UNIVERSITE VICTOR SEGALEN BORDEAUX 2

PATIENT AND HEALTH CARE SYSTEM DELAY IN THE DIAGNOSIS OF TUBERCULOSIS IN 142 DOTS CENTRE IN INDONESIA AND SPECIFIC ISSUE OF PPM DOTS IN BALI PROVINCE

Theodorus Aditya Anantha Kusuma

Master thesis is submitted to the Université Victor Segalen Bordeaux 2 in partial fulfilment of requirements for the award of tropEd European Master of Science in International Health

September, 2008

Thesis supervisor:

Dr. Philippe DUBROUS**,** Département d'Épidémiologie et Laboratoire de Biologie Médicale de l'Hôpital d'Instruction des Armées Robert Picqué, Bordeaux, France

Dr. Med. Sven Gudmund HINDERAKER**,** Centre for International Health (CIH) University Bergen Norway

Prof. Marthe-Aline JUTAND**,** ISPED, Institute de Santé Publique et de Développement, Université Bordeaux 2, France

Dr. Yodi MAHENDRADHATA, MSc, Centre for Tropical Medicine Faculty of Medicine Gadjah Mada University Yogyakarta Indonesia (Field Supervisor)

Jury :

Dr. Pascal MILLET, Centre Réne Labusquière Université Bordeaux 2 France

Prof. Denis MELVY, Centre Réne Labusquière Université Bordeaux 2 France

Prof. Jean Louis KOECK, Centre Réne Labusquière Université Bordeaux 2 France

Prof. Annie SASCO, ISPED, Institute de Santé Publique et de Développement, Université Bordeaux 2, France

DECLARATION

Where other people's work has been used (either from printed source, internet of any other source), this has been carefully acknowledged and referenced in accordance with departmental requirements.

The thesis ……...*Patient and health care system delay in the diagnosis of tuberculosis in 142 DOTS centre in Indonesia and specific issue of PPM DOTS in Bali province*…….. is my own work

Signature:……

…..

Total word count:…….

Date:……

ACKNOWLEDGMENTS

First and foremost I would like to thank to Lord Jesus Christ as He blessed me every day and every path I take, and for giving me wisdom, grace and peace. All the effort I took would not work without His will.

I especially thank to my family, my mother Fransiska Sirwatini, my father Fransiskus Xaverius Siswardi, my sister Rosalia and my borther Andreas who gave me love and support.

I would like to acknowledge my work for my supervisor Dr. Philipe Dubrous, Dr. Med. Sven Gudmund Hinderaker, Prof. Marthe-Aline Jutand and dr. Yodi Mahendradhata MSc who have supported and supervised me with all their knowledge and expertise.

I would like to thank my senior colleges in Indonesia, dr. Riris Andono Ahmad, MPH, dr. Ari Probandari MPH who gave me inputs during my thesis.

I would like to thank Erasmus Mundus program and tropEd network for financial support and assistance during my master study in Europe.

I would like to thank also Dr. Pascal Millet, PhD from University Bordeaux 2, Dr. Carsten Mantel, PhD from Insitute Tropical Medicine Charité Berlin for their assistance during my master study.

Special thank to my best classmates Hsiao Hsuan and Darivianca Lallo for giving me support during my study, and being the best friends.

Special thanks also to my Indonesian friends in Bergen Hans Panjaitan MSc, Nurul Aini MA, Kurnia Julia Utami BSc for their support during my stay in Bergen.

My special acknowledgment to Ben Johns from WHO and K.P Unnikhrisnan from National Tuberculosis Institute Bangalore for the assistance of development of questionnaire.

Lastly, I would like to thank all my classmates in Insitute Tropical Medicine Charité Berlin, Centre International Health University Bergen, and Centre Réne Labusquière Université Bordeaux 2 France, all the administrative staff, for their friendliness, support, and assistance during my master study.

CONTENTS

LIST OF ILLUSTRATION

LIST OF ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
CDR	Case Detection Rate
CNR	Case Notification Rate
DOTS	Directly Observed Treatment, Shortcourse
EPTB	Extra-pulmonary Tuberculosis
GFATM	Global Fund AIDS Tuberculosis Malaria
HBCs	High Burden Countries
HIV	Human Immunodeficiency Virus
NGOs	Non-Governmental Organizations
NTP	National Tuberculosis Programme
PHC	Primary Health Centre
PPs	Private Practitioners
PPM DOTS	Public-Private Mix DOTS
PTB	Pulmonary Tuberculosis
TB	Tuberculosis
WHO	World Health Organization

EXECUTIVE SUMMARY

PATIENT AND HEALTH CARE SYSTEM DELAY IN THE DIAGNOSIS OF TUBERCULOSIS IN 142 DOTS CENTRE IN INDONESIA AND SPECIFIC ISSUE OF PPM DOTS IN BALI PROVINCE

SETTING: Newly diagnosed smear positive, smear negative and extra-pulmonary tuberculosis patient in 142 DOTS centre in three provinces in Indonesia (Central Java, Bali and West Sumatra).

OBJECTIVE: To investigate factors associated with patient and health care system delay in diagnosing tuberculosis in 142 DOTS centre in Indonesia and to compare the delay between regular DOTS and PPM DOTS in Bali province

DESIGN: Cross-sectional study. The study was conducted under the project of 'Cost-Effectiveness of PPM DOTS in Indonesia'. Patients were interviewed using standardized questionnaire between April 2007 and July 2008. The information was also obtained from patient's register at DOTS centre.

RESULT: The median of patient, health care system and total diagnosis delay were 14, 25 and 50 respectively. Rural dwellers were significantly a risk factor for patient, health care system and total diagnosis delay. First visit to private practitioners and hospital/chest clinic/private clinic were significantly reduced patient delay. For health care system, visit to private practitioners was significantly a risk factor for delay. Subset analysis of comparison regular DOTS and PPM DOTS in Bali province revealed that PPM DOTS had longer delay than regular DOTS. Median of patient, health care system, and total diagnosis delay in regular DOTS were 21, 36, and 58 respectively. Median of patient, health care system, and total diagnosis delay in PPM DOTS were 20.5, 42 and 69 respectively.

CONCLUSION: In 142 DOTS Centres in three provinces almost fifty percents of patients had total diagnosis delay more than 2 months. Rural area was risk factors for longer total diagnosis delay and it suggests the increase of awareness of TB in the general population, and better health services for diagnosis tuberculosis in rural area. Total diagnosis delay in PPM DOTS in Bali province was found to be longer than in Regular DOTS, therefore it is necessary to assess further the effectiveness of the PPM DOTS program, improving capacity of private practitioners, adequate supervision by NTP, referral and information systems.

KEY WORDS : tuberculosis; patient delay; health care system delay; total diagnosis delay; regular DOTS; PPM-DOTS

CHAPTER 1
INTRODUCTION

Tuberculosis has a long history of decimation (Nerlich AG et al, 1997).There were an estimated 9.2 million new TB cases in 2006 (139 per 100.000), including 4.1 million (62 per 100.000) new smear-positive cases. These numbers include TB in HIV-positive people in India, China, Indonesia, South Africa and Nigeria rank first to fifth in terms of incident cases. Asia (South-East Asia and Western Pacific regions) accounts for 55% of global cases, and Africa accounts for 31%; the other regions account for relatively small fraction of global cases (WHO, 2008).

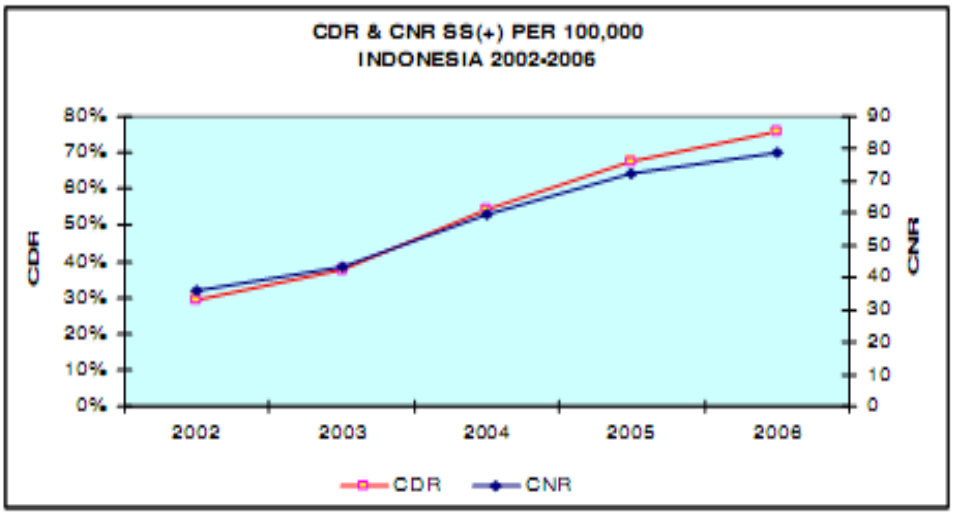
In 1993, WHO declared a state for global emergency for TB because of the steady increase of this disease worldwide (Storla et al, 2008). Various reasons including poverty, population growth, migration and HIV/AIDS are the major factors for the continued threat of TB in the world, but a significant problem lies with the fact that many cases remain undiagnosed (Yimer.S et al, 2005).

TB control program has the main goal to stop TB transmission in the community. It can be achieved by early detection of smear-positive pulmonary tuberculosis cases and rapid initiation of full short course treatment (Lienhardt C, 2001). Delay in diagnosing and treatment in tuberculosis (TB) will result in more severe disease and also higher case of mortality. It can also spread of infection to the community, and increases patient expenditure on treatment. Study from Madebo et al revealed that the longer the delay, the more contagious the patient, as the number of bacilli in sputum increases (Storla et al, 2008). Early detection and effective treatment, the two key factors in successful TB control, can be achieved by shortening the time from first symptom to arriving in standard health care (patient delay) and time between first visit and diagnosis (health system delay)

(Rojpibulstit.M et al, 2006). However the two terms are not without problems. For example, over the period of patient delay, health system related factors may also play a part (e.g. geographic accessibility of health facilities). Likewise, over the period of health system delay, patient factors may also play a part (e.g. patients might not follow doctor's advice o, diagnostic procedures) (Cheng et al, 2005). Many studies have been conducted to investigate these delays and give recommendations for improvement the quality and effectiveness of national TB programmes.

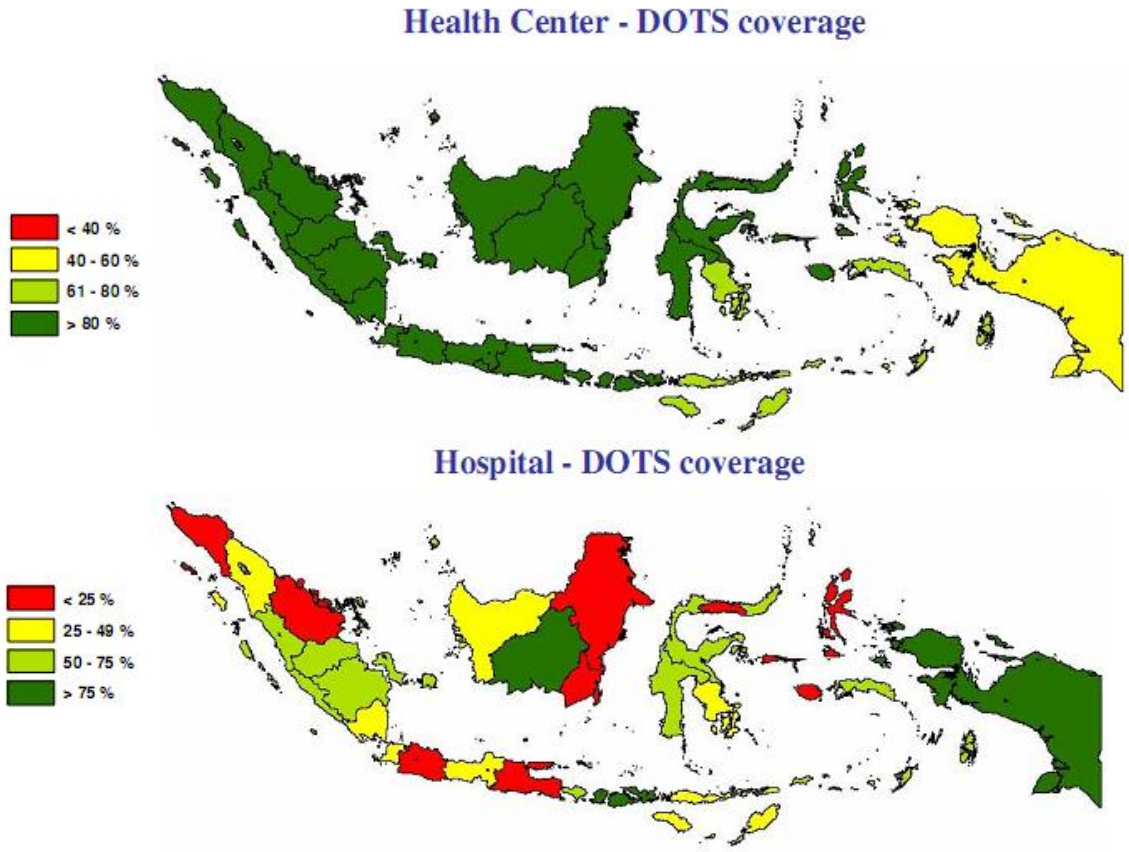
Indonesia is the third rank of TB in the world. According to WHO 2006 estimation, the incidence of all TB cases in Indonesia is 234 per 100.000 populations per year, where the incidence of smear positive cases is 105 per 100.000 populations per year (WHO, 2008). The Case Detection Rate (CDR) of smear positive cases in 2006 is 73%, slightly above the global target (at least 70% CDR of smear positive cases under DOTS). Until the year of 2006, DOTS coverage in Indonesia has reached 98% .Despite of the high coverage of DOTS in Indonesia, national data report that there are still difficulties with case finding and treatment of TB (Watkins RE et al, 2004).

Graph 1. CDR and CNR of Smear positive in Indonesia 2002-2006



(Source : http://tbcindonesia.or.id)

Figure 1. DOTS Coverage in Indonesia



(Source: http://tbcindonesia.or.id)

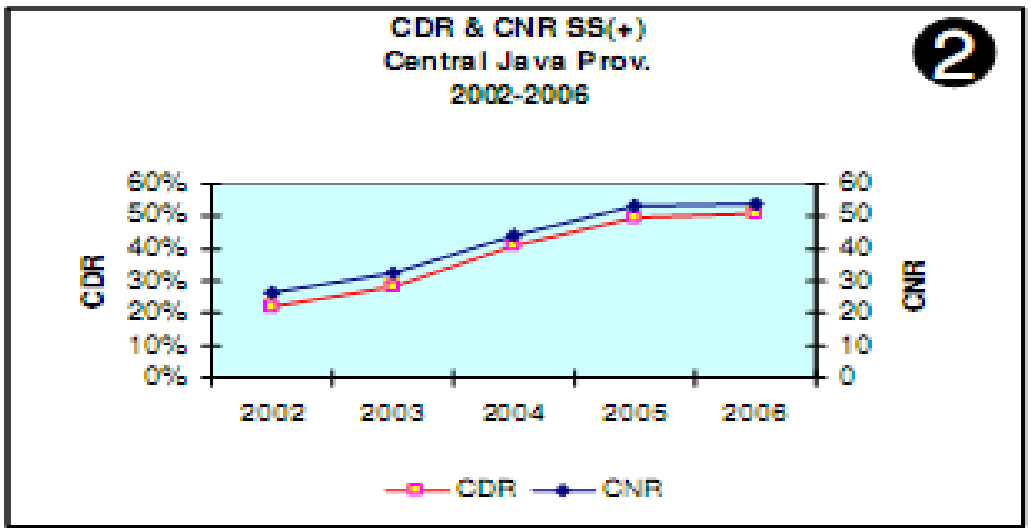
Central Java

Central Java has a network of 847 health centres, 152 hospitals (public and private), 11 chest clinics and 2615 private practices to serve the health needs of its 32 million populations. The TB programme has shown considerable progress with CDR increasing from 14% in 2000 to 49% in 2005 and 53% in 2006. This progress is partly attributed to the involvement of Lung hospital and clinics since 2003 and hospitals since 2004. The DOTS programme as of today encompassed 11 chest clinics, 1 lung hospital, 23 public hospitals and 23 private hospitals in addition to the 847 health centres. This has been achieved through activities carried out at provincial and district/municipal level.

