the project and during the various stages to be planned over time. Among points to be considered, there are technical parameters associated with understanding the method; logistical parameters connected to support of data transmission media and rapid access to analysis; organisational parameters connected to the specific characteristics of the health system; and human resource parameters with the training prospects at several levels.

The scheduling of the various stages would appear to be a factor for success in order to enable each participant to adapt and identify the required human and material resources, with the project leader giving continuity to this approach. Political validation is essential for reform to commence, because this reform pursues the goals of providing fuller information about the health situation at national level and supplying the necessary know-how to set-up and monitor programmes, and also because this reform implies an adaptation of human and material resources.

Conclusions

We feel that joint initiatives by international or regional organisations such as WHO, UNICEF or SPC to harmonise health information requirements in the Pacific are in many ways highly opportune, as well as being beneficial for New Caledonia. The first result of this work has been the formulation of two methods to select indicators useful for public health surveillance in various areas.

The incorporation of this reform has led to a list of common health indicators within a wider Pacific public health strategy. Interest in this approach is two-fold. On the one hand, the political priorities in public health must be clearly defined. This involves undertaking efforts to clarify the orientations chosen and to strengthen the educational aspects of data transmission. The PacSel method proposes a tool for decision-making in surveillance, according to predetermined criteria, on the condition that its users be carefully chosen. On the other hand, application of this method requires discussion with the various public health players concerned. Such discussions can only lead to better participation in health information systems, once they have been determined by all professional partners.

However, this transformation must be introduced **stage by stage** with each country having its own timetable. It would appear important to separate various fields at this point in time. Each priority surveillance activity must be studied from the point of view of the full information chain required even if some activities will be common (concept of surveillance system planning). It will then be vital to connect the information communication process with **information use** at various decision-making or outlying levels.

Finally, it would appear that transparency and improvement in surveillance, in particular of communicable diseases, is raising legitimate questions about **data confidentiality**, the infringement of medical secrecy, the borderline between the common interest and respect for individuals' private lives. There are guarantees to be formally provided by public health professionals to the politicians, field clinicians and members of the public if we want public health surveillance to increase in efficiency and be respected.

Telemedicine in Micronesia

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Abstract

Distance and isolation profoundly affect the delivery of health care in the islands of Micronesia. The lack of specialty services on most of the islands has led to a costly off-island referral system that strains health care budgets. Care providers have incorporated advances in telecommunications to create a telemedicine network amongst themselves and with a tertiary care hospital in Hawaii. They developed an interactive video teleconferencing system, a still-image transmission network, and a data-transfer network for use principally in patient care and continuing education. Patients now receive earlier evaluation by off-island specialists as part of an effort to improve the appropriateness of off-island referrals. Regularly-scheduled medical lectures are broadcast from Pohnpei, a main island, to physicians in several more remote locations. Transmission costs are kept low by using, when possible, pre-existing public service satellites, such as the PEACESAT system that serves the entire Pacific basin. The telemedicine system is evolving and its success depends greatly on the cooperative relationships of the partners.

Introduction

This paper describes a telemedicine programme designed to improve health care and health education in the Micronesian nations of the Republic of Belau (Palau), Republic of the Marshall Islands (RMI) and the Federated States of Micronesia (FSM). The programme is active and evolving, and it uses both low cost equipment and transmissions.

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Micronesia is an ethnogeographic region in the west-central Pacific, characterised, as its name suggests, by small islands (Figure 1). The names of few islands are well known: Yap because of its large stone coins, Bikini from America's testing of atomic weapons, Truk (now Chuuk) and Peleliu from World War II battles.

Among Palau, RMI and FSM, there are about 2,000 islands, atolls and islets, although only 97 are inhabited. The total land mass is only 529 square miles, less than half the size of Rhode Island, and the total population is 160,000. Although roughly 50 per cent of the people live in remote areas, the main villages are densely populated, and 45 per cent of the Islanders are under 15 years of age (Pihoa Data Matrix, 1993). Outsiders, imbued with the image of a tropical island paradise, may consider Micronesia idyllic, but its health care systems are limited. Micronesians suffer from problems of both the developing and developed countries. Malnutrition and communicable diseases, typical of the developing world (such as cholera, typhoid, and tuberculosis), are common. There are also high rates of chronic diseases such as diabetes, hypertension and cancer. These diseases are often undiagnosed until quite advanced (Smith, 1994).

Per capita health care expenditures across Micronesia are about $105 per year. Perhaps the greatest financial burden on the health care system is the amount spent on off-island referrals – when patients are sent to Honolulu or Manila for specialty care. For example, Kosrae, a state in the FSM, spends 49% of its health care budget on referrals (Pihoa Data Matrix, 1993).

