



**SIZE ESTIMATION OF KEY POPULATIONS**  
**MALAYSIA**  
**2018**

Ministry of Health Malaysia

# SIZE OF KEY POPULATIONS IN MALAYSIA

## 2018 Estimates



Report prepared by:

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## ***Size of key populations in Malaysia – 2018 estimates***

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We also appreciate the guidance given by our informal consultants from UNAIDS and East-West Center Hawaii for their comment and advices.

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## *Foreword*

Developing reliable and accurate estimates of key populations including people who inject drugs (PWID), female sex workers (FSW), men who have sex with men (MSM) and transgender people (TG) is fundamental in generating epidemiological evidence for understanding the magnitude and trajectory of the HIV epidemic especially in a country with low and concentrated epidemic like Malaysia. The estimates are of critical importance for strategic prioritisation of policies and programming to inform impactful response for ending the epidemic.



The process of estimating the size of key populations is complex and can be difficult, thus it has not been conducted regularly and the estimates were primarily based on expert consensus. The earliest documentation of estimates using multiplier method is dated in 2003 for PWID and 2010 for sex workers. The estimate for MSM was based on population-based survey of the National Morbidity and Health Survey (NMHS) conducted in 2006. Undoubtedly, these estimates are outdated and may give inaccurate picture of the disease burden leading to inadequate respond and plan.

The 2018 PSEs mark the beginning of a regular and consistent method employed in calculating the PSE which is also incorporated into the existing Integrated Bio-Behavioral Surveillance survey conducted every 2-3 years. We look forward to a better and more precise estimate in the future for adequate and appropriate resource allocation of HIV response.

Last, we would like to express our deepest appreciation to all parties for the valuable input and knowledge in the estimation activities. We are hopeful that this report will assist the HIV/AIDS control program, not only for the Ministry of Health, but also for all partners working on HIV AIDS control. We would like to especially thank the HIV/STI/Hepatitis C Sector for their perseverance in conducting this complex exercise.

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## List of abbreviation

AIDS	Acquired Immune Deficiency Syndrome
ART	Anti-Retroviral Therapy
ARV	Anti-Retroviral
CBT	Community Based Testing
FSW	Female sex worker
GAM	Global AIDS Monitoring
HIV	Human Immunodeficiency Virus
IBBS	Integrated Bio-Behavioral Surveillance
KP	Key population
MAC	Malaysian AIDS Council
MMT	Methadone maintenance therapy
MoH	Ministry of Health
MSM	Men having sex with men
NGO	Non-government organization
NSEP	Needle and Syringe Exchange Program
NSPEA	National Strategic Plan on Ending AIDS
PLHIV	People living with HIV
PSE	Population Size Estimates
PWID	People who inject drugs
TG	Transgender
WHO	World Health Organization

## CHAPTER 1 – PEOPLE WHO INJECT DRUGS

### A. Introduction

Malaysia has a matured and concentrated HIV epidemic with prevalence rates remain above 5% among key populations (KP) including person who inject drugs (PWID), female sex worker (FSW), transgender people (TG) and men having sex with men (MSM). Since the first case of HIV infection in the country was reported in 1986, a combination of efforts mainly focused on KP were implemented to reduce HIV infections nationwide. However, these population members are difficult to be identified and are considered as hard-to-reach population. Hence, the true size of these population is unknown, and this may lead to inaccurate estimates of targeted prevention, treatment and care.

Establishing the size estimate of KP at risk of HIV infection is essential for understanding the potential of HIV epidemic to grow in a geographic area. Besides, it also aids in an appropriate resource allocation for effective responses and to track the HIV epidemic using model that projects or estimates number of PLHIV. Usefulness of estimates is very much dependant on the appropriateness of the method employed and reliability of the data sources used.

In the previous years, the population size estimation of PWID in Malaysia relied heavily on the expert consensus. The first population estimates of PWID was attempted by Mohamed (2003) using service multiplier. In his survey, service data from National Antidrug Agency (NADA) was used as multiplier and he estimated population of PWID for the year 2002 at around 118,000 (104,486 to 135,506). This estimate was subsequently discussed at several consensus meetings involving multi-stakeholders and using literatures and secondary data, a population size estimates of PWID was finally agreed at 170,000 or 1.8% of adult male population in 2009. However, there has been no proper documentation on this final population size estimates and besides, it lacks sub-national aggregation.

Considering closer distance and easier access to Golden Triangle which is the world's largest heroin supply, countries like Myanmar, Lao and Thailand reported incredibly much lower estimates of PWID - 83,000 (2014) [1], 1,700 (2014) and 40,300 (2009) [2] respectively compared to Malaysia (170,000).

Growing popularity of methamphetamine over opiate has changed the addiction landscape in the country from injecting to oral addiction. Statistic from NADA reported that about 55% of drug addicts in 2017 were using methamphetamine [3], a whopping four times increase from 14% in 2013, while opiate users have reduced by half in the same period. With the changing pattern of drug use apart from outdated estimates of PWID, there is even greater need to re-estimate the population size of PWID. A new estimate is needed to set appropriate



programme targets, assess adequacy of the coverage and in producing national estimates and projections of HIV epidemic

In conjunction with the Biological and Behavioral Surveillance (IBBS) survey in 2017, we integrated several methods to estimate the size of PWID population. We included questions in the IBBS 2017 to estimate population of PWID in Malaysia using multiplier method and triangulating the findings to provide the most plausible estimates. There has been no in-country record of multiple estimates used in conjunction with IBBS.

## B. Methodology

### Step 1 – Multiplier method

There are few methods for estimating the population size for hidden population [4]. For PWID, we chose multiplier technique as this indirect estimate is the easiest to implement especially when the country is already planning for a probability survey (IBBS) for the key populations. Conducted periodically, IBBS was initiated in 2009 to compliment the national HIV surveillance system and the recent survey was scheduled in 2017. About 1,413 PWID respondents were recruited through respondent-driven sampling (RDS) method in ten (10) states in the last IBBS. Eligible respondents were current injectors, males, 18 years and older and had been injecting drugs for at least three months prior to survey. We included relevant questions to elicit specific HIV services used during the face-to-face interview. IBBS 2017 study was approved by the Malaysian Medical Research and Ethics Committee (NMRR-17-998-33876) and data collection conducted for period of May to July 2017.

Multiplier method relies on two overlapping but independent sources of existing data. In the present exercise, the first data source will be the count of male PWID who received specific services from a facility or organization providing services during a specified period. The second data source derived from representative population samples from IBBS 2017 that count respondents who had used or reached with HIV services in the last 12 months.

To calculate the population size estimate using these two (2) data sources, we divided the number of PWID who received the service (N) by the proportion of PWID reporting they had received the service in the IBBS 2017 survey (P). This can be expressed as:

Population size estimate, S =

$$\frac{\text{Number of PWID who received the service (N)}}{\text{Proportion of PWID in survey who reported receiving a service (P)..}}$$

However, multiplier method is highly dependent on the quality of the data. Therefore, to minimize potential bias resulting from a single service data, several sources of service data were explored as multipliers for this study and used simultaneously to minimize the potential influence of biases of any one multiplier. To further reduce bias, we ensured the data sources used as multipliers were independent of one another. We counted male PWID aged 18 years and above from service data to match with the IBBS 2017. Additionally, we aligned the time periods and geographic areas for both data sources. For estimates of PWID, we used two (2) service data sources to get two (2) estimates which are:

*a) Number of unique clients currently on MMT*

The MMT programme was incepted as part of National Harm Reduction Programme in 2005 and currently provided by Health Clinics and private clinics. All treatment centres are required to report number of registered and active clients to National HIV/AIDS Program on monthly basis. For estimation calculation, we counted number of unique clients on MMT between May to July 2017 from programmatic data.

