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## RESEARCH ARTICLE

URL of this article: <http://heanoti.com/index.php/hn/article/view/hn20502>

## Database Development on Surveillance System of Tuberculosis Cases Management through *Public Private Mix* (PPM) Approach in Health Office of Surabaya

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## ABSTRACT

Surabaya as urban area with high level urbanization and population density has become one of the biggest contributor of Tuberculosis (TB) cases in East Java Province. The number of new cases which are confirmed bacteriologically Tuberculosis lung in 2017 for 2.842 cases and the total number of Tuberculosis cases found and treated for 6.488 cases. This research used descriptive design. The design of this database model development was begun from creating output components, processing components, and identifying input components. The data collecting was done by indepth Interview to the Head of Infectious Disease Prevention and Control Section and two TB Wasor in Surabaya City Health Office of which output components consisted of percentage of health service facility that had implemented the TB service based on the standards, performing mandatory notification, accredited and certified, the number of professional organizations involved, and the number of community organizations involved. Process components consisted of data analysis of TB Public Private Mix, data interpretation and result dissemination. The input component was to analyze the material needed on database development of TB case management surveillance system through Public Private Mix approach formed recording and reporting, hardware-software requirements, human resources availability in surveillance system and methods/ procedures used in system development. Need to be undertaken a test from the development of a database that has been designed and conduct monitoring and evaluation therefore it can be input for further improvement.

**Keywords:** Tuberculosis, Surveillance, System

## INTRODUCTION

Tuberculosis (TB) is one of the health problems that needs to be solved immediately, due to the spread of TB cases is very easy and fast<sup>1</sup>. Based on TB Global Report on 2015 showed that the number of TB patients reaches 9.6 million while the TB death rate is about 1.5 million people<sup>(1)</sup>. In Indonesia, the burden of TB problems is quite high. Based on reports from WHO (2015) Indonesia ranked in second place as the most TB patients after India<sup>(1)</sup>. In 2014 the incidence rate of bacteriologic pulmonary tuberculosis in Indonesia was 176,677 cases. According to the national percentage, East Java Province ranked in second place with the highest TB cases after West Java<sup>(2)</sup>.

At the district or city scale, Surabaya as an urban area with high urbanization and population has become one of the biggest contributor to TB cases in East Java Province. The number of new cases of bacteriologically confirmed lung TB in 2017 was 2.842 cases and the total number of TB found and treated cases reached 6.488 cases. By those characteristics, Surabaya also faces uphill challenges in implementing TB Public Private Mix (PPM) especially in involving private services such as hospitals, clinics and private practices<sup>(3)</sup>.

In TB Control Program, one of the most important and stated in the DOTS TB strategy is the recording and reporting system that is able to assess the patient's treatment outcomes and overall program performance<sup>(2)</sup>. In 2012, it was estimated that about one third of TB cases are still inaccessible or reported. The inadequacy of TB care organizations in recording and reporting on standardized sessions is the cause of the failure of the TB program<sup>(2)</sup>.

Based on the notions above, the efforts to overcome the tuberculosis must be undertaken comprehensively by involving all elements, especially private health facilities through Public Private Mix approach that can be integrated in a similar system therefore the database development on TB case surveillance management system through Public Private Mix approach in Health Office of Surabaya should be done.

## METHODS

This research used descriptive design which aims to describe the model of database development on TB case management surveillance system through TB Public Private Mix approach in Health Office of Surabaya. The development design of this database model began with exploring the required information as an output component, designing what activities were required to produce the information as a process component, and identifying data and resource needs as input components. Data collecting was undertaken by indepth interview to the Head of Infectious Disease Prevention and Control; and two TB vice supervisors of Surabaya Health Office. Data and information that had been obtained will be described and analyzed descriptively through Data Flow Diagram (DFD).

## RESULTS

### The Identification of The Information Type Needs as Output Component

Identification of information needed is an initial activity undertaken in system development efforts. The following is the type of information required as an output component in the TB control program in Surabaya.