Figure 2. Map of Central Java

(Source: http://encarta.msn.com)

Graph 2. CDR and CNR of Smear positive in Central Java



(Source: http://tbcindonesia.or.id)

Bali

Bali province consists of six islands with Bali island is the largest island. The province covers an area of 5,632 km square with a population of 3.4 million inhabitants.

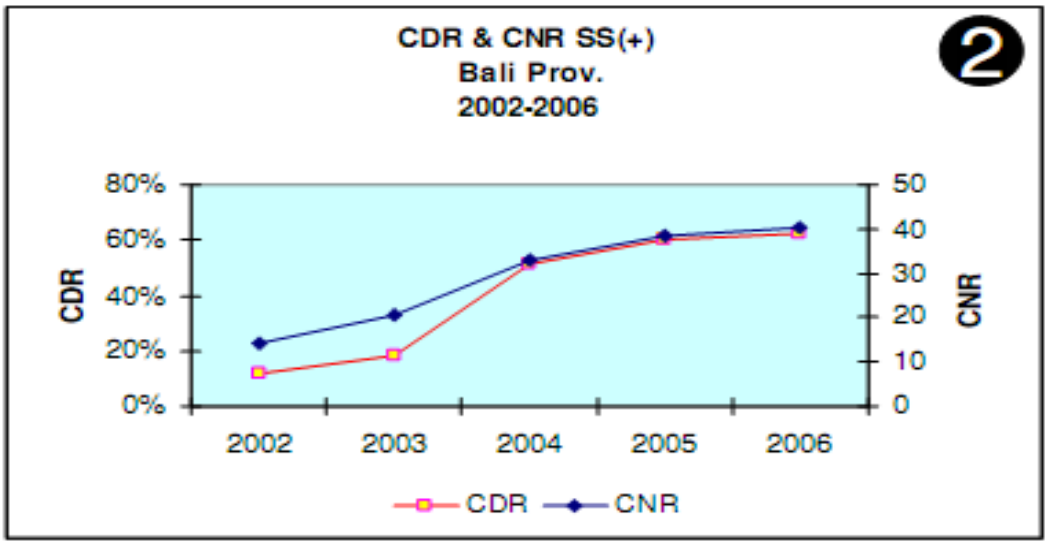
The province is administratively divided into 8 districts and 1 municipality. The population is predominantly native Balinese (95%), plus Javanese minority. Tourism is the backbone of the province's economy with millions of tourists arriving annually

Figure 3. Map of Bali province

(Source: http://encarta.msn.com)

By the year 2006, there are 107 Primary Health Centre/PHC, 10 public hospitals, 10 private hospitals, and 3 military/police hospitals which are implementing DOTS. The CDR in the same year has reached 62.7%.

Graph 3. CDR and CNR of Smear positive in Bali province



(Source: http://tbcindonesia.or.id)

The backbone of TB services in Bali is the network of community health centres/Primary Health Centre/puskesmas.The PHCs provide free sputum smear-positive testing, and those found to be sputum smear-positive are provided with free medication. People who fail to test sputum smear-positive can still receive free medication for TB at the puskesmas/PHC following diagnosis of TB by a specialist physician on the basis of a chest radiograph; however the patient must pay for these diagnosis services, which usually are performed at major public hospital in Bali.

This study was conducted in as a part of project in two districts Buleleng and Karangasem, and one municipal Denpasar city in Bali province Indonesia. Denpasar city as the capital city of Bali province, in 2007 has the population of 523.105 inhabitants, while Buleleng even though is not the capital, has the largest population among other districts in Bali province which is 603.705 inhabitants. Karangasem which is located in the east of Bali islands has the population of 390.906 inhabitants. These two districts and one municipal are the regions which have the largest cases of tuberculosis in Bali province

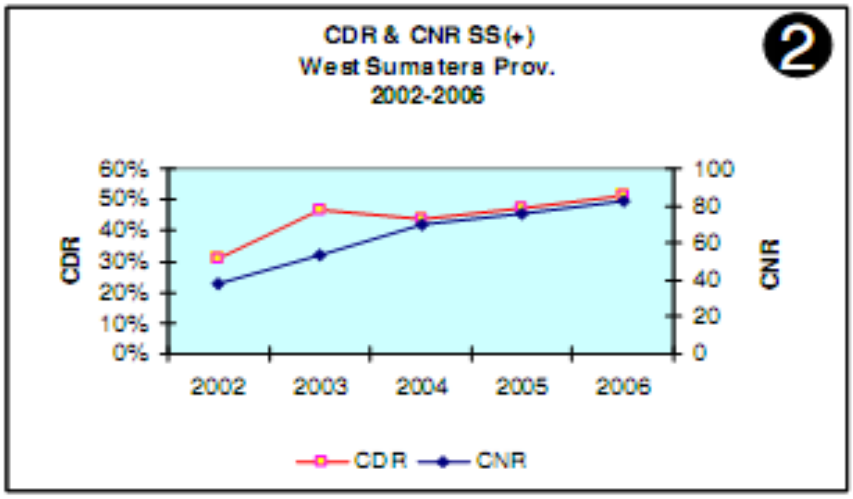
West Sumatra

Figure 4. Map of West Sumatra province

(Source: http://encarta.msn.com)

West Sumatra province covers an area of 41.000 kilometre square, with population of 4.428.000 inhabitants. There are 221 Primary Health Centres/PHC/puskesmas, 18 public hospital 14 private hospitals, 4 military/police hospitals, and 1 chest clinic. The TB control programme in West Sumatra is supported by 292 trained paramedics, 227 trained doctors, 89 trained lab technicians, 20 district/municipal supervisors, and 2 provincial supervisors. These personnel were engaged through stepwise involvement of various care providers beginning with health centres in 1995, chest clinic in 2001, public hospital in 2003 and private hospital as well as military hospital in 2005. This achievement was made possible through a sequence of activities including establishment of coalition for TB, establishment of collaboration with L.Alung Chest Clinic, and signing of MOU with the West Sumatra Branch of the Indonesian Association for Lung Specialists in 2002. These activities were supplanted by signing of MOU with directors of public hospitals in 2003 and exploration of MOU with private hospital directors in 2005. By 2006, all health centres, public hospitals, and military/police hospital 5 private hospitals, are implementing DOTS strategy and in the same year, the Case Detection Rate reached 51.5%.

Graph 4. CDR and CNR of Smear positive in West Sumatra Province



(Source: http://tbcindonesia.or.id)

The contribution to case finding is still dominated by health centres (65,7%), followed by chest clinic (23,7%) and hospitals (10,6%). These figures indicated that although activities to involve hospitals and chest clinic in DOTS strategy have been undertaken, the system in general has not function well.

Most countries implementing the DOTS strategy have shown that they can achieve high cure rates, but the prospect for detecting 70% of sputum smear positive cases are less certain. Unless the DOTS strategy can reach beyond public health reporting systems, or unless these systems can be improved, case detection will not rise much above 40% in the 22 HBCs, or in the world as a whole, even when the geographical coverage of DOTS is nominally 100% (Dye C et al, 2003).

In many high-burden countries, a significant proportion of TB cases are detected and treated by private health care providers (PPs). Depending on the setting, they may include traditional healers, pharmacists, qualified and unqualified medical practitioners, specialist chest physicians, private nursing homes and hospitals, and non-governmental organization (NGOs), and midwives (WHO, 2003). WHO began exploring private sector involvement in TB control by first undertaking a global assessment of the prevailing situations. Following global assessment, WHO helped to establish and document public-private mix initiatives for DOTS implementation (PPM-DOTS) in a variety of country settings (WHO, 2003).

Significant numbers of private practitioners in Indonesia accounts for about 63% of total national health expenditure and manage approximately 30% of TB patients in Indonesia. However, the management of TB by private practitioners is far from ideal (Uplekar et al, 2003). If private practitioners are properly engaged, they will give positive effect on TB control (Watkins RE et al, 2006). Indonesia has implemented the PPM-DOTS strategy, which started in Bali and Yogyakarta province with initiative of FIDELIS project in 2004. The similar initiative for involvement of private practitioners and small private

clinics has also been launched in South Sulawesi province under GFATM support (WHO, 2005). The hospital DOTS linkage which is an effort of DOTS expansion into government and private hospital has been established in Yogyakarta province. Generally, the PPM-DOTS strategy involves private practitioners (general practitioners, chest specialists, other specialist, nurses, midwives, clinics) in suspecting and referral of TB cases to puskesmas/Primary Health Centre for diagnosing.

There is still no publication about the delays of diagnosis tuberculosis in Indonesia. However, Tuberculosis Prevalence Survey in Indonesia which was conducted in 2004 revealed preliminary finding of total delay from tuberculosis patients who had accomplished 3 months of treatment, in various regions in Indonesia. The calculation of total delay was ranging from 71 until 107 days (NIHRD, 2005).

The information about risk factor for delays in tuberculosis, especially information on diagnostic delay and its trend over time is thus important., since diagnostic delay increases suffering of the patients and their relatives, it increases contamination of environment and the number of new infections, and increases the mortality from tuberculosis. The additional information whether the PPM-DOTS shortens the delays is also important in some regions who implement the PPM-DOTS strategy. This study is hoped to be beneficial for evaluation and improvement of TB control programmes in Indonesia.

CHAPTER II
METHODOLOGY

This thesis was planned and was done under the project of "Cost-effectiveness Analysis of PPM-DOTS", in Indonesia.

1. Site for Analysis

The sites of analysis were the province of 142 DOTS centres in Central Java, Bali and West Sumatra province.

Central Java

There were 30 DOTS centre in 30 health facilities. The selected districts contained health facilities that served urban and rural population, and contained either governmental or non-governmental health facilities. Health facilities were 2 hospitals, 1 chest clinic and 14 PHC/puskesmas in urban area (Semarang City), and the rural area were presented by two areas, Pekalongan City with 1 chest clinics and 5 Primary Health Centre/PHC/puskesmas and Pekalongan with 2 hospitals and 7 PHC/puskesmas

Bali

There were 62 DOTS centres in 62 health facilities. The selected districts contained health facilities that served the urban and rural population .The health facilities contained either governmental or non-governmental health facilities. Health facilities were 10 hospital which, and 20 PHC/puskesmas in urban area (Denpasar city), and the rural area were represented by two areas, Buleleng district with 20 PHC/puskesmas , and Karangasem district with 12 PHC/puskesmas.

West Sumatra

There were 50 DOTS centres in 50 health facilities. The selected districts contained health facilities either governmental or non-governmental health facilities. Health facilities were

21 PHC/puskesmas in Padang City, and Padang Pariaman with 23 PHC/puskesmas and 1 chest clinic, and Pariaman City with 5 PHC/puskesmas.

2. Study population and data collection

The type of study was a cross-sectional study. Category respondent were outpatient, new patients smear+, smear- and extra pulmonary cases which have started the treatment in the study area from April 2007 until 5 July 2008. Exclusion criteria were patients who did not give consent, were too ill to be interviewed, age under 16 years old, patients with mental disturbance, cases with chronic underlying pulmonary conditions, or unable to comprehend the procedure, and also relapses cases and defaulter.

The respondents were taken from respondents of the project "Cost-effectiveness Analysis of PPM-DOTS" with the number of respondents was 308 newly diagnosed tuberculosis patients from DOTS centres in Central Java province, 180 newly diagnosed tuberculosis patients from DOTS centres in Bali province, and 137 newly diagnosed patients from DOTS centres in West Sumatra provinces. For Bali provinces, the patients were also categorized into two different strategies, Regular DOTS and PPM DOTS in detailed analysis. There were 120 patients in Regular DOTS, and 60 patients in PPM DOTS. The patients were recruited from registers of patients diagnosed in DOTS centres.

Then data were collected from patient records in DOTS centres and from interview using standardized questionnaire, which was also used in the project of "Cost Effectiveness Analysis of PPM-DOTS", which included information on socio-demographic and economic characteristic, type and number of health providers consulted, interval between onset of symptoms and first attendance to providers, interval between first attendances in medical provider to diagnosis, expenses incurred during care seeking. These instruments was piloted beforehand to ensure validity. The interviews were conducted at DOTS centres in the local language, by surveyors who had been trained before the study was running. Patients who could not be interviewed in health facilities as visited at home to obtain the

required information. Surveyors obtained informed consent beforehand with assistance from local site collaborator, mainly nurses or TB health workers. Survey team coordinator checked all completed questionnaires for completeness. Data from the questionnaires will be double entered. The figure below are the strategies which was used to categorized patients from DOTS centres in Bali province..

Figure 5. Different schemas, with different implementation patterns of TB control in study area

Options	Suspect Identification	Diagnosis	Classi-fication	Initial Treatment	Continuation Treatment	Clinical Follow up	Reporting
1							
2							
3							

by Hospital/Chest clinic
By Private practitioners
by puskesmas/PHC
Mix PHC/Hosp/PPs

OPTION #	DESCRIPTION
Option 1:	Full case management by puskesmas/Primary Health Centre (PHC)
Option 2 :	Diagnosis of TB cases and full treatment (DOTS) in hospital.
Option 3 :	Suspect identification by private practitioners, followed by referral to puskesmas for diagnosis and treatment (DOT) with clinical follow-up by PHC/puskesmas or hospital, and reporting to private practitioners (PPM-DOTS)

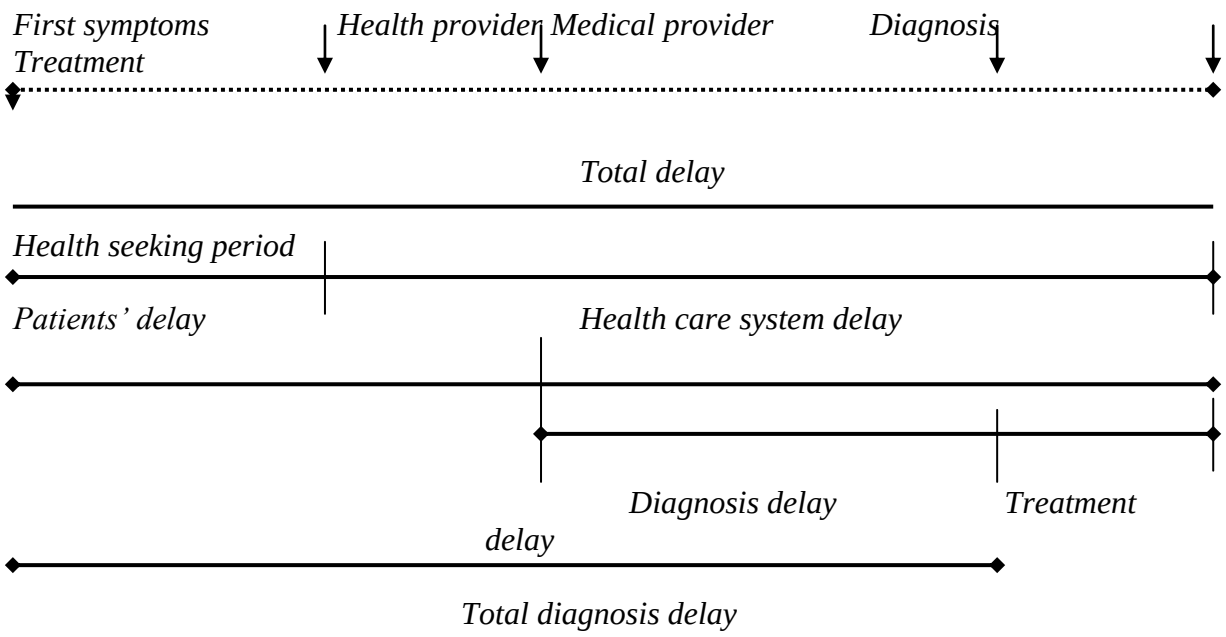
Note: option 3 (Strategy PPM-DOTS was only run in Bali province)

3. Definition

Patient delay was defined as the time (in days) from the first symptoms noted by patients to first relevant presentation to medical provider. Health care system delay was defined as the period between the patient's first relevant presentation to medical provider and the time of starting treatment. It consisted of diagnosis delay which was defined as the time (in days) from first relevant presentation to medical provider to diagnosis, and treatment delay which was defined as the time (in days) as the period between diagnosis of

TB and the time of starting treatment. In this study, health care system delay was focused on diagnosis part. Total diagnosis delay was combined patient and health care system delay. The possible first provider visited who was identified were private practitioners (general practitioners, specialists, nurses, midwives), PHC/puskesmas, hospital/chest clinic/private clinic, pharmacy, vendor and traditional healer. Medical provider itself was defined as qualified medical personnel/institution including private practitioners (general practitioners, specialists, midwifes, nurses), PHC/puskesmas, hospital/chest clinics/private clinics.