*b) Number of unique clients reached with HIV services through outreach services from Non-Government Organisation (NGO)*

This source of data collects information on unique PWID clients reached by Needle and Syringe Exchange Programme (NSEP) provided by the NGOs. This is an automated record management system under the management of Malaysian AIDS Council (MAC) that is integral for monitoring and recording of HIV prevention programs for KP. MAC is an umbrella organization that support and coordinate the effort of partner organizations working on HIV and AIDS issues in Malaysia. In this database, data reported include all HIV related services provided by NGOs including NSEP. For estimation calculation, we derived number of registered unique clients reached by NGO for NSEP programme between May 2016 to April 2017 from NGO programmatic data.

In IBBS 2017 survey, behavioural and other related data including the use of specific services were collected through face-to-face interview. Questions designed to be consistent with the service data during the study period are as described below:

*A. Are you still receiving MMT (Methadone Maintenance Therapy)?*

*B. In the past 12 months, have you ever received HIV services from NGO outreach worker?*

IBBS 2017 was conducted in ten of fourteen states in Malaysia, therefore, for states without survey data or states with 0% probability, multipliers (proportion of PWID reporting they had received the service in the IBBS 2017) from the adjacent state that has relatively similar socio-demographic and characteristics were used. For example, Perlis is the neighbouring state to Kedah and socio-demographically similar to Kedah. Thus, Perlis will use the multiplier from Kedah. However, East Malaysia (Sabah, Sarawak and Labuan) are not counted as the number of PWID in these states are negligible. National size estimation was calculated from the sum

of size estimation for all the states and adjusted to include female PWID. Based on the programmatic data (MMT), female PWID contribute about 2% of total PWID.

## Step 2 – National Consensus

A national consensus meeting with stakeholders was organized to discuss the new estimates derived from several multipliers as well as gathering other important relevant data. This meeting entailed the presentation of estimates for PWID for each approach (multiplier) used, identifying the average estimate of all methods used and eliciting feedback and expert opinions from stakeholders on the estimates. Report from Royal Malaysia Police (RMP) and NADA on statistics of drug addiction were used to triangulate the estimates. The consensus meeting took place on 16th August 2018 and brought together many stakeholders in the response to HIV related to PWID in Malaysia. These included expert consultants, key representatives from the Country Coordinating Mechanism (CCM), Civil Society Organisations, MAC, MOH, KP, RMP and the NADA.

We established upper and lower plausibility bounds for the estimates based on the data. Plausibility bounds are not the same as statistical confidence intervals but rather bounds established that make ‘plausible sense’ in our context.

## C. Results

Table 1 shows the estimates of male PWID using multiplier method. The data showed highest and lowest range of male PWID estimates from both service data. The estimate of PWID population was averaged using the two numbers as below and scaled up to include female PWID (2%):

Male PWID estimate from multiplier 1 (S1): 111,482

Male PWID estimate from multiplier 2 (S2): 31,814

Population estimate of male PWID (National):  $(111,482 + 31,814) / 2 = 71,648$

Population estimate of all PWID (National):  $(79,215 \times 100) / 98 = 73,110$

The calculation also takes into consideration the number of drug users arrested as reported by RMP and NADA are as below:

Total numbers of injecting drug users arrested by RMP (2017): 17,914

Total numbers of injecting drug users arrested by NADA (2017): 7,820

Total number of injecting drug users arrested (2017):  $17,914 + 7,820 = 25,734$

In a study by Mohamed et al (2003) [5], the average national multiplier for PWID was reported as 2.89. Assuming there are no changes in the multiplier, we calculated an estimate of PWID using the number of PWID arrested in 2017 as below.

Population estimate of PWID:  $25,734 \times 2.89 = 74,371$

Table 1: Population size estimates of PWID using multiplier method (by state)

State	Service data (N)		IBBS 2017 (P)		Size estimation (S)	
	Total active client on MMT (N1)	Total unique client reached with HIV services (N2)	Probability Still on MMT (P1)	Probability Ever received HIV services from ORW (P2)	S1	S2
Perlis	158	168	0.163	0.488	972	344
Kedah	1,465	1,389	0.163	0.488	9,010	2,846
Perak	2,424	1,434	0.163	0.293	14,908	4,894
Pulau Pinang	1,924	553	0.163	0.293	11,833	1,887
Selangor	2,497	1,278	0.320	0.587	7,803	2,177
WPKL	1,689	1,599	0.189	0.746	8,959	2,143
Negeri Sembilan	1,580	937	0.300	0.933	5,267	1,004
Melaka	1,403	275	0.590	0.540	2,378	509
Johor	1,046	2,328	0.040	0.860	26,150	2,707
Pahang	2,534	5,238	0.150	0.879	16,861	5,959
Terengganu	1,479	4,517	0.287	0.887	5,159	5,092
Kelantan	913	2,076	0.418	0.923	2,183	2,249
Sabah	10	-	-	-	0	0
Sarawak	4	-	-	-	0	0
Labuan	1	-	-	-	0	0
<b>Malaysia</b>					<b>111,482</b>	<b>31,814</b>

We tabled the estimates and discussed the strengths and weaknesses to the stakeholders in a national consultation involving key informants among service providers, RMP, NADA and the community. The results of estimates from several multiplier including the previous estimate (source 4) are depicted in Figure 1. Key stakeholders agreed and are comfortable with the estimate derived from averaging the estimate 1 and 3, rounded to 75,000. The breakdown of PWID estimates by state were proportioned based on program coverage of MMT and NSEP which is more representative of the PWID burden in the states. The final PSE for PWID are listed in Table 2.

Figure 1: Summary of population size estimates of PWID based on different multipliers

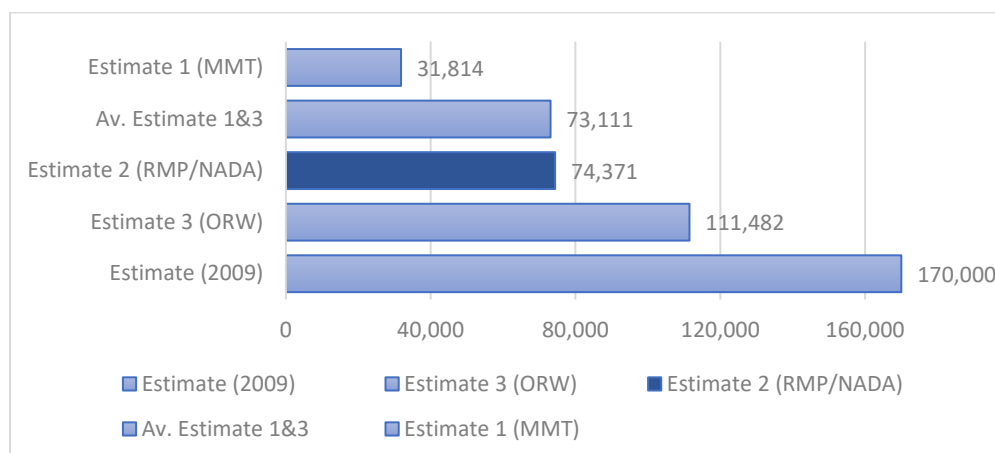


Table 2: Population size estimates of PWID in Malaysia, 2018

State	Estimated population size
Perlis	1,639
Kedah	5,033
P. Pinang	5,721
Perak	8,631
WPKL	4,888
Selangor	7,891
Melaka	4,294
N. Sembilan	6,319
Johor	7,913
Pahang	14,143
Kelantan	3,417
Terengganu	5,068
Sabah	23
Sarawak	18
WP Labuan	3
<b>MALAYSIA</b>	<b>75,000</b>

