The Cost-Effectiveness of HIV Programmes Targeting Injecting Drug Users in West Sumatera, Indonesia

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Indonesia

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A thesis submitted in partial fulfilment of the requirement for the degree of Master of Public Health

By

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Abbreviations

AEM	Asian Epidemic Model
AIDS	Acquired Immunodeficiency Syndrome
ART	Antiretroviral Therapy
ARV	Antiretroviral
EPP	Estimation and Projection Package
FHI	Family Health International
FSW	Female Sex Worker
GF-ATM	Global Fund AIDS Tuberculosis Malaria
HAART	Highly Active Antiretroviral Therapy
HIV	Human Immunodeficiency Virus
IBBS	Integrated Biological – Behavioural Surveillance
IDUs	Injecting drug users
IEC	Information and Education Communication
IHPCP	Indonesia HIV/AIDS Prevention and Care Project
MARPs	Most at Risk Populations
MMT	Methadone Maintenance Therapy
MSM	Men who have sex with men
NAC	National AIDS Commission
NASA	National AIDS Spending Assessment
NEP	Needle Exchange Programme
NGOs	Non-Government Organizations
NEP	Needle Exchange Programme
NSP	Needle/Syringe Programme
OI	Opportunistic Infections
OST	Opioid Substitution Therapy
OVC	Orphan and Vulnerable Children
PLHIV	People Living with HIV
PMTCT	Prevention Mother-to-Child Transmission
RNM	Resource Needs Model
STI	Sexually Transmitted Infection
UNAIDS	Joint UN Programme for AIDS
UNODC	United Nations Office on Drugs and Crime
VCT	Voluntary Counselling and Testing
WHO	World Health Organization

Abstract

Background: Injecting drug use has been a major driver of the HIV epidemic in West Sumatera Province, Indonesia. HIV programme intervention is urgently required to prevent further spread of HIV. The Indonesian Harm Reduction policy was issued in 2007 recommending the implementation of a comprehensive programme targeting injecting drug users which includes prevention measures, care and treatment. Although it is recommended by the National AIDS Commission to set the coverage target at 80% coverage, there is little evidence on the required level of HIV programme coverage targeting injecting drug users to substantially avert new infections within the limited amount of resources.

Objectives: To undertake a cost-effectiveness analysis to find the most cost-effective level of coverage from four levels of coverage: 20%, 40%, 60% and 80% of the comprehensive programme.

Methods: Two linked models, the Asian Epidemic Model and the Resource Needs Model, are used to generate both cost required for a certain level of coverage and new infections averted for each level of coverage, compared to the baseline (no intervention) scenario. Cost and averted infections data are applied to generate cost-effectiveness ratios.

Results: The 40% programme coverage is the most cost-effective coverage level, with a cost effectiveness ratio equal to US$1,016 per HIV infection averted over a period of five years.

Discussion & **Recommendation**: Although 40% level of coverage is the most cost-effective level of coverage, 80% coverage is needed to achieve universal access if the resources are available. Setting an ambitious coverage is also recommended, as the increase of HIV prevalence among IDU will cause proliferation of HIV to the general population, making it harder to control in the future. The priority action is to implement the comprehensive programme as soon as possible, mainly because West Sumatera has reached an advanced stage of HIV epidemic. Political commitment and strengthening support system such as the health system, human resources and institutional management, are vital to ensure the attainment of programme coverage and quality programme implementation.

Keyword: cost-effectiveness, epidemic model, injecting drug users

Introduction

Indonesia is one of the fastest growing epidemics in Asia (1), and injecting drug use (IDU) is the predominant mode of HIV transmissions (2). An evaluation report to the World Bank notified a significant progress on Indonesia government support to reverse the spread of HIV in Indonesia (3). However, the report recommended the Bank to put special effort to increase government commitment to respond to the IDU-driven epidemics.

To date, even more progress on government commitment was achieved. However, many obstacles are still there to be resolved; and the biggest challenge is how to harmonize an effective response between national and sub-national level (4). With regards to the national policy to increase the AIDS commission's capacity at all levels (Presidential Regulation No.75 Year 2006 about National AIDS Commission), one strategic framework of HIV prevention is of paramount importance. All provinces in Indonesia shall have their own provincial strategic plan in accordance with the national strategic plan and develop it in a participative method.

In the year 2007, the West Sumatera Provincial AIDS commission reactivated its organization by recruiting a full-time secretary, and strengthening the governance to really moving toward a better response to the HIV epidemic. By the end of 2008, stakeholder's involvement including NGOs and community participation had been made possible. Intersectoral coordination seems to get better. In order to develop the provincial strategic plan, the working group for planning, consisting of all related stakeholders, was formed.

Before attending the ICHD course I worked as a reporting coordinator in the National AIDS Commission Secretariat. I was also appointed to be a regional coordinator for Sumatera, having the responsibility to mediate between the Provincial AIDS Commission and the NAC. I was also one of the national facilitators for the planning and advocacy process, providing technical assistance to develop the sectoral as well as provincial AIDS strategic plans. The thesis is about finding the optimal coverage level to deal with the HIV epidemic within very limited resources. This information can be used as a basis to develop a strategic plan especially in relation to the intervention targeting injecting drug users (IDUs). I have chosen this topic because this has been my area of interest. When I go back to Indonesia, I will be able to discuss with the provincial planning working group the range of options to decide on the priority of the West Sumatera's strategic plan.

Chapter 1: Country Background

1.1. Country Profile

Indonesia is a country situated in Southeast Asia with a population of 230 million. This makes Indonesia the fourth most populous country in the world. Indonesia is a developing country with Gross National Income (GNI) per capita US$ 1,650 in 2007 (5). The World Bank (6) noticed that Indonesia has made a strong economic recovery from the 1997 financial crisis, and now development spending and poverty have returned to the pre-crisis level. However the central government expenditure (1997-2006) allocated for health was only 1 percent (7). Also, there are still 21% of population below the international poverty line of US$1.25 per day in 2005.

1.2. Country Health Care and Health Financing System

Indonesia started to implement the decentralization regulation in 2001 (8). The process of decentralization has been carried out in three phases. Those were, the introductory phase in 2001 to 2003; the consolidation phase in 2004 to 2007; and the stabilization phase in 2007 and forward. Before the stipulation of the National Health System Guideline in 2004, all Heads of Provinces and Districts from all over Indonesia had agreed to take over the health programme, health institutes, health budget, and health facility as the compulsory authority of the districts, in October 2003 (9). Nevertheless, the public health care system would remain the same, consisting of hospitals, health centers (*puskesmas*), subcenters (*puskesmas pembantu*), and integrated health and family planning posts (*posyandus*). Health care services are also available in the private sector, consisting of traditional and modern practitioners (10).

In terms of health financing, Indonesia had undergone a big change after the economic crisis. Hotckhiss and Jacobalis in 1998 (10) found that before the crisis the Indonesian health system was not well targeted to the poor, and that government resources were not spent efficiently. However, a recent report shows that in the year 2008, MoH had covered 76.4 million poor and near poor through insurance programmes (*Askeskin/Jamkesmas*) fulfilling the government's commitment in 2004 to provide the whole population with health insurance coverage through a mandatory public health insurance scheme (11). Nevertheless, in this World Bank report on Health Financing in Indonesia, it is mentioned that more than half the population still lacks health insurance.

1.3. The National AIDS Commission

In order to manage the coordinative action in responding to HIV epidemic in Indonesia, the National AIDS Commission (NAC) was formed based on

the Presidential Regulation No.75/2006. The NAC is chaired by the Coordinating Minister of People's Welfare. Two Vice Chairpersons are the Minister of Health and the Minister of Home Affair. There are 24 other Ministers or Heads of Institutions appointed as the NAC members, including the NAC Secretary. The NAC Secretary is the manager of a secretariat office supported by professional staffs in order to ensure the optimum function of the NAC. In executing the AIDS responses, several teams are built, i.e. The NAC Executive Team, The Sectoral Working Groups, The Thematic Working Groups and The Expert Team. Those kinds of teams are also formed in provincial and district levels.

The NAC refers not only to national level AIDS Commission but also to the Provincial AIDS Commission (PAC) and District AIDS Commission (DAC). The provinces and districts erect the PAC/DAC based on The Ministry of Home Affair Regulation No.20/2007. PACs are lead by the Governors and DACs are lead by the Mayors. Like in the national level, each PAC and DAC has a Secretary to chair the PAC/DAC Secretariat Office. To date, all 33 provinces in Indonesia have already full-functioning PACs. While out of 450 districts in Indonesia, about one third of them have active DACs.

The Assistance Team are groups of five persons especially formed for provincial level to provide the technical assistance in provincial level as well as in district level under the respective provinces. The Planning Working Group is one of the thematic working groups established at province and/or district level.

Chapter 2: Problem Statement

2.1. HIV Problem in Indonesia

The latest estimation carried out by the MoH in 2006 showed that there are 193.000 People Living with HIV (PLHIV) (2). Just like other parts of Southeast Asian countries, Indonesia is also experiencing the HIV epidemic driven mostly by IDU. There are about 219,000 IDUs living in Indonesia. In 2007, HIV prevalence among IDUs in Indonesia reaches more than 50%, higher than other high risk populations such as male and female sex worker (FSW) (9%), and men who have sex with men (MSM) (5%) (12). It is estimated that of all people living with HIV, 78% are IDUs, and 11% are IDUs' sexual partners (2). IDUs population is estimated only about 3% of all most at risk population[1] in Indonesia, but they have been at the forefront of the fast growing epidemic in Indonesia.

After the first AIDS cases among IDUs in 1998, HIV prevalence among IDUs in the year 2000 has increased dramatically. The elevation of IDUs HIV prevalence was followed by the raise of HIV prevalence among other risk groups, like female and transgender sex workers (13). This phenomenon confirms the relation between IDUs and sexual transmission (14), and that unsafe needle sharing is related to unsafe sex (15). More than one third of IDUs in Indonesia are buying sex, and there is evidence that condom use among IDUs with sex workers is low (12).

2.2. HIV Programme Coverage in Indonesia

As of December 2006, HIV programmes targeting IDUs had reached about 15.500 IDUs or 7% coverage compared to the estimated number of IDUs in year 2006. The NAC Secretariat recorded the IDUs national programme were reaching a 13% coverage in year 2007 and 23% in 2008 (16). These data were gathered by the NAC Secretariat based on the reported number of IDUs contacted through the outreach programme from all provinces.

To this date, there is a debate on how to measure the coverage (17). This debate started since the issue of universal access came to the surface (18). At the beginning, without any strong evidence the Dublin Declaration in 2004 had declared that an 80% level of coverage was needed to ensure the effectiveness of the programme and to ensure the human rights to access health services. However, later studies give

[1] Most at risk populations usually used in HIV concentrated level of epidemic countries, refers to groups which are most likely to be HIV infected due to their risk behaviours – unprotected sex with multiple sex partners and needle sharing. They are sex workers and their clients, injecting drug users, men who have sex with men including transgender sex workers, prisoners.

different outcomes on the level of coverage needed to significantly bring down the HIV epidemic as a result of IDU transmission given the limited recourse availability (19) (20) (21) – and those levels range between 20% to 50% coverage (22). UNAIDS, though, recommends all countries to achieve a 60% coverage level (23).

