



# ENDING AIDS IN MALAYSIA



Myth or reality?

MINISTRY OF HEALTH MALAYSIA  
PUTRAJAYA, 2015

# Ending AIDS in Malaysia

## Myth or Reality?



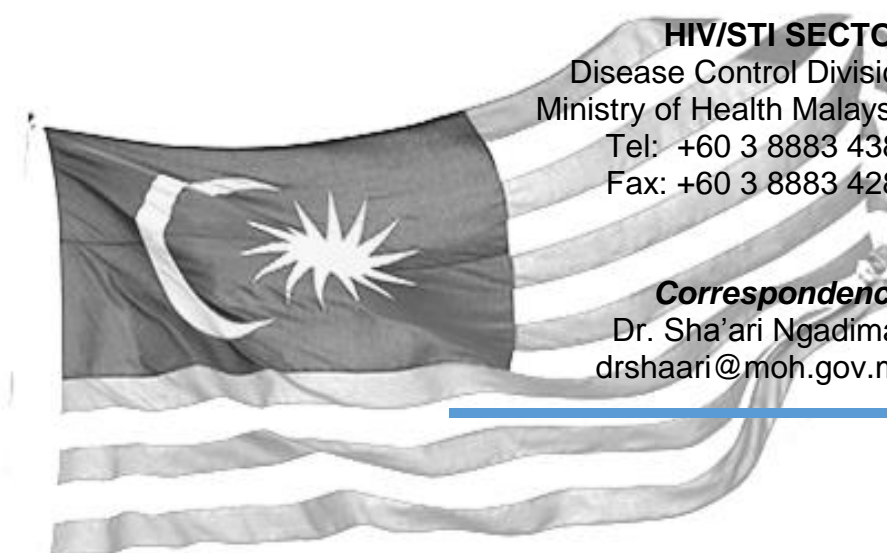
---

**Report prepared by:**

**HIV/STI SECTOR**  
Disease Control Division  
Ministry of Health Malaysia  
Tel: +60 3 8883 4387  
Fax: +60 3 8883 4285

**Correspondence:**  
Dr. Sha'ari Ngadiman  
drshaari@moh.gov.my

---



This report was coordinated and produced by HIV/STI Sector of Ministry of Health Malaysia.

**Malaysia AEM Core Team:**

1. Dr. Sha'ari Ngadiman (Modelling Advisor, Public Health Consultant)
2. Dr. Anita Suleiman (Modelling Team Leader, Public Health Physician)
3. Dr. Salina Md. Taib (M&E, HIV/STI Sector)
4. Dr. Hairul Izwan Abdul Rahman (Public Health Physician, Perak)
5. Dr. Rohaya Rahman (Public Health Physician, Pahang)
6. Hairudin Masnin (UNAIDS)
7. Parimelazhagan Ellan (Malaysia AIDS Council)
8. Tamayanty Kurusamy (Malaysia AIDS Council)

**TECHNICAL CONSULTANT:**

Dr. Wiwat Peerapatanapokin (East-West Centre Hawaii)

**EDITORIAL TEAM**

*Dr. Sha'ari Ngadiman, Chief Editor*

*Dr. Anita Suleiman, Lead author*

*Dr. Salina Md Taib*

*Dr. Hairul Izwan Abdul Rahman*

*Dr. Rohaya Rahman*

*Dr. Mohd Nasir Abd. Aziz*

*Dr. Zahariyah Yaacob*

*Parimelazhagan Ellan*

*Tamayanty Kurusamy*

*Shamala Chandrasekaran*

## Ending AIDS in Malaysia: Myth or Reality?



### *Acknowledgements*

*This document presents the result of the AIDS Epidemic Model (AEM) Projections for HIV/AIDS in Malaysia 2015-2030 prepared by the AEM Core Team. These projections were especially prepared to guide the development of the Malaysia 3<sup>rd</sup> National Strategic Plan for HIV and AIDS 2016-2030.*

*The editorial team would like to express our deepest appreciation to all those who provide the possibility to complete this report. Our special thanks to UNAIDS team for giving us a platform to conduct and develop the country's HIV and AIDS projections.*

*Furthermore, we would also like to acknowledge with much appreciation the role of the state AIDS Officers who provided us crucial data to the extent of collecting data in a form of small surveys for better estimates. Special thanks to the following AIDS Officers – Dr. Janizah Ghani (Penang), Dr. Hazura Mat Zubir (Kelantan), Dr. Mahani Nordin (Terengganu), Dr. Masitah Mohamed (Selangor), Dr. Norhayati Md Amin (Melaka), Dr. Surinah Asan (Johor), Dr. Ruziana Miss (Sarawak), Dr. Khamisah Awang Lukman (Sabah) and Dr. Rohemi Abu Bakar (Perlis).*



## Foreword



The development of AIDS Epidemic Model for Ending AIDS in Malaysia marks another important milestone in the country's unswerving commitment in shaping effective and sustainable response to the epidemic. To date, the country has notched many successes through its determined leadership aimed at reversing and halting the epidemic. New HIV infection rate has declined by half, falling from 22 per 100,000 populations in 2000 to 11 per 100,000 populations in 2009. The number of new infections have been stable in the past five years though it edged up in 2010.

Our almost three-decade long response to the HIV epidemic without signs of complacency has enabled us to achieve the MDG 6 target of reducing by half the proportion of new HIV infections. We need to build on these successes and maintain the momentum. The challenge is to sustain the achievement and embark on the fast track strategy to close the book on AIDS epidemic by 2030 or earlier, the first effort of its kind in the country. To achieve this goal, a powerful yet realistic tool such as the AIDS Epidemic Model (AEM) is pivotal.

Ending AIDS in this country may be ambitious but it is certainly doable. To succeed, we must first understand well the current situation and next, find the best tool to end AIDS epidemic. AEM explores the baseline (based on current responses) and projects best options that would yield the highest impact in saving lives, averting costs and advancing productivity and economic growth. Using country's best available data, this model will guide Malaysia on the way forward in materializing the aspiration.

It is clearer than ever that the effort to end the AIDS epidemic is an investment rather than a cost. This projection is timely as a starting point for post-2015 new strategic plan development. We would like to thank Malaysia AEM Core Team for their tremendous and relentless efforts in developing an HIV epidemic model for the country. Special thanks to Mr. Steve Krauss, regional Director of UNAIDS for Asia Pacific and his team and especially to Dr. Wiwat Peerapatanapokin, East-West Center Hawaii for his technical expert assistance. Last but not least, we would like to acknowledge the tremendous contribution and efforts that went into the preparation of this report.

A handwritten signature in black ink, appearing to read 'fhd', written over a white background.

**DATUK DR. NOOR HISHAM BIN ABDULLAH**  
**DIRECTOR GENERAL OF HEALTH MALAYSIA**

## Table of Contents

Foreword .....	iv
List of figures .....	vi
List of tables .....	vi
List of abbreviations .....	vii
Chapter 1 Country Responses on HIV.....	1
1.1 A Snapshot on Country Responses	
1.2 The surveillance system	
1.3 Epidemic overview	
1.4 HIV testing	
1.5 Treatment coverage	
1.6 Harm Reduction Programme	
1.7 Sexual transmission of HIV	
1.8 Rational	
Chapter 2 The Modelling Process.....	10
Chapter 3 The Baseline .....	12
Chapter 4 Designing Investment Options for Ending AIDS.....	17
4.1 What investment options do we have?	
4.2 Investment impact	
4.3 Key messages	
Chapter 5 What Next: Future Deliverables.....	25
5.1 Priority to 'End AIDS'	
5.2 Recommendation - Ending AIDS in Malaysia	
5.3 Conclusion	
Annex 1 Key Behavioral inputs .....	28
Annex 2 Snapshots of AEM Country Team in action.....	35

## List of figures

- Figure 1 Chronology of development of ARV component in continuum of care, treatment and prevention of HIV and AIDS in Malaysia
- Figure 2 Reported HIV and AIDS-related deaths, Malaysia 1986 – 2013
- Figure 3 Proportion of new HIV infection by Mode of Transmission, Malaysia 2000 – 2013
- Figure 4 HIV screening in Malaysia, 2000 - 2013
- Figure 5 ART coverage, Malaysia 2003 – 2013
- Figure 6 Treatment and prevention coverage, 2013
- Figure 7 Estimated numbers of new HIV, PLHIV and AIDS-related death in Malaysia, 1986 – 2030
- Figure 8 Proportion of HIV new infection by Mode of Transmission, Malaysia 2000 – 2030
- Figure 9 Estimated and projected number of cases by Mode of Transmission, Malaysia 1986 – 2030
- Figure 10 Total adult ART coverage and need, Malaysia 1986-2030
- Figure 11 New HIV Infections for total adult, Malaysia 2000-2030
- Figure 12 Total Resource Needs, Malaysia 2014-2050
- Figure 13 Resource Needs for total ART, 2013-2030
- Figure 14 Total investment and DALY saved, Malaysia 2015-2021

## List of tables

- Table 1 Major milestones of the country's responses
- Table 2 Pattern of condom use with last sexual partner, Malaysia 2009 & 2012
- Table 3 Distribution of KPs who have been tested for HIV, Malaysia 2009-2013
- Table 4 HIV prevalence among KPs, Malaysia 2009-2013
- Table 5 Overall impact of HIV epidemic
- Table 6 Summary of definition for each scenario
- Table 7 Summary of total resource need based on investment scenarios
- Table 8 Total annual resource need for 'Ending AIDS', 2015 – 2050
- Table 9 Summary of cost-effectiveness by different investment options

## List of Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
ART	Anti-Retroviral Therapy
BSS	Behavioural Surveillance Survey
CBO	Community-based Organization
DIC	Drop-In Centre
DRC	Drug Rehabilitation Centre
FRHAM	Federation of Reproductive Health Associations of Malaysia
HAART	Highly Active Anti-Retroviral Therapy
HIV	Human Immunodeficiency Virus
PWID	Injecting Drug Use/User
IBBS	Integrated Bio-Behavioural Surveillance
MAC	Malaysian AIDS Council
MDGs	Millennium Development Goals
MMT	Methadone Maintenance Therapy
MOH	Ministry of Health
MTCT	Mother-to-child transmission
MWFCD	Ministry of Women, Family and Community Development
NADA	National Anti-Drug Agency
NGO	Non-Government Organization
NSEP	Needle and Syringe Exchange Programme
NSP	National Strategic Plan on HIV/AIDS
PLHIV	People Living with HIV
PMTCT	Prevention of Mother-to-Child Transmission
SRH	Sexual Reproductive Health
STI	Sexually Transmitted Infection
SW	Sex Worker
TB	Tuberculosis
TG	Transgender
UNAIDS	United Nations Programme on HIV/AIDS
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
UNFPA	United Nations Population Fund
UNGASS	United Nations General Assembly Special Session
VDTs	Venue-Day-Time- Sampling
WHO	World Health Organization



## CHAPTER 1: COUNTRY RESPONSES ON HIV

### 1.1 A Snapshot on Country Responses

Malaysia's response could be traced back to 1985 with formation of the National AIDS Task Force. Chaired by the Director General of Health, this task force was responsible in formulating policies and coordinating AIDS Prevention and Control activities. A year later the first case was reported.

