

Theme: Building health information systems

Issues and challenges for health information systems in the Pacific:

Findings from the Pacific Health Information Network Meeting 29 September – 2 October 2009 and the Pacific Health Information Systems Development Forum 2–3 November 2009

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*Strengthening health systems
in Asia and the Pacific through
better evidence and practice*

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Acronyms and abbreviations

ADB	Asian Development Bank
AusAID	Australian Agency for International Development
DHS	demographic and health survey
HMN	Health Metrics Network
IT	information technology
MDG	Millennium Development Goal
MICS	multiple indicator cluster survey
NHN	national health number
PHIN	Pacific Health Information Network
POLHN	Pacific Open Learning Health Network
SPC	Secretariat of the Pacific Community
STEPS	STEPwise approach to surveillance
TAG	technical advisory group
UNICEF	United Nations Children's Fund
WFFC	world fit for children
WHO	World Health Organization
WPRO	World Health Organization Western Pacific Regional Office

Summary

This paper summarises the common issues and challenges for health information systems in Pacific island countries and territories. Pacific participants of two meetings hosted by the Health Information Systems Knowledge Hub in 2009 identified these issues and suggested future actions.

These two key events were held in the Pacific region in 2009: a meeting of the Pacific Health Information Network (PHIN) in September in Nadi and a Pacific Health Information Systems Development Forum in November in Brisbane. Both events were designed to create greater knowledge about what is happening within the region, and provide forums to discuss common issues and challenges and learn from relevant local advances.

The global agenda and drivers of health information systems were discussed at both meetings to provide a clearer understanding of how Pacific island countries are positioned within the larger international agenda.

The main issues and challenges for the Pacific islands that were identified were:

- improving data integration and sharing
- increasing data analytical skills among data producers
- regional approaches to health information systems
- strategies for advocacy for health information systems
- the role of health surveys
- the use of institution-based data.

The two meetings provided the opportunity for participants to highlight suggestions for future action. Many of the solutions proposed for the Pacific island countries and territories showed there is potential for regional solutions to the issues. This outcome suggests an urgent need for national health authorities and regional partners to agree on strategies and programs to derive maximum benefit from regional health information system resources.

Two key events were held in the Pacific region in 2009 to discuss the issues and challenges in health information systems.

Introduction

The Pacific region encompasses diverse geography, populations, cultures, economies and politics. It includes 22 island countries and territories, with an estimated population of 9 million people (SPC 2009). The Pacific islands are separated into three subregions of Melanesia (west), Polynesia (southeast) and Micronesia (north) based on ethnic, linguistic and cultural differences (SPC 2009).

Health outcomes in the Pacific region vary with subregion. Infectious diseases continue as a major health concern in some countries, while urbanisation and changes in lifestyle and diet have changed the epidemiology in the region. These factors have caused a rapid increase in noncommunicable diseases.

There is very little published material on health information systems in the Pacific region. It is often thought that information from many Pacific island countries and territories is incomplete, unreliable, obsolete and of poor quality (Finau 1994). To address these misconceptions and strive to close this research gap, in 2009 the Health Information Systems Knowledge Hub hosted the meeting of the Pacific Health Information Network (PHIN) and the Pacific Health Information Systems Development Forum (referred to in this paper as 'the Forum').

The PHIN meeting was held 29 September – 2 October 2009 in Nadi, Fiji. The target participants for the meeting were operational health information staff in their respective countries. The goal was to provide an opportunity for networking and knowledge sharing for operational staff on individual country health information system activities, in the areas of health information system policy, mortality and morbidity coding, and the use of information technology (IT) in health.

The Forum was held 2–3 November 2009 in Brisbane, Australia. The target participants for the Forum were senior leaders and decision-makers who have a critical role in promoting capacity building, knowledge and improvement in health information systems in their respective countries. The Forum's goal was for participants to identify and understand current practice and challenges for health information systems in the Pacific region. The Forum also enabled partner countries to actively contribute to a common vision of how best to build capacity for health information systems in the Pacific.

Fifteen partner countries were represented at the PHIN meeting and/or the Forum:

- American Samoa
- Cook Islands
- Commonwealth of Northern Mariana Islands
- Federated States of Micronesia
- Fiji
- Kiribati
- Nauru
- Palau
- Papua New Guinea
- Republic of Marshall Islands
- Samoa
- Solomon Islands
- Tonga
- Tuvalu
- Vanuatu.

These meetings were designed to bring together regional country stakeholders and global health information systems leaders to engage in discussions regarding the latest knowledge developments in health information systems. Both meetings provided the opportunity for knowledge and experience to be shared among a broad community of interested stakeholders, global expertise and representatives from across Pacific island countries and territories.

While the two meetings had different goals, they each used the same qualitative group methodology with key questions used to focus the discussions.

The Health Metrics Network (HMN) divides health information systems conceptually into six components in their *Framework and Standards for Country Health Information Systems* (WHO 2008; Figure 1). These components were used at both meetings to focus country presentations and to inform about current practice and challenges within their country health information system.

When the Health Information Systems Knowledge Hub was established in 2008, it selected a technical advisory group (TAG) of Australian and international experts who are well known for their contributions to the development of health information system research. The TAG serves as the key technical guide for the Health Information Systems Knowledge Hub, ensuring that the hub can effectively act as a think-tank, convening and advisory resource for the Australian Agency for International Development (AusAID) and

