

Policy Forum

The reality of health information systems: Challenges for standardization

Hirotsugu Aiga^{1,2,3,4,*}, Chushi Kuroiwa³, Ikuo Takizawa¹, Ritsuko Yamagata¹

¹ Human Development Department, Japan International Cooperation Agency (JICA), Tokyo, Japan;

² Department of Global Health, School of Public Health & Health Services, Medical Center, The George Washington University, Washington DC, USA;

³ Department of Health Policy and Planning, School of International Health, Faculty of Medicine, The University of Tokyo, Tokyo, Japan;

⁴ Emergency Needs Assessment Services, United Nations World Food Programme (WFP), Rome, Italy.

Summary

Health information systems (HISs) serve as an indispensable foundation for developing health policy and strategies and improving delivery of routine health services in an evidence-based manner. In developing countries, HISs are not adequately functioning in spite of their important role such as monitoring tools for the progress of the Millennium Development Goals. This paper attempts to classify the HISs into four types according to their data sources. Information requirement by the diseases-specific funding partnerships (e.g. Global Fund to Fight AIDS, Tuberculosis and Malaria) and projects implemented by development agencies increase the workloads of health professionals at facility level and subsequently compromise data quality. For the data quality assurance and comparability of data across countries overtime of major health indicators, standardization of HISs is the urgent task.

Keywords: Health information system, Health system, Developing countries

Introduction

To achieve better health status in developing countries, vertical and horizontal types of interventions have been tested and practically employed (1). A series of applications of both types provide us with the insight that a vertical national program is more effective in reducing the prevalence and burden of specific infectious diseases (e.g. HIV/AIDS, tuberculosis, and poliomyelitis) (2,3). Therefore, tremendous amounts of funds have been made available to target those diseases, i.e. Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), Global Alliance for Vaccines and Immunization (GAVI), and President's Emergency Plan for AIDS Relief (PEPFAR). However, noted that two previous studies reported that largely funded mass vaccination campaigns for poliomyelitis eradication and measles elimination, a typical vertical approach, could

damage the health system of routine immunization (4,5). When addressing other diseases and the issues related to preventive health services, a horizontal or comprehensive approach is likely to be more effective and sustainable (2). Therefore, the Primary Health Care has been relevant, as a minimum package of community-centered horizontal health system, since the Alma-Ata declaration in 1978. Yet, it is reality that the global debate is continuously taking place on which of two types is more effective and efficient for addressing respective health-related issues (1,6).

Given these lessons learned, health systems are currently required to play an increasingly important role by combining vertical and horizontal approaches in a complementary manner. For this reason, major development agencies have recently been emphasizing the importance of health systems and raising it as a crucial agenda (7). In 2000, WHO evaluated the health systems performance of all the member states (8) and publication of the results of its ranking brought about a series of technical and even political debates (9-14). This argument, however, rather fostered the foundation for mainstreaming health systems as a global agenda. For instance, World Bank employed health systems as

*Correspondence to: Dr. Hirotsugu Aiga, Human Development Department, Japan International Cooperation Agency (JICA), 2-1-1, Yoyogi, Shibuya, Tokyo 151-8558, Japan;
e-mail: aiga.hirotsugu@jica.go.jp

one of the top priorities in its development assistance strategies in 2007 (15). WHO keeps health systems prioritized and further has innovated a new concept and model of health systems in 2007 (7). Note that, also, there is the global consensus that strengthening health systems is a crucial step for achieving Millennium Development Goals (MDGs) by 2015 (16).

Health information systems (HISs) should serve as a core foundation which enables health planners and health administrators to make reasonable and accountable decisions in an evidence-based manner for building better health systems (17), as well as it is one of the components of the health systems, per se. However, it is highly questionable whether we have built consensus and are sharing common understandings and perception on HISs. This is most probably due to lack of recognition of the importance of HISs (18) and thereby lack of needs for clear definition and classification of HISs. This paper attempts to suggest one way of classifying HISs and further highlights the major challenges we are encountering.

Raison D'etre of HISs

The *raison d'etre* of HISs, particularly in context of developing countries, is summarized into three dimensions.

