The United Republic of Tanzania

NATIONAL AIDS CONTROL PROGRAMME (NACP)

CONSENSUS ESTIMATES ON KEY POPULATION SIZE AND HIV PREVALENCE IN TANZANIA

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- Sessions for female sex workers: Willis Odek (Futures Group), Neema Makyao (NACP), Bongo Mgeni (PSI), Dr. Switbert Kamazima (MUHAS).
- Sessions for men who have sex with men: Professor M. Leshabari (MUHAS), Kåre Moen (University of Oslo), Elia Mmbaga (MUHAS), and Joshua Levens (CDC).
- Sessions for people who use/inject drugs: Dr Jessie Mbwambo (MUHAS), Jennifer Ward (CDC)
- Other presenters: Emmanuel Baingana (UNAIDS), Bonita Kilama (NACP), Dr Jerome Kamwela (TACAIDS).

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Dr. Neema Rusibamayila
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ABBREVIATIONS

FSW	female sex worker
HSHSP III	Third Health Sector HIV and AIDS Strategic Plan
HPP	Health Policy Project
IBBS	Integrated Biological and Behavioral Surveillance
MSM	men who have sex with men
MUHAS	Muhimbili University of Health and Allied Sciences
NACP	National AIDS Control Programme
PWUD	people who use drugs
PWID	people who inject drugs
RDS	respondent-driven sampling
STI	sexually transmitted infection
UCSF	University of California, San Francisco
WRA	women of reproductive age

EXECUTIVE SUMMARY

The Ministry of Health and Social Welfare and the Tanzania Commission for AIDS have expressed a need for key population HIV prevalence and group size estimates to identify the costs of the Third National Multi-Sectoral Strategic Framework on HIV and AIDS; the Third Health Sector HIV and AIDS Strategic Plan (HSHSP III); and other HIV prevention, care, and treatment strategies. With support from the Health Policy Project (HPP), which is funded by the United States Agency for International Development (USAID), NACP held a one-day workshop on April 14, 2014, to discuss and reach consensus among key stakeholders on key populationestimates for mainland Tanzania.

The consensus-building workshop reviewed the existing evidence and evaluated specific studies with a view to identifying study limitations and knowledge gaps. A Delphi method was used to seek consensus on the estimated size of and HIV prevalence among the three key populations in Tanzania: **female sex workers (FSWs)**, **men who have sex with men (MSM)**, and **people who use/inject drugs (PWUD/PWID)**. Due to the uncertainty and lack of empirical data surrounding prior estimates of these indicators for mainland Tanzania, the Delphi method was used to garner the highest-quality and least-biased estimates possible. Each key population group had an expert panel of 9 to 14 people, each with extensive experience in and knowledge of the key population group in the Tanzanian context.

The results of this workshop are summarized here:

- **Female sex workers:** A consensus size estimate for mainland Tanzania of 155,450 individuals (range: 128,610–198,050) and a consensus point prevalence estimate of 26 percent (range 14–37%)
- **Men who have sex with men:** A consensus size estimate for *urban* mainland Tanzania of 49,700 individuals (range: 41,000–71,000) and a consensus point prevalence estimate of 25 percent (range: 18–35%)
- **People who inject drugs:** A consensus size estimate for mainland Tanzania of 30,000 individuals (range: 20,000–42,500) and a consensus point prevalence estimate of 36 percent (range: 22–43%)

INTRODUCTION

The Ministry of Health and Social Welfare and the Tanzania Commission for AIDS have expressed a need for key population HIV prevalence and group size estimates in order to identify the costs of the Third National Multi-Sectoral Strategic Framework on HIV and AIDS; the Third Health Sector HIV and AIDS Strategic Plan (HSHSP III); and other HIV prevention, care, and treatment strategies. These estimates will help determine the adequacy of coverage and quality of related HIV and AIDS interventions, facilitate impact assessments of existing programs, and inform program-related budgetary planning and resource allocation.

With support from the USAID-funded Health Policy Project (HPP), NACP held a one-day workshop on April 14, 2014, to discuss and reach consensus among key stakeholders on key population size estimates. Before the workshop, planning meetings among key facilitators were held to review the methodology and data, and a literature review was conducted.

The workshop sought to gain consensus among experts on appropriate regional and national size and HIV prevalence estimates for three focal key population groups in mainland Tanzania: female sex workers (FSWs), men who have sex with men (MSM), and people who inject drugs (PWID). These three groups are highlighted from a larger set of vulnerable and key populations in Tanzania. Sex work in Tanzania takes many forms; there are male, female, and transgendered sex workers, and money and goods are exchanged for sexual services in diverse ways. For the purpose of this workshop, in consultation with stakeholders, the focus was on female sex workers only. The term "men who have sex with men" similarly also refers to a range of male-male sexual behaviors that can include gay-identified men, heterosexually identified men who have sex with men, bisexual men, and male sex workers (Beyrer et al., 2012).

At this juncture, Tanzania's lack of national estimates for FSW, MSM, and PWID population group size and related HIV prevalence is considered significant for programmatic reasons. This consensus-building workshop focused on these three groups because there are specific intervention targets related to these groups in Tanzanian HIV strategic plans, and consensus estimates are required for resource allocation decisions. NACP determined that the focus would be on mainland Tanzania.

Objectives

The consensus-building workshop aimed to

1. Review the existing evidence and latest research on key population size estimates and HIV prevalence in Tanzania, including discussion of data quality and availability.
2. Reach consensus on a point estimate and range (lower and upper bound) for the population size and HIV prevalence among each of the three key population groups in Tanzania.

Building consensus on key population size is particularly important because there is no "gold standard" for size estimation. Additionally, existing studies on key population groups in parts of Tanzania use various size estimation methods, resulting in wide-ranging estimates. Reaching consensus does not equate to complete unanimity, but all participants must agree to support the final best estimate and range.

Outline of Report

This report contains two sections. First, the existing evidence on key population size and HIV prevalence in Tanzania is summarized. The second section reviews the process and results of the consensus-building workshop for each of the key population expert groups.