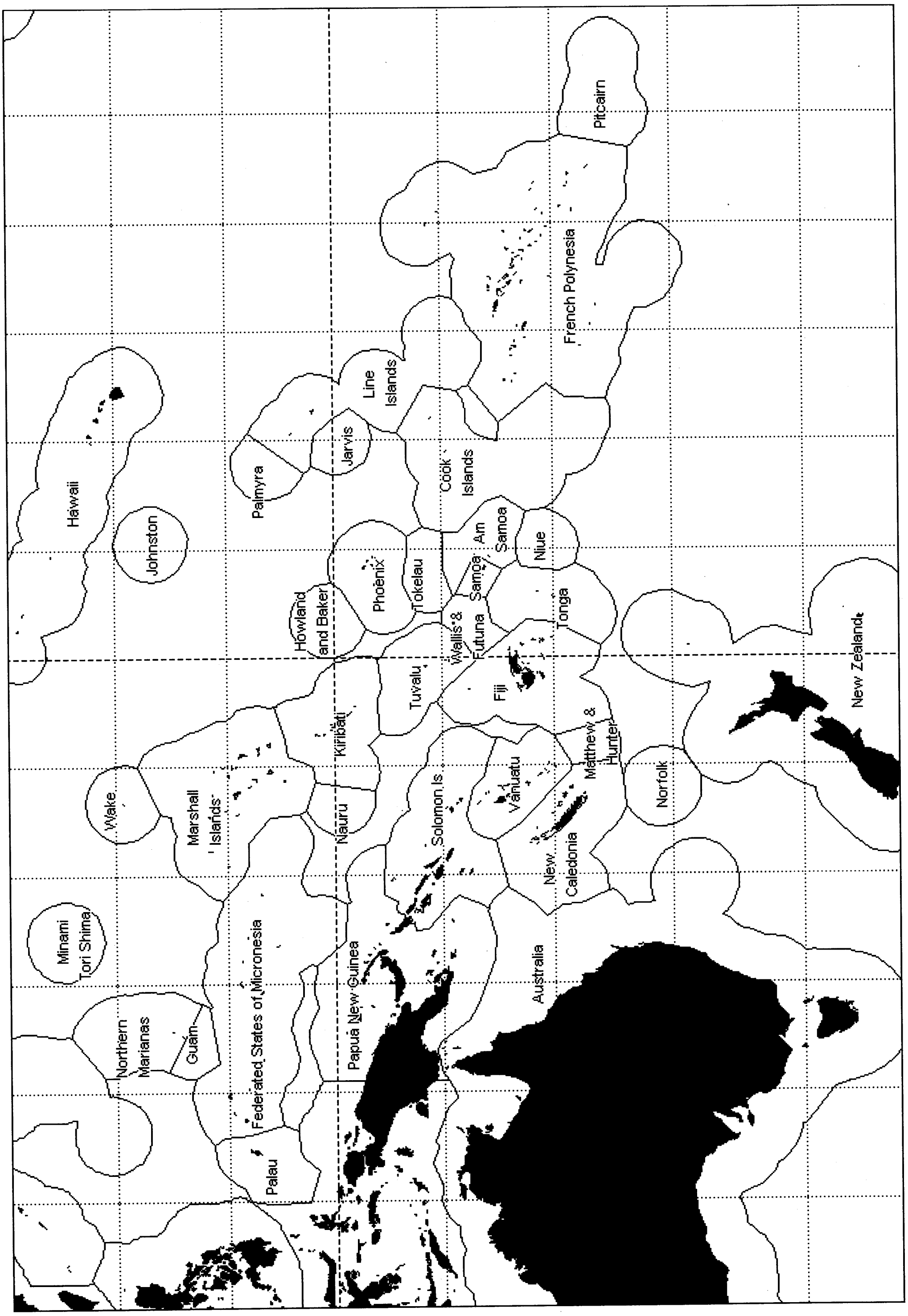
Some barriers to providing effective health care in Micronesia are listed in Table 1, including limited resources, expensive transportation, communication, professional isolation and limited opportunities for continuing medical education. In this paper, we describe how telemedicine may help resolve each problem.

Table 1. Some barriers to health care

Some barriers to health care
Limited primary care and specialty care
High cost of patient transfer off island
Limited diagnostic (laboratory, radiology, and pathology) facilities
Limited opportunities for continuing medical education
Stress of professional isolation
High cost of telecommunications
Too few indigenous practitioners and directors

Discussions of telemedicine often focus on distance and isolation as barriers to care. Perhaps nowhere else in the world do these factors have a more profound constraining effect on health care than in Micronesia. Occasionally islanders still travel by traditional canoe from outer islands to clinics, or they may wait for the periodic visits of government medical teams. Often, outer islanders may receive no intervention at all. Consequently, for much of Micronesia, primary care is episodic and specialty care either non-existent or extremely expensive.

Figure 1. Micronesia, an ethnogeographic region in the west-central Pacific, is characterised by small islands.



Historically, the US Government has had an interest in health affairs of these islands for a variety of reasons. The islands experienced a succession of colonial rulers – the Spanish from the time of Magellan until the decline in Spain's empire in the late 19th century, the Germans until the end of World War I, and the Japanese until the end of World War II. After the Japanese occupation, the United Nations designated the region as a trust territory administered by the US Independence came to RMI, FSM and Palau in the past decade but many indigenous institutions have been irreparably altered.

Kosrae, a state in the FSM, spends 49% of its health care budget on referrals.

Through treaties and compacts of free association, the US Congress has determined that several federal agencies will continue to provide financial and technical assistance in a number of areas (including health care) for these independent nations. The Public Health Service (PHS) helps develop the health programmes; and Tripler Army Medical Center in Honolulu provides tertiary and specialty care for Islanders. The issues of licensure and liability for Tripler's staff were resolved in prior agreements.

Kwajalein telemedicine programme

The Department of Defense leases Kwajalein Atoll in the Marshall Islands for testing the trajectories of strategic missiles. Three thousand Americans, a mix of federal and contract personnel, live on one islet of Kwajalein. There are a few US primary care physicians assigned to Kwajalein, but until recently, residents who required specialty consultations or care were evacuated to Honolulu. The annual cost of these evacuations was nearly $1 million in transportation alone. The commander of Kwajalein's army base asked the commander of Tripler to devise a programme to reduce the cost of off-island referrals – hence the impetus for Tripler to establish a telemedicine program (Delaplain, 1993). The Pacific telemedicine programme was inaugurated in January 1993, using video teleconferencing systems already in place at Tripler and Kwajalein. Transmission relies on an existing defense satellite system. Twice a month, the physicians on Kwajalein arrange by fax or electronic mail for particular Tripler specialists to meet over the airwaves for a teleconsultation.

Adjacent to Kwajalein islet is Ebeye, densely packed with 14,000 Marshallese on an islet smaller than one square mile. Medical conditions are unsatisfactory. Patients from Ebeye are also seen regularly by teleconsultation under Tripler's mandate to provide specialty care to the Marshallese. From 1993 to 1996, more than 250 teleconsultations in 23 specialties (Table 2) have been conducted.

Table 2. Specialty consultations between Kwajalein and Tripler

Specialty	Per cent
Dermatology	40 %
Orthopaedics	20 %
Radiology	20 %
Urology, cardiology, ophthalmology, otorhinolaryngology, psychiatry, social work service	20 %
Surgeries: Plastic, thoracic, general, oral; physical therapy, peadiatric neurology, gastroenterology, adult neurology, obstetrics, allergy, nutrition, podiatry	20 %

The telemedicine programme has enabled prompt intervention before the patients' conditions, acute or chronic, have deteriorated to the point of requiring evacuation. Although no systematic data have been gathered to document its specific benefit, it seems evident that the programme has averted many evacuations of both American personnel on Kwajalein and the Marshallese on Ebeye.