For more than 2 decades, Malaysia's epidemic has been and still concentrated with people who inject drug (PWID), female sex workers (FSW), transgender (TG) and men who have sex with men (MSM) represent populations most affected by the epidemic with HIV infection rates exceeds 5%. At the beginning of the epidemic, PWID was the main driver bearing the brunt of about 70-80% of all new reported cases.

Efforts to bring down the HIV infection in the country has started long before the MDG commitment was in place. The first National Plan of Action on AIDS was developed in 1988 focusing mainly on advocacy, screening, prevention and surveillance system on HIV/AIDS and AIDS-related death (table 1). High level commitment on HIV has led to formation of AIDS/STD Section within Ministry of Malaysia in 1992. This sector act as National Programme Coordinator. Beside rigorous health awareness campaign, active HIV screening was key response during 1990s that include screening of blood donors, prisoners, inmates of drug rehabilitation centers, STI and TB cases and contacts of HIV cases. HIV screening for premarital couples was added in 2002.

In 1998, prevention of mother-to-child transmission of HIV (PMTCT) became the country's key program where screening of all antenatal mother attending government health clinics was implemented country wide. To prevention vertical transmission of HIV, all HIV-positive mothers were given free antiretroviral therapy, ART prophylaxis given to all HIV-exposed infants and routine PCR test was strictly observed. To further prevent HIV transmission through breast milk, all HIV-exposed infants were given free replacement feeds.

With PWID being the major affected sub-population, the government has initiated, as in the National Strategic Plan (NSP) 2006 – 2010, the Harm Reduction (HR) programme with Methadone Maintenance Therapy (MMT) and Needle/Syringe Exchange (NSEP) being the key component. Fully funded by the government, NSEP was implemented country wide in 2006 to reduce if not altogether halt HIV infection among PWID in the country. Aside from MMT and NSEP, HR programme incorporated other services - voluntary counselling and testing (VCT), antiretroviral (ARV) drugs, treatment for sexually transmitted infections (STIs), adherence counseling, behavior change communication, social welfare, job placement, and rehabilitation. Today, HR programme remains at the heart of Malaysia's response to HIV and AIDS. It is jointly implemented by the MOH, the National Anti-Drug Agencies (NADA), the Prison Department, as well as NGOs - all zealously working together to make the programme a major contributor to the HIV and AIDS response of the country.

To address sexual transmission of HIV, the government was in partnership with the Non-Government Organization (NGO) through Malaysia AIDS Council (MAC) in delivering appropriate preventive services and education to KPs who are more vulnerable to sexual transmission of HIV - FSW, MSM and TG. Established in 1992, MAC functions as an umbrella organization that supports and coordinates the efforts of NGOs, civil societies and community-based organizations (CBO) related to HIV and AIDS work in the country. The allotted government funds are disbursed through MAC to more than 30 NGOs working on HIV and AIDS issues throughout the country.

Through these years, the MOH initiated Government – Non Government Organization (GONGO) partnership has demonstrated tremendous collaborative efforts in collectively mapping the way forward. The GONGO partnership places great emphasis on strengthening partnerships with non-governmental organizations, mobilizing the community members and actors in joining forces and building their capacity for a more sustainable and effective response to the epidemic.

While most part of the Asia Pacific are threatened by sustainable funding for its HIV and AIDS programmes, Malaysia has witnessed successes in reduction of new infections and AIDS-related deaths and increase in treatment coverage and support, mainly due to MOH's prioritization of the key populations (KPs) in its national response to HIV and AIDS. The MOH has allotted more than 72 million (USD22.6 million) since year 2003 for implementation of impactful prevention and treatment, care and support programmes amongst the KPs in the country. Undoubtedly, the MOH recognizes the pivotal role of civil society in complementing the government's effort to effectively respond to the epidemic. The MOH crafted a unique, meaningful opportunity for greater involvement of the community and its actors to be part of the national response through the establishment of the Malaysian AIDS Council (MAC) under its initiative in year 1992.

Malaysia has made a significant progress in expanding the availability and accessibility of antiretroviral (ARV) in the country since the government introduced ARV as an integral component in the continuum of care, treatment and prevention in 1990 (Figure 1). Through sufficient investment and timely acceleration of ARV provision, more people living with HIV (PLHIV) are able to live longer, decreasing the total number of AIDS related death in the past years. At the initiative of the MOH, in 2003 Malaysia became the first country to issue a compulsory license following the adoption of the Doha Declaration on Trade-related aspect of Intellectual Properties (TRIPS) and Public Health by the 2001 Ministerial Conference of the World Trade Organization.

The policy to provide free 1st line ARV to all PLHIV in 2006 marked an important milestone in the national response to the HIV epidemic followed by a shift in ARV initiation from CD4 200 to 350 cells/ $\mu$ L in 2010. Latest development in prevention of transmission to sexual partner - implementation of treatment for sero-discordant couple introduced in Consensus Guidelines on Antiretroviral Therapy 2014.

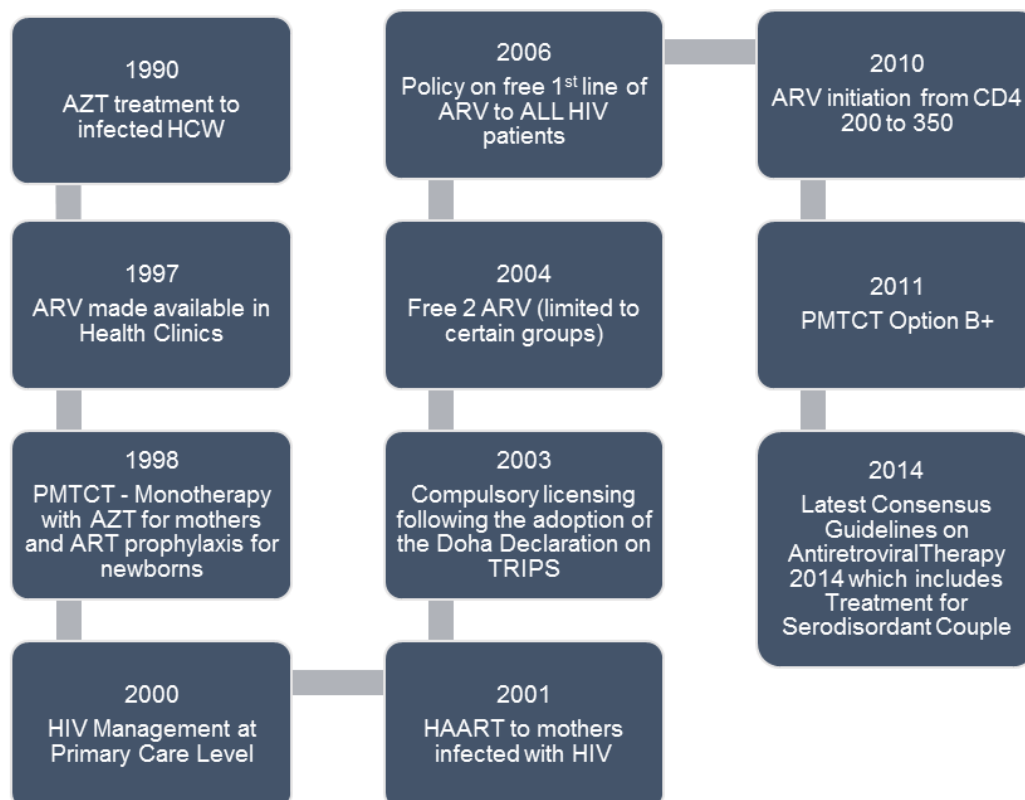
For more than two decades, Malaysia has notable successes against AIDS and this is contributed largely by political commitment that has ensured sustainable financing from public purse. A great deal of allocation for HIV response have been spent on the provision of HIV

treatment. In general, the total expenditure has increased every year and in 2013, total expenditure was calculated at around RM181 million (USD56.5 million), an increase of 2.6% compared to the previous year. Of the country's total expenditure on HIV, 95% was contributed by domestic public fund or around RM172 million (USD 52.3 million) while international fund contributed to only 4%.

Table 1. Major milestones of the country's responses

<b>Year</b>	<b>National Response</b>
1985	National AIDS Task Force
	National Surveillance System
<b>1986</b>	<b>First case reported</b>
1988	First National Plan of Action on AIDS
1992	Formation of AIDS/STD Section (National AIDS Programme Secretariat)
	Formation of Malaysia AIDS Council (MAC)
1990	Screening of HIV - prison, drug rehabilitation centers, TB/STI patients, sex workers, antenatal (sentinel)
	Public awareness campaigns
	Provision of AZT treatment for health care worker exposed to HIV
1997	AZT made available in government Health Clinics
1998	Revised Plan of Action on HIV/AIDS
	Prevention of Mother-to-Child Transmission of HIV (PMTCT) Programme
2000	Cabinet Committee on AIDS (CCA)
	HIV Management at Primary Care
2002	Premarital HIV Screening Programme
2003	Government partnership with MAC through funding scheme
2004	Provision of Free two ART to limited group
2005	Harm Reduction Programme
2006	1 <sup>st</sup> National Strategic Plan for HIV and AIDS (2006 – 2010)
	Provision of Free first line ART to all Malaysians
2009	National AIDS Registry
2010	Shifting of CD4 threshold for ART initiation from 200 to 350 cells/ $\mu$ L
2011	2 <sup>nd</sup> National Strategic Plan for HIV and AIDS (2011 – 2015)
	Treatment Option B+ for PMTCT
	Provision of isoniazid prophylaxis for PLHIV
2013	City Getting to Zero

Figure 1. Chronology of development of ARV component in continuum of care, treatment and prevention of HIV and AIDS in Malaysia.



## 1.2 The surveillance system

HIV and AIDS case notification was initiated in 1985 and further strengthened in 1988 with introduction of first National Plan of Action for Prevention and Control of HIV. Over 25 years, a number of surveillance related activities have been in place namely:

### (a) Case notification

All HIV, AIDS and AIDS-related death diagnosed by registered medical practitioners are required to be reported manually to the Ministry of Health as stipulated in the Prevention and Disease Control Act 1988. A nominal case reporting, this surveillance system aimed to better characterize the populations in which HIV have been newly diagnosed and also for public health follow up. Source of notifications include health facilities, routine HIV screening among drug users in drug rehabilitation centers and prisons, TB and STD patients, women attending antenatal clinics and blood donors. This system was upgraded to web-based notification in 2001.

### (b) National AIDS Registry

The Ministry of Health established the National AIDS Registry (NAR) in 2009. Intended to replace the existing surveillance system, the internet-based registry is designed to function as

streamlined and effective national HIV programme monitoring mechanism and able to capture detailed disaggregated data continuously and systematically. The registry captures data on each HIV patient relating to their socioeconomic background, risk factor, date of confirmation, contact information, AIDS-related symptoms and so on.

