Health Information System Assessment: Base Plan and Implementation Strategy

U.S. Territory of American Samoa

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Pacific Island Health Officer Association
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Acknowledgment

This Assessment of American Samoa Health Information System falls on the heels of earlier work and efforts conducted by a number of organizations. Those assessments as well as the current one could not have been undertaken without the full cooperation of the Department of Health and dedicated program staff, and stakeholders, principally the Lyndon Baines Johnson Hospital which remains closely associated with the Department of Health and is a key advocate for HIS.

Particular thanks go to the Department of Health Acting Director, Seiuli E. Ponausuia and HIS Committee Chair, Jacki Tulafono and dedicated Committee members for their commitment to this process. Additional special thanks go to Mr. Fale Uele, DOH Administrator, for all the extra hours and commitment in seeing this assessment through to completion and insuring an extensive list of people were contacted in gathering the assessment findings.

Many other people and organizations provided valuable information that helped to inform the structure of the *HIS Plan and Implementation* Strategy. They provided important background information on the workings of DOH and the number of grant mechanisms used to implement the public health programs in American Samoa. These informants and others candidly shared history and insights of some the core issues confronting DOH in its operation and particularly as it might pertain to implementing HIS.

This assessment would not be complete without mentioning *fa'a Samoa* and the ever-pervasive *fa'alavelave*. These cultural aspects of Samoan society, along with their deep faith in believing God will ultimately cure and provide, cannot be ignored when planning a sustainable solution for HIS, as American Samoa is unique among U.S. Territories in many ways.

Summary and Assessment Approach

American Samoa presents a unique and challenging operational environment for Public Health and health information systems. As a United States Territory, American Samoa (AS) is responsible for reporting to U.S. agencies on public health events and incidences of infectious disease. The American Samoa Government (ASG), Department of Health (DOH) uses these same data to a limited extent for planning and budget considerations and performance review. Overall the state of HIS in American Samoa is no different than in many developing countries globally. Compared to a U.S. State, AS is less developed, fragmented and under capacitated.

The four overriding HIS challenges assessed in this report are human resource capacity, leadership, data quality and processing, and network connectivity. DOH has a little bit of all of these but not enough of any one to reach critical mass to effect a sustainable HIS architecture. The observations in this assessment further corroborate findings of previous assessments conducted over the past ten years including among others "Health Data and Information System U.S. Territories and Freely Associated States, Final Report" prepared for the U.S. Department of Interior Office of Insular Affairs in March 2008.[i]

ASG total government spending is $222 million (FY 09) of which 63.5% is from U.S. Government grants. DOH receives $3.8 million (2009) of this amount.[ii] Program areas spend approximately $40,000 of these monies collectively on data and information systems and support services. These should be pooled.

ASG like other U.S. Territories is governed locally and operates semi-autonomously under the U.S. Department of Interior. As such, ASG has no voting representation in the U.S. Congress or Senate and thus no proportionate share of tax revenues for public health. Public health policy and program direction is largely directed and funded through one or another U.S. Department or Agency. Notwithstanding, ASG is fully obligated for any assistance received. This "step-child" relationship has the off-setting effect of pulling local resource away from DOH administration to support U.S. national public health priorities which epidemiologically are not always the same. This is problematic for ASG/DOH given the number of health programs on which to report and in-kind services required in doing so. Additionally, health data generated from DOH programs often become lost in the aggregate when leveled against other Territories and U.S. States reporting disease prevalence.

DOH operates in a resource-poor health sector with a weak, nearly-absent, central control and policy environment. This poses a special problem when meeting accountability of health expenditures and program performance. Most data and health information system

Key: Invest in the existing, underlying health data information systems at the program level for the purpose of sharing data *horizontally* among all program areas starting at point of intervention.

resources are consumed at program levels to meet specific grant reporting requirements often circumventing DOH entirely in vertical data streams. Few resources are available at the administration level to interface with these same programs. With few exceptions, DOH has been unable to move beyond a basic "log-and-count" functionality of recording program outputs, e.g., number of diabetics in a program area versus reporting on outcomes such as the number of incidences of diabetes mellitus averted and associated cost-savings.

There is keen interest in preventative health as a means to reduce health care costs, principally by lowering demand on services. Essential to this are preventative care models that reduce demand on acute and emergency care and treatment. Good data and evidence are required to pick-out early warning symptoms that suggest an emerging health condition. Or, and more interesting, covariate *wellness* factors that indicate resilience to diseases within segments of the population. Current data use does not accommodate this.

Preventative models hope to reduce the number of incidences of *controllable* health events and disease and assist clients and patients to better manage non-communicable diseases (NCD) and spread of infectious disease. Early detection is vital to the success of these models and requires good data to validate results within the context of AS. There is no better case for preventative medicine than in AS where diabetes, morbid obesity, and hypertension are epidemic; hence the renewed focus on health data and information systems as tools to understand the public health demographics and health determinants.

Policy Requirement #1

All Program areas must operate inside of established Department of Health HIS Policies and Procedures Guideline for data collection and reporting as established in Policy and Procedures directives.

Policy 1 Establish HIS Policy and Procedure guidance.

Informants of this Assessment describe some program areas as "siloed": characterized as myopic and insular with limited communications with other programs outside of their own. Organizationally, this sometimes presents itself in passive *aggressive behavior* among staff who may view program data as their own and not-sharable, and often taking a non-cooperative stance to DOH initiatives. DOH leadership directives and reporting requirements are often discounted in deference to those of the grantor. This type of organizational behavior impairs institutional capacity and sustainability, and effectively negates the value of having a department of health altogether. The net effect is a highly fragmented set of disconnected and nonintegrated public health programs. A sustainable HIS in this type of environment will prove unattainable.

Absence of central policies and procedures has each program area operating in a special relationship with the grantors –not quite a vacuum, but nearly so. Each program has in effect established its own set of internal procedures, MOUs, and independently supported information and communication technology (ICT) contracts for their own data management information systems.

Programs grants funding do not adequately capture the overhead cost incurred by DOH in administering program areas. Nevertheless, DOH is required to support program reporting requirements as a fiduciary without adequate resources to do so. DOH receives minimal support for the administrative overhead costs associated with grant administration and program operations. With the small exception of quarterly payments of approximately $3100 provided from the Vital Statistics Cooperation Program (VSCP), an IDIQ through National Center for Health Statistics, there is no other revenue stream generated for HIS activity and program support services. VCSP will continue the current annual payment of $50,000 to a

maximum available payout of $350,000 over five years in FY 2013. Additional revenues derived from the small amount of fees charged the public for health services is insignificant and cannot sustain programs in on their own. Absent a comprehensive annual plan and accountability DOH cannot substantiate budget request for local revenue support from the Fono.

Based on DOH program performance reports and the quality of the data used, there appears to be insufficient evidence to inform ASG on program activities and reasonableness of expenditures. There is a clear disconnect between (a) public health program expenditures, (b) activities, and (c) program outcomes. Better use of evidence-based data that support decision-making and program accountability is the first step to insuring ASG public health needs are adequately expressed and met. Publishing these data in an interesting and informative way that turns HIS data into actionable information is the second step required to realize a return on investment in HIS. A prerequisite to this is an adequate and sustainable Health Information System (HIS) and supportive DOH policy and procedure framework.

WHO recognizes that a functional HIS is essential for health data and information systems and reporting and is foundational for new eHealth strategies now emerging to leverage 21st century technology. Data provided through a functional HIS is the basis for planning, resource allocation, policy-making and effective management of public health resources and accountability.[iii]

The major shortcoming in the current HIS environment is not the amount of data –as an adequate number of reports are produced, but rather the quality, depth, and breadth of the data being captured and reported, and how it's used for local decision-making. In the current environment data and information is used nearly exclusively for top level program output reporting, generally for use by grantors. These data are expressed in the aggregate as tabulated summary data drawn nearly exclusively from log books. Whereas some program areas use specific data from interventions (patient or client level data) for program design and in-service training, and reporting many do not. Disaggregating tabular data to report health outcomes within sub-populations or cohorts, say pregnant women between ages of 16 and 24 who are also diabetic and come from a certain socio-economic strata or locale, is not determinable. Data used locally in AS often anecdotal and not quantifiable.

There is sufficient indication that AS public health data, its currency, accuracy, precision, latency, and relevance to the epidemiology of the Territory is questionable and in many cases wholly inadequate to make informed decisions. Some programs requiring real-time data are at high risk of being totally ineffective in meeting their intended objectives given state of the HIS environment.

This report presents some of the findings that help define the state of HIS in AS and proposes several recommendations in implementing a staged approach to developing an HIS framework. There are a number of challenges to overcome including organizational and operational changes required, policies, human resource development, ICT infrastructure, and the establishment of a well-resourced office for health informatics functions. Uptake of the recommendations in this report should go a long way in leveraging the tremendous knowledgebase held among the many veteran AS public health workers and stakeholders who are well aware of the problems and difficulty in acquiring timely and qualified data for informed decision-making. These same champions are the greatest advocates for HIS and have implemented a number of remedial solutions on their own. This *HIS Assessment and Base Plan for the U.S. Territory of American Samoa* builds on those efforts.

Assessment Methodology

Assessments and program evaluations are on their own interventional and heighten expectations of those interviewed. Some of the activities included in this Assessment, especially in the area of human resource

development and newly formed working groups (WG), are immediate interventions that should continue. The HIS Plan is intended to leverage these first steps as part of an *inception phase*, and build on that interest throughout the implementation in the months going forward. In this way DOH should gain early buy-in from program areas. Formation of working groups in particular will address many of the data, policy, and information gaps, and allow interested staff to participate in the process. Studies show that early buy-in and constructive engagement by users of data yields sustainable results when designing systems. Feedback received on the first draft of the Assessment and this inception phase, have been incorporated into the final report and implementation strategy.

This HIS assessment follows a set order of activity using a 360° participatory approach whereby the following series of activities are conducted alongside DOH counterpart(s):

- Initial presentation of HIS concepts and an illustrative model to HIS Committee members keyed to the 16+ health programs in AS. (The presentation is repeated to other key stakeholders outside of DOH during course o of Assessment including LBJ, DOC, DHSS, and others). [iv]
- One-on-one interviews with program area informants (Attachment B). These also serve as small focus groups.
- Presentation of a short set of in-service training and seminars based on identified knowledge gaps.
- Vetting of Draft 1.0 with senior management and HIS Committee
- Revisions and Draft 2.0
- Vetting of Draft 2.0 with DOH and ancillary Stakeholders including DOC, DHSS, LBJ Hospital, with invitation to support organizations such as PIHOA, WHO, SPC, HRSA, CDC, others)
- Revisions Draft 2.0 in preparation of **Final Report**

Assessment Findings

Overview

Policy Requirement #2

DOH shall establish an *Annual Performance Plan* in which programs areas can be monitored and measured as contributors using metrics drawn from patient-level data.

Policy 2 Requirement for Annual Performance Plan

There are about sixteen different program areas in the Department of Health (DOH), "depending on how you slice it", according to one informant. The ecology of the information and communication environment appears weak. There is no clear HIS policy framework, written or otherwise, or DOH guidance on data collection and information processing and dissemination, and no central repository for data, or a fully functional[v] database. VISTA/CPRS could technically be considered a central database but data accuracy, completeness, and connectivity denies it that role.

There appears to be a general lack of commitment in ASG to support DOH reform. As an indicator of this, the DOH director position has been left unfilled for two years, and several proposed organizational and re-structure plans have yet been approved by ASG.

DOH leadership control is largely decentralized and dispersed among a number of program areas with no clear line of

authority; this favors program autonomy but devalues the roles of DOH leadership and diffuse resources. Most all program areas defer to grantors as the controlling authority effectively by-passing DOH, diffusing limited resources and narrowing the zone of effective HIS resource management.