The Indonesian National AIDS Action Plan 2007-2010 has set the target to 80% coverage in the year 2010 (24). This also follows the spirit to achieve universal access for all people who need health services. As recommended by the NAC in the national policy on harm reduction (The Regulation of Coordinating Minister of People's Welfare acting as Chairperson of National AIDS Commission No.2/2007), the intervention targeting IDUs should be a comprehensive programme. It means that the programme should include a full range of HIV prevention, care and treatment targeting IDUs.

The comprehensive programme package includes harm reduction to decrease new HIV infection among IDUs by minimizing needle sharing behaviour. The harm reduction programme is delivered through provision of information and education, clean needle/syringe, and opioid substitution therapy. The comprehensive programme also comprises counselling and testing, and antiretroviral therapy as well as other treatment for opportunistic infections. Preventing mother to child transmission (PMTCT) is as important as other programmes, although much less women are IDUs. By implementing the comprehensive programme, IDUs sexual partner can also be targeted. The aforementioned programmes are considered to represent to comprehensive package of interventions targeting IDUs investigated in this thesis.

The National Action Plan 2007-2010 not only serves as the priority action, but also as an advocacy tool so as to attract more funds, either from international funds or domestic funds. As of end of year 2006, the Indonesian National AIDS Spending Assessment (NASA) identified that the HIV programme was mostly supported by the international funds (70%), such as Global Fund, USAID, DfID and AusAID. The rests, 22% comes from national government budget, 5% from the provincial government budget, and 3% were from the district government budget (25). Given this information, therefore, advocacy aims to increase the government budget from all levels in the future.

2.3. West Sumatera HIV and AIDS Situation in relation with IDU

Like in most provinces of Indonesia, HIV and AIDS cases reported in the West Sumatera province are mainly IDUs. It is estimated that out of around 3.000 people living with HIV in West Sumatera (2) 79% of them were IDUs and 11% were IDUs partners. This figure is similar to the

general figure for Indonesia, where the IDUs are the main source of the spread of HIV infections. Out of a 1.7 million population aged 15 years and older, 37 thousand of them are the most at risk populations[2] in West Sumatera. About 6 thousands are IDUs, and 2.5 thousands are prisoner IDUs. A small proportion is FSW, and relatively big proportion is MSM and clients of FSW. However, very little information is available about FSW and MSM; and their HIV prevalence is estimated to be much lower than IDUs (2). From all of the reported cases received by the Ministry of Health, West Sumatera lists as the sixth highest AIDS cases infected through IDU from all provinces in Indonesia (26).

From almost no systematic HIV programme intervention in 2007, the West Sumatera PAC has reported significant outreach coverage of all most at risk population including IDUs, FSW, Transgender, MSM, and Prisoners (16). Approximately 12% IDUs[3] coverage level in 2008 has been reached. However, the intervention programme is not comprehensive, mostly only basic information and education programme without essential funding support.

2.4. Justification

The HIV epidemic in West Sumatera is now getting worrisome. IDU has been the major driver of the HIV epidemic in this province. To prevent further spread of HIV transmission among IDUs and their partners, the HIV programme interventions targeting IDUs are strongly required. This is the reason for focussing the discussion on IDUs.

The problem is that we are not sure of what level of coverage of this comprehensive programme reach to significantly reduce the epidemic within the limited resources that are available. We can set the highest level of coverage, as recommended by the NAC and the UNAIDS. Yet, lots of resources are required. At the other extreme, we can set a conveniently low coverage target for reasons of limited availability of funds. However, in order to know the optimum level of coverage result in a relatively significant effect on reducing the HIV epidemic at relatively low cost will probably lie somewhere in the middle between the highest and the lowest coverage levels of the comprehensive programme.

To find that level of coverage, which negotiates the universal access target and the resource limitation constraint, a cost-effectiveness analysis (CEA) is employed. By using the level of coverage and its relation with the

[2] Estimated number of Most at risk populations (2): IDUs (6,000); Partners of IDUs (2,500); Female Sex worker (620); Clients of Female Sex Worker (9,000); Spouse of Female Sex Worker's Clients (6,800); Man who have sex with man (9,000); Transgender Sex Worker (60); Clients of transgender (200); and prisoners (2,500).

[3] Reported 732 IDUs in West Sumatera are reached in 2008. Total estimated number of IDUs in West Sumatera is 6080 (based on 2006 estimation by MoH). Percentage of coverage level in 2008 is therefore, is 732 out of 6080 IDUs or approximately 12% level of coverage.

HIV epidemic we can calculate the cost-effectiveness ratio. Two linked projection models, the Asian Epidemic Model (AEM) and the Resource Needs Model (RNM) are used to support the process. AEM will be used to generate the epidemic figure – here the number of new HIV infections averted. RNM will be used to generate the cost of a specific level of intervention using the-already-available unit cost data for Indonesia. Various levels of coverage levels on IDUs as target of interventions will be developed using RNM. First is the "baseline scenario" or no intervention scenario as the benchmark; second, the "low to medium level of coverage programme" or 20% of coverage of comprehensive programme of all IDUs in West Sumatera; third, the "medium level of coverage programme" or 40% of coverage; forth, the "high level of coverage programme" or 60% of coverage; fifth, the "very high level of coverage programme" or 80% of coverage.

The planning exercise will take a five years period of implementation. The level of coverage interventions being investigated – respectively no intervention, 20%, 40%, 60% and 80% scenarios, start in 2007 and end in 2011. All scenarios use the same starting point in 2007, 0.1% level of coverage, or no intervention scenario.

Using what is the so called the league table to summarize the model output (cost and new infection over 5 years), the cost-effectiveness ratio will be generated to identify the most cost-effective level of intervention.

2.5. Objectives and specific objectives

2.5.1. General objective

To explore the possible options for HIV intervention targeting IDUs and their effects on HIV epidemic in West Sumatera in order to provide recommendations for planning IDU intervention in West Sumatera.

2.5.2. Specific objectives

1. To examine factors influencing HIV epidemic in West Sumatera, Indonesia with a focus on IDUs and develop the baseline epidemic model based on the current situation

2. To discuss programmes to control HIV epidemic related to IDUs

3. To develop intervention scenarios targeting IDUs taking into consideration the unit cost and target coverage

4. To assess the cost-effectiveness of the above intervention scenarios using a linked process of Asian Epidemic Model and Resource Needs Model

5. To formulate recommendations for planning IDU intervention in West Sumatera

2.6. Study Questions

1. How is injecting drug use affecting the HIV epidemic in West Sumatera, Indonesia?

2. Given the recommendation to implement the comprehensive programme, what are the intervention levels of coverage possible in West Sumatera?

3. Given the limited resource available for HIV intervention in West Sumatera, what is the most cost-effective level of coverage?

2.7. Methodology

This thesis uses two linked models to conduct the cost-effectiveness analysis. A sensitivity analysis is carried out to test the robustness of the result. I will first explain the models. After this I will continue with a description of the cost effectiveness, and the sensitivity analysis. Finally, I will describe the detailed steps of data collection and data analysis.

2.7.1. The Models

The Asian Epidemic Model (AEM) was chosen over the UNAIDS Workbook, the Estimation Projection Package (EPP), and the Spectrum Projection Package because AEM had been used to calibrate the national and other provinces projection in Indonesia; and was recommended by the NAC. Moreover, AEM can produce more comprehensive results than the other epidemic model and is linked with Resource Needs Model (RNM) to investigate various interventions needed to conduct the cost-effective analysis.

The AEM is the epidemic model developed by Tim Brown and Wiwat Peerapatanapokin of East-West Centre in Bangkok (27). Unlike the workbook and EPP, which uses a curve fitting approach (28), the AEM is a full process model that mathematically replicates the key processes driving HIV transmission in Asia (29).

Within a population aged ≥ 15 years, particular populations are divided in 8 compartments, which are specifically relevant to Asian epidemics. Those are Males who are clients of sex workers; Males who are not clients of sex workers; Lower risk general population females; Direct female sex workers (those with a higher frequency of partnering); Indirect female sex workers (those with a lower frequency of partnering); IDUs in higher risk sharing networks; IDUs who are in lower risk networks or do not share; Male sex workers; Men who have sex with men, who are not sex workers. The size of population and behavioural data were entered into the model to generate HIV epidemic information (29).

The new infections of IDUs are calculated by multiplying the frequency of injection among sharers, HIV prevalence level among injectors, and levels of protective behaviours such as cleaning or disinfecting needles (14).

Validation of the model was then undertaken by comparing the model output with the reference data provided by the MoH.

The Resource Needs Model (RNM). The intervention scenarios targeting IDUs for this thesis were built using RNM. RNM is usually used to assist national-level strategic planning efforts to examine the financial resources needed to implement a variety HIV programmes. RNM calculates the total resources needed for prevention, care, and orphan and vulnerable children support for HIV/AIDS at a national level. Those three fields are the sub-models. Each one of them has three main elements: Population target groups, Unit costs, and Coverage or access targets (30).

In this thesis, the main parameters are the percentages of IDUs population in the community and prison setting being targeted. The data entry was done in detail for each programme intervention of the comprehensive programme in each year from 2007 to 2011 to reach a certain percentage of target coverage in the last year of the programme, 2011. The programme intervention studied is a comprehensive IDUs programme consisting of a needle exchange programme, an opiate substitution therapy, an outreach programme, VCT, PMTCT, Testing and Diagnostics, an Opportunistic Infection Therapy, and an Antiretroviral Therapy. Unit costs were obtained from the Indonesian unit cost used for the national level RNM exercise.

2.7.2. The Cost Effective Analysis

The Cost Effective Analysis (CEA) employed in this thesis is carried out in line with The Generalized Cost-Effectiveness Analysis Guidelines developed by WHO (31). The CEA was carried out using the models' output: the cost of interventions and new infection averted. CEA was used to evaluate interventions in comparison with the baseline intervention. The baseline is defined as the null set scenario or the scenario with no intervention, i.e. current practice. The Cost-effectiveness ratio (CER) is calculated as the cost attributable to the specific level of intervention as the numerator and the health benefit as the denominator (31) (32).

The general CER formula is:

[Costs with programme - costs without programme] / [health with programme – health without programme]

(Source: Rob Baltussen, 2008) (33)

In this thesis the CER equals the cost of a specific level of intervention divided by the total number of new infections averted as shown in the formula below.

