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2012

## Using capture-recapture methodology for enumerating most-at-risk populations (MARPs)

Population Council

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TRAINING GUIDE

USING CAPTURE-RECAPTURE  
METHODOLOGY FOR  
ENUMERATING  
MOST-AT-RISK  
POPULATIONS (MARPS)



USING CAPTURE-RECAPTURE METHODOLOGY FOR  
ENUMERATING MOST-AT-RISK POPULATIONS  
(MARPS)

The Population Council confronts critical health and development issues—from stopping the spread of HIV to improving reproductive health and ensuring that young people lead full and productive lives. Through biomedical, social science, and public health research in 50 countries, we work with our partners to deliver solutions that lead to more effective policies, programs, and technologies that improve lives around the world. Established in 1952 and headquartered in New York, the Council is a nongovernmental, nonprofit organization governed by an international board of trustees.

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## INTRODUCTION

Populations at higher risk for HIV infection are often the most difficult to reach and this is particularly true of men who have sex with men (MSM), injecting drug users (IDUs) and female sex workers (FSWs) in sub-Saharan Africa. These sub-populations are frequently marginalized by society because of the illicit and/or illegal activities they engage in. Estimating the size of hard-to-reach populations, is important to effectively plan, implement, monitor and evaluate HIV and AIDS prevention and care programs. Estimates provide a better understanding of the burden of disease, which in turn shape more targeted evidence-informed programs and policies. *National* estimates are needed for policy formulation, while *local* estimates are sufficient for programming purposes and also to determine program coverage of certain high-risk groups.

'Capture-recapture' is a method of estimating the prevalence of a trait in a population or more simply, it's a method that provides a good estimation of the size of a particular population.

This method has been found useful in estimating the sizes of hard-to-reach and stigmatized human populations.

The Population Council in collaboration with research partners have conducted and validated capture-recapture enumerations of MSM sex workers in Mombasa, Kenya; Johannesburg, South Africa; Kano, Lagos and Portharcourt, Nigeria. In these cities, several hundreds of male sex workers were found to operate on weekend nights in the city of Mombasa, inner-city Johannesburg; Kano, Lagos and Portharcourt, Nigeria.

<sup>1</sup> 'Are you on the market?': a capture-recapture enumeration of men who sell sex to men in and around Mombasa, Kenya. Scott Geibel, Elisabeth M. van der Elst, Nzioki King'ola et al. *AIDS* 2007, 21: 1349 - 1354

<sup>2</sup> A population-based estimate of the number of MSM sex workers in inner-city Johannesburg, South Africa: Implications for HIV prevention. Scott Kellerman, Zukiswa Fipaza, Bagnol Bagnol et al. *5th IAS Conference on HIV Pathogenesis, Treatment and Prevention*, 2009. Abstract No. LBPEC09.

<sup>3</sup> The experiences of men engaged in transactional sex with other men in urban Nigeria. A size estimation and qualitative study. 2012. Population Council, Nigeria.

## WHY CONDUCT RESEARCH ON MARPS?

Throughout the world, most-at-risk populations (MARPs) – female sex workers (FSWs), injecting drug users (IDUs) and men who have sex with men (MSM) are disproportionately affected by HIV/AIDS. There are several factors which contribute to high HIV prevalence among these groups:

1. High risk sexual and social behaviours - Unprotected anal sex with an infected partner; high risk drug injecting practices i.e. needle and drug equipment sharing
2. Because of stigma, lack of detection, and lack of appropriate care, MARPs carry a high burden of other sexually transmitted infections (STIs)—and having another STI dramatically increases one's risk of contracting HIV;
3. MARPs often have many sexual or injecting partners;
4. In many countries, little or no HIV prevention messages are targeted to MARPs particularly MSM and IDUs. As a result, many are unaware of their risks.

Who is a 'female sex worker'?

A female sex worker (FSW) is one who receives money or goods in exchange for sexual services, either regularly or occasionally, and who may or may not consciously define those activities as income-generating". The term sex worker has gained popularity over prostitute because those involved feel that it is less stigmatizing and say that the reference to work better describes their experience. Female sex workers (FSWs) in Nigeria broadly consist of two groups – brothel-based and non-brothel based. The brothels for sex work activities are usually located in low rated "hotels' with bars where women rent rooms. In some of the cases, the "hotels" are conveniently located where clients can be easily recruited such as major markets and motor parks. Sex work could be direct (where sex work is the primary economic activity) or indirect (where sex work is a supplementary economic activity with the sex worker primarily engaged in another income generating activity).

As locals who are familiar with local customs and expectations about sex and exchange, the team of enumerators is in the best position to collectively come to a definition of what constitutes a female sex worker. Therefore, it is important to

collectively agree on a working definition so that everyone working on the research will have a common understanding of which women should be included in this research.

Much of the training will involve the enumerators sharing information and opinions on how to best identify who might be a female sex worker in the field.