## D. Discussion

The current national estimated population size of PWID (75,000) shows a marked reduction when compare to the 2009 estimate (170,000). The reduction is consistent with the local changing pattern of drug use from opiate to more methamphetamine and ATS use as reported by the NADA. Higher mortality rate may also result in reduction of population size of PWID as

majority were not receiving the antiretroviral treatment. This estimate is also consistent with triangulated data from RMP and NADA (74,371). With the new estimate, the prevalence of PWID in this country is at 0.3%, consistent with Asian region prevalence of 0.03% – 0.72% [2].

This is the first estimate using multiple data sources integrated into the ongoing IBBS and certainly has several limitations. The estimates were derived from limited methods from MMT and ORW services. The estimates could be better and stronger should there be more methods and data made available for example ART and HIV testing services.

The IBBS survey and the services used were limited to respondents aged 18 years and above because of the need to get parental consent. The estimate did not consider young people below 18. But we assumed that the magnitude of PWID among young adolescent below 18 would be small as majority of young people choose oral methamphetamine over injecting heroin.

The two methods used different time frame. For MMT service, it referred to current service between May and July 2017 concurrent with the ongoing IBBS survey time frame, thus recall bias is not a big issue. However, for ORW service, it referred to service used in the last 12 months that has larger time frame (June 2016 and May 2017). Possible recall bias may lead to distortion of the estimate.

In summary, the estimates from this study should be viewed as figures that can be improved in the next round of IBBS. A clear time frame for services used should be set for a shorter duration to reduce recall bias and more methods should be included in the next IBBS. The possibility of adding other methods like census and enumeration should also be explored. Nevertheless, this finding can be used to advocate for and mobilize resources for future PWID programme target setting.

## E. Conclusion

The final estimated population size of PWID in 2018 is 75,000 (30,000 – 110,000), approximately 56% reduction from the 2009 estimate (170,000). The new estimates will guide the country in responding effectively to the current HIV landscape.

## CHAPTER 2 – SEX WORKER

### A. Introduction

Available data suggest that the risk of HIV acquisition is 13 times higher for sex workers than adults in the general population [6]. In this regard, SW is considered one of the key populations where targeted HIV prevention programmes were implemented through smart partnership between government and civil societies since 2002. As reported by the IBBS (2012, 2014 & 2017), condom used with most recent partner has been above 80% [7]. Over the years, HIV prevalence started to decline among female sex workers (FSW) but this is not the case with transgender sex worker (TGSW).

To date, there has been little research done on sex workers in Malaysia. Prohibitive legal environment as well as stigma and discrimination within the society is pushing the sex workers underground. Traditionally, sex work venues range from the streets to brothel and entertainment establishments such as fitness clubs and hairdressing salons. The social networking apps like WeChat and WhatsApp are nowadays becoming easy ways of sourcing sex, outperforming the traditional ways. This can be both a challenge as well as an opportunity to reach SW for HIV prevention package. Hence, an estimate of SW population is important to inform the coverage of HIV responses and the trend of HIV epidemic in this sub-population.

Estimating the population size of SW is not new in Malaysia. The earliest documentation recorded that there were estimated 20,000 and 1,398 population of FSW and MSW/TGSW combined in 2005 [8] giving a total of 22,000 SW in Malaysia. In 2010, Lim et al [9] conducted another estimate using enumeration and triangulation method. The population size estimates were adjusted to accommodate for mobility, inaccessibility and non-venue based giving the final estimates of 60,000 sex workers (40,000 FSW and 20,000 TGSW). In 2014, a national consensus meeting involving multi-stakeholder and researcher involved with the earlier estimates of sex worker was convened and agreed with a new estimate of sex worker at 45,000 (21,000 FSW and 24,000 TGSW) (unpublished).

We undertake this study to re-estimate the population size of FSW and TGSW because the existing estimates were outdated. In addition, new estimates are crucial to help the country to understand potential of HIV epidemic to grow as well as to assist the country in appropriate allocation of resources for effective responses.

### B. Methodology

For purpose of estimation, the target population were defined as sex worker (TGSW and FSW) who currently engaged in the risk behaviour of interest. We did not consider the non-sex worker TG women in the count because they have less risk compared to transgender sex

workers [10]. For enumeration method, we did not include a reference period in the operational definition, for example having sex with another men or client in the past 12 months or receiving money in exchange for sex in the past six (6) months. This is because, during the mapping, it is generally not feasible to screen all individuals present in order to determine whether they fit in the definition. However, for multiplier method, the reference period used in the operational definition for IBBS 2017 was taken as females reporting having been paid in cash or any kind for sex with more than 1 client within the last 3 months.

General operational definitions are as below:

Female Sex Worker (FSW): Females present at known FSW venues who were identifiable as FSW to outreach workers, based on appearance and behaviour.

Transgender sex worker (TGSW): Transgender refers to a diverse population whose gender identity or expression differs from their assigned sex at birth. TGSW is TG present at known TGSW venues who were identified as TGSW by the outreach workers based on appearance and behaviour.

There are few known methods to estimate the population size for hidden population [11]. For estimation of SW population size (FSW and TGSW) in Malaysia, we used two (2) methods - multiplier and enumeration. Multiplier method generally rely on information from two (2) sources that overlap in a known way; the programmatic data as primary source which is readily available, and the second data source is from the recent Integrated Bio-Behavioural Surveillance (IBBS) survey 2017 that use a respondent driven sampling method. The multiplier method is applicable for FSW only because both data sources are readily available. As for TGSW, calculation of estimates using this method is not possible because data is sparse and unreliable.

The enumeration method requires fewer resources and is less expensive to conduct as it covers a fraction of the population. For this exercise, we used well-trained outreach workers among the community that can provide better access to the sex worker population compared to other methods.

### Multiplier Method

Multiplier method relies on two overlapping but independent sources of existing data. In the present exercise, the first data source will be the count of KP receiving a service from a facility or organization providing services to the KP during a specified period. The second data source is derived from representative population samples from IBBS 2017 that count respondents who had utilized the services in the last year.

To minimize potential bias resulting from a single service data, several sources of service data were explored as multipliers and used simultaneously to minimize the potential influence of biases of any one multiplier. For the estimate to be unbiased, we ensured that data sources



used were independent of one another. For IBBS 2017, we selected respondents aged 18 years and above, and this is applied to count client in the service data. Additionally, the two data sources must have aligned time periods and geographic areas. To estimate FSW, we used one (1) data source for service data.