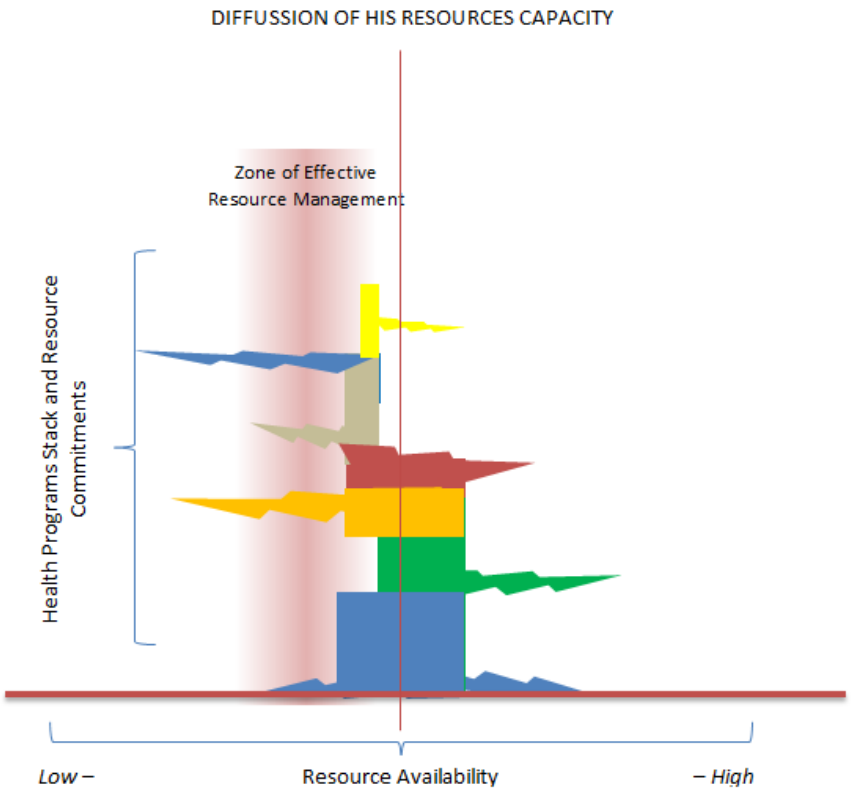


Figure 1 HIS Resource diffusion

Unlike program information data reporting requirements set out by the grantors, DOH has no corresponding policies on how grant mechanisms should report to DOH internally with the same data or how information should be managed. And unlike many programs that may have their own to store and manage data, DOH does not.

There is little guidance provided by DOH administration to program areas on data and information management practices: no procedures on data processing and information exchange; no policies on managing internal use of data and information; no knowledge management practices in place to disseminate information and build institutional memory and capacity; and, no policy for the provision of ICT (information and communication technology) infrastructure and support services. An argument could be made that there is no funding that allows DOH to provide for these necessary components. A counter argument could be made that DOH has not presented evidence to suggest the need to do so. Barring an effective HIS this is impossible to do so. However, DOH avidly supports the provision of HIS and has been fully supportive of the activities within this Assessment which demonstrates keen interest in changing this modality.

ASG Code, Title 13, “Health Economic and Welfare Services” provides the legal framework to empower DOH to implement a fully effective HIS without limitation. Specifically, Section 13.0216 provides DOH full power and authority to collect, analyze and use data from all program areas:

"(a) The department shall administer a health information system to collect, use and analyze health, medical and vital information for the Territory. The health information system may include, but is not limited to, identifiable health information, non-identifiable health information, vaccination records, testing results, examination results, surveillance activity results, cancer registry and any and all other information needed, used, or acquired to protect the public health or perform essential public health services and functions.

(b) The health information system may include system elements located in, and provide information services to, LBJ Tropical Medical Center under cooperative agreements, or contracts, approved by the director and the hospital authority board.

(c) The department is authorized to collect, analyze, and maintain databases of identifiable health information and non-identifiable health information related to…"

Policy Requirement #3

DOH shall provide a fully staffed and functional Office of Health Information Systems capable of managing health data and information generated by all DOH program areas.

Policy 3 Health Information System Office

There is no central web portal or information clearinghouse accessible to the public or internally. The www.doh.as domain [IP: 209.160.40.240] is registered and hosted but has no web presence outside of webmail services used by some personnel. Nearly all other DOH employees use third party email services provided by Google or Yahoo or other providers. This makes it difficult to manage a common collaborative work space. Use of webmail without an *email client* (Outlook, Thunderbird, etc.) on desktops inhibits automated functions which could be added to existing electronic data files systems to store and forward data when connections are available. It also impairs DOH from implementing policy and control of email services.

Understanding of HIS and knowledge management (KM) practices is limited and closely held by a few and mainly among senior level staff. Occasionally program data are used for in-service training but generally introspectively and outside of a wider cross-sector context. With few exceptions, trainings received off-island is not made widely available to other program areas or benefit public health in a way that imparts *knowledge* that could shift norms or encourage behavioral change, important to preventative models. Those privileged with receiving training should give back to others by presenting what was learned in written and oral presentations.

Chronology of HIS Initiatives in America Samoa

Interest in health management information systems has been ongoing since the start of the federally funded State Health Planning and Development Agency (c. 1974). At that time DOH was part of the Lyndon Baines Johnson Hospital (LBJ), a quasi-public corporation. Nearly all births and every death occur and are recorded at LBJ. Its principal database is VISTA – an open-source database provided by U.S. Veterans Administration and used as a patient record-keeping system through a computerized patient record system (CPRS).

While part of LBJ, public health programs were intrinsically linked with medical services and vice versa. In 1998, DOH was broken off from LBJ and became its own department with a Director. Since then there has been three directors and two acting directors. Currently there is an Acting Director. There has always

been an interest in data and information but no single unit or division having authority or budget to undertake the responsibility despite a division of Information Technology in the organizational structure.

Several studies and assessments have been undertaken over the past fifteen years in support of a more comprehensive HIS. The more recent ones are as follows:

Date	Study
8/17/2007	Survey on State eHealth Information Strategies
3/14/ 2008	Health Data and Information System U.S. Territories and Freely Associated States, Final Report
4/10/2010	Summary Overview of American Samoa Data Collection Challenges and Obstacles
8/11/2011	Health information systems assessment report-DOH
4/10/2010	Information Technology Services Office Infrastructure and Network Connectivity Assessment (CDC)
5/30/2011	Health Information Exchange Strategic and Operational Plan Profile
7/4/2012	National Public Health Improvement Initiative assessments.

The current (approved) organizational structure provides for an office of Information and Technology (IT) under DOH Assistant Director of Planning and Development (see Attachment C). The *de facto* organizational structure is a *facsimile* of the approved model with a Health Information System office (HISO) under the DOH Administrator. Regardless of nomenclature it is important that the Office is properly resourced and positioned to fulfill the functions envisioned. Current HISO staffing consists of one statistical analyst and DOH Administrator as a supervisor. The Administrator also oversees Sanitation and Environmental Health and holds a number of other responsibilities.

Policy Requirement #4

The Health Information System Office shall set out guidance on program reporting requirements and management of data standards.

Policy 4 Program Reporting Requirement

Around 2007, there was an attempt to link all databases to a central web-based system beginning with linking births records to a program that tests for infant hearing functions. The vision expanded to include linking all public health programs through Shared Integrated Link America Samoa (SILAS). Today the database is used only by Helping Babies Hear – an off-shoot of Helping Hands. This program along with most others under DOH receives significant support from outside contractors for IT services and other resources paid through program funding.

There are at least four overlapping HIS related initiatives in AS today: two within DOH –which includes this HIS Assessment process and a separate Quality Assurance Assessment, and two among six program areas within Department of Social Services (DSS) having health-related components. The initiatives have among other common objectives a goal to improve evidence-based decision-making.

State of Health Information System

Whereas DOH enjoys substantial monetary and technical support from a number of U.S. Agencies including HRSA (Health Resources and Services Agency), CDC (Center for Disease Control and Prevention), NIH (National Institute of Health), EPA (environmental Protections Agency), OHS (Office of Homeland Security) and others, these grantors bring with them performance expectations. Grantors have in some cases created an exclusive operating environment providing a full bevy of support services

for data processing and information systems subverting what would be normal administrative functions of a health department. This is not an uncommon practice where department management has no revenue stream to finance data and information system of their own. Strong leadership and advocacy on several fronts can go a long way to reform that paradigm and make DOH the key player.

Policy Requirement #5

DOH shall implement an *umbrella* MOU with grantors and other health-allied stakeholders that references ASG Code and address interoperability of data management information systems and reporting requirements consistent with the HIS implementation plan, articulating roles and responsibilities of DOH and program areas.

Policy 5 MOUs with grantors and stakeholders

Health Information System Office

Conspicuously absent in the current HIS environment is a single, "go to" entity with recognizable authority for health data and information management. Filling this gap has been the Maternal and Child Health (MCH) program which has taken on some HIS leadership responsibilities while meeting its own needs. Notwithstanding, the Health Information System Office (HISO) is responsible to collect vital statistics and program data for central reporting purposes.

HISO is responsible for collecting specific health data with insufficient resources to go beyond collating data submitted periodically (and irregularly) by each program areas. The highest output demand on HISO is providing vital records information to Department of Census (DOC), and quarterly Program Performance Reports (tabulated data summaries) to the Governor and the *Fono* –the ASG legislative body. HISO is also charged with creating *ad hoc* reports and yearly reports on marriages and divorces. Marriages and divorces reporting service seems somewhat misplaced in DOH and circular in practice as DOC sends monthly counts of marriages and divorces to HISO which in turns maintains a running tally and then supplies the same data back to DOC annually.

Staffing requirements for an adequately functional HISO should include the following staff positions and minimal skill sets. These staff should have a health background so to pick up on data inconsistencies and *patterns*:

Position	Primary skills
Chief Information and Technology Officer	IS Program management with server and network skills
Health informatics technician	Data and statistical analysis and report writing
Software programmer	Database development, coding, and web services
Help Desk support	Customer relations and services management

For successful HIS implementation each program area needs to know that there is someone or some group at the helm of DOH shepherding the process forward; hence the need for a fully functional HISO. This currently is not the case.

Program Offices

The following program offices were surveyed in 2008[vi] and interviewed again in this assessment to determine the type of data collection tools and data management information systems used. In addition to

the electronic files systems indicated, all program areas use paper forms and log books for client/patient triage encounters, diagnostics, referrals, and lab work. A limited set of these data are entered in a standard log used for tabulation and reporting purposes. Most programs complete the log book at the end of the patient visit rather than at the start. Some program data are entered in CPRS but few personnel have rights or permissions to do so and limited connectivity hampers those that do. There is no policy that outlines access rights or permission levels. Many clinical staff does not have access; others have been waiting for permission to use CPRS for "a long time".

Statistics Program	Excel spreadsheets and EpiInfo
Vital Records	Statistics Database (TBD EVE/STEVE)
Tuberculosis Program	Excel and On-Line feed to web database -type unknown
TB, HIV, Emergency Preparedness	Excel Spreadsheets and EpiInfo
Immunization & Hepatitis Program	WebTamaIZ a product of In-Vision
Maternal Child Health Program	Excel Spreadsheets, Access
Helping Hands Program	Access Database, SharePoint
Preventative Health Program (Tobacco)	Excel Spreadsheets
Breast and Cervical Cancer	CAST
Diabetes	Chronic Disease Electronic Management System (Web-based –CDC supported)
LBJ	CPRS/VISTA
Community Health Centers	Excel, VISTA/CPRS

Figure 2 illustrates how current data reporting can be characterized in DOH where each program area (*n* =10) maintains a few independent linkages to other program areas and produce its own set of reports directly to grantors. With each linkage come and additional interface and additional processes and communications which contribute to overhead expense.

In this model each intervention area is responsible for capturing and recording patient or client data related to their program areas. Some of these data may be of interest to other program areas useful for advance indication of an emerging health condition or providing current health status and most recent intervention(s) including medications. Missing in this model is a "core" HIS coordinating body and administrative oversight.

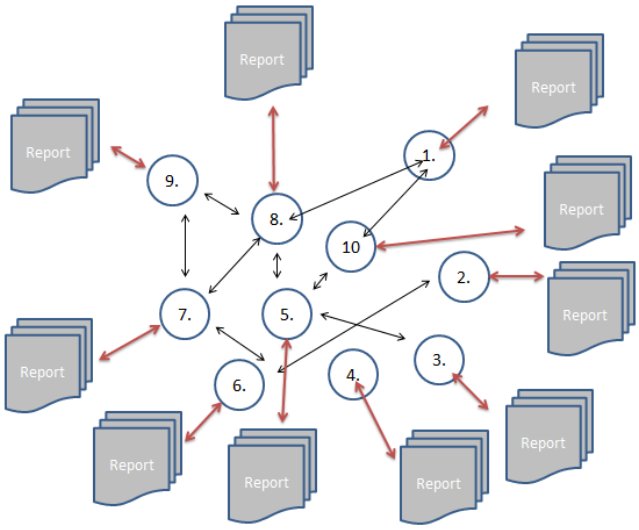


Figure 2 Data Flow and Reporting

Other Public Health Stakeholders

Principal stakeholders operating in the public health space and serving much of the same client base include the Lyndon Bines Johnson (LBJ) Hospital, Department of Social Services, U.S. Homeland Security, and Veterans Hospital. This assessment focused nearly exclusively on the first two.