*GROUP ACTIVITY: Come up with a working definition for 'Female sex worker' for the sake of this research. This may work best by thinking through different scenarios of brothel based and non-brothel based sex.*

### Who is an injecting drug user?

An injecting drug user (IDU) is one who introduces a drug into the body with a hollow needle and a syringe which is pierced through the skin into the body (usually intravenous, but also intramuscular or subcutaneous). Drugs used by IDUs are of a wide variety including cocaine, amphetamines, tranquilizers, barbiturates as well as other pharmaceutically produced opiates of which heroin is the most common and well known. The use of contaminated equipment for intravenous drug administration is a more efficient way of contracting HIV than almost any other. Drugs can also be taken in a variety of ways including drinking, smoking, snorting, sniffing, eating and rubbing. There is a strong linkage between sex work and drug use as IDUs can exchange sex for drugs or engage in sex work to support their drug use habit.

*GROUP ACTIVITY: Come up with a working definition for 'IDU' for the sake of this research. This may work best by thinking through different scenarios of drug use and deciding if each would be considered a drug user or not.*

### Who are 'MSM'?

MSM is an inclusive public health term used to define sexual behaviour of men having sex with other men. It is the preferred term in the context of HIV because the important issue is *risk behaviour* rather than *sexual identity*. It does not refer to an identifiable community or gender identification. Men who have sex with men (MSM) includes not only self-identified gay/homosexual and bisexual men, but also men who engage in sex with men and women and self-identify as

heterosexual.. For example, certain situations, such as in prisons or military service may result in men engaging in sexual intercourse with other men when they would not do so in other contexts.

In Nigeria, MSM activities are often carried out in a clandestine manner and many MSM do not disclose their sexual identity. As a result, many MSM in Nigeria are bisexual in behavior which increases their risk of transmitting HIV to their spouses or other female sex partners. With the state of legal provisions in Nigeria, which makes homosexuality illegal, the risk embodied in same-sex activities is high and makes the hiding of same sex activities almost a norm.

*GROUP ACTIVITY: List terms for different groups of MSM, including terms used in the area where the research will be conducted. What do these groups share in common? How are they different?*

Who is a 'male sex worker'?

By male sex worker (MSW), we generally mean '*any man actively seeking male clients, or currently willing to exchange sex for money or goods with other men.*' While this may sound straightforward, in the real world it can be much more difficult to come to agreement on what constitutes "sex work". For instance, in some places it is expected or common that sex is accompanied by exchange of money or other gifts—and this may or may not be considered as different from street-based, anonymous commercial sex work.

As locals who are familiar with local customs and expectations about sex and exchange, the team of enumerators is in the best position to collectively come to a definition of what constitutes a MSW. Therefore, it is important to collectively agree on a working definition so that everyone working on the research will have a common understanding of which men should be included in this research.

Much of the training will involve the enumerators sharing information and opinions on how to best identify who might be a MSW in the field. The following factors should be considered in discussing how to identify sex workers:

- Body language and eye contact;
- Dress and appearance;
- Speech interactions and "code" words;
- Locations

*GROUP ACTIVITY: Come up with a working definition for 'MSM sex worker' for the sake of this research. This may work best by thinking through different scenarios of 2 men negotiating sex and deciding if each would be considered 'male sex work' or not.*

## WHAT IS 'CAPTURE-RECAPTURE'?

'Capture-recapture' is a method of estimating the prevalence of a trait in a population or more simply, it's a method that provides a pretty good guess of the number of a particular population. The method was initially used to research populations of wild animals, which were captured, marked, released and recaptured. The same statistical process is now used to estimate other types of populations. In this case, this method will be used to estimate the number of MSWs in a particular geographic area.

The basic idea of capture-recapture studies is to sample and identify individuals, from a population and then resample the population to see what fraction of individuals in the second sample were identified in the first sample (i.e. the fraction of individuals, or cases, that were found in both samples). This method has been found useful in estimating the sizes of hard-to-reach and stigmatized human populations.

## HOW IS CAPTURE-RECAPTURE CONDUCTED?

The enumeration involves conducting two "counts."

- The first count ("capture") contacts MSWs and "tags" them
- By "tagging", we mean that men who are included in the study are offered something distinctive and memorable that they will remember receiving. In past projects, we used a brightly colored brochure, or a key ring with a logo on it
- The second count ("recapture", done 1-2 weeks later) counts MSW who were previously "tagged" (i.e. received the tag) as well as MSW who did not previously receive the "tag".

This method is simple yet delicate, and needs careful planning and execution to avoid potential miscounts or ethical violations. We need to ensure that the following are adhered to:

- The collection of the two samples should be done within a short period of time. Most likely, the capture and recapture will be

done a week apart, on the same weekend night.

- It is also important to avoid collecting data during public holidays or times when people are not available to participate.
- One way of avoiding over-counting or undercounting problems is to have enumeration teams rotate locations, so that enumerators work in different hotspots from the capture than they do in the recapture.

## STEP 1: MAPPING

Mapping and careful selection of boundaries for enumeration should be well defined. The use of existing information such as street and location names to assist the study team in mapping the targeted areas will be used for both counts.