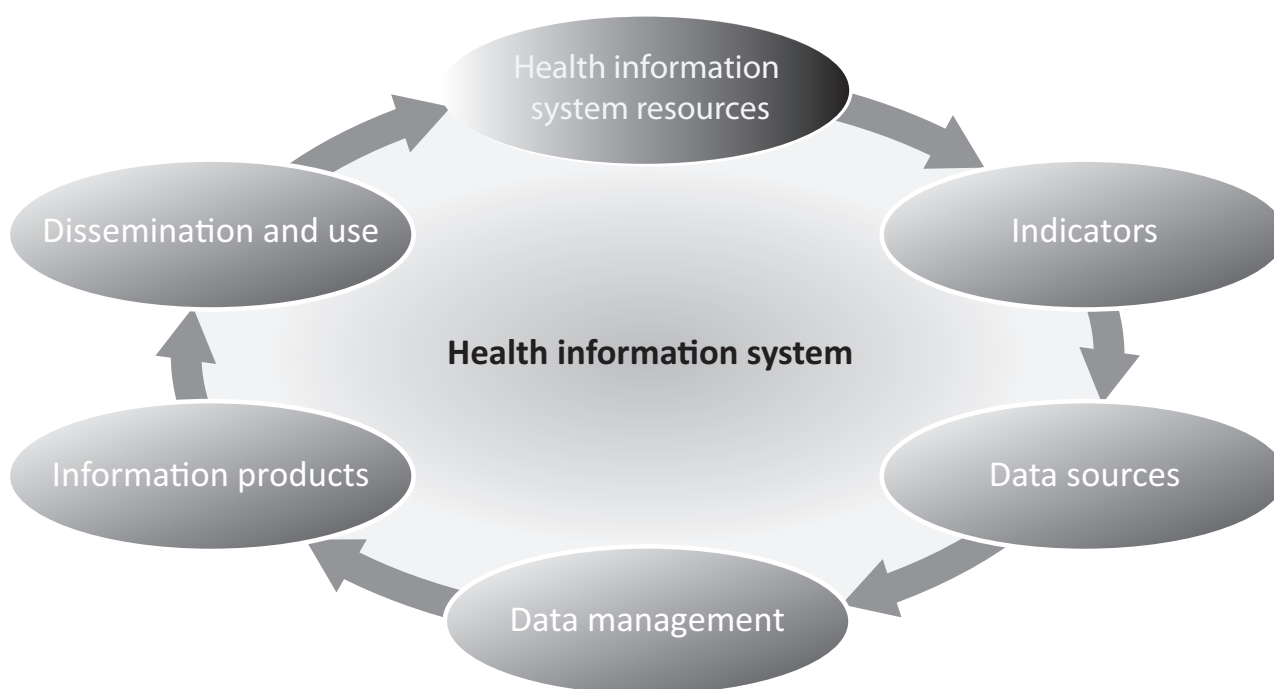


Figure 1 Components and standards of a health information system (HMN 2008)

other development partners. During the Forum, members of the TAG informed the meeting about the latest developments and key issues in health information and each presentation was followed by robust debate on best practice and improvements for health information systems in the region's developing countries. Development partners represented included the World Health Organization (WHO), the Australian Bureau of Statistics, the Australian Institute of Health and Welfare, Fiji School of Medicine, the National Centre for Classification in Health, the National Centre for Health Information Research and Training, the Secretariat of the Pacific Community and the Department of Health and Ageing.

To summarise the learning from the country presentations at the Forum, working groups concurrently further explored key themes, priorities and knowledge gaps that had emerged from the country presentations. The topics discussed were:

- improving data integration and sharing
- increasing data analysis skills among data producers
- the potential for regional approaches to health information systems

- strategies for advocacy for health information systems
- the role of health surveys
- the use of institution-based data.

This paper has been structured around these six specific themes and identifies the key issues and challenges for Pacific island countries and territories in these areas and contains suggestions for future action.

Health information systems agenda

At the Forum, Mrs Carla AbouZahr's keynote presentation summarised the global health information systems agenda, comparing the many international and national demands on health information systems. Globally, it is increasingly understood that there are rigorous demands on health information systems. Health information systems are important for a well-functioning health system, especially because of increased accountability for resource allocation and the need for measuring health outcomes. For donors and decision-makers to invest financially in health information systems, it is becoming more important that performance requirements such as quality, coverage and efficiency are met.

The presentation also identified many well-known complexities of health information system activities. They are systemic in nature, with no easy 'quick fixes' such as through rapid introduction of information technologies and communication.

Data integration and reconciliation issues are prominent and not made any easier by the proliferation of new health partnerships and alliances, both disease-focused and information-focused, as well as the global reporting of Millennium Development Goal (MDG) indicators. Pacific island countries and territories need to be empowered to take ownership of their own health information and to lead strategies and action plans to address such issues. Donors should align their reporting requirements with the country health information collections and plans.

Human resources for health information systems are vital, and there is an obvious need to build on existing capacities for data collection and management. In particular, Mrs AbouZahr emphasised the critical need for developing skills in data evaluation, analysis, interpretation and reconciliation from different sources. These skills are lacking in many countries in the Pacific.

A health information system is vital not only for managing acute diseases but also chronic conditions. With the rapid epidemiological transition in the Pacific from acute to chronic, and the sometimes 'double-burden', there is a great need to address the long-term implications for the health system. Hence, systems need to value longitudinal patient and institution-based data more highly and reward data collectors, managers, archivists and analysts for their efforts.

Mrs AbouZahr stated that health information systems are expected to be fit-for-purpose to meet multiple

users' needs, so must be shrewdly designed. They serve multiple purposes from the perspectives of patients, providers, program managers, communities, civil societies and decision-makers. A health information system must inform all dimensions of a health system's performance: quality, coverage and efficiency. It must provide this information in a timely way. An additional expectation is that the health information system will be the basis for research and knowledge generation.

In light of this broad context for health information systems, Mrs AbouZahr saw that the Pacific region has many similarities with the increasing demands for information both at the national level and regionally.

Improving data integration and sharing

The WHO Western Pacific Regional Office (WPRO) defined health information system integration as 'the process of combining different components of health information systems so that they function in a more coordinated and unified manner' (WPRO 2006). Integration can take place at many levels of the health information system including:

- contents (indicators/information)
- data management (use of information technology including a central repository)
- data analysis and quality assurance (use of standardised analytical and statistical techniques)
- organisation support (training and capacity building)
- data sharing and dissemination (visual analytics)
- donor inputs (resource sharing).

Data integration is the effort to link independent data elements or different data sources with different data types or storage media to create new information. It covers all aspects of data handling from collection, storage, quality assurance and flow to processing, compilation and analysis. The goal of 'perfect' data is largely unattainable because all data collection methods have limitations. In general, there is more scope for data omission and for transcription and computational errors at the primary collection source (eg clinic level). As a result, data reported by health facilities often have quality issues, particularly bias, missing values and computation errors. Therefore, data quality needs to be assessed, including adjustment and reconciliation of data

from different sources so the data is reliable for use for planning and reporting progress on key indicators.

At the Forum and PHIN meeting, participants recognised that collection of the same data multiple times for multiple purposes is inefficient and costly. They also noted that different sources of information often generate different results for the same indicator. For example, maternal mortality ratios calculated from death registrations may differ from those calculated by a demographic and health survey (DHS). While this can appear problematic, it also allows a more critical appraisal of the reliability of different data sources. Reconciling and integrating data from multiple sources can serve a useful validation function and can also help fill critical data gaps.

Within health, data are collected at multiple levels and for a myriad of different uses and users. Clinical data collected by health care providers at the individual level are primarily used in patient care (eg taking a blood pressure reading). A secondary use of the same data (usually in an aggregated format), but applied to a different purpose may involve collating and averaging blood pressure readings from all patients with ischemic heart disease. Secondary data are most often applied to health service management such as resource allocation, evaluation of services, policy development and planning, research and education.

Common challenges for the Pacific island countries and territories concerning data quality and integration were identified and are outlined below.

Poor sharing of data among health information system stakeholders

Participants recognised that information and knowledge are a vital part of public health infrastructure (WHO 2009a) that comprises a public good beyond a health care system (eg transborder information on infectious disease surveillance). Sharing data across multiple stakeholders is a way to add value without significant cost. It allows the same data to be used to answer new questions. In many developing countries in the Pacific, however, data collected by different agencies, or by different groups within agencies, are not routinely shared.

A common problem is that the private sector and nongovernment agencies do not always report data to the ministry of health. The reasons for this are many but usually relate to the absence of a strong legal and regulatory framework governing the private sector. More generally, data sharing within government administrations is often poor because different government departments historically have been separated. Financial incentives for data exchange, combined with lack of knowledge about the potential benefits of sharing data, may be lacking. Other causes are privacy concerns and an absence of the necessary human capacity and technological infrastructure (Pisani 2009). Data sharing should concern all data producers and users in health, regardless of the disease-specific program or corporate function.