REVIEW OF EXISTING EVIDENCE ON KEY POPULATIONS

A review of the existing evidence served as the basis for building consensus on key population estimates. The current research was also a useful starting point to extrapolate estimates for regions where data were not available. This section details the methods and key findings from the most recent and relevant research on key population sizes and HIV prevalence in Tanzania.

Studies on FSWs in Tanzania

Mainland Tanzania conducted integrated biological and behavioral surveillance (IBBS) surveys of FSWs in 2010 and 2013.

Methods

The 2010 IBBS survey (NACP, 2011) was implemented in three municipalities of Dar es Salaam from which FSW survey respondents were recruited. Extrapolation of the survey data provided estimates for the Dar es Salaam region for FSW group size, key behavioral and socio-demographic characteristics, and HIV/sexually transmitted infection (STI) prevalence. The study used respondent-driven sampling (RDS) with a sample size of 537. The size estimation process involved use of the multiplier method where a unique object (a branded handkerchief) was distributed by project staff in hotspots to FSWs age 15 or older.[1] Eleven seeds were recruited (independent of the unique object distribution) to initiate the survey and recruit peers to join the survey as per a referral chain sampling process. FSWs visited the study site, where they responded to a questionnaire administered by research assistants and provided blood and vaginal swabs for HIV and other STI testing. A question was added to the survey instrument on whether the FSW had received the unique object. A calculation factoring the number of objects distributed divided by the proportion of FSWs who reported receiving the object was analyzed using RDS data analysis software (NACP, 2011). This corresponds to the "unique object multiplier" method.

The 2013 IBBS design utilized the same methodology (RDS) as the 2010 survey; however, the survey expanded to cover sites in seven regions (two sites in Dar es Salaam and one site each in Iringa, Mbeya, Shinyanga, Tabora, Mara, and Mwanza). The final total sample size for the study was 1,869 FSWs. The inclusion criteria for survey participants were similar to the 2010 survey. Population size estimates were established using the multiplier method where a unique object (a colored bracelet) was distributed by peer educators two to four weeks before the study began. Participants recruited into the survey responded to three questions about the unique object.

The population size estimate for each region was conducted with the unique object identifier method (see Box 1), using RDSAT software, along with 95 percent confidence intervals for many of the behavioral and biological estimates. These are shown in the next section. In addition to the size estimate, HIV and STI prevalence were determined using testing of samples as per the national testing algorithm (NACP, 2013).

Box 1: Formula for the unique object multiplier size estimation method

$$\frac{n1}{N} = \frac{m}{n2}$$

where N=estimated size, n_1= no. of FSWs receiving object, n_2= no. of FSWs participating in survey (sample), m= no. of FSWs in sample who report receiving the object

[1] Inclusion criteria were: subjects age 15 or older (if below age 18, subject must be an emancipated minor); had exchanged sexual intercourse for money in the past six months; and resident of Dar es Salaam for at least the past three months. Hotspots are defined as geographical areas or locations with evidence of large sex worker population sizes.

Results

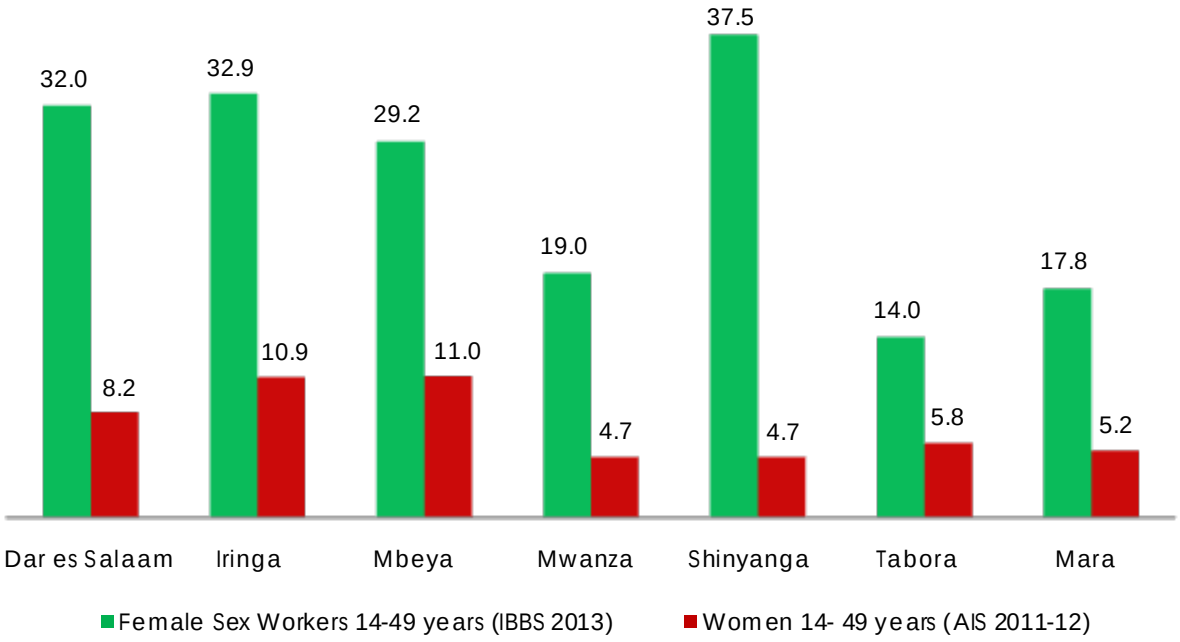
The 2010 IBBS study provided a point estimate of 7,000 FSWs in Dar es Salaam, with a range between 5,000 and 10,000 (NACP, 2011). The 2013 study gave a lower estimate for Dar es Salaam at 5,767 (Table 1). Regional estimates ranged from 2,302 in Mara to 7,883 FSWs in Mbeya (NACP, 2013).

