Assessment of Nutrition Information System Using Health Metrics Network Framework

Penilaian Sistem Informasi Gizi Menggunakan Kerangka Health Metrics Network

Mochamad Iqbal Nurmansyah*, Catur Rosidati**, Riastuti Kusuma Wardani**, Badra Al-Aufa***

*Public Health Department, Institute of Health Sciences, Dokuz Eylul University, Turkey, **Public Health Studies Program, Faculty of Medicine and Health Sciences, UIN Syarif Hidayatullah Jakarta, Indonesia, ***Health Services Quality Specialization, Faculty of Public Health, Universitas Indonesia, Indonesia

Abstract

Nutrition Information System (NIS) developed by Heath Ministry's Nutritional Development Directorate since 2011 covers data of toddler assessment in integrated health care, malnutrition case, coverages of *Fe* tablet among pregnant mothers, iodized salt consumption, vitamin A distribution and exclusive breastfeeding. This study aimed to assess NIS performance in South Tangerang City Health Agency using WHO's Health Metrics Network 2008 framework. NIS is national level information system with gradual reporting mechanism starting from 508 districts/cities to 34 provinces ended at national level. Eight districts/cities over Banten Province have conducted NIS. This study had six informants namely nutrition section, health resources and health information system section, two nutrition duties and two integrated health care workers. Data was collected on January - April 2013 using interview, observation and document analysis guidelines. Data analysis used interpretation analysis. The result showed no any policy and training implemented regarding nutrition surveillance. Monitoring activity was already conducted. Facilities were adequate, but the maintenance was deficient. There are six nutritional development indicators according to MDGs. Data grouping and dictionaries were available. Data reporting was conducted every month. Graphics and maps were used for presenting data. The data served was used for monitoring and making a decision on nutritional development programs at integrated health care, primary health care and health agency levels. Generally, NIS implementation in South Tangerang City. Health agency was already adequate.

Keywords: Information system performance, nutrition information system, nutritional coaching reporting activity, system assessment

Abstrak

Sistem informasi gizi (Sigizi) dikembangkan oleh Direktorat Bina Gizi Kementerian Kesehatan sejak 2011. Data Sigizi mencakup data penimbangan balita di posyandu, kasus gizi buruk, cakupan pemberian tablet *Fe* pada ibu hamil, konsumsi garam beryodium, pemberian vitamin A, dan ASI eksklusif. Penelitian ini bertujuan untuk mengukur kinerja pengelolaan Sigizi di Dinas Kesehatan Kota Tangerang Selatan menggunakan kerangka *Health Metrics Network* yang dikeluarkan oleh WHO tahun 2008. Sigizi merupakan sistem informasi yang diaplikasikan pada tingkat nasional dengan mekanisme pelaporan berjenjang, dari 508 kabupaten/kota menuju 34 provinsi dan bermuara di tingkat nasional. Di Provinsi Banten, terdapat delapan kabupaten/kota yang menjalankan Sigizi. Informan penelitian berjumlah enam orang, yaitu seksi gizi, seksi sumber daya kesehatan dan sistem informasi kesehatan, dua tenaga pelaksana gizi, dan dua kader posyandu. Pengumpulan data dilakukan Januari – April 2013 menggunakan pedoman wawancara, observasi, dan telaah dokumen. Analisis interpretasi digunakan dalam menganalisis data. Hasil penelitian menunjukan belum ada kebijakan serta pelatihan mengenai pengawasan gizi. Kegiatan pemantauan telah dilakukan. Sarana dinilai cukup, namun terdapat kekurangan dalam upaya perawatannya. Terdapat enam indikator dalam pembinaan gizi yang mengacu pada MDGs. Terdapat pengelompokan dan kamus data. Pelaporan data dilakukan setiap bulan. Grafik dan peta digunakan untuk menyajikan data. Data yang tersedia digunakan untuk pemonitoran dan pengambilan keputusan dalam kegiatan pembinaan gizi, baik di tingkat posyandu, puskesmas maupun dinkes. Secara umum, pelaksanaan Sigizi di Dinas Kesehatan Kota Tangerang Selatan telah memadai.