The second data source derived from representative population samples from IBBS 2017 that count respondents who had received the same service in the last year. The respondent-driven sampling IBBS was introduced in Malaysia since 2009 to complement the National HIV Surveillance system in the Ministry of Health as a mechanism to track down HIV trend and associated behavioural patterns. All respondents were 18 years and above and resided in the respective states where the study was located. For FSW, there were six (6) states involved in IBBS 2017 which were Penang, Perak, Federal Territory of Kuala Lumpur, Pahang, Sabah and Sarawak. IBBS 2017 study was approved by the Malaysian Medical Research and Ethics Committee (NMRR-17-998-33876) and data collection conducted for period of May to December 2017. In this survey, behavioural and other related data including service used and treatment coverage were collected through face-to-face interview. Questions were designed to be compatible with the service data during a specified period.

Data sources used for multiplier method:

**1. *Service data: Number of unique clients currently still on ART from National AIDS Registry (NAR)***

The National AIDS Registry is an online database that record all HIV, AIDS and death related to HIV/AIDS including treatment information. We count number of unique clients who are still on ART during the specified time period that coincide with the survey time interval.

**2. *IBBS 2017 survey***

***Related questions added in this survey that compatible with the service data source from NAR – “Are you still receiving ART?”***

Since IBBS 2017 was conducted in selected states only, their multipliers will be applied to other adjacent states that did not conduct the survey but has relatively similar socio-demographic and characteristics. For example, Terengganu is the neighbouring state to Pahang and socio-demographically similar to Pahang, thus, we applied Pahang’s multiplier to Terengganu. National estimate was calculated from the summation of population size estimates for all states.

## Data analysis

To calculate the population size estimate using these two (2) data sources, we divide the number of KP who received the service (N) by the proportion of KP reporting had received the service in the IBBS 2017 (P). This can be expressed as:

$$\text{Population size estimate, } S = \frac{\text{Number of SW who received the service (N)}}{\text{Proportion of SW receiving the service in the IBBS 2017 (P)}}$$

## Enumeration Method (Mapping)

### Overall estimation strategy

Due to limited resources and based on the understanding shared by the community that majority of sex workers had serviced their clients in urban areas, the estimates calculated represent the SW in urban areas throughout the country. However, this method does not necessarily exclude sex worker residing in the rural areas because most of them would eventually meet sex partners or clients in urban areas. The resulting estimate is assumed to represent the most important components of the risk network contributing to the national HIV epidemic in Malaysia.

The overall approach to developing the size estimates for urban sex worker (TGSW and FSW) can be summarized as below.

1. Develop a “local” mapping-based size estimates to the remaining district in the same state based on census population
2. Sum the state-level size estimates to obtain the national size estimates

All fourteen (14) states in Malaysia except Federal Territory Labuan was selected to do the geographical mapping. In each state, at least two (2) or more district was selected to develop a “local” size estimates, that would then be extrapolated to the remaining districts in the same state that was not included in the data collection. The extrapolation was carried out assuming the levels of risk behaviors were not different in urban and rural districts.

The mapping-based size estimation method was conducted to quantify the SW that frequent specific venues (physical venues) which can be readily identified by outreach workers.

### Data collection

Data collection was conducted from 16th May 2018 to 25th June 2018.

**Part one (Training and gathering information):** Meetings were held with identified outreach workers or knowledgeable community members in each state to train and assist them in developing a list of known gathering venues for SW (hotspots). The results were number of known hotspots in each district, peak operating times and count of FSW during peak times at each hotspot. Hotspot were classified into the following:

- Street, alley or any outdoor area such park
- Hotel, rest house or brothel
- Spa or massage parlor
- Entertainment venue such as bar, nightclub, karaoke, discotheque
- Private residence
- Others such as hairdresser, café or restaurant

**Part two (Data collection):** Larger venues and cities with high number of SW were selected for head count. The outreach workers visited each of the selected hotspots and spent 30 - 120 minutes for data collection depending on the size of the hotspot. The visit was done outside peak hours for safety reason since most of the hotspot peak at midnight till early morning. During each visit, data was gathered using two methods:

- a) **Direct observation** to determine the number of SW present at the hotspot during the visit. Field teams identified and counted SW based on their appearance and behavior.
- b) **Interviews** with at least one of the SW at the venue. They were asked to provide an estimate number of SW present including those who were absent during the visit to estimate number of SW during peak hours (to compare with the team observation and information gathered during part one).

### Data analysis

Data collection began with the observed counts of individuals at venues (or hotspot) and then a series of statistical adjustments applied to account for population segments that may have been missed during the mapping for reason as below.

1. Data collection was done during non-peak hours
2. Individuals from unmapped hotspots in the district (only some of the hotspot in the district was covered during the mapping exercise)
3. Individuals from unmapped district (no mapping exercise was done at this district)

In some cases, these adjustment factors were derived from interviews with respondents' during the mapping exercise. Where data was not available from the survey, we used assumptions; field teams were asked to deliberate and reach consensus on adjustment factors based on their experience and best working knowledge as outreach workers.

The calculation of the estimates is described below:

*i. Geographic mapping:*

- a) **Initial observed count:** The initial count at each hotspot where data were collected was taken to be the highest count reported by the field team and from information during interviews.
- b) **Extrapolation to unmapped hotspots:** The initial counts were inflated to represent the hotspots not included in level two data collection. The unmapped hotspots were provided by the civil society and community in the district. We then applied an adjustment factor representing the average number of TGSW/FSW that the community and field teams believed would be present at the unmapped hotspots relative to mapped hotspots in the district.
- c) **Extrapolation to peak time:** The counting was done outside peak time, thus we applied inflation factor of 200 percent for TGSW and 150 percent for FSW to count those who have been missed. The level of the adjustment was determined during level one.

The average mobility or movement of SW between hotspot is about 3 months. To avoid double counting, the mapping was done within a brief period of less than a month and concurrent counting across all selected hotspot where possible. Therefore, adjustment for double counting was not taken into consideration in this data analysis.