- The team conducting the mapping exercise, which will likely include enumerators, must observe and take note of some of the key information needed for identification of cases. This observation includes:
  - Determining whether the potential site is “active” (i.e. has a lot of the activity going on) and if so, what are the most “active” times.
  - Collecting information on any special considerations (e.g. club entrance fees, asking for permission for entry into the targeted area from any property owners or other gatekeepers, etc.)
  - Sites should be assessed for the potential for violence. These activities occur at night and many potential areas may be too dangerous for the enumerators to work.

*GROUP ACTIVITY: Have the enumerators brainstorm areas of the city where they know or suspect that male sex work occurs. Once a list of locations has been generated, go through each location as a group to say as much as is known about each spot.*

*Here's an example:*

No.	LOCATION	AREA	TYPE	PEAK TIME/DAY	VISITED?	INFO SOURCE	NOTES
1	Gadu Garden	Ijora/Iganmu	Bars	Sunday evenings/night, from 6pm	21 June evening	Ben, etc.	Guys congregate near cars just inside main street entrance, on right. Obvious and active.
2	Fabu Hotels	Surulere (Babs Animashaun St.)	Bars and Nightclubs	Weekend evenings	21 June	Ben, etc.	Several hotels nearby. Entire area seems rough.
3	Armadillo's	Victoria Island (Etim Inyang Crescent)	Nightclub	Weekend nights	21 June (outside only)	Rex	Upscale nightclub.

*Next, physically map out the locations on a city map.*

Mapping may also include a group field exercise, whereby the enumerators go out all together or in teams to observe activities in the proposed study sites.

## STEP 2: CAPTURE

Once training and mapping are completed, the initial capture phase of the capture-recapture exercise will commence on a weekend evening that will be determined based on the mapping activity. Enumerators will go to assigned venues and locations identified during the formative work and mapping where they will employ a three-step approach to identify MSM and IDU informants:

- 1) Identification of MSM and IDUs through body language and other techniques identified during the formative work and training;
- 2) Interaction with these informants and their self-identification as MSM and IDUs; and
- 3) Confirmation that the informant is MSM or IDU.

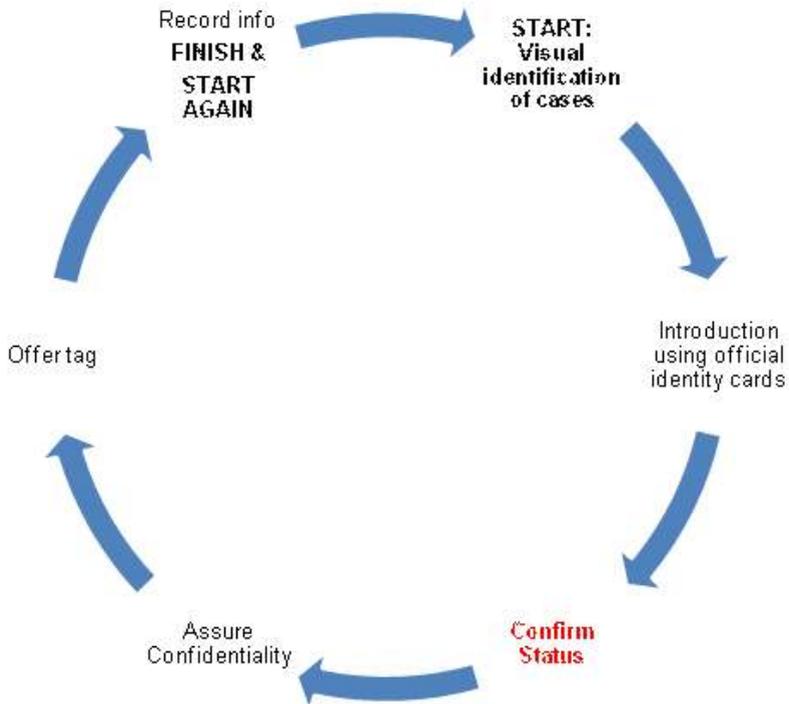
Enumerators will first visually identify individuals thought to be MSM or IDUs, then discreetly approach and start casual conversation with a suspected contact (i.e., informant). Once the enumerator is confident of the contact's status, the enumerator will ask in the socially appropriate context if the MSM or IDU is seeking clients for sex in return for payment, drugs, etc. If the above conditions are met, a "tag" will be given to the informant in the form of a key chain.



*GROUP ACTIVITY: Have the enumerators break into smaller groups and discuss how to identify MSM and IDUs. Enumerators should list what appearance, behaviour, and location clues might indicate that someone is "on the market". Reconvene as a larger group and compare these notes.*

In offering the "tag", the enumerator is confirming that the informant is indeed an MSM or IDU. The informant is free to either accept or refuse the "tag", but in either circumstance, the enumerator will record the event (Form 1). This will catalogue the time, date, and location of each identified informant. No identifying information will be collected but HIV prevention information, literature and/or a referral list of HIV providers will be offered regardless. If the identified MSM or IDU accepts the "tag", they are considered a capture. If another enumerator approaches the informant at another time or place on the same night, they will first ask if the informant had received the tag from anyone else that night. If they reply yes, the contact will end there. The enumerator will then go to the next potential MSM or IDU and repeat the process. This will continue until:

The procedure for the enumeration process looks like this:



Probably the single most important activity for the training is for the enumerators to become comfortable identifying and interacting with suspected MSM or IDU. Enumerators should practice the above process over and over again and training sessions should focus on each aspect of the interaction.