Table 1. Design of information needed on TB case management surveillance system through Public Private Mix (PPM) approach in Health Office of Surabaya

No	Information Needed	Operational Definition	Data Displays	Periods
1.	Percentage of health care facilities, Percentage of (hospital, clinic, DPM) that has implemented TB services based on standardization	The number of health care facilities who have implemented standard TB services compared to the number of registered and licensed health care facilities in a given period is 100%.	Graphic, Table	Quarterly, Annually
2.	Proportion of health care facilities (hospital, clinic, DPM) that has committed the compulsory notification.	The number of health care facilities that has undertaken the compulsory notification of required TB compared with the number of registered and licensed health care facilities in certain period then multiplied by 100%.	Graphic, Table	Quarterly, Annually
3.	Proportion of health care (FKTP and FKRTL) that is already accredited and certified.	The number of health care facilities that is already accredited and certified then compared with the number of registered and licensed health care facilities in certain period multiplied by 100%	Graphic, Table	Annually
4.	The number of professional organizations involved (IDI, PDPI, IDAI, PAPDI, PPNI, IBI, IAI, ILKI, etc)	The number of professional organization involved in TB control program then compared with the number of registered professional organization in certain period multiplied by 100%.	Table	Annually
5.	The number of social organizations involved	The number of social organization involved in the TB control program then compared with the number of social organization in certain period multiplied by 100%.	Table	Annually

The identification of information needed based on the system users can be shown as follows.

Table 2. Information Needed Based on System Users

No	Information Needed	System Users		
		Health care facilities	District/Province City	Central
1.	Percentage of health care facilities, percentage of (hospital, clinic, DPM) that has implemented TB services based on standardization	✓	✓	✓
2.	Proportion of health care facilities (hospital, clinic, DPM) that has committed the compulsory notification.	✓	✓	✓
3.	Proportion of health care (FKTP and FKRTL) that is already accredited and certified.	-	✓	✓
4.	The number of professional organization involved (IDI, PDPI, IDAI, PAPDI, PPNI, IBI, IAI, ILKI, dll)	-	✓	✓
5.	The number of social organizations involved	-	✓	✓

### Design of Activity to Produce the Information Needed on Process Components

In database development of TB case surveillance management system through Public Private Mix (PPM) approach in Health Office of Surabaya, there are some activities to produce the required information on process component as follows.

#### 1. Data Collection

Beside of the data which are already available in SITT (*Sistem Informasi Tuberculosis/* Information System of Tuberculosis), in database development on TB case management surveillance system through PPM approach, it is also necessary to collect basic data of health facilities and their networks through cross-sector coordination mechanism in Health Office of Surabaya which is updated every year.

#### 2. Data Compilation

Based on interviews and document studies, the available data in Health Office of Surabaya have been grouped based on the person (gender and age) variable, place and time.

#### 3. Data Analysis and Interpretation

Data that have been collected, then processed and analyzed by TB vice supervisor. Based on the results of interviews and document studies, it can be evaluated that the data are based on epidemiological information as people, places, and time. Data that have been analyzed are made in the tables, graphs, diagrams, and maps.

### The Identification of Data Needs and Resources Capable of Producing the Needs on Input Components

#### 1. Data

In developing database on TB case management monitoring system through Public Private Mix (PPM) approach, there are some identifications of requirement on input component as follows:

Table 3. Identification of data needs in database development design on TB case management surveillance system through Public Private Mix (PPM) approach at Health Office of Surabaya