(c) Behavioral surveillance system

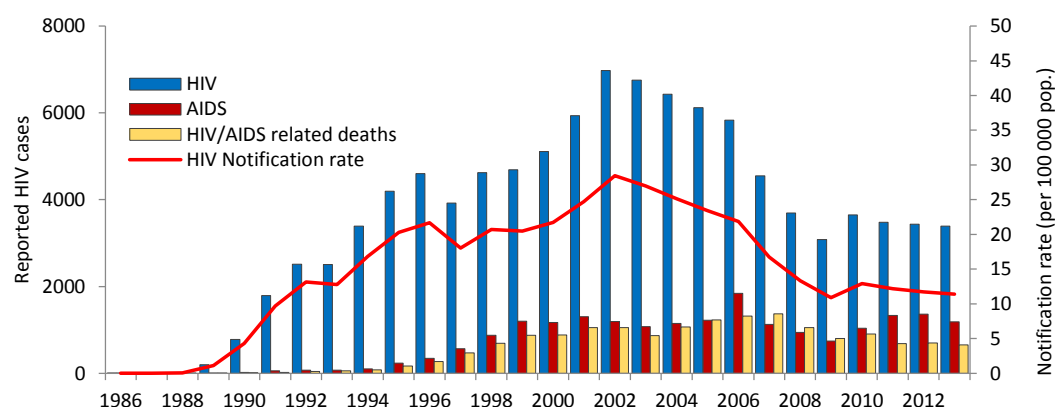
Malaysia had begun implementing the third generation surveillance system (Behavioral Surveillance System) among KPs for the first time in 2004 under the auspices of Ministry of Health Malaysia. Biological component (HIV test) was integrated in the survey in 2009. Going for its third round, integrated bio-behavioral surveillance survey (IBBS) is currently complementing the National Surveillance System and conducted periodically.

### 1.3 Epidemic overview

As informed by the surveillance system, the new HIV infection in this country decreased by about 50% between 2000 and 2009 but that decline has stalled in recent years (figure 2). The notification rate of HIV also continues to experience a decrease from 28.4 in 2002 to 10.9 cases per 100,000 populations in 2009 and remain largely unchanged in the last 5 years.

The number of reported AIDS-related deaths is also declining. The reduction has been directly attributed to the introduction of more affordable and accessible first and second line life-saving ARV treatment. By the end of 2013, there were 17,369 PLHIV on treatment which is 47% of the estimated number of PLHIV eligible for ARV treatment (37,274; EPP).

Figure 2. Reported HIV/AIDS and AIDS-related deaths, Malaysia 1986 – 2013



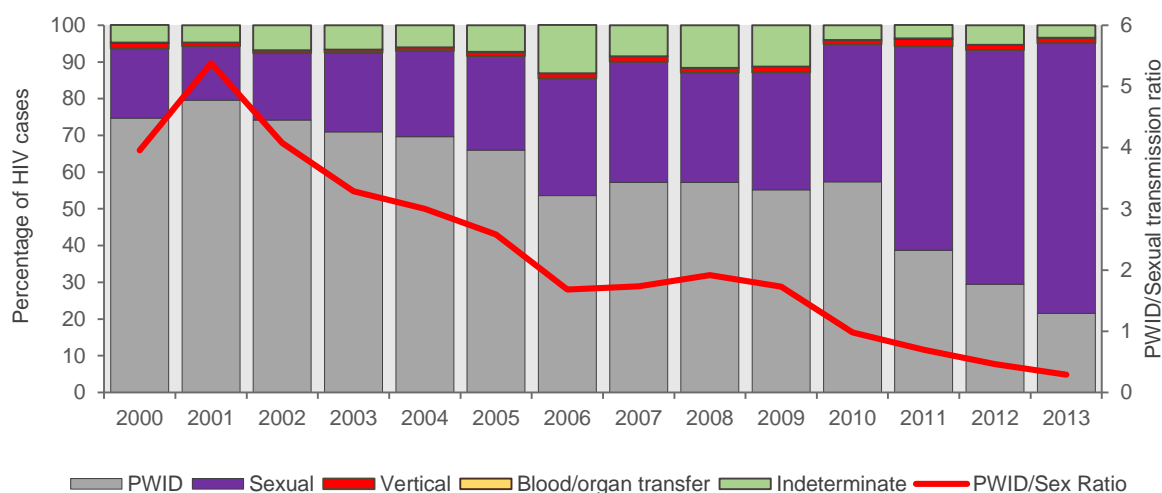
In the earlier phase of the epidemic, PWID was the key driven factor. With rigorous implementation of harm reduction programmes since 2005, the country is shifting progressively from PWID predominant to more sexual transmission with PWID/sexual transmission ratio of 3.9 in 2000 to 1 in 2010 and to 0.3 in 2013 (figure 3)



### 1.4 HIV testing

HIV screening in Malaysia has started as early as 1985 with screening of donated blood and blood products. Provided free in all government health facilities, the Ministry adopted voluntary and confidential HIV test (VCT) as well as Provider Initiated Testing and Counselling (PITC). Among the screening programme that has been implemented are routine HIV screening of all donated blood, blood products and organs, antenatal mothers, inmates in drug rehabilitation centers and prisons, TB and STI cases, clients of harm reduction programme, contacts of cases and voluntary screening for premarital couples.

Figure 3. Proportion of new HIV infection by Mode of Transmission, Malaysia 2000 – 2013



Over the past five years, an average of 1.3 million HIV screening was conducted (Figure 4). In 2013, about 1,328,031 men and women aged 15 and above had received HIV test and counseling and know the result, out of which 1,412 (0.11%) were HIV positive. Despite intensified screening activities, the detection rate of HIV is declining - compatible with the declining HIV cases reported through the surveillance system. It also validated the reduction in new HIV cases in the country as estimated through estimation and projection exercise. Based on surveillance data and screening activities, it was clearly shown that the HIV infections in this country are still confined within the KPs.

### 1.5 Treatment coverage

Malaysia is committed to provide clinical care through the public health system. Heavily funded by government, this include free or subsidized ART, point of care CD4 and viral load test and other related services. This services have been extended to include inmates of drug rehabilitation center (DRC) and prisoners who are living with HIV.

The Government’s achievements in the area of HIV treatment have been improving annually (figure 5). Health services in the hospital and primary healthcare systems are of high standard, especially those relating to clinical management of HIV. This commitment would take on the form of improving the availability of treatment and lowering the actual cost of treatment. It also aimed to obtain the widest range of ARV drugs at the best possible cost to the Government.

Two significant achievements have been accomplished, firstly, the availability and provision of first line ARV treatment at no cost for those who need it and secondly, the availability of ARV treatment for incarcerated populations specifically for HIV positive prisoners as well as inmates in drug rehabilitation centers.

Figure 4. HIV screening in Malaysia, 2000 - 2013

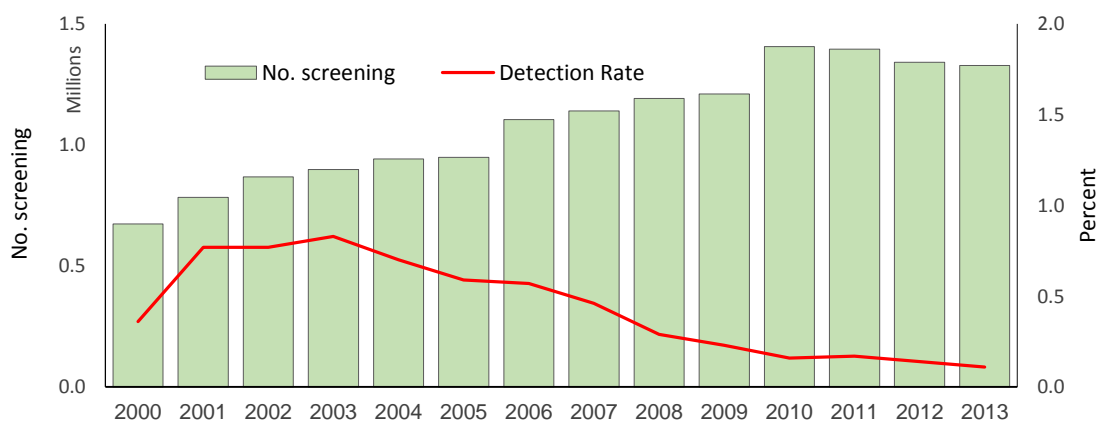
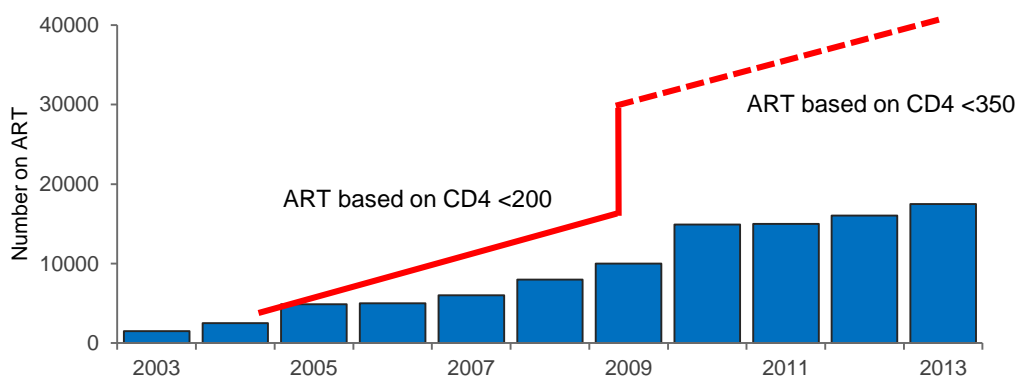


Figure 5. ART coverage, Malaysia 2003 – 2013



### 1.6 Harm Reduction Programme

Harm reduction initiatives - the Methadone Maintenance Therapy (MMT) and needle/syringe exchange program (NSEP) have been part of the Malaysia response for several years now. Together, these programmes aimed at reaching out to 102,000 (60%) persons out of estimated population of 170,000 PWID by 2015. Provision of harm reduction services continues and up-scaled through 692 NSEP sites and 466 MMT outlets established in government health facilities, NGO sites, private health facilities, National Anti-Drug Agency (NADA) service outlets and prisons. As of 2013, NSEP programme has reached out to 72,686 PWID. In the same year, the average distribution of needle and syringe were about 116 per PWID. As for MMT programme, it has reached out to 33,444 drug users country wide. In total, 106,130 (62%) drug users were reached out through Harm Reduction Program.

### 1.7 Sexual transmission of HIV

In addressing sexual transmission of HIV, coverage of interventions has improved through smart partnership with NGO. Guided by the National Strategic Plans, the Malaysian AIDS Council and its Partner Organizations (PO) continue working towards implementation of targeted community-based interventions encompassing promotion and provision of preventive tools, behavior change communication materials and effective linkages to clinical services amongst the sex workers, transgender and men who have sex with men communities.

Periodic IBBS showed improvement in condom use behavior among most KPs and HIV test coverage has certainly got better. Overall HIV prevalence has declined except for MSM (table 2-4).