Clarity of data ownership

Many Pacific island countries and territories expressed the view that they had little control over the global reporting of their country data. Several country participants described how large donors may require country-level data collection as a condition of funding; however, data is analysed by external experts with little country involvement. This calls into question who owns the information so they can control it and decide on access for its subsequent analysis and use.

Sharing of individual health records, particularly sensitive personal information such as sexual and reproductive health data, is often constrained by privacy and confidentiality. However, it was pointed out that the issue of protecting individual privacy and confidentiality should not be a critical barrier to data sharing. Well-tested anonymisation techniques are now available that overcome many obstacles associated with confidentiality. Such techniques are improving constantly (UK Data Archive 2008) and may be useful in certain Pacific countries. Another issue is the small size of Pacific populations and collectivist cultural values that mean that health information is often informally shared with communities and family members.

Lack of health information system legislation or regulation

Most Pacific island countries have public health legislation that demands reporting of notifiable infectious diseases. However, there is little legislation relating to health information; policies to mandate minimum collection of health data; or standard processes for data management, reporting and dissemination (see Country snapshot 1). The weakness or absence of these measures may contribute to the lack of data sharing among stakeholders.

Nonetheless, several Pacific island countries and territories have a law aligned with the United Nations Fundamental Principles of Official Statistics,¹ which defines the responsibilities of national statistical systems and supports data integration and sharing. These principles could be used as the basis for appropriate health legislation and policy regarding statistical information. However, changes to laws generally require considerable time to be drafted, accepted, implemented and enforced. Many countries therefore have integrated an obligation to report data to the government into the licence to practise for private hospitals and practitioners.

Country snapshot 1: Vanuatu

Vanuatu has a large number of health-related legislation (eg *Public Health Act 1994*, *Health Committees Act 2005* and *Health Practitioners Act 1984*). However there is no legislative framework that specifically provides guidelines on the analysis, collection, storage or management of health information, apart from the mandated reporting of notifiable diseases. This is particularly important because of concerns for privacy and confidentiality in a growing private health care sector.

Need for unique identifiers

Many countries cannot link individual patient data from different sources because there is no unique and permanent individual identifier used in health data collections. A unique identifier would help link data about individuals across multiple databases, regardless of place or type of treatment. Some Pacific countries

¹ The United Nations Fundamental Principles of Official Statistics can be found at <http://unstats.un.org/unsd/dnss/gp/fundprinciples.aspx>

have accomplished this in urban areas, or over the entire country if the population is small. Country snapshot 2 explains how this was achieved in Fiji. The need for unique identifiers is growing as health care transitions from acute, short-term care to the long-term management of chronic, noncommunicable diseases.

Country snapshot 2: Fiji

A national health number (NHN) for Fiji was introduced in early 2002 with the implementation of a computerised patient information system. This tool was key to improving availability and use of information for both patient care and statistical analysis. It works by linking all admitted patient facility-generated data across the country under a common number. Facilities retain ownership of the paper-based record; however, summary data is available for continuity of patient care (including pharmacy, operating theatres, obstetrics, radiology, dental care and some pathology). A person is issued with an NHN and a laminated card when they first register at any facility on the database. The NHN and patient details are automatically synchronised across all linked installations. Patients use the same identification number for services at any health facility in the country that is linked to the system.

Need for data standards

A lack of data standards magnifies the problems associated with fragmentation of data collection and management. This is a particular problem with data collection activities funded by external donors that are not integrated into a coherent national health information plan, or use different standards. Data cannot be readily exchanged, shared, combined or compared when systems:

- lack global standard definitions in health statistics for many quantities of interest
- use different templates, forms, guidelines and databases
- lack consensus with quality assurance processes
- use different analytical methods.

The lack of interoperability across data storage and management systems also severely limits the usefulness of the data collected. Integration and data sharing critically depend on the application of agreed standards

for data and metadata, which make exchanging data more flexible (Standards Australia 2007, ISO 2007).

Better use of technology to increase data sharing

Information technologies have not yet been used to their full potential to improve integrating and sharing health-related data (Tan-Toress Edejer 2000). Electronic medical records, for example, can help strengthen the linkage between patient care and improved public health data. They permit large amounts of data to be managed more efficiently. Potential benefits include more timely and accurate data for decision-makers and better patient information for health care workers and clinical managers. At the aggregate level, information technologies enable data sharing through the use of interoperability standards, permit large data sets to be managed, analysed, stored and archived. International standards for data and metadata exchange include the Statistical Data and Metadata Exchange (SDMX-HD), based on the ISO SDMX standard,² and the SDMX metadata common vocabulary (MCV), which provides standardised code lists across statistical domains. Other metadata, such as referential metadata (data about data) is documented in standards like ISO 11179 (data elements), the Data Documentation Initiative (DDI) (surveys) and the SDMX (summary measures). Most Pacific island countries have little use or understanding of the need and value of data standards for improving the operational ability of their health information system.

Globally, many countries and organisations are developing data warehouses for better data management and sharing. A data warehouse is a consolidated central repository of data with standard definitions in which the data are stored in a common structure that enables them to be analysed by multiple users. A data warehouse supports strategic planning, modelling and forecasting at the organisational level; offers a single, comprehensive and consistent view of the information; and enables data to be readily accessible and understandable. Rigorous data quality standards (see above) are assumed. Without a standardised storage method, data cannot be combined. The data warehouse enables users to compare and contrast data across multiple sources and systems and enables the efficient discovery of previously

unknown, valid, potentially useful and understandable patterns in large datasets with drilldown options.

Inadequate human resources for data management

Better integration and enhanced data sharing critically depend on the availability and skills of data managers. However, in many Pacific countries, data management is undervalued and thus underfunded. The size of total government and health system-specific budgets of these small nations exacerbates this under-resourcing. For data sharing to become a norm, there must be more investment in developing skills and long-term career paths in data management (further discussed in the section on regional approaches to health information system recruitment and retention), as well as in the infrastructure needed for secure storage, backup and archiving. When routine surveillance data are kept (as collected) in separate files for each subpopulation, by location and year, it can take several hours to generate an analysis comparing trends over time. Once data files have been integrated, the same analysis can be generated much faster. Having data stored and managed properly will increase use by local decision-makers, journalists and researchers. Practical support for data management may encourage potential researchers to share data, since it will make their own analysis work much easier.

