EPIDEMIOLOGICAL REVIEW RELATED TO THE MODES OF TRANSMISSION ANALYSIS (EPI–MOT)

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PURPOSE OF THE EPI-MOT

The analysis of the distribution of new HIV infections by modes of transmission aims to help countries become more systematic in their prevention response by strengthening the country's use of available strategic information about the HIV epidemic.

A comprehensive review of the epidemiological data available in the country is essential for the application of the UNAIDS Modes of Transmission model (MoT). It serves to provide a catalogue of relevant studies and data while identifying key gaps in strategic information. The **Epi Review Instrument** or "**Epi-MoT**" was developed to help systematize the review process and add a quantitative component to the exercise. It provides guidance for the systematic extraction of data to be used in the MoT analysis and assesses whether the data availability and quality are sufficient for conducting the MoT analysis with reasonable levels of accuracy. Epi-MoT is the required first step before applying the UNAIDS MoT model. In addition, countries can use the Epi-MoT as a stand-alone tool to evaluate the availability and quality of data and plan for future data collection. Results of the Epi-MoT, in addition to other "Know your Epidemic" efforts, could make an important contribution to focusing the prevention response and to informing the national strategic plan.

STRUCTURE OF THE EPI-MOT TOOL

The Epi-MoT tool, developed in Excel, contains several worksheets that include:

- An overview of the process
- A checklist to assess data availability by risk population
- Worksheets for each risk population to collect relevant data and to assess quality of data
- Results page to provide an overall summary of data quality
- Action plan page, to plan further activities related to potential MoT analysis

POTENTIAL USES OF THE EPI-MOT TOOL

- Review of available epidemiological data specifically related to MoT analysis
- Evaluation of availability and quality of data to conduct the MoT model
- Identification of key gaps in strategic information in order to inform data collection priorities
- Verification of the type of data required for the MoT model according to the epidemiological situation in the country
- Decision on whether the country can proceed with the application of the MoT model

FINAL PRODUCTS

- Catalogue of relevant studies and available data in the country
- Score for the availability of data required to conduct the MoT
- Score for the quality of available data, by risk population and overall, required to conduct the MoT
- Data ready to be incorporated in the MoT model, in cases where availability and quality are satisfactory
- Identification of gaps in relevant information
- Plans to address the gaps in relevant information
- Report of the epidemiological review (Epi-MoT)

EXPERTISE REQUIRED FOR THE USE OF EPI-MOT

To ensure the process is carried out rigorously it is important that the Epi-MoT team includes professionals with the following knowledge and expertise:

- Knowledge of the HIV epidemic in the country.
- Familiarity with HIV-related data, available studies and key stakeholders.
- Experience in the evaluation and review of epidemiological data.
- For application of the MoT model the Epi-MoT team should ideally include a mathematical / epidemiological modeler with relevant experience.

1 OVERVIEW OF THE PROCESS

UNAIDS is developing a set of tools relevant to the "Know your Epidemic / Know your Response" initiative, to help countries become more systematic in getting to know their HIV epidemic and planning their response. It aims to guide countries in (1) extracting and verifying the information available on the epidemic and identifying the gaps in strategic information (Epi-MoT); (2) identifying which population groups and associated risk behaviours are contributing to new HIV infections (MoT modeling); and (3) planning the national response based on strategic evidence.

The epidemiological review (for which the Epi-MoT spreadsheet was developed) is the first step in the "Know your Epidemic" process (Figure 1). It serves as a guide to help countries review HIV epidemiological data and to assess data availability and quality before conducting the MoT analysis. If the available country data are of reasonable quality, the data are typically used as inputs in the UNAIDS MoT model in order to estimate the distribution of new HIV infections by modes of transmission. This analysis, in addition to other efforts to understand the epidemic, can contribute to improved national prevention strategies, plans and budgets.

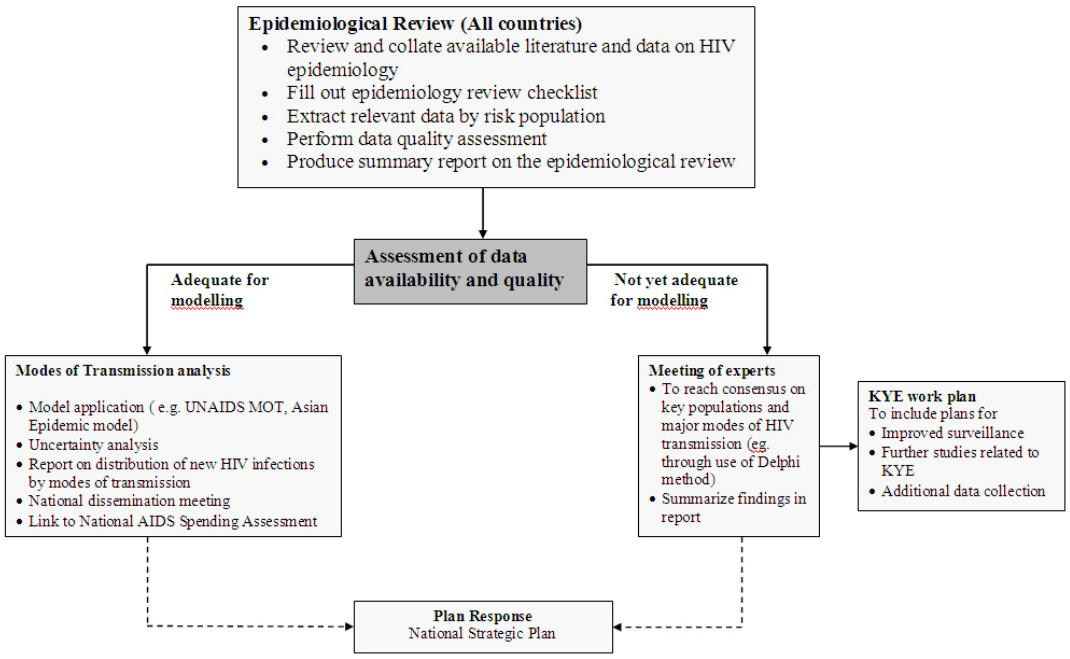
If the relevant data are not available in a country, or the quality is generally too poor to conduct the MoT analysis with reasonable levels of confidence, it may be necessary to organize a meeting with national HIV experts in order to reach consensus on key populations (for example through the use of the Delphi method), to agree on assumptions or decisions related to estimating missing indicators, and to plan for further data collection or improvements in surveillance efforts.