*GROUP ACTIVITY: Ask for two volunteers from the group. One volunteer will perform the role of potential MSM or IDU and the other will perform the role of an enumerator. All the enumerators should take turns in practicing and the larger group will critique the enumerator's performance.*

The trainers should prompt those who are playing the role of the MSM or IDU to behave in different ways, so that the enumerators will be able to better handle potential interactions in the field. These may include:

- 1) A person who ignores the enumerator;
- 2) A person who is drunk;
- 3) A person who denies being a sex worker;
- 4) A person who flirts with the enumerator;
- 5) A person who is offended by the enumerator's questions and acts in an aggressive manner.

It is also important for the enumerators to practice the field interaction in local languages, to assure that they will be comfortable asking these highly sensitive questions in an appropriate manner. Before and during the role play, enumerators and trainers should determine how questions will be phrased in the appropriate local language(s) to solicit the requested information. If helpful to the enumerators, the trainers can print off enumeration forms translated into local language(s).

It is not necessary for each enumerator to ask the questions using precisely the same words. Rather each enumerator should approach suspected informants in a way in which he feels comfortable. However, each enumerator should demonstrate during training that he has developed strategies for asking the questions required on the enumeration forms, and can ask the questions in the appropriate order.

## The Capture Form

### FORM 1 First Count ("Capture") Data Collection Form

#### CONFIRM CONTACT STATUS BEFORE FILLING FORM

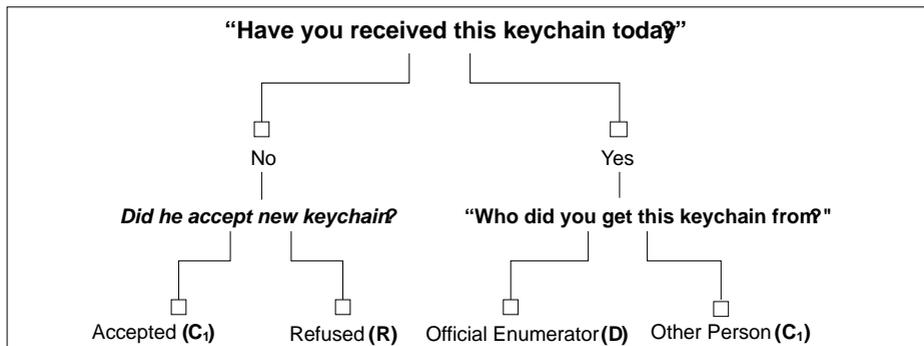
- Identify
- Confirm
- Introduce and Explain

ENUMERATOR ID: [\_\_|\_\_]

DATE (DD/MM/YYYY): [\_\_|\_\_|\_\_|\_\_|\_\_|\_\_|\_\_|\_\_]

TIME OF CONTACT: [\_\_|\_\_:\_\_|\_\_]

LOCATION: \_\_\_\_\_



An important point to stress when explaining how to fill both the capture and recapture forms is that *if the form has been filled properly, only ONE of the four boxes on the bottom row will be checked.*

### STEP 3: RECAPTURE

The initial steps of the "recapture" are the same as the "capture". The enumerator observes behavior in the assigned location, approaches men he suspects as being sex workers, confirms their status as MSM and sex workers, and then offers them a tag. However, for the recapture there are several more questions asked.

- Was the informant offered a keychain (tag) previous week, and from whom;
- Did the informant accept the tag in the previous week;
- Did the informant receive a tag this week and if yes by whom;
- Did the informant accept a tag this week.

FORM 2  
Second Count ("Recapture") Data Collection Form

CONFIRM CONTACT STATUS BEFORE FILLING FORM

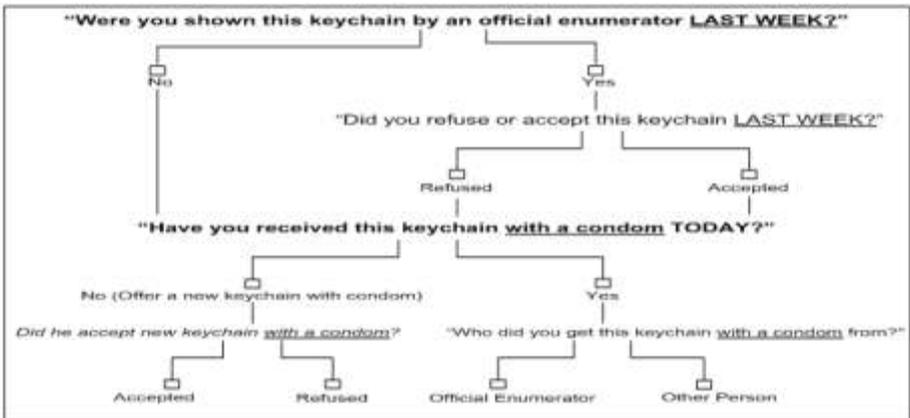
- Identify
- Confirm
- Introduce and Explain