No.	Information	Data Needs	Data Source
1.	Finding and Treatment Data of TB Cases	a. presumed number of TB b. the number of TB cases found and treated c. presumed number of TB referred by: <ul style="list-style-type: none"> <li>▪ Private doctors</li> <li>▪ Clinic</li> <li>▪ Hospital</li> <li>▪ Society</li> <li>▪ etc</li> </ul> d. presumed number of TB referred by: <ul style="list-style-type: none"> <li>▪ Private doctor</li> <li>▪ Clinic</li> <li>▪ Hospital</li> <li>▪ Society</li> <li>▪ etc</li> </ul> e. the number of TB cases treated by Standard and Non-Standard	Form TB 06, Form TB 01, Register TB 03
2.	Treatment Result Data of TB Patients	The number of TB Patients Treated with: <ul style="list-style-type: none"> <li>a. Heal</li> <li>b. Complete Treatment</li> <li>c. Default</li> <li>d. Failed</li> <li>e. Move</li> <li>f. Died</li> </ul>	Register TB 03, TB 08
3.	Health Care Facilities Basic Data	a. The number of hospitals in working area b. The number of clinics in working area c. The number of private doctors in working area d. The number of laboratories in working area e. The number of pharmacies in working area f. The number of cadres	Health Care Facilities Basic Data Form
4.	The number of health care facilities	a. The number of Public health centers b. The number of attendant public health centers c. The number of hospitals d. The number of clinics e. The number of laboratories	Health care facilities basic data form

No.	Information	Data Needs	Data Source
	f.	The number of private doctors	
	g.	The number of pharmacies	
	h.	The number of clinics for working	
	i.	The number of professional organizations	
	j.	The number of social organizations	
	k.	The number of health care facilities (FKTP and FKRTL) accredited and certified	

## 2. Material

### a) Registering and Reporting Form

The design of basic data registering and reporting forms that can be used to support the design of TB case surveillance management systems through the Public Private Mix (PPM) approach as follows:

Table 4. Basic Data Form Design of Health Care Facilities in Developing Public Private Mix (PPM) TB Control Program

No	Type of health care facilities	Total	Tb dots service	
			The number of dots service	The number of non dots service
1	Public Health Center			
2	Attendant Public Health Center (Pustu)			
3	Hospitals			
	a. Government Hospital			
	b. Private Hospital			
4	Clinics			
	a. Government Clinic			
	b. Private Clinic			
5	Laboratories			
	a. Government Laboratory			
	b. Private Laboratory			
6	Private Doctors			
	a. General Practitioner			
	b. Pulmonologist			
	c. Pediatric			
	d. Internist			
	e. Orthopedic			
7	Pharmacy			
8	Workplace Clinic			
9	Professional organization existed			
10	Social organization existed			
11	Health care facilities			
	a. Public health center			
	b. Hospital (government/private)			
	c. Clinic			

### b) Hardware dan Software

Hardware required is a set of computers for each data managers of TB program therefore data can be inputted systematically to be analyzed more efficiently.

## 3. Human resources

The availability of human resources in Surabaya Health Office has fulfilled the existing standard with the availability of personnel consisting of two TB vice supervisors, one contract worker as administrative officer and one person of TB Data Officer who becomes assistant that financed by GF-NFM (Global Fund-New Funding Model) TB Component Health Office of East Java Province.

## 4. Method/Procedure

Availability of data at district health offices still includes health care facilities and routinely reports (Public Health Centers and Hospitals). Reports of TB suspected findings and cases of TB outside of public health center and hospitals such as Clinics and Private Doctors are included in Public health center reports based on working area.

## Design of Database Development Model

Description of the TB Information System in Surabaya Health Office's flow is generally described with the context diagram and data flow diagram. The following are diagrams of context diagrams, data flow diagrams and data flow diagrams of database development on a TB case management surveillance system through the Public Private Mix (PPM) approach.