Table 2. Pattern of condom use with last sexual partner, Malaysia 2009 & 2012

Key Population	IBBS 2009	IBBS 2012
Female sex workers	60.9%	83.4%
Transgender	95%	83%
MSM	63%	76.7%

Table 3. Distribution of KPs who have been tested for HIV, Malaysia 2009-2013

Key Population	IBBS 2009	IBBS 2012
Female sex workers	46.1%	32.4%
Transgender	48.6%	43%
MSM	41%	51.2%

Table 4. HIV prevalence among KPs, Malaysia 2009-2013

Key Population	IBBS 2009	IBBS 2012
Female sex workers	10.5%	4.2%
Transgender	9.3%	4.8%
MSM	3.9%	7.1%

### **1.8 Rational**

Over 25 years, the HIV epidemic has declined and Malaysia has almost reached its national target with halving new HIV transmission to 11 per 100,000 populations by 2015. Those achievements were brought about by workable Policy, Partnership and multi-stakeholder Participation (3Ps). However, progress remain uneven. About half of eligible people living with HIV (PLHIV) have no access to life saving treatment and ART. Progress is lagging on targets such as reducing sexual transmission by 50 per cent and making significant impact on stigma and discrimination. Malaysia is highly committed to assure that HIV is no longer a public health threat. This initiative is timely and undertaken to find out the current situation of HIV and to find out the best options that will give the highest impact in responding to AIDS through modelling exercise using AIDS Epidemic Model (AEM) version 4.05.

## CHAPTER 2: THE MODELLING PROCESS

### 2.1 *The Methodology*

In order to predict the future trend of HIV and to assist in the appropriate strategic planning, we embarked upon a process of constructing an epidemic model for the country using AIDS Epidemic Model (AEM). An updated version of Asian Epidemic Model (v4.04), the AEM application is a tool that provide a picture of past and future epidemics and enables policy makers to estimate the future impact of proposed policies and programme coverage levels, as well as the size of investment. The analytical work and review process started in October 2014 through April 2015. A technical Working Group consist of expert in HIV program, behavioral survey, M&E, representatives of civil societies and UNAIDS country manager was responsible in collecting, collating, analyzing and triangulating data from various programmatic and survey data.

Three workshops were held to develop, validate and analyze a baseline model and a set of scenarios for the response with expert assistance from East-West Centre Hawaii (Dr. Wiwat Peerapatanapokin). The first workshop (October 2014) worked towards the development of a baseline model including unit costs; the second (December 2014) validated and refined the baseline model and began work on scenarios for Malaysia's epidemic; and a final review of the scenarios and unit costs was conducted at the third workshop (April 2015).

The AEM uses existing data that include:

- (a) Population data including demographic information (by age and gender)
- (b) Population size estimates for key populations derived from previous study and consensus.
- (c) Behavior data from three (3) studies – Behavioural Surveillance Survey (BSS) 2004, Integrated Bio-Behavioral studies (IBBS) 2009 and 2012. Information include injection practices, needle sharing, proportion of condom used, and sexual behavior among KPs.
- (d) HIV/AIDS reported cases from National Surveillance System.
- (e) ART coverage by sub-populations.
- (f) National M&E data for HIV screening among antenatal mothers, premarital couples, closed settings (drug rehabilitation centers and prisons), STI and TB cases.
- (g) HIV screening at VCT centers in the government health clinics and community-based clinics.
- (h) Outreach program coverage from civil societies.

Wherever necessary, data were interpolated for missing values and weighted to get national representativeness. Data were entered into AEM worksheets using AEM Tool as projection engine. Baseline estimates and projections resulting from the model were finally validated with



national surveillance data and other available M&E data. Finally, we run impact analysis using the baseline scenario (current interventions) compared with several alternative scenarios incorporating medium coverage and ambitious coverage of interventions. The precise sources of information on key behaviours are described in more details in annex 1.

### CHAPTER 3: THE BASELINE

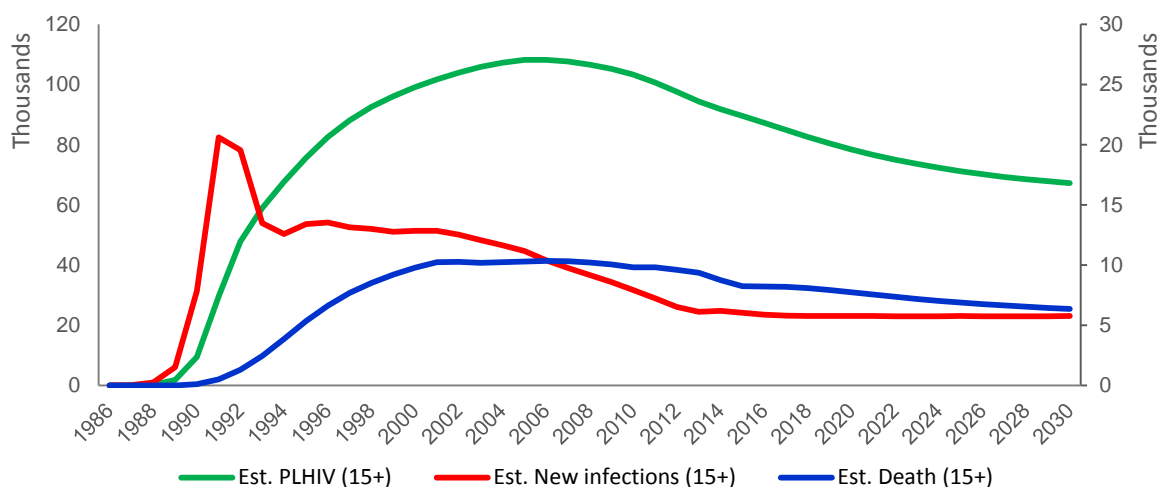
This chapter describes current AIDS epidemic and its course in Malaysia based on outputs generated from AEM package; this is referred as ‘Baseline’ scenario. The baseline scenario illustrates impact of HIV epidemic based on prevention and treatment coverage as in 2013 (business as usual).

The prevention interventions for key populations in 2013 were reaching 52% of PWID, 52% of FSW, 49% of TGSW and 38% of MSM (figure 6). Treatment coverage was reaching only 44% of eligible PLHIV (CD4 <350). Majority of PLHIV in Malaysia who either did not know their HIV status or had not been initiated on ART was PWID, not initiated for fear that they may not be able to adhere to the regime. Using this baseline levels and assuming that the interventions continue at the present level, the model predicted that the new HIV cases will decline and stabilized from 2014 onwards (Figure 7). This could be due to declining new cases among PWID as they change substance use from injecting to oral drugs. At the same time HIV cases among other risk groups would increase as more get tested and treated early. This projection indicates that the HIV transmission would be ongoing in 2021 and beyond, AIDS-related death and HIV prevalence gradually declining.

Figure 6. Treatment and prevention coverage, 2013



Figure 7. Estimated numbers of new HIV, PLHIV and AIDS-related death in Malaysia, 1986 - 2030



As for mode of transmission, PWID would remain the main driver of the epidemic that contribute to about 54% of total cases in 2013 and increasing thereafter (figure 8). The number of cases among MSM and low risk female (LRF) are expected to increase and inversely, number of cases among low risk male (LRM) declining (figure 8). We assume that LRM acquire infection from FSW<sup>1</sup> (IBBS 2012). HIV transmission among the low risk female (LRF) most probably comes from their male PWID partner as reported in our programmatic data on antenatal screening.

ART not only improves quality and saving life of PLHIV but also prevent transmission. Based on current ART coverage (at 44%) and projected forward, the AIDS-related deaths and new HIV infection decreases for a couple of decades and stabilized (figure 7). Figure 10 shows the trend of ART coverage and as summarized in table 5, it is projected that ART coverage barely would reach half of those in need if interventions remain the same as in 2013.

<sup>1</sup> Ministry of Health Malaysia. Integrated Bio-Behavioural Surveillance Survey 2012 (unpublished)

Figure 8. Proportion of HIV new infection by Mode of Transmission, Malaysia 2000 - 2030

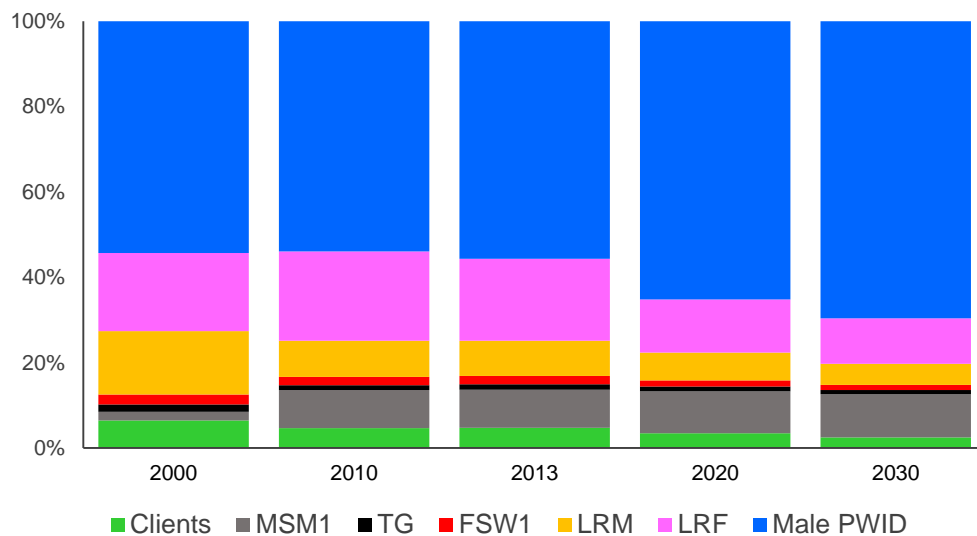


Figure 9. Estimated and projected number of cases by Mode of Transmission, Malaysia 1986 – 2030