NOTE:

Poor quality data used in the MoT analysis will affect the accuracy and credibility of results and will result in questionable outputs.

Figure 1:Overview of the Epi-MoT process and its results

KNOW YOUR EPIDEMIC PACKAGE



COMPONENTS OF THE EPI-MOT

The Epi-MoT tool assesses (i) the availability of required data, and (ii) the quality of available data necessary to conduct the UNAIDS MoT analysis. To assess the availability of data, the user starts by filling in the Epi-MoT checklist (described below) from which a percentage score is generated based on those data that are available. To assess the data quality, the user has to review all potential data sources for each of the risk populations (including published and unpublished studies and reports) that could be used to inform the indicators in the MoT model. Relevant information is then extracted from each study, such as year of data collection, sample size, gender, geographic area included, definition of risk group and, of course, the estimate for the specific indicator of interested and the uncertainty associated with it (such as the standard error or confidence intervals). Some of the data may be clearly defined and easily extracted, whereas others may be poorly specified or may be estimated using indirect methods.

The user has to evaluate each data source by giving it a quality score that varies from 0 when there is no data available, 1 indicating poor quality, to 3 indicating good quality. The spreadsheet finally shows the total data availability scores for each risk population which can be used as an overall measure to decide whether the country can proceed with the MoT analysis.

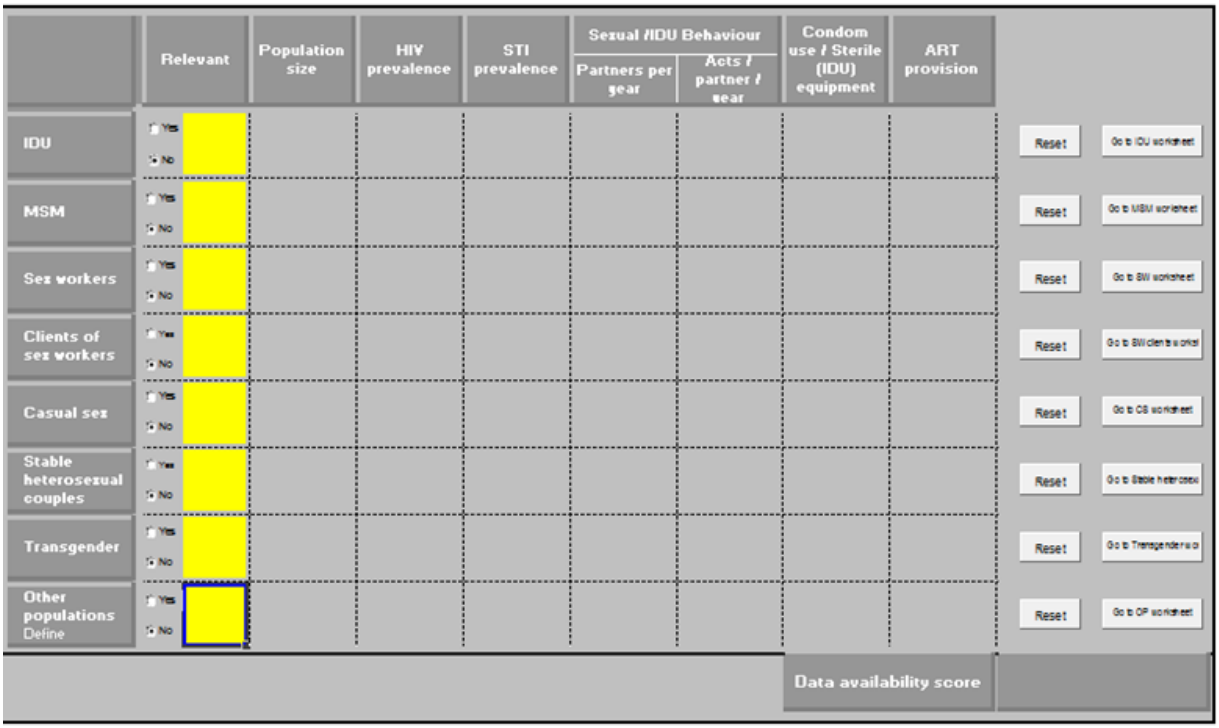
RECOMMENDED SCORE:

It is recommended that if the overall data availability score is higher than 50% and the average quality score per risk population is generally greater than 1.5, the country may proceed with MoT modeling and uncertainty analysis.