### 1. Context Diagram

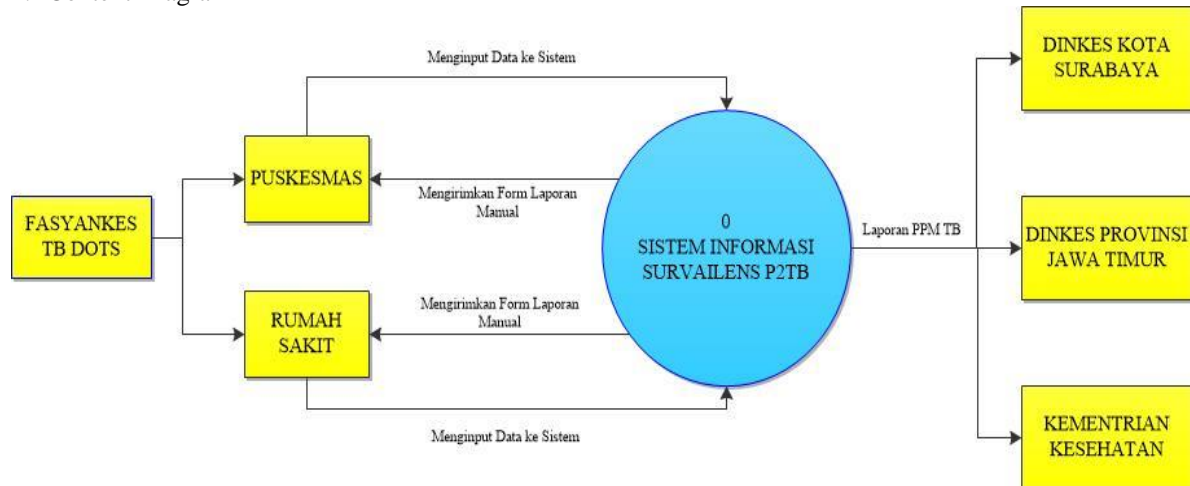


Figure 1. Context Diagram of ongoing P2TB program surveillance information system in Surabaya Health Office (diagrams are written in the Indonesian version)