First, HISs are essential for accurate monitoring of the progress towards the MDGs by 2015 (19). Of a total of eight MDGs, three are directly health-related, *i.e.* (i) reduce by two thirds the under-five mortality rate; (ii) reduce by three quarters the maternal mortality ratio; and (iii) halt and begin to reverse the spread of HIV/AIDS and reverse the incidence of malaria and other major diseases (20). Ideally, these basic health and demographic indicators should be measured through the national HISs operated by governments. However, the governments of many developing countries are not capable enough to undertake data collection and analysis on a sustainable basis. It is reality that they are dependent on the surveys conducted with external assistance, *e.g.* the Demographic and Health Survey (DHS) which have been conducted in over 75 developing countries through support from the United States Agency for International Development (21). Needless to say, developing countries receive tremendous assistance from developed countries also in health interventions in parallel. Even though we admit the needs for assistance in achieving the MDGs, data collection and analysis for monitoring the progress towards the MDGs should, ideally or in the long run if not, be undertaken by the governments of developing countries. Therefore, the governments are currently required to establish reliable HISs and equip themselves with operational capacity of HISs.

Second, HISs are expected to play a core role in performance-based disbursement of donor-pooled

funds (*i.e.* common basket funds) which a ministry of health (MOH) in principle manages by their initiative (19). In 1970s-1990s, a number of health projects were implemented with little coordination in a fragmented manner. As a result, a number of inefficient development-agency-driven implementations have been identified and criticized. Also, the workloads of health administrators and health practitioners in many developing countries had significantly increased. To address these issues, common basket funds have been created as one of the solutions in many developing countries since late 1990s. In other words, development agencies have rapidly shifted their primary roles from implementation of the projects to monitoring and evaluation of the projects being implemented by the MOH. In order for a MOH to justify the use of common basket funds and ensure smoother project implementation, performance-based disbursement of the common basket funds is required by development agencies who contribute to the funds. Under these circumstances, HISs are essential sources of information for gauging the performance.

Third, HISs are an indispensable foundation for continuous improvement of health services. A health management information system (HMIS), one of the representative HISs, collects data of daily operation of health facilities (*e.g.* the number of outpatients, type of health problems diagnosed, bed occupancy rate, drug stock, and users fee account). The information should flow in smaller cycle, *i.e.* (i) health facility to collect data and submit them to district health administration; (ii) district health administration to compile and analyze the data; (iii) district health administration to utilize the results of analysis for solving health facilities' operational problems to improve quality of health services; and (iv) provincial health administration office and MOH headquarters to analyze and utilize the data for developing provincial and national health policies and strategies by referring to the database from district health administration (Figure 1b). This is precisely in line with on-going decentralization and devolution process in many developing countries (22). In those countries, district health administration offices are required to prepare budget proposals and submit them not to provincial and MOH headquarters but to district councils or city offices. Then, budget competition with other sectors (*e.g.* public works, agriculture, and education) takes place at district level. In order for the health budget proposals to be justified and approved at district parliaments, they need to be prepared in an evidence-based manner by maximizing well-functioning HISs. This will also contribute to the increase in transparency and accountability of local governance in developing countries. Note that it is reality that the HMIS in many developing countries was or is still utilized primarily for preparation of the MOH annual report at central level without appropriate and