Of these stakeholders, LBJ has the strongest connection to DOH given its earlier history. The life cycle of most Samoans begins and ends at LBJ. Hospital lab and medical services work closely with DOH program areas reporting health events and patient diagnoses. Unfortunately this is seen as a one-way street among some where data is sent to DOH but no feedback is returned. This same complaint is harbored by most program areas. The three DOH Community Health Centers and three Health Dispensaries share data with LBJ and vice versa through VISTA/CPRS but the connection is spotty. Some programs areas complain that it is down 30-40% of the time.

LBJ records data on births and deaths and most health events in between if available. Vital records data are forwarded from LBJ Admissions to HISO as well as to Vital Records under Homeland Security in printed form, after first being captured in hand-written form and entered in VISTA/CPRS and/or Excel. The Excel records at LBJ are kept as individual files rather than in a spreadsheet capable of holding multiple records. The printed records (certificates of live births and deaths) received by HISO are then entered into another Excel spreadsheets. Here multiple records are entered in a single spread sheet but there are multiple spreadsheets depending on the intended report; this attributed to lack of training in sorting and filtering of data. There are minimal data management skill sets in HISO as in most all other program areas.

By most accounts, program data in paper form generated at the three Community Health Centers and three dispensaries are often at odds with data in CPRS/VISTA. Inconsistency of program data and medical data in CPRS is attributable to poor and inconsistent connectivity and ambiguous data management policy. At LBJ and elsewhere, data entry in VISTA/CPRS is considered "optional" in some locations, allowing users to skip CPRS in favor of logbook and patient file records. The expectation is that the paper data will later be entered in batch to CPRS when there is connectivity.

VISTA/CPRS connection at LBJ is managed through the local area network (LAN). Off-site connection by health centers requires an Internet Service Provider (ISP) and TCP/P connectivity. Aside from a few specific programs, internet service is provided to DOH through American Samoa Telecommunication and Communication Authority (ASTCA). Each program area pays for its own contract for Internet services at average of $200 per month. The other major ISP provider is BlueSky, a private corporation. This service is in some cases twice as expensive and otherwise averages about 30% more in cost. There are also three other smaller players in this space but none large enough to service the demands of the public health sector.

Policy Framework

Outside of a single policy on HIPPA and another on the appropriate use of the Internet while on the job, there is no policy that pertains to data, information, and communication. Nor policy documents that support a functional HIS or designate a responsible entity, such as HISO to support HIS. Notwithstanding, program areas have established their own data processes and have set out to defined data sets. These tend to be program-specific and not standardized across the Department. This leads to a problem of data *flow*, integrity and precision and complicates data-sharing as discussed in more detail below

Resource Capacity

Health Information Systems require a number of organizational assets and adequate resources from three principal areas: Human, Material, and Financial. DOH has resource capacity in all three areas however combined there is insufficient resource in total to implement a system-wide HIS.

Human Resource

DOH human resource base is reasonably educated, and well trained in their service areas. Most have been trained on-the-job. Many have traveled off-island for more intense training and exposure. On-line learning opportunities are limited and infrequently utilized. What exposure to HIS and data and information services ('informatics") received is scoped to program service level indicator reporting used to produce top-level reports. Most personnel have little or no knowledge of data standards and data management practices. This may be attributable to an issue of grantor-dependency where most program areas look to their grantors for technical guidance and assistance rather than to a DOH as provider of technical assistance and training. In part this is because there is no functional office at present in DOH that can offer those services. The downside of this scenario is that HIS capacity is not developing internal to DOH. This works against building institutional capacity.

Policy Requirement # 6

DOH/HISO shall articulate and administer data access rights and privileges, and permission levels for data use and transmission consistent with DOH Policy and Procedure Guidelines.

Policy 6 Data Use and Access Rights

It should be kept in mind that grantors have their own objectives in funding program areas and they are usually mutually exclusive of other department programs or overall DOH objectives. With few exceptions this imparts a limited view of the "big picture" within program areas. More cross-training and data-sharing can help bridge that knowledge gap.

Six training sessions were presented as part of this Assessment to expose participants to health informatics and some programmatic aspects of epidemiology A data-mapping workshop was held during the assessment in which program operators were brought together to review data collection forms used by all program areas. Data collection standards and rules of *data normalization* and validation were discussed. Participants joined in to create a "menu" of available data elements from each of their program areas. From this list participants pick and choose which data from other program areas they would find useful in program implementation or research. The combined data list is a result of that exercise and can be illustrated as data schema for a repository, visually represented as a HIS *data spectrum* (Figure 5). Each program maintains an interface to the repository.

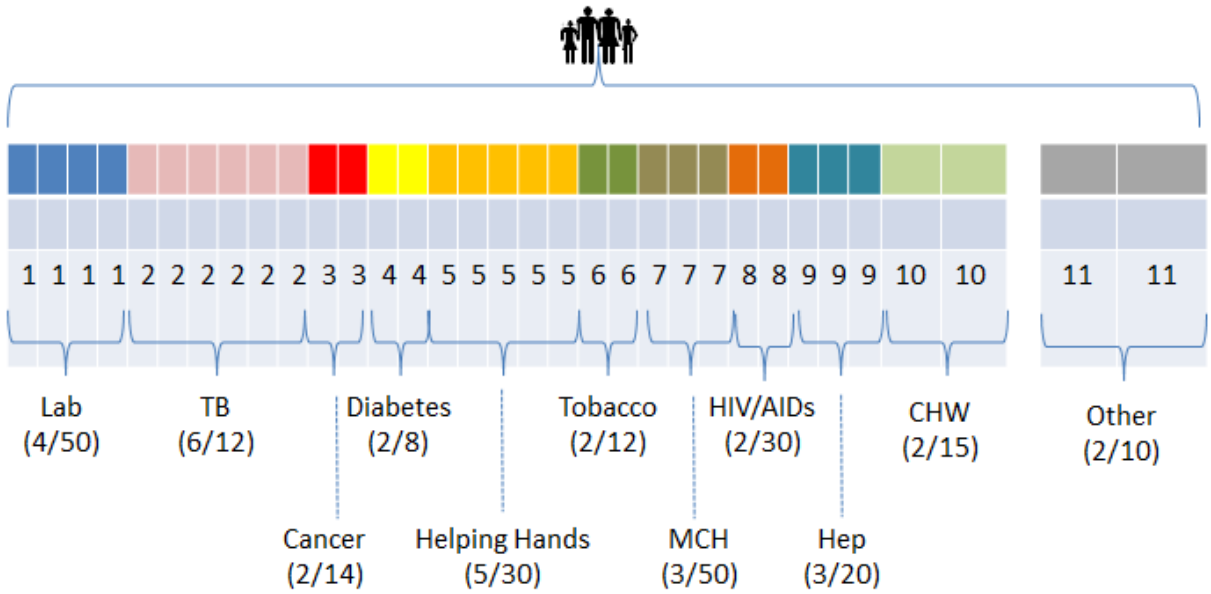


Figure 3 HIS Data Spectrum

Material and Equipment

Program areas appear to be adequate equipped with computers and network physical infrastructure would connectivity not be an issue. DOH administrative offices are less so. Microsoft Windows is the ubiquitous operating systems with most computers using the lower grade Vista or Home edition products. Software is outdated and like the OS varies from computer to computer. There is no dedicated equipment for data backup or archiving. A common practice is for users to back-up data on USB stick-drives. These are often carried off-site or maintained in a drawer near their computers. No data are encrypted.

Financial

Many of the Public Health services provided in AS are fee-based where the patient/client are required to pay a nominal amount for treatment, lab work, and other medical interventions. Some patients pay nothing. There is evidence that suggest that services provided and what is paid for is not equivalent. According to one report for example, service logs at one Community Health Center show *X* number of services rendered but only *Y* amount of fees collected. It is not possible to determine whether fees were owed or just not paid, only that they were not registered. For some patients fees are waived but without a linked financial recording system that reconciles service delivery provisions with patient payment status it is impossible to make that assertion. For accountability linkage to financial systems must be present and working.

Data Accuracy and Precision

Determining which public health interventions offers the greatest impact on public health outcomes is difficult without accurate data to attribute results to intervention.

Among small homogeneous populations such as the case in AS it becomes more difficult to detect emerging disease or other determinants of health outcome as data appear normally distributed in most population based statistics. Most analyses do not look at *intraclass correlation*, or clustering effect, thus broad population-based intervention often miss the target as segments of the population are *hidden* within the larger homogenous cluster. [vii] Hidden as well are the positive trend data that suggests when

interventions work. Highly aggregated or summary data has little value in these population groups and thus program summary reports are insufficient to make informed decisions. For this reason it is necessary to use more granular data extracted from individual health records to determine appropriate clusters and more precise interventions. Understanding the intraclass correlation will require data drawn from other sectors in addition to health, such as environment, social services, education, and economic. There is ample health workforce found among the number of outreach programs to pull out these data.

Data Integrity and Security

The data in DOH is unsecure. All input and output data are easily compromised for lack of policy and training on proper data handling. There is little if any data validation at time of data entry. There is no recording of Date and Time when the data record is created or updated and often not assignable to any health worker entering the data. Unique values are often found in duplicate. Data files are found on unprotected machines having no password for protection. There are data on numerous USB stick-drives, equally unprotected. Some infected with virus.[viii] When the hurricane hit a few years back nearly all data on births and deaths were lost and have yet to be restored from other sources, primarily because there was no backup of the data. The condition is ripe again for that kind of loss as data protection practices have not improved since then and little use of off-site storage

Birth records contain primary identification data on all Samoans. Each birth receives a Hospital Identification (HPID) which is used for all subsequent health services and events up to and including death. A birth certificate identification number (CERTID) is also attached to the record. The HPID could be considered unique however it cannot be asserted that the HPID is assigned exclusively to a single person. In a cursory review of January birth records alone, evidence shows three unique HPIDs are shared by two people each for a total of 6 suspect records. Birth records also show identical birth CERID issued to different people. Other anecdotal evidence suggests that the HPID is "lent" to others for health care and treatment, especially among guest workers, most notably Western Samoans. In normal practice, patient and client record keeping systems should have an internal record identifier not shared with patients and used by the computer system. This insures that every record is unique and that key values are not duplicated. Absent this provision, every data entry program should use *data validation* to avoid duplicate entry of key data such as HPID or CERTID.

Policy Requirement #7

DOH shall author and widely distribute an HIS Policy and Procedure Guidance document that details the realtion between data flow and the organizational structure and functional units of DOH, its administration and program offices, detailing data standards, responsibilities and measurements of accountability.

Policy 7 DOH Policy and Procedure Guidance

There is no clear DOH program policy on how data should be captured, processed, or reported in CPRS. There is a substantial amount of duplication of effort in the data collection in all systems. There are duplicate data records and sets of records. For example, in Primary Care there are three forms including several referrals forms where data entry is repeated recursively from one form to the next. Hard-copy of these same data is also found in the traditional log books and patient records and treatment charts. (The log book is one artifact that needs to be forgotten or, if absolutely needed, printed electronically).

Data output to/from program areas using CPRS is less than optimal and "questionable" according to some account where collated paper-based data, say on dialysis, doesn't match the same record in VISTA.

Data Utilization

The CDC provides a number of grant funding to DOH and additional value-added contribution in form of technical assistance support and data analyses. Charts and graphs are a few of the tangible deliverables provided from aggregated data sets. HIV/AIDS and TB, the two high-profile infectious diseases, enjoy special funding support and analyses, even given the low prevalence and caseloads. This is testament to CDC's commitment to prevention. Unfortunately few staff in DOH is able to generate these same information products for lack of know-how and training opportunity. This detracts from intellectual capital development and thwarts institutional capacity.