### 2. Level 0 Data Flow Diagram

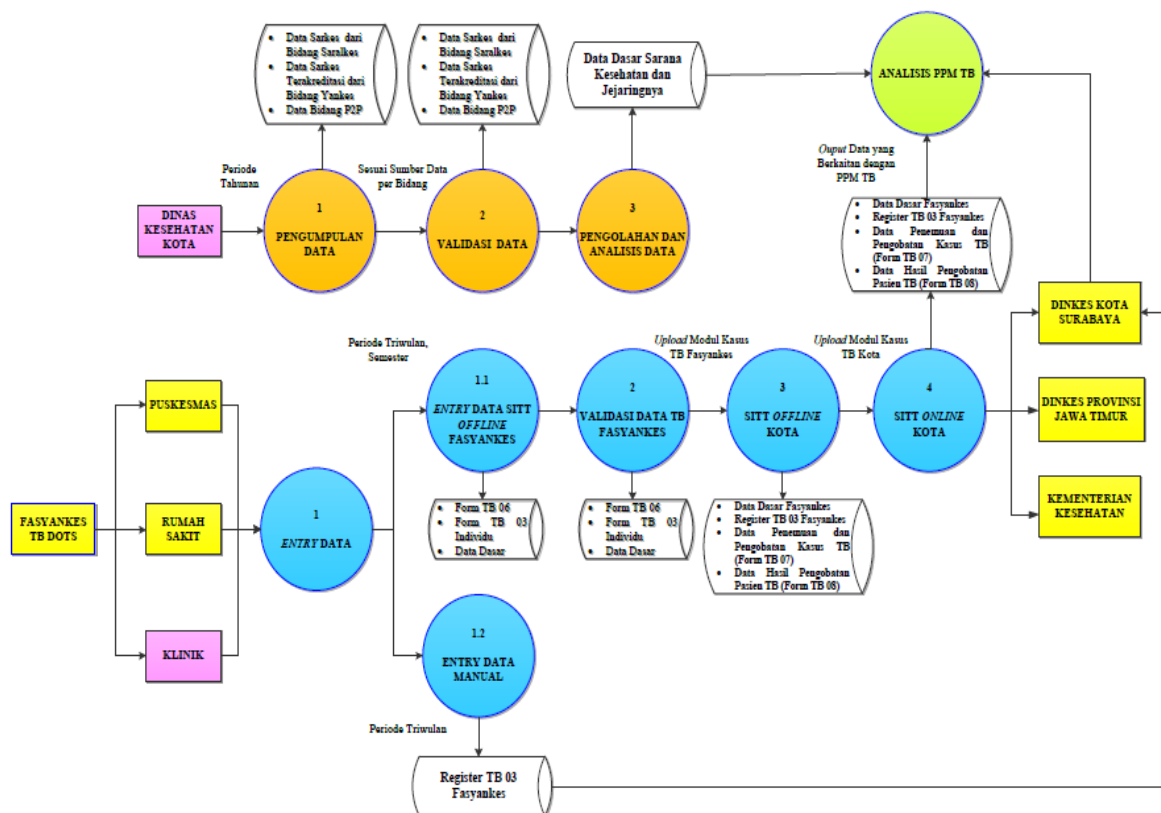


Figure 2. Level 0 Data Flow Diagram Surveillance System of TB Case Management through Public Private Mix Approach (PPM) P2TB in Surabaya Health Office (diagrams are written in the Indonesian version)