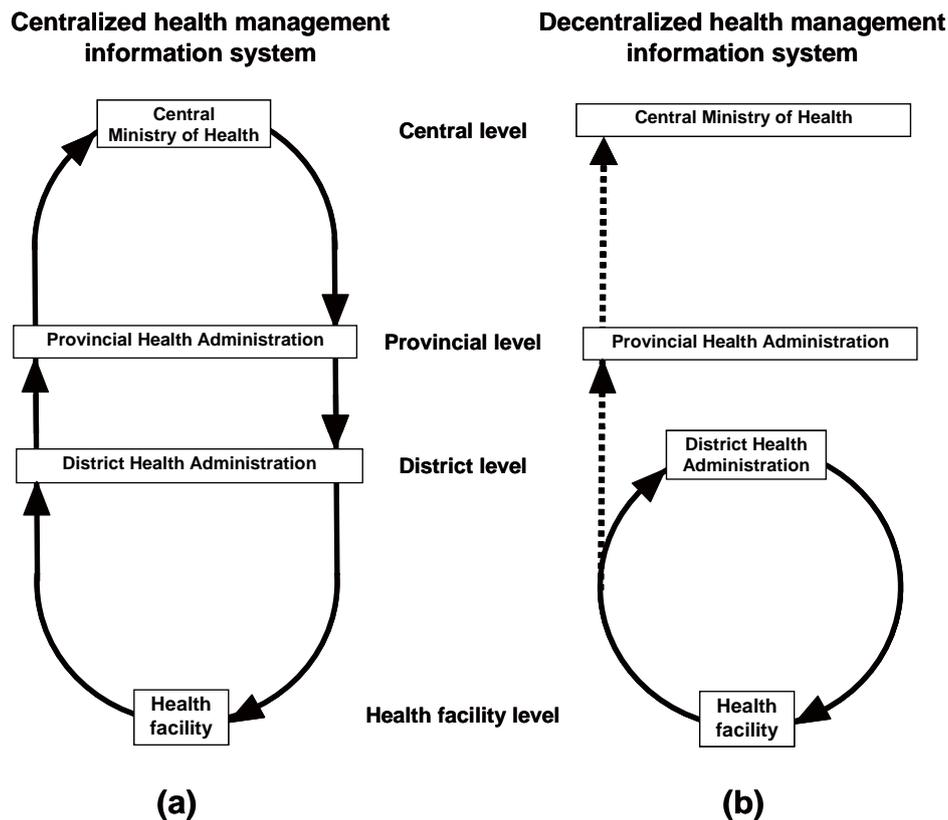


Figure 1. Two types of information flow in health management information system.

timely feedback to health facilities and district health administration offices. The information flow of this type of centralized HMIS created larger information cycle which is unable to provide appropriate and timely feedback to lower levels for maintaining and improving the quality of health services (Figure 1a). Clear shifting from centralized HMIS model (Figure 1a) to decentralized one (Figure 1b) will be conducive to quicker realization of delivery of better quality of health services and higher ownership of the data at district level.

Type of HISs

HISs are meant to be literally a package of various HISs and cannot be integrated into the single system. This is because several HISs employ the same indicators but their figures can be significantly different due to difference in the measurement methods. For instance, incidence of diarrhea at health centers (*e.g.* proportion of patients diagnosed as diarrhea cases to total number of patients) should differ from that at community level (*e.g.* proportion of persons with diarrhea to total number of residents in the community). Thus, facility-based and population-based incidences of diarrhea need to be independently measured and utilized for different purposes. Facility-based incidence of diarrhea should serve as the evidence for the measures for improving

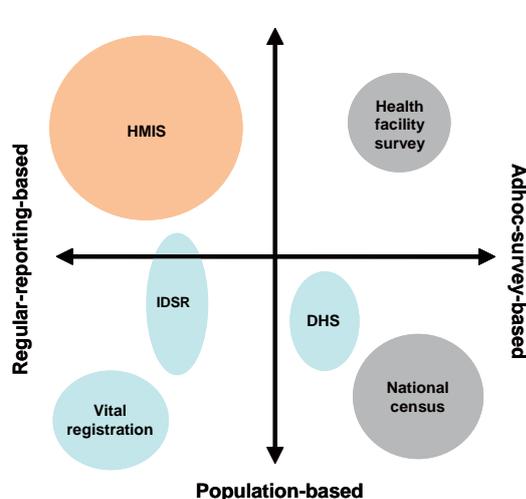
curative services (*e.g.* increase in availability of oral rehydration salt at health centers), while population-based one should serve as the evidence for the measures for improving preventive services (*e.g.* environmental and behavioral interventions for diarrhea prevention in communities).

Thus, clear definition and classification of each HIS type should be readily available and commonly understood. We suggest that HISs be defined and classified into four categories as shown in Table 1. Figure 2 shows the characteristics of HISs according to their data collection approaches, *i.e.* (i) data collection regularity; and (ii) data source. Figure 3 shows the characteristics of HISs according to their data utility, *i.e.* (i) the level of primary data user(s), and (ii) objectives of data utilization. There should be several other ways of classifying HISs. One of the examples is a classification of HISs by the length of period during and after which the data are most frequently and effectively utilized, *i.e.* (i) HISs for long-term policy and strategies at national level; (ii) HISs for long-term or medium-term capital investment plan; (iii) HISs for short-term annual resource allocation planning; and (iv) HISs for quick or timely response to disasters and disease outbreaks.