2 EPI REVIEW CHECKLIST

The Epi Review checklist (Figure 2) is the first page in the spreadsheet to be filled in and gives the user the opportunity to assess the availability of required data. For each risk population and variable used in the MoT analysis, the user has to either click Yes, if data are available, or No, if data are not available. A percentage score is then calculated for the available data and can be used in deciding whether the country is ready to proceed with the MoT analysis.

Figure 2: Epi Review checklist



STRUCTURE OF THE EPIDEMIC

The column *Relevant* is used to determine the HIV epidemic structure according to the main sources of HIV exposure in the country. The user has to choose the sub-populations by clicking on *Yes*, if the sub-population represents a potential source of exposure to HIV in the country or *No*, if it does not. For example, click "*No*" if injecting drug use is definitely not a source of HIV infections in the country. However, click "*Yes*" if IDU is a potential source of HIV infection even if there are no studies conducted on IDUs. A subpopulation marked as "*Not relevant*" will be excluded when calculating the overall availability score.

An important point when deciding on the HIV epidemic structure is to clearly define the sub-populations to be included in the model. The definition of the behavioral component (e.g. injecting drugs, selling sex) and of the time component (ideally over the last 12 months) needs to be clear. *Table 1* shows some examples of sub-population definitions generally adopted by a country.

Table 1: Examples of definitions of sub-populations

Population	Definition
MSM	Adult men who reported having had sex with another man in the last 12 months
Partners of MSM	The regular female sex partners of MSM, e.g. women who are married to or living with MSM
IDU	Adult men or women who reported currently, or in the last 12 months, injecting drugs
Partners of IDU	The regular sex partners of IDUs, i.e., people married or living with IDU
FSW	Adult women who reported having exchanged sex for money in the last year
Clients of FSW	Adult men reported having paid for sex with a sex worker in the last 12 months
Partners of client of FSW	Regular sex partners of FSW clients, i.e., women who are married or live with clients of FSW
People who engage in casual heterosexual sex	Men and women in the general population who had more than one sex partners in the last year
Partners of those who engage in casual heterosexual sex	The regular sex partners of CHS (i.e., who are married or living with CHS)
Stable heterosexual couples	Adult men and women who are currently in a stable heterosexual relationship with one other person
No risk	People who were not exposed to HIV (either through sex or the use of drugs) in the last year are considered at no risk

Figure 3 shows an example of a country that has decided to include IDU, MSM, female sex workers (FSW), clients of FSW, casual sex and stable heterosexual couples in their model. Note that the relevant sub-populations will be indicated in blue. The transgender subpopulation is now highlighted in yellow since in this example has been marked as not relevant meaning that it does not have a role in the HIV epidemic of this country.

Figure 3: Structure of the population for the MoT modeling

Rename this cell to add another sub-population

ADDING A RELEVANT SUB-POPULATION

If there is another sub-population that should be accounted for[1], the user may add it by using the *Other populations* cell and rename it accordingly.

When considering the inclusion of new transmission groups in the model, some key factors must be taken into account: for any new population considered relevant in a specific country it must be demonstrated -through the available evidence- that their behavior (number of sex acts/ year, partner change rate, condom usage), epidemiological parameters (prevalence and population size) and transmission risk, makes them specifically (biologically and epidemiologically) relevant to the Modes of Transmission assessment. Such an addition to the MoT must be supported by a thorough evaluation of the availability of relevant data for the new group. Hence, a new risk population should only be added if the required epidemiological and behavioral data are available and if the difference in the specific contribution of this population to the HIV epidemic, compared to other risk populations, can be demonstrated.

[1] If you decide to change the current structure of the country's epidemic, please refer to the UNAIDS representative for the required revision of the MoT model

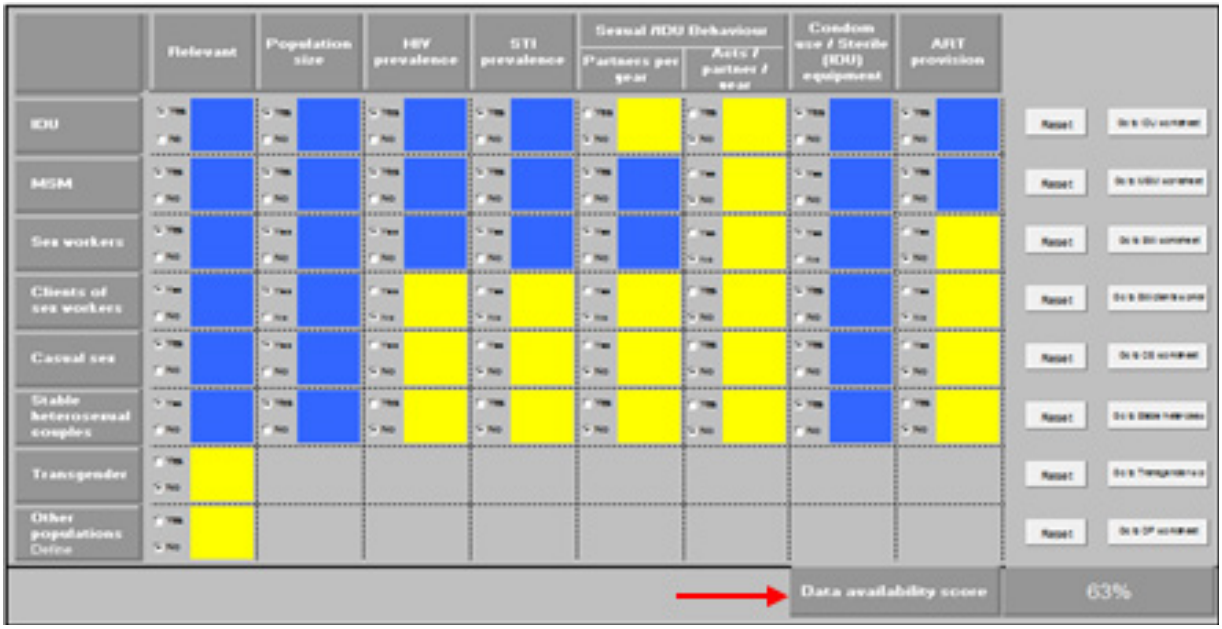
INDICATORS (POPULATION SIZE, HIV AND STI PREVALENCE, RISK BEHAVIOR)