## 3. Level 1 Data Flow Diagram

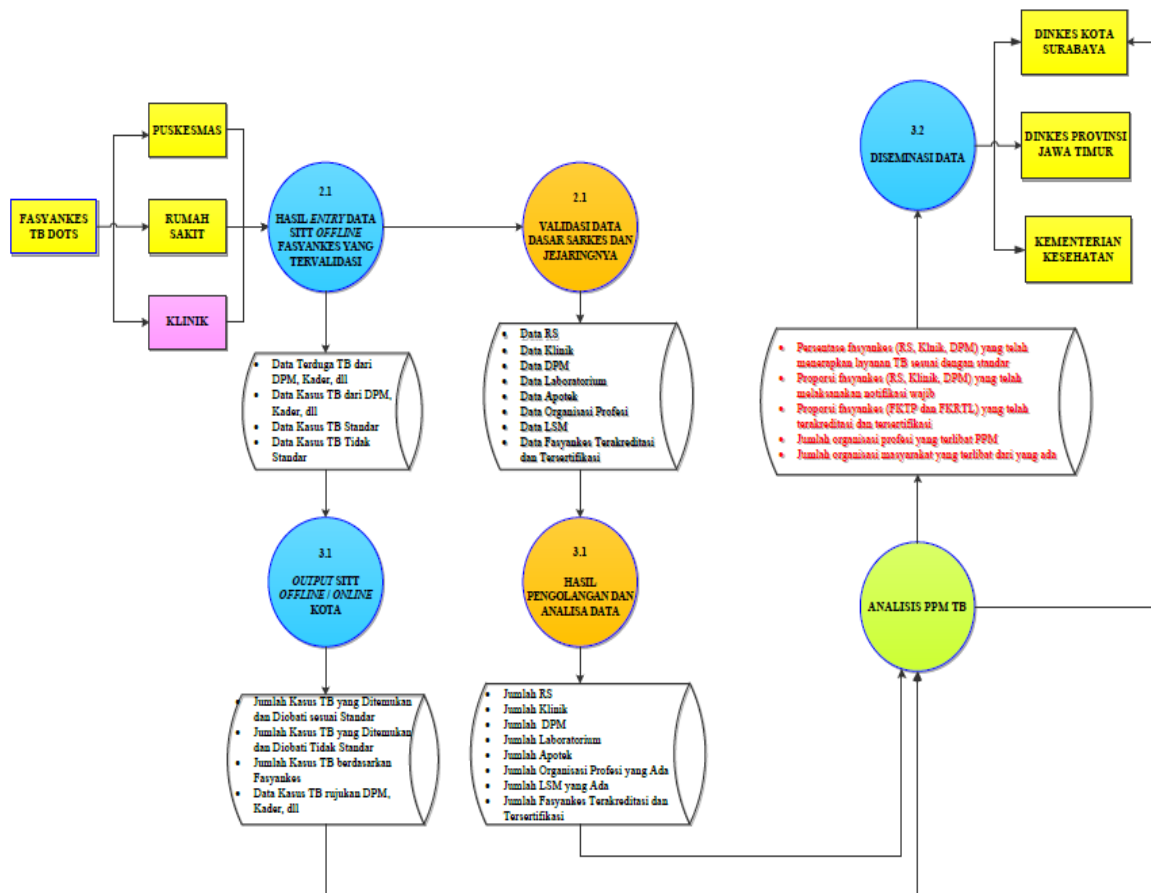


Figure 3. Level 1 Data Flow Diagram Surveillance System of TB Case Management through Public Private Mix Approach (PPM) P2TB in Surabaya Health Office (diagrams are written in the Indonesian version)

## DISCUSSION

## Identification of Information Type Needed as Output Component

Information needed are obtained from indepth interview with TB vice supervisor in Surabaya Health Office, literature study based on Minister of Health Regulation No. 67 year 2016 on TB Control, National TB Guidelines 2014 and Public Private Mix (PPM) National Action Plan TB Control<sup>(4)</sup>.

Until now the output of the SITT application has not been able to meet the information needed directly in accordance with the program indicators and other information related to PPM TB so that the resulting output is still in the form of information manually obtained by utilizing Ms. Excel program to sort one by one and even, in some cases, by making use of the calculator.

Some of the information that needs to be added from the existing system are 5 (five) indicators of the results of TB case management surveillance activities through the Public Private Mix (PPM) approach. Other information such as health care facilities data, the number of TB suspected findings and TB cases that receive standard or non-standars treat according to both public and private health care centers and hospitals, and individual data on TB cases referred based on external TB networks are present in the SITT output. Basic data of health facilities and its networking have also been available in the SITT output through the cross-cutting data provision coordination mechanism in Surabaya City Health Office.

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### Activity Design to Obtain Information Needed in the Process Component

1. Data Collecting  
Recording and reporting activities are conducted at the health care facilities and regency/city levels. Registration at health care centers and hospitals levels uses standard forms manually and is supported by information systems electronically. TB recording and reporting system electronically employs Web-based Integrated TB Information System version 10.04 and is nationally integrated with the Health Information System.
2. Data Compilation  
Data compilation is done by using computer/laptop and software application provided by National TB Control Program, namely SITT (Integrated Tuberculosis Information System) 2 Version 10.04 which is the latest version of SITT.
3. Data Analysis and Interpretation  
Data processing and analysis are adapted to the needs of information or data output required by health care centers, Provincial Health Office, and Ministry of Health. Results of data processing and analysis that are often needed are TB Case Notification Rate (CNR) and Treatment Success Rate (TSR).

### Identification of Data Need and Resource Capable of Providing Needs in the Input Component

1. Data  
The required data are variables that need to be added to the SITT output used to generate indicators and information needed for surveillance of TB case management through PPM at Surabaya City Health Office. Data that need to be added to the basic data form of health care facilities are the number of hospitals in work area, the number of clinics in work area, the number of independent practice doctors in work area, the number of laboratories in work area, the number of pharmacies in work area, and the number of cadres. The addition of these variables is based on the required information. In addition, for the city scale needs, it also requires additional data related to health facilities and its network in an effort to support PPM TB activities.
2. Material
  - a. Recording and Reporting Form  
For the surveillance needs of TB case management through PPM, SITT applications currently in use both offline and online have not been able to display the required output. TB recording and reporting is still derived from health care centers and hospitals DOTS that only describe some of the TB PPM activities through referral data that have been incomplete in the data entry process and are not evaluated at the regency/city level so that the achievement of PPM TB indicator has not been analyzed. Previous reporting formats that can be used in PPM TB activities have been deleted from the municipal regular reporting list and these types of reports have also never been reported.  
Therefore, in order to continuously support TB case management surveillance activities through PPM approach, the basic data form of health facilities and its networks that can be used for the routine data collection activities at the regency/city levels in accordance with the data needs used to analyze and evaluate the activities PPM TB is designed.
  - b. Hardware dan Software  
The required software is in the form of databases that can be used to facilitate the process of data analysis.
3. Human Resource  
Manpower standard at the regency/city levels based on Minister of Health Regulation No. 67 year 2016 concerning TB control<sup>(4)</sup> is that a trained TB program manager (vice supervisor) in Health Office oversees 10-20 health care facilities in the easy-accessed areas, while for the areas with more than 20 health care facilities is recommended to have more than one TB vise supervisor. The availability of other personnels which are the components of TB team that must be present are:
  - a. logistics manager of the TB control program;
  - b. laboratory manager when having a regional health laboratory;
  - c. TB health promotion team which consists of the health promotion division and TB control program at the local Health Office as well as other related elements.
4. Method/Procedure  
The guidelines used for TB surveillance activities still use 2014 TB national guidelines, Minister of Health Regulation No. 67 year 2016 on TB control<sup>(4)</sup>, and SITT guidebook. So far there is no Standard Operating Procedures (SOP) for the reporting and surveillance flows in each health care facility particularly that is related to TB case management through Public Private Mix (PPM) approach.