Kata kunci: Kinerja sistem informasi, sistem informasi gizi, pelaporan kegiatan pembinaan gizi, penilaian sistem

Introduction

Data availability urgency related to nutritional condition and its determinant factors in a region is a very important stuff considering that collecting and communi-

cating data effectively become one of terms for making an evidence-based policy.[1] In another hand, if we see prevalence of undernourishment-malnutrition in Indonesia, the prevalence of undernourishment-malnutrition among toddlers in 2013 was 19.6%. From World Health Organization (WHO)'s perspective, it is deemed serious if the prevalence of undernourishment-malnutrition in a country is between 20,0-29,0% and the prevalence ≥ 30% is deemed very serious, thus the undernourishment-malnutrition problem in Indonesia is a public health problem closed to serious category or high prevalence.[2]

In 2008, WHO released Health Metrics Network (HMN) that is a framework to help a country in strengthening health information system. In HMN, components and standards that will affect performance of health information system are resources of health information system, indicators, data sources, data management, information products, dissemination and data use.[3,4] Assessment of health information system in Afghanistan in accordance with HMN concept mentioned that several components, such as resources, indicators, data management, dissemination and data use were already adequate. However, several components, such as data sources and information products were inadequate.[5] A similar study was also conducted in Azerbaijan with the result showing the dissemination and the use of information were inadequate at all; the component resources, data sources and data management were available yet inadequate; the component information products was adequate and the component indicators was very adequate.[6]

Nutrition Information System (NIS) is one of national level information system managed by Directorate of Nutritional Development at Indonesian Health Ministry. The execution of surveillance through computer-based information system has been performed since 2011. Data related to nutritional development activities, such as data of toddler's body weight assessment at integrated health care, data of malnutrition cases, coverages of *Fe* tablet distribution among pregnant mothers, iodized salt consumption, data of vitamin A distribution and exclusive breastfeeding data are available in NIS.

One of health agencies which has not yet been optimal in using NIS is South Tangerang City Health Agency. Such matter can be seen through observation on data availability conducted on January 2013 from the city Health Agency in NIS whereby emptiness of data was found regarding coverages of vitamin A distribution, exclusive breastfeeding and iodized salt consumption that should be filled on August 2012. This study aimed to determine, assess and find out problems within the reporting execution of public nutritional development performance through NIS at South Tangerang City Health Agency in accordance with HMN framework.

Method

NIS is an information system applied at national level with gradual reporting mechanism starting from 508 districts/cities to 34 provinces then ended at national level. In Banten Province itself, there are eight districts/cities executing NIS. This study conducted in South Tangerang City Health Agency used qualitative study design. The informant selection was conducted using purposive sampling method in which the selected informants were the parties involved and or responsible on reporting nutritional development activities started from integrated health care level, primary health care level up to South Tangerang City Health Agency level. Snowball sampling was also used for determining informants who had capability in answering questions of study based on reference from respondents who most knew the entire condition namely nutrition section staff at the city health agency. Data collecting was continually conducted until answering the aim of study and be terminated when the information was considered saturated. For such basis, the study informants were six people coming from nutrition section staff, health resources and health information system section staff, two nutrition duties and two integrated health care workers. Data taking in this study was conducted on January - April 2013.

In accordance with HMN guidelines version 4.00 released by WHO, variables in this study were resources, indicators, data sources, data management, information products, dissemination and the use of data on NIS. The data sources in this study were results of interview, document analysis and observation categorized as primary and secondary data in form of document related to nutritional development. The instrument used was guidelines of semi-structured interview, observation and document analysis. The interview guideline consisted of 43 questions in which such guideline referred to HMN with several adjustments of which there were 15 questions on resources variable, one question on indicators variable, three questions on data sources variable, 14 questions on data management variable, three questions on information products variable and seven questions on dissemination and data use variables.

Document analysis was conducted toward Regional Health System (RHS) of South Tangerang City and nutritional development activity data at any health services level. Validation was conducted through triangulation of sources namely asking similar questions to different sources and triangulation of method namely taking similar data by different data taking method. The triangulation of sources and method can be seen in details on Table 1.