Suggestions for future action

Participants suggested ways to improve data integration and sharing. These included four ideas for structural changes in health information systems and the use of normative frameworks to promote data sharing:

- **Independent health statistics units**—issues around data sharing and ownership could be resolved through establishing independent health statistics units within countries. Such a unit would have a mandate to coordinate data sharing and assure overall data quality. It would agree on data sharing and accessibility policies, and on applying confidentiality measures. Given the limited capacity in many Pacific island countries, it was also suggested that a regional body or organisation could provide technical support and advice across the region.
- **Data warehouse**—countries would benefit from bringing together data from multiple sources into a data warehouse. This would improve access for users and help implement the principle of ‘collect once,

2 Information on the Statistical Data and Metadata Exchange can be found at http://sdmx.org/?page_id=10 and further information on the Data Documentation Initiative can be found at <http://www.icpsr.umich.edu/DDI/generated> much faster.

use many times'. The data warehouse need not be a single central database containing all data; rather the preferred model was that of a federated system of linked, interoperable databases. They would align with agreed standards for data and metadata quality, and feature user-friendly access, data download capabilities, and unique identifiers.

- **International standard or code of practice**—an international standard or code for data sharing would be helpful, around which national policies could be aligned. Work currently being led by WHO on the development of a 'code of conduct' for data sharing is a useful first step towards this goal. An initial draft was discussed during the meeting of the Global Forum for Health Research in Mali, November 2008 (Global Forum for Health Research 2008). While this proposal related mainly to the sharing of research data, some of the underlying principles are valid also for routine data collections.
- **Core dataset for sharing of health information**—a core dataset is needed, including data from the private sector. As a first step, this would involve adapting existing data to conform to metadata registries such as Australia's Metadata Online Registry (METeOR)³ or the WHO Indicator and Metadata Registry as standards for core indicators (ensuring that they are ISO- and SDMX-compliant). A review of all indicators, forms and data sources within each disease program and service area is needed to determine and define a core dataset for shared use.

Increasing analytical skills among data producers

'At present, the health information systems in many low- and middle-income countries tend to be "data-rich" but "information-poor"' (WHO 2008, p. 42).

Data analysis is the process of transforming raw data into usable information that adds value to the statistical output (OECD 2009). Often presented as a published article, analysis can be both quantitative and qualitative. To meet the increasing demand for information to measure performance against national priorities and policies, there is an urgent need to increase the data analysis skills of information producers. Meeting participants were asked to discuss what kind of data

analytical skills were needed and to provide suggestions on how to improve access to these skills. The people who produce health data can have a variety of backgrounds and be required to produce data for a variety of reasons. Similarly, the types of analytical skills needed are diverse, but effectively need to cover the following nine key areas of health information (AbouZahr and Boerma 2005):

1. census
2. modelling, estimates and projections
3. population and household surveys
4. behavioural surveillance (focus on risk factors)
5. surveillance and response systems
6. health research
7. continuous monitoring of births and deaths, with certification of the cause of death
8. national health accounts, financial and management information
9. service-generated data (facilities and patient-provider interactions).

Based on this framework, the group identified key challenges and issues that needed to be addressed in the Pacific region, including the need to increase capacity for data analysis and ensuring communication of analysis and findings.

Need to increase capacity for data analysis

Often in Pacific health systems, personnel responsible for data collection and analysis are undervalued or underskilled. Therefore incentives are needed at a human resource level to ensure quality of skills. There are limited courses available through formal training institutions such as the University of the South Pacific, Fiji National University, Oceania University of Medicine and University of Papua New Guinea. The group noted that the United Nations Children's Fund (UNICEF) and the Secretariat of the Pacific Community (SPC) deliver biostatistics workshops, but that these were targeted at staff within the national statistics offices rather than health departments. Participants agreed that training on data analysis needs to be tailored to the level of knowledge and background of the target group. Further, an essential step in strengthening a health information system is to bring data producers (those delivering care) together with data users (those involved in decision-making, management, planning and financing

³ Information on the Australian Institute of Health and Welfare's METeOR metadata registry can be found at <http://meteor.aihw.gov.au>

of health programs) (WHO 2007). A good example of how this has been successfully achieved is contained in Country snapshot 3.

Country snapshot 3: Tonga

Tonga's Health System Strengthening Program was initiated in 1999. At the time, there were strong political incentives with a new Minister of Health who had a clinical background. After finding that the Ministry of Health annual reports were unreliable in content and the evidence base for making quality decisions was contestable, a health information system was listed as one of six national priority areas defined in the National Health Strategic Plan 2012.

Funding for the work was obtained from the World Bank and included procuring an electronic patient administration system, which went live in March 2009. The project is an excellent demonstration of the good outcomes that can be achieved with strong political and management support and early engagement of clinical champions.

Ensuring communication of analysis and findings

Health information is valuable if it is useful to decision-makers and provides incentives for, or facilitates, the use of information. Many Pacific health professionals believe that only specialists can interpret epidemiological data. They believe that there is insufficient effort to make the information understandable to decision-makers. Thus, many perceive health information as obscure, unclear and sometimes contradictory (WHO 2007). A reader is not likely to understand or use health information that is not communicated in an appropriate way. It is therefore important to use a range of communication styles including visual (text and graphics) and auditory. This is especially true in the Pacific region, where there are language, age, gender and cultural behaviours that can influence communication to those in authority. An example of such a cultural behaviour may be when a junior staff member knows some information is incorrect but will not question or disagree publicly with an older colleague in order to maintain respect. Pacific people also speak approximately one-third of the world's languages, with over 700 spoken in Papua New Guinea alone (SPC 2009). An example of how this can have an impact upon health information systems can be found in Vanuatu, where it is common to find a community health

data collection form completed in up to three languages (Bislama, French and English).

Suggestions for future action

Participants agreed that the following actions are needed:

- **Delivery of appropriate training on data analysis**—consideration should be given to how to better use the large amounts of health-related data already collected through a variety of mechanisms including routine reporting, census, vital registration and surveys. Surveys include DHS, STEPwise approach to surveillance (STEPS) and multiple indicator cluster survey (MICS). Training needs to be appropriate for different capability levels (eg from certificate to postgraduate levels), and needs to be delivered in different formats (eg in country or regionally delivered short-term workshops to full overseas degree options). The Health Information Systems Knowledge Hub will work in this area over 2010 to develop guidelines and step-by-step instructions for data validation and quality assessment of various types of existing datasets. These datasets include mortality data, survey data and best methods for presenting different types of data.
- **Regional dialogue on the incentives for data collection at the health-system level**—this could be through scaling up the delivery of workshops such as SPC's Data for Decision Making Training, and Field Epidemiology Training. This surveillance-focused curriculum has been designed for distance delivery, and allows a student to progress from a certificate to a masters level qualification (PPHSN 2009).

Potential for regional approaches to health information systems

Participants at both meetings felt the potential of regional approaches to health information systems in Pacific island countries and territories needs to be considered. The geographic area covered by the region is vast: over 30 million square kilometres (SPC 2009). However, measured by population size, all countries in the Pacific are quite small, with the exception of Papua New Guinea. Issues of isolation, remoteness and difficulty in transmission of data arise with small populations. The scale and sustainability of infrastructure

for any health information system activity can also be a problem. Strong collective health information systems among the Pacific islands would be more successful than health information systems for individual countries, especially in niche specialist and technical areas of health information and technology development. A non-health sector demonstration of this kind of initiative currently underway in the Pacific is the Pacific Rural Internet Connectivity System (PACRICS 2006). Established in 2008 by SPC and the Pacific Islands Forum Secretariat, it provides two-way internet connectivity. There are now 16 pilot sites across the Pacific region providing internet access to countries that previously did not have a stable connection.