### Database Development Model Design

Description of the general flow of TB Information System in Surabaya Health Office is depicted with

the context diagram and data flow diagram. Context diagram is a depiction pattern that serves to show the interaction of the information system with the environment in which the given system is placed<sup>(5)</sup>.

#### 1. Context Diagram

Data Flow Diagram (DFD) is a tool functioning to describe in detail about the system as a working network of inter-function that relates to each other by showing from and to where the data flow as well as its storage<sup>(6)</sup>. The preparation of DFD is based on the process of information flow in the form of recording and reporting conducted on every surveillance activity.

#### 2. Level 0 Data Flow Diagram

In the diagram of level 0 data flow, it can be seen that the reporting done by Surabaya Health Office is in the form of online SITT in which the basic data of health facilities and its network has not been included and the mechanism of data providing is separated. Therefore, the development of P2TB surveillance information system database especially which is related to surveillance of TB case management through Public Private Mix approach (PPM) is done on the process of analysis and dissemination of information

#### 3. Level 1 Data Flow Diagram

Data generated from the data collection process by health care centers, hospitals, and clinics related to Public Private Mix (PPM) TB surveillance activity are offline SITT data on form TB 06, TB 03 individual (Output TB 07 and TB 08) and basic data of health care facility, consisting of suspected TB from independent practice doctors, cadres and others, TB case data from independent practice doctors, cadres and others, TB standardized case data and TB non-standardized case data.

The analysis results of the TB Public Private Mix (PPM) activities can be directly utilized by Surabaya Health Office and disseminated to East Java Provincial Health Office and Ministry of Health of Indonesian Republic.

### CONCLUSION

The identification of the information required as an output component in the development of a database for TB case surveillance management system through the Public Private Mix approach are the percentage of health care facilities having applied the TB service as standardization, proportion of health care facilities having committed the compulsory notifications, the proportion of which has been accredited and certified, the number of professional organizations involved, and the number of social organizations involved from the existing social organizations. The designs of activities to yield the required information on the process components in the development of database of TB case surveillance management system through the Public Private Mix approach are data analysis of TB Public Private Mix, data interpretation, and results dissemination. The identification of data and resource needs that are able to produce the needs on input components are analyzing the material needs on developing database in TB case surveillance management system through the Public Private Mix approach by recording and reporting form, hardware-software needs, human resources availability in surveillance system, and methods or procedures that is used in system development.

There should be a support and cooperation from various parties, especially for all elements involved in input components, processes and outputs therefore the results can give an accurate and valid data and information. Need to undertake the test for the development of database that have been designed and conduct monitoring and evaluation hence it can be a recommendation for further improvement. The developed database still has limitation on the evaluation of TB PPM indicator. If it is possible, the further research can be overtaken to generate the application development that can map all health facilities already involved and not in TB PPM by region then compared to TB case finding coverage.

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