[Costs of specific level of intervention – Baseline cost] / [number of new infections averted (compared to baseline)]

2.7.3. The Sensitivity Analysis

To identify the robustness of the model due to the sensitivity of the result to the parameter estimates, a one-way sensitivity analysis using the AEM baseline scenario was conducted. The sensitivity analysis was done by varying one parameter while keeping the others constant to identify the most important determinant(s) among those parameters in affecting IDUs HIV prevalence (34) (35) (36) (37). The parameters checked in this sensitivity analysis only include the IDUs related parameters e.g. percentage of IDUs needle/syringe sharing, number of injections each day, average duration of injection, and probability of infection among IDUs.

This study did not carry out a sensitivity analysis for RNM. The sensitivity analysis for unit costs was done previously in Indonesia. Behaviour parameters were checked in the AEM; while the target coverage is the parameter that is investigated in finding the cost effectiveness.

2.7.4. Data Collection Procedure

A literature review was applied to get information for components of this thesis. Two kinds of literature review were carried out; secondary data review and web-based literature review.

1. Secondary data review. Behaviour and population data review was done using the published and unpublished reports and original soft copies, including former AEM and RNM software applied for the Indonesian National projections. Extensive review of surveillance surveys data and estimations projections data from MoH has been undertaken. Because of the behavioural data are at national level or at provincial and municipality level outside the site of West Sumatera, I developed assumptions based on those data for the West Sumatera Province. This method is supported by solid evidence that there is homogeneity of IDUs behaviours and that IDUs are mobile (13). Some IDUs in West Sumatera are related to IDUs from East Java and North Sumatera, while both are amongst 7 highest provinces in terms of HIV epidemic especially in IDUs (38).

2. Web-based literature review. Web-based search applying Pub med, Google scholar, and Scopus was used to get related articles. The articles were used to support the information with this thesis.

2.7.5. Data Analysis Procedure

1. Preparing the Asian Epidemic Model (AEM)

- Completing the secondary data review to collect the behavioural and population data for AEM
- Entering the behavioural parameters resulting from the analysis to AEM software

- Running the AEM to generate epidemic output
- Comparing the AEM output with reference data using tables to precede the model validity.
- Describing the AEM output with the purpose to explore the West Sumatera HIV situation

2. Describing the HIV programme targeting IDUs using information from literature review

3. Setting up different levels of intervention using RNM

- Describing the unit cost.
- Defining the coverage levels through an analysis on the definitions of coverage and the West Sumatera possible levels of coverage. The baseline scenario and four levels of interventions: 20%, 40%, 60%, and 80% coverage of estimated IDUs were developed for each activities in the comprehensive programmes targeting IDUs.
- Entering data into RNM and running computer programme AEM and RNM in linked fashion
- Summarising the cost implication and HIV Epidemic implication in a league graph
- Describing the HIV Epidemic implication under different levels of intervention

4. Carrying out the Cost-Effectiveness Analysis to generate the Cost-Effectiveness Ratio

- Developing the league table consisting of the model output to get the data on numbers of new infections averted in 5 years, the costs of intervention levels, and the average cost effectiveness ratio.
- The number of new infections averted was calculated by subtracting the baseline total new infections with the total new infections from specific intervention level.
- The costs of interventions are calculated as the difference between the baseline comprehensive costs in 5 years with the comprehensive programme cost in 5 years from various intervention levels.
- The average cost-effectiveness ratio was calculated by dividing each cost of intervention with each number of new infections averted under the same level of intervention. See the aforementioned CER formula.

2.7.6. Study Limitation

Within the limited time and the reliance on the electronic documents, some data especially unpublished and local-specific data could not be obtained. While the models need detailed data, the author could sometimes only provide assumptive data. The data processing has been

carried out without verification from the local authority, and without close supervision from the expert on modelling.

The West Sumatera Province is chosen as the study site. Although the HIV epidemic especially in relation with IDU is alarming, but very limited data are available.

In terms of cultural boundaries, beside the commonality shared with other provinces in Indonesia, this particular province has a distinct characteristic. That specific characteristic in culture and social dynamic may influence the HIV sexual transmission. This issue is not touched upon by the author, partly because the thesis is focused on IDUs. And the other part is that because there is very limited information available. Therefore the result of the study is not to be generalized to other provinces in Indonesia.

Key words in searching: injecting drug user, HIV/AIDS, Asian Epidemic Model, Resource Need Model, outreach, methadone, prison, needle programme, voluntary counselling and testing, antiretroviral, cost-effectiveness, uncertainty analysis

Chapter 3: Injecting Drug Users and HIV Epidemic in West Sumatera

The relationship between IDUs and the HIV epidemic will be described in two sections; first factors affecting the HIV epidemic in relation to IDUs, and second the Asian Epidemic Model validation.

3.1. How IDUs Influence the HIV Epidemic

IDUs influence the HIV epidemic by their needle sharing behaviour among IDUs and by unprotected sexual behaviour to other IDUs or non-IDU partners. The magnitude of the influence depends on the population size of IDUs and their unsafe behaviours (19). Behavioural factors, such as the percentage of IDUs sharing their needle, the number of injection each day and average duration of injecting in years are some of determinants of the HIV epidemic among IDUs (14). The percentage of condom use is a determinant of the HIV epidemic to the more general population such as lower risk women (39).

In this section I will describe the factors influencing the epidemic using available national data to develop assumptions as the data input for the baseline scenario in West Sumatera.

3.1.1. Size-related Variable

Population size of IDUs. Estimated numbers of IDUs in 2006 were 6,080 people or 0.35% of 15-49 year-old adult male population in West Sumatera (2). It is higher than the estimate for 2002 of 3,778 or 0.24% of 15-49 year-old adult male population in West Sumatera (40). The number of IDUs has actually been on the rise in most of provinces in Indonesia.

IDUs who share their needle. At a national level, it was found that only 15 percent (12%-25%) of IDUs brought their own needle (13). In contrast, as much as 43% of IDUs respondents in Medan (North Sumatera) and 24% in Surabaya (East Java) confessed that they did not share needles (13). These findings imply that more than half IDUs share needles. These data were originally from cities where the needle exchange programme (NEP) was implemented. This particular programme to date was not yet initiated in the capital city of West Sumatera, Padang.

IBBS year 2007 data revealed differences in needle sharing behaviour; in particular that 63% IDUs in Jakarta, 16% in Medan and 56% in Surabaya still shared the needle of the last injection (12). This exceptional behaviour in Medan was possible, because the NEP coverage of IDUs receiving NEP was much higher between 2004 and 2007. It reflects that the effectiveness of NEP in reducing the IDUs needle sharing behaviour. However, this may not directly reduce the HIV transmission because the

drug sharing after mixing is higher in these three cities: Jakarta 94%, Medan 98% and Surabaya 84%. This paraphernalia sharing or indirect sharing of injecting equipment was also reported as a risk factor for HIV infection (41) (42).

If they have a choice, IDUs prefer to have their own needle than to share. Almost all IDUs reported their previous effort to reduce sharing. However, most of them admitted that they still sometimes reuse the needle whether as receivers or borrowers (43). If there is no threat from the police to arrest people bringing their own needle, IDU will tend to supply their own needle. As mentioned above, this fact was also confirmed in Indonesia. Considering that there is no NEP programme, I assumed that around 65% to 85% IDUs in West Sumatera are sharing the needle.

Percent in High Risk Network. The IDUs in Indonesia had friends, of whom in between 40% to 60% were also IDUs (13). Not all these friends are in the needle sharing network, so that reasonable estimate on the percentage of friends who are IDUs and share needle is in between 30% and 40%.

3.1.2. Behavioural variable

Frequency of injecting. Respondents of 2005 BSS (13) in Medan injected in average 6 times a week, while IDUs in Surabaya injected in average 4 to 5 times a week. Assuming that the frequency of injecting will most probably the same, the injecting frequency in West Sumatera is around 4 to 6 times a week or almost 1 time a day.

Duration of injecting. In Medan it was found that the average duration of injecting was 4 to 5 years while in Surabaya it appeared to be 3.5 years duration. The assumption is that the current IDUs in West Sumatera have the same profile that is 3.5 years injecting in average.

Buying Sex and Condom Use with commercial sex. A considerable portion of IDUs were visiting commercial sex worker. Approximately 40% of IDUs bought sex (12) (13). There were variations in different places. The condom use among IDUs with the commercial sex was low to moderate. Data from 2004 survey showed the lowest condom use was in Jakarta (24%) and the highest condom use was in Surabaya (54%) (13). Two years later, the level of condom use seemed to be constant, or 32% of IDUs on average have consistently used condom with commercial sex in the last month (12).

Bringing together, the high HIV prevalence, the high proportion of IDUs bought sex, and low to moderate consistent condom, this is the recipe to wider spread of HIV to general population. In West Sumatera, it is assumed that, at least one forth of IDUs are buying sex and less than 20% is using condom for there is no programme targeting FSW in place.

Condom Use with spouse or regular partner. Data from the 2007 study show that 13% of IDUs in general use condoms with regular partners in the past month, whereas 82% to 95% of IDUs in different cities use condoms inconsistently with permanent partners in the past year (12).

This figure shows how low the condom use among IDUs with their spouse or regular partner. It is a risky behaviour, because 41% of IDUs also has casual partners and only 24% using condom consistently. However, in general population of Indonesia, the condom use is much lower, 1.3% (44) (45).

Since this situation was quite common in these cities of Indonesia, it is assumed that it also happens in West Sumatera.

Frequency of contact with regular partner (per week). Sexual behaviour is part of IDUs life. Sherman (15) found that drug use interdependency and sexual practice influence each other. A couple of drug users who live together and help their partners financially are less likely to use condoms consistently. Fifty percent Indonesian IDUs have a permanent sex partner and 41% have casual sex (12). These findings reflect that the majority of the IDUs in Indonesia are engaged in sex relations. The frequency of contact with regular partner is one parameter that reflects the HIV transmission with sexual partners. A study in Thailand, Japan, Belgium and the US found that the coital frequency per month ranged between 6 to 10 episodes (46). Study on female sexuality in Malaysia found that half of the respondents have sex 1 to 2 times a week (47). In Indonesia the findings are comparable with Malaysia, and the discussion the Planning Working Group in West Sumatera arrived at a number of contacts with regular partner equal to 2 times per week.

3.1.3. Injecting sex worker: an additional variable

The estimated number of FSW in West Sumatera is about 620 people out of 1.7 million female ≥ 15 year-old or 0.04% of female population. Indonesia MoH IBBS survey (12) found that the percentage of direct FSW who inject drugs in last year are 2.6% in North Sumatera, 0.2% in Batam, 0.9% in Jakarta, 0.1% in West Java and Central Java, 0.0 in East Java, 0.8% in Bali, and 0.3% in Tanah Papua.

The Injecting Sex Workers population is usually very small. However, if they exist and the size is considerable, they become one important determinant in the spread of HIV epidemic (48). Their population size is usually very small. They usually have higher HIV prevalence due to double exposures: sexual and needle sharing transmission. With low condom use, the HIV transmission between the injecting sex worker and their clients will be higher than those of non-injecting sex worker and their clients. From the clients of sex worker the HIV may pass to wider general population, especially lower risk women.