Table 1. IBBS 2013 Size Estimation Results

	Dar	Iringa	Mbeya	Mwanza	Shinyanga	Tabora	Mara
Sample Size	346	220	244	350	320	229	205
Estimated group size (95% CI)	**5,767** *(3,502–8,031)*	**3,034** *(2,060–4,009)*	**7,883** *(3,928–11,838)*	**3,281** *(2,600–3,963)*	**4,923** *(3,541–6,306)*	**4,244** *(2,289–6,200)*	**2,302** *(1,434–3,169)*

The 2010 study estimated HIV and STI prevalence through blood samples and vaginal swabs. Regionally, HIV and STI prevalence were estimated at 31.4 percent and 27.3 percent, respectively (NACP, 2011). In 2013, estimated HIV prevalence among FSWs in Dar es Salaam was stable at 32 percent. Overall, estimated HIV prevalence ranged from 14 percent in Tabora to 37.5 percent in Shinyanga (Figure 1) (NACP, 2013).

Figure 1. IBBS 2013 HIV Prevalence Results



Source: NACP, 2013

Studies on MSM in Tanzania

Methods

The most recent integrated bio-behavioral study on MSM in mainland Tanzania was conducted in Dar es Salaam by the Muhimbili University of Health and Allied Sciences (MUHAS) with support from UNAIDS. This survey also used RDS and sampled 753 MSM age 18 and above across all three districts of Dar es Salaam. A preponderance of those sampled were under age 35 (87%) and 46 percent were between ages 18 and 24.

Five RDS seeds were identified from members of previous studies of MSM in Dar es Salaam and represented different socioeconomic backgrounds. The size estimation of the MSM population in Dar es Salaam was conducted using three methods: capture recapture, service multiplier, and wisdom of the crowd (Leshabari et al., 2013). These methods differ from the unique object multiplier method used with the FSW studies as described above or in Box 1. A brief description of the first two calculation methods is provided in Box 2. Data were analyzed using RDSAT as well as statistical software. The service multiplier method was partially based on the service delivery statistics of the Pastoral Activities and Services for People with AIDS, Dar es Salaam Archdiocese (PASADA), a local NGO. In addition to group size, the study also estimated HIV and STI prevalence levels in the sample population, as well as recorded behavioral indicators.

Results

The MUHAS study estimated population sizes for MSM in Dar es Salaam, which varied greatly by method; the estimated size was 6,409 using the capture-recapture method, 13,513 using the service multiplier method, and 32,650 using the wisdom of the crowd method.

The overall prevalence of HIV among MSM in Dar es Salaam was 22.2 percent and varied according to sexual position during anal sex. It was higher among receptive partners (46.5%) and lower among insertive partners (10.5%). Those who practiced both positions had a prevalence of 21.2 percent (Leshabari et al., 2013). HIV prevalence was highest among the men in the 25–34 age group. There are no other recent studies of HIV prevalence among MSM from mainland Tanzania. Beyond this, the only other study with a prevalence estimate was for Unguja Island in Zanzibar, where HIV prevalence of 12.3 percent (8.7–16.3%) was estimated among MSM (Dahoma et al., 2009).

These results were compared to other studies in a literature review during the preparation for the workshop. Some older studies estimated the percentage of the male population in areas of mainland Tanzania who have an MSM identity. Between 1998 and 2000, 8 percent of men who attended an STI clinic in Dar es Salaam reported that they were homo- or bisexual (Nilsen et al., 2007). Additionally, in 1997–98, 2.3 percent of male youth attending a clinic for sexual and reproductive health in Dar es Salaam said they engaged in same-sex sexual relations (Mwakagile et al., 2001). In Zanzibar, a survey-based study conducted for Unguja Island suggested a population size of 2,157 MSM, which was the Delphi consensus estimate across several different calculation methods (Khalid et al., 2014). Depending on whether this is considered an urban MSM population or more distributed, this estimate suggests that individuals with an MSM identity are 0.5–0.9 percent of the male population, based on 2012 Census data. A review of international work on MSM population size in low- and middle-income countries, deriving from the study by Cáceres et al. (2008), suggests the average size of MSM populations in many low- and middle-income countries is between 2 and 5 percent of the overall male population.

Box 2: Formulae for size estimation methods used in the Dar es Salaam MSM study (Leshabari et al., 2012)

1. **Capture-recapture method** based on two survey rounds:

$$\text{Group size} = \frac{N1 \times N2}{M}$$

Where N1 is the number of participants in the first survey (753), N2 is the number of participants in the second survey (749), and M is the number of unique participants captured in *both* surveys (88).

2. **Service multiplier method** using service (PASADA) and survey data:

$$\text{Group size} = \frac{N}{P}$$

Where P is the proportion of MSM from the survey reporting use of PASADA services in the past three months (3.7%) and N is the actual number of MSM recipients recorded at PASADA (500).

Studies on PWID in Tanzania

Methods

The University of California, San Francisco (UCSF) and Centers for Disease Control (CDC) Tanzania are conducting a drug mapping study involving qualitative interviews with people who use drugs (PWUD) to estimate both PWUD and PWID population sizes in 12 regions of Tanzania. The PWUD group is the overall category, which includes those who smoke, sniff, ingest, or inject drugs. This study is not yet complete, though data from five regions have been collected. The study estimated counts of PWUD and PWID and identified hotspots in the selected regions. These estimates are shown in Table 2 (Laurent et al., 2014).

MUHAS also conducted a cross-sectional study using RDS to estimate HIV prevalence, drug use behaviors, and uptake of social services among PWID in Kinondini district of Dar es Salaam (Nyandindi, 2011). The study randomly enrolled 419 PWID at community venues accessible through the Tanzania AIDS Prevention Programme, 23.4 percent of whom were female. For this study, inclusion criteria were visual observation of needle track marks, age 18 or above, provision of verbal consent, and ability to meaningfully participate in the survey (sobriety and coherence). Previous community service delivery statistics and expert opinion were the basis of the PWID population size used for sample size calculations.

Results

There are only a few studies of PWID or PWUD population size for Dar es Salaam. A study of service delivery statistics from outreach sites and a medication-assisted treatment clinic suggested that from 2010 to 2011 there were at least 6,110 PWUD in the Kinondoni region, of whom 1,768 were injectors (Lambdin et al., 2012). Another study found that peers estimate there are 650 opiate (heroin) injectors in the Temeke district of Dar es Salaam (Bowring et al., 2011).