*ii. Derivation of national estimates:*

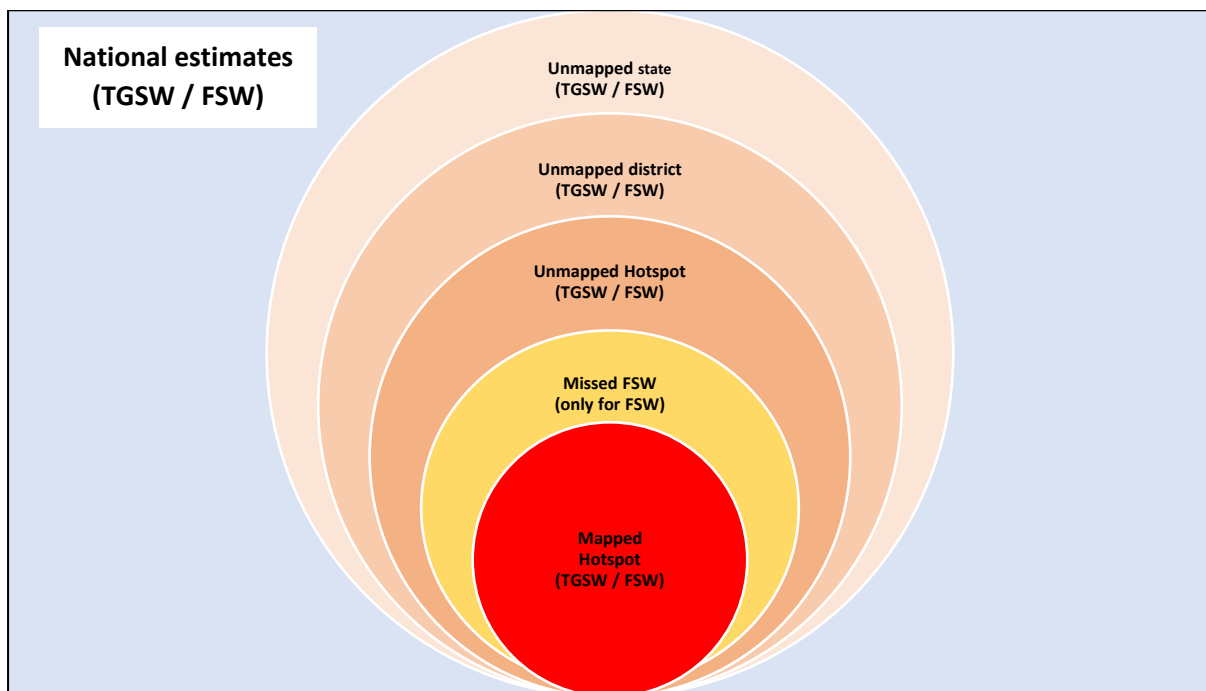
- a) **Extrapolation to unmapped district:** Due to limited resources, mapping at some district was not conducted. The number of hotspots in unmapped district were provided by the local civil society and community in the best of their knowledge. We then applied adjustment factors agreed by the community that represent the average number of TGSW and FSW who may be present in the unmapped hotspot at the unmapped district.
- b) **Adjustment for indirect FSW:** To account for indirect FSW (part-timer), we applied inflation factor of 32% based on the findings from IBBS 2017. Based on the

information obtained from the community, most TGSW are working full time as SW, thus we did not make any adjustment for TGSW.

- c) **National estimates:** The national estimates are the result of summation of estimated population size for TGSW and FSW across all states.

Figure 2 illustrate how we derived the national estimates for TGSW and FSW.

Figure 2: Derivation of the national estimates for TGSW and FSW



## C. Results

### Multiplier method

Table 3: Population size estimates of FSW using multiplier method (by state)

State	Service data (N)	IBBS 2017 (P)	Size estimation (S)
	Total client still on ART	Probability Still on ART	
Perlis	0	0.00	0
Kedah	0	0.01	0
Perak	0	0.00	0
Pulau Pinang	15	0.01	1,215
Selangor	538	0.02	22,237
FT KL	2	0.02	83
Negeri Sembilan	13	0.01	1,053
Melaka	0	0.02	0
Johor	11	0.02	455
Pahang	0	0.04	0
Terengganu	0	0.04	0
Kelantan	14	0.04	396
Sabah	0	0.01	0
Sarawak	0	0.00	0
FT Labuan	0	0.07	0
<b>Malaysia</b>			<b>25,438</b>

### Enumeration method (Mapping)

#### *Female Sex Worker*

#### Geographic mapping

The study identified approximately 1,125 hotspots where FSW congregate in Malaysia. Hotspots were identified during part 1 meeting and during part 2 data collection. However, due to time constraint and resource limitation, only 148 hotspots were visited during data collection (13.2%) (Table 4).

### Population size estimates of FSW

Table 5 shows summary of FSW size estimates by states in Malaysia. The national estimates are the result of summation of the estimated FSW population across all states which is 14,208. However, we inflated the national estimates with factor of 32% to count for the indirect FSW (part-timer) to derive the total FSW (direct and indirect) of 20,893.

Table 4: Geographic mapping for FSW by state in Malaysia

State	Hotspots visited during data collection	Approximate number of total hotspots	% of hotspot covered
Johor	10	129	7.8%
Kedah	22	36	61.1%
Kelantan	6	60	10%
FT Kuala Lumpur	50	255	19.6%
FT Labuan	0	10	0%
Melaka	0	13	0%
Negeri Sembilan	15	63	23.8%
Pahang	6	28	21.4%
Pulau Pinang	16	120	5.0%
Perak	13	37	35.1%
Perlis	2	7	28.6%
Sabah	0	54	0%
Sarawak	0	50	0%
Selangor	6	223	2.7%
Terengganu	2	40	5.0%
<b>Malaysia</b>	<b>148</b>	<b>1,125</b>	<b>13.2%</b>

Table 5: Summary of FSW population size estimates

State	Unadjusted - sum over observed count FSW at each visited Hotspot	Adjusted		
		Extrapolate to unmapped Hotspot only	Extrapolate to unmapped Hotspot and unmapped district	Adjust for FSW missed during data collection (150% inflation) and extrapolate to unmapped Hotspot and district
Johor	112	1,972	2,398	2,566
Kedah	82	77	123	246
Kelantan	29	29	119	163
FT Kuala Lumpur	1,018	1,718	3,068	4,595
Melaka	0	138	268	268
Negeri Sembilan	151	151	343	570
Pahang	218	372	511	838
Pulau Pinang	160	620	795	1,035
Perak	82	143	184	307
Perlis	6	27	37	46
Sabah	0	0	320	320
Sarawak	0	0	618	618
Selangor	70	710	2,174	2,279
Terengganu	13	13	238	258
FT Labuan	0	0	100	100
<b>Malaysia</b>	<b>1,941</b>	<b>5,970</b>	<b>11,296</b>	<b>14,208</b>

*Transgender Sex Worker*

## Geographic mapping

The study identified approximately 946 hotspots where TGSW congregate in Malaysia. Hotspots were identified during part 1 meeting and during part 2 data collection. However, due to time and resources limitations, only 372 hotspots were visited during data collection (39.3%) (Table 6).

## Population size estimates of TGSW

Table 7 shows summary of TGSW size estimates by states in Malaysia. The national estimates are the result of summation of the estimated TGSW population across all states which is 17,526.

Table 6: Geographic mapping for TGSW by state in Malaysia

State	Hotspot visited during data collection	Approximate number of total Hotspot	% of Hotspot covered
Johor	34	75	45.3%
Kedah	65	84	77.4%
Kelantan	14	50	28.0%
FT Kuala Lumpur	29	117	24.8%
FT Labuan	0	10	0%
Melaka	12	25	48.0%
Negeri Sembilan	10	45	22.2%
Pahang	6	30	20.0%
Pulau Pinang	29	182	15.9%
Perak	71	101	70.3%
Perlis	7	11	63.6%
Sabah	22	66	33.3%
Sarawak	61	132	46.2%
Selangor	39	86	45.3%
Terengganu	12	29	42.9%
<b>Malaysia</b>	<b>372</b>	<b>947</b>	<b>39.3%</b>



Table 7: Summary of TGSW population size estimates

State	Unadjusted - sum over observed count TGSW at each visited Hotspot	Adjusted		
		Extrapolate to unmapped Hotspot only	Extrapolate to unmapped Hotspot and unmapped district	Adjust for TGSW missed during data collection (200% inflation) and extrapolate to unmapped Hotspot and district
Johor	396	936	966	1,758
Kedah	300	488	488	1,088
Kelantan	138	271	331	607
FT Kuala Lumpur	429	701	1,526	2,384
Melaka	268	398	398	934
Negeri Sembilan	127	247	447	701
Pahang	320	610	713	1,353
Pulau Pinang	145	483	2,018	2,308
Perak	308	217	275	891
Perlis	38	90	90	166
Sabah	241	196	570	1,052
Sarawak	460	685	775	1,695
Selangor	477	770	936	1,890
Terengganu	132	195	235	499
FT Labuan	0	0	200	200
<b>Malaysia</b>	<b>3,779</b>	<b>6,287</b>	<b>9,968</b>	<b>17,526</b>

#### D. National Consensus for TGSW and FSW Population Estimates

A national consensus meeting with stakeholders was organized to table the calculated estimates for TGSW and FSW as well as to gather all other relevant data. This meeting entailed the presentation of preliminary estimates for TGSW and FSW for each approach used, identifying the average estimate of all methods used and eliciting feedback and expert opinions from stakeholders on the estimates. In addition, we also established upper and lower plausibility bounds for the estimates based on the data. Plausibility bounds are not the same as statistical confidence intervals but rather bounds established that make ‘plausible sense’ in our context.