Figure 6. The relation of the different delay period



The Regular DOTS was defined as the DOTS program that had been implemented in Indonesia since 1995, *without* involvement of private practitioners or other non-NTP providers. The PPM DOTS strategy was defined as the DOTS program with the involvement of private practitioners in referring patients to be diagnosed tuberculosis. The strategies were not chosen by the patients, but patients would be categorized into two

different strategies after seeing how they were finally actually diagnosed, through an referral of private practitioners (general practitioners, nurses, midwives, specialists) who were in engaged in PPM DOTS strategy.

4. Statistical analysis

Excel spreadsheet was used as the data entry sheet and analysis was performed by SPSS version 16.0. Median patient, health care system and total diagnosis delay was performed. The distribution of socio-demographic characteristic and their difference between both strategies were also showed. χ^2 with Fisher's exact test was used when appropriate for analysing the categorical data. In specific analysis of regular DOTS and PPM DOTS in Bali province, median patient, health care system and total diagnosis delay was performed. The distribution of socio-demographic characteristic and their difference between both strategies were also showed. χ^2 with Fisher's exact test was used when appropriate for analysing the categorical data. The level of significant was set of 5%. Uni- and multivariate logistic regression analysis were used to identify risk factors that were associated with delay. In the regression model we defined patient delay and health care system delay as 30 days or more (1=31+; 0=0-30), and total diagnosis delay was defined as 60 days or more (1=61+; 0=0-60). In multiple regressions we adjusted for all the independent variables.

The dependent variable was delay (total diagnosis, patient and health care system delay). The independent variables included: sex, age groups, education, occupation, marital status, residence, member of family, attendants, household income, possession of health insurance, type of tuberculosis, and type of strategy for Bali province.

5. Research questions

The research questions are:

- What are the factors associated with patient delay, health care system delay and total diagnosis delay of tuberculosis patient at 142 DOTS centres in Central Java, Bali and West Sumatra provinces?
- How are the patient, health care system and total diagnosis delays between strategy in regular DOTS and PPM DOTS?
- How is the distribution of the risk factor between the two strategies?
- Does implementation of PPM-DOTS strategy shorten the diagnosis delay?

6. Study objectives

The study objectives are:

- To estimate the median period of patient, health care system and total diagnosis delays of tuberculosis at 142 DOTS centres in Central Java, Bali and Wes Sumatra provinces.
- To identify the factors associated with patient, health care system and total diagnosis delays of tuberculosis in 142 DOTS centres in Central Java, Bali and West Sumatra provinces
- To estimate the median period with patient, health care system and total diagnosis delays of tuberculosis within regular DOTS and PPM DOTS.
- To assess the distribution of the risk factors of delay within regular DOTS and PPM DOTS

7. Ethical Consideration

Informed consent was obtained from all respondents prior to recruitment. Whether or not respondents consent to participate were not influence the standard of care they were offered. The study protocol of project “Cost-Effectiveness Analysis of PPM-DOTS” had been approved by the ethical review committee of the Faculty of Medicine, Gadjah Mada University Yogyakarta Indonesia. Administrative had been obtained from the National Tuberculosis Control Programme and the Central Java, Bali and West Sumatra provincial health office prior to implementation. The protocol of the project above had also been consulted with key stakeholders prior to implementation.

CHAPTER III

RESULT

Socio-demographic characteristics of patients

The background variable are presented in table 1 and it shows the distribution of age, sex, residence, educational status, marital status, occupation, member of the family, total household income per month, possession of medical insurance, attendants and type of tuberculosis .

The median of age was 39 years. The distribution of age showed that most subjects were in productive age (25 to 45 years), which were two hundred and ninety patients (46.4%), followed by two hundred and thirteen (34.1%) at the age of more than 45 years old, and 122 (19.5%) at the age of 15 to 24 years old. There were 371 (59.4%) male and 254 (40.6%) female in this study. More than fifty percent of patients who were recruited lived in urban area (56.8% vs 43.27%).

There was difference in educational background distribution. Most patients had high school background (46.6%), followed by elementary school (35.2%), no formal education (11.8%), and diploma/university (5.6%). Five patients did not have data on educational background.

In marital status, the majority of patients were reported as being married, three hundred and sixty-five (58.4%), compared to two hundred and sixty (41.6%) who were single. Two hundred and fifty-two (40.3%) patients recruited were reported as being unemployed within the last 12 months, followed by occupation on formal sector (25.3%), famer and unskilled worker (17.1%), and self-employed (16.8%). Three patients did not have the data on occupation.

In terms of possession of health insurance, more than two-third patients did not have health insurance, while thirty-percents were reported of having health insurance

The data in size of family shows that most patients were reported having five or less person in family (about 81.1%). Five patients did not have the data on size of family.

Four hundred and twenty-eight (89.5%) patients were reported to be accompanied by either family or friend while they made visit to provider, compared to one hundred and ninety-seven who came alone to seek the care.

Mean of total income per month was US$ 147.56, and the data on distribution of income per month showed that the majority of the patients had income per month les than US$100 (43%), followed by income per month between US$ 100 to US$ 250 (41%), and income per month above US$ 250.(13.9%). Eight patients did not have the data on income per month.

Pulmonary tuberculosis smear positive was the majority type of tuberculosis documented (69.9%), followed by pulmonary tuberculosis smear negative (29.1%), and extra-pulmonary tuberculosis (1%).

Presenting symptoms

The majority of patients came with a combination of symptoms (table 2). The most frequently reported symptoms were cough, dyspnoea and fever.

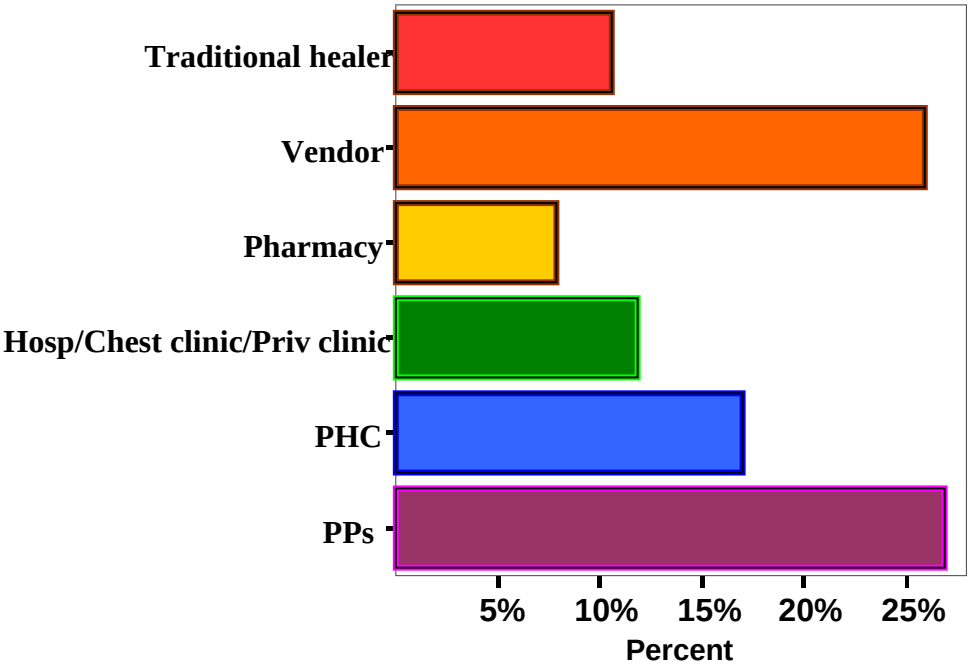
Table 3 shows the comparison of symptoms reported among each type of tuberculosis. There was a significant difference in cough (p value < 0.002), weight loss (p value < 0.028), and symptom 'others' (p value = 10^{-4}). The symptom of cough was the most common symptom in both smear positive and smear negative pulmonary tuberculosis (89.2% and 87.2% respectively), while extra-pulmonary tuberculosis patients came mostly (66.7%) with symptom 'others' (elbow pain, abdominal pain, etc). Patients with smear negative pulmonary tuberculosis present symptoms of haemoptysis, dyspnoea, sub-febrile

fever, chest pain, anorexia more frequently than patients with smear positive pulmonary tuberculosis. However, this difference was not statistically significant.

Type of first provider visited

From the Graph 5 it can be seen the different type of provider who was firstly visited by patients. The documented data showed that most patients went to private practitioners after the first onset of symptom (26.9%), followed by vendor (25.9%), Primary Health Centre/PHC (17%), Hospital/chest clinic/private clinic (11.8%), traditional healer (10.6%), and pharmacy (7.8%).

Graph 5. Percentage of different type first provider visited



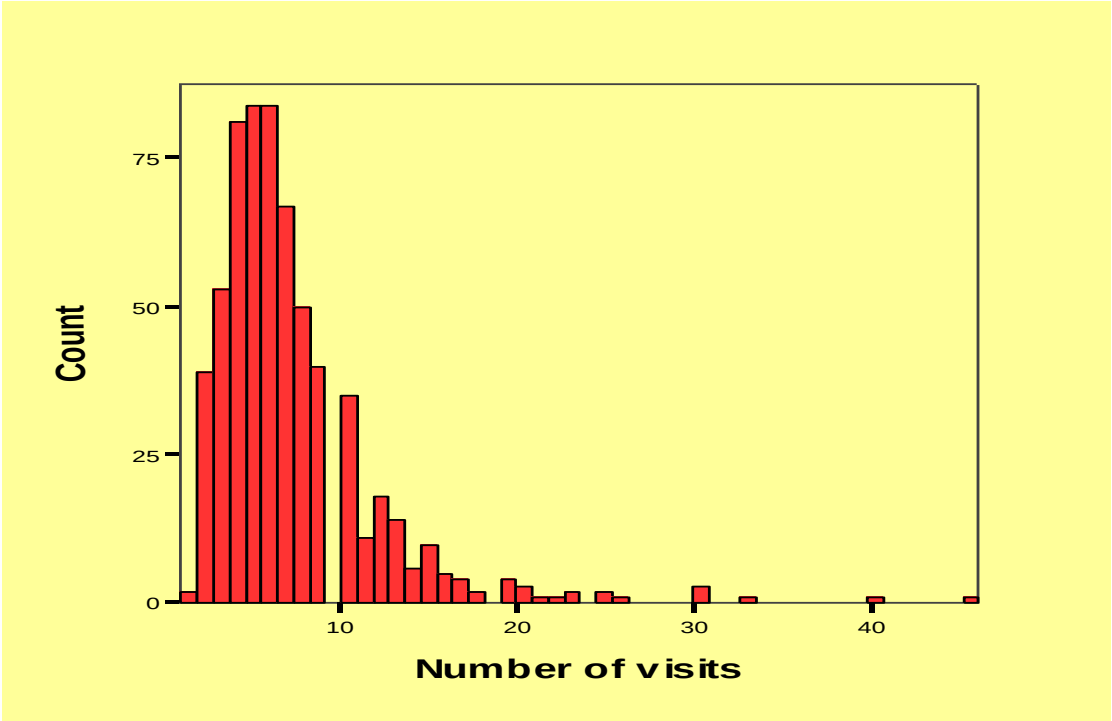
PHC = Primary Health Centre

PPs=Private Practitioners

Number of visits prior to diagnosis tuberculosis

Many tuberculosis patients had to make multiple visits to health provider prior to diagnosis being made. It is showed from the graph 6 that more than two-third of patients made more than four visits to various providers. Most patients in rural area made visit more than 8 visits until the diagnosis of tuberculosis, whereas most patients in urban area made 5 to 6 visits before the diagnosis (see table 4)

Graph 6. Number of visit made by patients prior to diagnosis tuberculosis

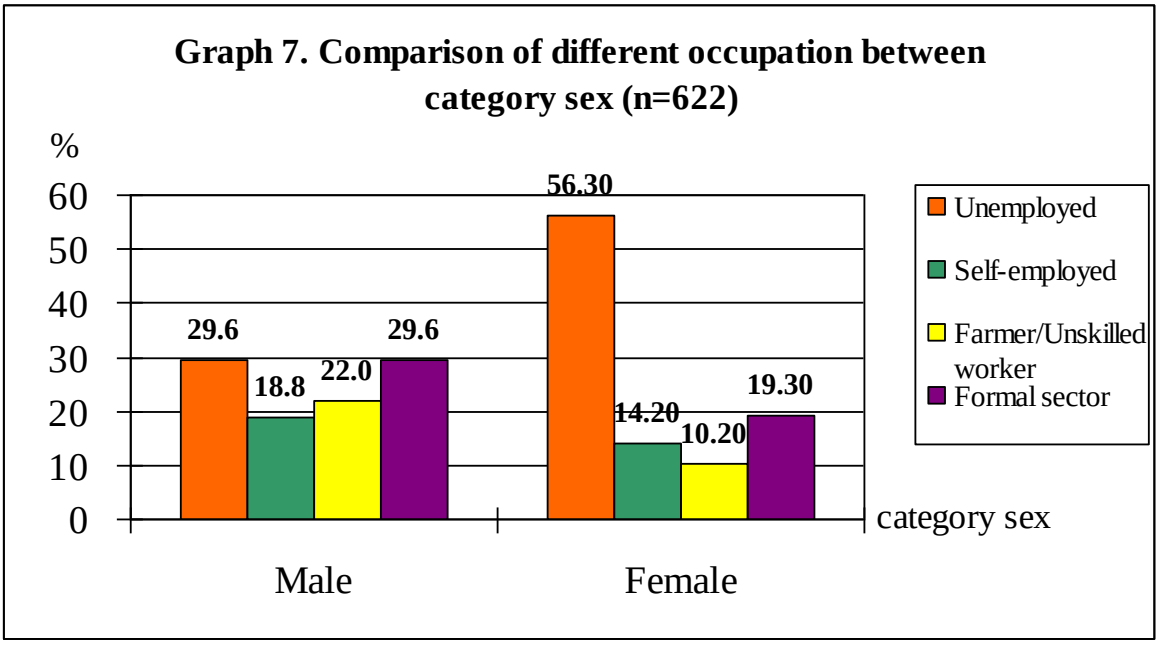


Patient's delay

The median patient delay was 14 days (see table 5). Table 9 shows the median of patient delay within each variable. Significantly more males were delayed than females (p value 0.001). Extra-pulmonary tuberculosis patients had the longest patient delay compared to other types (median 25 days), followed by pulmonary tuberculosis smear

negative (median 17 days), and pulmonary tuberculosis smear positive (median 14 days).However, this different could not be found as significant (p value= 0.759).