Data analysis of this study used content analysis technique that was collecting data and analyzing content from a word, meaning, picture, symbol, idea, theme or mes-

Table 1. Data Sources Based on Informants and Data-Collecting Method

	NIS Components Based on HMN	Informants	Method
Resources	Existence of regulation	A,B,C	W,D
	Monitoring routine	A,B,C,D,E	W
	Policy of holding a meeting	A,B,C	W,D
	Any functional unit	A,B,C	W
	Any training	A,B,C,D,E	W
	Special budget for NIS	A,B,C	W
	Availability of forms, papers and another assessment	A,B,C,D,E	W,O
	Availability of computer	A,B,C	W,O
	Availability of the internet and telephone	A,B,C	W,O
	Maintenance of equipments	A,B,C	W
Indicators	The core indicator	A,B,C,D,E	W,D
	Indicator referring to MDGs	A,B,C,D,E	W,D
	Indicator reporting	A,B,C,D,E	W,D
Data sources	Representative in measuring nutritional development activities	A,B,C,D,E	W,D
	Representative in measuring number of malnutrition-related mortality	A,B,C,D,E	W,D
	Data grouping on age and sex	A,B,C,D,E	W,D
	Annual meeting for coordinating variables	A,B,C	W
Data management	Written procedure	A,B,C	W,D
	User friendly reporting	A,B,C	W,D
	Any data storage at health agency level	A,B,C,D,E,F	W
	Any dictionary	A,B,C,D,E,F	W,D
	Any code in managing data	A,B,C,D,E,F	W
	Completeness and consistency	A,B,C,D,E	W,D
	Reported every month	A,B,C,D,E	W
	Time of measurement	B,C,D,E	W
	Coverage data as estimation basis	A	D
	Separation of data estimation	A,B,C	W,D
Dissemination and information use	Any requests from policy makers	A,B,C,D,E	W
	Any graphics in data serving	A,B,C,D,E	W,D
	Any maps in data serving	A,B,C,D,E	W,D
	Information use	A,B,C,D,E	W
	Any advocacy programs	A,B,C,D,E	W
	Information used in planning	A,B,C,D,E	W
	Any resources allocation	A,B,C	W

Explanation:
A = Nutrition Section Head at Health Agency of South Tangerang City
B and C = Primary health care nutrition duties
D and E = Integrated health care workers
F = Health resources and information system staff at Health Agency of South Tangerang City
D = Document analysis
O = Observation

sage in another form of communication.[7] As the first step, one main researcher gave assessment on every component of NIS performance in accordance with HMN guidelines based on the data received from any informants and methods. According to assessment guidelines of information system released by WHO, scores consist of integers whereby the highest score (3) is given to the components considered very adequate, score (2) is given to adequate components, score (1) is given to available yet inadequate components and score (0) is given to components considered inadequate at all to meet standards. Second, to avoid subjectivity and bias in assessment, therefore two senior researchers gave considerations in form of approval or another assessment for every assessed aspect. The third step is calculating percentage of value of every variable by dividing total value of every

component with maximum value that can be obtained by every variable. The fourth step is calculating the percentage of information system performance by dividing total value with maximum value that can be obtained by all information system components. The fifth step is classifying percentage of every variable and percentage of whole information system value in accordance with classifications made by WHO whereby the lowest level (0-25,1%) as inadequate for all; the next group (25,1-50,0%) classified as available yet inadequate; the third group (50,1-75,0%) classified as adequate and the last group (75,1-100%) classified as very adequate.

Results
Characteristics of Informants
At health agency level, there were two informants

namely Head of Nutrition Section at South Tangerang City Health Agency as the party responsible in analyzing data of public nutritional development performance and nutritional program execution as well as health resources and information system staff at South Tangerang City Health Agency as the party responsible in managing data bank. Informants at primary health care level were primary health care nutrition duties coming from Jurang Mangu Primary Health Care and Kampung Sawah Primary Health Care. Primary health care nutrition duty is the party recapitulating data coming from integrated health care and sending it to health agency. Informants at integrated health care level were integrated health care workers coming from Kampung Sawah and Jurang Mangu whereby they are the party recording and developing public nutrition.

Assessment of Resources

Resources in this study consisted of policies and coordinations, funding, executors and facilities. South Tangerang City Health Agency has not yet made a policy specifically regulating NIS management. Document analysis was conducted toward RHS of South Tangerang City. In the city RHS, basically information system of public health unit at district level is already regulated. Also, RHS has arranged decision making based on information and data collecting accuracy. Up to this time, NIS management has been referred to surveillance guidelines released by health ministry.

"We just have a regional regulation concerning the city health system and [we] are in the process of making mayor's regulations." (Nutrition section at South Tangerang City Health Agency)

A routine monitoring was conducted by the city health agency among primary health care in accordance with regional development guidelines released by South Tangerang City Health Agency. Such activity has a function to execute monitoring, provision and evaluation of primary health care programs at its development jurisdiction. The monitoring at integrated health care level was executed by village midwives at every primary health care based on jurisdiction.