However, due to the low number of FSW in West Sumatera the data inputted in the model for the injecting sex worker is negligibly low.

For comparison with the situation in Indonesia, about 4% of IDUs (or around 8,500 people) in Indonesia are female (2). While the number of female IDUs is considerably small that does not make them negligible in the real life. Gender issues in IDUs are an important issue in Indonesia. Female IDUs are more likely to have injecting partners (15). A qualitative study in Indonesia (49) found that one of the "tasks" of female IDUs is to sell sex in order to earn money, either for her own consumption or to support her IDU spouse. Violence against female IDUs is common, and they suffer multiple types of stigma and discrimination in trying to seek for health services. A special programme, a tailored outreach programme may thus be required. This implies that while targeting male IDUs, the programme implementer needs to be more sensitive in targeting female IDUs.

3.2. Epidemic Model: model validity

The population and behaviour data described in the previous section were entered into the model (see technical report in the annex 1) as the baseline scenario. This section aims to verify that the model output is in line with the formal data from the Ministry of Health. This process is to ensure that the model is consistent and the credible. The table below displays the model output in comparison with the reference data from the MoH (2) (40).

Table 1 Model Validity

Parameter	Model Output	Reference	Remark
IDUs HIV Prevalence			
2002	18.09%	15-25	West Sumatera (WS)
2006	32.66%	29-52	
FSW HIV prevalence			
2002	0.62%	0.4-1	West Sumatera (WS)
2006	3.17%	2.7-3.92	
Number of IDU current HIV infection			
2002 (community and prison)	1,017	Community 756 (39-1,823) Prison 93 (62-124)	The model does not separate IDUs living in community or prison. The number is inside the range of the estimation
2006 (community and prison)	2,436	Community 2,390 (2,000-2,780) Prison 70 (10-120)	
Other Adult Current HIV infection (2006)			
Female Sex Worker	21	20	Underestimate of HIV infection in sexual transmission groups due to limited information, related to cultural restriction that hinder the proper estimation
Client of Sex Worker	323	80	
Lower risk women	1,251	360	
Man sex with man	906	120	

Parameter	Model Output	Reference	Remark
Male IDUs Population			
2002	5,375	Community 236-7,298; prison 3,095	The number is within the estimation
2006	7,141	Community 6,080 (5,280-6,880); prison 2,540 (2,050–3,030)	

As the table shows, the model output is closely in line with the MoH reference data so that the model can be considered as valid and useable for investigating the HIV epidemic implication of various intervention scenarios.

Chapter 4: The Comprehensive Harm Reduction Package

The specific programme targeting IDUs in the community and in prison is basically harm reduction. A harm reduction policy had been issued in 2007 by Coordinating Ministry of People's Welfare acting as the Chairperson of the National AIDS Commission. In this policy a comprehensive package of harm reduction is stated to be the approach. This package consists of not only an IDU-specific programme but also other general programmes related to HIV control programmes not specifically designed for IDUs. In this chapter I will describe in detail the components which build the comprehensive programme targeting IDUs in two parts, the IDU specific programmes and the general programmes. Both are used in the model to develop the intervention scenarios. This chapter will end with a description of the intervention scenarios consisting of the unit cost of all components of the comprehensive package, and coverage levels used in the intervention scenarios in West Sumatera.

4.1. The IDUs specific programmes

Essentially, harm reduction consists of activities such as outreach, a needle and syringe programme, methadone maintenance therapy, condom programming and peer education training. It is suitable in both community-based programme and prison settings. Some adjustments are usually done to fit the programme to the local needs.

Outreach or street outreach for community-based programmes works to reduce sex and injection risks (50) and is known to be the entry point before other activities are introduced. A study in Tehran found that the outreach programme has a positive affect in reducing direct sharing among those who received more needle/syringe from the programme (51). In Spain, a review on these programmes showed that increased access to sterile syringes was followed by a sharp decrease in number of new drug injectors. This study also found a positive overall transition from injecting to non-injecting behaviour (52). However, outreach alone was not strong enough to change the behaviour. A study in Southern Thailand suggested a drug treatment intervention for IDUs because individual's knowledge and psychological risk perception might not be sufficient to overcome the influence of strong craving effect and drug withdrawal (43).

Drug treatment, mostly buprenorphine or methadone maintenance therapy (MMT) is the mainstay of treatment in opiate use disorders. The efficacy of both treatments are high for retention, relapse rates and level of opiate use, and proved more cost-effective than placebo or no treatment (53). Compared to naltrexone, buprenorphine has a significantly higher retention in treatment and heroin abstinent (54). An evaluation study on the practice of delivering buprenorphine treatment in

Manipur and Nagaland, northeast India found a positive result in terms of changing the HIV-related risk behaviour (55).

In a prison setting, Anglin et al. (56) found that heroin use and related criminal activities were decreased among patients with longer periods of methadone treatment, while random termination of methadone resulted in poorer treatment outcomes. IDUs who were already in treatment and had to stop methadone when they entered to prison had higher probability of contracting HIV and hepatitis-C (HCV) because of sharing injecting equipment (57). Another study suggested the potential benefits associated with methadone treatment in prison including reduced rates of re-imprisonment once inmates are released (56). It was explained by the reduced drug-related criminal activities and increased post-release treatment uptake.

MMT has been fruitful as medication for heroin dependence since its beginning in 1965 (58), and also many aspects of life such productivity, criminality and HIV risk behaviour as mentioned previously. Subsequently, it is important to retain IDUs in MMT to maximize the benefit of the treatment. However, Opioid Substitution treatment (OST) is not the only solution to reduce needle sharing behaviour. In fact, there is also an abstinent programme (59). The attendance of this programme is the indicator of programme attainment. The successful to programme attendance are significantly affected by individual planning to cease drug use and friend encouragement to attend the programme.

Drug use is interrelated with sex practice, and condom programme are a necessary part of harm reduction. A study in Vietnam found that all IDUs reported inconsistent condom use with their heterosexual partners. Most often, at the onset of the sexual relation, condoms may be used but as the relationship becomes "stronger" or more "meaningful", the couple tend to reject condom use and unprotected sex becomes "a normal thing" (60). Other study concludes the characteristics associated with consistent condom use were HIV-sero-positive status; not cohabiting with their sexual partners; and not being financially interdependent (15).

4.2. The More General HIV Programmes

Beside the harm reduction programme specifically targeted to IDUs, other general means of prevention programmes are necessary.

Factors that influence needle sharing behaviour are knowledge about routes of HIV transmission, undertaking voluntary counselling and testing (VCT) and knowing the HIV-sero-positive status, and care for wife/off springs (43). This finding shows that VCT is important to reduce needle sharing behaviours by making someone aware of one's HIV status. VCT also provides sessions to increase one's knowledge of HIV transmission and the possibility to transmit to their loved ones. Therefore, access to VCT will increase the IDUs preventive actions.

One study in Northern Thailand (61) discovered that respondents who had HIV testing after initiating drug injection were 2.5 times more likely to be HIV positive than those who had an HIV test before initiating injecting. Furthermore, it also appeared that IDUs who had an HIV test after injecting were almost three times more likely to share needles in the past 3 months than those who had test before they injecting. The prevention effects of VCT in this study were confirmed in this study. Those who never had an HIV test have higher HIV prevalence rate than that of those who had an HIV test; either with the ones with negative result or even those who did not receive the test result. There was also a tendency that people who experienced VCT are more likely to report consistent condom use with their wives.

In setting up the VCT centre, Bergenstrom study came up with the suggestion to consider the location because in his study the higher return rate to post counselling was associated with the residence (62).

In a comprehensive programme targeting IDUs, a prevention mother-to-child transmission (PMTCT) programme is an important part of the programme. Although the numbers of female IDUs are small, the numbers of HIV-positive pregnant women are larger. They are usually the IDUs partners. In PMTCT, Antiretroviral (ARV) drugs for pregnant women or through post-exposure prophylaxis for their newborn are used to prevent the HIV transmission during pregnancy, in the delivery process and after delivery. In the low and middle income countries, various antiretroviral therapies which are offered to pregnant women or/and to their newborn babies (63). PMTCT programme is usually implemented in antenatal care setting. PMTCT programme will increase diagnosis of HIV-positive women promptly that will increase access for them to receive antiretroviral prophylaxis as needed (64).

Once the person diagnosed to be HIV positive, further diagnostic test and ARV test are needed because not all HIV positive people are eligible to receive ARV (65). As the disease progresses the CD4 test are administered to start the ART. The treatment may also start from Opportunistic Infections (OI) treatment, such as using cotrimoxazol, fluconazol and TB prophylaxis, depending on the diseases. ART is a long life treatment. Adherence often seems to be an issue related to the IDUs, but Palepu et al. found that enrolment of MMT was associated with improved adherence (66). The life expectation after ART treatment depends on various factors including drug resistance and adherence. But in the Highly Active Antiretroviral therapy (HAART) era, most study find that the life expectancy is 10 years in average, and may be longer if the patients started ART before AIDS stage (67).

All the activities explained in this section make up a comprehensive package for targeting IDUs, either in community or prison setting.

In the next section I will describe two main steps of setting up the intervention scenarios: the unit cost and the level of coverage.

4.3. Setting up Intervention Scenarios targeting IDUs

4.3.1. The Unit Cost

This study uses the unit cost agreed for setting up Indonesian epidemic and resource need model in order to develop National Action Plan 2007-2010, January 2007. Using the weighted cost method the team came up with the list of unit costs. Below, I present 2 tables of Programme Unit Costs. Table 2 describes the IDUs specific programme costs and table 3 describes the general HIV programme costs included in the comprehensive package of IDUs intervention. The remark column gives information related to detail activities or components.