Within the field of health information systems there are many potential areas for a Pacific regional approach. The common challenges identified are presented in this section.

Recruitment of health information system workforce

There is a large and urgent need to recruit a skilled health information system workforce in both the public and private sectors, as more experienced workers retire or move to other positions. In Fiji, the mandatory retirement age for those in the public service was reduced to 55 years in an effort to reduce government spending in 2009 (Fiji Times 2009a). This action forced the retirement of two senior Health Information Unit officers within the Fiji Ministry of Health. Engaging the interest of the emerging workforce is important to ensure there is demand for entry to a health information systems career. Health information careers also need to be attractive at all levels, from school leavers and tertiary students to midcareer and senior officers. It was suggested that a regional recruitment package could be designed for secondary and tertiary education leavers, clearly explaining the career path and options for those working in health information systems, demonstrating how the career links into strategic policy directions and progress with technology in the region.

Retention of health information system workforce

Retention of the current workforce is a two-fold challenge. The first challenge is to provide professional development to ensure a highly skilled workforce. The second is to ensure there are appropriate incentives for

staff to remain in their posts. Further complicating this workforce problem is the regional 'brain drain' effecting most Pacific countries. Workers often leave for the private sector or overseas job markets. The population of many Pacific island countries and territories is very small, which limits the pool of professionals. The loss of a single health information system officer can have a huge impact on a country's health information system. Sadly, this took place in Tonga in 2009, with the unexpected death of the only trained health information manager. Since the loss, Vaiola Hospital has been functioning without a medical records manager, highlighting the need for a strong succession plan.

To address the issue of a skilled workforce, specific training paths must be identified. There is a need for a staged (multilevel) program of study so that students can progress from a certificate to a diploma, bachelor and postgraduate studies with entry and exit options at all levels. Training should be undertaken within the country, where possible, to minimise the need for essential staff to leave their posts, and to reduce the burden and cost of training overseas.

The health information system workforce needs to be valued, have opportunities for promotion and have recognition of their skills to remain in these positions, and to curb high turnover. Fiji School of Medicine research shows that one-third of all nurses in Fiji migrated overseas in the last five years, and these were often from senior specialist posts (Fiji Times 2009b). While the impact of 'brain drain' on clinical staff is obvious, it is also significant for administrative staff. All health information system training programs need to be run by people qualified and experienced with the country context. Currently, most health information system-related staff members have undertaken on-the-job training, or attended short courses locally or internationally. To address both capacity and volume issues it is very important to provide a structured, streamlined and long-term (sustainable) program of training. A specific example of a possible regional training opportunity would be to establish a model curriculum for health informatics training through the Pacific Open Learning Health Network.⁴

Salary is also a major challenge. In most Pacific island countries, those working in health information systems (eg clinical coders within health facilities) are not paid as professional staff but as general administrative

4 Further information can be found at <http://www.polhn.org/>

staff. There needs to be a considered effort to lobby the Public Service Commission/Association to regrade positions as professional and skilled staff. Many staff currently employed in administrative positions should be recognised as information managers. Incentives do not have to be monetary in resource-poor situations; however, it is crucial that staff feel motivated to remain in the post and perform to a high standard.

Definition of core regional health information system competencies

Based on the evidence presented at the Network Meeting and the Forum, a description of core job responsibilities and specifications required to support a health system is needed. These responsibilities include database management and health statistics. Defining these core competencies might be a joint role for educational institutions and country health departments. With core health information system competencies defined, regrading the job scope may improve the case for better pay and working conditions. Further, having attained those competencies, staff will be able to actively promote their skill set with their place of work. This may reduce mobility and promote regional competition for jobs. Regional bodies could develop sample position descriptions for adoption at the country level to improve the standardisation and recognition of these important roles.

Need for a health information committee

In some developed country health systems there is a role for a chief information officer to coordinate and manage the main functions and outputs of health information and technology. In most small Pacific island countries, however, a better option for this function would be in the form of a health information committee. An existing example of this can be found in Country snapshot 4. Instead of having a chief executive officer at the executive level of the health ministry, a broad-based committee including the national statistical office can provide strategic guidance for all information-related activities and ensure that they are aligned with national health system priorities. The committee would also lobby and champion ethical and privacy issues and provide leadership for budgets and standards.

Country snapshot 4: American Samoa

American Samoa's Department of Health has established a Health Data Committee. It is comprised of:

- Health Information System Administrator
- Health Information System Statisticians
- Medical Director
- Deputy Director
- Director of Public Health Nursing
- Maternal and Child Health Coordinator
- Director of Emergency Preparedness
- Computer Technician.

The committee's first function is to periodically evaluate existing methods of data collection and the validity and reliability of the data collected. Its role includes managing the approval process for proposals for the collection of new data elements. It is also tasked to ensure that information is shared between divisions of the Department of Health.

Cost of information technology

There is the potential for a regional or combined approach to purchasing software licensing, hardware and medical records-related stationery. Participants reported that alone, each country faces large costs and often reduces the quality of software or the number of licenses purchased. If the orders for these purchases were pooled, economies of scale would decrease the unit price. An example of this was Tonga's purchase in 2008 of a patient administration system (web-PAS) from iSOFT, a global medical software company. Vaiola Hospital now has a system that includes a patient master index and modules for admissions, discharge and transfers, medical records, emergency, theatre, outpatients, billing, pathology results and referral management. This purchase was negotiated through a twinning agreement with the St John of God Health Care group in Australia. Vaiola Hospital obtained licensing and support for the patient administration system by becoming an additional site on the group's contract with iSOFT (St John of God Health Care Inc 2007). If countries are not able to collectively purchase, there is still a need to lobby the telecommunications and software industry providers to reduce rates or costs for health system use.

In addition, donor approaches to the procurement process and specifications to obtain hardware and software must be harmonised. The idea of a regional fund for health technology capital updating and acquisition was raised and it was recommended that a specific budget line for health information systems be included in country health financial systems. Once investments have been made, countries in the Pacific can reap major advances in the accuracy and timeliness of health data, as can be seen in Country snapshot 5.

Country snapshot 5: Cook Islands

The Cook Islands has a 'whole-of-government' approach to providing national information and communication technology (ICT) services. They have an E-Government Strategy that stipulates how government ICT services will be provided to government agencies. Further, they have the continued rollout of information technology written into the Te Marae Ora (Ministry of Health) Management Review. The outer islands are connected to the hospital information system through Telecom Cook Islands and a leased broadband line. This arrangement provides reliable and timely information for continuity of patient care, among other benefits.

Maintaining quality of mortality coding

The idea of a regional mortality information and communication technology (ICT) coding initiative was raised as a potential solution to the shortage of suitably trained mortality coders, and the challenge of evaluating the quality of mortality estimates from the region. A centralized Pacific mortality coding centre would increase the quality of the cause of death data, as those undertaking the coding would be experienced and specifically trained. There would be a need for considerable regional buy-in. Additionally, for such a venture to be successful there must be a large parallel investment into improving the collection, certification and dissemination of mortality data, as well as resolving issues surrounding confidentiality and data ownership. All of these issues need to be addressed if Pacific island countries are to derive maximum benefit from their vital registration systems.