A routine meeting activity is arranged in written policy of the city Health Agency Chief. The routine meeting was executed in the early year for program planning and socialization, in the quarter of and in the end of the year for program evaluation. The meeting was executed to plan and evaluate standards of data collection, data preference, reports and activities that must be performed by primary health care workers and duties.

Another assessment was addressed for assessing functional unit, training activities and budget aimed in NIS execution. South Tangerang City Health Agency and primary health care are specifically responsible in NIS man-

agement. NIS management activity is only one of duties and functions of Public Nutritional Development Section. Any training regarding NIS management was not yet executed at the city Health Agency. Most officials learned NIS management independently and learned it from former officials. Budget for NIS management comes from the city budget and primary health care operational budget. The budget used for NIS management was considered available yet less adequate because such budget did not cover costs of maintenance, training and other operationals.

"It is only (duties and functions) and not in form of unit. We do not have training, [only by] self-educated learning, never get trained. Our budget comes from the city budget as [we] never [get any budget] from APBN (the state budget). [The budget] is spent more for [costs of] transport, tracking transport and administration such as ATK (office stationery). There is no training cost, even no maintenance cost, too." (Nutrition section at South Tangerang City Health Agency)

The conducted observation also showed that forms and *ATK* at the city Health Agency, primary health care and primary health care were always available. The internet at the Agency and primary health care was also available. However, in term of maintenance, it was still considered inadequate at all due to none of special budget and workers for equipment maintenance used in reporting through NIS.

Assessment of Nutrition Information System Indicators

In NIS, there was still any variable unidentified up to at primary health care and integrated health care level. Based on interview, such matter was found due to any change of indicator measurement on NIS. The assessment in that element was considered adequate. In term of indicator assessment related to Millenium Development Goals (MDGs), indicators of NIS were considered adequate because several measured indicators were related to suppression of child mortality rate and improvement of mother and child health as the fourth and the fifth aim in MDGs.

In term of activity reporting, such aspect was considered available yet less adequate considering the lack of resources, especially village midwives in nutritional development activity reporting, thus it caused the late of any needed data reporting.

"Following national indicators, such as exclusive breastfeeding, Fe, LB3 (waste of dangerous and poisonous materials) reporting, the late [of data reporting] occured because they said [the report] was already sent, but none. There are some changes. If there is any inappropriate matter, we do not have to fill it." (Nutrition section at South Tangerang City Health Agency)

"The workers are late to submit [data reports]. We

mean it by smooth words." (Nutrition duty of Jurang Mangu Primary Health Care)

"West Jurang Mangu [has] 26 posyandu (integrated health care) and [there is] one village midwife in every district."

Assessment of Nutrition Information System Data Sources

In integrated health care, there was an assessment of child development and nutritional development among children and mothers. Data measured in integrated health care activity are D/S coverage, vitamin A distribution, exclusive breastfeeding, *Fe* tablet distribution and malnutrition reporting and iodized salt use taken once a year. Based on document analysis, it was found that NIS measured six indicators covering D/S coverage, vitamin A distribution, exclusive breastfeeding, *Fe* tablet distribution, malnutrition that get treatment as well as iodized salt use, therefore NIS was considered very adequate because it can measure nutritional development activities.

Measuring malnutrition-related mortality rate was an element in data sources. Measurement of mother and child mortality was reported through reports of primary health care, hospitals and private health service facilities. Based on such matter, the point of this element was considered already very adequate. Another element measured in data sources aspect was annual meeting for coordinating time and variables measured. Meeting with integrated health care workers was executed in every early year to coordinate variables and time of report submission. Therefore, annual meeting aspect was considered already adequate.

Assessment of Nutrition Information System Management

In assessment of NIS management, the assessment was conducted toward data management procedure, data storage, dictionary and special code in infomation system. NIS management procedure referred to nutrition surveillance. However, such guideline was only found at health agency level. Meanwhile, primary health care did not know the existence of such guideline, so this aspect was considered existed yet less adequate.