Table 2 IDUs-Specific Programme Unit Cost

No	Programme	Unit	Cost	Setting	Remark
1	Outreach Programme	Per person per year	US$ 49.62	Community	Outreach workers, running cost, IEC Materials, Enabling environment, M&E
2	Needle and Syringe Programme	Per person per year	US$ 49.62	Community	US$0.14 times 365 day
3	Needle and syringe distributed and destroyed	Per needle/syringe	US$ 0.20	Community Prison	A factory purchase cost
4	Methadone maintenance therapy	Per IDUs contacted or per prisoner	US$ 131.71	Community Prison	Average cost, including MMT for PHC and Hospital-based
5	Male Condom distributed	Per condom	US$ 0.17	Community Prison	Including purchase, distribution and storage
6	Training Peer Educator	Per one person	US$ 38.89	Community Prison	Training materials, meals. Not included airline ticket because it is more on local-sourced training
7	Prisoner targeted with outreach programmes	Per prisoner	US$ 27.53	Prison	Does not include drugs and reagent for counselling and testing
8	Bleach distribution	Per prisoner	US$ 0.20	Prison	

Source: NAC's RNM soft document, 2007

Table 3 General HIV Programme Unit Cost

No	Programme	Unit	Cost	Remark
1	VCT			
	Cost per IDU VCT testing centre	Per person	US$ 86.87	Equivalent with community-based testing centre, including training, counselling remuneration, supervision, investment and running cost
	Cost to establish en new VCT site	Per testing centre	US$ 1667.67	Assumed that each VCT site can serve around 300 people for comprehensive Testing and Counselling
2	PMTCT			
	Cost per women screened	Per pregnant women	US$13.82	Default in Asia

No	Programme	Unit	Cost	Remark
	Cost for 1 year infant formula	Per women	US$ 55.56	Milk formula & vitamins
	Cost per infant follow up	Per infant	US$ 55.56	Includes running cost and training for 1 year cost of infant formula
3	Diagnosis and ART Test			
	HIV Test	Per person	US$ 4.5	Hospital-based VCT cost including pre-test and post-test
	Laboratory test for ARV therapy first years	Per person	US$ 45	In the first year, PLWHA has 3 CD4 examinations: A. CD4 examination for determining whether or not to start ART B. examination for every 6 month, to monitor the ART progress of CD4 improvement
	Laboratory test for ARV therapy in subsequent years	Per person	US$ 33.3	This cost is per person per year. This cost includes test of CD4 for every 6 month.
4	Opportunistic Infection			
	Treatment of OI	Per person	US$ 138.89	Half cost of life time (assumed 2 years) treatment
	Prophylaxis for OI	Per person	US$ 10	Other country experiences in cotrimoxazol for 1 year
5	ART			
	ARV Therapy	Per person	US$ 533	Drug cost, times 12 months (per year), 1st line therapy
	Cost of toxicity therapy	Per person	US$ 55.56	For 1 check per year, if there is an indication of side effect of ART use
	Cost of second line therapy	Per person	US$ 5,333	

Source: NAC's RNM soft document, 2007

4.3.2 The Coverage

4.3.2.1. Programmes and the level of coverage

The discussion on coverage became an issue when WHO/UNAIDS urge to scale up the comprehensive programmes for prevention, treatment, care and support for HIV/AIDS by 2010. The General Assembly of United Nations declaration and commitment of governments in 2006 agreed to set the Universal Access as the world target. This call for actions in relation to IDUs, in fact, had begun in the Dublin Declaration in 2004 which came to an agreement on an ambitious, albeit generic and poorly defined, target for prevention programmes covering 80% of persons at the highest risk to HIV and AIDS by 2010 (18).

In an attempt to examine the meaning of coverage of HIV prevention programmes among IDUs, Sharma et al. (17) came to three levels of coverage definitions: individual, population, and services provided to a population. He mentioned that at one point during the Satellite Session of 17th International Conference on the Reduction of Drug Related Harm in Vancouver, 2006, speakers had variously called for "coverage" to be increased to 20%, 60% and 80% of IDUs in a given area to prevent or stabilize HIV epidemic. However, these figures may also refer to very different aspects of coverage. There is lack of agreement in defining level of coverage, whether the intervention is a comprehensive package, whether the population denominator is accurate; whether the indicators

are properly defined, and whether the coverage had taken into account other important aspects of availability and quality of interventions.

In an effort to develop technical guidance, a comprehensive package for prevention, treatment and care of HIV in IDUs has been agreed upon by UNAIDS/WHO (18). The comprehensive package includes: needle and syringe programme (NSP), opioid substitution therapy (OST), Voluntary HIV Counselling and Testing (VCT), anti-retroviral therapy (ART), sexually transmitted infection (STI) prevention and treatment, condom programming for IDUs and partners, targeted information, education communication (IEC) for IDUs and sexual partners, and other opportunistic infection prevention, diagnosis and treatment as hepatitis and tuberculosis. It is also a consensus that no single intervention will effectively prevent or control HIV epidemic in relation to IDUs. The comprehensive package mentioned above has the greatest impact on HIV epidemic (17) (22) (68). IDUs in prison and other closed setting are also the key sites for intervention without discrimination because of the assurance of continuity of care between the community and prisons.

Sixty percent coverage of IDUs population was required to reverse the HIV epidemic where the HIV prevalence among IDUs was approximately 50% (20). Recent analysis has shown that far lower levels of reach (ranging from 20% to 30%) may have also led to declines in the prevalence of injecting equipment sharing (19). Additionally, there was no significant difference in rates of syringe sharing among IDUs with coverage percentage ranges as low as 24-39% as compared to IDUs with coverage between 90% and 125% (17). Des Jarlais (22) in his study found some central tendency of expert judgments with a majority suggesting that population coverage or reach levels of 20% - 33% are needed for NSP and opioid substitution programmes; 20% to 50% for outreach programmes. Using monitoring visit data of NSP participants in New Haven and Chicago, USA, Heimer concluded that coverage rates will vary as a function of the programme policy. He also noted that even modest coverage rates, or below UNAIDS recommendation - that is 60% coverage, can have significant impacts on HIV epidemics (21). However, it is very important to maintain the high political commitment to scale-up the comprehensive programmes to ensure the fund effectively mobilized and used efficiently, also reduce barriers to effective implementation (69).

Studied in Indonesia confirmed that argument. High coverage achievement of programmes targeting IDUs occurred in cities which have strong commitments from the Governors (12).

There are two methods to generate the actual level of coverage practiced in Indonesia. First method is based on routine reported data of all provinces of Indonesia to the NAC (16), and second is based on a cross sectional study which is done each 2 or 3 years. The Integrated Biological Behaviour Surveillance (IBBS) on most at risk populations (MARPs) 2007

is one of them (12). While the routine report data may be used to find the level of coverage in provincial and national level, the study particularly illustrated the city level of coverage where the study is done – and not to be deducted into the national level of coverage.

By the end of 2008 the West Sumatera Province reported that 730 IDUs are reached (16), or approximately 12% coverage level compare to total estimated number of IDUs in West Sumatera year 2006 (2). However, this report showed only the information and education communication as a main intervention. No comprehensive programme, not even a specific intervention like needle exchange programme reported. The last time I visited West Sumatera, in mid year of 2008, I found that there was no systematic intervention in place. For this reason, I assumed that the intervention was just introduced and that the quality of intervention was not yet sufficient. For the sake of developing a baseline scenario, I will use no intervention scenario.

4.3.2.2. The West Sumatra's levels of coverage scenarios for investigating the various interventions

Five scenarios were built using the linked programme of the Asian Epidemic Model and Resource Need Model. The components of each comprehensive intervention scenario are community-based programme and prison programme (Outreach, NEP and MMT), VCT, PMTCT, Diagnosis and ART Test, OI treatment and ART. The scenarios are the baseline scenario, low to medium intervention scenario, medium intervention scenarios, high intervention scenario and very high intervention scenario. The scenarios start in 2007 and end in 2011. They all have the same starting point in terms of level of coverage in 2007; but reaching different levels of coverage in the year 2011. (For further information, please see the technical report on coverage, annex 2). The intervention levels of coverage developed are:

Table 4 The intervention levels of coverage under investigation

No.	The Scenarios	Level of Coverage	
		2007	2011
0	The baseline scenario	0.1%	0.1%
1	The low-to-medium intervention scenario	0.1%	20%
2	The medium intervention scenario	0.1%	40%
3	The high intervention scenario	0.1%	60%
4	The very high intervention scenario	0.1%	80%

The baseline scenario or 0.1% level of coverage reflects there was very limited programme addressing IDUs. This level of coverage remained the same up to 2011. Although there was no systematic approach, but IDUs still accessed the services individually. Therefore, it includes a low level of costs for purchasing syringe, having diagnostic process and treated with prophylaxis for OI or other treatment at individual level.

The coverage increase gradually starting in 2008. The higher the target coverage in year 2011, the higher the needs for government support, resource mobilization, and the implementing agents institutional strengthening, including NGOs, primary health care (*puskesmas*), and hospital. The ambitious target will definitely implies the needs for health system strengthening.

Chapter 5: The Results

This chapter will describe the output of the models: first, the epidemic profile of the baseline scenario; second, the cost implication of all interventions; and third the epidemic implication of the four intervention scenarios compared to the baseline scenarios. From those findings, in the forth section the Cost Effectiveness Analysis will be carried out. The last section of this chapter includes a Sensitivity Analysis.

5.1. Exploring HIV Epidemic in West Sumatera Using the AEM Baseline Scenario

Using the model, IDUs new HIV infections are compared with that of other risk groups. The IDUs HIV prevalence was presented to examine the trend over time. A comparison of HIV trends in West Sumatera and Indonesia is discussed later as well.

Figure 1 shows that the IDUs new HIV infections are at peak in 2002 and 2003, decrease rapidly in later years, and slightly increasing from 2005 up to 2014. The decrease of the new infections does not have anything to do with the treatment. The numbers of new infections are going down because the IDUs population got saturated – fewer and fewer susceptible negative IDUs are available.

The new HIV infections among low risk women seem to have a link with IDUs new infections. The sharp increase of new HIV infections among IDUs in the year 2001 and 2002 is followed by a rapid increase of low risk women in year 2002 and 2003.

The population of FSW is very small, and this figure can only show that there is a very light increase of new HIV infections. However, it is too early to judge because the information on FSW in West Sumatera is also very limited. Similar to FSW, it is suspected that the number of MSM will also increase vastly in the next future, but little knowledge is available on this right now. At the national level, it was found that about one forth MSM were using drugs, but most of them using methamphetamine or non IDU (12). In that case, it is unclear whether MSM new HIV infection relates to that of IDUs.

