

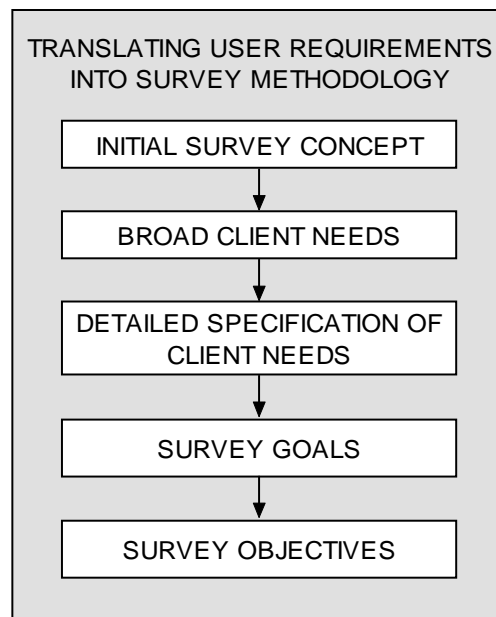
## Part III. Methodological issues

### Ch. III.A. Introduction

87. As outlined in chapters one and two of this manual, crime victimization surveys are conducted for a variety of purposes. Victimization surveys as a statistical activity are generally quite innovative activities given their reasonably short histories. [The requirements for running a victimisation survey also tend to be very different to the routine statistical activity of a National Statistics agency.](#) A wide variety of options relating to methodology, process and approach are available to an agency looking to design a new victimization survey. If working with areas of new or emerging areas of victimization, or areas which have not been surveyed before, methodologies may not be well developed at all. As a result, it is vital that when considering the methodological design of a crime victimization survey, the focus remains upon the identified goals and objectives of the survey. The methodologies employed in design, enumeration, processing and output processes will vary depending upon the survey's goals and objectives. Acting without full appreciation of the needs and requirements for the survey will result in data that are not relevant to the policy context, and potentially an inefficient use of resources.

88. The figure below illustrates the process required to identify client needs and establish a survey's goals and objectives. The following sections detail the steps illustrated in each dark grey box.

**Figure: Process used to translate user requirements into survey methodology**



## **Ch. III.B. Goals/objectives/purposes of survey/collection history**

### **Client needs and priorities**

89. The first major step in designing a victimization survey is to establish the client's needs and priorities as illustrated in the top left grey box of the figure. The first step when presented with an initial survey concept is to focus on "Broad client needs." These represent an overview of what the client is requesting. The second step involves the delineation of "*Detailed specification of client needs.*" This step covers the use of the data, the data items required and the varying levels of disaggregation. It is at this step that the level of precision of the data needs to be determined. The level of precision is ascertained by reviewing the intended use of the data as well as the timeframes in which clients intend to make decisions based on the data. These requirements vary according to intended uses of data. For example, timeliness may be crucial to the work of stakeholders or major decision-making windows may be missed. Or in other instances timeframes may be more flexible. Timeliness of data is often related to the complexity of the data required. It is crucial in determining methodologies and resource requirements to be clear about whether clients are only interested in broad indicators for policy making and evaluation of programs, or if clients require data that provides a more in-depth understanding of the concepts for research purposes. In general, broad indicators tend to be needed on a timely basis (i.e., 6 to 12 months) if being used for performance measures and evaluation. In contrast, more in-depth studies may only be needed on a less frequent basis where timeliness is less crucial. With large, in-depth surveys this may include lead times of years, with outputs based 15 to 18 months after enumeration.

### **Survey goals and objectives**

90. The second grey box in the figure includes the important steps of ascertaining survey goals, survey objectives, and methodology and content. The following sections address each of these important topics in detail.

#### *Survey goals*

91. Clearly identified goals provide the backbone to the development of the survey, placing broad parameters around the work to be completed. The most fundamental questions to be asked are about the data needs to be addressed by the survey. What are the policy questions that need to be answered? What data are available in the area(s) of interest, and what remain unmet information needs? These fundamental pieces of intelligence can be determined through understanding the potential stakeholders in the victimization survey, and conducting sufficient consultation to understand the information needs that need to be addressed.

92. One of the benefits of understanding the information needs of key stakeholders is that it enables an appreciation of the analytic requirements of users. It is important to have in mind the kinds of uses to which the output will be put when designing the survey vehicle, in order to ensure that outputs will be fit for the specified purpose when delivered. For instance, if users require broad indicators to conduct their analyses and answer the outstanding policy questions, then the data required to service these needs will differ substantially if the need is for longitudinal or detailed and integrated datasets for more complex exploratory analysis.

93. In a similar vein, the level of precision required in data is an important need to understand before proceeding with the development of the methodology. Depending on the

purposes the data will be put, different levels of error may be acceptable for some data. The level of acceptable error may also vary between data items or topics within the one vehicle, or national and regional estimates, depending on the intended use of the data. This is an important parameter to set in the goals for the survey, as it informs a range of decisions about the survey process relating to definition of sample size, costs and resources, and vehicle design.

94. Victimization surveys are costly to conduct, and these costs can vary considerably with different methodological decisions. Parameters need to be set that define the amount of resources available for the conduct of the survey. On the one hand, this may refer to the financial budget associated with the enterprise, but can also include the amount of personnel resource that can be dedicated to a project through to the technological resources available through the data design, collection, processing and dissemination phases. Setting clear goals about the maximum resource that can be expended on the survey at an early stage can guide development and design of these subsequent phases, and make it more likely that the resulting survey will be a feasible exercise.

95. Consideration should be given to any other constraints that can be expected to be encountered during the conduct of the survey. These should form part of the goal setting process determined at the beginning of the survey wherever possible, enabling subsequent methodologies employed to anticipate constraints and maximise the data that can be generated within those constraints. For instance, if there are legal requirements, policies or limitations on the data that can be collected, this should be clearly understood and stated. Examples of this may be restrictions on the types of persons who can be questioned (children or persons under or over a certain age), situations in which data can be collected (in private settings or with other persons present), or subject-matter that can be dealt with through specific methodologies (i.e. sensitive topics such as sexual assault). In many countries, legislation covers the activities of official statistical agencies or Government departments, and it is vital that the planned survey activities do not contravene any of the requirements set out in statute or policy.

**Box: Questions to be answered in developing survey goals**

- What questions/issues does the survey intended to address?
- What kinds of analyses are anticipated?
- What level of precision is required?
- What resources (financial or otherwise) are available for the survey?
- What constraints may influence upon the ability to implement the desired methodologies?
- What are the limitations that can be accepted (in terms of coverage, generalizeability, etc)?

*Survey objectives*

96. The establishment of survey objectives is a process of translating the survey goals into a more tangible and concrete range of concepts. This process specifies the statistical outcomes to be achieved by the survey. This more specific planning of statistical activity works to ensure that the detailed methodological decisions made reflect the overarching goals of the survey, and the data needs of users. The principal information to be used in determining these

objectives will be the goals of the survey, the information required to meet the data needs of stakeholders, and how this data needs to be utilized. For example, the survey objectives may be different if users wish to formulate or monitor policy, provide input into operational processes, input into lobbying of industry or government agencies, or support decision-making by businesses and organizations.