"[In term of] procedure, there is no any tightening regulation. We have discipline, experience, yes we analyze it then we narrow it in appropriate with the surveillance. The health agency is who enters data to Sigizi (NIS). It is indeed better with puskesmas (primary health care), but if any change, just wait for next year to socialize it." (Nutrition section at South Tangerang City Health Agency)

"There is procedure [applied] only at socialization, but it is not a formal procedure as automatically [we] already know." (Nutrition duty of Jurang Mangu Primary Health Care)

Another aspect is an easy use. In this matter, NIS was considered already easy in term of accessibility considering data saved there could be accessed by all people and from the use itself was also easy. User is the party authorized to enter data to NIS. The party authorized to enter data is health agency officials. In the easiness aspect, this aspect was considered existed yet inadequate considering the use was only able to be executed by health agency and not yet to include primary health care party.

The next aspect is data bank. Health agency owned data bank managed by six staff. Facilities had by data bank were two computers. Data bank backed up data every month whereby data was backed up to any section at South Tangerang City Health Agency in accordance with type of data and data backup in the computer. The city Health Agency owned data bank that could be accessed by all circles, so such aspect was considered already adequate.

Data dictionary was also available in surveillance guidelines, so based on WHO's assesment equipment, such aspect was considered adequate. NIS was also completed with special code in data-combining chart, so this aspect was considered already adequate.

Assessment of Nutrition Information System Products

In NIS product aspect, several elements would be assessed, such as consistency of data, intensity of reporting, intensity of measurement and characteristics of information. Variables on NIS have several changes since it was first made. Such matter caused several data unfilled because such data were not submitted at health agency level. In term of consistency, such aspect was considered existed yet less adequate. The information reporting flow of nutritional development activities was conducted through several steps. First, data was taken at integrated health care level for *SKDN* (data for toddler growth monitoring), vitamin A, *Fe* tablet distribution, undernourishment cases and exclusive breastfeeding. Second, data was delivered to village midwives. However, especially data of iodized salt use, it was directly taken by the village midwives. Third, data was recapitulated by primary health care nutrition duties. The last, data was delivered to South Tangerang City Health Agency.

In term of reporting, there were monthly and half-year reporting. Monthly reporting covered data of toddler assessment, undernourished toddlers and *Fe* tablet distribution. Meanwhile, half-year reporting covered vitamin A distribution and exclusive breastfeeding. Data taken once a year was iodized salt distribution. The reporting was considered existed yet less adequate because data was not yet to be reported regularly on NIS. Coverage data from Central Statistics Agency regarding number of toddlers became the basis of projection, so assessment on coverages was considered very adequate. Classification of data based on demographic, economic

and regional characteristics had been conducted in depicting malnutrition problem, so this aspect was considered very adequate.

Assessment of Dissemination and Information Use of Nutrition Information System

In dissemination and information use aspect, there would be assessed related to needs and analysis of data, advocacy, implementation and actions as well as information use in planning, priority arrangement and resource allocation. Availability of information for the time needed was considered adequate because the data needed for annual planning was already available at the planning stage. Moreover, the data needed for direct handling, such as regarding malnutrition problem, was also available at the right time.

In term of appropriation, there were several data requested in NIS, but unavailable in nutritional development namely data related to anemia among pregnant mothers thus nutrition section must take a coordination with other sections. In term of data accuracy, data was considered quite accurate in looking at occurrence because D/S coverage was already quite high, so it could be the projection reference. Based on such explanation, this aspect was considered adequate. Data serving using graphics was already started from both primary health care and health agency level, so that aspect was considered very adequate. Meanwhile, data serving in form of maps was only used at health agency level, so that aspect was existed yet less adequate.

The next aspect that would be assessed is information use in accordance with its authorization. The available infomation was used by every level of health services to monitor and evaluate nutritional development. The information was also used for influencing the behavior of susceptible groups. Such matter was specifically executed by integrated health care whereby integrated health care conducted assessment and mobile vitamin A distribution if the rate of invitation to integrated health care was ecreasing. The information was discussed in every monthly meeting at every health services level. Therefore, this aspect was considered very adequate.

The last aspect is related to priority and resources allocation. Health Agency would ask primary health care to conduct sweeping if the coverage did not meet the target. Moreover, regions which had malnutrition problem would receive higher budget allocation. health agency also had prioritized two activities namely malnutrition problem and *Fe* tablet distribution among pregnant mothers considering those two indicators did not meet coverage target. Based on that explanation, therefore this aspect was considered adequate.