Figure 1 New HIV Infections in Male IDUs and Other Risk Groups

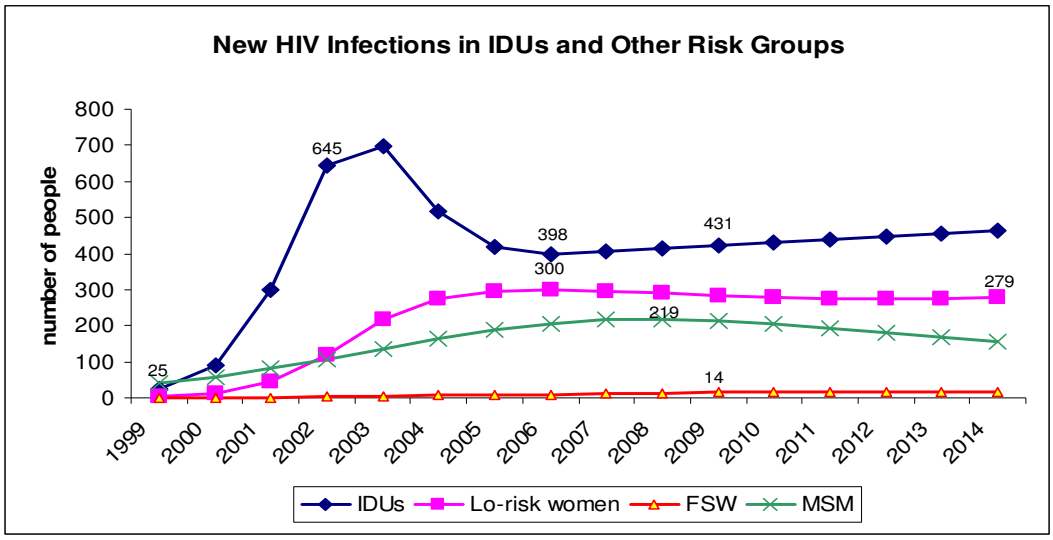
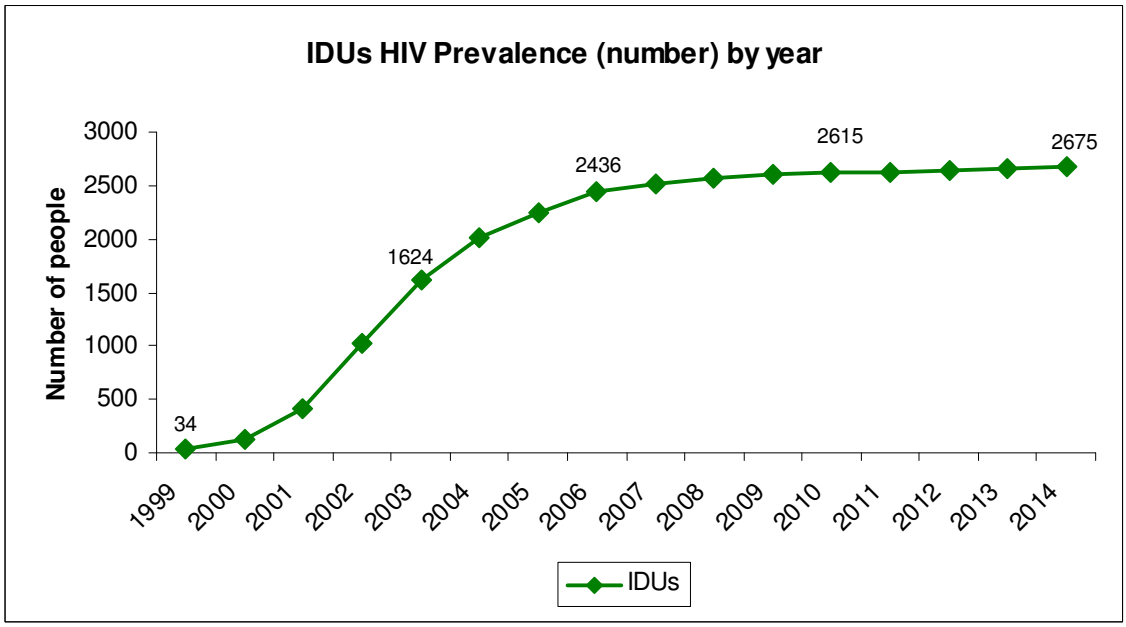


Figure 2 represents the IDUs HIV prevalence or simply the total number of people living with HIV (PLHIV) in that year. The sharp increase of the number of PLHIV happened in 2002-2003, soon after the onset of infected IDUs in 1997. A considerable increase still continues up to 2007, but afterward starts to increase at a decreasing rate until 2014.

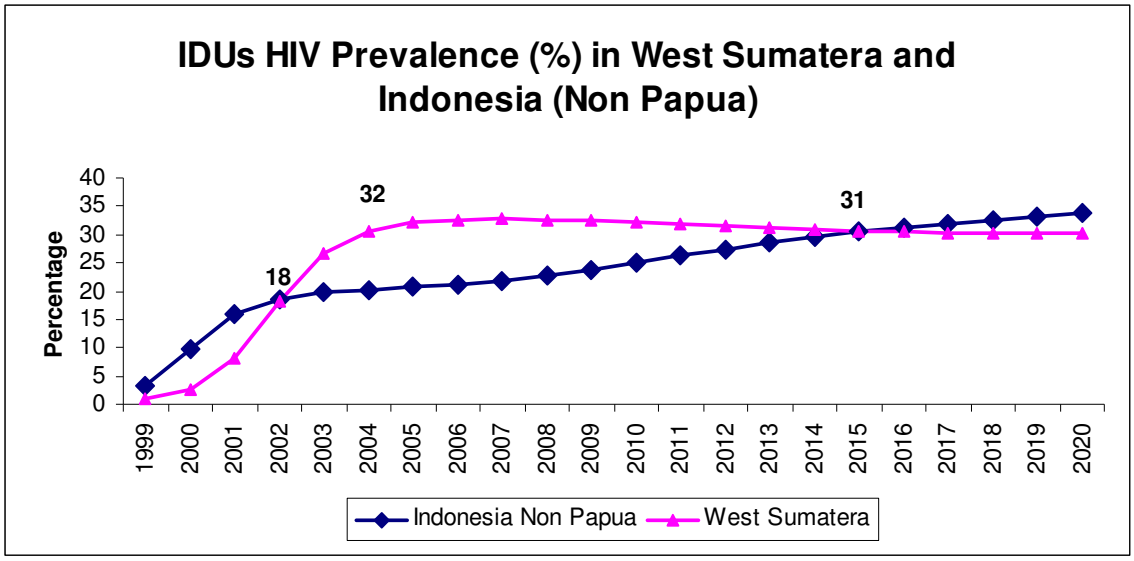
In figure 2 also, we can see that once the number reached 2,500, the additional increase is very small. Of total estimated 6 thousand IDUs, the HIV new infection is already reaching saturation because only 40% of IDUs are in high risk network. However, there are still new infections from the lower risk network because quite high percentage of IDUs is sharing their needle.

Figure 2 IDUs Current HIV Infection by Year



In Figure 3, I compared the situation in West Sumatera with that of Indonesia in terms of HIV prevalence among IDUs. The data from Indonesia represents the situation in 2006. It appears that the HIV prevalence in West Sumatera increases following the Indonesia HIV prevalence from year 2000 to year 2002. This is probably due to the elicit drug distribution. Other bigger capital cities like Jakarta, Bandung, Surabaya and Medan are usually the initial targets of illegal drug trade. While Padang city in West Sumatera is not as big as those cities. Unfortunately, the HIV prevalence surpassed the Indonesia HIV prevalence in 2003. The possible explanation for this vastly increasing of HIV prevalence in West Sumatera is that because the IDUs population size is much smaller than that of Indonesia. With the same level of high risk network, the spread of HIV will be much faster in the smaller population, up until it reaches saturation.

Figure 3 Comparing IDUs HIV Prevalence in West Sumatera and Indonesia (Non Papua)



5.2. Exploring the Cost Implication and Epidemic Implication of Five Scenarios

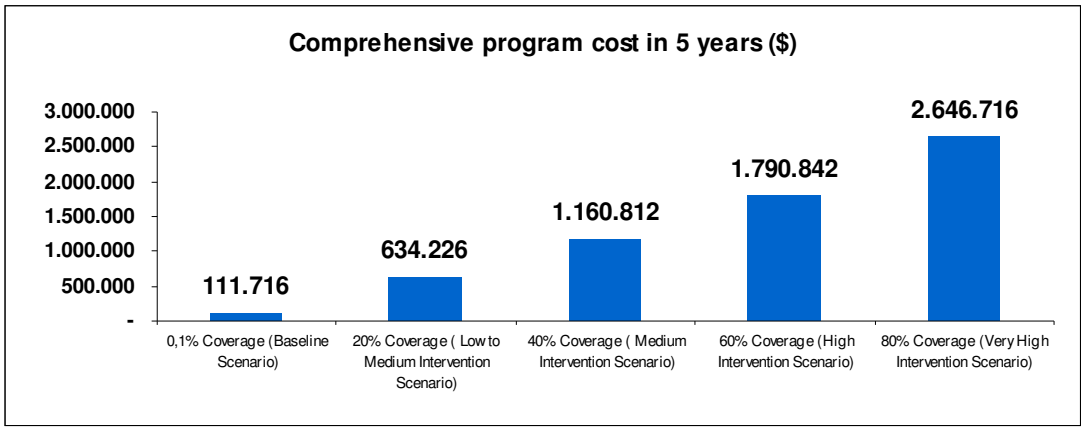
In this section I will describe the model output under all the scenarios.

5.2.1. The Cost Implication

The figure below presents the cost required for running the HIV programme to reach certain level of coverage. As seen in Figure 4, the 5-year cost from 2007 to 2011 increases with the increase of coverage. The cost of the very high intervention scenario is about 24 times of the baseline scenario. The detailed costs on each programme can be seen in Annex 3.

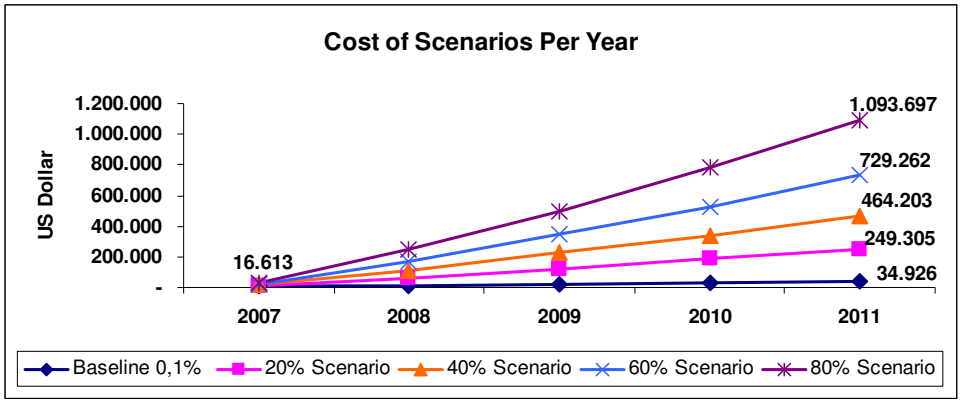
The largest components of the cost are community-based programme, VCT and ART, because the coverage of people is largest in the community compared to prisons, and because ART unit cost is relatively high.

Figure 4 Comprehensive programme cost in 5 years ($)



If we breakdown the scenario cost per year, the result will be as Figure 5.

Figure 5 Cost of Scenario per Year



A cost of US$16 thousand HIV comprehensive programme targeting IDUs starts in 2007. In year 2011 the scenario of 80% coverage reaches up to a level of cost which is 60 times higher compared to the first year (1 million US$).