Data drawn from patient records are valuable information assets useful for planning and programming. In some cases the lack of this data compromises program integrity and stifles knowledge of the unique epidemiology of AS. In some cases proxy data are used instead of raw data. This is not major problem if data currency and latency is not an issue, say in routine, non-emergency situations. In other circumstances it is: When up-to-the-minute data are needed say, knowing what medication has been prescribed prior to surgery; or, place and time a food or water-borne disease was contracted. Learning of this information in near to real-time as possible improves treatment and averts wider exposure.

Emergency Preparedness (EP) collects symptomatic data as *syndromic surveillance* of clinical data gathered weekly from log books and lab reports. Unfortunately, these data are at times incomplete and aged. Here, currency and high latency (weekly collection) effectively degrades the capability of EP to respond in real-time to public health threats such as a highly infectious disease outbreak or environmental contaminants. Additionally these data are viewed in summary or at the population level and not useful in understanding of patient or client history. Further latency is added by the lengthy turn-around time of lab confirmations which often come from island weeks later.

Poor data quality and latency also affects the ability of programs and services to predict new emerging disease or stock outs of important supplies and drug inventories. What inventory management systems are used in AS suggest a level of dysfunction as some informants report that even basic supplies and commodities (test reagents, hand soap, fluoride) are often out of stock.

Informatics

The value of information products are their ability to educate and inform program planning and help to establish services priorities and set funding levels. There is little evidence that DOH use available data at the level of granularity necessary to produce these products outside of grant applications which in most cases are likely to be funded regardless. For example, looking at high birth weights by mother's age and village might suggest targeted program interventions in one village over another and among certain age cohorts over others.[ix]

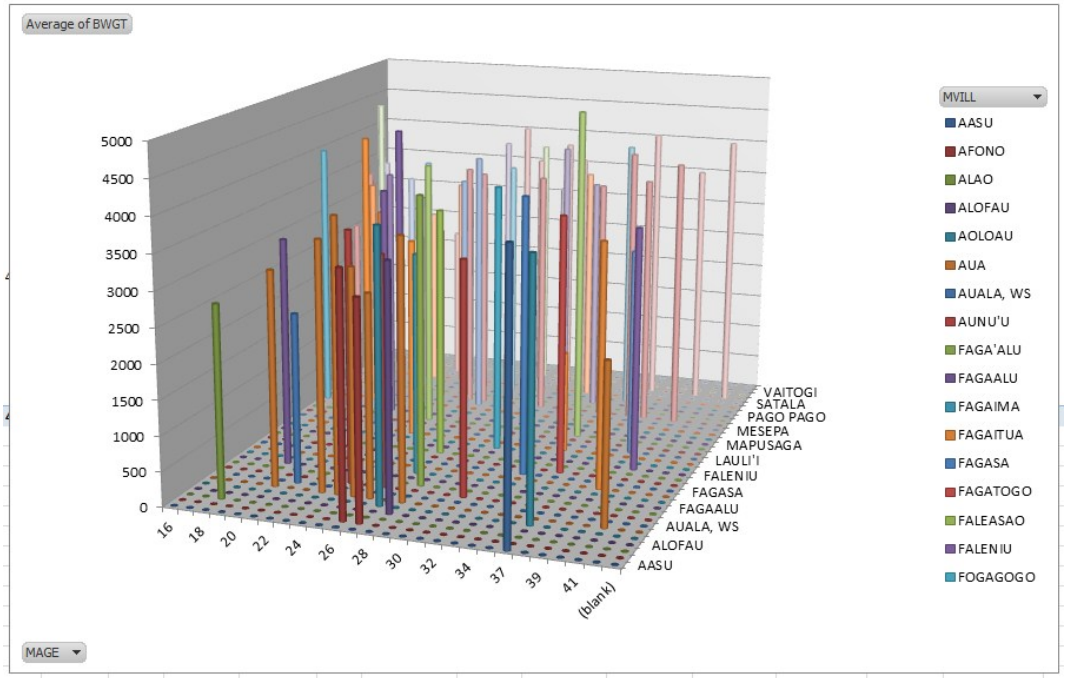
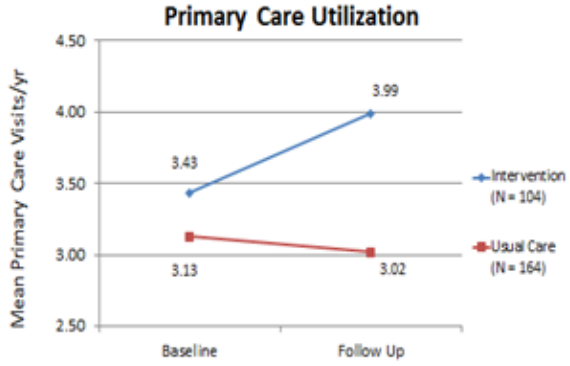


Figure 4 Birth weights by mother's age and village

The degree of aggregation of the data collected at program level currently cannot produce these sorts of visual displays (figure 3) as data are not used in this fashion, nor has there been adequate training to do so; regardless the data are available.

Properly analyzed and linked with financial records, data can infer attribution of select program interventions to health outcomes and unit cost of health care per individual – an extremely valuable bit of information for accountability. For instance, we know that childhood immunization off-sets the cost of childhood illness would children not receive vaccinations for polio or measles. This same evidence-based intervention strategy could apply to all prevention programs. For example, a recent trial diabetes outreach program using Community Health Workers (CHW) reduced emergency care visits among participants and increased use of beneficial primary care visits and thus improved health.[x] From the study we can deduce that improved patient outreach among diabetics resulted in an estimated cost savings of 50% based American Hospital Association average costs of Emergency Room visit of $1318[xi] , and the $676 per person unit cost of the intervention.



Emergency Room utilization during 1 year

ER visits	No.	Counts	Person-Years	Rate per 100 PY	RD per 100 py	Unadj Rate Ratio	Unadjusted Rate Diff %
Control	164	237	163	146.0	[ref]	1.00	[ref]
CHW	104	91	100	91.3	-54.7	**0.63(0.49,0.80)**	↓37

N visits Pre-study	Usual Care	Adjusted RR (95% CI) CHW (ER)
0	[ref]	1.04 (0.69,1.57)
1	[ref]	0.84 (0.57,1.24)
2	[ref]	**0.68 (0.46,1.00)**
3	[ref]	**0.55 (0.37,0.82)**
4	[ref]	**0.44 (0.29,0.68)**

The intervention had a significant effect in reducing emergency visits among the CHW group **only in those who had more ER visits before the study**.

Why? **Higher users of ER care before the study had more poorly controlled diabetes**
We think the CHW intervention sessions improved self-care and self-management, **especially among those with poorly managed diabetes.**

Figure 5 Diabetes intervention impact on health care services

DOH cannot easily provide that level and detail of evidence today because more resources are used to collect data for top-level reporting through vertical, tabular, reporting systems rather than at the horizontal level point of intervention. Although both data classes are important, investing more resources in the later will empower health workers and improve health outcomes more quickly over time. These data in turn can be used in grant applications to justify more preventative activity and extended use of community health workers in other program areas, highlighting the importance of collecting routine data at point of intervention and use of the data interactively with clients.

The HIS Plan proposes a system of using a data repository as a *visualization layer*, not unlike the Electronic Verification of Vital Events (EVVE) as it relates to State and Territorial Exchange of Vital Events (STEVE)[xii] . EVVE is soon to be operational in AS and installed in Office of Homeland Security. There is no provision that would avert vital record data being entered the same way as it is now: manually from printed COLB provided by LBJ.

The HIS repository differs as it uses raw data and connects one program data to another as *token ring* allowing data to be contributed and shared across program areas as if connected to the same machine. The shared data are accessible to all participating DOH and stakeholder programs. It also forms a nexus of data and information exchange useful to DOH and ASG in developing annual plans and measuring performance indicators. One output of the HIS repository is input to EVVE or other schemas.

HIS Plan

The HIS Plan is a *base plan* that builds on and extends the current data and information systems by providing the foundational underpinnings that allow systems to grow incremental over time. The strategy taps into the existing program systems and data sharing models currently in use. [xiii] In this way we can leverage existing resources without too many upfront changes. Over time most of these systems will evolve and converge into a more refined architecture given the right policy environment and leadership.

The Plan proposes to modify various data and information processing procedures, while using the same tools, and managing those practices within a policy framework. Additionally it calls on DOH to operate using an *annual plan* which incorporates all program areas currently in place. It will require organizational change and development specifically in the area of human resource development with a renew emphasis on responsibility and accountability. Included as well are recommendations for cost-sharing measures whereby program areas contribute to the development of HIS both financial and through in-kind human resource contributions. With no *skin in the game* there is no chance for a sustainable HIS.

It is clear that certain growth barriers will not resolve immediately, such as adequate resources as those described above, or reliable network connectivity that would allow HIS to move to a web-based or "cloud computing" system. Regardless of these impediments, the recommended Plan will position DOH to take that next step when those resources and capability become available. The proposed HIS Plan and the set of recommendations that follow can be implemented in three phases. DOH should feel free to rearrange tasks according to resource availability.

1. Inception Phase – Foundational Strengthening

This is the current phase and includes this Assessment as the start of HIS development. Several intermediate objectives have already been achieved such as training in Excel, the *de facto* tool of choice among program areas, and exposure to some advance concepts of health informatics and epidemiology. These trainings and education activities should continue throughout the next phases.

Immediate tasks still needing completion in this phase include:

Tasks

a. Expand awareness of HIS Plan and objectives.
b. Refine and approve this HIS Plan and implementation strategy keeping in mind modification to the Plan and milestones will need to be adjusted over time.
c. Data entry and report skills training (Excel I and II training provision)
d. Strengthening of understanding of heath informatics (HIS/EPI training provision)
e. On-going support to Policy, ICT, and Data working groups (3WG)
f. A simple architectural design of a HIS repository (Product of Data WG)
g. Complete policy framework. (Product of Policy WG)
h. Enact policy framework.

2. HIS Build-out and Strengthening Phase

In this phase resources are directed to upgrade and extend the capacity of existing programs' data processing and information systems to interface with a HIS repository, and build the capacity and functions of HISO to manage the development of HIS in conjunction with the HIS Committee.

Tasks

a. Enable 3WGs to develop policy and procedures for data archiving and transmission protocols.
b. Upgrade all desktops Windows Operating System to latest version.
c. Upgrade software including antiviral to latest versions.
d. Install and test web-based database application systems that interface with CPRS (or other repository)[xiv]
e. Test feasibility of automated SMS gateway services for client payments and linkage of finance with program delivery.
f. Provide program areas *store and forward* functionality as a remedial measure to poor connectivity.
g. Develop an umbrella MOU for DOH data and information system interface with outside agencies and departments.
h. Resource HISO to a level where it is functional.
i. Combine all program ICT services and supply contracts under one DOH contract mechanism and SLA managed by HISO with support from Governor's IT Department.
j. Define *the business rule layer* and *rules* that control data input/output, rights, permissions, with explicit links to Policy.
k. Restructure database systems and file systems to use *primary keys* and date/time stamping in record management.

3. HIS Scale-up Phase

Key indicators that give the green light to begin this stage are (i) the quality of data (ii) data throughput and latency, (iii) reliability of networked systems. Here we are looking to get as close to real-time as feasible given network system constraints. A cost-benefit analysis should be conducted in advance of these tasks to determine the feasibility of managing HIS services in-house or outsourcing through an open bid process. The long term goal is web based, cloud computing.

Tasks

a. Invest in upgraded servers
b. Extend HIS to other allied health subscribers.
c. Provision of dedicated network transmission channels.
d. Expand HISO service level agreements.
e. Qualify meaningful use of data in order to comply with new accountability standards.

Focus Areas to Observe in HIS Implementation

There are a number of focus areas to observe throughout the implementation phases. These form a strategy by which DOH should undertake the number of tasks listed above. These areas represent the most salient findings of this assessment as identified by informants as areas of particular interest or concerns.

Center on Core Function of DOH Administration and its Role in HIS

Public Health program management must be restored at the senior management level of DOH. Effort must be made on the part of grantors to assist DOH management to reestablish its authority and responsibility for the implementation of the HIS –this, above the role of programs and 3WG participation. An immediate step in this direction is the re-establishment of a Senior Management Team to assist the Director in performing administrative and management functions to *institutionalize* HIS. The first action item of the SMT should be to adopt a policy framework for HIS as advised by the 3WG.