Preliminary results from the UCSF/CDC Tanzania study are available for five regions (Mtwara, Dodoma, Morogoro, Pwani, and Kilimanjaro); the study estimates that there are 708 PWID in these five regions (Table 2). The numbers of PWID who frequented other hotspots or individuals who were not visible to the study group are unknown. Rigorous estimates using any of the known RDS-based methods are not available for other regions or the entirety of mainland Tanzania. Some sources based on expert opinion suggest an estimate of 25,000 PWID in Tanzania (Bowring et al., 2011), while others project double that number (Pangaea Global AIDS Foundation, 2012). Given the wide variability in these estimates, a mainland Tanzania consensus population size estimate is still required.

Table 2. Size Estimates for PWUD and PWID at Hotspots in Six Regions

	Mtwara	Dodoma	Morogoro	Pwani	Kilimanjaro	Kinondoni*
PWUD						
Male	65 (35–150)	913 (460–1600)	1,250 (750–1800)	1,475 (1,000–2,700)	450 (200–650)	~6,110
Female	0 (0–1)	183 (92–320)	250 (150–360)	64 (43–117)	113 (50–163)	
PWID						
Male	7 (2–10)	100 (50–130)	260 (180–500)	150 (50–250)	80 (55–125)	~1,768
Female	0 (0–0)	33 (17–43)	37 (26–71)	14 (5–23)	27 (18–42)	

Source: Laurent et al., 2014 (except Dar es Salaam)
* Based on service delivery data collection points with TAPP group of NGOs, source: Lambdin et al., 2012

There are comparatively more data points on biological and behavioral indicators related to PWID and PWUD and the risk of HIV infection and STI. Most cross-sectional studies have suggested very high

levels of HIV prevalence in the PWID population. Injecting behavior is a major source of risk, but the cross-sectional bio-behavioral studies suggest overlapping areas of risk, which include lack of condom use in sexual encounters, a high number of sexual partners, and various forms of sex work among female PWID (Bowring et al., 2011; Williams et al., 2009). In one study, 90 percent of female PWID surveyed had some experience in sex work (Williams et al., 2009).

The 2011 MUHAS study found that 51.1 percent of PWID in the Kinondoni district of Dar es Salaam were HIV positive (Nyandindi, 2011). Female PWID, who comprised just 23 percent of the sample, were more likely to be HIV positive (71.4% compared to 44.9% for male PWID).

The MUHAS study corroborates previous findings, which also showed a higher prevalence among female PWID. For example, a previous study that collected data over 2005–06 (sample size: 534) estimated that 42 percent overall, and 28 percent of male and 64 percent of female PWID sampled were HIV positive (Williams et al., 2009). A survey (sample size: 267) conducted via snowball and targeted sampling at drop-in centers operated by Médecins du Monde in 2011 estimated an overall HIV prevalence of 34.8 percent (95% CI: 29.1–40.9) among PWID, and 30 percent and 66.7 percent, respectively, among male and female PWID (Bowring et al., 2013). In a related report, data on non-injecting drug users was also presented from this survey, where the HIV prevalence was 11.7 percent (Bowring et al., 2011). In this prior report, the HIV prevalence for the PWUD group as a whole was 26 percent.

CONSENSUS ESTIMATES AND WORKSHOP RESULTS

This section highlights the consensus-building process, the key decisions made by each expert panel, and the agreed-upon estimates for size and HIV prevalence among FSWs, MSM, and PWID in Tanzania.

Planning for the workshop began in March 2014, and NACP and HPP engaged other stakeholders on the need for such an exercise and for selecting the appropriate date and venue. Facilitators from key organizations with experience in conducting size and prevalence estimation studies were nominated. Close to the date of the workshop, HPP organized a working session of the key facilitators for the various sessions of the workshop. This meeting was held in early April 2014 at MUHAS, and attended by facilitators from the USAID-supported MEASURE Evaluation project, Population Services International (PSI), UNAIDS, and MUHAS. The meeting reviewed the workshop design, key methods related to the Delphi technique (discussed in more detail below), and the various existing studies that would be presented. Decisions were also made on the other datasets that would be made available to workshop participants to facilitate discussion. A short facilitator's guide had been developed and was reviewed at the planning meeting.

Workshop Methods

The consensus-building workshop began with an overview of the workshop's objectives and purpose and a breakout session to review the existing evidence (see Annex 1 for the workshop agenda). Workshop participants evaluated the studies discussed in the previous section to identify study limitations and knowledge gaps.

In the afternoon, a modified Delphi method was used to achieve consensus on the estimated size of and HIV prevalence among the three key populations in Tanzania. The modification here refers to the innovation in the traditional process and the use of visual aids at the end of consensus-building rounds, which helped to facilitate discussion. Annex 2 provides flowcharts that describe the process for the modified Delphi method. Due to the uncertainty and lack of empirical data surrounding these estimates in Tanzania, the Delphi method was used to garner the highest-quality and least biased estimates possible.

Each key population group had its own expert panel comprised of between 9 and 14 people with extensive experience in and knowledge of the key population group in the Tanzanian context (see Annex 3 for complete list of participants). The panel met face-to-face in two separate breakout sessions to discuss the quality and availability of data, and each expert's opinion on exact size estimation and HIV prevalence remained anonymous via written communication with a facilitator.

The modified Delphi process consisted of four rounds. During the first round, experts submitted estimates and justifications for the estimates to the facilitator, who presented the group's results. The second round allowed for participants to change their initial estimate and discuss the new results. The third round established the best point estimate; respondents wrote their final estimates and the facilitator-guided discussion on adjustments to the average point estimate based on dissenting opinion. In the final round, participants agreed on a range (lower and upper bounds) that encompassed the point estimate established in the previous round.