The urban dwellers had the median delay of 16 days and rural dwellers had the median of 14 days, and this was statistically different (p value =0.034). Farmer and unskilled worker had the longest delay (median 21 days), and other occupations had delay closer to the median. (p value = 0.013)

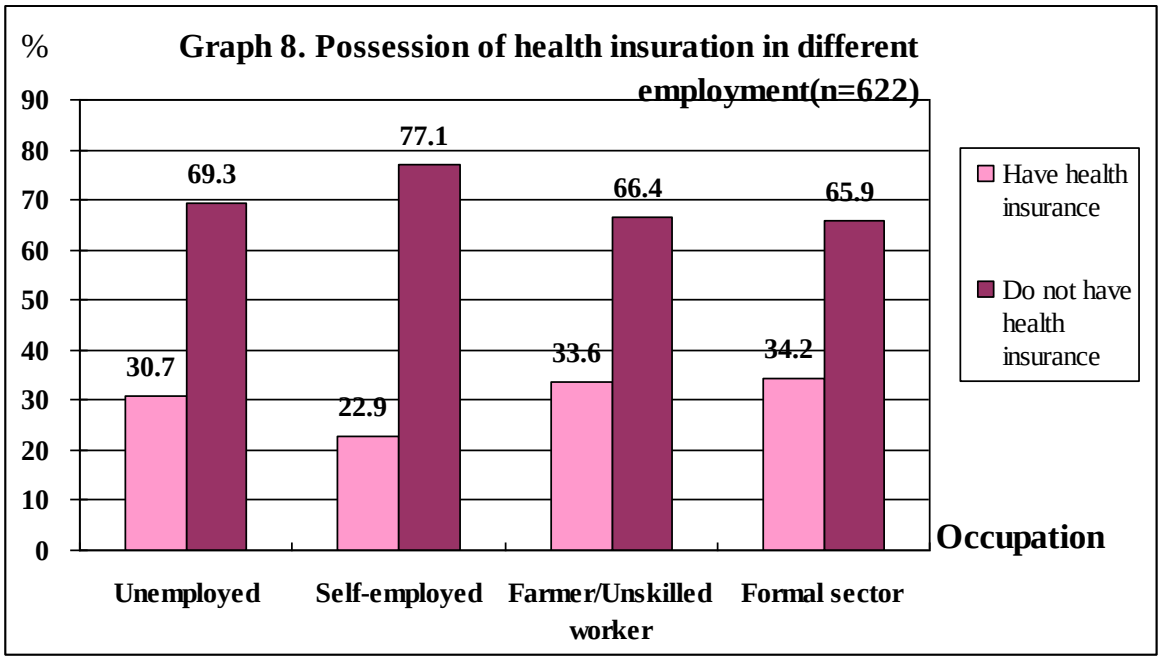


Graph 7 shows the distribution of male and female among different occupation. A big proportion (56.3%) of female were unemployed , while in male the proportion of unemployed were similar to proportion of occupation on formal sector (29.6%).

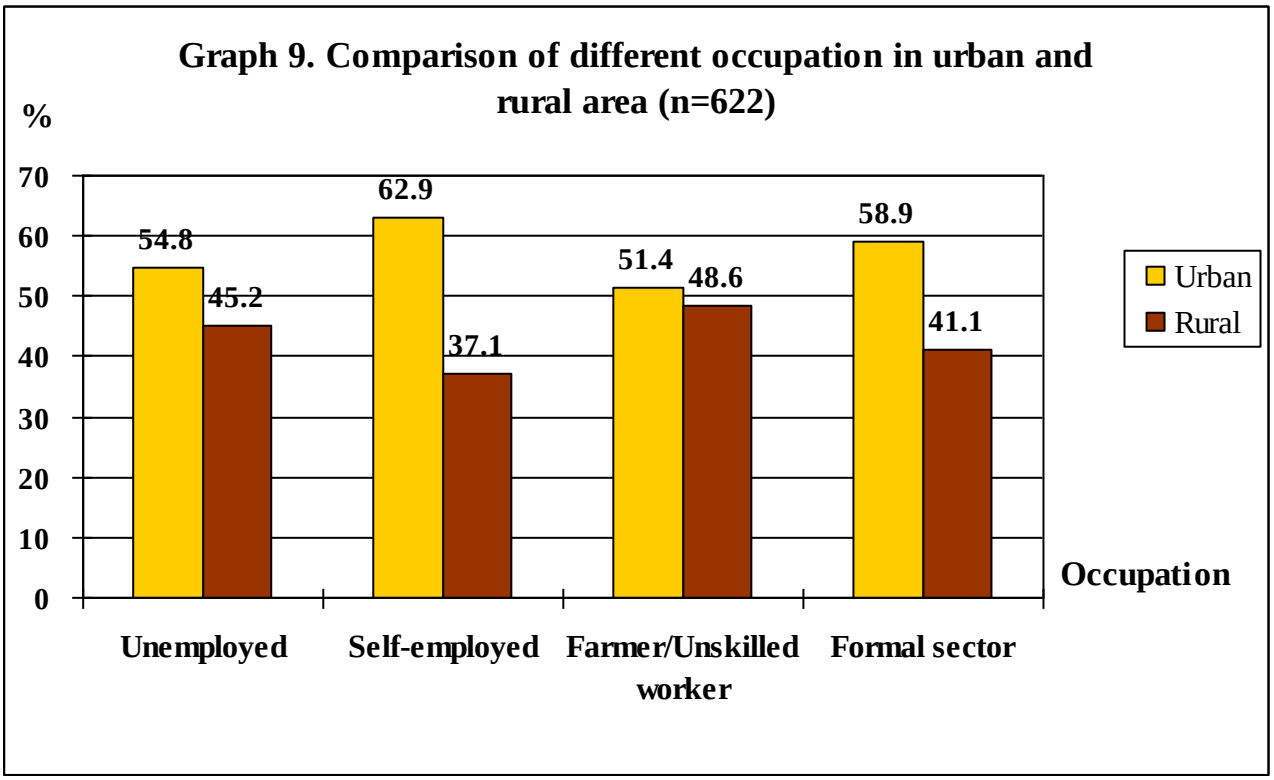
The possession of health insurance in different occupations is presented in graph 8. It can be seen that the proportion of those who had health insurance and those who did not have were almost the same, indicating there were no difference in possession of health insurance among the different occupations.

Graph 9 presents the distribution of occupations in urban dwellers and rural dwellers. The proportion of unemployed and farmer/unskilled worker were almost the

same between both area. Self-employed was most likely in urban area, as well as formal sector.



.



Patient who first visited private practitioners and Primary Health Centre/PHC after the beginning of the symptoms had the shortest patient delay (median 7 days), followed by

hospital/chest clinic/private clinic (median 12). Patients who went to pharmacy or vendor had the same median of patient delay (28 days), and those who went traditional healer had the longest delay (median 34) (p value<10^{-4}).

Table 8 shows the distribution of various first providers visited in urban and rural area. More patients in rural area went to vendor as the first visit after onset of symptom (30.4%), while in urban area, patients most likely went to private practitioners (27.3%). Rural area had approximately half percentage than urban area of hospital/chest clinic/private clinic visits as being first destination of patients (p value <10^{-4}).

In the logistic regression analysis is shown in table 12. The patients lived in urban area had less risk of delay compared to patient live in rural area (adjusted OR 0.544, p value=0.015). Patients who initially visited private practitioners (adjusted OR 0.07, 95%CI 0.03-0.17) and who initially visited Hospital/chest clinic/private clinic (adjusted OR 0.22, 95% CI 0.10-0.48) had less risk of delay compared to first visit to Primary Health Centre). First visit to traditional healer had double risk of having delay with the respect to first visit to Primary Health Centre (adjusted OR 2.146, 95% CI 1.096-4.202).

Health care system delay

Median of health care system delay was 25 days (see table 5). In contrast with finding of patient delay, median health care system delay showed that patients who lived in urban area had shorter delay than rural area (22 vs 29, p value=0.014). There was significant difference the median of health care system delay in various educational backgrounds (p value=0.007). Patients who have no formal education have the longest delay (median 35 days), followed by those who finished elementary school (median 29 days), diploma or university (median 23 days), and high school (median 21 days). Significantly more patients who were single had longer delay compared to those who were married (29 vs 23, p value=0.028).

Table 9 shows health care system delay in various first medical providers consulted. Significantly different in median (p value=$<10^{-4}$), that patients who went to hospital or chest clinic or private clinic have shortest delay (median 8 days), followed by Primary Health Centre/PHC (median 26 days), and private practitioners (median 34 days). The distribution of health care system delay among male and female in urban and rural area are presented in table 10. There was significant difference in the median of health care system delay in male between urban and rural area (16 vs 28, p value=0.003).

In logistic regression model (see table 13), patients who went to private practitioners as the first medical consultation had more than 50% risk to get delay compared to those who went to Primary Health Centre (adjusted OR 1.513, 95% CI 1.023-2.238). The health care system delay was also significantly associated with hospital/chest clinic/private clinic as the first destination in seeking medical care. Patients who went to those medical provider had half the risk compared to patients who visited Primary Health Centre/PHC as the first destination (adjusted OR 0.493, 95% CI 0.293-0.831).

Total diagnosis delay

Median of total diagnosis delay is 50 days (see table 5). Significantly different total diagnosis delay among different age group (p value=0.019), which are showed in table 6. Patients who were older than 45 years old have the longest delay (56 days), followed by age group of 25 to 45 years old (median 50 days), and age group of 15-24 years old (median 42.5 days). Urban was reported having shorter delay (median 46 days) compared to rural area (median 56 days, p value=0.004).

There was significant different in total diagnosis delay in various occupation (p value 0.046). Farmer and unskilled worker were most likely had the longest delay (median 61 days), followed by unemployed (median 50 days), formal sector (median 47.5 days), and self-employed (median 44 days).

The difference in median of total diagnosis delay in different type of first provider visited and first medical provider consulted are shown in table 11. Patients who went to traditional healer as initial visit had the longest delay (median 82 days), and patients who visited hospital or chest clinic or private clinic as initial visit had the shortest delay (median 31.5 days). For first medical provider consulted, visit to private practitioners had the longest delay (median 56 days), followed by Primary Health Centre/PHC (median 52 days) and hospital/chest clinic/private clinic (median 41 days).

Multivariate logistic regression (see table 14) revealed that total diagnosis delay was associated with residency and first visit to private practitioners. Urban area had les of total diagnosis delay (adjusted OR 0.566, CI 95% 0.386-0.831)) compared to rural area. First visit to private practitioners after the onset of symptoms had less risk of total diagnosis delay compared to first visit to Primary Health Care/PHC (adjusted OR 0.427, CI 95% 0.229-0.798).

PPM DOTS in Bali province

Socio-demographic characteristics of patients

Socio-demographic characteristic of patients in Bali province by two strategies are presented in table 18. Data showed that median age of patients in PPM DOTS were older than patients in Regular DOTS and in distribution of age group between both strategies was also found to be significant (p value 0.022). In PPM DOTS strategy most patients lived in rural area while in Regular DOTS strategy was the opposite (p value $<10^{-4}$).

Majority the patients in Regular DOTS had high school educational background. .Whereas the PPM DOTS strategy, the majority of the patients had no formal education (35%). The different in distribution of educational background between two strategies was found to be significant (p value 0.001).

First provider visited

There was significant different on type of first provider visited by patients between both strategies (p value 0.028). Most patients in Regular DOTS strategy went to private practitioners as the first visit after the symptom began whereas in PPM DOTS strategy, the proportion of private practitioner and traditional healer as the first visit was equal (30%). None of the patients in PPM DOTS strategy went to Hospital or chest clinic or private clinic after the onset of symptom (see table 22)

The table 20 shows the patient, health care system and total diagnosis delay between two strategies. There was only slight different in the median of patient delay (21 vs 20.50). Meanwhile the health care system delay showed the different as the Regular DOTS had the median 36 days and PPM DOTS had the median 42 But this different was found not to be significant (p value=0.120). Regular DOTS had shorter total diagnosis delay compared to PPM DOTS strategy (19% longer in PPM DOTS strategy). But the different was also found not to be significant (p value=0.299).

CHAPTER IV
DISCUSSION

The median total diagnosis delay in this study was similar to the study conducted in China (50 days) (Xu B et al, 2005). It was shorter than other studies conducted in neighbouring countries ; from Cambodia (58 days) (Pungrassami P, 1993), Thailand (66 days) (Rojpilbulsit M et al, 2006) and Malaysia (88 days) (Liam CK, 1997).

The health care system delay was longer than patient delay, and the similar finding was reported from Tanzania (Wandwalo ER et al, 2000), Ghana (Lawn SD et al, 1998), Malaysia (Liam CK, 1997), Botswana (Steen TW et al, 1998), New Zealand (Masjedi MR et al, 2002), Uganda (Kiwuwa MS, 2005), Ethiopia (Yimer S, 2005), Nepal (Yamasaki-Nakagawa M et al, 2001), Mongolia (Enkhbat S et al, 1996), Italy (Gagliotti C, 2006), Spain (Franco J et al, 1996), Norway (Farah MG et al, 2006), India (Rajeswari R et al, 2002), China (Xu B et al, 2005), and Taiwan (Chiang CY et al, 2005).

There was no patient who refused to participate in the study. However, patients who were recruited were lower than the actual number of TB patients registered since the patients were taken from respondents of the project 'Cost Effective Analysis of PPM-DOTS', which only needed relative small sample compared to epidemiological study.

The proportion of male and female in this study were similar with the proportion of tuberculosis patients reported by National Tuberculosis Program. The percentage of pulmonary tuberculosis cases found in this study was 69%, slightly higher than the national data (66%) in 2006 (WHO, 2008).

Health insurance in Indonesia only is owned by small percentages of population. However, in certain occupation for instance government officer or some private company, they have access of health insurance provided by government or the companies itself. Nevertheless, the documented data showed that only slight different in percentage of each different occupation which had health insurance. The almost equal distribution of

possession of health insurance among various occupations reflected the better access of occupations other then formal sector to health insurance.

Private practitioners (General practitioner, nurse and midwife) were most likely to be the first destination of patients when they seek for medical care, because of their availability even in remote area. They open a daily private practice in neighbourhood, within reachable distance to patients home. Nurse and midwife also had a close connection with their patients, mostly with women patients. Previous research in Bali highlighted the preference of TB patients to be treated by a local provider whom they know and trust, as well as a reluctance to attend PHC/puskesmas early in the course of their illness. These included the high level of patient confidence in private practitioners and the continuity of care that they can provide (Watkins RE et al 2006).

More than twenty five percents of patients made more than 8 visits before diagnosis. This could be due to inability of provider visited to make proper diagnosis, and in another part was the un-satisfaction of patients for one provider to another provider and lead to 'provider shopping'. The data documented showed that most patients in rural area made visit more than 8 visits before to diagnosis, compared to patients in urban area who mostly made 5 to 6 visits before diagnosis. This finding suggested the opposite way of perception that patients in urban area usually are more critical for the health service they get, which leads to several visits to health provider in case of unsatisfactory. Patients in rural area made more visits probably due low performance health personals and health institution, which were failed to make proper diagnosis for patients, and possibly reflected the change of trend in health service satisfactory.

Patient delay was observed in this study to be shorter than the health care system delay (median 14 vs 25). It could be assumed that patients became more concern about the disease they had, which then encouraged them to seek for medical care once they had problem with their health. In the other part, it influenced how the health practitioners or

health institutions to respond. Tuberculosis is a chronic infection, and most health practitioners are aware of tuberculosis when patient had the symptoms of cough more than two or three weeks .When the patients came with early symptoms, the health practitioners or health institutions could be failed to make proper diagnoses because of unspecific symptoms, which made patients start to seek another medical care. The inadequate facility particularly in laboratory as the support for diagnosis could also be the cause. Another reason was the poor performance of health practitioners and health institution itself in recognizing the disease and made the correct diagnosis.