Telemedicine in other Pacific Islands

The residents of Kwajalein and Ebeye constitute a small proportion of the federal beneficiaries in the Pacific. Tripler Army Medical Center organised a loose consortium of agencies, governmental and non-governmental (e.g. University of Hawaii), to consider additional telemedicine programs to reach the remainder of beneficiaries. This consortium first met in Honolulu in 1994 and continues to work together to coordinate telecommunications activities for the provision of health care services in the Pacific.

The initial goals of the telemedicine/telehealth programme as envisioned by the consortium are as follows:

- to extend primary care services;
- to provide specialty consultations as necessary;
- to develop continuing health education;
- to provide patient and community health education; and
- to provide a communications link among providers in the Pacific.

Together with the physicians and the senior medical leadership from the islands, the group adapted the following principles to guide the planning of additional telemedicine programmes:

- existing low-cost telecommunications technology should be used whenever possible rather than buying expensive new equipment;
- select equipment that is easy to use, as most health workers in Micronesia are unfamiliar with technological devices;

— equipment must be durable and easy to maintain;
— the telemedicine system must be integrated with the existing medical and telecommunications infrastructure;
— local support for telemedicine must be secured before installation; and
— local control should be maximised to maintain traditional cultural values.

PEACESAT

Several of the programmes use the existing satellite communication system known as PEACESAT or Pan-Pacific Education and Communication Experiments by Satellite. This programme is funded by the US Department of Commerce and is housed at the University of Hawaii. It uses older federal satellites (e.g., from the National Aeronautics and Space Administration [NASA] and the National Oceanic and Atmospheric Administration [NOAA]) to provide non-commercial, public-access satellite communications across the Pacific. Many of PEACESAT's ground stations have been in place and operating since 1971. They avoid long-distance charges associated with conventional telephones.

The current satellite, a GOES-2 meteorological satellite provided by NOAA, has a fixed orbit over the Pacific and supports links between and among 44 ground stations in 22 countries and in both US-affiliated and non-US-affiliated states, covering nearly every political entity in the Pacific. The basic hardware of a ground station consists of a three-metre dish and a work station that have a combined cost of $30,000. The devices are usually housed at a government office, often the Ministry of Education. Currently each PEACESAT station is capable of transmitting voice, data, fax, and electronic mail. Several stations can also handle simple still images.

PEACESAT's charter designates four service areas: education, economic development, disaster management and health. An example of an education programme is a multipoint voice-only interactive teacher conference. For economic development, the system is used primarily for fisheries management. PEACESAT's role in disaster management involves both pre-disaster planning and postdisaster response, especially if conventional communication systems are damaged by a typhoon or tsunami. For instance, after Hurricane Iniki devastated the Hawaiian island of Kaua'i in 1992, the Federal Emergency Management Agency (FEMA) used PEACESAT to broadcast from that island for three days before phone service was restored. But until now the health part of the charter has been largely ignored.

The first telemedicine project with PEACESAT was to create an electronic database – Pacific HealthNet – for health care workers. One objective was an e-mail service, for rapid dissemination of health information and an efficient resource for answering questions about specific patients and health problems. However, during the occasional outbreaks of cholera, typhoid, dengue and measles on the islands, rapid multipoint becomes necessary.

The Pacific HealthNet has a limited link with GratefulMed, an on-line database from the National Library of Medicine. Once refined, it will allow MEDLINE searching from some of the most remote locations in the world. Recently the Centers for Disease Control and

Prevention (CDC) placed the *Morbidity and Mortality Weekly Report (MMWR)* (CDC, 1995) on-line, and it may now be downloaded weekly. More important than acquiring the specific information in each issue is the symbolic importance for the staff at these small, remote hospitals to be able to use the communication system for linking them to sophisticated medical databases.

Tripler's medical database (Composite Health Care System [CHCS]) is also on-line. This database allows eligible clinicians rapid retrieval of laboratory and surgical pathology results on specimens sent to Tripler, thereby reducing delays associated with the postal system. The database is available only to federal health care workers in the Pacific, including those in the armed forces, PHS, Peace Corps and Coast Guard. Nevertheless, almost every island has a federal health care worker who can assist the Micronesian physicians with patient data retrieval.

The telemedicine programme has enabled prompt intervention before the patients' conditions required evacuation.

Several current and imminent developments will further improve the PEACESAT system. Today a health care provider must travel from the island's hospital to the island's PEACESAT ground station as the PEACESAT sites and the hospitals are not collocated. New hardware may obviate this problem by enabling remote dial-in access. Several hospitals are planning to install these devices in the near future. Other devices like the AT&T Picasso picturephonecan improve the PEACESAT system. This picture phone is capable of transmitting high-quality, color still images over PEACESAT. Engineers from AT&T and PEACESAT are continuing to test the system and may soon place Picasso picturephones at several PEACESAT stations.

Most importantly, PEACESAT will soon upgrade its services in eight Island states to add multiple compressed video circuits and INTERNET connections to existing services. The sites to be upgraded are Fiji (Suva), Solomon Islands (Honiara), Palau (Koror), Guam, Commonwealth of the Northern Mariana Islands (Saipan), FSM (Pohnpei) and RMI (Kwajalein). The upgraded system should allow interactive motion video among hospitals (including facilities in New Zealand, Fiji and Hawaii) for patient care, medical education, public health and other health-related purposes.

Formal medical education

The Pacific Basin Medical Officers Training Programme (PBMOTP) in Pohnpei, FSM, a satellite programme of University of Hawaii's John A. Burns School of Medicine, is committed to developing an indigenous physician workforce to serve the US-affiliated central Pacific states (RMI, Palau, FSM and American Samoa). Each year, about 15 students are admitted to a five-year programme to become physicians. Graduates earn a Medical Officer degree and are licensed to practice in the participating jurisdictions (Dever, 1994).

Physicians graduating from the PBMOTP return to their home islands for a year-long, poorly structured, locally-controlled, apprentice-style internship. Afterwards they have little or no further medical education. Continuing and graduate medical education programmes (CME and GME) are virtually non-existent, and there is neither adequate funding nor opportunity to send the graduates abroad for courses. The directors of the two medical schools in the mid-Pacific, the PBMOTP and the Fiji School of Medicine, have long sought to develop a distance learning programmes for CME and GME. This model for distance-learning has been adopted by the Fiji School of Medicine under the auspices of the World Health Organization for dissemination in much of the western tropical Pacific basin (WHO, 1995).

The telemedicine system should allow interactive motion video for patient care and medical education.