97. A primary purpose of most crime victimization surveys is to establish the prevalence of a particular kind of victimization within a certain population. This may be victimization experienced by persons, households or businesses, such as the estimated number of persons experiencing physical assault within a particular period of time. Data from victimization surveys can be used to supplement official police recorded statistics, and as such, an object of the survey may be to determine a prevalence rate for particular offenses dealt with by the formal criminal justice system. Part of the requirement for outputs of the survey to meet this objective would be to produce survey data that is complementary to official police statistics. However, this may not be possible for all offence types, and the reliability of the estimates produced will also vary depending on how commonplace a particular crime might be.

98. Victimization surveys provide an alternative insight into actual levels of offending than those provided by police data. As such, a goal may be to generate figures of crimes not reported to police, or seek additional information about those incidents which are reported, but where detailed characteristics may not be available. In these instances, it may be necessary to look for alignment with existing collections or definitions, and keep these data sources in mind when considering survey goals and subsequent methodologies. Victimization surveys will never be able to be totally comparable to any administrative or official statistics in form or function, but if consideration is given in the design phase, they can become a complementary dataset to provide more extensive analysis.

99. When victimization surveys are conducted in new or emerging areas of crime where data has not previously been gathered, or the offenses are not thought to be well represented in recorded crime statistics, the objective of the survey may be to establish a baseline crime victimization rate. An example of this type of objective may be for the survey to provide an estimate of the number of victims of specific electronic or white collar crimes.

100. Where crime victimization surveys have been conducted on a topic in the past, the survey may be commissioned at a later date to re-examine the changes in experiences of crime over time and explore trends in victimization. In these situations, comparability with previous surveys to create a time series is necessary, and the stated survey objectives should include these requirements. If the survey is to have repeating elements to enable comparability and monitoring over a period of time, this too, should be specified in the survey objectives.

101. Victimization survey data can be used to reveal specific details about victims, offenders, and other characteristics of criminal incidents. Expectations of key characteristics should be established in the survey objectives to ensure that the most appropriate methodologies to gather this information are utilized. Additionally, objectives relating to these detailed data should be set in a way that is realistically achievable. Methodological decisions will be made easier if these requirements are stated specifically, such as: "The survey should aim to collect data about women's experience of domestic violence." If objectives are specific, priorities are more clear to the survey manager which assists in the determination of data collection, and how much data needs to be disaggregated. This can have major impacts on the size of the sample and resource needed to produce the survey outputs required.

**Box: Survey objective examples**

- Prevalence of a particular phenomenon (i.e., persons, households, or businesses experiencing victimization)
- Estimate the number of crimes occurring during a specified period
- Establishing baseline crime victimization rates
- Exploring movements in crime victimization rates
- Replicate past surveys in order to create comparable time series data
- Monitoring trends in victimization
- Gathering details relating to characteristics of victims, offenders and criminal events
- Collect respondent attitudes
- Gauge respondent perceptions of the criminal justice system, and official responses to crime
- Determine respondents' fear of crime or feelings of safety
- Collate information about implementation of safety measures and effects

**An example of establishing survey objectives**

102. The following is an example of the identification of client needs as well as the establishing of goals and objectives. This example utilizes the *Survey of consumer and mass marketed fraud victimization*

*Examine client broad and detailed requirements and priorities*

103. Initial client needs were for survey data to inform policing, policy and education activities in relation to consumer fraud victimization. There was a lack of data on this topic, and no reliable information about the size of the problem or the kinds of frauds being encountered by consumers in particular.

104. In order to provide more direction to the data needs, further consultation with clients formed the basis for setting survey objectives. As mass marketed frauds and scams generally require the victim to respond or interact to an invitation of some sort, it was also important to gather a measure of exposure (where people received an invitation that they could respond to), as well as when they actually did respond, and where they subsequently lost money. Clients had a range of frauds and scams that they were most interested in knowing about in detail, as they were the most common frauds that were reported to authorities (credit card fraud, identity theft, lotteries, phishing, advance fee fraud, fake financial advice, fortune telling scams, chain letters and pyramid schemes). As little was known about this form of crime victimization in this jurisdiction, clients were keen to get a wide range of details about incidents and the socio-demographic characteristics of victims and non-victims. They were also interested in elements of electronic security employed, behavior change over time, detailed geographic locations, etc.

105. These information needs were prioritized, with core requirements stated as: prevalence of exposure, prevalence of response, prevalence of financial loss, amount of financial loss. A

range of key characteristic requirements about specific incidents, such as whether reported, mode of invitation, amount of money lost, amount of time lost, and behavior change.

106. Survey outputs were discussed with the clients, who required a formal publication, in addition to supplementary tables relating to large geographical/administrative regions. Access to confidentialized unit record data from the survey was also desirable.

107. It was determined that this survey required a representative national sample. As the expected prevalence based on international work suggested that the prevalence for this offense is quite low, the sample needed to be quite large to increase the likelihood of generating useful results. A major risk to the survey data was the possibility that the prevalence of these frauds may be even lower than expected, and that data quality would suffer due to increasing error rates. Other issues identified related to problems in defining some of the frauds, and overcoming confusion amongst respondents and their inability to recognise some of these frauds. Determining the appropriate reference period for frauds (particularly identity thefts which can take some time to be discovered) was also considered.

108. The clients were presented with a survey proposal, and memorandums of understanding were signed to secure funding for the survey and outline the required outputs and delivery dates.

#### *Survey goal established*

109. Based on client interaction, the survey goal was identified as 'determine a benchmark of the level and characteristics of consumer and mass marketed fraud victimization'.

#### *Survey objectives established*

110. The objectives of the survey, therefore, were to meet as many of the detailed needs described above as was possible, given the resources available and practical constraints.

#### **Collection history and consideration of other data**

111. Once objectives are identified, it is necessary to identify other sources of data that may be available to meet these needs. This will enable the refinement of the stated data needs and verification of whether or not there is a need for any new or expanded collection activity or if there are existing surveys where the scope can be reconsidered or extended. By using existing data wherever possible to meet user needs, and focusing on meeting genuine information needs as a priority, unnecessary use of resources and provider load are reduced. Part of this analysis should include whether or not administrative by-product information from justice or other related agencies may prove to be a sufficient source of data to meet user needs. These sources can prove efficient and cost-effective ways to boost information gained from surveys, and contribute to a broader statistical program in relation to crime and victimization.

## Ch. III.C. Budget, time frame and other constraints

112. There is a strong relationship between frequency, timelines, survey goals and available resources when conducting a victim survey. In order to control these factors through the survey process, a survey manager needs to be aware of, and able to estimate the influence of, a range of operational constraints. Simultaneously, the survey manager must also understand the expectations of clients and stakeholders, and the primary focus to produce data that is fit for the purpose it is intended. It may not always be possible to meet all client needs, as there are many factors that need to be taken into account before proceeding with a survey. These include:

- Available resources/budget
- Time available to deliver 'fit for purpose' data to clients
- Technologies/systems requirements
- Size of sample which impacts on workloads
- The precision levels required of the final data
- Organizational and operational constraints
- Low prevalence of selected offense types or events
- Questions that may not be appropriate for surveys
- Provider load
- Competing work program priorities
- Design of surveys to ensure appropriate coverage of those in scope.