ENUMERATOR ID: [\_\_|\_\_]

DATE (DD/MM/YYYY): [\_\_|\_\_|\_\_|\_\_|\_\_|\_\_|\_\_|\_\_|\_\_]

TIME OF CONTACT: [\_\_|\_\_:\_\_|\_\_]

LOCATION: \_\_\_\_\_



*GROUP ACTIVITY: Two trainers or enumerators should perform different recapture scenarios, leading to different outcomes on the decision tree. At the end of each scenario, the rest of the enumerators should fill out a recapture form that matches the scenario enacted. As a large group, go over the forms and talk through any discrepancies.*

## Recapture day review

On the day of the recapture, it is beneficial to reconvene with the enumerators before returning to the field. Going over the following points will make the recapture run more smoothly:

- 1) Discuss what went well during the capture phase of the research. What strategies of observing, approaching, and interacting with respondents were effective?
- 2) Discuss what challenges were faced and how performance can be improved for the recapture.
- 3) Review what venues were most and least active and reshuffle enumerators to best cover the most active areas.
- 4) Review the recapture form and perform role plays so that the enumerators are feeling secure using the form before returning to the field.

## ETHICAL CONSIDERATIONS FOR ENUMERATORS

Due to the sensitive nature of the research, certain procedures must be followed in order to ensure the privacy and safety of both the enumerators and

the informants.

The following points should be stressed during training:

- 1) Enumerators must NOT approach any individual as a potential client. Doing so carries the risk of harm to the enumerator and may jeopardize the research.
- 2) Enumerators should not drink during the capture-recapture activity even though much of the work will likely occur in bars. The loss of judgment may endanger them by leaving them vulnerable to theft, attack, etc.
- 3) Enumerators should stay available at all times. This means leaving cell phones turned on in case they need to be contacted by any other members of the team. They must also have some credit on their phone, in case they need to place a call.
- 4) Except in the case of an emergency, enumerators should not leave their assigned locations.
- 5) Enumerators are expected to actively conduct research. This means that they should stay focused on the task of identifying and approaching potential MARPs. While there is no minimum number of people that an enumerator should contact in a night—and different venues will yield different numbers of informants—it is expected that enumerators remain actively engaged in the research throughout the course of the evening.
- 6) Enumerators should be made aware of the importance of not falsely

reporting data. The enumeration is not a competition to get the most respondents. Different locations will yield more “captures” than others, and there is no minimum number of enumeration forms that enumerators are expected to fill and no minimum number of tags that they are expected to pass out.

## SECURITY IN THE FIELD

The research team will be working with a small team of security personnel who will be on call and patrolling the research areas. All enumerators will have a list of contacts for security, the project monitor, and other enumerators working in their area. The bottom line is that faced with any potentially threatening situation, the enumerator should immediately remove him or herself to a secure location and call for assistance right away. The following is a list of security measures that should be followed:

1. All enumerators will have phone numbers of all security personnel and all research monitors, and all security and monitors will have numbers for all enumerators.
2. Enumerators must self-evaluate all locations for safety, if the enumerator does not feel a location is safe, he or she should leave and report immediately to the security and monitors.
3. Enumerators must phone (or text if network problems occur) their assigned team leader before leaving one location and going to another location.
4. Enumerators must work in pairs always and should have their partner's phone number.
5. If enumerators are in a location and they become aware that the police or other authorities are present in the area, they should move to another area due to the delicate nature of the research.
6. Enumerators must remain sober for the entirety of the research period.
7. Enumerators should wear clothing appropriate to blend in to their study locations.
8. Enumerators should finish working by a time decided by the research monitors and security team, and must check in with the security staff when they conclude the work.

## Emergencies:

1. In case of a threatening or dangerous situation, enumerators should immediately leave the scene and contact their supervisor as soon as possible.
2. In case of an interaction with police, military, religious group, or any other authority, enumerators should immediately contact the security personnel. Enumerators are expected to remain polite and calm at all costs.

## HOW IS THE POPULATION SIZE ESTIMATED?

*[N.B. It is not necessary for enumerators to understand the formula below for estimating the population size. This information is included in case any of the enumerators wish to know, but it is probably not a good idea to bore or confuse people with the statistical details.]*

A formula is used to calculate the estimated population size.