In April 1995, a distance-learning network for the Pacific was established. AT&T Picasso picturephones were used to transmit voice and high-quality still images over phone lines. An inaugural interactive lecture on acquired immunodeficiency syndrome (AIDS) in the Pacific was presented from Honolulu via the Picasso picturephone, to about 60 on-site health care workers on both Pohnpei and Palau. The audience listened to the lecturer's voice on the Picasso's speakerphone, observed a series of still images on the television monitor, and discussed issues interactively with the lecturer. The lecture was attended by senior clinical and political health officials from several nations, the director of the PBMOTP, and the dean of the Fiji School of Medicine.

The demonstration led to the proposed expansion of this education network in the Pacific basin. The PBMOTP's weekly grand rounds lecture is now transmitted from the medical school to the hospital on Kosrae. Furthermore, instructors at the remote sites can present lectures to the more populous sites. For example, staff at the PBMOTP have delivered presentations on telemedicine to the annual Waianae Comprehensive Health Care Conference on O'ahu, Hawai'i, to the Alaska Telemedicine Project in Anchorage, Alaska, and to the South Pacific Commission in Noumea, New Caledonia.

Patient care network

The telemedicine network has another primary purpose: patient care. Patient care connections will be conducted at three levels. The first level will be intra-island, from one side of Pohnpei to another. PBMOTP students rotate for one-month assignments at a clinic on the opposite side of the island, which is several hours' drive away from the medical school. The Picasso picturephone permits regular teleconsultations and patient-based learning to continue.

The second level is intra-national (for example, between the FSM's smallest hospital on Kosrae and its largest one on Pohnpei). The third level is international (e.g. consultations between the medical officers on Pohnpei and Palau, or between a Micronesian hospital and Tripler). To date, approximately 25 international teleconsultations have been conducted. In about half of the cases, an evacuation was averted. Another use of the Picasso picturephone system will be to bring community-oriented education to several sites simultaneously. This programme will be designed and conducted on the local level.

Electronic mail

A major goal of the telemedicine programme is to establish e-mail links in countries that have no Internet nodes. The health benefits of e-mail include access to medical bulletins, clinical consultations, transfer and discharge summaries, laboratory and biopsy information, educational materials, supply requests, and epidemiological data. Moreover, the interactive or conversational aspects should reduce professional isolation, especially in the more remote areas. For example, Compuserve accounts at 2,400 baud have been established on Pohnpei and Yap for users to retrieve biopsy results, to pose questions to Tripler consultants, or to send transfer notes before an evacuation. The medical sector continues to encourage the telecommunications authorities in Micronesia to establish more efficient e-mail access.

Other beneficiaries

There are a number of other potential beneficiaries in Pacific countries. The Peace Corps medical officer for Micronesia has used the Picasso system from Pohnpei to support the Peace Corps volunteers in FSM. Professional organisations, such as the Pacific Basin Medical Association and the PBMOTP Alumni Association, are considering whether to hold regular meetings over PEACESAT as an inexpensive alternative to periodic gatherings on a particular islands.

Conclusions

We have described the early experiences of a telemedicine network in the central Pacific. The system uses inexpensive, low-bandwidth equipment and, where possible, relies on existing communications systems. This is an ongoing operational programme, not simply a demonstration project. Data collection is underway to permit analysis of costs, clinical outcomes, and effects on referral patterns. Further improvements and expansion are planned as warranted. The Pacific telemedicine programme now provides the following services and capabilities:

- a clinical consultation network for timely access to specialty consultations, which is likely to improve appropriateness of off-island referrals; and
- a health education network to provide CME and GME programmes, which is likely to enhance quality of care and reduce professional isolation.

The following areas have been demonstrated but still require technical refinement:

- access to electronic medical databases such as those at the CDC, National Library of Medicine, and Tripler;
- an efficient e-mail network to permit connections among Pacific basin health workers and from the Pacific basin to the outside world.

This project may be one of the few large-scale, self-sustaining telemedicine programmes in the world. The entire costs of the programme are offset simply by preventing several unnecessary evacuations. Some of the lessons from this programme may be exportable to other underserved communities.

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Vital registration and health programme monitoring in Pacific Island countries – some myths and realities

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Abstract

Population, health and development are linked in a complex dynamic. For example, a very young population structure and an overall environment conducive to high levels of communicable and infectious diseases may have an adverse impact on a country's labour force, its economic productivity and its development potential. Population data are needed to evaluate health conditions and how they interact with particular sub-groups and specific environments. Among the Pacific Island countries and territories, few actually have reliable, accurate and timely information. This lack of data impedes the tasks of national planning agencies and international development organisations, which really need vital statistics to undertake health programme monitoring and impact evaluation. Nevertheless, the registration systems can be improved. Demographers can make a positive contribution towards improving health information in three areas: improving the collection of vital statistics, improving the user-relevance of demographic reports, and contributing to a better understanding among Pacific Island planners and policy-makers.

Introduction

Discussions about Pacific Island social and economic development issues invariably involve considerations of populations. While rapid growth, unbalanced demographic structures, and unequal geographic distributions affect some countries more than others, most Pacific Island countries and territories found in recent years that their economic growth has not kept up with population growth, and that towns and cities are growing at a faster pace than rural populations (SPC, 1994). When reviewing the underlying situational and structural contexts of these population developments, it is quite difficult not to see an important interface with health: regarding fertility, we acknowledge biological–physiological aspects such as the ability to reproduce, and it is impossible to grasp the meaning and implications of contemporary mortality patterns without understanding associated developments in morbidity.

Population, health and development are linked in a complex dynamic, with a country's overall population and health situations both the result of, as well as the cause for, specific social and economic development conditions. For example, a young population structure with median ages of 20 years and younger, as is the case in most Pacific Island countries and territories[1], with high fertility, with high levels of infant and maternal mortality, and with low life expectancy at birth, is usually indicative of the demographic and health status of a developing rather than a developed nation. On the other hand, a very young population structure and an overall environment conducive to high levels of, for example, communicable and infectious diseases, have an adverse impact on a country's labour force, its economic productivity, and its development potential.

[1] The Marshall Islands (14.1 years) and the Solomon Islands (15.8 years), respectively, have the youngest populations of all Pacific Island countries and territories; others, with median ages of up to 20 years are American Samoa, Fiji, FSM, Kiribati, Nauru, PNG, Tokelau, Tonga, Vanuatu, Wallis and Futuna, and Western Samoa (South Pacific Statistical Bulletin, 1995).