### Budget

113. One of the most fundamental constraints upon a survey enterprise is the budget available. In some instances, the agency conducting the survey is in a position to fund the survey from internal resources. In other instances, the agency's efforts in conducting a survey are funded from multiple agencies or organizations. The size of the available budget influences virtually every area of the survey process from scope, design, timeframe, available methodologies, as well as the sophistication and extent of outputs and further analysis.

#### Question 1:

What financial resources are available to develop and conduct the survey?

114. Other key factors to consider when embarking on a crime victimization survey include whether an organization has the infrastructure available and capability to undertake a crime victimization survey. In some cases some or none of the infrastructure or capability may be available therefore one option may be to outsource some or all of the components of a survey.

115. Depending upon the particular policies in place in a jurisdiction, it may be an option to have an external market research agency or other related business take over part of the work of the survey. Keep in mind that out-sourcing offers both advantages and disadvantages. For instance, out-sourcing may result in possible reductions in response rates, restrictions upon the type of information that can be collected, the range of people that can be reached by the organization, the protection of the privacy and confidentiality of respondents' personal information, and the need to monitor and evaluate an external agency. On the other hand, out-

sourcing may offer a faster and less-expensive alternative. For agencies who do not maintain panels of interviewers or other forms of infrastructure necessary to conduct population-based surveys, out-sourcing can be an important option to cost and consider.

116. Depending upon the specific expertise of the survey managers, it may be necessary to also pay for external consultants to work on various elements of the project. For example, if a survey is being run from within an area specializing in justice policy and administration, it may be necessary to consult with survey methodologists when designing the survey, processing and analyzing data. This can add significantly to staff costs on a survey, and should be budgeted for in advance wherever possible. Alternatively, if a statistical agency is commissioned to run the survey but does not have access to persons with specialist substantive experience in criminology or justice-related backgrounds, then this expertise may also have to be brought in from outside the organization.

**Caution!**

A risk strategy should be developed if outsourcing is used to ensure that the results are not compromised in any way. Outsourcing adds a level of complexity to the survey process, with less ability to control and monitor the process and quality. Care should be taken to ensure that certain principles are not compromised (e.g., confidentiality, privacy, copyright).

117. Although outsourcing is an option, there are advantages in developing and maintaining in-house capability, if these do not already exist within an organization. These include maintaining tight control over the survey, building expertise and staffing capability over time, which can minimize costs.

118. Depending on the infrastructure available within an organization, costs can also be kept to a minimum by utilizing existing survey vehicles. Crime victimization surveys do not have to be conducted in their own right. Depending on the client needs, it may be appropriate to add specific questions to an existing omnibus survey.

119. A number of other components need to be considered when preparing a budget estimate for a crime victimization survey. One of the most prominent is the feasibility of the scope stated in the survey goals and objectives given the available resources. If the stated aim of the survey is too broad, or by contrast, contains too many elements of ‘essential data’, it may be that it is not feasible to conduct a survey of the size required given the available resources. Value for money can be provided if the survey manager is able to prioritize the essential content of a survey and scope of a collection – what is really *required* to answer the question, and how does this balance with available resources? Answering these questions can help direct the manager to limit the scope of the survey if necessary, based on the resources available. By assessing the cost of various aspects of the survey process, it is possible to start balancing the two.

120. The time taken for development, and the amount of development required is an important area to budget appropriately. If the topics to be covered in the victimization survey are relatively new and emerging areas, sensitive topics, or merely topics that may not have been collected within a jurisdiction or using a particular methodology, development costs in time and resources are likely to be significant. By way of comparison, however, development

### Ch. III.C. Budget, time frame and other constraints

costs for an ongoing survey collection, or where one is essentially repeating a previously conducted survey tend to be less. Creating a budget to cover development costs should take into account a range of activities, which may all have greater or lesser drains on resources. For example:

- Scoping studies, including desktop research, and may extend to focus groups or roundtable exercises with panels of experts to determine key items and definitions
- Design of questionnaires and questions
- Cognitive testing, or other forms of questionnaire testing, which can be very beneficial but labor intensive
- Preparation of materials required to go into the field (coding for use with technology; preparation of printed materials)
- Creation of training required for interviewers or other staff to enable them to work with the particular survey.

121. Crime victimization surveys can be conducted using a variety of modes including face-to-face interviewing, mail surveys, telephone surveys, and internet-based surveys. Each of these methods is associated with different budget needs. Generally the most expensive method is the face-to-face interviewing due to greater personnel involvement required in data collection. Thus more resources will need to be allocated to the effort should one select this method.

122. With survey data collection, processing and output increasingly utilizing new technologies, a significant proportion of the budget may be required to purchase or maintain new computer systems, networks or other tools if undertaken in-house and no other survey vehicle is being utilised. Depending on the size and nature of the victimization survey to be conducted, specialized technology applications may be required to enable the design of forms or questionnaires, the collection of data (particularly if computer assisted interviewing is to be used), processing and collation of data, and creation of various outputs. Additional related costs can include: network, telephone and internet charges, the cost of physical technology hardware, and support costs.

123. Staff costs generally are essential components of the budget. As mentioned previously, there are a number of variables here: Existing staff within the agency in salaried positions, management costs, costs of interviewers if necessary, and costs that may be involved with external consultants or experts. If utilizing focus groups or cognitive testing exercises in survey development, it may be necessary to factor the nominal payments generally made to participants into the budget. The inclusion of specific cultural groups or remote areas may require specialized strategies that can add considerably to the cost of a survey.

124. Depending upon the topic, and the stakeholders identified, there may be a wide range of consultation required. This may involve travel to key clients, paying for the costs of hosting round-tables or other forums, travel to communicate with community leaders or groups about the survey prior to enumeration, etc. The costs of maintaining communication with clients, and undertaking necessary liaison to ensure the survey runs successfully should be considered.

125. Raw materials should also be included in a survey budget. This can include costs of printing and distribution of forms, survey instructions and other materials. If outputs are to be disseminated in printed paper format, then this cost should also be estimated. Increasingly victimization survey results are made available in electronic formats, which can be cheaper

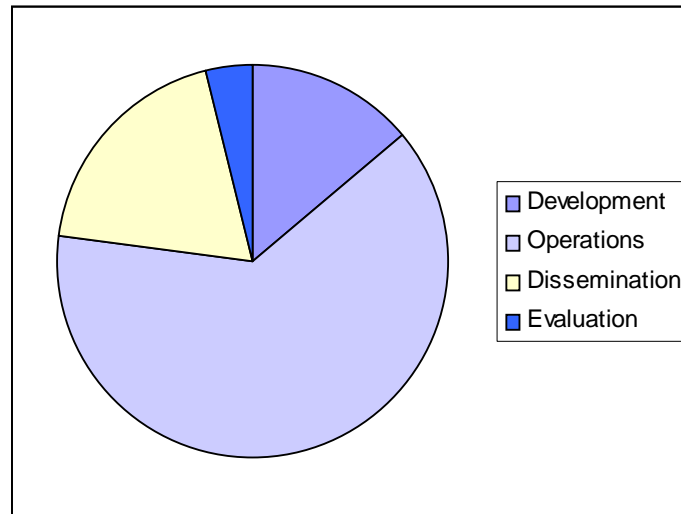
from a resource perspective. They can, however, limit the access of clients and other users to the survey outputs, depending on the availability of such services.