- $c_1$ =MARPs captured in first count
- $c_2$ =MARPs captured in second count
- $m$ =Matches (MARPs captured in both counts)
- $n$ =Estimated population size

$$\frac{c_1}{n} = \frac{m}{c_2}$$

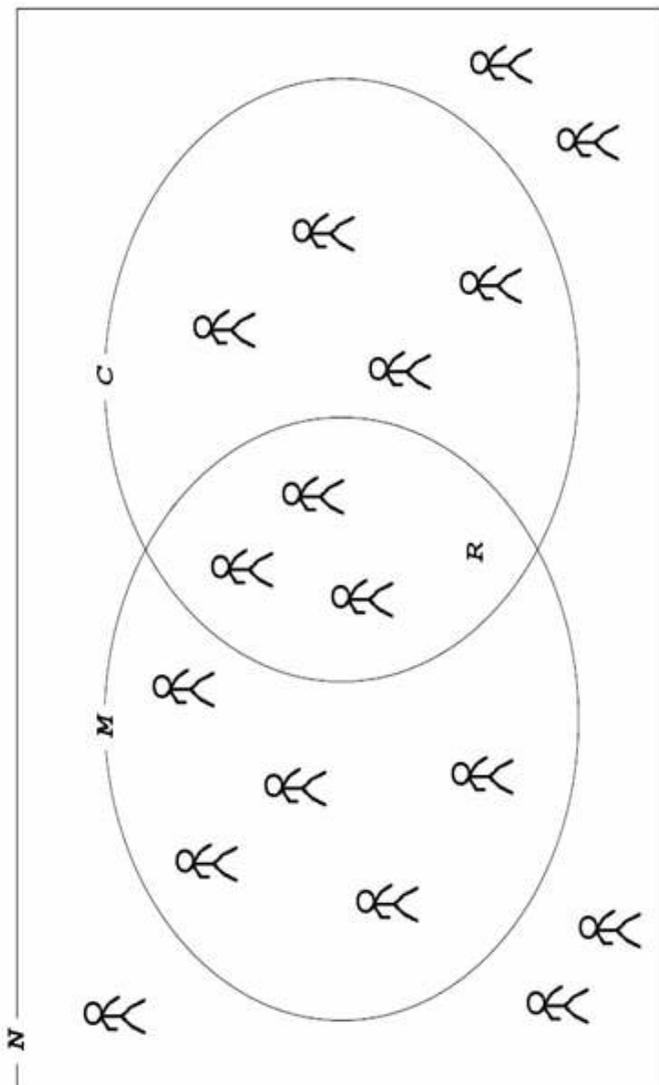
$$n = \frac{c_1 * c_2}{m}$$

$$95\% \text{ CI} = n - 1.96 * \sqrt{\text{Var} (n)}$$

Where:

$$\text{Var} (n) = \frac{c_1 * c_2 * (c_1 - m) * (c_2 - m)}{m^3}$$

Figure 1 : A capture-recapture study



4 Notes on using capture-recapture techniques to assess the sensitivity of rapid case-finding methods VALID International Ltd.

Version 0.71 July 2006

**Figure 2** : The four sets of cases in a capture-recapture study

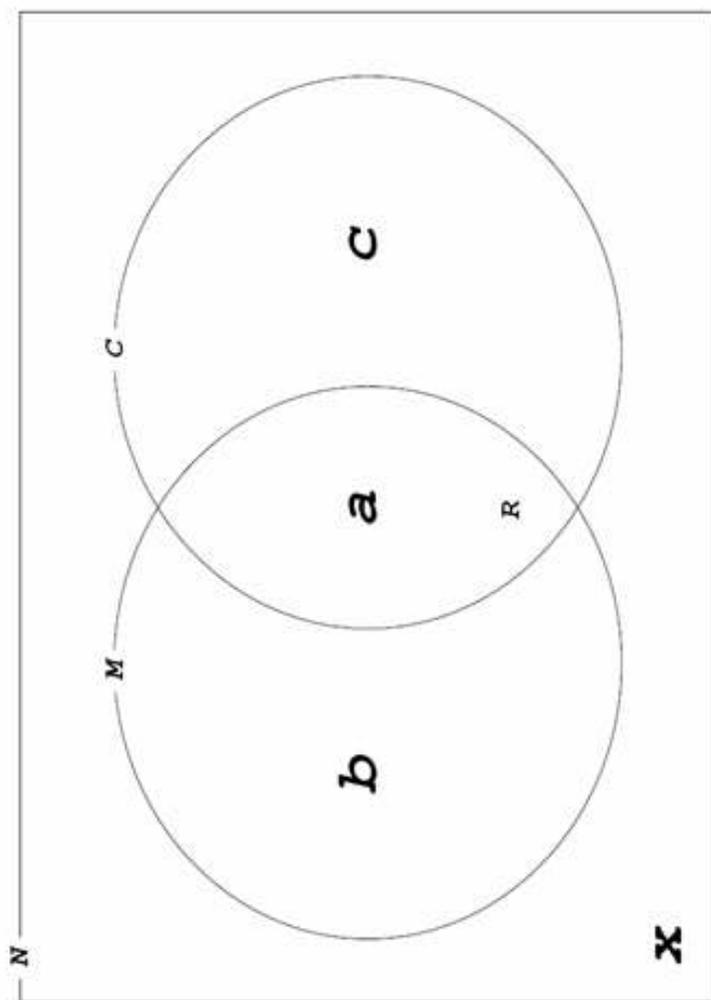


Figure 1:

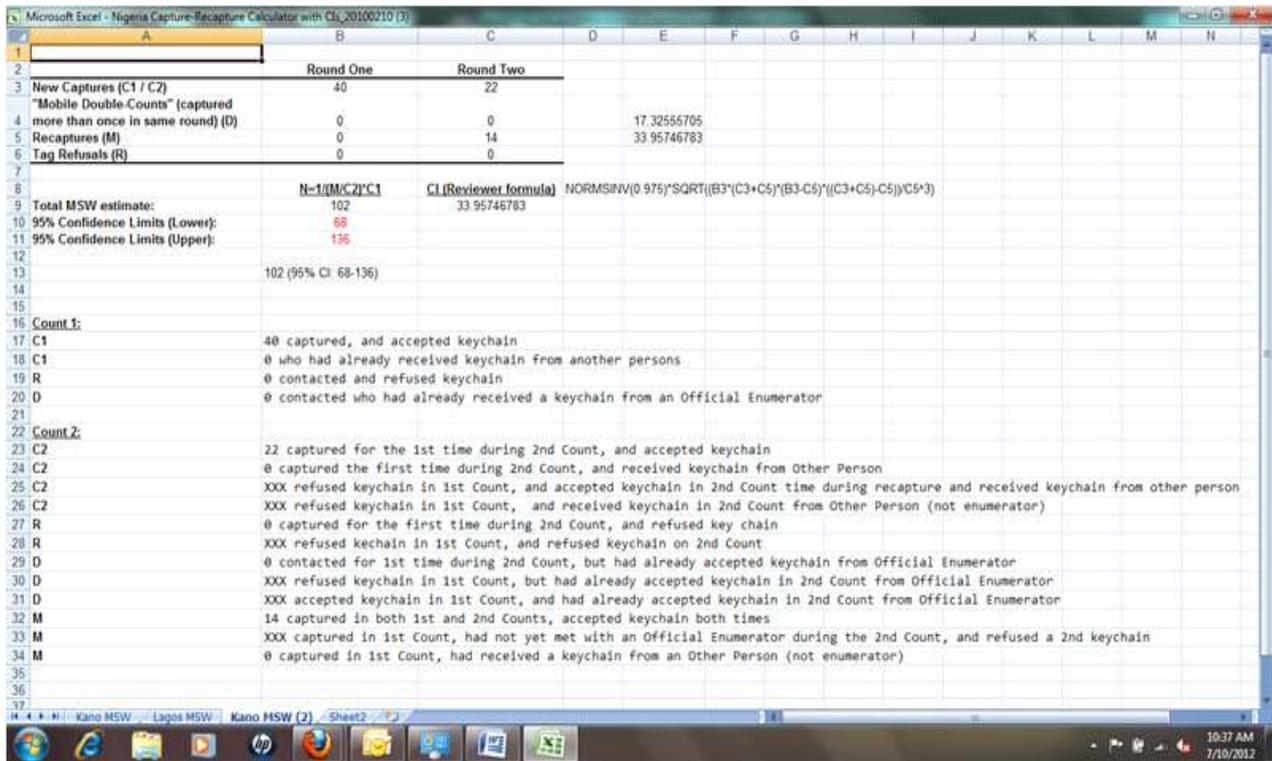


Figure 2:

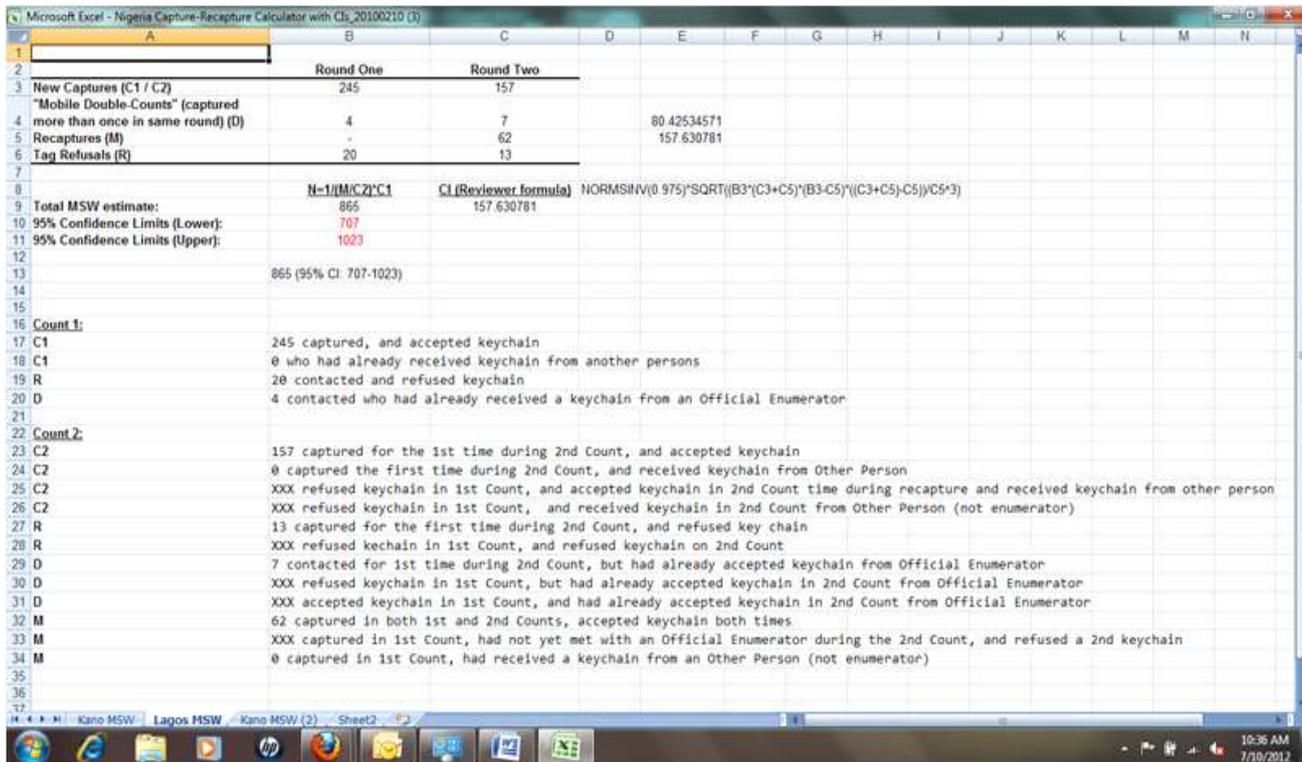


Figure 3:

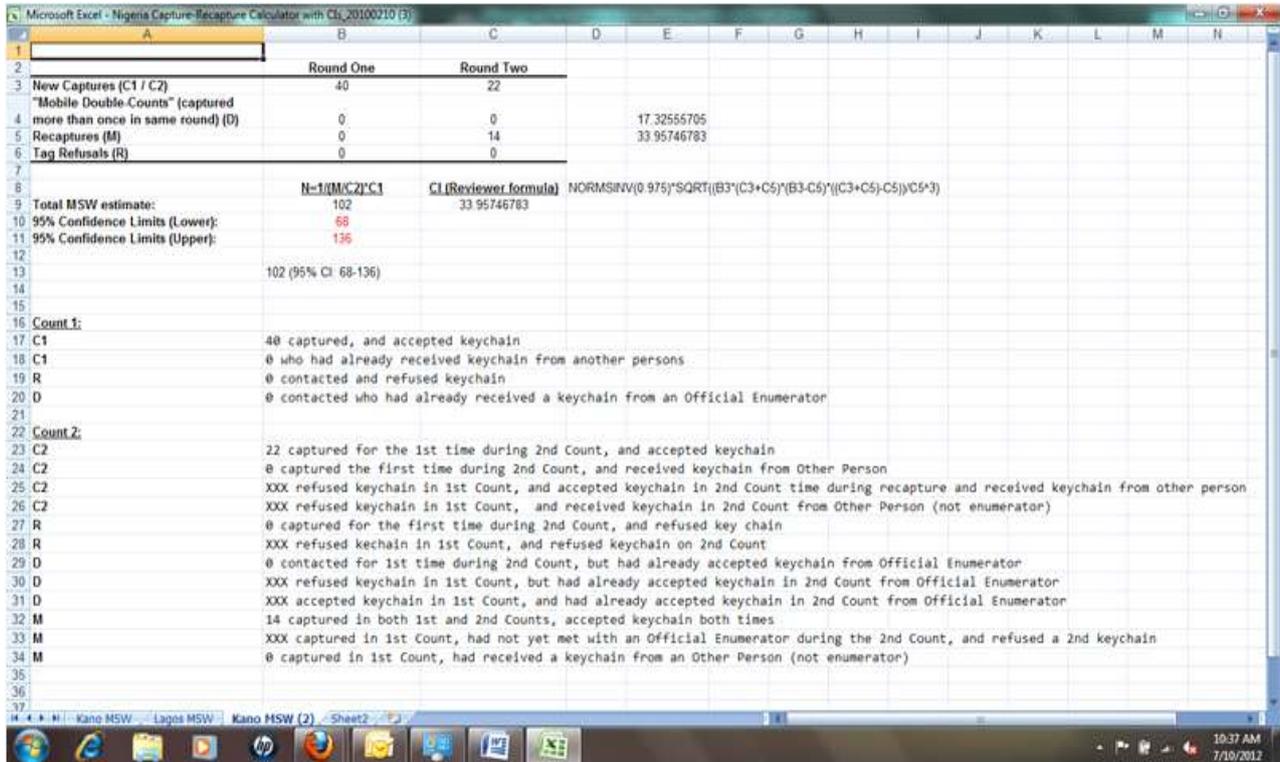


Figure 4:

The screenshot shows a Microsoft Excel spreadsheet with the following data:

	Kano	Lagos	Port Harcourt
Private Homes	28	76	102
Streets/Public Areas	228	72	132
Cinemas	405	258	132
Shopping Areas	72	31	105
Cafe/Restaurants	33	183	434
Clubs/Bars	47	195	72
Hotels/Pool	47	72	72



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