Suggestions for future action

Participants recommended that:

- A regional scoping project could be undertaken to **define the core challenges** for health information system positions. These include education levels, pay, governance, supervisory responsibilities, duties and opportunities for promotion. This scoping project could then form the basis of a regional proposal to develop core health information system position descriptions. This project could also coordinate donor scholarships and ongoing training for health information system workforce where possible.
- There is a need to further research and evaluate the current **sustainability of health information technology investments** made in the region. This should be done using health financing standard packages to incorporate and identify true costs. This will provide evidence to encourage countries to incorporate health information system costs into capital and recurrent funding bids. The Health Information Systems Knowledge Hub will work in this area during 2010 by looking at innovative uses of health information technologies in the Pacific through case studies.
- Work should be undertaken to establish either core specifications for a chief information officer or for the establishment of a **health information committee** that operates at an executive level.
- An initial concept or business case for establishing a **regional mortality initiative** to dramatically improve data on mortality and cause of death is a priority. Analytical skills are needed to more effectively analyse input from regional stakeholders and consider the benefits gained and the investments needed. This should be discussed at the regional health ministers meeting.

Strategies for advocacy for health information systems

In many Pacific island countries, health planning and policy decisions are made in the absence of reliable information. Decisions are often based on politics, anecdotal evidence or donor pressure. It is common that health information system activities and personnel

are not acknowledged or supported financially within a health system.

Advocacy is needed to motivate decision-makers to make investments and changes to improve data collection and quality, and therefore increase confidence in its validity as evidence. Advocacy is a combination of individual and social actions designed to gain political commitment, policy support, social acceptance and systems-support for a particular goal. Stakeholders need to think more about the actions needed to promote and increase understanding of health information systems and the value of information. 'Successful implementation and maintenance of a health information system in the Pacific depends on balancing the need for timely, representative and consistent data against the practical need to minimise reporting burdens on the staff and on the performance of clinical tasks' (Finau 1994, p. 162).

Participants identified several challenge and issues for the Pacific regions. These are given below.

Advocacy for health information

The use of the media (radio, print and television) and consumer voice is a powerful tool for all health promotion needs, and this use extends to promoting a strong health information system. The media can advocate, if supported, for the need for a strong health information system by providing the general public with evidence so they can make the best choices for their health care. The media can also inform the public of their rights regarding their personal information. The use of patient stories encourages the public to seek treatment or follow a prescribed course of health action. This has been used to great effect for promotion of awareness of infectious diseases (Wan Smol Bag 2007). Sometimes low levels of literacy and the oral culture in the Pacific mean the public often respond more vigorously to visual or auditory messages than traditional print media, as demonstrated by Country snapshot 6.

Country snapshot 6: Palau

In 2008, the Republic of Palau Ministry of Health used a slideshow of images and statistics to visually present the core components of a standard annual report to parliament, which was well received and commended.

It can be a challenge to ensure that media stakeholders understand basic statistical outputs and that they present the information in a factual way, without misleading consumers or creating hysteria; for example, during pandemic outbreaks like avian influenza (H1N1) in 2009. Providing clearly articulated press releases with simple health information can overcome this issue. In recognition of the important role the media play, AusAID resourced the Pacific Media Initiative (1999–2001) and the Pacific Media and Communications Facility (2004–2007) to strengthen the media's role in encouraging good governance by articulating public policy debates (GRM International 2007). Holding short tutorials with media stakeholders can also be an effective strategy. It was also mentioned that it was strategic to use high profile leaders to promote a health problem. A good example of this was the late King of Tonga's lead in promoting exercise to combat obesity and the rising rates of noncommunicable diseases in Tonga (WPRO 2002). Linking the timing of press releases with relevant data can help to monitor the success of such campaigns.

Beyond using the media, there is potential for non-monetary incentives for investing in health information systems. In resource-limited environments, there are often no monetary incentives that can be given to advocate for health information systems. There is, however, potential to investigate the use of nonmonetary motivations for stakeholders to increase awareness of the use and quality of information. A good example is to encourage healthy competition between facilities or data collecting sites by providing analysed data back to the site of origin, comparing their service delivery against set indicators. In both Fiji and Papua New Guinea, this approach has been used at the community health facility level to provide feedback on service and resource records to encourage the creation of centres of excellence.

Engaging decision-makers

It is extremely important to start any advocacy efforts for health information with consultations among decision-makers. The goal of advocacy should be to stimulate a culture of evidence and enthusiasm for data use that will lead to increased demand for information and drive improvements from the top down. Country snapshot 7 outlines the process in Samoa, which sought to revise its health system indicators to ensure adequate evidence was created for the Health Sector Plan. It is critical to

take a multisectoral approach by engaging with other government departments at a high level.

There is a clear need to identify ‘health information system champions’ at senior levels who come from a variety of backgrounds (or professional groups) within the health sector: clinical, administrative, academic and political. These health information system champions will act as central advocates for their respective professional groups for the promotion of the health information systems, and mitigate potential problems if they arise.

Country snapshot 7: Samoa

As part of the Samoan Health Sector Plan (HSP), the Ministry of Health created an overarching monitoring and evaluation framework of the health system to give a comprehensive understanding of its efficiency, effectiveness, quality, equity and sustainability. The ministry went through a process of refining the national health system indicators. They found that organisational cultures around the use of information were heavily entrenched and a large degree of change management was required. Three levels of indicators were proposed:

1. health status, health outcomes and health determinants
2. health system performance
3. inputs, processes and outputs at the level of program activities.

With 95 indicators in the core list, these levels were chosen to reflect the six key strategic areas identified in the HSP to ensure high-level buy-in.

These strategic areas were:

1. strengthen health promotion and primary prevention
 2. improve access and strengthen quality health care delivery
 3. strengthen the regulatory governance and leadership role of the Ministry of Health
 4. strengthen health systems through active engagement of sector partners
 5. improve health sector financial management and long-term planning and health financing
 6. ensure improved donor participation and coordination of activities.
-

Suggestions for future action

- Encourage health information system staff to **align emerging health information system needs and activities to current management priorities** (eg human resource shortages). This approach has a direct and strategic relationship to how health information systems will provide evidence for decision-making. It can be started by developing a list of key priority activities, writing a business plan and drafting a budget.
- Start increasing the health information system expectations of clinicians during training at medical school by building health information system awareness into the curriculum. Clinicians need to understand the primary and secondary uses of health information; be able to document accurately in medical records and certify death correctly; and understand policy and procedures for data collection, management and analysis. Clinicians should become major advocates for better health information to help them improve clinical practice and outcomes.

Role of health surveys

Health surveys are a key source of population-based data and are used to reduce gaps in country health information collection where routine data may not be accurate or complete, such as vital registration systems. Surveys can be linked to other data sources to provide a broader picture of a health problem and non-health socioeconomic determinants (WHO 2008).