126. All of the costs outlined above, where applicable, comprise the base operation costs of running a survey. In addition to that, there are costs which increase or decrease depending upon the number of persons, households or businesses to be sampled in the victimization survey. These could be considered unit-based costs, and are important to consider when determining if sufficient sample is affordable given the available budget. It is also important to note that the budget required to conduct a survey may run over more than one financial year's budget and this needs to be understood and factored in advance.

127. There may be additional unit-based costs depending on the focus of the victimisation survey. For example when making a survey on domestic violence there is a need for additional measures to ensure the privacy of the interviews and safety of the respondents, which might involve making several appointments. Surveys of minorities may require the translation of the fieldwork documents or recruitment and training of multi-lingual fieldwork staff.

128. The following figure presents an estimated proportion of budget which can be expected to be required for different stages of survey development, enumeration and output. Specific costs will vary based on subject matter, sample size, methodology, resource availability, local conditions and the amount of experience the agency has with running surveys. This presentation assumes that the survey is being run for the first time, by one agency, and therefore requires significant development. If a survey was to be run on a repeat basis, this stage may require a much smaller outlay of funds in comparison to other activities. The majority of funds will be required for the operational aspects of the survey (interviewers, materials, processing and other survey infrastructure), which actually generate the data. It is recommended that a small portion of resources be retained to enable evaluation of the survey processes, outputs and outcomes – particularly if there is a possibility of having the survey run again in the future. This step adds accountability, as well as allowing for the improvement of processes and avoidance of problems in the future. Should the survey be run under any other circumstances than 'in-house', such as via contract or external agency agreement, then the funding required for different stages will depend upon the experience of the agency with running surveys, how well established the organization's survey infrastructure and interviewer workforce may be, as well as other commercial issues such as competition, supply and demand.

**Figure: Estimated proportion of budget for each survey stage**



129. Once the expected costs of various components of survey operation have been calculated, the survey manager is in a good position to determine whether the goals and objectives of the survey can be met with the likely available resources, and consider negotiating for or seeking additional funding. If this is not possible, it may be necessary to consider changes to scope, sample size or complexity, size of outputs, or timeframes.

### **Timeframe**

130. The timeframe involved in a survey is an important constraint upon the survey process and resources required. If the crime victimization survey planned has not been conducted before it is important to establish how much lead time will be required to develop the survey to the point where it can be put into the field for enumeration. If this is both a new survey and a new or emerging topic, lead times may be longer given the additional work required to scope the topic and devise a survey which can measure the constructs of interest. If this is a new version of an existing survey, or a continuous survey, it may be able to operate on a shorter lead time, but it may become more important to adhere to a regular timetable of data collection, processing and output.

131. The timeliness of outputs is a crucial measure of success for most victimization surveys. This is particularly the case for those specifically required for purposes of policy formulation or evaluation. Again, timeframes should be primarily specified with reference to the information required from the survey, and the purpose for which the data may be required. For instance, if the information need is an urgent one, then a survey that produces a highly accurate measure of the data items of interest may be pointless if it is provided in three years' time. In some instances, it may be appropriate to produce a smaller dataset or less detailed output within a shorter timeframe in order to meet the requirements of users. However, if the information need is an ongoing one, and it is important to spend the necessary time obtaining detailed and high quality data, then this may be an acceptable timeframe, and the results may still be relevant. Striking an appropriate balance between the quality and depth of outputs, the timeliness required for the data to be relevant and useful to users, and the resources required, is a tension survey managers need to be aware of when setting parameters for the survey process.

132. One important consideration when estimating the necessary budget and timeframe is the influence of timeliness. In some instances, it is less expensive to take longer to complete a

process, and in other instances, it can be less expensive if activities are conducted intensively. For example, it is important for survey managers to consider whether or not savings can be made by the staggered delivery of outputs. It may be necessary to compromise timeliness in order to achieve the survey aims and goals.

### **Other considerations**

133. A number of other constraints can affect the survey process and should be considered early on in the survey development process. Policies of the statistical agency or other agencies involved in the survey can impose a number of restrictions on survey activities. Examples of these potential restrictions are limits on interview times or the types of topics that can be addressed via various methods. For example, one must assess whether there are particularly sensitive topics such as sexual assault or domestic violence, limits to the links that can be made between surveys or datasets, types of acceptable outputs and access to data by users, etc. In addition, the organizational structure of the statistical agency and the governance of the survey project may impose some restrictions on decision-making or other aspects of the survey process.

134. The maintenance of the privacy and confidentiality of respondents is paramount to any statistical agency, as without the confidence of respondents, an agency cannot hope to gain support for survey activities, maintain high response rates, or generate data which can be considered the result of honest reporting. As a result, policies designed to protect data and the identity of respondents should be given considerable weight. In addition to the specific policies of a statistical agency, there are often ethical responsibilities and legal controls around personal data (for example, through acts of law protecting the privacy of individuals).

135. Limitations may exist around who can, should or must be brought into the survey development and operational process. Commercial arrangements between agencies may impose restrictions on access to survey instruments or raw data, and the implications for the work of the statistical agency under these arrangements should be carefully managed. If the statistical agency has strict guidelines and policies in relation to the privacy of respondents and the protection of data, the involvement of external persons or agencies may be restricted to consultative interactions only, or additional control measures might be necessary to ensure that any subcontractors also fulfil the same privacy requirements.

136. Cultural considerations may be an issue to be considered that might impact the survey. For instance, in some situations it may be necessary to obtain the permission of one particular person for other family members to be interviewed, or for another person to be present during an interview. It may not be appropriate to deal with some topics in certain ways, and in this way, there may be an impact of cultural factors on the methodology. Methods, content and questions may need to be adjusted to accommodate the needs of different respondents from different cultural backgrounds.

137. Logistical difficulties may need to be considered if the survey specifications include the collection of data from persons living in geographically remote areas, or areas without certain technologies available. The availability of persons who may otherwise be in scope for the survey can be limited by these considerations, and bias may be introduced into the sample frame if these issues are not appropriately understood and managed. This can also occur in highly-developed and urban areas where technologies are changing and evolving. For instance, surveys that rely on telephone interviewing can encounter difficulties since the advent of mobile phones as primary points of contact. If relying on public contact lists or random-digit-dialing of land-lines, many people who have adopted mobile phones as their

primary contact point will be excluded. Given that these shifts in the use of technology generally do not occur at even rates throughout the population, this will create bias in a sample. Consideration should be given to developing strategies to overcome these issues such as initial face-to-face contact and letters of introduction.