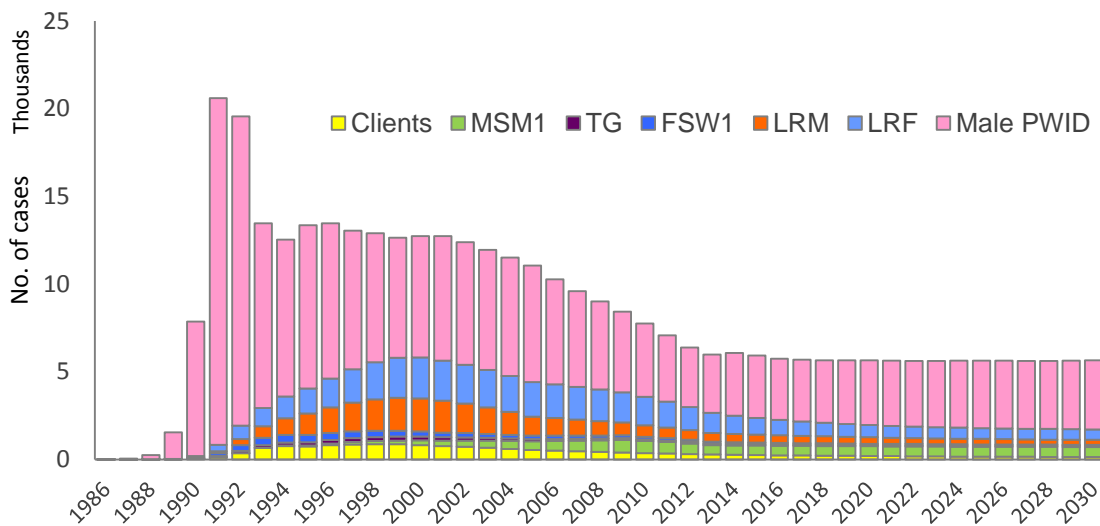
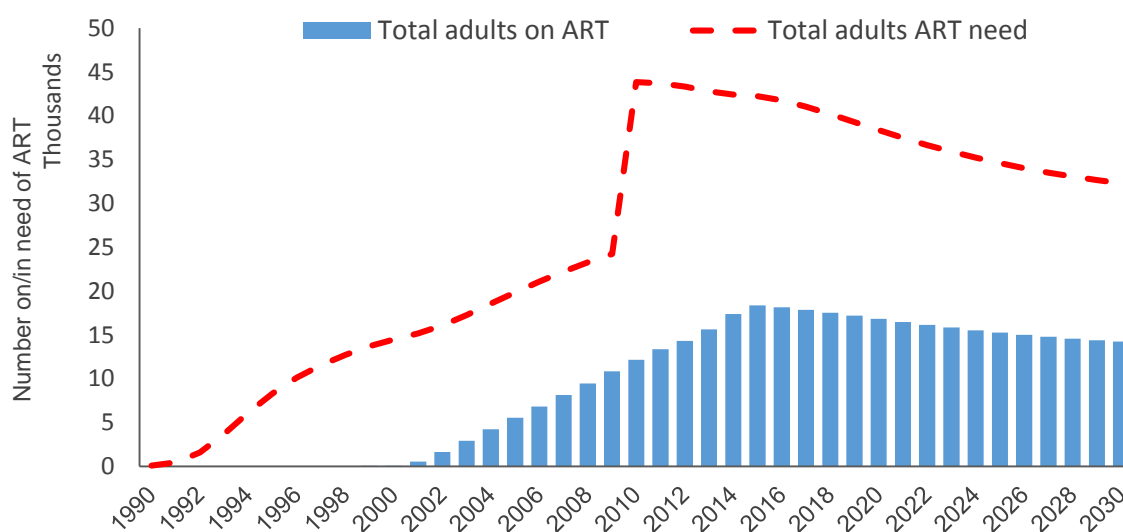


Table 5. Overall impact of HIV epidemic

Sub-epidemic model	2000	2010	2013	2020	2030
PLHIV	99,175	103,319	94,399	78,480	67,277
New HIV infection	12,853	7,936	6,118	5,780	5,781
Annual AIDS related death	9,809	9,838	9,366	7,748	6,373
Number of PLHIV on ART	82	12,148	15,615	16,826	14,236
PLHIV in need for ART (CD4 < 350 counts)	14,487	43,842	42,764	38,350	32,305

Figure 10. Total adult ART coverage and need, Malaysia 1986-2030



### Model validation

The baseline scenario and unit costs were validated using national surveillance and programmatic data. In addition to that, several consensus were carried out with various government, non-government agencies and community representatives. Based on AEM model, PWID comprised of 53% of total cases in 2013, however the National Surveillance data reported only 23%. This proportion was adjusted according to proportion of testing among non-PWID. It was observed that there has been an increase in HIV testing by 3-fold among non-PWID groups. After adjustment, the proportion of PWID and other KPs are compatible with the National Surveillance data.



Based on the National Surveillance and the model, it clearly shows that PWID is still the main contributor for the country epidemic. Cases among PWID as reported in the surveillance system was declining and lower than in the model because most PWID have been picked up through screening programmes earlier from various sources (MMT, NSEP, DRC and prison). Based on programmatic data, the uptake of HIV test among other KPs has increased by 3-fold, however the HIV prevalence is stable.

### **Summary of key messages**

At baseline scenario,

1. New HIV infection showed a smooth decline at the beginning but reached plateau from 2014 onwards. This means that the epidemic will continue, thus ending AIDS is far from reality.
2. AIDS-related death would be declining but only gradually.
3. Epidemic would be largest in PWID with increasing proportions reaching 62% of all by 2030.
4. The infections among MSM would continue to climb slowly in the range of less than 10%. In opposite, infections among LRM, LRF, clients of FSW and TG would be declining.
5. This model showed that more than 50% PLHIV still would not get ART; this explain the slow decline of AIDS-related deaths.

## CHAPTER 4: DESIGNING INVESTMENT OPTIONS

### 4.1 *What investment options do we have?*

Using AEM, we projected six (6) best investment scenarios that focus on ending AIDS. The definition for each scenario is summarized in table 6. The summary findings are as follow.

a) Scenario 1: Business as usual

This scenario shows how the epidemic would progress over the years if the present prevention intervention and treatment coverage remain as in 2013. The average annual resource need from 2015 to 2021 would be around **USD 25.2 million** (RM 93.2 million).

b) Scenario 2: Accelerate treatment only

This scenario looks at the impact of a rapid scale-up of universal access to ART by adopting the 'test and treat' model (treating 90% of PLHIV regardless of CD4 count), while sustaining prevention coverage at current levels for all KPs. This scenario would require an average annual investment of **USD 71 million** (RM 262.7 million) from 2015 to 2021.

c) Scenario 3: Scale-up Prevention only

In this scenario, the prevention coverage is scaled up for the KPs with the greatest need - 80% coverage for opioid substitution therapy and 15% for needle exchange programme, 80% coverage for female sex workers, MSM and transgender respectively. This scenario would require an average annual investment of **USD 28.7 million** (RM 106.2 million) from 2015 to 2021.

d) Scenario 4: Scale-up Harm Reduction for PWID and treatment at CD4<350 cells/ $\mu$ L

This scenario was designed to scale-up access to 80% coverage for opioid substitution therapy and 15% coverage for needle exchange programme and 80% treatment coverage for PLHIV at CD4<350 cells/ $\mu$ L. This scenario would require an average annual investment of **USD 38 million** (RM 140.6 million) from 2015 to 2021.

e) Scenario 5: Scale-up Harm Reduction for PWID and treatment at CD4 <500 cells/ $\mu$ L

This scenario was designed to scale-up access to 80% coverage for opioid substitution therapy and 15% coverage for needle exchange programme and 80% treatment coverage for PLHIV at CD4<500 cells/ $\mu$ L. This scenario would require an average annual investment of **USD 46.7 million** (RM 172.8 million) from 2015 to 2021.

f) Scenario 6: Ending AIDS

The scenario was designed to scale-up Harm Reduction coverage for PWID - 80% for MMT and 15% for NSEP and simultaneously increase to 80% prevention coverage for other KPs (FSW, TG and MSM). This scenario also adds in 95% treatment coverage for all key populations irrespective of CD4 counts. To end AIDS, the country would require an average annual investment of **USD 69.6 million** (RM 257.5 million) from 2015 to 2021.

Table 6. Summary of definition for each scenario

Options	MMT	NSEP	FSW	MSM	TG	CD4	ART
Scenario 1: Business as usual (Base-line)	31%	21%	52%	38%	49%	350	37%
Scenario 2: Accelerate treatment only	31%	21%	52%	38%	49%	ALL	95%
Scenario 3: Scale-up prevention only	80%	15%	80%	80%	80%	350	37%
Scenario 4: Scale-up Harm Reduction and treatment CD4<350	80%	15%	52%	38%	49%	350	80%
Scenario 5: Scale-up Harm Reduction and treatment CD4<500	80%	15%	52%	38%	49%	500	80%
Scenario 6: Ending AIDS	80%	15%	80%	80%	80%	ALL	95%

## 4.2 Investment Impact

### a) Impact on the epidemic

The estimated number of new infections has already started to decline. The interventions, starting from 2015, would result in the biggest reduction in the number of PLHIV in scenario 'Scale-up prevention only' (figure 10). However, in the absence of treatment intervention, more PLHIV would progress to AIDS and end up with premature death, thus bringing down the number of current infections year by year. Focusing solely on treatment, on the other hand, would stagnate the epidemic but the country would end up having to constantly increase resources for ART.

The graph in figure 11 shows that the number of new infections has started to decline beginning in 2002 but this decline would stall from 2014 onwards in baseline scenario. Investing in treatment only is not a good choice as this would eventually result in another cycle of epidemic after 2021, and to spiraling treatment cost. A good investment needs to balance between prevention and treatment interventions. AEM has modeled several options that would lead to a decline of new infections. Comparing all options, 'Ending AIDS' will reach 90% reduction of new HIV cases to less than 800 new HIV cases in 2021, eventually leading to ending AIDS, while the other scenarios would drive the country further away from ending AIDS, even after 2050.

Figure 10. Current infections (PLHIV) for Adult, Malaysia 2000 – 2030

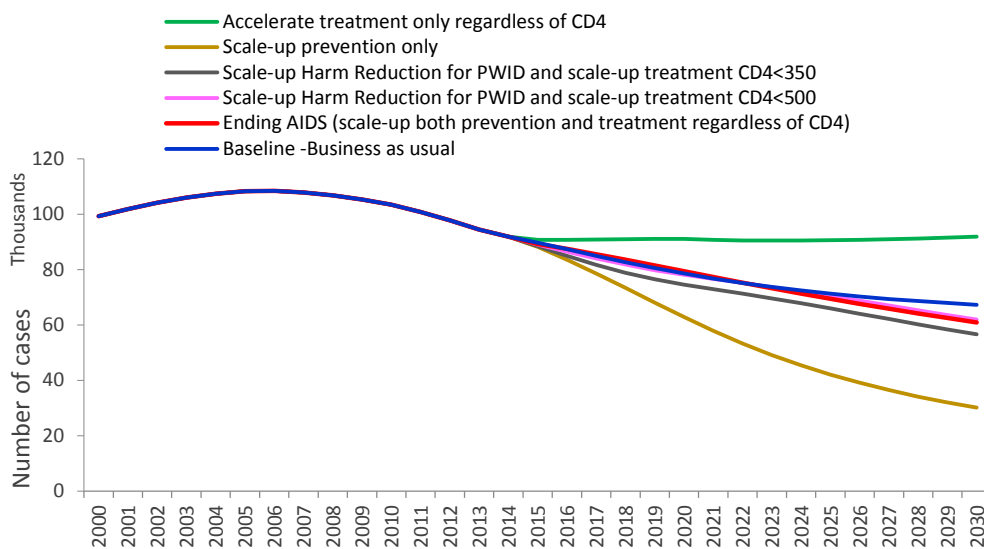
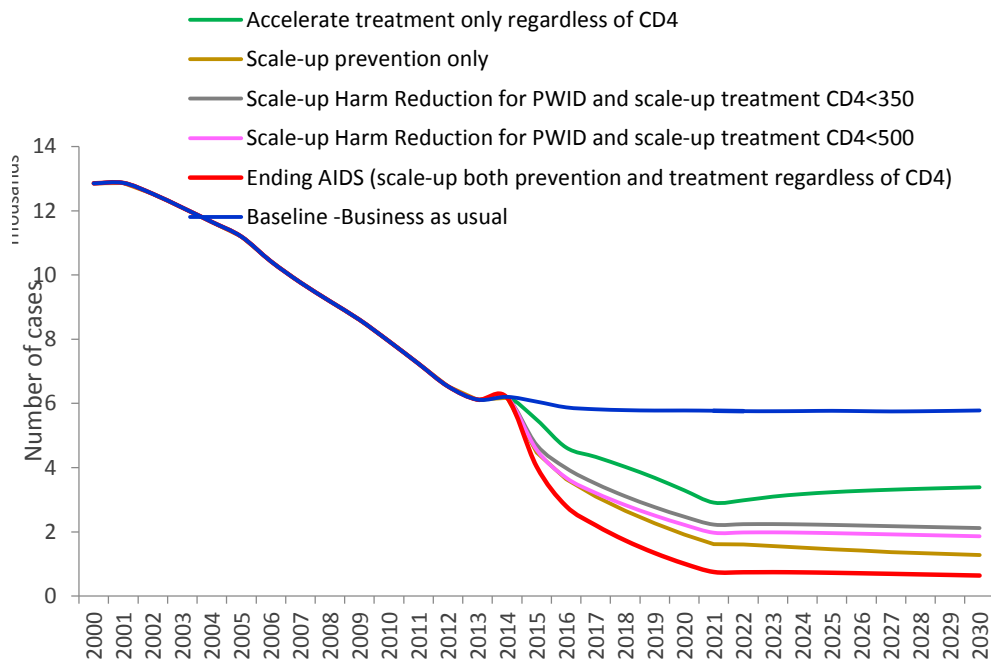