A value of surveys is to give voice to a representative group of respondents on issues that are not reflected in routine data collection as a way to assess unmet needs. For example, disadvantaged groups who are less likely to use health services may be missed by routine health information systems, so surveys can target these groups. Surveys, however, are also subject to bias, and need to follow strict procedures. Procedures include an agreed protocol for sampling, questionnaire design; field supervision; consent and confidentiality; data processing, collection and analysis; and reporting.

There are many surveys commonly undertaken in the Pacific. The best known of these include:

- WHO STEPwise approach to chronic disease risk factor surveillance (STEPS) (WHO 2009b). STEPS

surveys have been completed in a large number of Pacific island countries.

- UNICEF MICS program focuses on child mortality, nutrition, immunisation, environment, development, education and protection. The results establish a strong baseline for measurement of progress towards the MDGs and the goals of a World Fit for Children (WFFC). The first MICS in the Pacific region was conducted in 2007 in Vanuatu.⁵
- DHS have recently been undertaken in a number of Pacific island countries. The Asian Development Bank (ADB), with Macro and SPC are carrying out a project to undertake a Pacific-wide DHS (ADB 2009) and have piloted it in four countries (Solomon Islands, Republic of Marshall Islands, Tuvalu and Nauru). The project focuses on establishing a baseline for regional indicators and capacity development of country statistical officers.

The potential use of surveys to provide essential health intelligence for country health planning is demonstrated in Country snapshot 8.

The meeting participants discussed these examples and some issues and challenges regarding the value and role of surveys within a health information system.

Linking surveys to routine surveillance

Surveys should be included within a country's routine surveillance. They should provide supportive evidence of what is not being recorded routinely and fill information gaps in data that cannot be captured in routine collections. When linked to routine data collections, surveys also provide an opportunity to map historical changes in public health practices and disease burden, and help health service managers and decision-makers evaluate their programs and learn from previous errors.

Making surveys accessible to stakeholders

Although an important challenge for all aspects of a health information system, communication of survey methods and results to stakeholders and communities is vitally important, particularly when tailoring the survey and the process of data collection to the sample target group. Other interest groups may also need visual or interactive methods of communication, depending on

level of education. Decision-makers may need higher level statistical and graphical overviews (eg comparison and ranking among different geographical locations). This is significant as some Pacific nations have low adult literacy rates (AusAID 2009). In addition, there should be an advisor role that reports to the minister and is responsible for highlighting key issues.

Country snapshot 8: Kiribati

In 2008–2009, Kiribati conducted five major national surveys, all of which provide point-in-time information about the health needs of the population. The following surveys were undertaken:

Number	Type	Year	Facilitated by
1	Mini-STEPS surveys (following up from 2004–2006 full report)	2009	WHO, SPC
2	Demographic and health survey	2009	SPC
3	Second generation HIV surveillance	2005, 2008	SPC
4	Mapping of Knowledge, Attitudes and Practices (KAP) survey of Most At risk Adolescents (MARA) and Especially Vulnerable Adolescents (EVA)	2009	UNICEF
5	Lymphatic Filariasis Prevalence Survey	2008	WHO

Cost of surveys

Health statistics offices and monitoring and evaluation units are often understaffed and underfunded in many Pacific island countries. Surveys often require a large investment in time and technical analysis. They are seen as costly of money and human resources, as staff members are often diverted from their daily duties to undertake the surveys. A lack of donor funding should not be a justification to cut surveys. It was suggested instead to reduce duplication of effort by better coordinating survey schedules and by undertaking surveys together, where appropriate.

⁵ The Vanuatu Multiple Indicator Cluster Survey is available at www.unicef.org/pacificislands/MICS_Reportsmla.pdf (AusAID 2009).

Suggestions for future action

- A further **Pacific regional review of the role of health surveys** and subsequently, the development of a strategic plan to identify which information should come from routine health information systems and which should come from surveys. This could incorporate knowledge on how to coordinate donor support for undertaking surveys. The Health Information Systems Knowledge Hub is currently researching the role of health surveys in health information systems, which will inform this debate.⁶
- A **guide for survey methodology and questions**. Such a guide could be developed using the experiences and lessons learnt from Pacific islands in planning and conducting surveys and analysing and disseminating survey results. A guide could help countries evaluate the merits of inclusion or exclusion of specific survey questions and reflect on their value as key performance indicators for their respective ministries of health.

Use of institution-based data

Institution-based data are the by-product of operational activities and are often the only data that can be disaggregated down to provinces or districts. Institution-based data has been defined by HMN as consisting of three kinds. These are (WHO 2008, pp. 32–35):

- individual records—include any documentation of services to individual patients (eg outpatient or inpatient records, case reports and disease registers)
- service records—measure and record occasions of health service, actions or events (eg environmental health inspections, outpatient attendances and immunisations)
- resources records—measure and record administrative information about quality, availability and logistics of resources (eg human resources, expenditure and pharmaceutical information).

An example of the collection and use of institution-based data in one country is demonstrated in Country snapshot 9.

⁶ This paper is available from the Health Information Systems Knowledge Hub website at www.uq.edu.au/hishub

Country snapshot 9: Federated States of Micronesia

The Federated States of Micronesia has a complex Department of Health and Social Affairs system reporting structure from their four island states of Kosrae, Pohnpei, Chuuk and Yap. There are three levels of care, each of which generate institution-based data:

1. primary health care (prevention)—dispensaries, community health centres and private clinics
2. secondary health care—four state hospitals, various vertical public health clinics and one private hospital
3. tertiary care and treatment—overseas referrals to Guam, Hawaii and the Philippines.

These levels all contribute to the collection of data used to calculate the 14 national health indicators. Data collection is challenged by the geographic dispersion of the islands, which often results in late reporting and the decentralisation of data across the four island states.

Institution-based data is often the primary focus of attention for clinicians as it involves clinical data for managing patient treatment. It is the source of information for health service managers to use for the management of the health service. It is usually the source of most performance indicator data (eg immunisation coverage, number of overseas referrals or cost of diabetic treatment drug distribution). A limitation of institution-based data sources is that they only represent people who have accessed health services and may not cover vulnerable groups or those with less or no access to services. Common issues and challenges identified are discussed below.

Quality of individual records

Individual records are used for the direct clinical management of patients, regardless of whether a service is delivered in the community or within a facility. They are a legal record of the activity undertaken for that patient. Individual records need to be simple and effective to minimise collector burden and confusion. They are also a communication tool for continuity of care among providers over time. There is need for a review of all forms used for patient care recording to ensure they are clinically valid or to provide clear information about the patient. In most Pacific island countries individual records remain paper based for primary data collection.

Data quality problems often stem from incomplete or illegible documentation, or poorly designed forms. To overcome this, clinicians who complete the documentation must be made aware of the value of this activity. Another issue is of a shortage of dedicated, trained coding professionals with time allocated to this task. A major challenge for health information systems is how to influence clinician behaviour to improve the quality of their documentation. Clinician-focused issues include the poor quality of observations, investigations and progress reports as well as unclear conclusions, which are often a mix of provisional and final diagnoses.