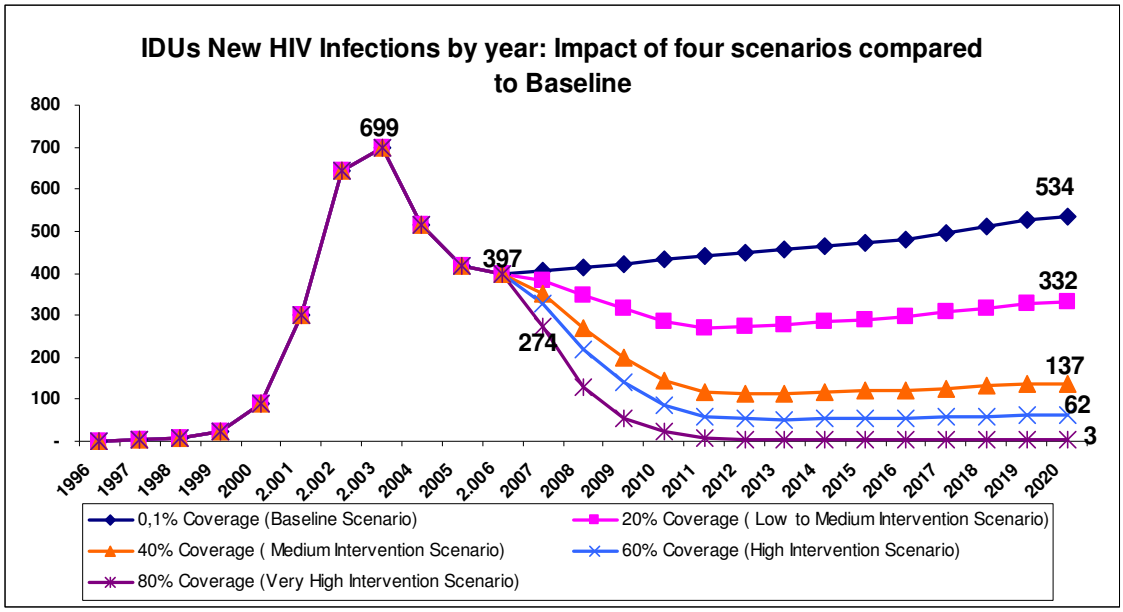
The linearity showed in Figure 4 and 5 occurs because RNM assumes that all unit costs are constant, regardless of the production volume or variations of cost due to age, location and strata i.e. levels of skill (70). There are studies that use different assumptions (71), but the RNM adheres to the most commonly used of constant unit cost.

A study by Kumaranayake et al. (72) came to conclusions that there is a difference costing dynamic of HIV preventions and HIV care and treatment in scaling up HIV programmes. Cost of HIV preventions will increase in the same proportion as the increase of coverage levels, while the cost of care and treatment is more complicated. Cost of care and treatment unit cost should include considerations about the capacity constraints and the efficiency implications. In order to ensure the efficiency, the assessment of care and treatment cost should take into account the infrastructure requirements.

5.2.2. The Epidemic Implication

Figure 6 illustrates the number of new infections from year 1996 to 2020 for all scenarios.

Figure 6 IDUs New HIV Infection: Impact of three scenarios compared to Baseline



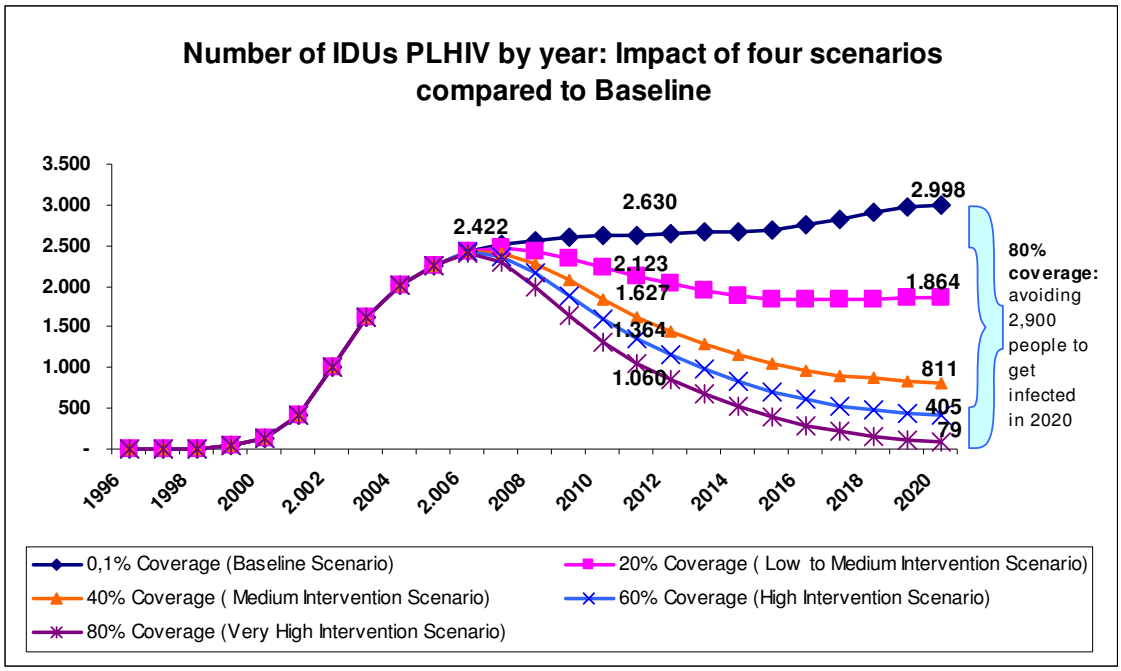
The figure indicates that the highest infection rate had already occurred in 2003. That was the period when IDUs were just acknowledged and most of cases were already in the advanced stage that compels them to seek the health services. This situation was common all over Indonesia.

It appears that, even the lowest (20%) level of HIV programme coverage is able to avert the new infections from 20 new cases in 2007 to 200 new cases in 2020. As expected, higher coverage will avert more new cases. The medium (40%) level of HIV programme coverage is able to avert 40 new cases in 2007 to 400 new cases in 2020.

The extra benefit of averting new infections become less with a higher starting point: from 40% to 60% coverage and from 60% to 80% coverage less new infections are averted. It is reflecting that increasing the coverage from a relatively high starting point is much harder than increasing those of the relatively lower starting point (31). However, it is also important to note that an 80% HIV programme coverage is able to suppress the new HIV infections to a minimum level at the end of 2011.

Figure 7 illustrates the number of IDUs People Living with HIV. This graph shows that by implementing 80% programme coverage, about 2,900 people in year 2020 or about 1,500 people in year 2011 are hindered to become infected in comparison with the baseline scenario.

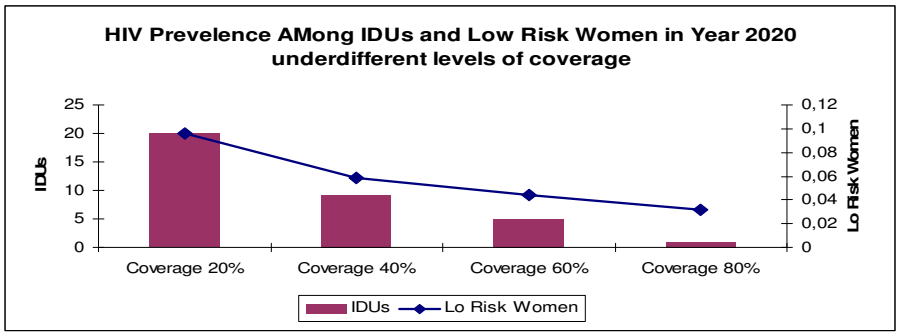
Figure 7 IDUs Current HIV Infection: Impact of four scenarios compared to Baseline



If we compare the 20% with the 40% level of coverage, we find that a thousand are averted infections. However, the number of infections averted from 40% to 60% level of coverage is only about 400. This again, demonstrates the non-linear impact of the intervention scenarios.

Once IDUs are averted from infections, the low risk women are automatically averted from contracting HIV. Further analysis on HIV prevalence in year 2020, under different interventions level showed that the HIV prevalence among IDUs is related to HIV prevalence among lower risk women (See Figure 8). It means the HIV epidemics among IDUs can spread the HIV to general population and contribute to generalised epidemic. Whether or not the HIV epidemic among IDUs will spread to general populations is in questions. Archibald et al. (73) argued that it will be determined more by the sexual behaviour characteristics of the general population than the risk behaviour characteristics of IDUs. If most of general population do not have multiple sex partners, the HIV will not spread widely. It will stop at lower risk women or their infected babies. On the contrary, Vickerman and Watts (39) cautioned that IDU population can have significant impact on the course of an epidemic in a general population and can be the main sustaining factor of the epidemic. Both arguments are based on the projection models.

Figure 8 HIV Prevalence among IDUs and Low Risk Women in year 2020 under different levels of coverage



5.3. Cost Effectiveness Analysis

The cost-effectiveness analysis was done by calculating the cost-effectiveness ratio (CER). The numerator is the cost of interventions in five years and the denominator is the total number of new infections averted in five years under the specific coverage. The league table of interventions: resource needed and new infection averted, is shown in Table 4.

Table 5 The Cost Effectiveness: Five-year new infection averted, Comprehensive HIV programme cost and average cost effectiveness for four intervention scenarios against baseline/ no intervention scenario

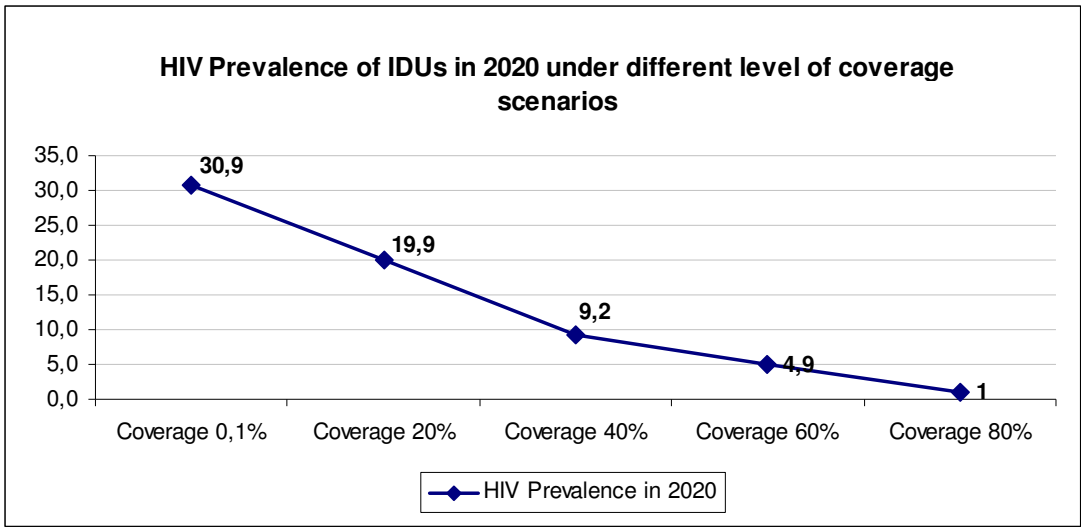
	Level of Coverage	Total Number of New Infections in 5 years (a)	Number of New Infections averted 5 years ($b=a_x-a_0$)	Comprehensive programme cost in 5 years (c)	Cost of Interventions in 5 years ($d=c_x-c_0$)	Average Cost Effectiveness Ratio (d/b)
0	0,1% Coverage (Baseline Scenario) – No Intervention	2,113	-	111,716	-	-
X1	20% Coverage (Low to Medium Intervention Scenario)	1,603	510	634,226	522,510	1,026
X2	40% Coverage (Medium Intervention Scenario)	1,081	1,032	1,160,812	1,049,096	1,016
X3	60% Coverage (High Intervention Scenario)	832	1,281	1,790,842	1,679,126	1,311
X4	80% Coverage (Very High Intervention Scenario)	490	1,623	2,646,716	2,535,000	1,562

The table shows that the medium intervention scenario of 40% coverage is the most cost-effective level of intervention per HIV infection averted.