Male was observed had the longer patient delay than female. In health care system the opposite finding was observed as female had longer delay than male. For the total diagnosis delay, male had slightly longer delay compared to female. This was similar with other studies from Ethiopia (Madebo T et al, 1999), Malaysia (Hooi LN, 1994), Uganda (Kiwuwa MS et al, 2005) and India (Rajeswari R et al, 2002). Multivariate analysis in patient delay showed that male had around sixty percents of risk of getting delay. Female could be said were more concern to health. Most of them were also housewives, which probably had more time compared to male who had to work, and they would go to seek medical care once they were aware of the symptom they had. The availability of private practitioners such as nurse or midwife made them easier to seek for medical care. Worth to be noted that it could not be perceived that male had less access to health care.

Even there was only one week different between male and female in health care system delay, it raised the issue of gender inequity in health care systems. Male was considered to have more access to better treatment, and there might be also different services provided by health institutions or health practitioners between male and female. The different of median of health care system delay between male and female was greater in urban area than in rural area. However, it could not be said that there were more gender

inequity in urban area, but it was merely because both male and female patients in rural area did not receive adequate health service by health personals or health institutions.

Data on total diagnosis delay revealed that rural area was the risk factor for delay.. This finding was similar to studies from Ethiopia (Madebo T et al, 1999), Ghana (Lawn SD et al, 1998), Nepal (Yamasaki-Nakagawa M et al, 2001), Turkey (Guneylioglu D et al, 2004), Uganda (Kiwuwa MS et al, 2005), India (Rajeswari R et al, 2002), Tanzania (Wandwalo ER et al, 2000), Vietnam (Long NH et al, 1999), Korea (Mori T et al, 1992), and Gambia (Lienhardt C et al, 2001). However, from median of patient delay was slightly higher in urban area than in rural area. This could be explained as the patients live in urban area were more occupied in terms of work and activity rather than patients live in rural area. Therefore, they might have longer delay when they sought for medication. Rural area which were the risk factor for health care system delay and total diagnosis delay could be the explanation of the weak health institution existed in rural area, the unavailability of health personals or health institutions in rural area, lack of adequate supporting facility in health institution and also low competence of health personals.

In multivariate analysis it could not significantly be found that various occupations as risk factor for patient, health care system and total diagnosis delay. However, there was a significant different in median among various occupation, where farmer and unskilled worker had the longest delay on patient delay (p value 0.013), and total diagnosis delay (p value 0.046). Famer and unskilled worker had the similarity with unemployed and self-employed group in terms of access to health care. But the different that is the limited time farmer and unskilled worker compared to other two groups, due to work. Self-employed had the flexibility in doing health visit as well as unemployed group.

There were clear associations between patient delay and first provider visited. First visit to private practitioners and hospital/chest clinic/private clinic reduced the risk of delay. They were significantly different compared to Primary Health Centre/PHC. PHC as

the backbone of tuberculosis program are found in every part of Indonesia, covering area of sub-district. Besides tuberculosis program, they also run other health programs such as immunization, sanitation, malaria, maternal and child health, etc. Due to overload programs in PHC which is also jeopardized by lacking of human resources, many programs sometimes could not be run effectively including daily health services. These possibly lead patients to choose private practitioners and hospital or chest clinic or private clinic as the first visited, where they then got better health service. A qualitative study from Bali revealed that delays in treatment were associated with previous personal experiences or expericences of family members at the Primary Health Centre/puskesmas. These experiences resulted in participants who were suspected of having tuberculosis not wishing to go to PHC/puskesmas because of perception that the treatment was a poor quality, did not work, or was not appropriate for their condition (Watkins RE et al, 2004).

First visit to traditional healer was documented had the longest patient delay. There was only around 11% of first visit to traditional healer. Studies in other countries have found that traditional healer plays an important rule as first contact for TB patients (Brouwer JA et al, 1998) (WHO, 1998). The role of traditional healer was usually more visible in rural area, where patients are still believed in traditional and supernatural perspectives. There was however only small different in traditional healer visits between urban and rural which suggested that the role of traditional healer was also acknowledged by people who lived in urban area.

There were also clear associations between health care system delay and first medical provider consulted. The interesting finding was that private practitioners became the risk factor for the health care system delay. Patients who went to private practitioners to seek medical care might get several examinations which lead to long diagnosis or several uncertain diagnosis which also lead to long diagnosis, and could be due to low competence of private practitioners itself. The same figure was observed in total diagnosis

delay but in multivariate analysis private practitioners were significantly reduced risk for patient delay.

PPM DOTS in Bali Province

It was documented that patient who were in PPM DOTS were on average older than those in Regular DOTS strategy. As it is explained in previously in methodology, the strategies were not chosen by the patients, but patients would be categorized into two different strategies after seeing how they were finally diagnosed, through an referral of private practitioners (general practitioners, nurses, midwives, specialists) who were in engaged in PPM DOTS strategy.

Thus the difference in age would be firstly as a coincidence that the median age in PPM DOTS strategy was higher than in Regular DOTS. Second possible explanation was indeed more older patients came to private practitioners than young patients in the process of their health seeking care, and private practitioners would be most likely to refer them due to obvious symptoms in older people. It has been also observed that there were more referrals from private practitioners to diagnosis tuberculosis in rural area. The data even so revealed that in rural area, private practitioners and traditional healer had the equal proportions of being the first destination for patients in health seeking care. Therefore, it was possible that almost all the patients in rural area who went to private practitioners were referred to get diagnosis of tuberculosis and this could represent that the program of PPM DOTS might have successfully engaged the private practitioners in rural area.

It was observed that total diagnosis delay in PPM DOTS strategy had longer delay than in Regular DOTS. The result in this study found the contrary of what was known before, that the involvement of private practitioners in tuberculosis control will enhance the case detection and reduce the risk of diagnosis delay. A study from Vietnam in accessing Public-private mix control for TB revealed that there was tendency towards

increased case detection associated with PPM (Quy HT et al, 2003). Another study from Kerala India resulted that the public-private partnership substantially increased TB case detection and established a sustainable framework for private sector involvement in TB control (Kumar MKA et al, 2005). However, the finding in this study statistically could not be proved to be significant, and it was possible due to small number of patients recruited in Bali province (180 patients).

The longer total diagnosis delay in PPM DOTS in this study could be possibly due to concurrence, that the patients who then finally referred by private practitioners, they had made many visits to provider beforehand, compared to patients in Regular DOTS. However, the longer diagnosis delay in PPM DOTS could also an indication of in-effectiveness of PPM DOTS program, ineffective referral procedure, insufficient information received by private practitioners, or inadequate supervision by NTP. A previous study suggested that an effective intervention package should include the components of orienting private practitioners (PPs) and the staff of the national TB programme, improving the referral and information system through simple practical tools, adequate supervision and monitoring of PPs by NTP, and the NTP providing free anti-TB drugs to patients treated in the private sector (Lönnroth K et al, 2004). Engaging with the private sector for DOTS is not easy, but it is well justified (Uplekar MW, 2003). Further study is needed to access the effectiveness of PPM DOTS in case detection and reducing diagnosis delay, with more precise method and adequate sample size.

One strength of the study was its real-life environment in a place where delay studies were lacking. Many workers in the project were helpful in data collection.

The study has the weaknesses as the outcome measure of delay in seeking care was self-reported, implying a recall bias. In order to minimize this, during the interview, the patients were asked specifically the onset of major symptoms and how long after these symptoms they consulted the health provider.

Another weaknesses was that the patients in this study were taken from the project of 'Cost-effectiveness of PPM DOTS', which like other cost effectiveness study, it required only small number of sample, dissimilar from epidemiological study. So as to get better estimate of the result, the sample size for this kind of study (delay study) should be better calculated with the power needed.

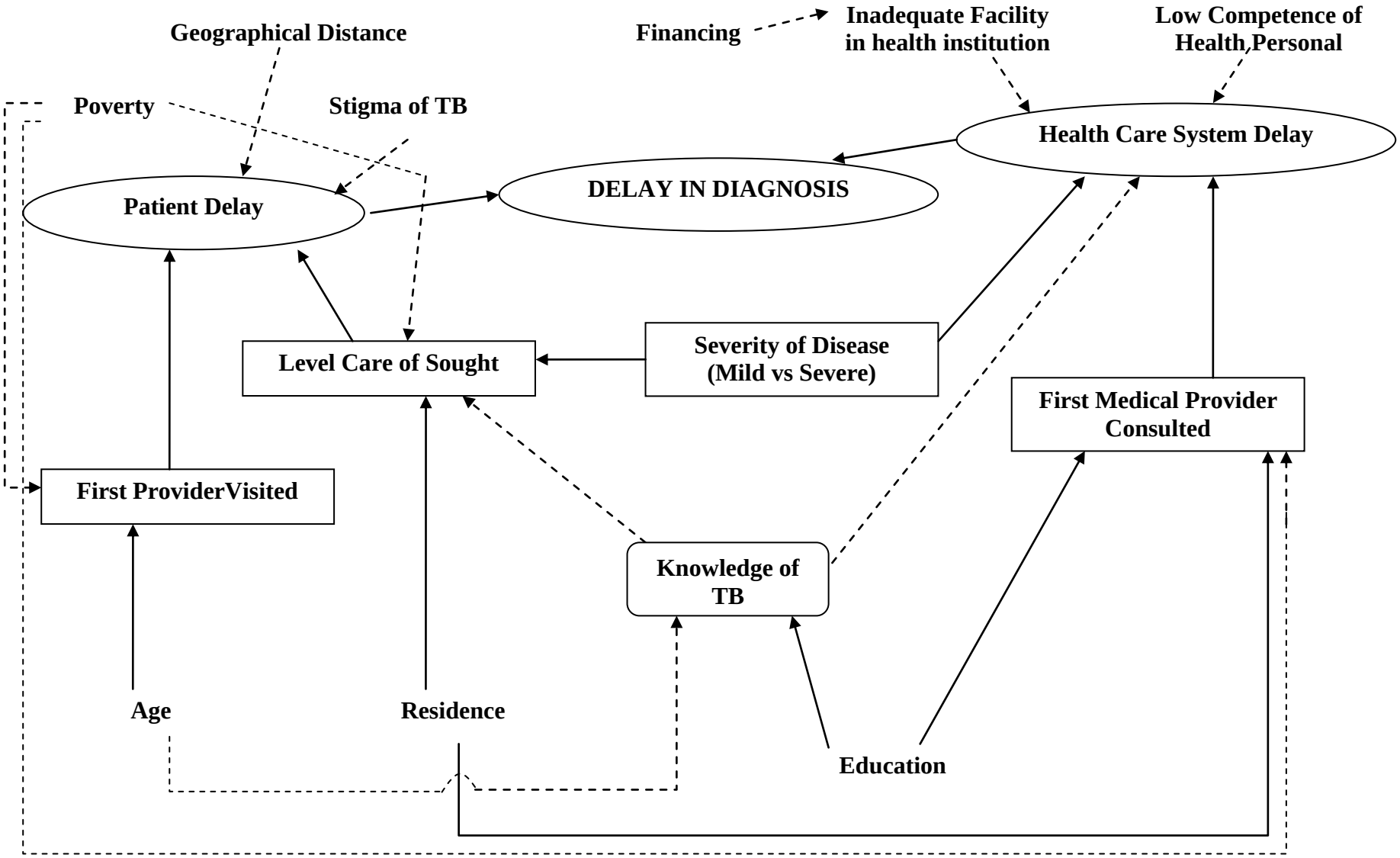


Figure 7. Conceptual Framework

CHAPTER V
CONCLUSION

In 142 DOTS Centres in three provinces, it was observed that almost fifty percents of patients had total diagnosis delay more than 2 months. Rural area was risk factors for longer total diagnosis delay. This suggests the increase of awareness of TB in the general population, and better health services for diagnosis tuberculosis in rural area.

Total diagnosis delay in PPM DOTS in Bali province was found to be longer than in Regular DOTS. These implies the need for further assessment of effectiveness of the PPM DOTS program, improving capacity of private practitioners, adequate supervision by NTP, referral and information systems.

KEY LITERATURE

Arora VK, Sarin R, Lonnroth K, 2003. Feasibility and effectiveness of a public-private mix project for improved TB control in Delhi, India. *Int J Tuberc Lung Dis*, 7:1131-1138

Cambanis A, yassin MA, Ramsay A, BertelSquire S, Arbide I, Cuevas LE, 2005. Rural poverty and delayed presentation to tuberculosis services in Ethiopia, *Trop Med Int Health*, 10(4):330-5

Cheng G, Tolhurst R, Li R Z, Meng Q Y, Tang S, 2005. Factors affecting delays in tuberculosis diagnosis in rural China : a case study in four counties in Shandong Province. *Royal Society of Tropical Medicine and Hygiene*, 99, 355-362

Chiang CY, Chang CT, Chang RE, Li CT, Huang RM, 2005. Patient and health system delays in the diagnosis and treatment of tuberculosis in Southern Taiwan. *Int J Tuberc Lung Dis*, 9(9): 1006-12

Demissie M, Lindtjorn B, Beharne Y, 2002. Patient and health service delay in the diagnosis of pulmonary tuberculosis in Ethiopia. *BMC Public Health*, Sep 25:2;23

DOH-ROI, 2006, National Guidelines for Tuberculosis Control. DOH-ROI, Jakarta, Indonesia

Enkhbat S, Toyota M, Yasuda N, Ohara H, 1997. Differing influence on delays in the case – finding process for tuberculosis between general physicians and specialists in Mongolia, *J Epidemiol*, 7(2):93-98

Farah MG, Rygh JH, Steen TW, Selmer R, Heldal E, Bjune G, 2006. Patient and health care system delays in the start of tuberculosis treatment in Norway. *BMC Infect Dis*, 6:33

Franco J, Blanquer R, Flores J, Fernandez E, Olaza P, Noquiera JM, 1996. Analysis of the diagnostic delay in tuberculosis. *Med Clin (Barc)*, 107(12) :453-457

Gagliotti C, Resi D, Moro ML, 2006. Delay in treatment of pulmonary TB in a changing demographic scenario. *Int J Tuberc Lung Dis*, 10(3):305-309

Golub JE, Bur S, Cronin WA, Gange S, baruch N, Comstock GW, Chaisson RE, 2005. Patient and health care system delays in pulmonary tuberculosis diagnosis in a low-incidence state. *Int J Tuberc Lung Dis*, 9(9):992-998

Goofrey-Faussett P, Kaunda H, Kamanga J, van Beers S, van Cleeff M, Kumwenda-Phiri R, Tihon V, 2002. Why do patients with a cough delay seeking care at Lusaka urban health centres?A health systems research approach. *Int J Tuberc Lung Dis*, 6(9): 796-805

Guneylioglu D, Yilmas A, Bilgin S, Bayram U, Akkaya E, 2004. factors affecting delay in diagnosis and treatment of pulmonary tuberculosis in a tertiary care hospital in Istanbul, Turkey. *Med Sci Monilt*, 10(2):CR62-7

Hooi LN, 1994. Case-finding for pulmonary tuberculosis in Penang. *Med J Malaysia*, 49 (3):223-230

Huong NT, Vree M, Duong BD, Khanh VT, Loan VT, Co NV, Borgdorff MW, Cobelens FG, 2007. Delays in the diagnosis and treatment of tuberculosis patients in Vietnam: a cross-sectional study. *BMC Public Health*, 7(147): 110

Kasse Y, Jasseh M, Corrah T, Donkor SA, Antonnio M, Jallow A, Adegbola RA, Hill PC, 2006. Health seeking behaviour, health system experience and tuberculosis case finding in Gambians with cough. *BMC Public Health*, 6:143

Kiwuwa MS, Karamagi C, Harriet MK, 2005. Patient and health service delay in pulmonary tuberculosis patients attending a referral hospital: a cross-sectional study. *BMC Public Health*, 24(5): 122

Kumar MKA, Dewan PK, Nair PKJ, Frieden TR, Sahu S, Wares F, Laserson K, Wells C, Granich R, Chauhan LS, 2005. Improved tuberculosis case detection through public-private partnership and laboratory based surveillance, Kanur District, Kerala, India, 2001-2002. *Int J Tuberc Lung Dis*, 9(8):870-876

Lawn SD, Afful B, Acheampong JW, 1998. Pulmonary tuberculosis diagnostic delay in Ghanaian adults. *Int J Tuberc Lung Dis*, 2(8):635-640

Liam CK, Tang BG, 1997. Delay in the diagnosis and treatment of pulmonary tuberculosis in patients attending a university teaching hospital. *Int J Tuberc Lung Dis*, 1(4):326-332

Lienhardt C, Rowley J, Manneh K, Lahai G, Needham D, Miligan P, McAdam KPWJ, 2001. Factors affecting time delay to treatment in a tuberculosis control programme in a sub-Saharan African country: the experience of The Gambia. *Int J Tuberc Lung Dis*, 5(3): 233-39

Long NH, Johanssen E, Lonnroth K, Eriksson B, Winkvist A, Diwan VK, 1999. Longer delays in tuberculosis diagnosis among women in Vietnam. *Int J Tuberc Lung Dis*, 3(5):388-393

Lonnroth K, Uplekar M, Arora VK, et al. 2004. Public-private mix for DOTS implementation: what makes it works?. *Bull World Health Organ*, 82: 580-586

Madebo T, Lindjørn B, 1999. Delay in treatment of Pulmonary Tuberculosis: An Analysis of Symptom duration among Ethiopian patients, Medscape general Medicine (http://www.medscape.com/viewarticle/407989). Access on 23 June 2008.