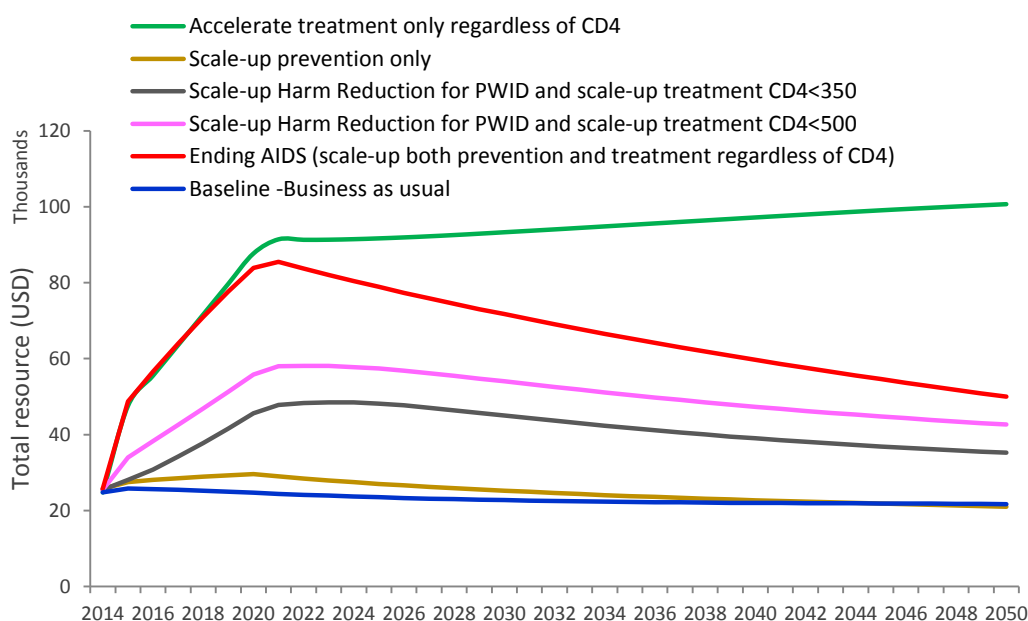
Figure 11. New HIV Infections for total adult, Malaysia 2000-2030



## b) Impact on resource needs

Based on projected annual new HIV infections (Figure 11), the country would reach 90% reduction of new cases in 2021 through 'Ending AIDS' scenario. The total resources needed to realize this target will amount to USD 429.1 million for period of 2015 to 2021. The initial investment is undeniably high, but the annual expenditure needed would start declining within as little as 7 years (figure 12). Summary of total resource needs is narrated in table 7. Under all scenarios, the treatment cost of ongoing infections drives up the costs incrementally year by year. Looking at all scenarios, prevention would be a 'must have' component in any investment option as it averts substantial costs of providing HIV treatment over medium to long-term. In contrast, avoiding such investments will merely postpone huge, ever-increasing costs into the distant future.

Figure 12. Total Resource Needs, Malaysia 2014-2050



If intervention remains as before (business as usual) or no new investment in the response, the HIV epidemic would continue with serious implications for public health as well as major social and economic costs. But focusing all investments on accelerating treatment only would still lead to a continuous increase in new infections each year. The key to significantly reducing new HIV infections, therefore, is to scale up the prevention and accelerate treatment.

Table 7. Summary of total resource need based on investment scenarios

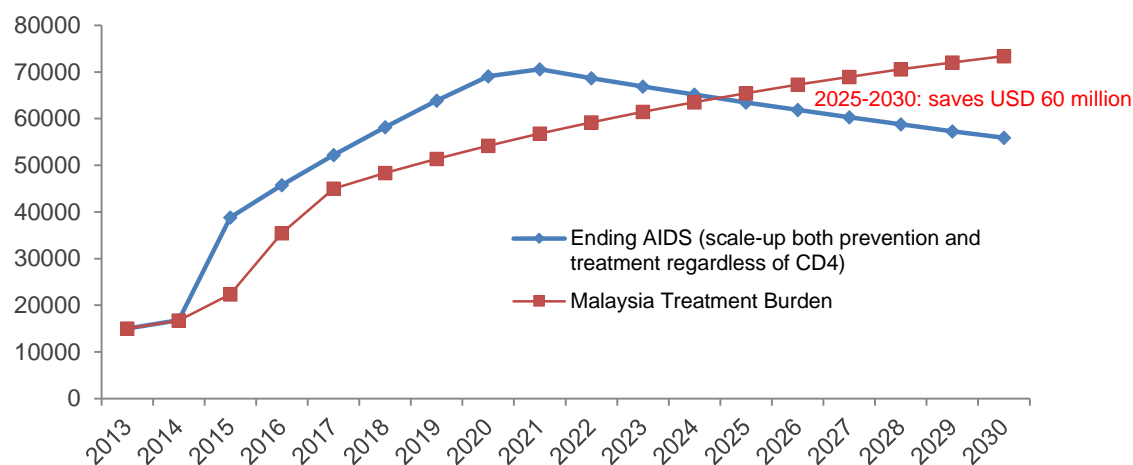
SCENARIO	INVESTMENT OPTION	TOTAL RESOURCE NEED (USD)	
		2015-2021	2022-2050
Scenario 1	Business as usual (Baseline)	157.1 million	434.4 million
Scenario 2	Accelerate treatment only	436.9 million	1.8 billion
Scenario 3	Scale-up prevention only	178.7 million	470.3 million
Scenario 4	Scale-up HR for PWID and treatment CD4<350	234.1 million	820.5 million
Scenario 5	Scale-up HR for PWID and treatment CD4<500	287.9 million	987.7 million
Scenario 6	Ending AIDS	429.1 million	1.3 billion

The 'Ending AIDS' scenario shows that investing in prevention yields significant savings on treatment costs later, making the program affordable over the long term (Table 8). As clearly depicted in figure 13, Malaysia can save up to USD 60 million between 2025 and 2030 on treatment alone if we embark on 'Ending AIDS' option now. If ART is scaled up without expanding and optimizing prevention coverage of the most affected populations, new infections continue to increase, treatment costs will spiral upwards, and the program becomes unsustainable.

Table 8. Total annual resource need for 'Ending AIDS', 2015 – 2050

	Prevention (thousands, USD)	Treatment (thousands, USD)	Total (thousands, USD)
<b>2015</b>	9,603.01	37,712.80	47,315.81
<b>2016</b>	10,235.63	43,111.03	53,346.67
<b>2017</b>	10,826.34	47,744.67	58,571.00
<b>Invest now</b> <b>2018</b>	11,383.30	51,702.61	63,085.91
<b>2019</b>	11,913.32	55,063.60	66,976.92
<b>2020</b>	12,426.93	57,852.18	70,279.11
<b>2021</b>	12,155.47	57,364.74	69,520.21
<b>Ending AIDS (2015-2021)</b>	<b>78,544.00</b>	<b>350,551.63</b>	<b>429,095.63</b>
<b>Future savings</b> <b>2030</b>	9,859.81	34,828.19	44,687.99
<b>2040</b>	7,464.09	20,219.52	27,683.60
<b>2050</b>	5,540.05	11,706.14	17,246.19

Figure 13. Resource Needs for total ART, 2013-2030



### c) Return of investment

The returns on investing in AIDS can be measured in several different ways. Among others are annual reduction of new cases, treatment cost saved if fewer people become infected and number of disability-adjusted life years (DALY) saved. AEM allows calculation of DALYs and comparison between scenarios. A DALY is equal to one year of healthy (and productive) life which in turn translate into one year of earned per capita GDP – currently at USD 10,500 (World Bank). Every HIV infection averted in Malaysia saves an average of 27 DALYs, amounting to USD 285,580 GDP earned.

Table 9 shows the impact and resource needs for each investment option. The analysis of the six different scenarios shows that the highest impact can be attained through ‘Ending AIDS’ scenario that is combination of prevention (coverage of FSW, MSM and TG at 80%, and PWID at 95% with reference to MMT 80% and NSEP 15%) and scaling up effective testing of key populations to 95%, treatment of those detected with HIV to 95% and achieving adherence of those in ART to 95%. This investment option will save more lives and yield the greatest cost-benefits in terms of DALYs, income and treatment cost saved. Saving DALYs is good for productivity and economic growth and reduces the impact of AIDS on individuals, families and society in general. The impact on the longer term is even more striking. Figure 14 compare number of DALYs that could be saved under each scenario between 2015 and 2021. ‘Ending AIDS’ save over 640,000 DALYs compared to just about 300,000 if only treatment is accelerated.