The next step in the process is to check the availability of every indicator for each sub-population by clicking Yes, if empirical data are available, or No, if not. Note that if data are available the field is colored in blue, if not, in yellow. After checking all fields, the user should check the *Data availability* score which is calculated and shown at the bottom of the Epi-MoT checklist (*Figure 4*). The score is calculated by a weighted arithmetic mean of the indicators with the populations size and HIV prevalence weighting 2, sexual/IDU behavior indicators (number of partners and exposure acts per partner per year) combined contributing 1 and other indicators (STI prevalence, condom use/sterile needles, ART provision) weighting 1 each. In the example illustrated in Figure 4, the overall data availability score for the country is 63%.

NOTE:

The country may not have empirical data for all indicators. In the absence of data, the user might want to make assumptions based on expert consensus, regional estimates or on data from a neighboring country. In these cases, the user should choose No when filling out the Epi-MoT checklist for data availability.

Figure 4: Results of data availability



3 WORKSHEETS FOR COLLECTING DATA FOR EACH SPECIFIC RISK POPULATION AND FOR MEDICAL INJECTIONS AND BLOOD TRANSFUSIONS

When completing the Epi-MoT checklist, the user may go to the sub-population worksheet to summarize and describe the data that are available. The user may access the worksheets by clicking on the "Go to…" box or by clicking on the population tab at the bottom of the page (*Figures 5 and 6*).

Figure 5: How to access the sub-population worksheet

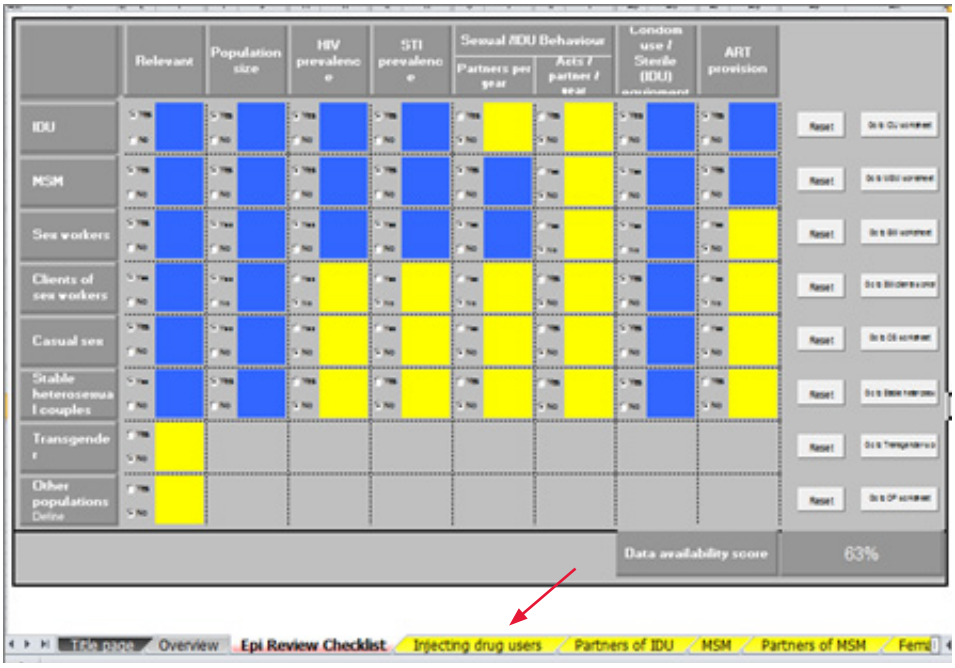
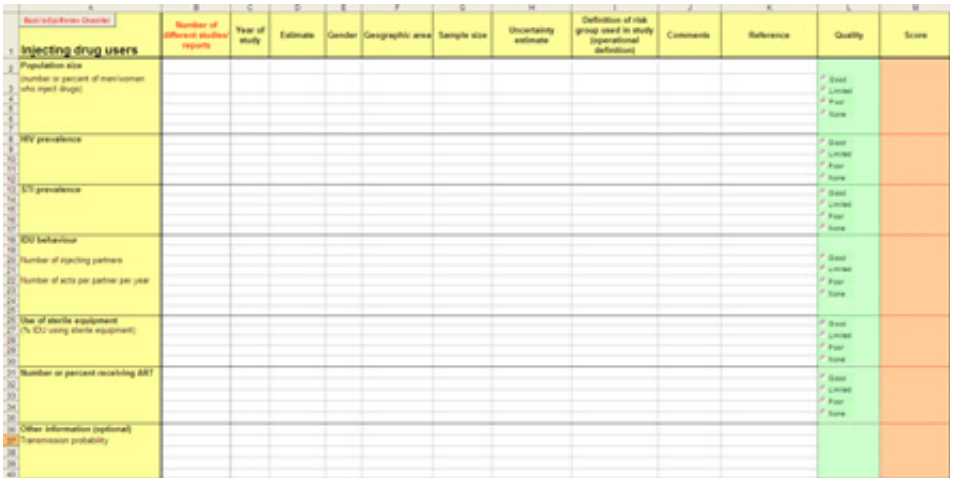