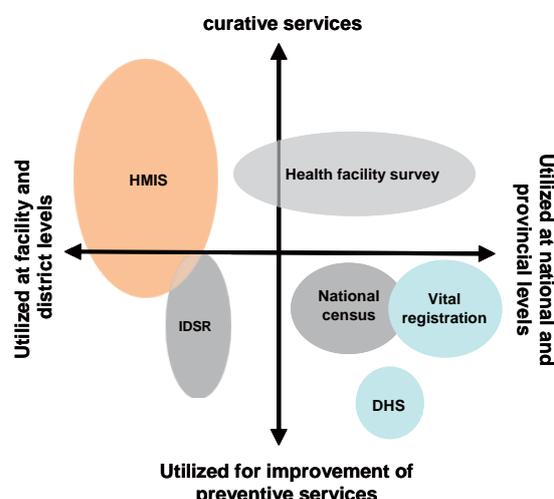
Thus, HISs are again a package of various HISs which should coexist in a complimentary manner. The MOH of each developing country should strategically prioritize which HISs must most urgently be improved

Table 1. Type of health information systems

	Definition of HIS	Examples
Type I	HISs which are designed to improve and maintain smooth and sustainable operation of curative and preventive health services at health facilities such as health centers and district hospitals	<ul style="list-style-type: none"> ■ Integrated Disease Surveillance and Response (IDSR) ■ Disease Early Warning System (DEWS)
Type II	HISs which are designed to measure the locations and quantities of health resources (facility building, health professionals, medical equipment, <i>etc.</i>)	<ul style="list-style-type: none"> ■ Health facility survey ■ Health workforce survey
Type III	HISs which are designed to estimate birth and mortality rates using population-based datasets	<ul style="list-style-type: none"> ■ Vital registration ■ Demographic and Health Survey (DHS) ■ Multi-Indicators Cluster Survey (MICS) ■ World Health Survey (WHS)
Type IV	HISs which are designed to propose immediate necessary measure to be taken to address specific disease (particularly, to cope with an outbreak of an infectious disease)	<ul style="list-style-type: none"> ■ Integrated Disease Surveillance and Response (IDSR) ■ Disease Early Warning System (DEWS)



[Note] HMIS: Health Management Information System
IDSR: Integrated Disease Surveillance and Response
DHS: Demographic and Health Survey

Figure 2. Data collection characteristics of respective HISs.

[Note] HMIS: Health Management Information System
IDSR: Integrated Disease Surveillance and Response
DHS: Demographic and Health Survey

Figure 3. Data utilization characteristics of respective HISs.

and adjusted in order to meet their data requirement, given the national health policy and strategies.

Challenges for Standardization of HISs

The most significant challenge on HISs is to, in principle, integrate and standardize the same or similar HISs at health facility and district health administration level into one (micro-level standardization). Some development agencies and NGOs still tend to develop and introduce a HIS exclusively for the purpose of monitoring and evaluation of their projects. After a project is completed, its HIS is expected to be kept functioning and its reporting forms and database remain at health facilities and district health administration offices. Yet, the same information (*e.g.* number of diarrhea cases among children under five years of age) often needs to be recorded in the existing MOH's HIS reporting forms as well as a newly introduced project-specific HIS reporting forms. As a result, the

workloads of health workers significantly increase. This situation is likely to compromise the quality of both data and health services. Thus, it is suggested that development agencies and NGOs employ the existing HISs in the country as the major sources of information for monitoring and evaluation without building up a new HIS exclusively for their projects. If the existing HISs do not include indicators the project requires, development agencies ideally should either select any proxy indicators from the existing HISs or request the MOH to add some key indicators to the existing HISs. However, note that it might be necessary for a project aiming at piloting an intervention model to tentatively set up an additional HIS specific to the project.

Another major challenge on HISs is to harmonize and standardize the HIS overall framework at global level (macro-level standardization). As earlier described, a number of global health partnerships are playing an increasingly important and dominant role in combating major diseases in developing

countries (e.g. GFATM, GAVI, and PEPFAR). For accountability and result-orientation reasons, these disease-specific partnerships tend to require beneficiary countries to report the progress of interventions they are financing by employing specific recommended indicators. However, the efforts have been made by the partnerships to promote the employment of indicators available in existing HIS in each country. Despite their flexibility on choice of indicators, the MOH of developing countries tends to create or maintain ad-hoc disease specific HISs in little coordination with existing routine national HISs, in order to attract the partnerships by increasing more indicators in the reports. This situation often leads the MOH to manage two major HIS channels (*i.e.* integrated routine HIS and ad-hoc disease-specific HIS channels) and subsequently causes the compromise in data accuracy and the significant loss of opportunity costs spent by health practitioners and health administrators. Moreover, there could be different figures for the same indicators if there are any different measurement methods and timing between the two HIS channels (23). In order to avoid unnecessary confusion that stems from several HIS channels being functioning in parallel, it is essential to develop the globally standardized HIS framework and agree on it among those major disease-specific funding partnerships and other stakeholders. Note that, also, this helps to ensure comparability of data across the countries over time.