Specific Recommendations:

1. Immediately form a Senior Management Team (SMT) composed of:
    a. Finance
    b. HR
    c. Chief Health (Medical) Officer
    d. Head Nurse
    e. Administrator
    f. Deputy Director (Acting)
2. Empower the SMT to do the following:
    a. Manage the 3WGS and implement recommendations especially in Policy
    b. Create a set of new Policies and Procedures through work of 3WG for DOH and all programs.
    c. Devise a set of rewards and sanctions for DOH staff
3. Call an all-hands meeting of all program managers and coordinators and inform them of the formation of the SMT and its role:
    a. Outline the responsibilities of the SMT to all staff:
    b. Stipulate participation requirements of all staff in DOH priority initiatives (e.g., HIS or others) with implication of noncompliance to include sanctions of grant fund withholding or staff probation.

Program Areas of Highest Cost-burden

There are limited resources for the provision of health services. Accordingly more resources have been consumed in care and treatment over preventative intervention. Data and information services have been relegated to a lower tier of budget allocation given the high cost of care and treatment and constraint of resources (human, material, financial).

The over-all burden of disease is reflected in the cost of providing care and treatment. For this reason those program areas which positively impact health outcomes should receive the bulk of investment in an HIS construct. This does not exclude other program areas but only weights resource distribution in those areas that will provide the highest return on investment (ROI) i.e., lowered health cost burdens, in the least amount of time. The spin-offs of those investments can be extended to benefit all program areas. For example, focus first on Diabetes and other high cost NCD. To that end:

- Develop 100% data throughput connectivity and transmission with VISTA.
- Develop a HIS repository *visualization layer* with associate business rules.
- Connect those data stores with
    - birth records
    - death records, and
    - environment and sanitation

These outputs will create the underlying infrastructure benefiting all other program areas while meeting data demands of those having the highest cost-burden to public health.

Data and Information Systems

The HIS Plan suggests a *nascent development model* (build on what you have and evolve) which places high value on human capital as a value-contribution to the design and implementation of HIS. Investing principally in human resource, through training and skills development will enhance the viability of a successful HIS. Human resource is what drives data and information systems *not the technology*.

Technologically, properly designed and resourced, the HIS will allow for "event triggering" on a backend database, e.g., VISTA. This is a functional output of a "smart database" that prompts users or sends messages alerts when the data indicates a certain conditions exist. Data-driven events are defined as rules and triggers and built into the *business rules layer* and backend data validation.

VISTA/CPRS represents a significant investment. DOH, in collaboration with LBJ, should leverage this asset by investing in improved connectivity and revise the processes and procedures for access rights to the data. This empowers users and leverages the investment of data as a resource to build human capacity and thereby institutional capacity.

It may be necessary to bid-out services to an outside provider, perhaps attracting new investments off-island. Current ICT contracts should be allowed to expire while bidding out new services. The Governor's Office of IT expressed interest in facilitating DOH in preparing Requests for Information (ROI), tendering bids, and price negotiations.

Insuring that the HIS implementation does not lose momentum over time it is recommended that a program evaluation and review technique (PERT) [xv] be used to schedule and monitor deliverables. The PERT should be reviewed periodically over the course of the implementation and recalibrated as necessary (see figure 7).

Particular attention should be given to the three WGs (3WG) in meeting their deliverables. One-week trainings should be provided to each one of the following technical areas:

Data WG	Data standardization, normalization, validation, business rules, and queries
Policy WG	Policy writing, approaches to change management organizational development, leadership, MOUs
Information & Communication WG	Policy dissemination, social messaging, legislative messaging, behavioral change communication, social marketing, media channels

Data Security and Confidentiality

Data saved on computers is generally unprotected. The data are not encrypted and not password protected. At minimum password protection should be implemented at the machine level at logon. Ideally individual data files should be password protected as well.

In addition to securing access to data, data should be encrypted. Enciphered data is important when more than one user has access to the files or when data are transmitted or stored. It is advisable to encrypt and password protect all data files using tools such as "TrueCrypt " (http://www.truececrypt.org) - freeware that meets U.S. Government encryption standards, or similar tool. Data that use the Internet (TCP/IP) for transmission should use a secure socket layer (SSL) and HTTPS protocol. If sufficiently encrypted FTP protocol is acceptable.

Data Integrity

CD10 diagnostic codes, employee identification numbers, hospital identification numbers, village codes, county codes, and other *control data* as these must be managed. These lists of encoded data should be used for data entry in standard format. For example, it is standard practice to use ID numbers such as

village id or hospital ID rather than the village name or person's name. If the actual name is needed, say in a confidential report, then a query pulls the name from a lookup table. This practice guarantees data integrity and anonymity is better than keying in text data than can be misspelled or ambiguous. For example, entering a diagnosis textually as "Typhoid Fever" rather than ICD A0101 (typhoid meningitis) means something entirely different and would not trigger proper medical response. Just as the A01 code would not precisely identify the type of fever. The most recent CD10 list is available at http://www.cdc.gov/nchs/icd/icd10cm.htm A copy of CD10 has been added to an Excel workbook (LookupCodes.xlsx) along with other commonly used lookup values (village, race, nationality, doctors, etc.) . This file was distributed to participants who took the Excel training provided as part of this assessment. [xvi]

Schema for virtual HIS Repository

An illustrative data sharing model was presented to several groups of informants which hinted at a *HIS Repository* wherein each program area maintains a single interface to a *virtual database* as a visualization layer. The output of such a system can channel data to registries, special reports, or research. It could allow DOH to share data with other sectors such as Social Services. The VISTA system or any other Structured Query Language (SQL) platform could serve as a backend database to support a respository. In this schema data are shared and are viewable by any program area depending on permissions as articulated in the policy framework. A wide range of statitical analysis and reporting is posisble given the level of data (individual paient and client records). Access to the repository – and thus the backend databse, is controlled by a *business rule* layer which sits between the backend database and visualization layer.

Computers and Software: Nearly all computers reviewed had users logged on in Administrative mode.

This is a dangerous practice which can allow viral intrusion and system file corruption. All machines should have password log-ins. Some computers were running unauthenticated Windows OS which can serve as good vehicles for pirating system resources and consuming bandwidth. Others have outdated software version making it difficult to exchange files and share data. Anti-viral software is not all current. This complicates data collection and functionality between versions.

Managing Multiple Tracks in HIS Implementation

Multiple tracks are recommended in the implementation of the HIS Plan as a number of activities can run concurrently. These activities can be tracked and managed over time by using a technique specifying specific milestones that need to be achieved over time in the HIS roll-out and include these categories of intervention:

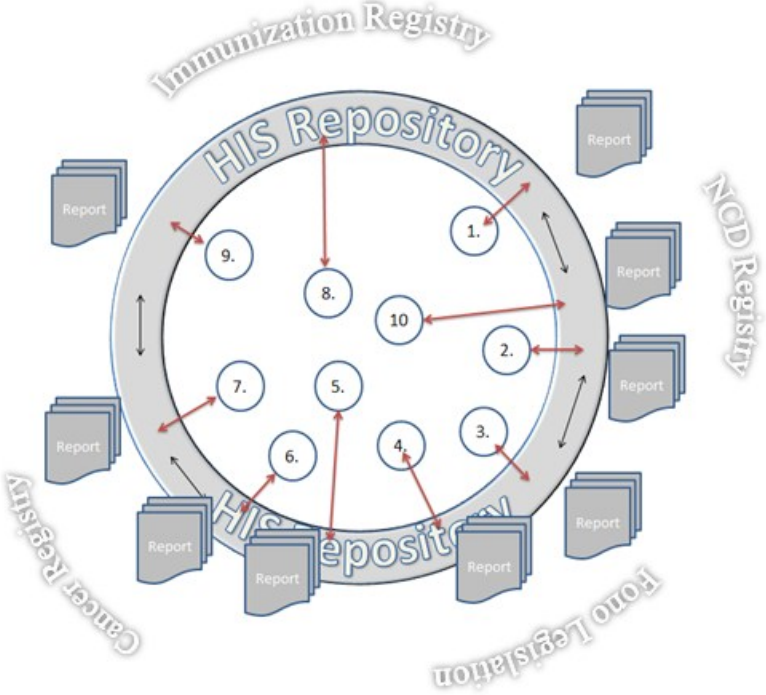


Figure 6 Illustrative HIS Repository and Output Reporting

- Human Resource Development

- Equipment and Hardware Upgrades
- HIS Policy Framework
- Data and Information Sharing Environment
- Organizational Development

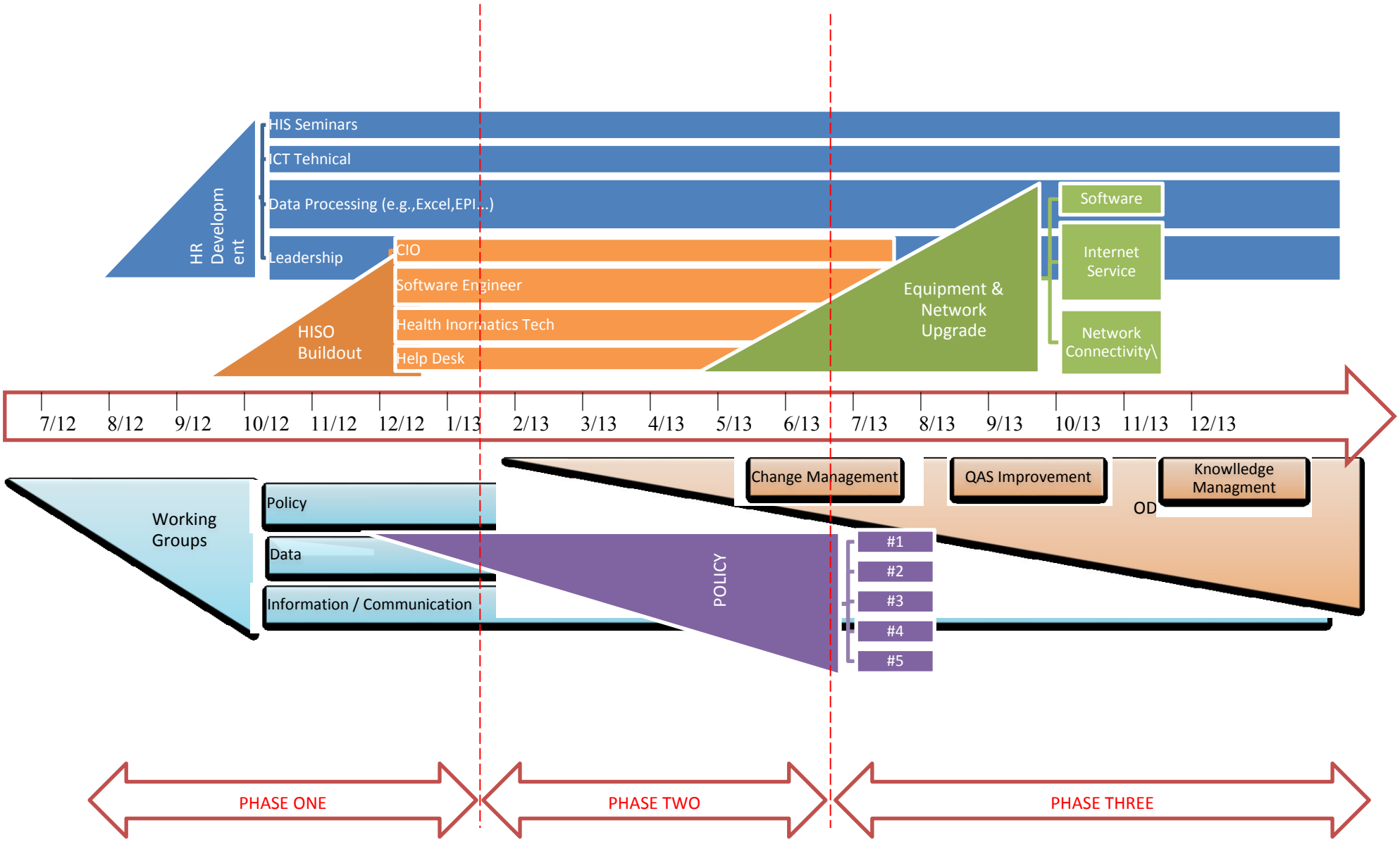


Figure 8 PERT timeframe and HIS component deliverables.