Figure 6: Worksheet for each risk population to summarize available data



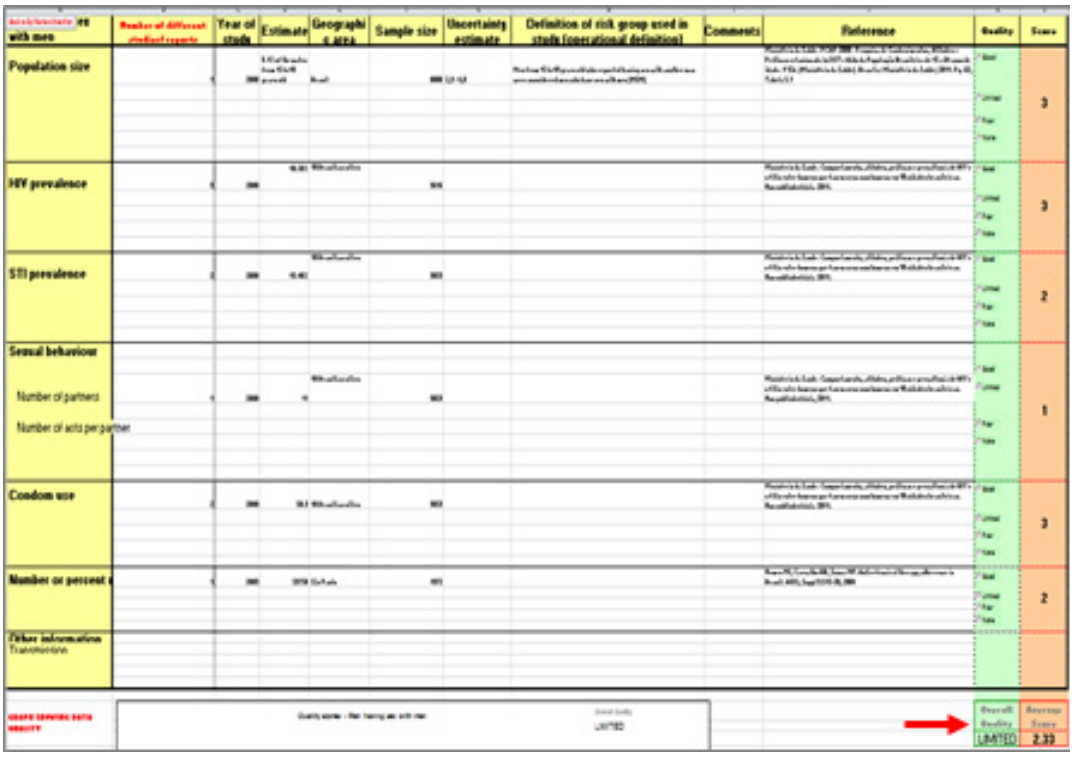
The worksheets are developed to help the user list and describe all the available studies/papers/reports, and to extract the data that directly or indirectly inform the indicators needed for each sub-population. Each study should be described according to the year of data collection, indicator estimate, gender (where necessary), geographic area, sample size, uncertainty estimate (e.g. standard error or confidence interval) and definition of risk group. A column for Comments is also available to record additional information as required. For example, if indirect methods are used to obtain an estimate, the details of the methods should be recorded.

After describing the studies and extracting the required data, the user should score the quality of the information as good (score of 3), limited or restricted/incomplete (score of 2), poor (score of 1) or none (score of 0). The quality score should be based on all available sources of information for a particular

NOTE:

The risk populations in the MoT model are assumed to be mutually exclusive; meaning that one person can only be included in one sub-population even though they may have several different means of exposure (except in the medical injections and blood transfusions groups, which are counted independently).
While it is possible that there is some overlap in risk behaviors (e.g. a sex worker can also inject drugs), individuals should be placed in the risk group where they are at highest risk of getting infected, i.e. following the hierarchy based on transmission probability. For example, the act of injecting drugs has the highest transmission risk, followed by anal sex and by heterosexual sex.

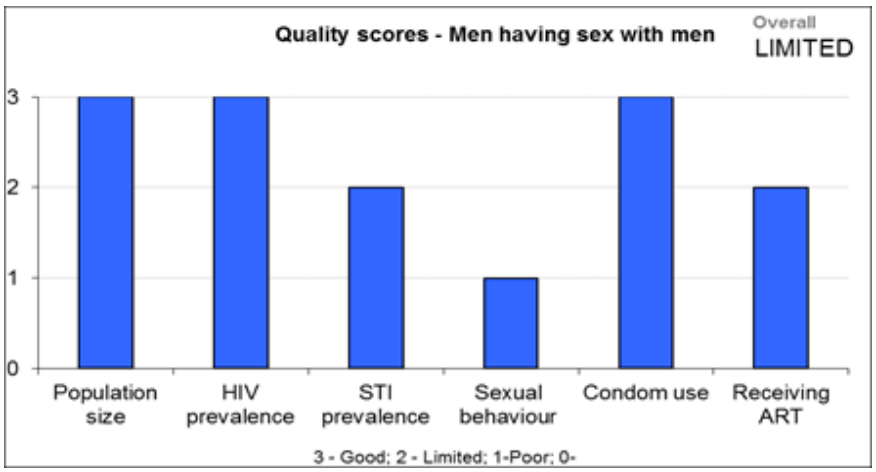
Figure 7: Data quality and average score



indicator and the user should therefore evaluate each study carefully. Some guidelines on how to assess the quality are provided in Box 1 below.