138. A primary concern for statistical agencies is to minimize respondent burden when conducting surveys. This is generally done in the form of minimizing the time taken to complete any survey and generate data needed to meet the stated statistical objectives. This is a particular concern when dealing with smaller population sub-groups or heavily sampled communities, where a number of statistical activities may be operating on a continuous basis. In order to maintain the goodwill necessary from public respondents, placing an undue surveying load on those sampled should be avoided.

139. In order to minimize the effects of heavy surveying load, statistical agencies must ensure that collections are not conducted more frequently than is necessary to meet the needs of users. It is helpful if an explanation of the reasons for the data collection is provided to respondents. Some agencies may have particular limits on the burden that can be placed upon respondents, either individually or collectively. These constraints need to be managed in relation to other surveys and the survey under consideration. In order to measure the impact of surveys upon respondents and therefore monitor respondent burden, it is recommended that survey collections include a standard question on the time taken which should be placed at the back of the questionnaire for paper or computer based instruments. Where telephone interviews are to be utilized, it is recommended that the data collector monitor interview lengths. This information is generally required for payment and other management functions, but is also an important indicator of respondent burden.

140. In summary, a survey manager needs to understand the resources that are available, identify the priority user needs, and identify the key characteristics that will make the data fit for the specified purpose. If that is not possible given the available environment and resources, then communication with the client is necessary to manage expectations, gather additional funding, refine major purposes of the survey, and/or select alternative methodologies.

## Ch. III.D. Survey Coverage

141. The survey coverage refers to the *target population* of interest in a survey. Stated differently, the target population is the complete set of units to be studied. For example one may be interested in studying the general population of individuals or one may wish to examine all businesses. The choice of target population is strictly related to the problem under study and it can be constrained by different and sometimes competing factors as the sample frame, costs and availability of resources, accessibility of population, and the attributes of the population. In relation to victimization, the target population is the set of units that could be victims of the crimes under study. The target population in victimization surveys is usually defined by age or gender, as well as their geographic location, for example:

- All adults (specify lower age limit: 14 in Italy; 16 in England and Wales, 18 in some other countries)
- All persons between ages 12 and 65 (but when considering children, the use of a proxy respondent is needed e.g., to provide household information)
- All women (specify lower age limit: 16 in Italy and England and Wales), when the issue is about violence against women
- Other groups such as ethnic minorities, immigrants, the disabled, the lesbian and gay community, or people living in special circumstances.

142. At the same time one decides on the target population, the method of sampling also needs to be considered as it is likely that there will be subgroups that will be more difficult to sample. In the example of a survey of adults aged 18 or older for example, people living in institutions (e.g. care homes, hospitals, prisons etc.) or the homeless will be more difficult to include in the overall sample. In these cases it is usual to exclude such groups from the sample. This means that the *survey population* may not fully match the *target population* and this will need to be taken into account when presenting estimates. In the example above, it is possible that some of the missing sub-groups (e.g., those in prison and the homeless) will have higher levels of victimization so their exclusion may affect the overall estimates. These additional sub-groups can be the focus of specially designed surveys, the findings from which can then be used to complement a more general victimization survey.

143. According to different legal and/or cultural rules or habits, specific subgroups can be excluded from the target population. One example is that people over a certain age who might be harder to access or to interview may not be in sample. In other cases, some population groups might also be interviewed indirectly using proxies. Proxies are people who respond on behalf of the actual respondent. While it is advantageous to get the interview via a proxy versus no interview at all, there are issues in relation to the degree to which proxies would have full knowledge of the victimization of those they are reporting on. Further, in some cases (such as family members or care-givers) the proxies may themselves be the perpetrator of the victimization against the respondent.

144. In addition, other types of populations could be specific communities or ethnic minorities. However, for certain types of victimization, quite different target populations may be required. For example, a study of work-place violence may require a sample of those employed in particular occupations. Or a study of corruption may seek a sample population working in specific industries or sectors.

145. Including young people (ages less than 16 or 18 years) in the sample add additional considerations to the design of the survey. Parental and/or school permission may be necessary, the confidentiality of the young person's answers will need to be assured, question

wording may need to be amended for younger people and the survey design, and format and mode of delivery may need to be changed. Schools are often used as a place of conducting surveys on young people, but this is to the exclusion of those who do not attend school. Similar considerations are needed for surveys targeting other sub-groups, such as the physically and mentally disabled or those with low literacy.

**Box: The Importance of the target population**

The target population must be carefully considered in terms of designing the sampling frame and interpreting the results. For example, measuring victimization within a particular geographic area such as a city must account for differences between those who *live* within the area's boundaries, and those who are in the city area for work or leisure only. Transient populations such as these would also be at risk of victimization but would not be captured in a standard household survey focused on a city. This will also affect any comparisons that are made between victimization survey results and police report statistics, since the latter are likely to include also cases that have happened to non-residents.

146. When selecting the target population there are a range of factors to consider. First, the nature of the problem being addressed and attributes of the population must be measured. Will a general population sample be suitable or is there a particular group who are important? For example, if young people are the most heavily victimized would it be more efficient to cover young people only or is it more important to obtain an overall picture of victimization? Second, the accessibility of the population must be considered. A general population sample is the most easily obtained. Sub-groups are by definition more difficult to sample and find, especially if the members of a group are spread evenly over an area. Coverage defined by age incurs additional costs because not all persons approached are eligible, while coverage defined by other attributes such as race incurs extra costs and are less likely to result in a fully representative sample. And finally, the availability of resources is a vital consideration in selecting the target population. The resources available both in terms of funding and people to conduct the survey contribute to the decisions on coverage particularly in relation to accessibility of some groups.

### Ch. III.E. Survey Sample Frames

147. The survey sampling frame refers to a complete list of the population from which the target population will be sampled. It defines the technique and methods of sampling units, the design of which also affects the estimates and their statistical significance.

148. Sampling frames include lists of:

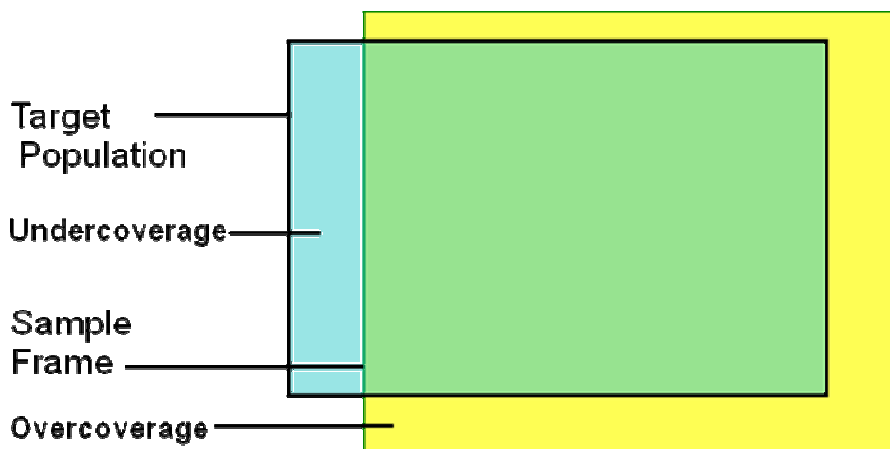
- population registers, electoral registers, birth registers, medical registers can be used as sampling frames for individuals.
- postal address files or electoral registers could be used as a sampling frame for households.
- driver's licenses lists may be used as a sampling frame for persons old enough to have such a license.
- phone number listings may be used as a frame for homes with phones.
- a list of businesses or organizations in a business directory may be used as a sampling frame for businesses.