FSW Consensus-Building Process and Final Results

Process

The FSW breakout session began with a review of the available evidence, especially the RDS-based IBBSs from 2010 and 2013 (NACP, 2011 and 2013). This discussion was followed by the Delphi-based

rounds of a size estimation exercise that provided each of the experts an opportunity to propose estimates building on the existing evidence, local knowledge, and experience with FSW programming. Unlike the other two key population group sessions, the FSW session participants spent more time on the size estimation exercise, beginning with a thorough examination of the available information by region. Therefore, a full Delphi process as outlined in Annex 2 was not concluded for HIV prevalence among FSWs.

The IBBS data were evaluated against the implications of other sources, including demographic and service delivery data, to further enhance the interpretation of the point estimates and ranges for the size. One key analysis conducted was to convert the point estimate and the range of FSW population size from the 2010 and 2013 IBBS surveys into a percentage of the estimate of women of reproductive age (WRA; ages15–49) based on Census 2012 data. The results of this exercise are shown in Box 3. This and other discussions contributed toward a reasonable estimate for all regions.

Box 3: Estimated FSW group size in regions from the 2010 and 2013 IBBS surveys as a percentage of the Census 2012 number of WRA (15–49 years)

Dar es Salaam (2010): **0.5**% (0.4–0.7)

Dar es Salaam (2013): **0.4**% (0.3–0.6)

Iringa (2013): **1.3**% (0.9–1.7)

Mara (2013): **0.6**% (0.4–0.8)

Mwanza (2013): **0.5**% (0.4–0.6)

Mbeya (2013): **1.2**% (0.6–1.7)

Shinyanga (2013): **1.4**% (1–1.8)

Tabora (2013): **0.8**% (0.4–1.2)

The FSW session discussed several limitations of size estimation methods used in the 2010 and 2013 IBBS study reports, particularly the detriments of the unique object multiplier method and the rollout of the RDS survey itself when used without the benefit of other methods such as geographic hotspot mapping. In addition, there was general agreement that values for FSW population size were likely to be underestimates, particularly for the Dar es Salaam region. Participants discussed specific limitations of the IBBS studies, including potential double recruitment into the sample, possible exclusion of certain FSW segments due to the study's definition of FSWs, and double distribution of the unique object that resulted from delays in opening the study site. Furthermore, the 2013 study faced challenges with the distribution of the unique object: saturation was not achieved in certain regions, including Dar es Salaam; and there were in- and out-migration of FSWs.

As a result of these considerations, the participants of the FSW session agreed to the following guidance for the discussion leading to proposing/evaluating size estimate results:

1. Regional/global estimates of the ratio of FSWs to WRA would be used as an appropriate comparator to the Tanzanian case.
2. An appropriate upper ceiling for the ratio of FSWs to WRA would be 2.5 percent in large urban areas.
3. Regions with large rural populations would generally have a lower ratio of FSWs to WRA, except areas with a significant concentration of economic activities such as large farming areas/plantations and mining, or with the presence of fishing communities.
4. Beginning with regions where some preliminary data are available (those shown in Box 1), after appropriate adjustments, these regions would serve as a basis for comparisons to other regions without much data that portrayed similar characteristics (e.g., rural/urban split of the total population, adult HIV prevalence, other risk factors).
5. Overall, to guide adjustments to values, regions would be divided into three general tiers for comparisons based on their socioeconomic profiles:
    a. Tier 1: Dar, Mwanza, Arusha, Shinyanga

   b. Tier 2: Mbeya, Kilimanjaro, Iringa, Njombe, Tanga, Dodoma, Morogoro
   c. Tier 3: Tabora, Mtwara, Ruvuma, Singida, Rukwa, Kigoma, Kagera, Katavi, Manyara, Simyu, Gieta, Pwani, Lindi, Mara

6. Point estimates of FSW population size (and the related range) for those regions where prior size estimates were not available would be discussed within the group as deriving from a first consensus on the percentage of WRA that FSWs represent.

Based on discussions guided by the principles above, the participants made some key decisions on the proportion of FSWs to WRA by region (see Table 3) to derive the point estimates of population size. After comparing regions and subsequent to minor incremental adjustments to the percentages made during each Delphi round, the panel arrived at the values in the last three columns of Table 3 using the Census 2012 data tables that were provided to all participants. These final values derive from the discussion of a "profile" for each region related to characteristics behind the proportion of FSWs in the population of WRA:

1. Arusha's profile is similar to Mwanza and Dar es Salaam, so the Arusha percentage is the average of the latter two (2%)
2. Dodoma is similar to Mwanza (1.5%)
3. Gieta is similar to Shinyanga
4. Kagera, Katavi, and Kigoma are similar to Tabora and Mara, so the average of the latter two was used
5. Kilimanjaro is similar to Arusha, but slightly lower-profile, so FSWs are an estimated 1.8 percent of WRA
6. Lindi is similar to Mwanza, but lower-profile, so FSWs are estimated to be 1 percent of WRA
7. Manyara matches other regions that are predominately rural (i.e., assumption of 0.6% of WRA)
8. Simiyu and Singida have similar profiles to Manyara
9. Morogoro is similar to Arusha
10. Mtwara is similar to Lindi
11. Njombe is similar to Iringa
12. Pwani is similar to Dar es Salaam, however due to larger rural population used lower limit of Dar
13. Rukwa is similar to Katavi
14. Ruvuma is similar to Iringa and Mbeya, so the group would take the average of the two figures
15. Tanga is similar to Pwani

Results

The FSW session participants estimated there are **155,459** FSWs in mainland Tanzania, with a range for this value of 128,610 to 198,050. This is based on the calculations suggested by Table 3. Specifically, this national population size estimate is the sum of the regional point estimates, which were calculated by multiplying the consensus value of FSWs as a percentage of the WRA in the region.

The results by region are shown in Table 3. The region with the largest estimated FSW population is Dar es Salaam, with a point estimate of 28,000 (22,500–34,645). Morogoro, Mbeya, and Mwanza also have large estimated FSW population sizes. The regions with the lowest estimated FSW population sizes are Manyara, Singida, and Katavi; each of these regions is estimated to have fewer than 2,000 FSWs.