After describing the studies in the spreadsheet and scoring the information, the user can check the overall quality of the information, which is based on the average across all indicators (and also varies between 0 and 3), as shown in Figure 7. In addition, the score per indicator is reflected graphically on this page, as illustrated in Figure 8.

Figure 8: Graph showing data quality



Box 1. GUIDELINES FOR ASSESSING DATA QUALITY

The evaluation of the quality of the information may be a challenging process. UNAIDS has developed a basic set of rules to serve as guidance when evaluating the quality of a study.

The study should be evaluated according to its setting, period of data collection, representativeness and generalizability, study inclusion criteria, and the extent to which it contributes to deriving the value for the indicator. For each one of these topics, there are some possible categories. Each category has a different score based on the strength of the methodology and the score varies from 1 (weak) to 3 (strong). A simple arithmetic average of the topics' score may represent the study quality score.

1. Setting
   - National estimation (e.g., national household survey) (3)
   - Regional estimation (2)
   - Specific sites e.g., Capital cities, treatment facilities, testing sites, prisons, hospitals (1)
2. Periods of recruitment
   - Within the last 4 years (3)
   - 5-7 years ago (2)
   - 8 to 10 years ago (1)
   - More than 10 years ago (0)
3. External validity (representativeness and generalizability of the study)
   - The sample represents the population of interest geographically and demographically. E.g., National BSS survey for estimation of population sizes. (3)
   - The sample represents the population of interest demographically but not geographically. E.g., estimation of HIV prevalence in the FSW population only in one city or state that does not represent the national population. (2)
   - The sample represents the population of interest geographically but not demographically. E.g., national survey for estimation of the HIV prevalence among brothel based female sex workers. (2)
   - The sample does not represent the population of interest not demographically nor geographically, but serves as a proxy. E.g., estimation of HIV prevalence among IDU population in prisons to estimate national HIV prevalence among IDU. (1)
4. Methods for estimating the required indicator
   - Directly from population survey or representative study (3)
   - Indirect single or multiple methods (2)
   - Expert's judgment – for example RAR studies, registered cases, estimates based on local polls, and questionnaires to clients of local services and similar (1)

4 RESULTS PAGE

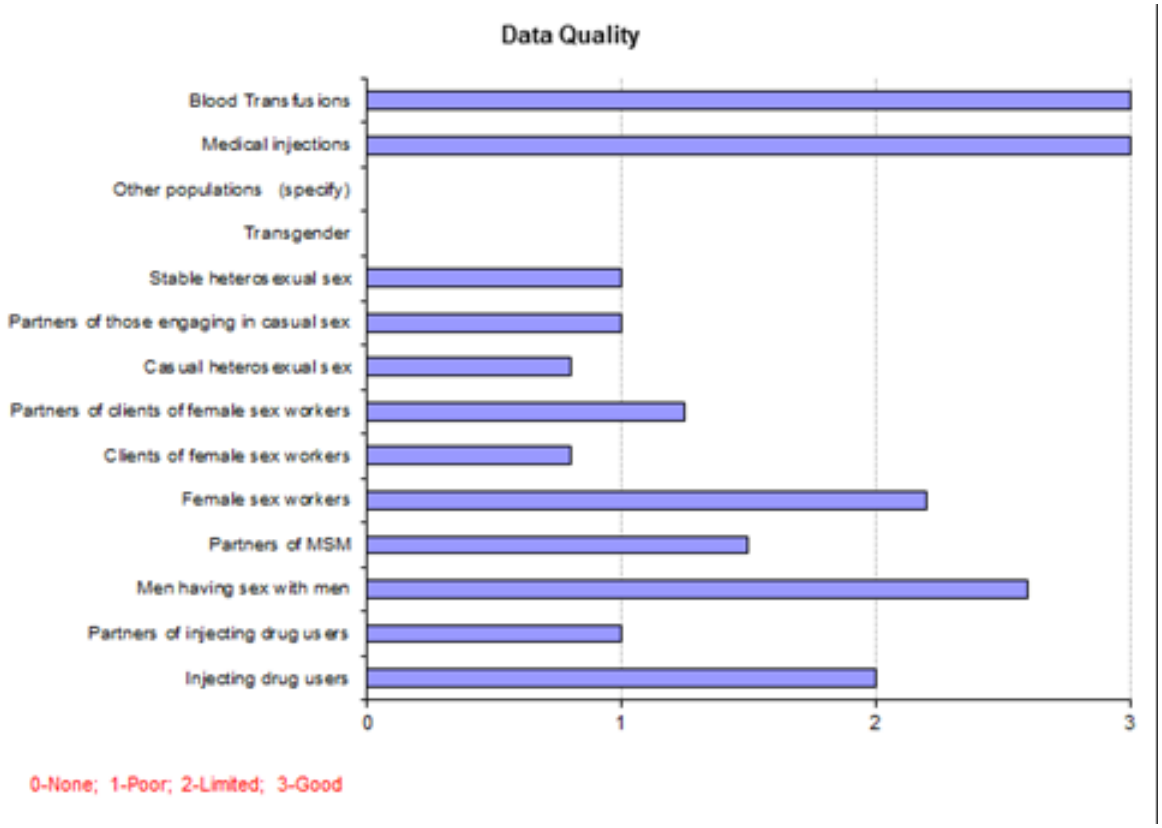
After describing and scoring the available data by indicator for each sub-population, the user can find the quality across all populations at risk by clicking on the *Results* tab. In the *Results* worksheet the average data quality scores are reflected by risk population in tabular (*Figure 9*) and in graphical format (*Figure 10*).