149. Sample frames are very often not an exact representation of the target population as they may not include some elements of the target (under-coverage) or may contain non-target elements, e.g., misidentified sample units (over-coverage). Examples of under-coverage would be the exclusion of people living in group or shared residences, such as student halls of residence or old people's homes, from a general household survey. Or under-coverage occurs with the exclusion of households who only use a mobile phone from a general household telephone survey, or who have registered their telephone number in order to be excluded from unrequested calls. An example of over-coverage might be the inclusion of overseas visitors in a survey of victimization of the normally resident population.

150. In order to avoid non-relevant units from being included in the sample, the first part of an interview normally includes some questions used to check the eligibility of the person or unit being contacted. For example, depending on the sampling frame, the field representative may ask the respondent if they are of a particular gender, age, or if they are a full-time resident of the home.

151. The following figures illustrate the relationships between target population, the sampled population and the sample frame. They show the related problems of under- or over-coverage, with the corresponding main reasons, related to the interview mode (e.g., telephone, face-to-face, mail, email or internet survey).

**Figure: The relationship between target population, sampled population and sample frame**



152. The box framed in black represents the target population. The part framed in green represents the sample frame which includes all the available units listed to be sampled. Only the green part of the sample frame is useful to study the target population, but we do not know it in advance, as errors on the sample frame list are not always easily detected. Furthermore the yellow part of the sample frame is not useful to study the target population, and represents the over-coverage of the list. The blue part of the target population represents the under-coverage part of the population not listed and therefore not sampled. The gray part of the figure represents the sample population.

### **Issues to consider**

153. Coverage and mode of data collection determines the type of sampling frame that is required. If the coverage refers to people in the general population then lists of people, addresses or phone numbers may be appropriate. If the survey is of businesses then some sort of business register is required. Face-to-face surveys require a list of people with their addresses, a list of addresses where individuals are not identified or a list of phone numbers to make initial contact. Postal surveys require a list of addresses (which may or may not identify an individual) and telephone surveys require either a list of phone numbers or the use of random-digit-dialing (see below).

154. Some countries have population registers which provide useful sampling frames for different purposes as they tend to have good coverage of the population, are regularly updated, and contain useful additional information or can be linked to other databases to acquire additional data. Such resources decrease the burden on respondents when information is available elsewhere.

155. Postal address files can provide a comprehensive list of addresses but coverage should be verified. Does the list include all private addresses? Are business addresses included? Is it possible to identify multi-household addresses? Electoral registers can provide a list of addresses or individuals at those addresses but coverage is limited to those who register to vote and in some countries (e.g., United Kingdom) people can ask for their details not to be listed. Education authorities have comprehensive lists of children of school age but there may be issues of confidentiality and access which need to be considered.

156. Frame imperfections such as under-coverage (e.g., the list of addresses does not include new houses) and over-coverage (e.g., the list of persons includes people who are deceased or have moved away) are likely to bias or diminish the reliability of the survey estimates and to increase data collection costs, so it is important to establish the following information:

- What information is available on the frame about sample units? (e.g., name, address, sex, age, date of birth, territorial area). This sort of information can be useful in stratifying the sample (see Section below), identifying sub-groups, data processing, imputation, estimation, record linkage, quality assessment and analysis.
- What is the quality of this information - what are the levels of missing data and what is known about the accuracy of the records?
- How complete and accurate are the sampling lists? Lists created from administrative sources may not be as accurate as survey researchers would hope. There may also be omissions.
- How often does the sample frame get updated? The most recent version should be used, taking into account any available updates. Countries where census data is the

main source of population data available, as opposed to regularly updated population registers, face particular challenges when trying to construct an up-to-date sample frame.

- How will the survey frame be updated in the future?
- How are duplicates treated? All frames are likely to include duplicates. These need to be identified in order to ensure equal probability of selection. If there is no standard procedure for the chosen frame this will need to be incorporated into the sample design.
- What form is the list in and is it available to use? Many lists are now available electronically but special software may be required. If lists are not electronic, resources will be a particular issue for the selection of the sample which will require considerably more time than an electronic selection. Some lists may be restricted to certain groups of users, and access may need to be specially negotiated.

157. It is possible to use multiple sampling frames in certain circumstances. When several frames exist, some of which are incomplete but less expensive to use and others more complete but prohibitively expensive, the use of multiple frames should be considered. This can be particularly valuable in addressing issues of under-coverage. For example, people not reachable by phone can be interviewed by face-to-face interviews, using other lists such as addresses, births, driver's licenses or electoral registers, in case of household surveys. However, pooling results to provide overall estimates derived from different methods and different sampling design needs to take into account their specific measurement error, and the overall error is likely to be higher.

#### **Case study: Sampling using general population telephone surveys**

Most countries have lists of landline users though they have become progressively less comprehensive in terms of population coverage with the increase in the cell-phone-only households. A 2008 Special Eurobarometer 'E-Communications Household Survey' report indicates households with only mobile phone or cell phone access are growing rapidly in Europe. This instrument surveyed mobile versus landline telephone coverage in the European Union's (EU) 27 Member States (plus Croatia and Turkey) during the period November-December 2007 and compared results with an earlier sweep in November-December 2006, (see p. 32 in report - [http://ec.europa.eu/public\\_opinion/archives/ebs/ebs\\_293\\_full\\_en.pdf](http://ec.europa.eu/public_opinion/archives/ebs/ebs_293_full_en.pdf)). Findings show that many central and east European countries have a particularly high share of mobile-only households, and the number of these households is increasing at a high rate. Czech Republic has the highest rate of mobile-only households at 64 per cent while among the 'old' EU Member States Finland has the highest rate at 61 per cent. In Italy, the percentage of households having only a mobile phone increased from 3.3 per cent in 1998 to 17.1 per cent in 2005. In addition, many households with a land-line only are not listed in the directory and some countries (e.g., United Kingdom, Italy, and Finland) also operate a service where people can ask not to be contacted by businesses (although social researchers can negotiate access to these numbers in certain circumstances). Coverage can also vary by region, and specific social and demographic characteristics. Some households have more than one phone number listed, so they are over-covered, and have a higher chance of being sampled. Substitution in cases of replication can be considered.