An on-going review of HIS progress must continue throughout each phase of the development process as illustrated above adjusting the timeframe and deliverables of each component as necessary.

HIS Implementation Strategy

Strategic implementation of HIS strategy requires strong leadership at all levels in DOH and within each program area. The policy framework should outline the relationship between the DOH directorate and administration and that of program areas and their grantors. Individuals at each level need to be named and held accountable in the development of the HIS. DOH administration should in turn set out procedural guidelines for program offices to follow in meeting policy objectives. Each program office should have a corresponding set of processes to follow in meeting DOH policy directives for HIS. This assembly of DOH policies and programmatic procedures will inform the development of the HIS.

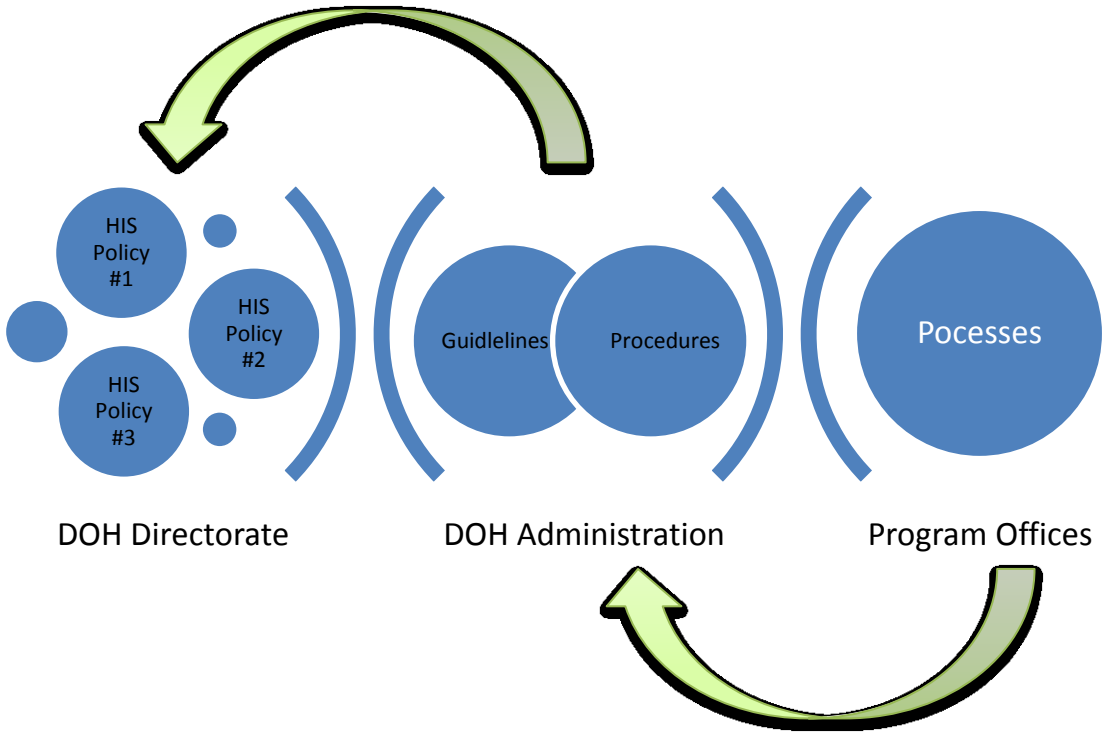


Figure 9 Policy input from Program processes

Policy Framework and Operational Procedures

Several policy areas need to be addressed to insure a successful development of a functional HIS. The Policy Framework for HIS must embrace the wider public health agenda for ASG and the provision of data and information services from the lowest to the highest level of program services to inform program design and funding. HIS policies will affect all programs that generate data and should address access rights and permission levels of staff in using data; security measures that safeguard and protect the confidentiality of the data; data storage; transmission; and access rights to the larger store of public health data and information maintained by DOH.

The following set of HIS policies areas should be completed by the Policy WG and modified as appropriate. Policy examples provided through PIHOA and elsewhere are available from DOH/Administrator HISO. Once created, policies must be formerly introduced by DOH administration to all program areas in a general assembly and be posted to a publicly accessible web portal. A simple *policy distribution system* could be place into effect by designating a web page on a DOH web site following other models.[xvii]

Assistance in policy development should be sought from the DOH Quality Assurance program and other resources such as WHO and PIHOA.

Illustrative Policy Areas

	ADMINISTRATION	
A	Health Programs participation in HIS Framework	The objective of this policy is to bind all data generated from the various DOH program areas to annual plans. All programs should be required to demonstrate that commitment in their respective grant applications as well as financially by contributing to DOH overhead support.
	HUMAN RESOURCE	
A	Knowledge Transfer	The objective of this policy is to build institutional memory. Should include a requirement that program managers, supervisors and others receiving training and other transferable skills, whether on or off-island, be required to present what they learned.
B	Training	The objective of this policy is to invest in human capital and instill valuation of data and information.
C	Incentivization	Personnel should be rewarded for positive work ethics and behavior, e.g., certifications, bonuses, achievement recognition awards. This helps prevent attrition and costs associated with re-hire and training.
	DATA	
A	Data Collection	Authorized methods and safeguard procedures…
B	Data Sharing	Internal and external requests – HISO should manage all external (non-grantor) requests
C	Data Access	Policy should establish tiers of access based on permission level and "need to know"
D	Code Sets	Control data used in look-up tables for doctor codes, employee id, CD10, village codes, hospital id, certification ids, etc. –must be securely managed and controlled.
	INFORMATION	
A	Report Generation	Define types of reports that are to be generated in what detail and frequency, i.e., program reports, performance reports, congressional reports….
B	Public Communication	Channels for information dissemination
C	Knowledge management	[Full scope of public health "library services"]

Internal and External Communications

DOH has benefited from having a Public Relations person who is charged with keeping public health in public view. There are a number of messaging channels used including public events and fundraisers,

television and radio spots, and legal forums. DOH can leverage this position to work even closer with preventative programs and helping them shape messages that can be used for Behavioral Change Communications (BCC) and other "wellness" messaging. These same skills can be applied internally within DOH to help the administration integrate program delivery and keep program areas informed of each other's activities through different messaging channels, such as newsletters, tweets, or a blog site. This would improve institutional memory and encourage discussion and diversity in program design.

Health Work Force Development

Investment in human capital is essential to building and understanding of the extent and depth of disease burden in AS. All measures should be examined to retain workers who add to the knowledge base and those who use data and information to improve service delivery. Turnover of staff is the leading cause of institutional failure as attrition depletes the level of human capital and diminishes institutional memory of what works and what does not.

Enhancing management skills and supporting *champions* who can move the HIS agenda forward is critical. These individuals need to be identified early on. Identification should be based on interest, skill and competency and not on years in service or other altruistic or nepotistic reasons. Some methods to help develop a stronger human resource and improve institutional capacity for HIS include:

- In-service training among program areas should include periodic presentations from other program areas to cross-fertilize ideas and program practices.
- Off-island travel to conferences and workshops dealing with HIS data and information management should be supported and made available to employees that demonstrate value-added contribution to DOH. Alternatively, and more cost-efficient would be for DOH, through program funding, contract for ongoing periodic on-island training and seminars through nearby universities (I.e., Fiji, Hawaii, New Zealand). This would benefit a greater number at a lower cost.
- Partnering with AS Community College in securing grants and curriculum development in health informatics for students and DOH staff.
- Personnel who demonstrate use of proper metrics and data for program improvement should be rewarded with advancement opportunity to encourage more evidence-based programming practice.
- A culture of knowledge workers needs to be encouraged and supported by the leadership through a system of recognition, awards and incentives
- Individualized employee performance plans should be supported that allow employees to self-direct their own skills development in data and information systems and intervention research.

Health Information Systems Management

The current system of data sharing and report output (Attachment A) should be modified to reflect a *system of reciprocity* where two-way data sharing is integral to the provision of program services in a more comprehensive patient and client -centric delivery model to encourage data-sharing.

In a reciprocal model, program data are shared universally with other subscribers by allowing visualization of data based on need through the repository. Each program subscribes to the data store.

Resources expended by program areas on ICT support services should be pooled and managed by HISO.

Strengthen Health Information System Office

Responsibilities of HISO should include the following functional areas of health information systems and services. Those indicated with an asterisk (*) are recommended to be managed through an out-sourced contract. This recommendation is based on current DOH capacity:

- Informatics training for HISO staff *
- Hosting and managing a web presence for DOH *
- Managing the local area network
- Information Services for all Program Areas to include:
    - IT support, e.g., help desk for hardware and software (Level 1)
    - IT support, e.g., help desk for hardware and software (Level 2) *
    - Qualitative Analysis of program outputs
- Generation of routine program and management reports for planning and budgets
- Custodian of reference tables used by program areas for data collection and reporting. e.g., facility id numbers, village codes, establishment codes, of all look-up tables
- Manage dissemination and access of DOH of Policies through a web portal or list-serve
- Establish normalized data schema and set standards for data and information transmission protocols:
    - A single data dictionaries defining data types
    - Transmission protocols, e.g., SMTP, FTP, TCP/IP
- Provide templates and other uniform data entry interfaces to program areas consistent with data definitions *
- Provide in-service training and maintain computer training facilities.
- Management of business rules used for data access and credentials validation.

HISO Branding

The Office of Health Information System needs to be recognized as the "got to" authority responsible for the HIS and all data matters. Accordingly, HISO should be strategically placed within the organizational structure to serve the data and informational needs of DOH in planning and program performance monitoring, and easily accessible to all program areas and various other departments of ASG, and the general public. Accordingly it should carry its own insignia and use other implements of branding to gain recognition from its "customers".

Paying For it – Sustainability

Each program area provides for their own ICT services and pay for that through grant awards.

The new Vital Statistics Cooperation Program (VSCP) contracts, also known as an IDIQ, recently executes by DOH allows for "Special Projects" and should be investigated. The VSCP mechanism could potentially channel up to $350,000 to DOH over the next five years, a sufficient amount to fund HISO and nearly all tasks associated with the HIS Plan.

Grants allow programs to budget for information and communication technology equipment and services as part of the overhead expense for implementation. Other grantors allow programs to budget for training to use software for data collection and reporting; travel for workshops and seminars on data and information handling; and, cost of internet access and other ICT related expenses. All of these are considered as reasonable and necessary expenses for program implementation. As such, program contributions that support integration of program data with the wider HIS framework should also be included in grant proposals and should expect the same *reasonableness* criteria to be applied by grantors.

ICT expenses (equipment, services, and connectivity costs) necessary for programs to contribute to the HIS Initiative should be articulated in grant applications. The narrative section should set out the value contribution of DOH -HIS to the program area and the [new] DOH policy requirement for integrating program data with a larger DOH repository or database, while the budget should detail which costs will be covered in that participation. The justification is the need to better integrate and share data across health interventions in the interest of a better public health services. This notion of program integration and cross-sector data sharing is widely supported among most grantors.

Program areas should identify DOH-HIS-related costs by breaking out equipment costs and data and information processing required of in participating in the HIS operating environment. DOH/HISO can facilitate this by breaking out the set of services it will provide programs into cost categories which programs can choose to support in their budgets consistent with grantor guidelines.

An illustrative list of reasonable expenses would include the following categories:

- Software integration support to…
- Network services to connect to…
- Hardware and device configuration necessary for…
- Training use of tools and procedures for…
- Travel expense to attend HIS stakeholder meetings and workshops.

Post-Inception Phase: Scope of Work to Complete HIS Development and Implementation

Immediate Quick Action Steps

The following seven actions should be undertaken immediately.