Health Metrics Network, being hosted in WHO headquarters, is ardently addressing these issues related to HISs (24). To accelerate the process, more serious international attention should be drawn. It is the global urgent task that harmonization and standardization of HISs in developing countries are undertaken and completed.

Acknowledgments

The author gratefully acknowledges Goro Yamada of World Health Organization (WHO), Geneva, for his critical comments and Masako Nonoguchi of Japan International Cooperation Agency (JICA), Tokyo, for her technical support. Special thank goes to the secretariat of Health Metrics Network, World Health Organization, Geneva, for sharing useful insights on health information systems.

References

- 1 Kickbusch I. The World Health Organization: Some governance challenges: for the Fourth Global Environmental Governance Dialogue "Strengthening the international environmental regime". Yale University, New Haven, CT, USA, 2000; pp. 2-5.
- 2 Msuya J. Horizontal and vertical delivery of health services: What are the trade offs? World Bank, Washington DC, USA, 2005; pp. 3-17.
- 3 World Bank. Disease control priorities in developing

- countries (2nd ed.). World Bank, Washington DC, USA, 2006; pp. 87-89.
- 4 Kuroiwa C. Toward sustainability of health system in Laos: vertical approach versus comprehensive approach. Lessons learned from polio eradication. *Infection and Immunity in Childhood* 2005; 17:125-133. (In Japanese)
- 5 Kuroiwa C, Xayyavong P, Vongphrachanh P, Khampapongpane B, Yamanama M, Nakamura S. Difficulties in measles elimination: prevalence of measles antibodies before and after mass vaccination campaign in Laos. *Vaccine* 2003; 21:479-484.
- 6 Uplekar M, Raviglione M. The "vertical-horizontal" debates: time for the pendulum to. *Bull World Health Organ* 2005; 83:413-414.
- 7 World Health Organization (WHO). *Everybody's business, strengthening health systems to improve health outcomes: A framework for action*. WHO, Geneva, Switzerland, 2007.
- 8 World Health Organization (WHO). *World health report 2000, Health systems: improving performance*. WHO, Geneva, Switzerland, 2000.
- 9 Navarro V. Assessment of the World Health Report 2000. *Lancet* 2000; 356:1598-1601.
- 10 Murray C, Frenk J. World Health Report 2000: a step towards evidence-based health policy. *Lancet* 2001; 357:1698-1700.
- 11 Navarro V. World Health Report 2000: responses to Murray and Frenk. *Lancet* 2001; 357:1701-1702; discussion 1702-1703.
- 12 Avery G. WHO report 2000. *Lancet* 2001; 358:1097.
- 13 Houweling TA, Kunst AE, Mackenbach JP. World Health Report 2000: inequality index and socioeconomic inequalities in mortality. *Lancet* 2001; 357:1671-1672.
- 14 Almeida C, Braveman P, Gold MR, *et al.* Methodological concerns and recommendations on policy consequences of the World Health Report 2000. *Lancet* 2001; 357:1692-1697.
- 15 World Bank. *Healthy Development. The World Bank strategy for health, nutrition, and population results*. World Bank, Washington DC, USA, 2007; pp. 44-46.
- 16 Travis P, Bennett S, Haines A, Pang T, Bhutta Z, Hyder AA, Pielemeier N, Mills A, Evans T. Overcoming health-systems constraints to achieve the Millennium Development Goals. *Lancet* 2004; 364:900-906.
- 17 Boerma T. Getting the numbers right. *Bull World Health Organ* 2005; 83:567.
- 18 World Health Organization (WHO). *Health Metrics Network framework and standardization for the development of country health information systems*. WHO, Geneva, Switzerland, 2007; p. 7.
- 19 Stansfield S. Structuring information and incentives to improve health. *Bull World Health Organ* 2005; 83:562.
- 20 United Nations. *The Millennium Development Goals report 2006*. UN, New York, USA, 2006.
- 21 MEASURE DHS. Who we are? <http://www.measuredhs.com/aboutdhs/whoweare.cfm> (accessed on November 16, 2007).
- 22 Aiga H. Why health information systems are necessary? *JICA Health Newsletter* 2007; 7:1. (in Japanese)
- 23 Aiga H. Bombarding people with questions: A reconsideration of survey ethics. *Bull World Health Organ* 2007; 85:823.
- 24 World Health Organization (WHO). *Framework and standards for country health information systems*. WHO, Geneva, Switzerland, 2007.

(Received January 7, 2008; Accepted January 11, 2008)