Figure 9: Table showing the average quality score per sub-population

Results

Population group	Average Score
Injecting drug users	2.0
Partners of injecting drug users	1.0
Men having sex with men	2.6
Partners of MSM	1.5
Female sex workers	2.2
Clients of female sex workers	0.8
Partners of clients of female sex workers	1.3
Casual heterosexual sex	0.8
Partners of those engaging in casual sex	1.0
Stable heterosexual sex	1.0
Transgender	#VALUE!
Other populations (specify)	#VALUE!
Medical injections	3.0
Blood Transfusions	3.0

Figure10: Graph showing data quality per sub-population



Based on the average quality score per sub-population and on the data availability score described in the Epi-MoT checklist, the user can assess if the country is ready to perform the MoT modeling or if additional actions must be considered in order to collect more data.

If the data availability score > 50% and quality across risk populations is generally ≥ 1.5, then the country could proceed with MoT modeling with reasonable confidence. However, if these criteria are not met, then it is strongly recommended that the MoT modeling in a country be delayed until further data are collected, because poor data availability and quality could lead to unreliable model outputs. In this case the country should develop an action plan for additional data collection and to improve existing surveillance efforts.

However, even the countries that have enough data to conduct the MoT analysis may not have all the data that are required. Therefore, it may be necessary to make some assumptions that could include borrowing data from neighboring countries, using regional estimates or deriving estimates indirectly from other sources of data (i.e. deriving estimates for clients of FSW using data from FSW). These assumptions should be made carefully and should involve an experienced epidemiologist. Care should be taken to provide a detailed summary of all assumptions and indirect methods in this spreadsheet for future use or clarification.

NOTE:

It is recommended that a mathematical/epidemiological modeler always be part of the team conducting a MoT study using the UNAIDS MoT model. Also, results should be subjected to a national (and where needed international) peer-review process and should be reviewed by an expert at UNAIDS before completing, releasing and using in national plans.

5 ACTION PLAN PAGE

The action plan page contains a collection of all the graphs that show the overall quality score for the different risk populations and a table to be completed by the user to describe the plans on how to deal with weaknesses in data (*Table 2*).

Table 2: Example of action plan for addressing weaknesses in data

Population	Indicator	Action Plan	Timeline	Budget
IDU	Number of injecting partners per year	Include questions in the next BBS survey		
	Number of IDUs that have regular sex partners			
Clients of FSW	Number of FSW clients	Literature review for indirect estimation methods using data from sex workers		
	Number of sex acts per FSW per year			
MSM	Number or percent of all adult men who have sex with other men	Literature review to obtain regional data or estimates from neighboring countries or Plan size estimation study		

6 WHAT TO DO WHEN THE AVAILABILITY AND QUALITY SCORES ARE BELOW THE CUT OFF (SCORES <50% AVAILABILITY AND <1.5 QUALITY)

If the data availability score is < 50% and quality is generally <1.5, then it is strongly recommended that the MoT modeling in a country be delayed until further data are collected because poor data availability and quality could lead to unreliable model outputs. In this case the country should develop an action plan for additional data collection and to improve existing surveillance efforts.

Countries that do not have sufficient data to conduct the MoT analysis using the UNAIDS MoT model may still benefit from a preliminary consensus meeting among experts on the main modes of transmission of HIV based on those data that are available, as well as expert judgement. In these cases, it will be necessary to make some assumptions which, in the absence of sufficient information, can be challenging. Consensus methods such as the Delphi method (briefly described and illustrated in Box 2)[2,3], can be employed in situations where there is a lack of agreement or the state of knowledge is incomplete in order to obtain individual judgment / expertise and, through combining responses in a systematic way, to reach expert consensus.

[2] Jones J, Hunter D. Qualitative Research: Consensus methods for medical and health services research. BMJ 1995; 311:376

[3] Chin J, Sato PA, Mann JM. Projections of HIV infections and AIDS cases to the year 2000. Bull WHO. 1990; 68: 1-11

Box 2. DESCRIPTION AND EXAMPLE OF THE DELPHI METHOD

The main advantage of the Delphi process is the achievement of consensus in a given area of uncertainty or where there is lack of empirical data.

The Delphi process starts with the definition of the problem, for example, *ranking the modes of HIV transmission in order of its contribution to new HIV infections* as a first step, and *quantifying the ranking in terms of percentage new infections explained by each of the transmission modes* as a second step. A group of experts with extensive experience in the epidemiology of HIV in the country of interest is carefully chosen to participate in the exercise. It is important to include experts with experience and knowledge in the fields of HIV transmission and in the relevant risk populations (e.g. experts in MSM, IDU, FSW, and transmission in the heterosexual population). The group does not meet face-to-face and the participants are not aware of the identity of the other participants so that their responses cannot be influenced by others. Communication is normally done in writing, by letter or email. A facilitator is appointed to coordinate the interactions among the participants and to process the information. The process is carried out in a series of rounds as shown, for example, in *Figure 11*.