Table 3.Population Size Estimates for FSWs by Region and Related Determinants

Region	Adjusted % of WRA who are FSWs	FSW population size point estimate	Estimated Range	
			Minimum	Maximum
Regions where data were available from 2010 or 2013 IBBS study				
Dar es Salaam	2.0%	28,000	22,500	34,645
Iringa	2.2%	5,170	4,000	8,000
Mara	1.0%	3,810	3,000	5,500
Mbeya	1.5%	10,152	9,187	12,000
Mwanza	1.5%	10,000	6,500	13,076
Shinyanga	2.0%	7,030	6,000	9,000
Tabora	0.9%	4,688	4,000	6,000
Regions where data were not available, and comparisons were made				
Arusha	2.0%	8,905	7,124	10,953
Dodoma	1.5%	7,069	6,397	8,356
Geita	2.0%	7,678	6,547	9,828
Kagera	0.9%	4,914	4,177	6,290
Katavi	0.9%	1,118	950	1,431
Kigoma	0.9%	4,263	3,624	5,457
Kilimanjaro	1.8%	7,074	6,013	9,055
Lindi	1.0%	2,156	1,703	2,824
Kagera	0.9%	4,914	4,177	6,290
Manyara	0.6%	1,869	1,607	2,392
Morogoro	2.0%	10,802	9,182	13,827
Mtwara	0.9%	2,851	2,423	3,649
Njombe	2.2%	3,871	2,981	6,000
Pwani	1.6%	4,262	3,410	5,242
Rukwa	0.9%	2,011	1,709	2,574
Ruvuma	1.8%	5,966	5,071	7,636
Simiyu	0.6%	2,092	1,778	2,678
Singida	0.6%	1,808	1,537	2,314
Tanga	1.6%	7,901	7,190	9,323
TOTAL	**1.5%**	**155,459**	**128,610**	**198,050**

Source: Tanzania key population consensus size estimation workshop, 2014

In terms of HIV prevalence, the group derived an initial point estimate of **26 percent** HIV prevalence among FSWs for mainland Tanzania, with a range of 14 to 37 percent. However, the group agreed that the proposed approach used to arrive at this national figure was only provisional, and such assumptions would not be adequate to estimate HIV prevalence by region, since HIV prevalence data were not available for many regions. The group recommended a review of alternative approaches for regional estimates of HIV prevalence, such as pooling HIV prevalence using confidence intervals and extrapolation. Due to time constraints, these could not be completed during this workshop.

MSM Consensus-Building Process and Final Results

Process

The MSM group acknowledged the lack of studies on MSM in Tanzania, particularly in rural areas. Global data show that MSM congregate in urban areas, but rural Tanzanians have limited mobility and may not have the ability to relocate to urban areas. Therefore, there may not be a large difference between urban and rural concentration of MSM in Tanzania compared to other countries with better infrastructure and mobility. However, the group was unwilling to make any assumptions without data from a rural study.

When reviewing particular studies, the group discussed that current size estimates are likely underestimates. The TACAIDS study recruited only a few older men, people in higher socioeconomic positions, and individuals with higher education, likely resulting in these groups being underrepresented. Furthermore, qualitative research reveals that MSM think MSM size estimations for Dar es Salaam are too low.

In terms of HIV prevalence, the group discussed two studies that presented a wide range of HIV prevalence among MSM and captured different proportions of MSM by sexual position preference (i.e., insertive partners, receptive partners, and those with both). In general, receptive partners registered as having much higher HIV prevalence than insertive partners. Therefore, the group discussed the absolute distribution of these sexual preferences in the MSM population.

For both size estimation and HIV prevalence, the panel decided to focus on men ages 15 to 49 who were living in the *urban areas of mainland Tanzania*, due to the lack of data from any of the rural areas. The total size of the population taken into consideration was 2.9 million men, derived from the following Census 2012 estimates:

1. Men in mainland Tanzania: 21,239,313
2. Percentage of the population living in urban areas: 29.1%
3. Percentage of persons in the 15 to 49 age group: 47.2%

Results

The point estimate for the MSM population size in the urban areas of Tanzania was **49,000**, with an estimated range from 41,000 to 71,000. The point estimate corresponds to 1.7 percent of men in the 15 to 49 age range, whereas the lower and higher bounds of the interval are 1.4 percent and 2.4 percent of men ages 15 to 49, respectively. The point estimate of population size skews toward the lower limit of this range, and hence deviates from the mean or median. This was seen as appropriate due to the participants' view that in Tanzania, the population percentage of MSM would be on the lower end of values seen as appropriate in other African countries which average around 1 percent of the total male population for urban areas.

The estimated consensus HIV prevalence among MSM ages 15 to 49 living in urban areas in mainland Tanzania was set at **25 percent**, with an estimated range from 18 to 35 percent. Similar to the size estimate, the point estimate for HIV prevalence is at the low end of this wide range.

PWID Consensus Process and Results

Process

The PWID panel estimated population sizes and HIV prevalence for both PWUD and PWID, with PWID being a subset of PWUD. Rather than estimating population sizes region by region, the group decided to use information from the collective discussions on different regions to inform a national population size

estimate. The experts discussed how transport routes (e.g., railways and roads), previously identified hotspots (e.g., mining communities), and coverage and effectiveness of PWID-targeted interventions influenced drug use and thus the prevailing PWID population size and HIV prevalence. Further, the panel wanted to capture previously hidden groups, including female and younger PWID, in their estimates.

In general, female and younger PWID are more vulnerable and thus less likely to be included in PWID studies. The session participants viewed this potential underrepresentation of women and young PWID as suggestive of possible inaccuracies in the current estimates of PWID size and HIV prevalence in Tanzania. Since there is a strong link between sex work and injecting drug use, the participants also considered the potential overlap between sex worker population size and PWID population size.

Participants discussed the strengths and limitations of the available studies. For instance, although the MUHAS study from 2011 (Nyandindi, 2011) may have sampled many PWID in the Kinondoni district of Dar es Salaam, it excluded youth and only 23.4 percent of respondents were women. The ongoing UCSF/CDC Tanzania study was the only one to estimate PWID population sizes in regions outside of Dar es Salaam, and though there were limited results available as of April 2014, this study provided an important basis for national population size estimates.