While it is not the primary purpose of this paper to review the many facets of the interrelationship between population, health, and development, it is useful to briefly elaborate on some recent conceptual developments in the field of demography, before addressing the question of what demography can contribute towards meeting health information requirements for programme monitoring and disease surveillance in the Pacific Island region.

Population, health and development – an ongoing dialectic

The most obvious indication of a population–health intersection is evident from demography's key analytical concerns with reproduction (fertility, fecundity) and mortality. Major conceptual developments in demography over the past 10 to 15 years saw, among other things, the emergence of a greater population and development focus, and with it, the emergence of more specialised sub-disciplines, such as health demography, and more applied approaches, such as health transition research[1]. Of critical importance in this context has been a growing emphasis on health rather than demographic rationales in such areas as family planning and infant and maternal mortality (Zurayk, 1994).

Most Pacific Island countries and territories found in recent years that their economic growth has not kept up with population growth.

This development is neatly illustrated in the emergence of a 'health rationale' for family. Traditionally the cornerstone of population policies concerned with high rates of population growth – resulting from persistent high fertility amid declining mortality levels, Bongaart's (1978) framework for analysing the proximate determinants of fertility called for greater analytical attention to be accorded to intermediate variables, such as breastfeeding and abortion, which have obvious and direct health implications.

The consolidation of an important health rationale for family planning is also evident from two other developments. The first dates back to the time surrounding the Second International Conference on Population in Mexico (1984), which saw great emphasis being placed on conceptualising population as a *human resource* (Zurayk, 1994). Recognising the important contribution of population to the development process meant a growing general recognition of health considerations in the study of population (and development). The second development has to be seen in consideration of growing concerns in recent years about reproductive rights and health (including sexual health), which all but dominated the Third International Conference on Population and Development in Cairo (1994) – particularly the concern about maternal mortality, as a consequence of having too many children, too early and too close together. The integration of family planning and women (and child) health programmes, are testimony to these developments.

This growing general recognition of health considerations in the study of population (and development) is also evident in the study of mortality, particularly in the area of infant and child mortality. Research on child survival began in earnest in the mid 1980s, following the publication of Mosley and Chen's (1984) analytical framework which views

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[1] For a recent overview on the contribution of health transition research to improving health, see Forum, Health Transition Review, 1995:223–258.

infant and child mortality as the result of 'cumulative insults exerted on the health of the infant and child leading to growth faltering and possibly to death' (Zurayk, 1994). The emphasis on cumulation, stressing a process rather than an outcome (mortality) implied a need to pay greater attention to children's exposure to risk factors, both in terms of (health) intervention and analysis. Much like Bongaart's two-level analysis of fertility, the child-survival framework differentiates between 'intermediate' and 'background' factors impacting on child health[1].

Population mobility (usually referred to as migration), the third component of population dynamics, highlights a further important population and health intersection, as is manifest in the field of epidemiology and the analysis of spatial distributions of disease and epidemics. International labour migration, refugee movements, as well as large-scale and growing international tourism are testimony to the importance of population mobility in the transmission of disease. And geographic mobility represents a key dimension in standard epidemiological problem-solving and procedures, such as shown in recent AIDS studies.

Recognising the importance of population structure and processes, thus acknowledging important population-health intersections, has been a long-established epidemiological practice. Examining the progress of countries through the epidemiological transition highlights that, unlike acute infectious conditions affecting individuals irrespective of age, gender and other social attributes (status, class, income), chronic conditions are more frequently related to specific biopsychosocial factors (lifestyles, heredity, psychological conditions) that are manifest in some population groups (age, gender, occupational status) more than in others.

To understand health conditions in a particular country, and/or to tackle specific diseases, requires a good understanding of the country's demographic profile. Of particular importance are its age and gender structure, age-standardised morbidity and mortality, and the geographic distribution of its population.

The importance of demographic variables regarding health research and interventions is also clearly evident from examining the dynamics of the epidemiological transition. While medical science is usually credited with the elimination of most infectious diseases, an increasing number of researchers have argued in recent years that it had only a limited impact on these diseases, and hence made only minor contributions to the reduction of mortality rates in this century, citing changes in demographic characteristics of the population rather than medical care as key agents of change, brought about by general improvements in socio-economic conditions, education, and nutrition (Pol and Thomas, 1992).

Nobody would negate the importance of vaccine developments and their impact on eradicating major infectious diseases, or at least greatly reducing associated mortality. Analogously, it would be equally futile to pursue a single-minded socio-economic development explanation. The key issue at stake here is not to review the relative merits of demography and health, but simply to highlight another important population–health intersection.

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[1] *Intermediate* factors include such factors as age of mother, child spacing, prevailing health conditions and nutritional status, whereas *background* factors refer to the social context (Mosley and Chen, 1984).

Demography and health programme monitoring – myths and realities concerning Pacific Island vital statistics

Acknowledging the inter-relationship between population, health, and development, what particular practical contributions can demography make towards improving health information and health programme monitoring in Pacific Island countries and territories? Having previously established that indications of morbidity and mortality say much about a population's state of development, and considering the impact of fertility on a population's age and gender structure[1], it appears only logical that the provision of reliable and timely demographic data on one hand, and of planning- and policy-relevant information on the other, are the two most obvious areas where demography can contribute towards improving existing health information systems and (health) programme monitoring.

Population data are essential to describe the demographic contexts in which health conditions occur. We need this information to appreciate existing health conditions and how they interact with particular population sub-groups and specific environments. We need such demographic profiles for health sector planning, both with regard to the setting of substantive programme priorities, as well as strategic goals, objectives, targets and implementation schedules. We also require this information to have the necessary baseline data to undertake regular programme monitoring and to conduct impact evaluations.

Data on births and deaths in Pacific Island countries and territories are usually available from the following sources: population censuses, vital/civil registration systems, and vital statistics surveys. In some countries, one occasionally also comes across village population registers kept by village headmen or chiefs, but these registers are too rare to figure into a serious analysis of population data sources.