Masjedi MR, Cheragvandi A, Hadian M, Velayati AA, 2002. Reasons for delay in the management of patients with pulmonary tuberculosis. *East Mediterr Health J*, 8(2-3):324-329

Metcalf EP, Davies JC, Wood F, Buttler C, 2007. Unwrapping the diagnosis of tuberculosis in primary care. *Br J Gen Pract*, 57(535);116-22

Ministry of Health Republic of Indonesia, 2007. ***Indonesia Health Profile 2005***. Jakarta

Mori T, Shimao T, Jin BW, Kim SJ, 1992. Analysis of case-finding process of tuberculosis in Korea. *Tuberc Lung Dis*, 73(4)225-231

Needham DM, Foster SD, Tomlinson G, Godfrey-Faussett P, 2001. Socio-economic, gender and health services factors affecting diagnostic delay for tuberculosis patients in urban Zambia. *Trop Med Int Health*, 6(4): 256-9

Nerlich AG, Hans CJ, Zink A, et al. 1997. Molecular evidence for Tuberculosis in an ancient Egyptian. *Lancet*, 350, 1404

Nguyen T Huong, Marleen Vree, Bui D Duong, Vu T Khanh, Vu T Loan, Nguyen V Co, Martien W Borgdorff,Frank G Cobelens, 2007. Delays in the diagnosis and treatment of tuberculosis patients in Vietnam: a cross-sectional study. *BMC Public Health*,7:110 doi: 1186/1471-2458-7-110

NIHRD,2005.***Tuberculosis Prevalence Survey In Indonesia 2004***. Jakarta, Indonesia

Odusanya OO, Babafemi JO, 2004. Patterns of delays amongst pulmonary tuberculosis patient in Lagos, Nigeria. *BMC Public Health*, 4:18

Ouédraogo M, Kounda S, Boncoungou K, Dembélé M, Zoubga ZA, Ouédraogo SM, Coulibaly G, 2006. Treatment seeking behaviour of smear-positive tuberculosis patients diagnosed in Burkina Faso. *Int J Tuberc Lung Dis*, 10(2):184-7

Pehme L, Rahu K, Rahu M, Altraja A, 2007. Factors related to health system delays in the diagnosis of pulmonary tuberculosis in Estonia. *Int J Tuberc Lung Dis*, 11(3):275-281

Punggrassami P, Hirunayapa J, Tunsawai V, Pongpanich S, Petchborisut O, 1993. The study of patient's and doctor's delay of tuberculosis case-detection in TB center Zone 12 Yala. *Thai J Tuberc Chest Dis*, 14:73-83

Quy HT, Lan NTN, Lönnroth K, Buu TN, Dieu TTN, Hai LT, 2003. Public-private mix for improved TB control in Ho Chi Minh City Vietnam:an assessment of its impact on case detection. *Int J Tuberc Lung Dis*, 7(5):464-471

Rajeswari R, Chandrasekaran V, Suhadev M, Sivasubramaniam S, Sudha G, Renu G, 2002. Factors associated with patient and health system delays in the diagnosis of tuberculosis in South India. *Int J Tuberc Lung Dis*, 6 (9), 789-795

Rojpibulstit M, Kanjanakiritamrong J, Chongsuvivatwong V, 2006.Patient delays in the diagnosis of tuberculosis in Southern Thailand after health care reform.*Int J Tuberc Lung Dis*, 10 (4), 422-428

Sherman L F, Fujiwara P I, Cook S V, Bazerman L B, Frieden T R, 1999. Patient and health care system delays in the diagnosis and treatment of tuberculosis. *Int J Tuberc Lung Dis*, 3 (12), 1088-1095

Steen TW, Mazonde GN, 1998. Pulmonary tuberculosis in Kweneng District, Botswana: delays in diagnosis in 212 smear-positive patients. *Int J Tuberc Lung Dis*, 2(8): 627-634

Storla DG, Yimer S, Bjune GA, 2008. A systematic review of delay in the diagnosis and treatment of tuberculosis. *BMC Public Health*, 8:15

Uplekar MW, 2003. Public-private mix for DOTS:demanding, but delay will only hamper TB control. *Int J Tuberc Lung Dis*, 7(12):1113-1114

Uplekar M, Pathania V, Ravligione M, 2001. Private practitioners and public health: weak links in tuberculosis control. *Lancet*, 358 : 912-916.

Uplekar M, Zignol M, Mehta F, et al, 2003. **Public-private mix DOTS in Indonesia : a strategy for action.** WHO/CDS/TB/2003.326.Geneva, Switzerland: WHO

Wandwalo ER, Mørkve O, 2000. Delay in tuberculosis case-finding and treatment in Mwanza, Tanzania. *Int J Tuberc Lung Dis*, 4(2) : 133-8

Watkins RE, Feeney KT, Bakar OA, Plant AJ, 2006. Joining the DOTS in Bali: private practitioners' perceptions of tuberculosis control. *Int J Tuberc Lung Dis*, 10 (9) : 988-94

Watkins RE, Plant AJ, 2004. Pathways to treatment for tuberculosis in Bali : patient perspectives. *Qual Health Res*, 14/ 691-703

Watkins RE, Rouse CR, Plant AJ, 2004. Tuberculosis treatment delivery in Bali : a qualitative study of clinic perceptions. *Int J Tuberc Lung Dis*, 8(2) : 218-25

World Health Organization, 2003. ***Public-Private Mix for DOTS. Practical tools to help implementation***. WHO/CDS/TB/2003.325. Geneva. Switzerland, WHO

World Health Organization Regional Office for South-East Asia, 2005. ***Report of the External TB Monitoring Mission. Indonesia, 7-18 March 2005.*** New Delhi India

World Health Organization, 2007. Report 2008. ***Global Tuberculosis Control ; Surveillance, Planning, Financing***. WHO/HTM/TB/2008. Geneva, Switzerland, WHO

Xu B, Jiang QW, Xiu Y, Diwan VK, 2005. Diagnostic delays in access to tuberculosis care in counties with or without the National Tuberculosis Control Programme in rural China. *Int J Tuberc Lung Dis*, 9(7):784-790

Yamasaki-Nakagawa M, Ozasa K, Yamada N, osuga K, Shimouchi A, Ishikawa N, Bam DS, Mori T, 2001. Gender difference in delays to diagnosis and health care seeking behaviour in a rural area of Nepal. *Int J Tuberc Lung Dis*, 5(4): 390

Yan F, Thomson R, Tang S, Squire SB, WangW, Liu X, Gong Y, Zhao F, Tolhurst R, 2007. Multiple perpectives on diagnostic delay for tuberculosis from key stakeholders in poor rural China: case study in four provinces. *Health Policy*, 82(2): 186-99

Yimer S, Bjune G, Alene G, 2005. Diagnostic and treatment delay among pulmonary tuberculosis patients in Ethiopia : a cross sectional study. *BMC Infect Dis*, 5:112

ANNEXES A TABLES

Table 1. Socioeconomic demographic characteristic (n=625)

Variable	Number (percentage)
Age (year)	
Median age (inter-quartile range)	39 (26-50)
Mean	38.00
Age	
15-24 years old	122 (19.5%)
25-45 years old	290 (46.4%)
> 45 years old	213 (34.1%)
Sex	
Male	371 (59.4%)
Female	254 (40.6%)
Residency	
Urban	355 (56.8%)
Rural	270 (43.2%)
Educational status	
No education	74 (11.8%)
Elementary School	220 (35.2%)
High School	291 (46.6%)
Diploma/University degree	35 (5.6%)
Missing	5
Marital status	
Married	365 (58.4%)
Single	260 (41.6%)
Occupation	
Unemployed	252 (40.3%)
Self-employed	105 (16.8%)
Farmer/Unskilled worker	107 (17.1%)
Formal sector	158 (25.3%)
Missing	3
Possession of Health Insurance	
Yes	192 (30%)
No	432 (69.1%)
Missing	1
Member of the family	
≤ 5 persons	507 (81.1%)
> 5 persons	113 (18.1%)
Missing	5
Attendants	
Yes	428 (89.5%)
No	197 (31.5%)
Mean of total income (US$)	147.56
Total household income (US$)	
< US$ 100	269 (43%)
US$ 100-249	261 (41.8%)
> US$ 250	87 (13.9%)
Missing	8
Type of tuberculosis	
Pulmonary TB smear positive	437 (69.9%)
Pulmonary TB smear negative	182 (29.1%)
Extra-pulmonary TB	6 (1%)

Table 2. Symptoms reported by patients (n=625)

Symptoms	Number of patients (%)
Cough	551 (88.2%)
Dyspnoea	199 (31.8%)
Fever	143 (22.9%)
Anorexia	87 (13.9%)
Haemoptysis	86 (13.8%)
Chest pain	58 (9.3%)
Weight loss	47 (7.5%)
Malaise	47 (7.5%)
Night sweat	40 (6.4%)
Others	28 (4.5%)

Table 3. First symptoms reported by patients in different type of tuberculosis

Symptoms	PTB+ (n=437)	PTB- (n=182)	EPTB (n=6)	p-value
Cough	390 (89.2%)	159(87.4%)	2 (33.3%)	0.002
Dyspnoea	133 (30.4%)	65 (35.7%)	1 (16.7%)	0.367
Fever	95 (21.7%)	48 (26.4%)	0 (0.0%)	0.197
Anorexia	54 (12.4%)	32 (17.6%)	1 (16.7%)	0.149
Haemoptysis	57 (13.0%)	29 (15.9%)	0 (0.0%)	0.496
Chest pain	40 (9.2%)	18 (9.9%)	0 (0.0%)	0.870
Weight loss	25 (5.7%)	22 (12.1%)	0 (0.0%)	0.028
Malaise	33 (7.6%)	14 (7.7%)	0 (0.0%)	≈ 1
Night Sweat	30 (6.9%)	10 (5.5%)	0 (0.0%)	0.729
Other	11 (2.5%)	13 (7.1%)	4 (66.7%)	$<10^{-4}$

Table 4. Comparison number of visit between urban and rural area

Number of visits	Urban	Rural	P value
1-2	25 (7.0%)	16 (5.9%)	0.036
3-4	87 (24.5%)	47 (17.4%)	
5-6	102 (28.7%)	66 (24.4%)	
7-8	59 (16.6%)	58 (21.5%)	
>8	82 (23.1%)	83 (30.7%)	

Table 5. Patient, health care system and total diagnosis delay in 142 DOTS centres

	Median	Mean	Inter-quartile range	Minimum-Maximum
Patient delay (days)	14	30.29	7-30	1-720
Health care system delay (days)	25	47.9	10-55.5	0-830
Total diagnosis delay (days)	50	78.19	29-91	1-833

Table 6. Median and inter-quartile range patient delay, health care system delay and total diagnosis delay by characteristic socio-demographic (n=625)

	N	Patient delay(days)	Health care system delay (days)	Total diagnosis delay (days)
Age				
15-24 years old	122	15.50 (7-30)	21.5 (7-38.5)	42.5 (25.5-68.5)
25-45 years old	290	15 (7-32)	24.5 (11-58)	50 (30-88)
> 45 years old	213	14 (7-30)	29 (9.5-70.5)	56 (30-105.5)
p-value		0.785	0.119	0.019
Sex				
Male	371	19 (7-35)	22 (7-52)	51 (28-92)
Female	254	14 (7-28)	29 (14-60.25)	49.5 (28-86.75)
p-value		0.001	0.099	0.978
Residency				
Urban	355	16 (7-28)	22 (8-49)	46 (29-84)
Rural	270	14 (7-35)	29.5 (14-70)	56 (29.75-119)
p-value		0.034	0.014	0.004
Educational status				
No education	74	17.5 (7-28)	35 (13.75-79.25)	56 (34-111)
Elementary School	220	14 (7-28)	29 (13.25 -66.5)	55.5 (33.25-100.5)
High School	291	17 (7-31)	21 (8-48)	45 (27-84)
Diploma/University	35	14 (7-35)	23 (8-85)	50 (27-149)
p-value		0.745	0.007	0.127
Marital status				
Married	365	14 (7-30)	14 (7-30)	46 (28.5-87)
Single	260	17 (7-30)	17 (7-30)	56 (30-102.75)
p-value		0.790	0.790	0.081
Occupation				
Unemployed	252	15 (7-28.75)	27.5 (11-53)	50 (30-91)
Self-employed	105	14 (7-21)	23 (8-60)	44 (24 -86.5)
Farmer/Unskilled worker	107	21 (10-42)	32 (9-71)	61 (37-129)
Formal Sector	158	14 (7-21)	21.5 (8.75-50)	47.5 (28-83.25)
p-value		0.013	0.257	0.046
Possession of health insurance				
Yes	192	14 (7-33)	22.5 (9-53)	50.50 (28-88.75)
No	432	17 (7-29)	26.5 (10-56)	50 (30-93.75)
p-value		0.325	0.412	0.584
Member of family				
≤ 5 persons	507	16 (7-33)	23 (9-53)	50 (29-91)
> 5 persons	113	14 (7-28)	34 (14-65.5)	54 (30-94.5)
p-value		0.124	0.077	0.335
Attendants				
Yes	428	14 (7-30)	28 (10-58)	52 (28-91.75)
No	197	17 (7-32.5)	21 (8-52)	48 (30.50-85.50)
p-value		0.583	0.221	0.386
Total household income per month				
< US$ 100	269	17 (7-55)	24 (9.5-58)	52 (29-103.5)
US$ 100-249	261	14 (7-30)	25 (10-53.5)	50 (30-90.5)
US$ 250-500	87	14 (7-28)	30 (8-56)	54 (30-84)
p-value		0.311	0.381	0.783
Type of TB				
PTB smear positive	437	14 (7-29)	25 (10-58)	51 (28-92)
PTB smear negative	182	17 (7-30.25)	24.5 (9.75-50)	49.5 (30-91)
EPTB	6	25 (6-85.25)	30.5 (3.75-59.5)	-
p-value		0.759	0.924	0.889

Table 7. Patient delay in various type of first provider visited (n=625)

	N	Median	Mean	Inter-quartile range	Minimum-maximum
Type of first provider visited					
Private practitioners	168	7	15.12	7-14	1-180
PHC	106	7	12.79	5-14	1-60
Hospital/Chest clinic/Private clinic	74	12	16	6.75-22.75	1-84
Pharmacy	49	28	40.73	18-42	7-224
Vendor	162	28	42.30	16-44	2-395
Traditional healer	66	34	75.83	21-68.5	2-720
p-value		$<10^{-4}$	$<10^{-4}$		