Size estimations were based on the proportion of total PWID population residing in Dar es Salaam and the proportion of PWID in urban versus rural areas according to other studies. The panel assumed that Dar es Salaam holds 30 to 50 percent of the total PWID population in Tanzania, and the population of PWID in regions such as Tanga, Iringa, Mwanza, and Arusha will grow in the coming years.

Results

The participants estimated that there were approximately **300,000** PWUD in Tanzania, ranging from 200,000 to 350,000. The best size estimate for PWID was **30,000**, with a range of 20,000 to 42,500.

The overall consensus PWID HIV prevalence point estimate was **35** percent, with a range of 22 to 43 percent. Although there was not enough time to come to consensus on separate HIV prevalence estimates for male and female PWID, the group tried to account for the higher HIV prevalence rates seen in female PWID as being possibly due to women also being involved in sex work or being last in line when syringes are shared. The participants expressed a strong interest in conducting the Delphi process separately for male and female PWID, though time did not permit this. The lower bound of the range was heavily influenced by the high HIV prevalence rates among female PWID and the fact that they are underrepresented in current estimates. HIV prevalence among PWUD was estimated to be lower, between 18 and 25 percent.

Uses of the Estimates and Next Steps

This report is based on notes from all of the Delphi consensus-building sessions submitted by the group facilitators, as well as additional literature review and writing.

The results from the key population consensus estimates workshop were presented in draft form at an April 2014 meeting of implementers and technical experts on optimal care models for PWID. The results are also being used to inform the HIV and AIDS investment case in Tanzania—they were used as essential data inputs for a preliminary analysis using the Goals mathematical model in April 2014, which was presented at a meeting of the Tanzania HIV/AIDS Care and Treatment TWG meeting in April 2014. The final investment case will assess the cost and impact of various scale-up scenarios and resource allocation decisions for HIV and AIDS in Tanzania.

Additional uses of these key population size estimates will emerge over time and are likely to relate to programmatic decision making, cost and resource estimation, as well as various coverage assessment and strategic planning needs.

The methodologies used in the workshop in Tanzania are innovative and were regarded as being very effective. With the documentation provided in this report, they are available for use in other similar contexts in sub-Saharan Africa and beyond.

ANNEX 1: MEETING AGENDA

TIME	ITEM	RESPONSIBLE
8:30 AM–9:00 AM	Registration, Breakfast	
9:00 AM–10:30 AM *15 minutes* *10 minutes* *10 minutes* *20 minutes* *10 minutes*	PLENARY SESSION • Introduction to workshop, key objectives • Key uses of consensus estimates 1. Modes of Transmission study and HIV Investment Case 2. Costing analysis for NSMF III and HSHSP III, HIV care and treatment scenarios • Summary overview of key data available in Tanzania for KP (size estimates and HIV prevalence) • Experiences in Kenya for consensus size estimation	• NACP • Technical partners: 1. UNAIDS 2. Health Policy Project (HPP) • NACP and HPP • Dr. Willis Odek, Futures Group
10:30 AM–10:45 AM	Break	
10:45 AM– 12:00 PM	BREAKOUT SESSIONS: Sex workers (focus on female), MSM, PWID For each group • Review of regional size estimates, including IBBS, small RDS studies, other studies • Review of existing HIV prevalence estimates • Review of other data at national and sub-national levels	Facilitators: FSW: Dr. Switbert Kamazima (MUHAS) PWID: Dr. Jessie Mbwambo (MUHAS) MSM: Prof. M. Leshabari, (MUHAS)
12:00 PM–1:00 PM	LUNCH	
1:00 PM–3:15 PM	BREAKOUT SESSIONS Delphi process to arrive at consensus estimates	Facilitators: FSW: Willis Odek (Futures Group) PWID: Jennifer Ward (CDC) MSM: Dr. Kåre Moen (MUHAS/University of Oslo)
3:15 PM–3:30 PM	BREAK	
3:30 PM–4:00 PM	PLENARY SESSION Reporting of consensus estimates by group	MODERATOR: NACP (Dr. Neema Makyao)
4:00–4:30 PM	DISCUSSION and NEXT STEPS	