Population census

Important demographic data can be extracted from regular censuses, provided, obviously, that relevant questions are included in the census schedules. To allow for an assessment of fertility levels, most Pacific Island countries and territories now include questions on the number of children ever born (and surviving), and/or on births occurring during the 12 months preceding the census. The situation is somewhat different when it comes to evaluating mortality conditions (such as infant and child mortality levels, and life expectancies at birth), with only a minority of countries including the relevant questions on whether or not one's parents (or spouses) are still alive.

There are many methodologically valid reasons for not including mortality questions in census schedules, particularly for the purpose of gauging adult mortality, because some people may refuse to talk about such events, and with internal and/or international migration of great importance to Pacific Island countries and territories, deaths are frequently under-recorded in situations when children have moved elsewhere, thus unable to talk about parents long dead.

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[1] The proportions of a population that are young and old depend largely on birth and not death rates. Populations age with falling birth rates (as the proportion of children is reduced), and declining death rates contribute to younger age distributions as more infants and children survive.

Apart from these obvious analytical limitations, the single biggest drawback of using census data for the purpose of generating meaningful and reliable demographic information is timeliness: with censuses conducted only every five or ten years, it is easy to understand the frustration of (potential) census data users such as policy-makers and planners, as well as international donor agencies and development banks, when provided with important population data that are up to 10 years out of date. We shall return to this issue again at a later stage.

Vital or civil registration

This problem of timeliness could be easily overcome with civil or vital registration systems; such systems are also better placed to capture vital events than retrospective questions such as used in a census, with births and deaths duly registered shortly after their occurrence.

Despite the existence of many different agencies entrusted with the registration of births and deaths, these data are rarely used for computing fertility and mortality rates.

This is the theory. The reality in Pacific Island countries and territories is somewhat different, with vital registration existing in name only! While most countries have set up separate agencies, or specific units in various Government departments to deal specifically with the collection of population statistics, the recording and reporting of vital events is often undertaken by various different agencies, as reflected in a recent review undertaken by the SPC Demography/Population programme (Figure 1).

Across 21 Pacific Island countries and territories[1], the registration of birth and death statistics is carried out by various different agencies:

- specific registrar offices exist only in the French territories of New Caledonia, French Polynesia and Wallis and Futuna, as well as in Fiji and Nauru;
- while Fiji and Nauru have a registrar general's office, the registration of births in Fiji is the responsibility of the Department of Health, while in Nauru both birth and death information is supplied by public and private health authorities;
- similar situations also apply to the Cook Islands, Niue, PNG, Tonga and Western Samoa, where the official responsibility for vital registration is vested in the department of justice or the attorney-general's office, but where birth and death records are supplied by the countries' health authorities;
- in the remaining 11 countries and territories, responsibility for vital registration rests with a variety of other government agencies, such as ministries of home/internal affairs, health, social development and, in the case of Tuvalu, with the Prime Minister's Office.

Focusing on the reporting of these vital statistics, the picture becomes even more complex:

- Only in 9 of 21 Pacific Island countries and territories does the agency that officially registers vital statistics also report these data; yet even among this group, we find that in 5 countries vital statistics are also reported by other government agencies.
- In the majority (12) of Pacific Island countries and territories, however, there is no overlap between agencies that register and report vital statistics.

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[1] Pitcairn Island, with a population of 53 inhabitants as of 31 December 1993, is excluded from this analysis.

Figure 1. Registration and reporting of vital statistics in Pacific Island countries and territories

REPORTING

	Registrar of births and deaths	Justice/ attorney-general	Registrar of BD/ attorney-general plus other department	Health department or ministry	Home affairs/ internal affairs	Prime minister's office	Social development	National statistics offfice
Registrar of births and deaths	New Caledonia French Polynesia Wallis & Futuna							
Justice/ attorney-general		Tonga		Tonga Western Samoa				Tonga Western Samoa
Registrar of BD, justice, attorney-general plus other department	Fiji		PNG	Fiji Cook Islands				Fiji PNG Nauru Cook Islands Niue
Health department or ministry				FSM Guam Palau American Samoa				FSM CNMI Palau Am. Samoa
Home affairs/ internal affairs				Solomon Islands Marshall Islands Vanuatu				Solomon Islands Marshall Islands Vanuatu
Prime ministers office				Tuvalu				
Social development								Kiribati
National statistics office								

Cross-classifying the sources of registered and reported birth and death data, with the sources of vital statistics actually used for computing fertility and mortality indicators, highlights another interesting feature:

— Despite the existence of many different agencies entrusted with the registration of births and deaths, these data are rarely used for computing fertility and mortality rates (Figure 2).

The reason? A high incidence of under-enumeration of births, and an even smaller coverage of deaths are to blame. In the latest available vital registration report from Fiji, dating back to the situation of 1988, for example, registered births amount to only around 75% of births reported by the Ministry of Health for the same year. In Western Samoa, the Department of Justice reported 1,082 births for 1991, with the census recording 4,212 births for the same year. Regarding deaths, the Western Samoan Department of Justice registered 191 deaths for 1991, and 260 deaths for 1992, whereas the annual reports from the Department of Health give figures of 822 and 794 deaths, respectively. In FSM, as yet unpublished figures from the Departments of Health and of Statistics give coverage rates of around 85% and 55% for births and deaths, respectively, as recorded by the Department of Health. Similar situations prevail in many other Pacific Island countries, according to cross-classifications of census and civil registration data, and anecdotal evidence cited by health statisticians[1].

With only the three French Pacific territories, plus Guam and CNMI, an American Territory and an American Commonwealth respectively, actually using their respective registration systems to compute fertility and mortality indicators, one may wonder why Pacific Island countries even bother with various forms of vital registration. As all Pacific Island countries and territories use census data to compute some, if not all fertility and mortality rates required for planning and policy-formulation, it is not surprising that only five countries and territories have up-to-date information on total fertility, infant mortality and life expectancy at birth (Figure 3):

— these are New Caledonia, French Polynesia, Guam, CNMI and the Federated States of Micronesia, the first four as a result of well–functioning registration systems, and FSM because they conducted a census in 1994;

— other countries — the Cook Islands, Marshall Islands, Tonga and Tuvalu — have at least some current population information; whereas

— the remaining countries rely on fertility and mortality indicators that are at least two years old, with the situation most alarming in the Melanesian countries of Fiji, PNG, the Solomon Islands and Vanuatu, where this information dates back four to ten years.