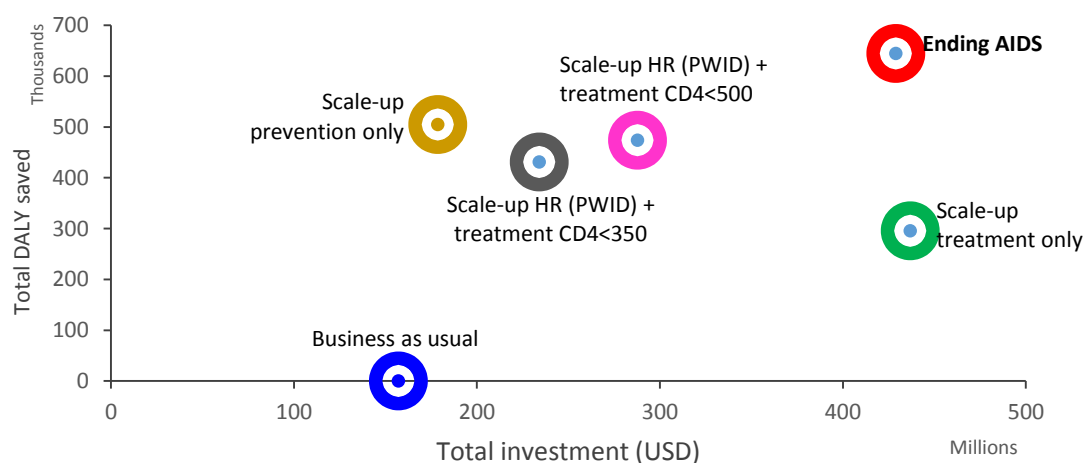
Table 9. Summary of cost-effectiveness by different investment options

	Base-line	Business as usual	Accelerate treatment only	Scale-up prevention only	Scale-up PWID + treatment CD4<350	Scale-up PWID + treatment CD4<500	Ending AIDS
	2013	2021	2021	2021	2021	2021	2021
New infections	6,118	5,773	2,912	1,622	2,227	1,974	751
HIV averted	-	-	2,861	4,151	3,546	3,799	5,022
Death averted	-	-	4,318	902	3,717	4,135	4,676
PLHIV on ART	15,614	16,477	86,142	14,641	35,739	46,341	73,358
DALYs saved	-	-	76,000	110,000	94,000	100,000	133,000
GDP earned (million)	-	-	798	1,155	987	1,050	1,396
Resource Need (thousand)		\$24,418	\$91,417	\$29,031	\$47,794	\$57,991	\$85,501

Malaysia GDP per capita – \$10,500 (World Bank 2015)

From the model, it can be concluded that through an investment of approximately USD 429 million over short period of 7 years (2015-2021) or an average of USD 61 million a year, Malaysia will be able to avert close to 27,000 HIV infections and save over 640,000 DALYs potentially ending AIDS by 2021. The financial returns are also substantial. 'Ending AIDS' will save USD 6.8 billion in future income. Moreover, the marginal cost per DALY saved is USD 422 – far less than the country's per capita GDP—making 'Ending AIDS' a highly cost-effective investment<sup>2</sup>. The message from the scenarios is obvious - only 'Ending AIDS' will stop and reverse the epidemic. While global target to end AIDS is set at 2030, Malaysia can end AIDS in less than 10 years!

Figure 14. Total investment and DALY saved, Malaysia 2015-2021



<sup>2</sup> WHO considers per capita spending on interventions to be “very cost-effective” if it is less than GDP per capita. Expenditure equivalent to 1-3 times GDP per capita is “cost-effective”; if it is greater than 3 times GDP per capita, it is “not cost-effective”. See [http://www.who.int/choice/costs/CER\\_levels/en/](http://www.who.int/choice/costs/CER_levels/en/)

### 4.3 Key messages

If investment start now,

- (a) Ending AIDS is possible in Malaysia and can be achieved in 2021
- (b) For a total investment of USD 429 million in 7 years beginning 2015, 'Ending AIDS' will:
  - i. Reduce new HIV infection by 90% from 2010 (7,936) to 2021 (751)
  - ii. Each HIV infection averted saves an average of 27 DALYs; resulting in \$283,500 GDP earned
  - iii. Save total of 644,000 DALYs, or healthy, productive life years
- (c) 'Ending AIDS' scenario will reverse the epidemic and achieve the three Zeros.

## CHAPTER 5: WHAT NEXT - FUTURE DELIVERABLES

AEM model generates options that will guide the country in future planning. These models are timely as the country is now preparing for post-2015 new strategic framework (2016-2030). While the previous strategic framework was designed mainly to achieve Millennium Development Goal, the three zeros and the High Level Political Declaration on HIV/AIDS 2011, the new strategic framework (2016-2030) will focus on Sustaining Development Goal (SDG) and subsequently ending AIDS by 2030. The analysis of the investment options has clearly shown that increasing investment in targeted prevention and substantially expanding access to treatment will put Malaysia on track to end AIDS much earlier.

### 5.1 *Priorities to 'End AIDS'*

To maximize the impact of investment, the country needs to invest adequately, timely and strategically at where, who and what to invest in to generate better returns. The following priorities are based on what works in local context.

#### **(a) Priority 1. Test and treat.**

There has been ample evidence that keeping PLHIV alive and healthy, antiretroviral treatment offsets the potential far-reaching social and economic costs associated with advanced HIV-related illness, orphaned children and foregone productivity. HIV treatment not only averts deaths but also prevents new infections. New analysis shows that for every 10% increase in the number of PLHIV getting treatment, the population-level HIV transmission rate drops by 1%<sup>3</sup> as new infection drops. Malaysia has the potential to seize this opportunity and aims for 95% treatment coverage for PLHIV in the new strategic framework. However, the current low coverage of HIV testing and counselling among key affected populations is a major bottleneck in the HIV cascade, slowing wider and earlier access to treatment. The next step is scale up testing activities – making it accessible in the community in addition to existing health facilities and to shorten the interval between a positive screening result, confirmation, and enrolment in HIV care. Table

#### **(b) Priority 2. Target shifting in Harm Reduction.**

PWID is still predominant and key driven factor for the country's epidemic. In effort to control spread of HIV among PWID, Malaysia has embarked on Harm Reduction Programme through provision of needles and syringes and Methadone Maintenance Therapy (MMT). This program has been a cornerstone of the government responses for HIV since 2006. Though 81% of estimated 170,000 PWID population have been enrolled, the proportion receiving antiretroviral is still far below target. It is a great challenge to shift PWID to using MMT so life-saving ART could be initiated. To end AIDS, more innovative efforts involving civil societies and the communities need to be in place in shifting target to 15% PWID on NS and 80% PWID taking oral substitute (MMT).

---

<sup>3</sup> UNAIDS. The Gap Report. Geneva: UNAIDS; 2014. Available at [http://www.unaids.org/sites/default/files/media\\_asset/UNAIDS\\_Gap\\_reporten.pdf](http://www.unaids.org/sites/default/files/media_asset/UNAIDS_Gap_reporten.pdf)

### **(c) Priority 3. Mitigate sexual transmission**

The country acknowledges the increasing trend of HIV infection acquired through sexual exposure. There is certainly a need for innovative and effective ways to mitigate sexual transmission of HIV focusing on behavior modification and its deliverables. To end AIDS, the country need to scale-up prevention programme to cover at least 80% of other key affected populations.

### **5.2 Recommendation - Ending AIDS in Malaysia**

With the epidemic still at a low level, Malaysia can seize the epidemic and end AIDS within just seven years. The analysis of the investment options shows that the highest impact will be delivered by the Ending AIDS scenario - accelerating treatment coverage to 95% of all PLHIV by 2015; reaching 80% of PWID with MMT, 15% of PWID with NS, 80% of MSM, FSW and TG with prevention programs. Over the next seven years these interventions will save more lives and yield the greatest cost-benefits in terms of DALYs, income and treatment costs saved. A total investment of USD 429 million in seven years (2015-2021) will avert 27,000 infections, save 640,000 DALYs and end AIDS in Malaysia by 2021. Table 10 summarize estimated new HIV infections and ART need for the country.

Ending AIDS scenario is clearly more cost-effective than other scenarios. The key is to target investment where it will have the greatest impact: test and treat, target shifting for harm reduction – more MMT less NS and scaling up prevention interventions for MSM, FSW and TG. End result from this investment - reduction in new and current infections and DALYs saved.

### **5.3 Conclusion**

AEM is a process model that replicates the transmission dynamics of HIV in Asian settings, thus allowing to estimate and project country's epidemic. In addition, it also enabling the country to come up with the best investment for effective responses on AIDS. The findings of this model is compatible with the country's National Surveillance.

Ending AIDS is possible and achievable. There are many successful approaches and impressive examples in prevention, treatment, care and support across the globe that have shown results. With strong policy, political will and full participation of all players, Malaysia can translate focused and innovative investments into a concrete and lasting gain. In Malaysia context, investment that will end AIDS can be achieved through accelerating testing and treatment, upscaling and target shifting in Harm reduction and mitigating sexual transmission. In assuring long-term progress, it is therefore pertinent that HIV must continue to feature prominently within the country's future health and development agenda specifically in post 2015 SDG.

Table 10. Summary of estimated new HIV infection and PLHIV in need of treatment for Ending AIDS Scenario, 2014-2030

Year	Est. new infection	Est. PLHIV in need of ART
2014	6,176	42,408
2015	4,032	89,184
2016	2,800	87,427
2017	2,207	85,466
2018	1,734	83,439
2019	1,341	81,411
2020	1,010	79,353
<b>2021</b>	<b>751</b>	<b>77,219</b>
2022	743	75,166
2023	746	73,181
2024	740	71,247
2025	727	69,365
2026	711	67,536
2027	694	65,766
2028	677	64,056
2029	659	62,405
2030	641	60,809

**Annex 1****Key Behavioural inputs**

Data Input for Malaysia baseline is based on the following sources. Adjustments and assumptions are made when necessary and they are also described in the document below. In this AEM Model, only FSW1 (direct FSW), MSM1 (reachable), MSM2 (not reachable), TG and Male PWID data are used. Other groups of KPs are not included.

**1. Country population**

Population data used in Malaysia AEM is based on UN population division data from 1975 to 2050 (as used in Spectrum 5.03).

**2. Heterosexual sheet****(a) FSW1 size estimate**

Final size estimate is based on Consensus 2014 which is 21,000 FSW in 2013 (0.24%). Only 1 group of FSW is modeled (FSW1).

**(b) Number of clients per day / Days worked per week**

Based on IBBS 2009, the average number of clients is taken as 1.2 per day. Number of days work per week is 5 days.

**(c) Percent condom use**

Percentage of condom use is assumed at 10% from 1975 to 1990, increasing to 12% in 1992 (Singh & Croft 1992). Then, the trend is increase to 48.7% in 1994 (Choon et. al. 1997). The percentage is increased to 65% (after adjusting for over-reporting) in 2012 (IBBS 2012). The percentages in between are interpolated. The trend after 2012 is constant at 65% onwards.

**(d) Percent of males age 15-49 visiting sex workers in last year**

The percentage of males visiting sex workers in last year is 6.8% (IBBS 2012).

**(e) Duration of selling sex (year)**

The final duration of sex work is taken as 5 years from 1975 to 1990 and increased to 10 years in 2012 (based on IBBS 2012). Trends are interpolated between 1990 and 2012. The duration of 10 years is constant from 2012 onwards.

**(f) STI prevalence among FSW1**

Start with 20.4% as assumption in 1975 onwards until 1990 (Ramachandran & Ngeow 1990- STI prevalence is 40.75%). Use 20.4% to represent national levels. The STI prevalence is assumed at 8% in 2012; which is supported by an increase in condom use (IBBS 2012). The prevalence is interpolated in between.

**(g) Duration of buying sex**

Duration of buying sex is derived from IBBS 2012. Based on this survey duration of buying sex is calculated by subtracting median age of male who came for premarital screening

(28 years) with median age at sex debut (19 years). Therefore, we assume that duration of buying sex among male is 9 years.

(h) Percent of adult males who are circumcised

Based on country demographic pattern, Muslim contribute to 65% of total population. We assume that all Muslim male are circumcised.

(d) Percent of males engaging in casual sex in the last year

Based on 2009 HIV Expert Consensus, percent of males engaging in casual sex is 5%.

(j) Percent of females engaging in casual sex in the last year

We take percent for female as half of that in male population (2%).