Round 1

The questionnaire used in the first round is usually unstructured and seeks an open response. For the above example, participants are firstly asked, based on their knowledge and expertise, to *list the major modes of HIV transmission* and to *rank them in order of their contribution to new HIV infections in the country*. An alternative would be for the study facilitator/team to express their opinion on this and to invite comments from the panel. When the responses are received, the facilitator then groups together the results which provide the basis on which the second round is constructed.

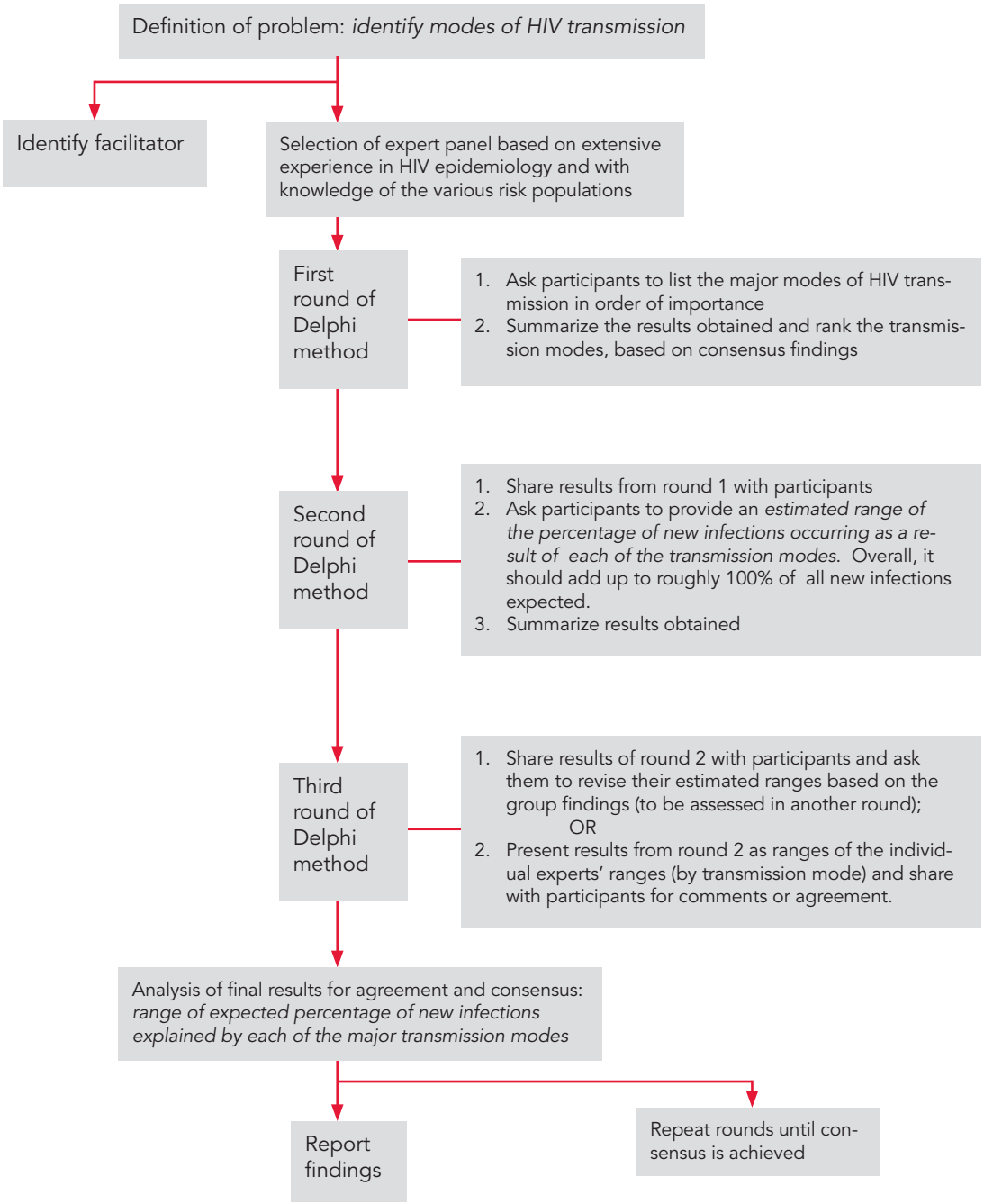
Round 2

In the second round the consensus result in relation to ranking the major modes of HIV transmission is being presented to the participants. The participants are then asked, based on their experience and knowledge, to provide *an estimated range of the percentage of new infections explained by each of the transmission modes (to add up to roughly 100% of all expected new infections)*. These results are analysed and summarized by the facilitator and used in round 3.

Round 3

Two options are possible at this stage: a summary of the results obtained in round 2 can be communicated to the participants and they can be asked to revise their previous estimates based on the group response, and the round may be repeated. Alternatively, the facilitator can use the results from round 2 and present it as *a range of the individual experts' proposed estimates for each transmission mode*, and share it with the group for comments. Finally, if an acceptable degree of consensus is obtained the process may cease, with final results fed back to participants and written up in a report.

Figure 11: Example of the Delphi method to obtain consensus agreement on the distribution of new HIV infections by modes of HIV transmission



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