Table 8. Different first provider visited by category residence (n=625)

Provider	Urban	Rural	p-value
Private practitioners	97% (27.3%)	71 (26.3%)	$<10^{-4}$
PHC	45 (12.7%)	61 (22.6%)	
Hospital/chest clinic/private clinic	54 (15.2%)	20 (7.4%)	
Pharmacy	45 (12.7%)	4 (1.5%)	
Vendor	80 (22.5%)	82 (30.4%)	
Traditional healer	34 (9.6%)	32 (11.9%)	

Table 9. Health care system delay in various type of first medical provider consulted (n=625)

	N	Median	Mean	Inter-quartile range	Minimum-maximum
Type of first provider visited					
Private practitioners	293	34	57.36	16-67	2-816
PHC	193	26	47.08	8-57	0-830
Hospital/Chest clinic/Private clinic	139	8	29.11	2-29	0-512
p-value		$<10^{-4}$	0.002		

Table 10. Health care system delay between male and female in different residence of urban and rural area (n=625)

		Health care system delay			p-value
		Median	Mean	Inter-quartile range	
Male n=371	**Urban**	16	38.44	6-44.25	0.003
	Rural	28	56.25	11.5-71	
Female n=254	**Urban**	27	46.94	14-58.5	0.165
	Rural	31	56.57	14-66.5	

Table 11. Total diagnosis delay in various type of first provider visited (n=625)

	N	Median	Mean	Inter-quartile range	Minimum-maximum
Type of first provider visited					
Private practitioners	168	49.5	74.73	28-85	5-684
PHC	106	42	66.81	25-72.5	3-833
Hospital/Chest clinic/Private clinic	74	31.5	51.80	20-62.5	1-314
Pharmacy	49	56	70.65	39-86	13-347
Vendor	162	56	80.46	33.75-112	4-461
Traditional healer	66	82	134.92	43-152.5	10-830
p-value		$<10^{-4}$	$<10^{-4}$		
Type of first medical provider consulted					
Private practitioners	293	56	82.03	34-96	5-830
PHC	193	52	80.73	29.5-104.5	29.5-104
Hospital/Chest clinic/Private clinic	139	41	66.59	23-76	1-804
p-value		0.005	0.246		

Table 12. Logistic regression analysis of patient delay > 30 days

Variable	Unadjusted OR	95%CI	P value	Adjusted OR (with all variables)	95% CI	P value
Age						
15-24 years old	0.845	0.511-.397	0.511	1.144	0.602-2.172	0.681
25-45 years old (reference)	1			1		
> 45 years old	0.912	0.603-1.378	0.662	0.949	0.558-1.615	0.848
Sex						
Male	1.909	1.286-2.835	0.001	1.602	0.987-2.623	0.061
Female (reference)	1			1		
Residency						
Urban	0.672	0.465-0.972	0.035	0.544	0.333-0.890	0.015
Rural (reference)	1			1		
Education						
No education	0.759	0.406-1.419	0.388	0.790	0.332-1.881	0.594
Elementary School	0.901	0.598-1.358	0.619	0.813	0.468-1.415	0.464
High School (reference)	1			1		
Diploma/University	1.195	0.548-2.605	0.655	0.950	0.361-2.501	0.918
Marital Status						
Married	1.052	0.724-1.528	0.790	1.498	0.917-2.447	0.107
Single (reference)	1			1		
Occupation						
Unemployed	1.412	0.775-2.573	0.260	1.075	0.525-2.198	0.844
Self employed (reference)	1			1		
Farmer/unskilled worker	2.625	1.362-5.058	0.04	1.664	0.761-3.637	0.202
Formal sector	1.936	1.035-3.621	0.039	1.665	0.797-3.475	0.175
Possession of health Insurance						
Yes (reference)	1			1		
No	1.217	0.823-1.799	0.326	1.545	0.945-2.526	0.083
Member of family						
≤ 5 persons (reference)	1			1		
> 5 persons	0.669	0.4-1.119	0.125	0.710	0.371-1.359	0.301
Attendants						
Yes (reference)	1			1		
No	0.896	0.606-1.326	0.584	0.984	0.612-1.581	0.947
Income						
< US$ 100	1.151	0.777-1.706	0.484	0.934	0.576-1.515	0.783
US$ 100 – 249 (reference)	1			1		
> US$ 250	0.723	0.392-1.335	0.300	0.702	0.334-1.474	0.350
Type of tuberculosis						
PTB smear positive (reference)	1			1		
PTB smear negative	1.065	0.712-1.593	0.759	1.041	0.638-1.698	0.874
EPTB	1.621	0.293-8.980	0.580	2.239	0.218-22.976	0.497
Type of first health provider visited						
Private practitioners	0.083	0.034-0.200	$<10^{-4}$	0.069	0.028-0.174	$<10^{-4}$
PHC (reference)	1			1		
Hospital/chest clinic/private clinic	0.216	0.103-0.450	$<10^{-4}$	0.221	0.101-0.482	$<10^{-4}$
Pharmacy	1.126	0.592-2.144	0.717	1.625	0.781-3.381	0.194
Vendor	1.078	1.037-1.164	$<10^{-4}$	1.082	1.038-1.177	$<10^{-4}$
Traditional healer	1.561	0.878-2.775	0.129	2.146	1.096-4.202	0.026

Table 13. Logistic regression analysis of health care system delay > 30 days

Variable	Unadjusted OR	95%CI	P value	Adjusted OR (with all variables)	95% CI	P value
Age						
15-24 years old	0.822	0.532-1.268	0.375	0.836	0.512-1.366	0.475
25-45 years old (reference)	1			1		
> 45 years old	1.295	0.908-1.849	0.154	1.251	0.831-1.883	0.284
Sex						
Male	0.763	0.553-1.052	0.099	0.848	0.589-1.223	0.378
Female (reference)	1			1		
Residency						
Urban	0.671	0.487-0.923	0.014	0.705	0.486-1.022	0.065
Rural (reference)	1			1		
Education						
No education	2.023	1.208-3.388	0.007	1.279	0.680-2.406	0.445
Elementary School	1.689	1.183-2.140	0.004	1.468	0.968-2.228	0.071
High School (reference)	1			1		
Diploma/University	1.290	0.643-2.625	0.483	1.233	0.556-2.733	0.606
Marital Status						
Married	0.698	0.507-0.962	0.028	0.718	0.494-1.043	0.082
Single (reference)	1			1		
Occupation						
Unemployed	1.109	0.70-1.758	0.659	0.983	0.591-1.634	0.947
Self employed (reference)	1			1		
Farmer/unskilled worker	1.466	0.853-2.522	0.166	1.397	0.774-2.521	0.267
Formal sector	0.895	0.542-1.480	0.666	1.010	0.582-1.755	0.971
Possession of health Insurance						
Yes (reference)	1			1		
No	0.866	0.614-1.222	0.412	0.844	0.575-1.240	0.338
Member of family						
≤ 5 persons (reference)	1			1		
> 5 persons	1.444	0.959-2.173	0.078	1.189	0.746-1.895	0.468
Attendants						
Yes (reference)	1			1		
No	1.238	0.879-1.744	0.221	1.181	0.813-1.717	0.382
Income						
< US$ 100	0.865	0.613-1.220	0.408	0.762	0.521-1.115	0.161
US$ 100 – 249 (reference)	1			1		
> US$ 250	1.203	0.740-1.955	0.456	1.334	0.782-2.276	0.291
Type of tuberculosis						
PTB smear positive (reference)	1			1		
PTB smear negative	0.957	0.675-1.357	0.759	1.018	0.696-1.488	0.928
EPTB	1.276	0.255-6.393	0.580	1.085	0.185-6.380	0.928
Type of first medical provider consulted						
General practitioners	1.584	1.098-2.285	0.014	1.513	1.023-2.238	0.038
PHC (reference)	1			1		
Hospital/chest clinic/private clinic	0.421	0.260-0.684	$<10^{-4}$	0.493	0.293-0.831	0.008

Table 14. Logistic regression analysis of total diagnosis delay > 60 days

Variable	Unadjusted OR	95%CI	P value	Adjusted OR (with all variables)	95% CI	P value
Age						
15-24 years old	0.762	0.486-1.197	0.238	0.752	0.452-1.253	0.274
25-45 years old (reference)	1			1		
> 45 years old	1.436	1.002-2.057	0.049	1.501	0.996-2.260	0.052
Sex						
Male	1.005	0.724-1.393	0.978	0.986	0.678-1.434	0.941
Female (reference)	1			1		
Residency						
Urban	0.618	0.447-0.855	0.004	0.566	0.386-0.831	0.004
Rural (reference)	1			1		
Education						
No education	1.599	0.998-2.049	0.075	0.891	0.470-1.688	0.723
Elementary School	1.430	0.954-2.681	0.051	1.091	0.716-1.664	0.684
High School (reference)	1			1		
Diploma/University	0.981	0.469-2.054	0.960	0.985	0.435-2.231	0.972
Marital Status						
Married	0.749	0.541-1.036	0.081	0.750	0.513-1.097	0.138
Single (reference)	1			1		
Occupation						
Unemployed	1.077	0.673-1.723	0.757	0.953	0.569-1.597	0.855
Self employed (reference)	1			1		
Farmer/unskilled worker	1.724	0.977-2.983	0.051	1.395	0.770-2.528	0.273
Formal sector	0.854	0.510-1.430	0.549	0.911	0.523-1.588	0.743
Possession of health Insurance						
Yes (reference)	1			1		
No	0.907	0.639-1.287	0.585	0.886	0.599-1.309	0.543
Member of family						
≤ 5 persons (reference)	1			1		
> 5 persons	1.225	0.811-1.851	0.335	1.161	0.724-1.861	0.536
Attendants						
Yes (reference)	1			1		
No	1.166	0.823-1.653	0.386	1.160	0.794-1.694	0.444
Income						
< US$ 100	1.132	0.799-1.604	0.486	0.962	0.655-1.413	0.845
US$ 100 – 249 (reference)	1			1		
> US$ 250	1.050	0.638-1.727	0.848	1.175	0.686-2.014	0.557
Type of tuberculosis						
PTB smear positive (reference)	1			1		
PTB smear negative	0.932	0.653-1.330	0.697	0.960	0.654-1.410	0.836
EPTB	0.763	0.138-4.211	0.756	0.710	0.113-4.440	0.714
Type of first provider visited						
Private practitioners	0.538	0.321-0.899	0.018	0.427	0.229-0.798	0.008
PHC (reference)	1			1		
Hospital/chest clinic/private clinic	0.411	0.224-0.753	0.004	0.779	0.361-1.683	0.526
Pharmacy	0.753	0.392-1.446	0.394	1.047	0.514-2.132	0.899
Vendor	0.714	0.460-1.107	0.132	0.772	0.444-1.343	0.360
Traditional healer	1.427	0.803-2.535	0.225	1.322	0.703-2.486	0.387
Type of first medical provider consulted						
Private practitioners	0.986	0.683-1.426	0.942	0.729	0.410-1.295	0.281
PHC (reference)	1			1		
Hospital/chest clinic/private clinic	0.578	0.364-0.919	0.021	0.523	0.265-1.034	0.062

Table 15. Patient delay by background n=625 (cumulative distribution in percentage)

Variable	1 week	2 weeks	3 weeks	4 weeks	5 weeks	6 weeks	> 6 weeks
Age							
15-24 years old	32.8	49.2	64.8	73.8	82.8	86.1	100
25-45 years old	33.4	49.7	61.7	73.4	80.3	84.8	100
> 55 years old	33.8	51.6	67.1	74.2	78.4	84.0	100
Sex							
Male	30.5	46.6	59.6	69.3	76.5	82.2	100
Female	37.8	55.5	70.9	80.3	85.4	88.6	100
Type of tuberculosis							
PTB smear positive	33.0	51.0	64.8	74.8	80.1	84.9	100
PTB smear negative	34.16	48.9	63.2	71.4	80.8	84.6	100
EPTB	33.3	-	50.0	68.7	-	83.3	100
Residency							
Urban	33.0	49.3	65.4	76.6	82.3	86.2	100
Rural (reference)	34.1	51.5	62.6	70.0	77.1	83.0	100
Education							
No education	29.7	45.9	66.2	77.0	81.1	83.8	100
Elementary School	35.9	52.3	65.5	75.5	79.5	83.6	100
Junior High School	32.0	48.8	62.5	71.8	80.4	86.3	100
Diploma/University	34.3	54.3	62.9	71.4	80.0	82.9	100
Marital Status							
Married	35.9	53.4	64.1	73.4	79.7	84.9	100
Single	30.0	45.8	64.2	74.2	80.8	84.6	100
Occupation							
Unemployed	32.5	50.0	64.3	75.0	82.1	85.7	100
Self employed	41.0	61.9	76.2	81.0	87.6	91.4	100
Farmer/Unskilled worker	24.3	40.2	54.2	65.4	68.2	75.7	100
Formal sector	36.1	49.4	62.0	72.2	79.7	84.8	100
Size of family							
≤ 5 persons	32.3	49.5	62.7	72.6	78.9	84.2	100
> 5 persons	37.3	52.2	69.9	77.9	85.0	86.7	100
Income							
< US$ 100	30.5	47.6	61.3	71.7	76.2	82.2	100
US$ 100 – 249	35.2	52.1	65.1	73.2	82.0	85.8	100
> US$ 250	36.8	51.7	69.0	80.5	86.2	88.5	100
Possession of medical Insurance							
Yes	30.6	48.6	64.6	74.8	81.2	85.0	100
No	39.6	53.6	63.0	71.4	77.6	84.4	100
Attendants							
Yes	33.0	49.2	61.9	73.1	80.2	85.3	100
No	33.6	50.7	65.2	74.1	80.1	84.6	100

Table 16. Health Care System delay by background n=625 (cumulative distribution)

Variable	1 week	2 weeks	3 weeks	4 weeks	5 weeks	6 weeks	7 weeks	8 weeks	> 8 weeks
Age									
15-24 years old	25.4	36.9	50.0	55.7	69.7	77.9	82.8	86.9	100
25-45 years old	16.9	32.4	45.5	55.2	62.4	66.9	71.7	74.8	100
> 55 years old	22.1	32.9	41.3	49.8	54.5	60.6	66.7	69.5	100
Sex									
Male	25.9	38.3	49.9	56.3	62.8	69.0	73.9	76.3	100
Female	12.2	26.4	37.8	49.2	58.7	63.8	69.7	74.0	100
Type of tuberculosis									
PTB smear positive	19.9	32.3	44.6	54.0	60.0	66.4	70.9	74.6	100
PTB smear negative	20.9	36.3	46.2	52.2	64.3	68.1	74.7	76.9	100
EPTB	33.3	-	-	50.0	-	66.7	83.3	-	100
Residency									
Urban	24.8	38.9	49.3	57.2	65.4	71.5	76.1	79.4	100
Rural (reference)	14.4	26.3	39.3	48.5	55.6	60.7	67.0	70.0	100
Education									
No education	13.5	28.4	37.8	45.9	51.4	56.8	66.2	68.9	100
Elementary School	19.1	29.1	37.7	47.3	55.0	62.3	68.6	71.8	100
Junior High School	23.7	38.1	51.5	60.1	68.4	73.2	76.6	80.1	100
Diploma/University	17.1	27.1	48.6	51.4	60.0	65.7	68.6	71.4	100
Marital Status									
Married	22.5	35.6	46.6	57.0	64.9	69.9	74.2	76.4	100
Single	17.3	30.4	42.7	48.5	55.8	62.7	69.2	73.8	100
Occupation									
Unemployed	18.7	33.7	42.1	52.4	61.1	66.3	73.4	76.2	100
Self employed	21.0	31.4	49.5	53.3	59.0	66.7	72.4	73.3	100
Farmer/Unskilled worker	21.5	29.9	38.3	45.8	56.1	61.7	65.4	68.2	100
Formal sector	21.5	36.1	50.0	59.5	65.2	70.9	74.1	79.7	100
Size of family									
≤ 5 persons	21.1	34.7	47.1	54.6	63.1	67.9	72.6	75.9	100
> 5 persons	15.0	25.7	33.6	46.9	51.3	61.9	69.0	71.7	100
Income									
< US$ 100	20.4	33.8	45.7	54.3	64.3	68.0	72.5	74.7	100
US$ 100 – 249	18.4	32.6	44.4	53.3	59.8	68.2	72.4	75.5	100
> US$ 250	24.1	33.3	42.5	45.4	54.0	58.6	69.0	75.9	100
Possession of medical Insurance									
Yes	19.9	32.6	43.5	52.3	60.2	66.2	71.8	75.2	100
No	21.4	35.4	48.4	56.2	63.5	68.2	72.9	75.5	100
Attendants									
Yes	22.8	34.0	51.3	56.9	64.5	69.5	73.6	77.2	100
No	19.2	33.2	42.1	51.9	59.6	65.7	71.5	74.5	100