The consensus meeting took place on 15<sup>th</sup> and 16<sup>th</sup> August 2018 and brought together many stakeholders in the response to HIV related to FSW and TGSW in Malaysia. These included expert consultants, key representatives from the Country Coordinating Mechanism (CCM), Civil Society Organisations, MAC, MOH, key population representatives, the Royal Police Department of Malaysia (RMP) and Malaysia Islamic Development Department (JAKIM).

### Final consensus for National FSW

The estimates of FSW from the multiplier method using the service data and IBBS 2017 presented the highest range of FSW in Malaysia while estimates of FSW using the enumeration method showed the lowest range of FSW in Malaysia. Therefore, it was agreed during the national consensus meeting that the estimation of FSW population was obtained by taking the average of the two methods as below:

Estimates from multiplier method (1)	25,438
Estimates from enumeration method (2)	20,893
<b>Average 1 and 2</b>	<b>23,165</b>

Based on expert opinion from stakeholders and supported by feedback from outreach workers and key populations representatives during the consensus meeting, they decided the estimates of FSW should be between 21,000 and 25,000 with point estimate 22,000 in 2018.

*Final consensus for FSW size estimates  
= 22,000 (Range: 21,000 – 25,000)*

The FSW population percentage was calculated by dividing FSW estimated number by the census population of females aged 15 to 49 years in 2018. The estimated 22,000 is equivalent to 0.25 per cent of all females aged 15 to 49 years in Malaysia.

### Final consensus for National TGSW

It was agreed during the national consensus meeting that the estimation of TGSW population will be obtained merely from enumeration method, given that the calculation of TGSW estimates cannot be made using the multiplier method. Therefore, total unmapped hotspot and unmapped district presented the lowest range of TGSW in Malaysia while total missed TGSW during data collection and unmapped hotspot and district showed the highest range of TGSW in Malaysia. The consensus agreed to obtain TGSW estimates by taking the average of the two data from enumeration method as below:

Total unmapped hotspot and unmapped district	9,968
Total missed during data collection and unmapped hotspot and district	17,526
Average of above	13,747

Therefore, average estimates from the two (2) data is 13,747. However, based on expert opinion from stakeholders and supported by feedback from outreach workers and key populations representatives during the consensus meeting, they decided the best estimates of TGSW should be around  $\approx 15,000$ .

*Final consensus for TGSW size estimates*  
= 13,747  $\approx$  15,000 (Range: 10,000 – 18,000)

The TGSW population percentage was calculated by dividing TGSW estimated number by the census population of males aged 15 to 49 years in 2018. The estimated 15,000 is equivalent to 0.13 per cent of all males aged 15 to 49 years in Malaysia.

### Population Size Estimates of TGSW and FSW by state

To calculate the PSE of TGSW and FSW by state, the proportion of TGSW and FSW receiving HIV services from NGO were used as multipliers. The final PSE for TGSW and FSW is presented on *Table 8*.

*Table 8: Population size estimates of TGSW and FSW by state in Malaysia, 2018*

State	PSE TGSW	PSE FSW
Perlis	142	71
Kedah	931	381
P. Pinang	1,975	1,603
Perak	763	475
FT KL	2,040	7,115
Selangor	1,618	3,529
Melaka	799	415
N. Sembilan	600	882
Johor	1,505	3,973
Pahang	1,158	1,298
Kelantan	520	252
Terengganu	427	399
Sabah	900	496
Sarawak	1,451	957
FT Labuan	171	155
<b>Malaysia</b>	<b>15,000</b>	<b>22,000</b>

## E. Discussion

Using multiple population size estimation methods, we triangulated data from various sources to estimate the size of FSW and TGSW in Malaysia. We estimate that there is approximately 22,000 FSW with a plausible range of 21,000 – 25,000 FSW in Malaysia. This constitutes about 0.25% of total female adult population which is within the regional patterns (0.2-0.8%) [12]. As for TGSW, we estimate that there are about 15,000 TGSW with a plausible range of 10,000 – 18,000 TGSW in Malaysia. We employed enumeration method coupled with multiplier method to estimate FSW population, thus giving a stronger outcome of estimate. But we can only employ enumeration method to estimate TGSW because the service data from NAR does not single out TG as a reported gender instead, they are categorised as male. Nevertheless, these estimates went through a thorough discussions and consensus process with the key stakeholders from the community and government agencies. Taken together, these approaches lend a strength to our results. Application of multiple methods is important to generate multiple estimates to triangulate to reach both a point estimate and a range. The results were accepted as reasonably accurate and precise enough for use by local stakeholders involved in HIV prevention and care planning during the consensus meeting.

However, there are few limitations to this study. Due to resource constraint and availability of quality data sources, we were only able to employ two estimation methods which undoubtedly has its limit in scope and method. Our estimation could have been more robust should more methods and/or data had been available. Second, the number of areas that was covered may not be adequate to give a better size estimation. Third, service multiplier data from NAR may not accurately reflect FSW currently on ART as they may not readily identify themselves as sex workers, hence possibility of underestimation of population size. High-quality service data and accurate population estimates would greatly contribute to improving service coverage efforts while assisting surveillance activities in monitoring the HIV epidemic. This calls for careful consideration when interpreting service multiplier data. Fourth, estimation using enumeration method in this study is likely to miss individuals who do not meet clients at sex work venues and sex workers who reside in rural areas. However, we assumed that the levels of risk behaviours were not different between urban and rural sex workers and the number of sex workers who are doing part time or who do not meet clients at sex work venues are small. Lastly, there is a possibility of duplication if the individuals happened to visit two or more of the hotspots or venues when the field teams were doing the enumeration especially if the data collection were conducted over a period which may lead to overestimation. During discussion with sex workers representatives and outreach worker, the turnover rate for sex workers in most venue is every 3 months. Therefore, we reduced this potential overestimate by conducting the data collection in less than a month.

Overall, our estimate of SW (37,000) show marked reduction by 38% compared to the previous estimates by Lim et al in 2010 (60,000). Our estimates of 37,000 has taken into account the invisible or part-time SW based on the IBBS findings.

### F. Conclusion

This study is one of the first to use multiple method to estimate the size of SW who are most at-risk populations for HIV infection in Malaysia. It is concluded that the population size of SW in Malaysia in 2018 is 37,000 (22,000 FSW and 15,000 TGSW).

This study of estimating the FSW and TGSW population in Malaysia provides an important information for both macro- and micro-level planning of HIV prevention programmes, including the prioritization of resources by states and locations for targeted HIV prevention, treatment and care activities. The findings of this mapping study can help policy makers in HIV prevention programme planning.