	Action	Level of Effort as *Time*
1	Re-establishment of a Senior Management Team	1 day
2	Issue an administrative directive requiring all new grant applications include a 8% indirect cost rate	30 minutes
3	Assign a DOH.as domain email addresses for all employees	2-3 hours
4	Install open-source email client on all computers[xviii]	2-3 days
5	Include mother and father HPID in all birth records	1 hour
6	Include cause of death diagnoses for all death records	1-2 day training
7	ICT infrastructure and Organizational Development Upgrades	[see Attachment F]
8	Add the parent HPID to each Birth Record, and to all other pediatric programs so no child record is "orphaned" from the parent health record. This will allow linkages between children and parents and better understanding of the family health pathology.	30 minute training of LBJ head nurse and record clerk

Scope of Work for Remaining Tasks in HIS Implementation

The Government of America Samoa, Department of Health (ASG/DOH) requires assistance in implementing a strategic Health Information System (HIS). Numerous assessments and evaluations have been conducted over the past several years. The most recent assessment, "Health Information System Assessment: Plan and Implementation Strategy for the U.S. Territory of American Samoa (August 2012), identifies a number of independent systems, data processing practices, use of data and information, the policy environment, and resource base. The assessment process included several immediate interventions including basic data skill training on Excel, the creation of three working groups (Policy, IT, Data) to help provide input and direction to the HIS planning process.

There remains a substantial amount of technical work support required in completing the first phase and assistance in executing the next two phases of the implementation plan.

The following two medium-term positions are required in completion of the following set of tasks:

1. Organizational Development (OD) consultant familiar with health systems and public health organizations –Knowledge of HIS implementation strategies is essential.
2. Database (DB) Applications Developer familiar with health information systems.

Estimated Time for Completion

Combined the hours of work required to complete the tasks of this work following the PERT schedule above are estimated to be 2080 or approximately 3 months of OD and 8 months for DB over the scheduled period.

Objectives

Assist DOH and program areas to implement a health Information System (HIS) in-line with recommendations outlined in the "HIS Assessment and Base Plan" , building on work already completed and currently underway.

Tasks Set I (OD Consultant)

- Provide ongoing in-service seminars and workshops on data use and information presentation, principles of HIS
- Support DOH-HIS Working Groups completing HIS and Policy Frameworks
    - Policy WG
    - Information & Communication WG
    - Data WG
- Assist DOH to source funding for HISO
    - Develop HISO annual plan and delivery milestones
    - Assist DOH in recruiting candidates for HISO staffing
- Assist DOH in developing new MOUs with all program grantors and DOH regarding data use and supported HISO functions
- Work closely with DB Application Developer in preparation of training curriculum to coincide with timing of release of data tools and new data processing procedures

Skill Sets Required

- Knowledge of group dynamics within fragmented organizations

- Expert on change management methods
- Experience in organizational change within a public health setting
- Knowledge of international development practices.

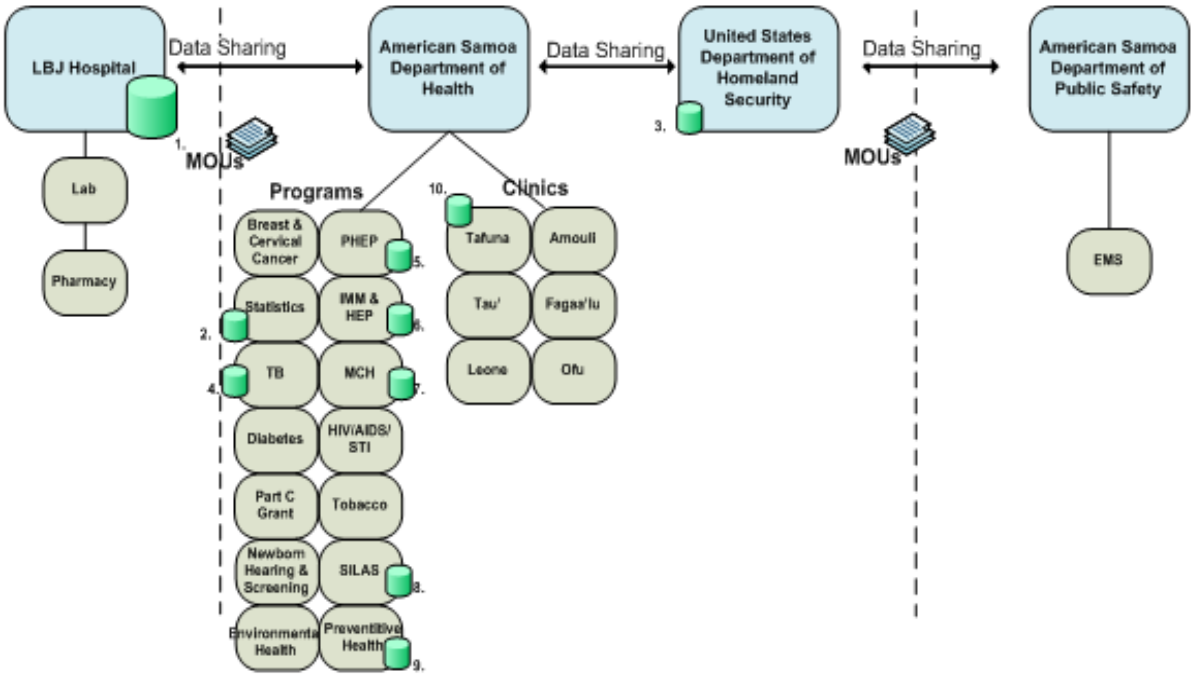
Tasks Set I (DB Applications Developer)

- Provide training in use of Excel
    - Introductory level training
    - Intermediate level training
    - Advance level training
- Develop a set of business rules to be used by HIS Repository to manage queries and CRUD (*create, read, update and delete)* functions for to be used in conjunction with backend database.
- Assist DOH to source upgraded network connectivity to enable 100% through-put to VISTA immediately deploying a store and forward of Excel data files using SMTP for delivery to HISO while at the same time develop and deploy use of MDWS[xix] (This will complete a three track redundancy model for data input and transmission: CPRS, Excel , MDWS. When MDWS matures the SMTP protocol maybe abandoned).
- Develop a set of "canned" queries using structured query language (SQL) to extract data from (a) VISTA, and (2) Excel ODBC data sources to create views of data defined by HIS Repository.
- Upgrade all desktops and laptops software with recent versions
- Configure all desktops with email client with email accounts at DOH. AS domain
- Assist each program area to develop a *Data-sharing Interface* with HIS Repository.
- Work closely with OD Consultant in preparation of training curriculum and use of data tools.

Skill Sets Required

- High level knowledge of database design, business rule layer, and front end client interface development using appropriate development tools compatible with existing Windows OS.
- Knowledge of health information systems design and methods of information sharing and data transfer protocols.
- Understanding of database schema, business rules, transmission protocols
- Understanding of social systems and human interface in digital design and software applications

Attachment A – Current Data Sharing Model



Attachment B – Informant List

Name	Organization	Telephone	Email
Akapusi Ledua	LBJ MD Orthopedics	633-1222	
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Angelina Stevens	DOH Cancer Registrar	633-4589	as.cancer.registry@gmail.com
Anouise Uso	MCH (Dentist)	633-4616	
Dotti Siavi'i	DOH TOBACCO/PREVENTIV	633-2260	futiolo@hotmail.com
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Fatima Langkilde	DOH PUBLIC RELATION	633-4606	
Fred Malala	DOH ENV/SANITATION	633-1468-9	
Fred Malala	Environmental Services		s.ioapo@yahoo.com
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Loretta Perolini	DOH PERSONNEL MANGER	633-4606	
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Mark Meredith	DOH FINANCE MANAGER	633-4606	
Mike Gerstenberger	LBJ CEO	633-1222	
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Moira Wright/Va'asa	BREAST/CERVICAL CANCER	633-2135	
Ofeira Nuusolia *	CHC's		
Pasa Turituri	AMOULI HLTH CENTRE		
Puni Vele	Finance	633-4606	
Ray Tulafono Jr,	HIT Coordinator		ray.tulafono@lbj.as
Richard Ripley	CENTRE (Physician)	6227456	
Ruth Te'o *	Early Intervention/Newborn Hearing Screening		
Saipale Fuimaono	DOH Physical Exam	633-5871/5872	
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Tele Hill *	Nursing Director		
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Tinousi Jennings	CII BABY CLINIC FAGAALU	633-4388-9	
Toaga Seumala	Chief Nurse - LBJ	633-1222	toaga.seumato@lbj.as
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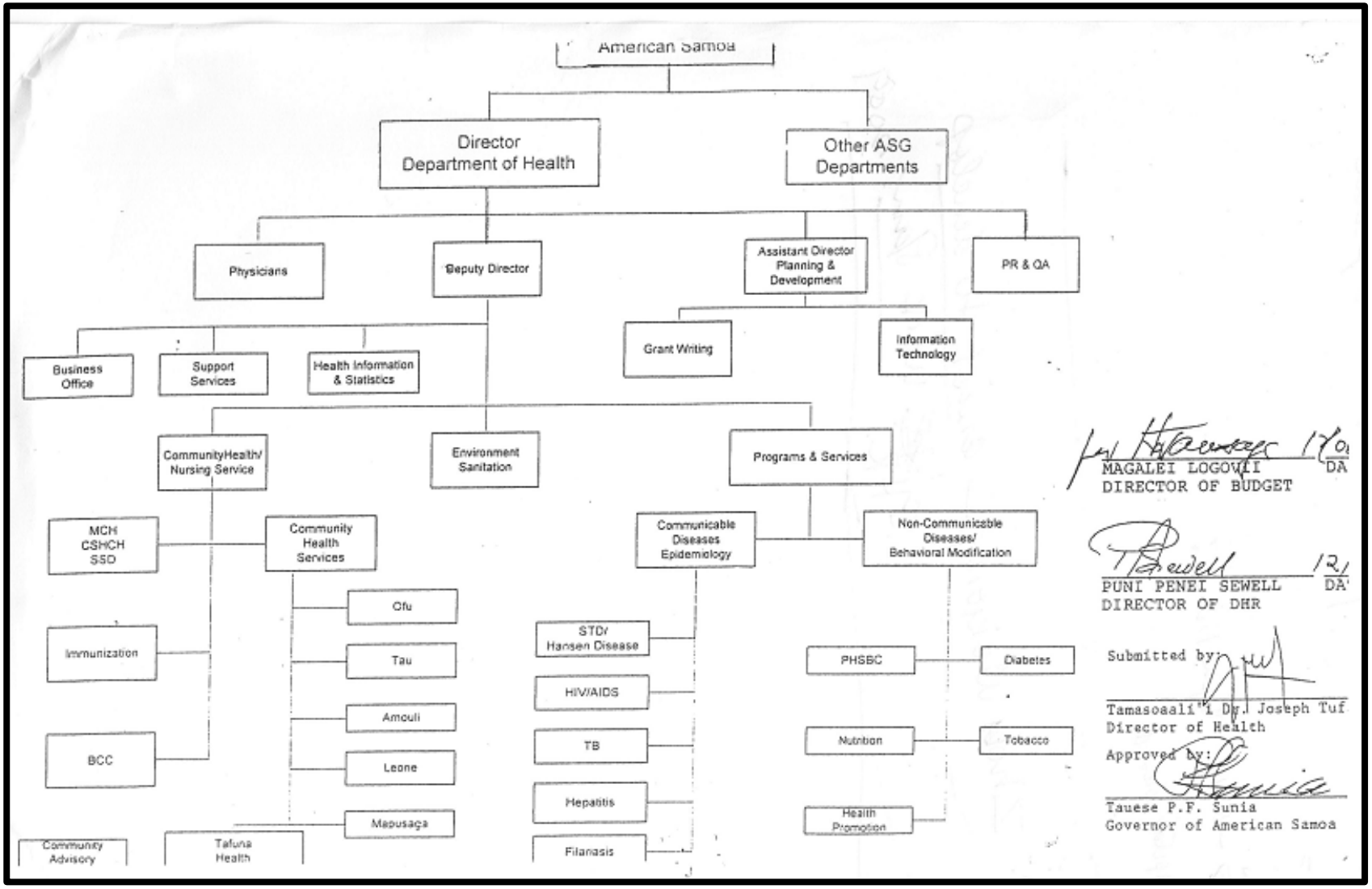
Yolanda Masunu *	IMMUNIZATION/HEP	699-8464	

Attachment C – Organizational Chart (Approved, c. 1997)



Attachment D – HIS rapid Assessment RESULTS

A- Questions for Admin and Supervisors

P- Questions for Program Managers

NOTE: The term *National* will be interpreted herein to mean Territorial American Samoa