Table 17 . Total diagnosis delay by background n=625 (cumulative distribution)

Variable	1 months	2 months	3 months	4 months	> 4 months
Age					
15-24 years old	34.4	68.9	80.3	86.1	100
25-45 years old	26.2	62.8	75.9	83.4	100
> 55 years old	26.8	54.0	69.0	79.3	100
Sex					
Male	28.8	60.9	74.4	82.5	100
Female	26.8	61.0	74.4	82.7	100
Type of tuberculosis					
PTB smear positive	27.2	60.4	73.9	82.8	100
PTB smear negative	30.2	62.1	75.8	82.4	100
EPTB	16.7	66.7	-	-	100
Residency					
Urban	29.9	65.9	79.4	87.3	100
Rural (reference)	25.6	54.4	67.8	76.3	100
Education					
No education	21.6	54.1	68.9	79.7	100
Elementary School	21.4	56.8	70.9	79.1	100
Junior High School	34.0	65.3	79.0	87.3	100
Diploma/University	28.6	65.7	71.4	-	100
Marital Status					
Married	28.5	63.8	76.4	83.0	100
Single	27.3	56.9	71.5	81.9	100
Occupation					
Unemployed	27.0	61.1	74.2	82.5	100
Self employed	36.2	62.9	76.2	83.8	100
Farmer/Unskilled worker	18.7	49.5	64.5	72.0	100
Formal sector	29.7	66.5	79.7	88.6	100
Size of family					
≤ 5 persons	28.2	61.5	74.4	82.4	100
> 5 persons	25.7	56.6	73.5	82.3	100
Income					
< US$ 100	28.3	59.1	71.7	81.0	100
US$ 100 – 249	28.0	62.1	75.1	83.1	100
> US$ 250	25.3	60.9	79.3	85.1	100
Possession of medical Insurance					
Yes	27.1	60.2	73.8	82.4	100
No	30.2	62.5	75.5	82.8	100
Attendants					
Yes	24.9	63.5	75.6	83.8	100
No	29.4	59.8	73.8	82.0	100

Tabel 18. Socio-economic demographic characteristic Bali province (n=180)

	Number (percentage)	No referral from PPs/Regular DOTS n=120 (%within strategy)	Referral from PPs/PPM DOTS n=60 (% within strategy)	p-value
Median age (inter-quartile range)	38.5 (27-50)	33 (26-48.75)	45.5 (30.75-54.75)	
Mean	39.74	38.01	43.20	
Age				
15-24 years old	30 (16.7%)	24 (20%)	6 (10%)	0.022
25-45 years old	84 (46.7%)	60 (50%)	24 (40%)	
>45 years old	66 (36.7%)	36 (30%)	30 (50%)	
Sex				
Male	111 (61.7%)	79 (65.8%)	32 (53.3%)	0.104
Female	69 (38.3%)	41 (34.2%)	28 (46.7%)	
Residency				
Urban	100 (55.6%)	80 (66.7%)	20 (33.3%)	$<10^{-4}$
Rural	80 (44.4%)	40 (33.3%)	40 (66.7%)	
Educational status				
No education	43 (23.9%)	22 (18.3%)	21 (35%)	0.001
Elementary School	45 (25%)	26 (21.7%)	19 (31.7%)	
High School	84 (46.7%)	68 (56.7%)	16 (26.7%)	
Diploma/University	8 (4.4%)	4 (3.3%)	4 (6.7%	
Marital status				
Married	51 (28.3%)	37 (30.8%)	14 (23.3%)	0.293
Single	129 (71.7%)	83 (69.2%)	46 (76.7%)	
Occupation				
Unemployed	65 (36.1%)	42 (35%)	23 (38.3%)	0.107
Self-employed	27 (15%)	15 (12.5%)	12 (20%)	
Farmer/Unskilled worker	35 (19.4%)	21 (17.5%)	14 (23.3%)	
Formal sector	53 (29.4%)	42 (35%)	11 (18.3%)	
Possession of Health Insurance				
Yes	37 (20.6%)	28 (23.3%)	9 (15.0%)	0.192
No	143 (79.4%)	92 (76.7%)	51 (85%)	
Member of the family				
≤ 5 people	132 (73.3%)	87 (72.5%)	45 (75%)	0.721
> 5 people	48 (26.7%)	33 (27.5%)	15 (25%)	
Attendants				
Yes	107 (59.4%)	75 (62.5%)	32 (53.3%)	0.238
No	73 (40.6%)	45 (37.5%)	28 (46.7%)	
Mean of total income (US$)	175.18	187.67	150.21	0.112
Total household income (US$)				
< US$ 100	71 (39.4%)	42 (35%)	29 (48.3%)	0.194
US$ 100-249	66 (36.7%)	46 (38.3%)	20 (33.3%)	
> US$ 250	43 (23.9%)	32 (26.7%)	11 (18.3%)	
Type of tuberculosis				
Pulmonary TB smear positive	125 (69.4%)	84 (70%)	41 (68.3%)	0.536
Pulmonary TB smear negative	53 (29.4%)	34 (28.3%)	19 (31.7%)	
Extra-pulmonary TB	2 (1.1%)	2 (1.7%)	0 (0.0%)	

Table 19. Comparison of First provider visited and first medical provider consulted on both strategies (n=180)

	Strategy		p value
Type of first provider visited	**No referral from PPs/Regular DOTS (n=120)**	**Referral from PPs/ PPM DOTS (n=80)**	
Private practitioner	34 (28.3%)	18 (30.0%)	
PHC	8 (6.7%)	6 (10.0%)	
Hospital/chest clinic/private clinic	7 (5.8%)	0 (0.0%)	0.028
Pharmacy	22 (18.3%)	8 (13.3%)	
Vendor	33 (27.5%)	10 (16.7%)	
Traditional healer	16 (13.3%)	18 (30.0%)	
Type of first medical provider consulted			
Private practitioners	69 (57.5%)	51 (85.5%)	
PHC	31 (25.8%)	9 (15.0%)	$< 10^{-4}$
Hospital/chest clinic/private clinic	20 (16.7%)	0 (0.0%)	

Table 20. Patient, health care system and total diagnosis delay in Public and PPM (plus diagram)

	No referral from PPs/Regular DOTS	**Referral from PPs/PPM DOTS**	**p-value**
Patient delay (days)			
Mean	36.52	32.43	0.625
Median	21.00	20.50	
Interquartile range	7-35	11.50-35	
Health care system delay (days)			
Mean	54.87	76.10	0.120
Median	36	42	
Interquartile range	14-76.25	20-88	
Total diagnosis delay (days)			
Mean	91.39	108.53	0.299
Median	58.00	69.00	
Interquartile range	42-112.75	49-125.75	

ANNEX B QUESTIONAIRE

EVALUATION OF PPM-DOTS IN INDONESIA

1. Interview: At the stage of beginning treatment

1.1. Patient information

(to be collected from Treatment Card/TB Register/Lab Register before interview)
(Note 1: Make a copy of the treatment card and attach to this questionnaire
2: The Interviewers may tick (✓) the boxes where ever options are given)

a. District _____

b. Name of treating health facility:
_____

c. Name of the patient:
_____

d. Address :
_____

_____
___

_____
___

e. TB Number: /

f. Age: ☐☐ yrs. ***g.*** Sex: 1. Male ☐ 2. Female ☐

g. Disease classification: 1. Pulmonary ☐ 2. Extra-pulmonary ☐

h. Pre-treatment sputum smear examination:

Date : ☐☐☐☐***0***☐ *Result :* ☐ *No result recorded:* ☐
d d m m year

i. Result of X-Ray examinations (if any):
_____

j. Type of case: 1. New ☐ 2. Retreatment ☐ 3. Transfer-in ☐ 4. Others ☐

Note: only new cases should be included in this survey

k. Date of starting treatment : ☐☐☐☐***0***☐
d d m m year

l. Category of treatment : **1.Cat I** **2. Cat II** **3. Cat III**

m. Referring provider: ----------

n. Diagnosing provider: ----------

o. Treating provider ----------

p. DOT in health facility: 1. Yes ☐ 2. No ☐

If no, who is the DOT provider:

1. Colleague in the workplace ☐ 2. Community volunteer ☐

3. Others (specify) _____

q. Whether there has been a change of DOT provider since beginning of treatment

1. Yes ☐ 2. No ☐

1.2. Patient's willingness to participate in the interview

1. Patient participated in the interview ☐
2. Patient did not want to participate in the interview ☐
3. Patient not found after at least two visits to his house ☐
4. Died ☐
5. Excluded due to:

6. Non fulfilment of inclusion criteria: ☐

Reasons (specify) _____

1.3. Interview information

a. Date of interview: | | | | | ***0*** | |

d d m m year

b. Name of interviewer:
Mr/Ms._____

c. Interview location:

1.In health facility ☐ 2. In the patient's house ☐ 3.Others (specify) _____

1.4. Social, demographic and economic background of the patient

a. Permanent local resident : 1.Yes ☐ 2.No ☐

b. If 'no' residing locally for the last: ……. Years,……Months.

c. Are you living with **<u>your family</u>** in this house: 1. Yes ☐ 2. No ☐

If 'no' are you a : 1. relative ☐ 2. friend ☐

3. paying guest ☐ 4. maid servant ☐

5.others (specify) _____

d. Nature of the locality: 1. Slum ☐ 2. Lower middle class ☐

3. Middle class ☐ 4. Affluent ☐

(This may be assessed after making an onsite visit to the locality where the patient's residence is located)

e. **Standard of living (to be developed based n SUSENAS module)**

f. Individual characteristics

1. Marital status

1.Currently married ☐ 2. Separated ☐ 3. Deserted ☐

4. Divorced ☐ 5. Widowed ☐ 6. Never married ☐

*2. Educational status (**Record the highest qualification**)*

i. Can read and write 1 Yes ☐ 2. No ☐

ii. Has ever been to school? 1 Yes ☐ 2. No ☐

If 'yes' highest grade completed ? _____

iii. If under 18 years, still in school? 1 Yes ☐ 2. No ☐

iv. Have you completed a university degree? 1. Yes ☐ 2. No ☐

v. If 'no' have you completed any other technical course? 1. Yes ☐ 2.No ☐

3. Employment characteristics

i. Occupation

_____

1.Professional ☐ 2.Sales worker ☐ 3.Service worker ☐

4.Production worker ☐ 5.Agricultural worker ☐ 6.Others (specify)_____

ii. Employment

1.Family/farm business ☐ 2. Self employed ☐ 3. Employed by someone ☐ else

4.Not employed ☐ 5. Others (specify) _____

(If the answer is '4' go to question 'g')

iii. Work status

1.Currently working ☐ 2. Not worked in past 12 months ☐ 3. Others ☐

iv. Continuity of employment (if employed)

1.Throughout the year ☐ 2.Seasonal / part of the year ☐ 3.Once in a while ☐

v. Nature of earnings for the work done

1.Cash ☐ 2.Cash & kind ☐ 3. Kind ☐ 4.Not paid ☐

vi. Contribution of your earnings to the total family earnings

1. < half ☐ 2. about half ☐ 3. > half ☐ 4. full ☐ 5. none ☐

vii. What is your estimated individual income per month: Rs. _____

g. Number of people in the household* **:**_____

h. Number of earning members in the household* **:** _____

i. Total household income per month**:** _____
(Including the patient)*

1.5. Previous health care contacts and health care costs.

a. What is the name of the illness for which you are taking treatment?

b. When did you first experience the symptoms of the current illness?

c. What symptoms did you had to begin with?

d. History of diagnosis/treatment

Sl No	Name of the provider	Time gap after the onset of symptoms/ previous visit (in days)	Provider type	Duration of treatment in days (Approxi-mate dates)*	Costs incurred (in Rp.)				
					Doctor fee	Diagnosis related (Lab. Tests, X-ray etc.)	Medicines	Hospitalis-ation	Others (transport-ation** etc.)
1									
2									
3									
4									
5									
6									
Total									

(Indicate the dates of earlier treatment, if available from the patient or records)*
*(** Cost incurred on the patient only)*

e. Total number of days lost from work due to the current illness (right from the onset of first symptom/s to the date of start of treatment) _____.

f. Average amount of wages lost per day Rp. _____

g. Total wages lost **(e x f)** Rp. _____

h. Total cost to the patient (on medicines, diagnosis, treatment, hospitalisaton, wages lost etc) **(d + g)** Rp. _____

Note: ***The answers to questions from i to j will be based on the information collected in the table above. However clarifications could be sought from the patient in case of doubt.***

i. Total number of days since the appearance of first symptoms to the date of TB diagnosis _____.

j. Total number of days since the appearance of first symptoms to the date of starting Treatment for TB._____.

k. Total number of providers from whom health services were availed?
_____

l. Which of these providers referred you for diagnosis (referring provider)
_____

m. In which of these facilities were you diagnosed for TB?_____

n. Date of diagnosis _____

o. In which of these facilities are you currently treated (treating provider)?_____

p. Were you hospitalised either before or after starting treatment? 1.Yes ☐ 2. No ☐
If 'yes' for how many days? _____

1.6. Questions about attendant/s (if any)

a. For how many health care visits did someone accompany you?: _____ visit/s

b. Average amount spent on transportation/ other incidentals of the attendant/s per visit Rs._____

c. Total transportation/other incidental cost of the attendant/s **(a x b)** Rp._____

d. Number of days lost from work by the attendant/s _____

e. The average amount of wages lost per day? Rp. _____

f. Total wages lost on account of attending the patient **(d x e)** _____

g. Did you incur the attendant/s cost from your pocket? 1. Yes ☐ 2. No ☐

h. If 'no' who paid the attendant/s costs? _____

1.7. Financing of treatment

(in this section the interviewer will try to elicit information about how the patient or the person on whom the patient is dependent has managed to meet the costs associated with diagnosis and treatment)

a. Whether you hold a Medical insurance policy? 1.Yes ☐ 2.No ☐

b. Are you covered under any Government health/ medical reimbursement scheme? 1.Yes ☐ 2.No ☐

c. Do you draw any fixed monthly Medical Allowance 1.Yes ☐ 2.No ☐

d. Total reimbursement for payments related to the TB illness: Rp. _____

e. Did you have to borrow money to cover costs due to this illness? 1.Yes ☐ 2.No ☐
If 'yes' how much? Rp. _____

f. Have you paid any interest on this loan? 1.Yes ☐ 2.No ☐
If 'yes' how much until today? Rp. _____

g. Have you sold/mortgaged any item to finance the cost related to this illness, including interest for loans 1.Yes ☐ 2.No ☐
If 'yes' how much? Rp. _____

h. Cost of diagnosis / hospitalisation / treatment etc. met from own savings / sources Rp._____

1.8 Other observations

Date: **Interviewers signature**

Checked and signed by supervisor

Date: **Signature**