To further understand the reasons behind this finding, we can explore further the nature of both numerator and denominator of the CER. Since the relation of coverage levels and total costs is a complete linear, the relation of coverage level and HIV prevalence is investigated. This step is to find the coverage threshold, which, if reached, could lead to substantial decrease of HIV prevalence (19). Figure 9 below was presented to identify whether there is a threshold. Although there is no clear threshold break, the graph shows there is a shift on the slope of HIV prevalence at 40% coverage level. The HIV prevalence line beyond 40% coverage is

continuing linear again until reaching 80% coverage. It means that the highest reduction of HIV prevalence was at 40% coverage level. This corresponds with the result finding that the most cost effective level of coverage is 40% per infection averted.

Figure 9 HIV Prevalence of IDUs in 2020 under different level of coverage scenarios



5.4. Sensitivity Analysis

Sensitivity analysis is done in order to explore the robustness of the model (35). In this thesis the sensitivity analysis is carried out only for the epidemic model, AEM. Below is the result of the sensitivity analysis for IDUs-related parameter (See Table 5).

Table 6 Sensitivity Analysis for IDUs-related Parameters

No.	Parameters	Data input In 2007	HIV Prevalence (%) In 2014	Relative Change (%)*
1	Percent of IDUs sharing needle			
	Baseline estimate	65%	30,86	
	Low-end estimate	45%	22,33	-28%
	High-end estimate	85%	39,72	56%
2	Number of injections each day			
	Baseline estimate	2	30,86	
	Low-end estimate	1	26,38	-15%
	High-end estimate	3	32,19	4%
3	Average duration of injecting (year)			
	Baseline estimate	7	30,86	
	Low-end estimate	5	28,86	-6%
	High-end estimate	9	32,33	5%
4	Probability of infection among IDUs			
	Baseline estimate	0,0038	30,86	
	Low-end estimate	0,003	29,74	-4%
	High-end estimate	0,006	32,24	4%

*** (Low or High-end estimate – baseline estimate)/baseline estimate X 100%**

The results in Table 5 show that the results are most sensitive to the percentage of IDUs sharing the needle. The results also show that decreasing the number of injections per day had a great impact on HIV prevalence. However increasing the number of injections per day from 2 times to 3 times will not make a big difference to HIV prevalence. The change in the other parameters does not have a big impact on HIV prevalence. This result leads us to conclude that, reducing the percentage of IDUs needle sharing and the numbers of injections per day are important determinants in reducing the HIV epidemic in West Sumatera.

Chapter 6: Discussion, Conclusion and Recommendation

6.1. Discussion and Recommendations

The main findings of thesis are:

- The medium intervention or 40% programme coverage is the most cost-effective scenario. However, no statistical analysis has been carried out to find the confidence interval. Therefore the author is not confident whether there is statistically difference among CERs.
- The sensitivity analysis carried out for the epidemic model has brought to conclusion that the most important determinants of the HIV epidemic that are to reduce the percentage of IDUs sharing the needle and number of injection each day. Those can be done by implementing the NSP and MMT incorporated in a comprehensive package targeting IDUs.

However, these findings are based on the assumption that cost effectiveness is the main decision criteria. There are any other considerations to discuss before deciding the level of coverage target for the provincial strategic plan.

6.1.1. Prioritizing the intervention: The Cost Effectiveness and the Universal Access

Based on the cost-effectiveness consideration the 40% level of coverage is the most cost-effective coverage. However, if the universal access is the goal, 80% is an appropriate target level of coverage.

By setting the universal access as an ambitious target, it could be the instruments to acquire necessary resources and technical support (18) (74). In my experience working in the national level, the 80% target of coverage is very useful to mobilize resources, either from the international or domestic funds. From my observation, the key decision makers are mostly attracted to the presentation on the importance of achieving 80% target in connection with HIV epidemic in the future, respecting the human rights as well as protecting young generations. This projection tools are one of the powerful advocating tools for the decision makers to prioritize HIV responses in their actions.

6.1.2. Preventing the spread of HIV epidemic among IDUs to the general population

The HIV epidemic among IDUs spreads to the general population mostly through unsafe sexual behaviour. In most Asian countries, heterosexual HIV epidemic spreads through commercial sex (Sex Workers and their clients), and also between higher risk populations (clients of sex workers, MSM, and IDUs) and relatively lower risk populations (29) (75).

A projection study found that in the early stages of a heterosexual epidemic, maintaining HIV prevalence at low levels among IDUs can buy critical time to address rapid growth of heterosexual transmissions (14). In more advanced heterosexual epidemics, preventing HIV among IDUs can still avert a substantial numbers of infections.

Experts in HIV epidemics among IDUs (22) recommend implementing the HIV programme targeting IDUs even without complete information on the exact coverage level to really bring down the HIV incidence. The reason behind this argument is that delaying implementing programmes will permit the virus to spread within IDUs population, making it more difficult to prevent both further transmissions among IDUs and transmissions from IDUs to non injecting sexual partners.

This thesis also finds that the rise of IDUs new infections is followed by the rise of the new infections among low risk women. This implies timely implementation of the comprehensive HIV programme targeting IDUs in West Sumatera is urgently needed. Those are to prevent the further spread of HIV among IDUs and to general population.

In order to ensure proper implementation a political commitment and resource mobilization are highly required.

6.1.3. Increasing the political commitment and support for Strategic Plan implementation

The political commitment at all levels is the key element in relation with fund mobilisation, good governance and effective programme implementation (76). The political commitment also relates to reduction of stigma to remove barriers to accessing services. The wide scale implementation of effective intervention is only possible with the existence of this commitment.

Based on my observation, once the Governor or Vice Governor has confident to respond properly to the HIV epidemic, which reflect in his/her political will, the follow-up actions to programme implementation will be paved. However, that political will needs to be translated into actions. Dedicated, motivated and technically capable persons in the provincial level are very important. To catalyze the process, the national staffs need to support effectively the key persons and provide technical assistance along the way.

In order to optimize the political commitment in West Sumatera, the planning team has to ensure the key person from government to lead the strategic plan development process. It is also important to involve all related stakeholders i.e. related sectors and non-government organizations, in the planning process. A close coordination with the national level is necessary to gain technical support and resource mobilization. A good programme management is required.

Various tools can be applied to increase the stakeholder commitments:

- a tool to guide the implementing agents in reaching the strategic plan targets
- a clear description on sectoral responsibility and intersectoral coordination, aiming to reduce stigma and discrimination within the sectoral and to increase programme implementation under their areas of responsibilities.
- incorporating the health system strengthening, improvement of human resources and institutional management into programme modalities to increase efficiency of the programmes.
- posting the Assistance Team in a strategic position to enable them optimize their role in providing technical assistance in programme implementation period.

6.1.4. Incorporating social concerns into planning

Using mathematical model to produce cost-effectiveness ratio may have some disadvantages. It may not take into account social concern, such as the sick, reducing social inequalities in health, or the well-being of the future generation.

Knowing this potential disadvantage, there is a need to incorporate the social and gender equalities and increasing access to care and treatment. This will only be possible if the stigma and discrimination is well-addressed. A health promotion rather than threatening message is highly recommended, especially in the province with a strong culture related to religious.

Involvement of the education sectors is necessary to highlight the importance of primary prevention targeting young people in a positive way. Increasing the sectors' role to internally mainstream the HIV programme as actions of being the PAC member will also broaden the provincial responsibilities to respond to HIV epidemic. As community-based organizations as well as the non-organizational organizations are the main pillars in community activities, their participation in HIV response needs to be acknowledged in the strategic plan.

6.1.5. Improving the mathematical projection method

This study uses the assumptions to develop West Sumatera AEM. This procedure was undertaken because some related data from West Sumatera is not available. This condition will likely occur at many other provinces in Indonesia. However, the experiences of using models to develop the strategic plan in national and province level were advantageous. It serves as the advocacy tools for stakeholders' involvements and resource mobilization.

The mathematical projection method has some limitations. Brown et al. (29) stated that in spite of the dynamic and realistic picture of an

epidemic we can get from the AEM compared to UNAIDS workbook or EPP, the more complex set of inputs may be an issue especially in countries which have lack of sufficient data. The data issue may raise questions on the validity of the model (14). It is also noticed that the relation between behaviour and disease is more complex than the model can accommodate (77). However, the mathematical projection method has strengths in projecting the potential situations prospectively (17), which is valuable in planning occasion. By using this method we are able to identify parameters having the great effect to the HIV epidemic (19) (22).

In my experience, the use of the model output had support to convince various stakeholders to have the same perspective in looking at the problems of HIV and AIDS. This increases the alignment process in coordinating the actions, which in turn, had enabled the NAC/PAC to take the lead to more coordinated responses.

Although Indonesia, especially in province level faces the problems related to the lack of data, the use of mathematical projection is likely to increase in the future. Therefore, Indonesia needs to have access to update to the new findings. The technical assistance from the national level has to ensure the provision of technical assistance from the international level. To date, to increase the use evidence-based strategic planning, the collaboration between the NAC - involving key stakeholders including sectors, NGOs and Universities; Health Policy Initiative – USAID; HCPI - AusAID and UNAIDS facilitates the provision of particular technical assistance.

6.1.6. Further study required to improve the unit cost accuracy

This thesis uses the unit costs for Indonesia which were defined by using the weighted costs from three independent programmes. Now, since the unit costs has been extensively used, it is important to carry out the evaluation on the accuracy of the unit costs. To increase the quality of the planning, it is recommended to employ further study on the costing.

6.2. Conclusion

Based on the discussion, the main conclusion is to move toward 80% level of coverage, since the cost effectiveness is not the only consideration. The Universal Access, social concerns and prevention further spread of HIV are also very important. Timely intervention is not only important but also urgent. However, this will have a considerable cost implication. Those aforementioned recommendations, in my opinion are feasible, because the leadership of the provincial government to respond to HIV epidemic is getting stronger. However, it still needs a strong advocacy actions and resource mobilization at all levels. It also requires the strengthening of human resource, institutional and health system.

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