## CHAPTER 3 – MEN WHO HAVE SEX WITH MEN

### A. Introduction

The estimated size of populations by specific risk factors and behaviours is a critical determinant in the spread of HIV transmission and is one of the most important components on HIV surveillance. It is critical for understanding the epidemic shift along with trajectory of the HIV epidemic and for planning and monitoring an effective response, especially for countries with concentrated and low prevalence epidemics like Malaysia. It is also used in informing the National Strategic Plan and setting priorities and targets. It is also very useful for long-term planning in estimating HIV burden and projections. At the sub-national level, estimates of the sizes of key populations help programme management in setting measurable indicators, coverage and monitoring and evaluation of impact [12].

Estimating the size of key populations especially for hidden populations such as for men who have sex with men (MSM) remains a challenge for many countries. In Malaysia, the current official estimate for MSM dates back to 2006, calculated based on the Malaysian National Health Morbidity Survey (NHMS III) data on men self-reporting their sexual behaviours. The survey found that just under 2% adult males considered themselves homosexual giving a total estimate of 170,000 MSM in 2006. This, however, excludes those who reported themselves as bisexual. This estimation is also clearly outdated. The MSM population size estimate needs to be updated, considering the rapid changes of social and epidemiological factors in the population.

The recent IBBS highlighted the substantial rise of HIV prevalence among MSM from 8.9% in 2014 to 21.6% in 2017 [13] [14], reflecting a change in the main mode of HIV transmission in Malaysia, from one predominantly driven by injecting drug use, to sexual transmission. Having a reliable estimation of the MSM population size will improve policy makers' understanding of the impact of the epidemic among MSM in Malaysia and help with the planning and costing of intervention strategies.

This report outlines the methods behind the population size estimation (PSE) of MSM in Malaysia, conducted between April and September 2018. There are three components in the formulation and triangulation of the size estimate; the data from the multiplier method, data from the online dating network which were combined and discussed to reach a national consensus.

Estimation methods based on the use of social media and online dating networks data

In Malaysia, HIV programme data and population-based surveys are not likely to be the best options in population size estimation methodologies, as there are still substantial limitations of disclosure bias due to the nature of MSM being taboo and a hidden population, plus the limitations of coverage of these programmes and surveys. Thus, there is a need to incorporate data sources that are more reliable and representative of the population. The recent publication of Baral et al 2018, highlighted the use of social media among the MSM population (including for Malaysia), specifically the use of gay-oriented online dating apps, and how the number of registered users indicate a higher MSM population size compared to most of the official estimated figures for most countries [15].

Applying the utilization of such online-based data in Malaysia, the estimation strategy applied the triangulation and extrapolation of data from actual user number through consultation with social apps provider (Grindr), NHMS 2006 and online surveys, for which an assumption was made about the sub-population that it represented including taking into consideration of the sub-population of MSM not using internet or social apps.

## B. Methodology

This novel methodology is the first ever estimation method that encompass MSM who use internet or social apps to find sexual partners as well as MSM who do not use internet to find sexual partners. Phenomenon of using social apps is a relatively new phenomenon in Malaysia and this estimation exercise attempted to address it with the available data in a given time frame.

The method will be divided into two parts which is calculations to get the estimates of MSM using social media (part 1) and calculations to get the estimates of MSM in both urban and rural not using internet or social media (part 2) with assumptions adult age 50-64 years not using gay-oriented dating apps. Data for part 1 will be derived from a social network survey while part 2 was based on findings from National Morbidity Health Survey 2006 and national statistical data on internet accessibility. Summation of part 1 and part 2 will be obtained to get the final population size estimate of MSM in Malaysia.

An assumption was made that estimates of numbers of MSM who use online social networks and gay dating apps refer to males in both urban and rural areas in the 15-49 age group who use online social media. In this study, MSM were defined as adult Malaysian males who had anal sex with another male.

### Part 1: Estimating the number of MSM who are on social media

#### *Malaysian MSM Social Network Survey 2018*

The Malaysian MSM Social Network Survey 2018 was a blitz online survey conducted via Survey Monkey in September 2018. This method used an online form of snowball sampling, using MSM peer groups and social networks. A total of 277 responses were received. Of these, the final sample size was 195, after excluding non-citizens, data duplicates, and men who reported never had anal sex with another man or no male partner. This survey had recruited samples from all states in Malaysia, but majority (57.4%) were residing in big cities of Kuala Lumpur and Selangor.

It appears from the survey that more respondents in this survey preferred to use Grindr, accounting for 37.9% of the total respondents, followed by Blued and Hornet (3.1% and 2.1% respectively). This is comparable with the mobile apps ranking in Malaysia by SimilarWeb.com, in which they reported the top three grossing social apps for MSM in Google play store is Blued (rank 4th), Grindr (rank 17th) and Hornet (rank 38th); while top grossing social networking apps for MSM in Apple store is Grindr (rank 11th) and Blued (rank 20th) [16]. Using these top three grossing social apps for MSM in Malaysia (Grindr, Blued and Hornet), relevant social media usage parameters from the Malaysian MSM Social Network Survey 2018 were applied to extrapolate these numbers to estimate the number of urban and rural MSM aged 15-49 who use social media.

### Part 2: Estimating the number of MSM not using internet or social apps

Estimates of MSM from the remaining Malaysian male population not using internet or social apps was obtained based on data from the Department of Statistics, Malaysia. The adult male population not accounted for in part 1 include adult males aged 15-64 who are *not* on social media.

To obtain the denominator for the Part 2 sub-population the following data were obtained:

- adult males age 15-49 and 50-64 population by state,
- level of urbanization and rural in each state,
- internet usage in urban and rural area by state; and
- proportion of internet users who access social networking sites

Demographic data, disaggregated by age groups and states, was obtained from the 2017 Population Estimates, Department of Statistics Malaysia. The data on urbanization level of each state were obtained from 2010 Population and Housing Census of Malaysia [17]. Both data on internet usage and participation in social networks were obtained from the ICT Use and Access by Individuals and Households Survey Report 2017, published by the Department of Statistics [18].



Once the population size estimate for the base population for Part 2 (adult male aged 15-64 who are not on social media) was obtained, an assumption of 1.3% proportion of MSM among this sub-population was applied. This figure was obtained from the findings of the 2006 National Health and Morbidity Survey and it is assumed that proportion of MSM as adult male 15-64 will not change in this subset of population given the social and local context and accessibility to internet.

## C. Results

### Part 1: Estimating the number of MSM who are on social media

The social network survey gave parameters estimates for use in the size estimation of MSM, as outlined in Table 9.

Table 9: Parameters estimates for use in size estimation for MSM

Parameters	%
MSM use social apps:	
- Grindr only	37.9%
- Blued only	3.1%
- Hornet only	2.1%
- Grindr in combination with others	35.9%
- Others / no apps	17.5%
Non-MSM user	8.3%
Non-citizen	2.3%
Using Grindr apps within last 12 months with at least 1 partner	87.1%

*Source: Malaysian MSM Social Network Survey, 2018*

Based on the mobile apps ranking by SimilarWeb.com [16], the top social networking apps for MSM for both Google play store and Apple apps store is Grindr. It was reported that Grindr, a gay-oriented dating app, has a total of **151,720 daily active users** in Malaysia in 2017 [19]<sup>1</sup>. We assumed that they are within the age bracket of 15-49 year.