"Data is for monitoring, evaluation and evidence-based planning, malnutrition problem tracking. We con-duct validation. If coverages do not meet target, primary health care must conduct sweeping." (Nutrition section at South Tangerang City Health Agency)

After receiving any needed information, assessment on all components in every NIS variable was conducted. Such assessment can be seen on Table 2. After that assessment of percentage of every variable and the entire NIS was conducted. Figure 1 showed the percentage of every variable and the entire NIS at South Tangerang City Health Agency whereby resources variable still belonged to the second group in which component variable was already available yet still inadequate. Data management variable, dissemination and information use as well as indicators variable belonged to the third group in which variables were considered adequate. Meanwhile, information products and data sources variable belonged to the fourth group in which the variabel was already considered very adequate.

Discussion

Resources variable was at the second group that meant it was already available yet less adequate. Variable, indicators, data management as well as dissemination and information use were at the second group that meant the component was available and adequate. Then data sources and information product variables belonged to the fourth group whereby the variable was already very adequate. Based on such assessment, therefore percentage of the entire NIS at South Tangerang City Health Agency was at the third group that meant adequate.

Assessment tool released by WHO is basically used to measure health information system in general and used at national level. Considering difference of object and difference of information system implementation level measured, assessment of several aspects could not be conducted, so this study did any adjustment to such assessment tool. The assessment tool felt less sensitive in classifying assessment, so it may cause a bias in conducting assessment, specifically in classification of final score of every variable and infomation system.

Evaluation in details related to information technology in field of health becomes a concern for users and policy makers.[8] Execution of data collecting through computer-based information system in developing countries is not entirely well-performed. General problems are the minimum resources, number of staff, staff capacity, infrastructure, integration and data distribution, survey rules and regional approach in health information system.[9,10] Generally, such problems are caused by complexity of organization, fragmentation and organizational structure that are uncoordinated in maintenance of health information system, unrealistic ambition and more generally to sustainability.[11]

Ones of aspects considered deficient in NIS imple-

Table 2. Scores of Nutrition Information System of Health Agency of South Tangerang City

Assessment Items	Categories	Score
Resources	Existence of regulation	1
	Routine monitoring activity	3
	Policy of holding a meeting	1
	Any functional unit	0
	Any training	0
	Special budget for nutrition information system	1
	Availability of forms, papers and another assessment	3
	Availability of computer	3
	Availability of the internet and telephone	3
	Maintenance of tools	0
Indicators of nutrition information system	This indicator has been identified at regional level	2
	Indicator referred to MDGs	2
	Indicator reporting occurred regularly	1
Data sources of nutrition information system	Representative in measuring nutritional development activities	3
	Representative in measuring malnutrition-related mortality	3
	Any annual meeting for time and variable coordination	2
Data management of nutrition information system	Any a set of written procedure in data management	1
	Easy and accessable system	1
	Any accessable data bank for any users	2
	Any data dictionary	2
	Any special code for information system access	2
Products of nutrition information system	Completeness and consistency in reporting	1
	Reported every month	2
	Measured every month	3
	The latest coverage data as estimation basis	3
	Data estimation explained by demographic, economic and regional characteristics	3
Dissemination and information use of nutrition information system	Nutritional program makers request data completely, on time, accurately, relevant in receiving nutrition information	2
	Graphics used in data serving	3
	Maps used in data serving	1
	Health agency used information in managerial functions	3
	Nutrition information used for changing susceptible group behaviour	2
	Information used in planning and resources allocation	2
	Information used in budgeting process	2

mentation in South Tangerang City Health Agency are existence of policy, human resources support, training and special budget in the treatment used in reporting execution using NIS. Basically, every administrative level in health system has different roles and functions. In relation to health information system, policy making is basically at national level. Meanwhile, program making, evaluation and planning are at province level then regions conduct monitoring and surveillance.[12] However, to improve effectivity of information system execution, such role may change in accordance with needs and valid regulations in a country. By regional autonomy policy, now local government can make a policy in accordance with regional autonomy. Regional autonomy era demands creativity and initiative from local government as well as tightening corporation between local government and central government, so good execution of health information system can be performed.[13]