ANNEX 2: MODIFIED DELPHI PROCESS

Figure 1: Modified Delphi Process for Key Population Size

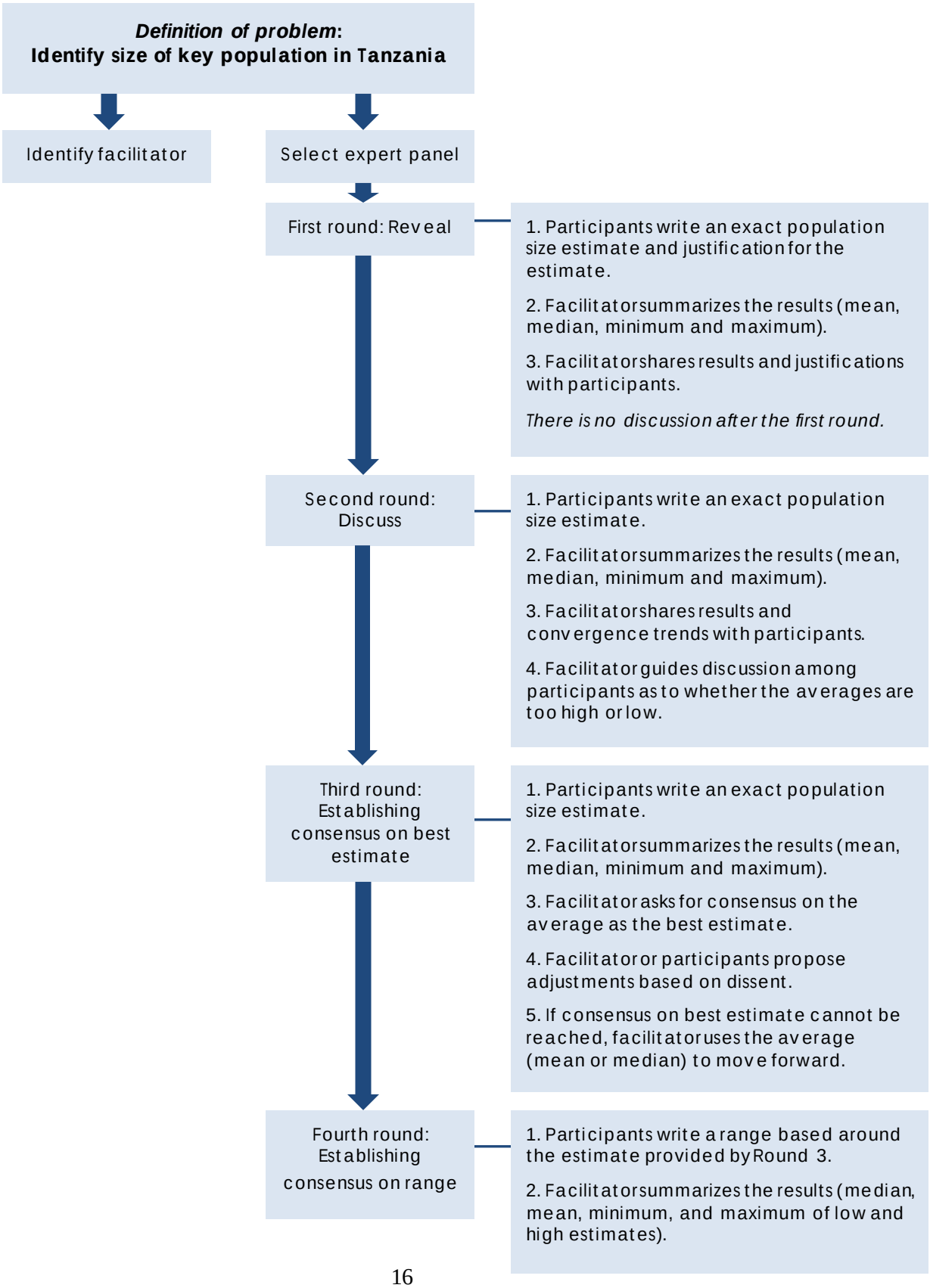
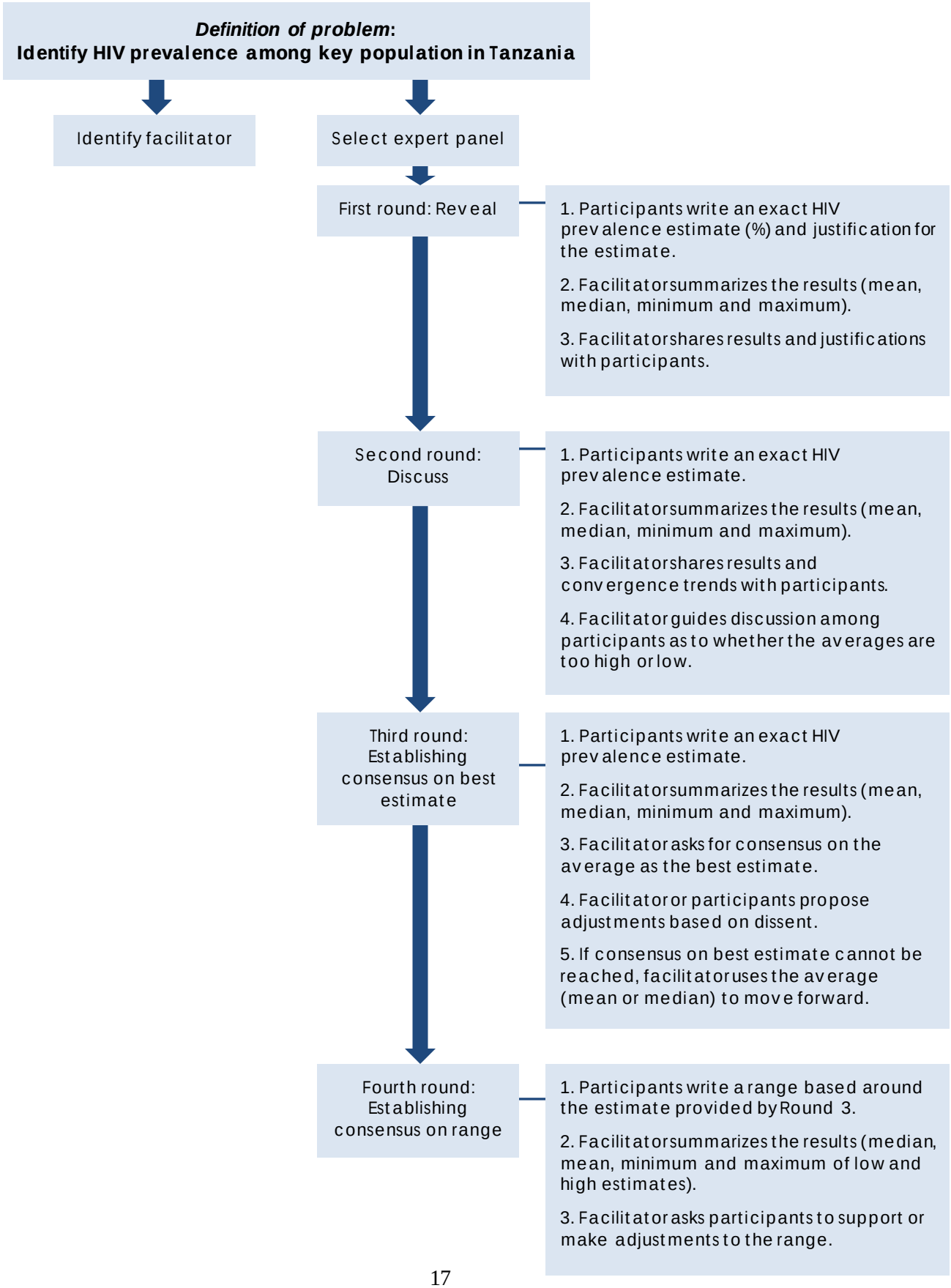


Figure 2: Modified Delphi Process for HIV Prevalence in Key Population



ANNEX 3: PARTICIPANT LIST

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