Transmission of data in geographically isolated areas

Most Pacific island countries face the issue of service delivery in remote island settings (excluding Nauru and Palau), and this has a large effect on transmission (export and import to central repositories) of institution-based data. Variables such as cost, timeliness, security, power and connectivity are often blamed for these difficulties. Common electronic data transmission formats are needed where all health information technology software can export and import data in comma-delimited text format or in XML.

Service and resource records for decision-making

Decision-makers use service and resource records. For this to be a good practice the records must accurately represent the population. Pacific island countries and territories might benefit by taking a top-down approach, first defining the health policy questions before trying to find an answer with the available data. Performance indicators can then be defined once the minimum information needs are determined. This strategy is demonstrated in Country snapshot 10. Countries should also consider using innovative tools to enrich service and resource records; for example, special disease registers or geographical information systems.

Validity of mortality reporting

A major challenge for health information systems in the Pacific is the poor quality of mortality data. Capture–recapture studies can be used to assess completeness of reporting (International Working Group for Disease Monitoring and Forecasting 1995). However, such studies can be expensive and time-consuming. Understanding

local cultural practices of mortality reporting is important. Changes to the design of paper forms or databases, and education workshops for clinicians on how to complete death certificates are likely to significantly improve quality and completeness of the data. The timely transmission of mortality data from out-of-hospital (or community) deaths is another priority challenge for the region.

Country snapshot 10: Tuvalu

The Tuvalu Ministry of Health Strategic Health Plan 2009–2019 articulates the objectives that need to be achieved to ensure a high standard of health for the people of Tuvalu. The plan is in alignment with the national development strategic plan *Te kakeega II*. The Strategic Health Plan has a series of subprograms, each of which has specific objectives, planned outputs and key performance targets. This approach allows the Ministry of Health to clearly understand the information that it needs to collect to provide sufficient evidence for policy action.

Suggestions for future action

- To improve the quality of admitted patient records, clinicians should develop a set of **criteria to use for auditing medical records** to determine deficiencies, as well as establish a process for the design or improvement of forms. This auditing process will determine whether errors arise specifically from the documentation, or if they are coder or system errors. Results would then need to be fed back to clinical and administrative staff for action.
- **Investigation of emerging data transmission technologies** should be carried out to determine if they provide practical and sustainable solutions for use in remote locations of the Pacific. A business case and some research are needed to explore the use of radio or mobile phone transmission of simple data templates.
- **Interactive workshops for physicians** and curriculum development for medical students about the correct application of the *International Statistical Classification of Diseases and Related Health Problems*, 10th revision (ICD-10) to certify cause of death.

Conclusion

Health information systems need to be recognised as an essential component of health system development in the Pacific region. Health information systems should be valued for their ability to provide evidence for decision-making. Globally there is an increasing understanding of their critical importance within any well-functioning health system to provide accountability for resource allocation and measuring health outcomes. This recognition is also taking place in the Pacific region and countries are being empowered to own their health information and take the lead in initiating strategies or action plans to address persistent health information system issues.

Future actions suggested in this paper should not be taken as a 'wish list' of health information system-specific tasks that must be undertaken. Presented are the suggestions of Pacific islands' participants in the context of the two Health Information Systems Knowledge Hub facilitated meetings. This paper has not sought to assess their comparative priority or feasibility of implementation. The practicalities of implementing these suggestions are vast and more properly determined by countries. Significant statistical organisational reform in countries, donor input and regional consultation is required.

The Health Information Systems Knowledge Hub is engaging with health information system health workers and decision-makers in Pacific islands to better define the knowledge gaps. Then, the region can adequately address the issues and challenges perceived at the country level. Common issues and challenges for health information systems in Pacific island countries and territories were raised at the PHIN meeting and at the Pacific Health Information Systems Development Forum. Many different countries shared similar experiences. The key challenges detailed in this paper are:

- improving data integration and sharing, particularly rationalising duplication of effort, multiple data systems collecting the same data and lack of clarity about data ownership and the benefits of data consolidation
- increasing data analytical skills among data producers, particularly to assess the quality and completeness of basic health statistics such as mortality and causes of death

- realising the potential for regional approaches to health information systems to address problems associated with the small numbers of trained staff in many countries, and to more efficiently process data
- strengthening strategies to advocate for health information systems, including the need for producers and users of health data to be more aware of their potential to inform health policy debates
- improving knowledge about the potential importance of health surveys, and increasing capacity to analyse surveys to better support policy
- making better use of institution-based data, particularly resolving issues around cost-effective means for data transmission, and improving practices and knowledge.

Many health information system issues and challenges in the Pacific region are similar to those identified elsewhere. However, the Pacific islands are unique because there is strong potential for regional solutions to collectively resolve some of these issues, especially in the areas of data standards, workforce and technological investments. The way forward to address these health information system issues for the Pacific region is to work as a collective group in advocating and strengthening health information systems.

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The Knowledge Hubs for Health Initiative

The Health Information Systems Knowledge Hub is one of four hubs established by AusAID in 2008 as part of the Australian Government's commitment to meeting the Millennium Development Goals and improving health in the Asia and Pacific regions. All four hubs share the common goal of expanding the expertise and knowledge base to help inform and guide health policy.

The Knowledge Hubs are funded by AusAID's Strategic Partnership for Health Initiative.

Health Information Systems Knowledge Hub

The University of Queensland

Aims to facilitate the development and integration of health information systems into the broader health system strengthening agenda, and increase local capacity to ensure that cost-effective, timely, reliable and relevant information is available. The Health Information Systems Knowledge Hub also aims to better inform health information systems policies across Asia and the Pacific.
www.uq.edu.au/hishub

Human Resources for Health Knowledge Hub

The University of New South Wales

Aims to contribute to the quality and effectiveness of Australia's engagement in the health sector in the Asia–Pacific region by developing innovative policy options for strengthening human resources for health systems. The hub supports regional, national and international partners to develop effective evidence-informed national policy-making in the field of human resources for health.
www.hrhub.unsw.edu.au

Health Finance and Health Policy Knowledge Hub

*The Nossal Institute for Global Health
(University of Melbourne)*

Aims to support regional, national and international partners to develop effective evidence-informed national policy-making, particularly in the field of health finance and health systems. Key thematic areas for this hub include comparative analysis of health finance interventions and health system outcomes; the role of non-state providers of health care; and health policy development in the Pacific.
www.ni.unimelb.edu.au

Compass: Women's and Children's Health Knowledge Hub

Compass is a partnership between the Centre for International Child Health, The University of Melbourne, Menzies School of Health Research and Burnet Institute's Centre for International Health.

Aims to enhance the quality and effectiveness of women's and children's health interventions and focuses on supporting the Millennium Development Goals 4 and 5—improved maternal and child health, and universal access to reproductive health. Key thematic areas for this hub include regional strategies for child survival; strengthening health systems for maternal and newborn health; adolescent reproductive health; and nutrition.
www.wchknowledgehub.com.au



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