Lack of staff's capability in health services to manage information system may influence sustainability of data reporting in information system.[14] Holding a training for staff in information system management becomes one aspect needed to be awared of.[15,16] Training related to production, analysis and use of data becomes one of keys in strengthening information system.[17] The training is also addressed not only how managers understand the work system in an information system, however, they are also expected to understand urgency and benefits of information system use.[18] In term of budget, budget in information system management can be divided to hardware de-
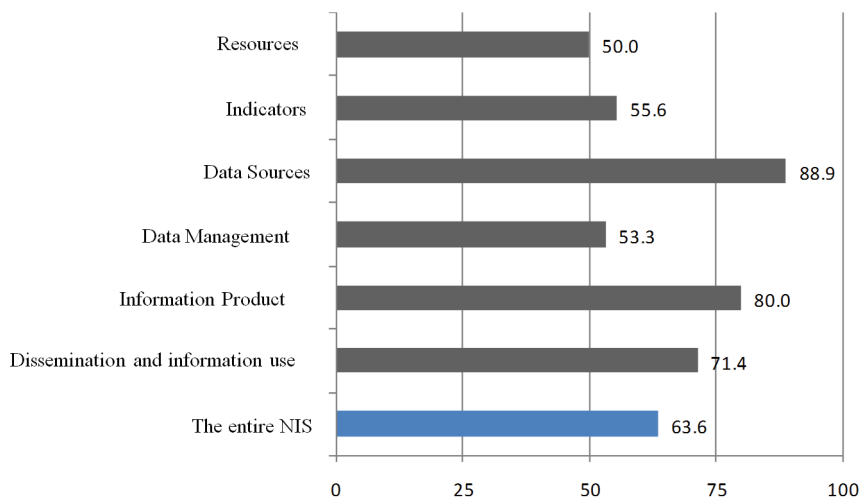
Figure 1. Percentage Value of Entire Nutrition Information System at Health Agency

vice, costs of analysis, design and system execution, costs of place and environment factor, costs of changes and operational costs.[19]

In nutritional development activity reporting aspect, the minimum number of resources causes the late reporting from primary health care to health agency. Such matter also causes the late of data in NIS. NIS is also considered already adequate in presenting nutritional development activities. Procedure in NIS use still refers to surveillance guidelines released by Health Ministry. Therefore, Health Ministry needs to make special guidelines discussing the use of NIS.

Any indicator changes in NIS were found in this study. Such matter definitely can cause non-existence of data in NIS considering that at technical level there is not yet any change in conducting data taking. A procedure, communication and coordination in health information system are needed in implementation of health information system, so there would be synchronization between valid regulation, implemented policy and activities conducted at all levels.[20]

In data presenting aspect, data presenting conducted in form of graphics at all health services levels and the use of maps at health agency level. Information found in NIS is really helpful for policy makers. Therefore, it needs effective marketing of NIS data product by improving types and modes, scopes and frequency of data product dissemination for every level of policy makers (including legislative).[21]

Data presented in NIS is also used by policy makers for monitoring nutritional development activities, planning programs and resources allocation. It needs epidemiology data integration into health information system to provide any useful input in a country's planning of health services and development of a country.[22] Evidence-based decision, an organization must have a

mechanism to find out and assess facts and professionalism in looking for, evaluating, saving and using information and knowledge.[23]

Generally, strengths of health information system in Indonesia are commitment and planning from Health Ministry to provide any deficient data through computerization system. Beside the strengths, there is also any weakness in any aspect, such as another funding and resources in term of information technology.[24]

Conclusion

Results of this study show that implementation of NIS at South Tangerang City Health Agency in accordance with WHO's HMN version 4.00 was considered already adequate. Variable considered still inadequate is resources variable.

Recommendation

Several matters need to be conducted by several institutions to improve performance of data reporting of nutritional development activity through NIS. Health Ministry needs to make a policy and guidelines regulating NIS comprehensively, ensuring that the guidelines made is distributed to all regions and levels, holding a training regarding NIS management, granting achievement to health agencies that collect data regularly and conduct uniformity of NIS form all over Indonesia. South Tangerang City Health Agency needs to make a policy concerning NIS execution, improve health agency commitment. City Council and mayor need to succeed reporting of nutritional development activities, add budget and human resources specifically in maintenance of equipments used in nutrition management, grant achievement to both primary health care and village midwives that collect data regularly, add health workers who help village midwife's activities and authorize primary

health care workers to enter NIS data independently. Primary health care over South Tangerang City need to improve performance, specifically in collecting and entering data of nutritional development activities, and grant achievement to integrated health care that have good reporting performance.

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