(k) Percent condom use with casual partner

The percentage of condom use before 2004 is 10.5% - calculated based on weighted average of condom use found in BSS 2004. The percentage of condom use after 2012 is 38.1% (weighted condom use among PWID). The percentage is interpolated in between those values.

(l) Average number of sex contacts in the last year (male)

Since there is no available data, we leave this number at default value (15).

(m) Number of sexual contacts with spouse or regular partners (per week)

Number of sexual contacts is set at 1 per week.

(n) Percent condom use with spouses or regular partners

The percentage of condom use with spouse is taken as percentage of condom use with spouse among PWID (IBBS 2012) assuming that most PLHIV are PWID.

(o) STI prevalence in adult population

The STI prevalence (0.7%) is based on sero-prevalence rate in Western Pacific region.

### 3. **PWID Sheet**

(a) Percent of adult males 15-49 years of age who inject drugs

We estimate that the current PWID population at 187,000 based on 10% increase from 2009 consensus (170,000). This is supported by 10% increase in number of new PWID reached each year.

(b) PWID mortality

PWID mortality in this exercise is estimated at 1.1% based on MOH Malaysia report 2009

(c) Percent of PWID in high-risk networks

We use default value as in the model (30%)

(d) Percentage of male PWID who share needles

For earlier data point (1975 to 2004), we take the mid-point (60%) of data derived from 2 studies – BSS 2004 and BSS 2007. The percentage is then interpolated to 37.5% in 2011 (CAHR 2011). The trend is constant from 2011 onwards.



(e) Percentage of injection shared among PWID who shared needles

The percentage is calculated based on median of frequency of needles shared among PWID who shared needle in BSS 2004, which fall in 'half of the time sharing'. Thus, this model is using 50% injections were shared among PWID who shared needles.

(f) Number of injections each day

Data points for 1975 to 2004 are based on finding from BSS 2004 i.e. 3 times/day. Data points from 2012 onwards are based on IBBS 2012 i.e. 2.6 times/day. Data from 2004 are interpolated to 2012.

(g) Average duration of injecting (years)

The average duration of injections is derived from BSS 2004 i.e. 15 years and is used to fit in data points from 1975 to 2004. Subsequent data points from 2004 are interpolated to 2012 using finding from IBBS 2012 i.e. 20 years.

(h) Percent visiting female sex workers

Based on average of 5 studies (BSS 2004: 11.1%, IBBS 2009: 15.1%, CAHR 2011: 22%, IBBS 2012: 8.4% and CAHR 2014: 7.1%), percent visiting female sex workers are set at 12.74% for all years.

(i) Percent condom use with FSW1

As there is no available data or study, we assume the percentage of condom use is 5% from 1975 to 1990. In 1992, the percentage is changed to 7% taking into consideration slight behavioural change among FSW over time. The percentage of condom use is raised to 61% and 72.7% in 2004 (BSS 2004) and 2011 (CAHR 2011) respectively. Percentages in between are interpolated.

(j) Percent condom use with spouse or regular partner

As there is no available data or study, we assume the percentage of condom use is 2% from 1975 to 1990. The percentages of condom use are 11.7% (BSS 2004), 19.1% (IBBS 2009) and 32.3% (IBBS 2012). Percentages in between are interpolated.

(k) Number of sexual contacts with regular partner

We use number of sexual contacts 1 per month or 0.25 per week and set same value throughout the years (Drug and Alcohol Dependence 2011).

#### 4. **MSM Sheet**

##### 4.1 General MSM

- (a) Percentage of males aged 15-49 engaging same sex behavior is set at 2% based on National Health Morbidity Survey 2006.
- (b) Percent of MSM in risk group 1 is considered proportion reachable and taken as 30% based on consensus in 2014.
- (c) Shift from MSM group 1 to group 2 (non-reachable) is assumed at 5% based on consensus.
- (d) MSW population is not considered in AEM Model because of unavailability of data.

#### 4.2 MSM1 population

- (a) Percent engaging in anal sex in the last year is set at 95% consistent to the findings from IBBS 2009 and IBBS 2012 at 95% and 94.3% respectively.
- (b) Number of anal sex contacts in the last week is taken at 1.5 based on IBBS 2012.
- (c) Average duration of same sex behavior is set at 25 years based on IBBS 2012 and consensus 2009.
- (d) Percentages of MSM1 with female partners are based on 3 studies, i.e. Kana & Koh 2008 (17.8%), VDTS 2009 (16.7%) and IBBS 2012 (9.5%). The percentage of 17.8% is used from year 1975 to 2008. The percentage is change to 16.7% in 2009 and 9.5% in 2012. The percentages are interpolated to produce trend between year 2009 and 2012. 9.5% is used after 2012.
- (e) Percentages of condom use in anal sex with MSM1 are based on several data points from Kana & Koh 2008 (23.5% condom used last anal sex), VDTS 2009 (31.4% condom used last anal sex) and IBBS 2012 (52.4% always used condom). Earlier data points (1975 to 1985) was taken at 10% assuming there was no awareness program for MSM. Data in between are interpolated to get the trend. The percentage of 52.4% is used after 2012 onwards.
- (f) STI prevalence among MSM1 is based on VDTS 2009, where 6.8% of MSM reported to be tested and have STI. The percentage of 6.8% is used throughout.

#### 4.3 MSM2 population (non-reachable)

Data points for this sub-population are based on assumption as below.

- (a) Percent engaging anal sex is assuming as half of that of MSM1 (47.5%).
- (b) Number of anal sex contact in the last week is 0.3 (less by 5 times) compared to MSM1
- (c) Average duration of same-sex behavior is set at same proportion as MSM1 (25 years)
- (d) Percentages of MSM2 with female partner equals to those of MSM1
- (e) Percentages of condom used in anal sex with MSM2 equals to those of MSM1
- (f) STI prevalence among MSM2 is 1.4% which is 5 times lower than that of MSM1.

### 5. ***Transgender Sheet***

#### 5.1 Transgender population - General

- (a) Percent of males aged 15-49 who are TG is set at 0.28% throughout the years from 1975 to 2050 based on size estimation workshop in 2014
- (b) Percent of TG who sell sex is 85% based on IBBS 2009 and IBBS 2012.
- (c) Percent of TG who engage in casual sex but not sex work is 11.4% (IBBS 2012)

## 5.2 Transgender Sex workers - Sexual Behaviour

- (a) Percent of TG sex workers engaging anal sex with clients is 84% throughout. This is based on weighted average between IBBS 2009 and IBBS 2012.
- (b) Number of anal sex contacts in the last week with clients is set at 10 throughout the year based on BSS 2004 and IBBS 2012.
- (c) Percent of anal sex contacts with clients which are receptive is 91.6% based on IBBS 2009.
- (d) Average duration selling sex (in years) is set at 14 years throughout (IBBS 2012, median is 7 years).
- (e) Percent condom use in anal sex with clients is set at 10% from 1975 to 1990 and 11% in 1991 (the initiation of awareness program). Thereafter, data points used are 74.9%, 82.5% and 85% in 2004 (BSS 2004), 2009 (IBBS 2009) and 2012 (IBBS 2012) respectively. Data points in between are interpolated and data points after 2012 are set at 85%
- (f) It is assumed that prevalence of anal STI among TG is much lower than MSM1 as condom use behavior is better among TG (based on BSS and IBBS). Thus, percent of anal STIs among TG who sell sex is taken at 3.4% which is half of that of MSM1.

## 5.3 Transgender sex worker – client make up (sums to 100%)

Based on consensus, it is assumed that:

- (a) 80% of TG clients are low-risk males.
- (b) 15% of TG clients are also clients of female sex workers
- (c) 2.5% of TG clients are MSM

## 5.4 TG engaging in casual sex – sexual behavior

- (a) About 92.5% of TG with casual sex partners engaged in anal sex (IBBS 2012)
- (b) Number of anal sex contacts in the last week is 0.96 (IBBS 2012)
- (c) About 91.6% of anal sex contacts are receptive (assume similar to that of TGSW)
- (d) Percent condom use in anal sex is assumed at 4.6% from 1975 to 1990. The trend is set to increase from 1991 to 2012 using recalculated data from IBBS 2012 which is 39.3% and similar value is used from 2012 onwards.
- (e) Percent anal STIs among TG who have casual partners is assumed half of that of TGSW which is 1.7%.

5.5 TG Sex Workers – Partner Make up for those with CPs (sums to 100%) Partner make-up is the same as that of TGSW client make-up

5.6 TG with regular partners – sexual behaviours

- (a) About 90% of TGs with regular partners engages in anal sex (IBBS 2012)
- (b) Number of anal sex contacts with regular partner in the last week is 0.4 (IBBS 2012)
- (c) Percent of anal sex contacts with regular partner which are receptive is taken as 91.6% (assume similar as TGSW)
- (d) Percent condom use in anal sex with regular partner is assumed at 7.3% from 1975 to 1990. The trend is set to increase from 1991 to 2012 using recalculated data from IBBS 2012 that is 61.9% and similar value is used from 2012 onwards.
- (e) Percent anal STIs among transgender who have regular partners only is 0.85% (assuming that STI prevalence is about half of that of TG casual sex).

5.7 TG sex workers – regular partner make-up

Regular partner make-up for TGSW is assumed to be similar as TGSW client make-up. Based on consensus, it is assumed that:

- a) 80% of TG clients are low-risk males.
- b) 15% of TG clients are also clients of female sex workers
- c) 2.5% of TG clients are MSM

## **6. *HIV Prevalence for key populations***

(a) Female Sex Workers

Three data points are used in AEM, which are 0.8% in 1991, 5.6% in 1996 and 5.8% in 2012. Data were weighted and down-calibrated by 10% from prevalence studies in Kuala Lumpur to generate trends of national prevalence.

(b) Male PWID

Trends of HIV prevalence among male PWID are based on prevalence data from drug rehabilitation center and 2 IBBS studies. There are 19 data points put in AEM.

(c) Men who have sex with men

The weighted average prevalence of 8.5% is used, based on IBBS 2012.

(d) Transgender sex worker

Only 1 data point is put in AEM based on IBBS 2012.

## 7. Unit cost

Epidemiological projection models costing exercise was undertaken at the subpopulation level where the route of infection was identified, whereby the resources that were required for each activity were quantified and costed. Unit costs for each resource or activity input were gathered from a number of different sources, namely:

- (a) National Surveillance
- (b) Programmatic Data
- (c) Consensuses among various government, non- governmental agencies and community representatives.

Unit costs in this model is based on integrated health care system whereby human resource cost are not calculated. Unit cost in this model include procurement and diagnostics. Summary of unit costs is as follows.

Summary of unit cost, Malaysia 2013

Key Population	Program coverage	Unit Cost (USD)
PWID	52%	65
FSW	52%	71
MSM	38%	29
TG	49%	71

For PWID, both Rapid Test Kit and ELISA test was included in the costing. For FSW, MSM & TG only Rapid Test Kit costing was included.



Annex 2

Snapshots of country team in action



HIV/STI Section  
Disease Control Division  
Ministry of Health Malaysia  
[www.moh.gov.my](http://www.moh.gov.my)