Number	Criteria for Success	Present*	Functioning*	Adequate*	Sustainable*	Comments/Evidence
HIS RESOURCES						
Coordination, Planning and Policies						
1 –A	Is there a national cross-sectoral HIS committee?	NO				
2- A	Is there a written national HIS policy?	NO				
3- A&P	Is there HIS related legislation to measure:					
4- A&P	Vital Statistics					
5 –A&P	Service Delivery	YES	NO			
6 – A&P	Notifiable Disease Reporting	YES	NO			
Financial and Human Resources						
7 –A	Are there human resources uniquely identified as HIS?	YES	YES	NO		
8- A&P	Are there clear lines of responsible for HIS?	NO				
9- A	Is there an allocated budget line within the MOH for HIS activities? **(HIS RELATED)**	YES	HIS	NO		

Infrastructure						
10- T	Is there sufficient hardware available for HIS use?	YES	YES	NO		
11-P&T	Is there sufficient software available for HIS use?	YES	YES	NO WITH SOME EXCEPTIONS	NO	
12 – T	Is there sufficient networking infrastructure to support HIS use?	YES	NO			
INDICATORS						
13-A&P	Are there national core indicators to measure: Health determinants Health system inputs and outputs					
14- A&P	 Health outcomes and status	YES	YES	NO		
15- A&P		NO				
16- A&P		YES	NO			
17- A&P	Is there a national strategy for collection of health indicators?	NO				
DATA SOURCES						
Population Based						
18-A	Is there a complete population census undertaken at least every 10 years?	YES	YES	YES	YES	
19-A	Is there a Civil Registration process in place for all births and deaths?	YES	YES	YES	YES	
20-A&P	Are periodic surveys undertaken to capture information for key health issues?	NO				

Institution Based						
21- A&P	Are individual health records maintained for recording the ongoing treatment of patients?	YES	YES	YES	NO	
22- A&P	Are there appropriate [ambiguous] health service records collected?	YES	YES	YES	NO	
23 -A&P	Are there appropriate resource records collected, including finance and human resources? Check w/ mark	YES	YES	YES	NO	
DATA MANAGEMENT						
Data Storage, Management and Transmission						
24 -A&P	Are there written procedures for data storage, including security and destruction?	NO				
25- A&P	Is there a centralised database or data warehouse that combines all health data collections?	NO				
26-P&T	Are there defined, locally appropriate mechanisms in place for data transmission?	NO				
INFORMATION PRODUCTS						
27 A&P	Are staff appropriately skilled to transform data into information?					
28 A&P	- At national level	NO				
29 A&P	- At District/county/Village level	NO				
30 A&P	Are there tools and procedures available to assess the quality of data?	NO				
31-A	Is there a set of national health data standards and definitions that are used across all health data	NO				

	collections?					
DISSEMINATION AND USE						
Demand, Analysis, Policy and Advocacy						
32 A&P	Are managers and clinicians using information for policy and advocacy?	YES	NO			
Planning, Priority Setting and Resource Allocation, Implementation and Action						
33 A	Is an annual health report submitted to Fono and Governor , AND USG each year?	YES	YES	YES	YES	
34 A&P	Are health managers using information for planning, priority setting or resource allocation and action?	YES	YES	YES	NO	
35 A&P	Are clinicians using information for planning, priority setting or resource allocation and action?	NO				
36 A&P&T	Is data readily available to internal and external users, e.g. on the internet or intranet?	NO				

*Key

Present – the criteria is met or has been met in the past

Functioning – the statement can be answered positively and evidence is available that this is happening regularly

Adequate – the statement can be answered positively and is meeting most needs

Sustainable –the criteria been in place and functioning without external support for some time

Attachment E –Monitoring, Evaluation And Review Of National Platform For National Health Strategies

Table 1. A monitoring, evaluation and review platform for national health strategies

KEY ATTRIBUTES	CHARACTERISTICS
I. The national health strategy as the basis for information and accountability	
1. The national health strategy specifies a sound monitoring, evaluation and review component.	1.1 Monitoring, evaluation and review addresses the goals and objectives of the national health strategy and is based on a sound situation analysis.
	1.2 Disease- and programme-specific monitoring, evaluation and review are aligned with that of the national health strategy.
	1.3 The monitoring, evaluation and review plan is costed and funded with full partner alignment and support.
	1.4 Monitoring, evaluation and review is regularly assessed.
II. Institutional capacity	
2. Roles, responsibilities and coordination mechanisms for monitoring, evaluation and review are clearly defined.	2.1 There is an effective country-led coordination mechanism for monitoring, evaluation and review.
	2.2 Key institutions and stakeholders have clear roles and responsibilities.
3. Capacity strengthening in monitoring, evaluation and review is addressed.	3.1 Capacity strengthening requirements are identified and addressed.
III. Monitoring and evaluation	
4. There is a comprehensive framework that guides the monitoring, evaluation and review work, including core indicators and targets.	4.1 There is a balanced and parsimonious set of core indicators with well-defined baselines and targets.
	4.2 Disease- and programme-specific indicators are aligned.
	4.3 Integrated with the national health information system strategy.
5. The monitoring, evaluation and review component specifies data sources, identifies and addresses data gaps, and defines responsibilities for data collection and information flow.	5.1 Data sources are specified in a comprehensive and integrated manner.
	5.2 Critical data gaps are identified and addressed.
	5.3 Responsibilities for data collection and management are specified.
6. Data analysis and synthesis work is specified, and data quality issues are anticipated and addressed.	6.1 Data analysis and synthesis work is specified.
	6.2 There are regular assessments of progress and performance, including systematic analyses of contextual and qualitative information.
	6.3 Specific processes for data quality assessment and adjustment are in place and are transparent.
7. Data dissemination and communication are effective and regular.	7.1 Analytical outputs as the basis for national and global reporting are defined and produced.
	7.2 Appropriate decision-support tools and approaches are used.
	7.3 Data, methods and analyses are publicly available.
8. Prospective evaluation is planned and implemented.	8.1 Prospective evaluation is planned and linked to monitoring, evaluation and review of national health strategies.
IV. Country mechanisms for review and action	
9. There is a system of joint periodic progress and performance reviews.	9.1 A regular and transparent system of reviews with broad involvement of key stakeholders is in place.
	9.2 There are systematic linkages between health sector reviews, disease- and programme-specific reviews, and global reporting.
10. There are processes by which related corrective measures can be taken and translated into action.	10.1 Results from reviews are incorporated into decision-making, including resource allocation and financial disbursement.
	10.2 Multi-stakeholder mechanisms are specified to provide routine feedback to subnational stakeholders.

Attachment F - Health ICT Infrastructure and Organizational Development

Ongoing HIS Expert Support

Performance Period: Three two- week sessions TBD (Schedule this to coincide with 3WG deliverables. Roughly every 3 months: 11/2012, 2/2013, 5/2013

Purpose: Follow-on and continuation of HIS Plan:

Quick Fix Expert Strike Team

Performance Period: Immediately

Purpose: Stabilize DOH data management information system environment.

Based on the recent HIS Assessment a number of systemic problems exists in DOH data management health information system. The current environment compromises data integrity and data security affecting all DOH program areas, adversely affecting data quality and reporting capabilities of all health programs, impairing program integration, and compromising the ability of DOH to effectively monitor and manage program resources adversely impacting health outcomes.

The HIS Assessment findings are that data saved on computers is unprotected. The data are not encrypted and not password protected. There is no backup system in place. There is limited connectivity to the main VISTA database, staff are under-trained.

The ubiquitous data entry program used by all program areas is Microsoft Excel and VISTA/CPRS. While CPRS is a desirable common database, the system has not been maintained and is not always available to Heath Centers and dispensaries or universally used by all program areas. Meanwhile those using Excel are using home-grown workbooks and spreadsheets which, although easy to create and use, do not conform to data standards, control data input, or data validation. Most users have limited training on data standards and designing proper spreadsheets that conform to conventional builds.

Whereas Excel is the *de* factor tool of choice and one that can fulfill most data entry requirements of DOH program areas, at least until such time as VISTA/CPRS is upgraded and made more widely accessible. Staff using Excel have little training or understanding of data processing methods, data standardization or of rules of data structure and normalization in creating spreadsheets. Improving use of this tool will improved data collection across all program areas so, at minimum, data collected can be back-fed into VISTA/CPRS through SQL until such time that VISTA/CPRS is upgraded and connectivity is no longer an issue.

Other findings include:

- Field data are not *strongly type* (meaning: a data field can take any data type of data: numeric, text, dates regardless of data format standards).
- Data from program areas are *non-forming* as there are no data standards or policies guiding the same

- Base-line data and information gathering and recording systems are in disrepair. Nearly all computer systems in use have no login requirements. Users are logged in with Administrator privilege.

Excel programs used range in version 1993 to 2010. Early versions are susceptible to macros which can house malware applets. Earlier versions are incapable also of certain data validation rules and data input control. Conventional data entry requirements require standardization of data conforming to *strong data typing.*

Data collected in excel files are often printed out into forms and rekeyed into another excel program by another program or DOH administration.

Tasks:

1. Network troubleshooting to trace data packets for loss from workstation to VISTA central database to identify system failure points and make necessary hardware/firmware patches.
2. Standardize Operating System (OS) for all DHS computers and laptops.
3. Extended training to Data WG in data processing tools currently in use, specifically Excel and include training in basic principles of database design and functionality.
4. Standardize the desktop and laptop OS "image"
    a. All desktops should have a standards set of icons
    b. There should be policy control (an OS function) of disallowed web sites that are capable of streaming video e.g., YouTube, Hula, Skype and others that require high bandwidth
    c. Installation of standards set of software applications:
        i. Mycroft Office (Business or Professional versions)
        ii. Open Office
        iii. Email client software such as Thunderbird (OpenOffice) or Microsoft Outlook
    d. All users should have login credentials other than as an Administrator

End Notes Reference

[i] 'Health Data and Information System U.S. Territories and Freely Associated States", http://www.pihoa.org/fullsite/newsroom/wp-content/uploads/downloads/2012/04/DOI-Report-Sela-Panapasa.pdf

[ii] U.S. Department of Interior, Office of Insular Affairs: http://www.doi.gov/archive/oia/Islandpages/asgpage.htm And ASG/DOH Accounting (2009).

[iii] Monitoring, Evaluation and Review of National Health Strategies A country-led platform for information and accountability. WHO. Geneva. May 2011. The implications of this approach for the Global Strategy were discussed and agreed upon by the Accountability Working Group of the Global Strategy in meeting in July 14-15, Glion, and July 16,Geneva 2010.

[iv] "HIS: Approach to Assessment", PowerPoint presentation (Settimi), July 2012.

v A functional database must be accessible with minimal downtime having data that is, accurate, precise, current, and be modifiable.

vi "Summary Overview of American Samoa Data Collection Challenges and Obstacles", NCI, April 10, 2010.

vii "What Is an Intracluster Correlation Coefficient? Crucial Concepts for Primary Care Researchers", Shersten Killip, MD, et al., .Annals of Family Medicine, 2004

[viii] In the course of this assessment my USB drive picked viruses, deleted files, and corrupted others.

[ix] New research on childhood obesity starting at birth suggest high likelihood of respiratory illness as children age.

x "Diabetes Care in American Samoa: Initial Findings", Stephen T McGarvey, PhD, MPH, Principal Investigator, NIH Grant, R18-DK075371, June 18, 2012

xi New MEPS data has been released showing the average/mean cost for an ER visit was $1318 in 2009..", http://aharesourcecenter.wordpress.com/2011/07/27/whats-the-average-cost-for-an-er-visit/

[xii] See http://www.naphsis.org/index.asp?bid=959

xiii "Summary Overview of American Samoa Data Collection Challenges and Obstacles", NCI, April 10, 2010.

xiv There is Veterans Administration-approved object layer software components that allow programming against VISTA without going through client-side CPR. Refer to Medical Domain Web Services (MDWS),Version 2.0, C3-C1 Conversion Project, Systems Management Guide (MWVS*2), September 2011.

xv For more on use of PERT see http://en.wikipedia.org/wiki/Program_Evaluation_and_Review_Technique.

[xvi] A Lookup table has been provided to HISO with latest CD10, and other (incomplete) lookup values (needs completion)

[xvii] Example of a policy distribution system for public health: http://www.health.nsw.gov.au/policies/dist/phu.html/

[xviii] Recommendation: Mozilla Thunderbird: http://www.mozilla.org/en-US/thunderbird/

xix Medical Domain Web Services (MDWS) Version 2.0 C3-C1 Conversion Project Systems Management Guide (MWVS*2)