The result of this is a picture most of us are quite familiar with: a prevailing sense of frustration among national planning agencies and international development organisations, which, given their real and obvious need for up-to-date population data, often resort to creating and publishing their own statistics; these are usually based on a selective choice of official recent single-year data without much feel for event coverage or an appreciation of the randomness of vital events over time in small populations. The consequences of all this are fairly generous distributions of fertility and mortality indicators

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[1] The author presently reviews the situation in other Pacific Island countries and territories for which the necessary registration and census data are available.

Figure 2. Data sources for vital events

Data sources for registration/reporting of births and deaths, compared to data sources used for computing vital statistics in Pacific Island countries and territories.

DATA SOURCE: Computing vital statistics

	Same as registration agency	Same as reporting agency	Registration and reporting agency	National population census	Demographic/ vital statistics survey
Registrar of births and deaths	New Caledonia French Polynesia Wallis & Futuna				
Justice/ attorney-general					
Registrar of births/deaths, attorney-general plus other department			Cook Islands Fiji Niue Tonga Western Samoa	Cook Islands (1986,91) Fiji (1986) Niue (1991,1994?) Tonga (1986) Western Samoa (1991) PNG (1990) Nauru (1992,1983)	PNG (DHS, 1991) Western Samoa (VSSS, 1991)
Health department or ministry			American Samoa FSM CNMI Palau Guam	Am. Samoa (1990) FSM (1994) Solomon Islands (1986) Palau (1990) Marshall Islands (1988)	Marshall Islands (HH survey, 1994)[1]
Home affairs/ internal affairs				Vanuatu (1989)	
Prime minister's office				Tuvalu (1991)[2]	
Social development				Kiribati (1990)	

1. The situation is most complex in the Marshall Islands: The Ministry of Internal Affairs is responsible for vital registration, with data on births and deaths provided by the Ministry of Health; the Ministry of Health and the Office of Planning and Statistics provide reports on births and deaths, yet these reports do not figure for the calculation of fertility and mortality rates, which are based on a 1988 census and a 1994 household survey, respectively.

2. The Prime Minister's Office is responsible for registration of births and deaths, with data based on health records.

Note: No information are available for Tokelau.

Figure 3. Timeliness of official Pacific Island vital statistics, recorded as year of most recent report

COUNTRY/ TERRITORY	Crude Birth Rate	Total Fertility Rate	Crude Death rate	Infant Mortality Rate	Life expectancy at Birth
Fiji	1988	1988	1988	1988	1986
Papua New Guinea	1991	1990	1991	1991	1991
New Caledonia	1994	1994	1994	1994	1994
Solomon Islands	1986	1986	1986	1986	1986
Vanuatu	1989	1989	1989	1989	1989
FSM	1994	1994	1994	1994	1994
Guam	1994	1994	1994	1994	1994
Kiribati	1990	1990	1990	1990	1990
Marshall Islands	1994	1994	1994	1988	1988
Nauru	1992	1992	1992	1992	1983
CNMI	1994	1990	1994	1994	1991
Palau	1990	1990	1990	1990	1990
American Samoa	1993	1990	1993	1993	1980
Cook Islands	1994	1987	1994	1994	1988
French Polynesia	1994	1994	1994	1994	1994
Niue[1]	1994	1994	1994	1990	1994
Tonga	1994	1986	1994	1986	1986
Tokelau	n.a.	1985	n.a.	1989	1986
Tuvalu	1994	1991	1994	1991	1991
Wallis and Futuna	1990	1990	1990	1988	1990
Western Samoa	1992	1992	1992	1991	1991

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[1] The actual year these reported statistics (published in 1994) refer to is unclear.

for the same country, and a widespread lack of acknowledging population parameters in development planning and policy formulation, in programme monitoring and evaluations, in annual budget allocations, and in the distribution of development grants and loans.

These problems are compounded by a prevalence of demographic analyses and reporting that emphasise the provision of data rather than information. The predominance of statistics and lengthy discussions of analytical techniques used to generate them, rather than explaining what they mean and how they relate to development and planning, ignores the information needs of potential users, presuming an understanding of demography and population and development interactions that is not always readily available.

Where do we go from here?

What can demography contribute towards improving health information and programme monitoring?

As emphasised earlier, vital statistics provide crucial information to understand the demographic contexts in which health conditions occur. We desperately need reliable and timely demographic profiles for health sector planning, as well as to provide the baseline data for regular programme monitoring and to conduct impact evaluations. There are three areas where demography and demographers can make a positive contribution towards improving health information and programme monitoring: improving the collection of vital statistics, improving the user-relevance and -friendliness of demographic analyses and reports, and contributing to a better understanding among Pacific Island planners and policy-makers of population, health and development interactions.

1. Improve collection of vital statistics

At the core of our efforts as demographers to contribute toward improving health information systems and programme monitoring has to be a critical overhaul of vital registration systems in Pacific Island countries and territories, in areas where a need for such activities appear to be most pressing. This can take various forms.

Considering that only the three French Pacific territories have functioning separate civil registrar offices, with vital registration elsewhere either established in, or associated with national/territorial health authorities, a consolidation of efforts to strengthen vital registration could concentrate on improving and strengthening the professional capacity of national/territorial health departments.

The experiences from CNMI and Guam show that the placement of civil and vital registry units in health departments can yield, when adequately equipped and staffed, up-to-date vital statistics, no different in timeliness and apparent quality from those produced by separate national civil (vital) registration offices.

As the incidence of births in health facilities throughout the region has dramatically increased during the past decade, and given the opportunity to also register non-hospital births during ambulant post-natal check-ups or immunisation campaigns, vital registration should be consolidated by national health authorities, rather than vesting this responsibility in the prime minister's office, ministries of justice, home affairs, and social development. This, for obvious reasons, need not apply to the three French Pacific territories at the present time, where civil registration is as much part of every-day life as the availability of fresh croissants at day-break, seven days a week.

Vital registration should be consolidated by national health authorities, rather than vesting this responsibility in the prime minister's office, or ministries of justice, home affairs, and social development.

An additional argument for the consolidation of vital and civil registration with national health authorities can be made on organisational and fiscal grounds. A proliferation of separate agencies within a country, all supposedly contributing some pieces to the puzzle called vital statistics, without, however, a great track record of successful completion, makes little organisational, and even less financial, sense.