Based on the MSM social network survey, majority of respondents were Malaysian (98.7%) but there were about 8.3% non-MSM males who reported having accounts on gay-oriented dating apps. Out of these, 87.1% of MSM with at least 1 partner are using social apps in the last 12 months, and these figures was used to extrapolate the total number of MSM on social

<sup>1</sup> This number is officially reported by Grindr through email communication with Malaysia AIDS Council

media. By applying these parameter estimates to the reported number Grindr users in Malaysia, it was estimated that the number of MSM on social media in Malaysia is **156,059**.

Table 10 lists the calculation steps, applying the various deflation and inflation calculations based on the parameters in Table 9, to give the estimate for Part 1. This estimate is disaggregated by subnational proportionate to the prevalence of MSM derived from the online survey (Table 11).

Table 10: Calculations for estimating the MSM population using social media

Parameters	Grindr data
Apps users	151,720
Excluding % non-citizens using apps	148,230
Excluding % non-MSM reporting having used apps	135,927
Extrapolate to MSM using apps in the last 12 months with at least 1 sexual partner	156,059
<b>Estimated MSM using social media</b>	<b>156,059</b>

Table 11: Estimations of MSM population using social media by subnational

Subnational	N	Percent	Population estimates
Selangor	49	25.3%	39,417
Sabah	14	7.2%	11,262
Johor	16	8.2%	12,871
Sarawak	5	2.6%	4,022
Perak	6	3.1%	4,827
Kedah	3	1.5%	2,413
Kelantan	3	1.5%	2,413
Kuala Lumpur	63	32.5%	50,679
Pulau Pinang	9	4.6%	7,240
Pahang	8	4.1%	6,435
Terengganu	2	1.0%	1,609
Negeri Sembilan	6	3.1%	4,827
Melaka	8	4.1%	6,435
Perlis	0	0.0%	0
W.P. Labuan	1	0.5%	804
W.P. Putrajaya	1	0.5%	804
	<b>194</b>	<b>100%</b>	<b>156,059</b>

## Part 2: Estimating the number of MSM not using internet or social apps

The data triangulation to obtain the estimate of the base population size, disaggregated by subnational, and the application of the assumptions is shown in Table 12.

### Population Size Estimates of MSM

The national population size estimates of MSM is summation of the subnational estimates for both Part 1 and Part 2 combined. Based on the calculations, it is estimated that total population size estimate of MSM in Malaysia is 221,698 rounded to 220,000. This estimates of MSM represents **2.2%** of total adult male population (15-64) in Malaysia.

Table 12 : Triangulation of urban/rural demographic data, with data on internet usage by male populations, by age groups and state

State	Male 15-49	% Urban	% Internet use (urban)	% Rural	% Internet use (rural)	% internet users on social media (urban/rural)	15-49 males not on social networks	50-64 males	Total Part 2 base population	1.3 % MSM 15-64
Selangor	2,001,500	91.4	90.8	8.6	78.7	84.3	487,022	389,200	876,222	11,391
Sabah	1,293,400	54	77.8	46	66.5	90.4	444,513	186,500	631,013	8,203
Johor	1,119,200	71.9	84.2	28.1	77.4	81.4	369,522	253,600	623,122	8,101
Sarawak	814,000	53.8	81.5	46.2	62.3	90.7	277,777	194,200	471,977	6,136
Perak	674,400	69.7	76.2	30.3	67.7	90.7	224,053	192,100	416,153	5,410
Kedah	593,400	64.6	73.8	35.4	60.8	94.3	206,184	146,600	352,784	4,586
Kelantan	480,900	42.4	77.4	57.6	63.7	83.9	200,449	103,800	304,249	3,955
Kuala Lumpur	538,000	100	86.5	0		90.1	118,702	130,800	249,502	3,244
Pulau Pinang	506,000	90.8	86.8	9.2	77.6	80.5	155,885	127,700	283,585	3,687
Pahang	496,800	50.5	87.9	49.5	67	73.9	212,071	103,600	315,671	4,104
Terengganu	326,800	59.1	80.2	40.9	73.2	88.5	103,128	69,000	172,128	2,238
Negeri Sembilan	327,600	66.5	82.8	33.5	72.3	86.2	103,713	77,200	180,913	2,352
Melaka	256,900	86.5	84.7	13.5	76.1	93.7	55,809	62,300	118,109	1,535
Perlis	66,300	51.4	85.4	48.6	79.9	91	16,388	17,400	33,788	439
W.P. Labuan	27,900	82.3	91.1	17.7	76.1	76.6	8,998	5,900	14,898	194
W.P. Putrajaya	18,800	100	99.5	0		96	842	4,100	4,942	64
<b>TOTAL</b>	<b>9,541,900</b>						<b>2,985,056</b>	<b>2,064,000</b>	<b>5,049,056</b>	<b>65,638</b>

Table 13: Population size estimates for MSM

Subnational	Part 1 (using social media)	Part 2 (not using social media)	Total estimates
Selangor	39,417	11,391	50,808
Sabah	11,262	8,203	19,465
Johor	12,871	8,101	20,972
Sarawak	4,022	6,136	10,158
Perak	4,827	5,410	10,237
Kedah	2,413	4,586	6,999
Kelantan	2,413	3,955	6,368
Kuala Lumpur	50,679	3,244	53,923
Pulau Pinang	7,240	3,687	10,927
Pahang	6,435	4,104	10,539
Terengganu	1,609	2,238	3,847
Negeri Sembilan	4,827	2,352	7,179
Melaka	6,435	1,535	7,970
Perlis	0	439	439
W.P. Labuan	804	194	998
W.P. Putrajaya	804	64	868
	<b>156,059</b>	<b>65,639</b>	<b>221,698</b>

## D. Discussion

### Data limitations and assumptions

The online MSM social network survey was based on convenience sampling in its first wave of reach, and from there cascaded through snowballing. A more methodical and strategic approach such as adding geographic and demographic mapping component may improve the reach and representativeness of the sample population, as well as provide more in-depth information on MSM networks which may be useful for other purposes, such as identifying network hotspots, targeting reachable populations and differentiating levels of risk between and within networks.

### MSM at risk and target populations for intervention

The definition of MSM applied in this calculation refers to men aged 15-64 who had sex with men in the last 12 months. For the purpose of HIV intervention strategies and depending on what these interventions and their objectives are, the definition may need to be refined in terms of MSM at higher risk of infection and reachable. Thus, calculating the denominator population size estimate for specific MSM programme coverage in different catchment areas may require an additional level of adjustment to the estimates provided here.

Using social media and online dating app data can inform further the characteristics of MSM who find partners online. Studies have indicated that those who find partners online may be at higher risk of HIV infection and transmission, including other factors such as use of drugs prior to sex [15] [20].

### E. Conclusion

It is estimated that there is a total of 220,000 MSM in Malaysia. This represents 2.2% of total adult male (15-64) population in Malaysia. The consultative process of estimating number of MSM reflects the level of commitment of multi-stakeholders in advocating for enhancing priorities to mitigate new HIV infections among MSM in Malaysia. The efforts of including multiple stakeholders such as civil society organisations and other government agencies, and in recognising the limitations of these estimates, is a step ahead for HIV response in Malaysia.

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## NOTES





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