The exclusion of mobile- or cell-phone only households from a sample frame is a particular problem in victimization surveys since these households tend to be younger and young people are more likely to experience victimization. Random-digit-dialing (RDD) overcomes the problems of non-listed numbers. RDD can also be used to include mobile phones, but often

this is not done because of higher costs, a lack of information available from telephone companies concerning the number sets in use (to limit the number of unsuccessful calls), and an inability to stratify the sample due to unavailability of information about the owner of the mobile phone number (particularly in countries with a large number of unregistered pre-paid subscriptions). RDD is also plagued by difficulties in establishing non-response since it is impossible to calculate accurately eligibility when calls are not answered. An additional problem is found in some countries that do not permit interviewing over cell phones (e.g., Canada and the United States). In the United States interviews are conducted by the Census Bureau (the agency that conducts National Crime Victimization Survey interviews). The Census Bureau will not interview via cell phones for a few reasons. First, the Census Bureau does not want to inflict the costs of cell phone use on the respondent. And second, because cell phone calls are conducted over “public” airwaves, confidentiality is potentially jeopardized.

Additionally, where mobile phone numbers can be identified for sampling purposes, consideration must be given to the fact that people move from one address to another and retain their mobile phone number. This poses problems for city or region-specific surveys that attempt to contextualize findings with respect to location. However, mobile phone companies do keep addresses for billing purposes, which might be utilized by survey researchers at some point in the future. Yet, in the case of European countries, the possibility of locating mobile phone subscribers is currently limited for two reasons: First, the majority of European countries are dominated by pre-paid mobile phone subscriptions that do not necessarily require subscribers to give their addresses (see Special Eurobarometer report on ‘E-Communications Household Survey (June 2008), section 2.5.3. on ‘mobile telephone access: contract versus pre-paid’). And second, because of existing data protection laws that survey and telephone companies must abide by, only the police and intelligence services are able to locate users of pre-paid phones. In addition, people may also own several different mobile phone numbers, while actively using only some of them, which means that the number of unsuccessful attempts when trying to contact these people may become very high. People may also actively use more than one mobile phone, which increases their selection probability.

In telephone surveys using phone lists, little information is available about the sample units. In household surveys, address files usually supply no more than the name and the address which can be at times out-of-date or incorrect. The main difference with RDD is that the probability of sampling a household is higher when using the list instead of the RDD. In both cases demographic characteristics about household members can be collected during the interview. This generally occurs at the start of the interview when respondent eligibility is verified.

Many countries are content to use telephone surveys. In fact, this is the method used in the International Crime Victimization Survey. However, some have experienced problems in obtaining a representative sample using telephone surveys. The issues are illustrated by Scotland’s pilot telephone victimization survey described in detail here: <http://www.scotland.gov.uk/Publications/2005/12/22132936/29366>.

### *Sampling minority groups and other special population groups*

158. When one wishes to sample minority groups such as ethnic minorities and people with an immigrant background, a general population survey is generally not going to work. Unless the general population survey is enormous (or the minority group is a very significant

percentage of the population), too few of the desired minorities will be sampled via standard random sampling to allow for any meaningful break-down of results by minority background. Instead, surveys that want to look at minorities either need to incorporate a booster sample of the group or groups they are interested in as part of a survey on the majority population, or consideration needs to be given to the development of a dedicated minority survey. These options require the use of alternative sampling frames as minorities tend not to be evenly distributed in the population. However many countries do not have local population data from which random samples of minorities can be readily drawn, or even any population data which includes information on minority status.

159. When looking to develop a random sample of minorities, a number of options exist that require a multistage sampling frame. The first stage randomly screens households/individuals to identify if they match the groups defined for survey purposes while the second stage randomly selects individuals to take part in the survey.

160. *Random-digit-dialing (RDD)* can be used to identify minorities by randomly dialing telephone numbers either for a CATI survey or for a follow-up CAPI or PAPI survey. Computerized call-management systems are able to identify inactive or fax numbers, with repeat and relatively cheap call backs of live numbers possible. However, as with surveys on young people, the use of landline-only screeners is increasingly problematic because of high mobile phone usage and low landline coverage among minority groups. In addition, mobile phone listings are not yet available in all countries, and, where they are, cannot be used to pinpoint respondents by geographical area (e.g., for sample stratification).

161. A second option is *random route or random walk sampling*. This method requires data at the local level on the distribution of minority groups. By knowing the share of minority groups in different areas the share of interviews in each area can be calculated, which are subdivided into clusters for carrying out a pre-determined number of interviews. Clusters are then selected at random for sampling, with standardized random routes for household selection drawn up from a central or randomly identified point in a settlement. If a household is identified as belonging to the minority group for surveying in an initial screening with the first contacted member of the household, standardized random selection procedures can be employed (such as last birthday) to identify potential respondents for interviewing.

162. A third possibility is the use of *focused enumeration*. This method asks interviewees, who are either from the majority or a minority population, to identify whether their neighbors, described as living a certain number of doors either side or above or below them (in the case of flats), are from a minority background. If so, interviewers call on identified neighbors, screen them to confirm whether they belong to the group for interviewing, and ask if they are willing to take part in the survey. This approach can be combined with a survey on the majority population as a means of boosting the minority sample.

163. A fourth option for reaching 'difficult to sample' or rare minorities is to use name lists, such as telephone directories, to select persons whose name refers to a minority population. However, this method has significant limitations. First, many minority groups will not have different family names to those of the majority population. Second, women from minority backgrounds who have married men from majority backgrounds cannot be identified using such lists. And finally, women from majority backgrounds who marry into a minority family name will be misidentified.

164. A fifth method to identify 'difficult to sample' or rare minorities is through network sampling. Once members of a minority group have been identified through means such as

name lists, information is collected from them about other potential respondents that are linked to their household in some way; such as friends or relatives. A random sample can then be drawn from individuals identified as part of the network. In small areas this approach may attempt to identify nearly all members of the target group before drawing the sample. Snowball sampling is a variation of this approach, whereby members of a minority group refer researchers on to other minority individuals, who may or may not be part of a network. However, the implications of these non-probability approaches are that the results cannot be generalized as representative of the target population.

165. Sixth, one can utilize institutional linkage as a means to locate ‘difficult to sample’ or rare minorities. This suggests that researchers approach institutions that have links to minority groups, such as charities, non-government organizations and community organizations, and ask them to draw up a list of contacts. Statistical agencies may also have access to the records of government agencies responsible for paying subsidies or financial support to particular groups e.g. for disability. However, as with network sampling, this approach has its drawbacks because members of minority groups who are not affiliated in some way to the minority community, either through community groups or family linkages, are not represented in any sample that is derived through group affiliation and therefore the results from such surveys could risk being unrepresentative.

166. And finally, ‘difficult to sample’ or rare minorities may be found via center sampling. This method samples visitors at locations regularly used by the minority group of interest. These locations include shops, internet/telephone call centers, and local parks. As a method it can be used in conjunction with available local population data, and can account for the representation of certain individuals within a group at particular locations and at certain times. A ‘popularity index’ can then be computed allowing for the design of sample weights. Yet once again, as with some of the other approaches described above, this method will not reach those members of minority groups who do not visit locations where other members of the group tend to congregate.