Vital registration needs to be made simple, if our primary emphasis is to provide timely planning- and management-relevant information on a regular basis. Birth and death registration cards need to be easily understood (by health staff recording, as well as by women supplying, the information) and completed within the shortest possible time after birth, in recognition of the fact that health staffs' primary and immediate function is providing health care, and to avoid situations of women and children being discharged without birth registration.

Appropriate staff training needs to be made available, across the board, as a matter of great urgency, particularly for the health workers and government officials entrusted with routine demographic data collections: MCH/FP nurses, health assistants, village health workers, aid post orderlies and district officials. Considering that 75 per cent of the Pacific Island region's 6.7 million people live in often quite isolated (outer islands) rural areas, even the most well-intentioned improvements to vital registration at the national level will mean absolutely nothing in terms of improving coverage rate and timeliness, if statistics from rural areas are not fed into the national system.

Appropriate forms of training also need to extend to those responsible for the final compilation, analysis, and reporting of birth and death data (as will be further discussed in section 3).

Given available expertise and experience in these areas within SPC's Community Health and Demography/Population programmes respectively, there is no reason why both could not collaborate with other interested specialised international agencies in improving vital registration in Pacific Island countries. This, however, also requires the goodwill and collaboration of funding agencies, and the realisation that advocacy, good governance, and structural reforms are only possible once we know who we are talking about: in other words, who and how big our target groups are.

2. Improve user-relevance of demographic analyses and reporting

The most important and immediate objective here has to be a radical rethinking of how most of us go about presenting our analytical work. As stated earlier, the key issue at stake is to move away from an almost obsessive preoccupation with data and methods, to providing information; we need to pay greater attention to 'adding value' to demographic data by translating these into user-relevant and user-friendly information.

We like to stress the importance of *translation*, as not enough emphasis, to date, is placed on potential data-users and their needs. This is because, for one, most of us demographers were never taught to write for anybody else but fellow demographers, or at least for a like-minded audience, with more emphasis placed on data manipulation than data interpretation. The cluttering of demographic reports with equations and formulae suggest a sense of scientific rigor to the non-initiates, but usually not much else. Part of the problem is that most intended users of demographic data and information don't know how to use this material, and hence don't give feed-back to demographers about what their real data and information needs are (this issue will be addressed more fully in the next section).

The key issue is to move away from an almost obsessive preoccupation with data and methods, to providing information.

Planners and policy-makers would find it more helpful and relevant if demographic analyses and reports were to pay greater analytical attention to substantive population and development matters. Rather than stating that a Pacific Island country's Infant Mortality Rate has dropped from 80/1000 to 50/1000, and then proceeding at great length to explain how these figures were arrived at, potential users of such information would find it more useful to know what this rate of 50 means in real terms. For example,

- if it reflects the true levels of Infant Mortality across the country, or conceals significant regional variations; and
- if variations appear consistently between islands, regions, rural and urban areas, and/or are in line with different living conditions (type of housing, availability of water supply and sanitation), socio-economic household characteristics (household income, educational level of mother, food supply, nutrition) and health conditions (access to MCH facilities).

This information is essential to target specific geographic priority areas and devise appropriate intervention programmes and budgets. Only when such relationships are properly analysed and documented in an easily understandable language and format, thus representing true information, will such reports be likely to be used, and justify the collection and analysis of vital and other population statistics.

The SPC Demography/Population programme made a modest start early in 1995 in preparing such planning-relevant country population profiles; draft reports prepared for FSM and Tonga are awaiting final government clearance, and similar analyses are in progress for Fiji, Guam, and Western Samoa, to be followed by population profiles for CNMI and Palau, once results of their recent population censuses become available.

Another important contribution demography can make toward improving health information (and health sector planning), is a greater use of population modelling to assist decision-makers in targeting specific programme areas (see also next section). Based on the use of projection methodology, population modelling or scenario-building can easily pinpoint the implications of future developments in fertility and mortality on population growth, structures, and distribution. This information can be used to:

- identify future health programme priority areas; and to
- evaluate outcomes of different policy alternatives (such as on family planning and infant/child health) long before such policies are actually implemented. In other words, policy-makers can actually 'see' what would happen if they were to adopt different policy options (including pursuing the policy of doing nothing).

Another form of population modelling is the use of population projections to demonstrate the expected effects of health programmes. Mathematically a fairly complex procedure, the *index of health years of life saved by health interventions,* draws on standard life-table analyses and population projections to estimate the number of deaths that would be averted by a specific health programme, which are then multiplied by life expectancy at each age (Preston, 1993).

3. Improve understanding of population, health and development interactions

As previously alluded to, an important reason for the lack of communication between data and information providers and users is that most potential users don't know what to do with these demographic data and information. Data collection hence usually proceeds on the basis of 'everyone else does it and so should we', 'because it is required by law or the Statistics Act', or 'because donor funding is available for it', rather than because it meets well-defined information needs. A prerequisite for improving data collection and management is in-country staff training of national and sectoral planners and statisticians in:

- basic demographic concepts and measures;
- the relevance of population, health and development interactions for planning, budgeting and policy formulation; and in
- data utilisation, such as population modelling.

Only when the relevance of population data for health (and development) applications is understood, can we realistically expect interest in a reliable and timely recording of birth and death statistics, the planning for data and information, and the gradual disappearance from the Pacific Island demographic landscape of Total Fertility Rates of 70, annual upward and downward variations of infant mortality rates by up to 400%, and mortality indicators suggesting half-dead people[1].

The SPC Demography/Population programme embarked in 1994 on providing such in-country training on the integration of population issues into development planning. Workshops have thus far been conducted in the Cook Islands, Fiji, Tonga, Vanuatu and Western Samoa (which included participants from Tokelau), with five further workshops scheduled for 1996 in Guam, CNMI, FSM, Tuvalu and Palau. These workshops are usually attended by national as well as sectoral planners, project economists, and statisticians, and have, in some countries, included health planners and statisticians.

Maximising benefits for the health sector, and contributing towards more effective health information systems and programme monitoring requires little more than consolidating these various activities, and integrating them with similar activities undertaken by other specialised agencies, such as UNFPA, UNICEF, WHO, and the international donor community, with nothing more required of all of us than a commitment to improve health conditions and development in the Pacific Island region and to look beyond our respective institutional self-interests and egos.

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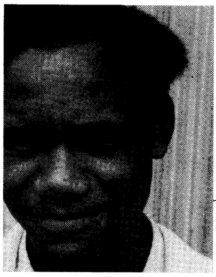

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