167. Although the above methods have been described with respect to the particular example of ethnic minority and immigrant populations, in many cases they can also be transferred to research on other ‘difficult to sample groups’, such as the disabled and the gay and lesbian community. In addition, there are other survey research methods that are increasingly being used, such as web-based surveys, which might be suitable for sampling some rare populations; although means of controlling for ‘who’ is responding to on-line surveys are still in their infancy and therefore there is a risk that such samples, again, are not truly representative.

#### **Case study: Surveying minority groups**

A number of considerations need to be taken into account when conducting survey research on minority groups in the population. First, a definition of which minority groups are of interest is required. The designation of these groups will largely depend on the history of migration and recognition of ‘minority’ status in each country. In general, minority groups are defined by their ethnicity, immigrant status or background, race, disabilities or faith.

Once the minority group of interest is identified, a clear definition is required to determine who should and should not be included in the group. It is important to recognize that how individuals define themselves may be very different from the way governmental officials or researchers define them. For some groups such as racial or ethnic minorities research

experience suggests that respondents' self-identification is the preferred method. For other groups, however, self-identification is not practical. For instance individuals may vary greatly in defining themselves as immigrants or disabled. In cases like these, the researcher needs to implement basic exclusion criteria for defining persons in these groups. For instance, criteria for immigrants may include limiting respondents to those who are legal residents and have been in the country for a minimum period of time. Or criteria for disabled persons may require that their disability have certain characteristics (e.g., be permanent).

When deciding on which minority groups to survey, regard must be given to constraints on and availability of population data for these groups. The availability of this information must be considered in the development of sampling frames and the subsequent application of weights to the survey population. Where information on individual minority status is collected, it often protected by laws so that name and/or address lists are not available.

Population data that includes 'ethnicity' and 'race' are widely used and generally accepted in English-speaking countries. In comparison, data collection that distinguishes people on the basis of their 'ethnicity' or 'race' is considered to be a discriminatory practice in some countries. In other countries, this practice is forbidden. Further, in some countries the legal status of 'national minority' is afforded to some groups but not others with implications for population data collection. Yet, given these differences, many countries do collect population data about country of birth, country of birth of an individual's parents. And typically many countries record the nationality or citizenship of resident populations which can be used to identify population groups for surveying. This information can be used as proxy data for 'difficult to sample' minority groups in the absence of data on, for example, ethnicity.

In the European Union (EU) dedicated surveys of ethnic minority and immigrant populations are limited. This situation reflects a number of factors including the fact that significant minority populations are a relatively new phenomenon in a number of European countries. Traditionally many European countries have been countries of emigration. A second factor associated with limited surveys of ethnic and immigrant populations is that survey research on minorities has not been given prominence by policy and funding authorities. Among EU Member States, the British Crime Survey is currently the best example of a large-scale survey on the majority population that includes a significant booster sample of ethnic minority respondents. However, inroads into survey research on minorities have been made by the European Union's Fundamental Rights Agency (FRA). FRA conducted a pilot victim survey research in six Member States, at the end of 2006 and beginning of 2007 to test different probability sampling approaches on selected ethnic minority and immigrant groups in countries where population data on minorities is often limited. The results of the FRA's pilot survey exercise are intended to inform the Agency's development of a full-scale survey instrument to look at immigrants and other minorities experiences' of discrimination and victimization in EU Member States.

In consideration of both majority and minority populations for sampling, once coverage is agreed then a suitable method or methods of selecting a sample can be planned. Then there will be subsequent requirements for large enough samples of relevant groups to be identified in analysis and possibly special arrangements for interview; for example, in the case of surveys on minority groups there may be the need to translate the original questionnaire into different languages and to provide for bi-lingual interviewers, including provision of minority interviewers from the same background as the groups being surveyed.

### **Coverage error**

168. Coverage error is the degree to which the sample frame is not representative of the target population. Several guidelines are useful in identifying and addressing coverage error. First, test possible frames at the planning stage of a survey for their suitability and quality. Second, define as precisely as possible the target population to enable the selection of the best sampling frame and sampling procedures (this is particularly important in surveys of minority groups). Third, for area frames, implement map checks to ensure clear and non-overlapping geographic areas used in the sampling design. Fourth, determine how the coverage provided by the frame differs from the target population. Find out how the frame is created and investigate possible omissions. Fifth, ascertain whether segments of the population may have been systematically excluded from the sampling frame and explore ways of including them if possible and the possible effect of exclusion. Make adjustments to the data or use supplementary data from other sources to offset coverage error of the frame. Sixth, identify duplication if multiple frames are used. And finally, conduct interviews as soon as possible after the sample has been selected to reduce the effect of changes in the frame

### **Other general guidelines for sampling frames**

169. Aside from the material above, there are several strategies recommended regarding sampling frames. First, retain and store information about sampling, rotation and data collection so that coordination between surveys can be achieved and respondent relations and response burden can be better managed. Second, monitor the frame quality by periodically assessing its coverage and the quality of the information on the characteristics of the units. Third, incorporate frame updates in the timeliest manner possible. And finally, include descriptions of the target and survey populations, any differences between the target population and the survey population, as well as the description of the frame and its coverage errors in the survey documentation.

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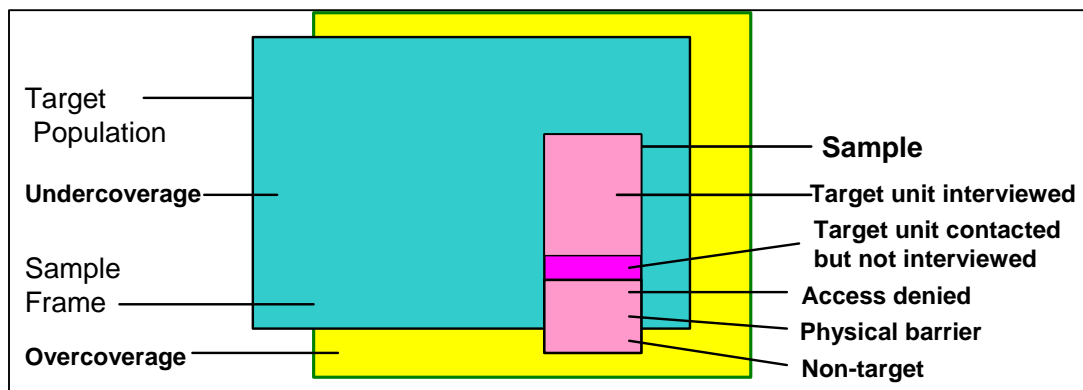
### **Ch. III.F. Sample design**

170. Sample design is the method used to select the sample from the target population. Selecting the sample design is the third step in drawing the sample, after determining the target population and selecting the appropriate sampling frame, although in reality the survey developer must have a sample design in mind when creating the sampling frame. There are several ways to select statistically viable samples. For example, of the 78 victimization

surveys inventoried in 2005 by UNODC-UNECE, 16 (21%) utilized simple probability samples, while 54 (69%) used some kind of multistage stratified sample.

171. This section provides an overview of sample design concepts and pertains to the *initial sample* drawn to represent the population. This should not be confused with the *achieved sample* or *final sample*, which represents the survey respondents actually contacted and enumerated for the survey. In the figure below, the dark pink box represents the initial sample, and the light pink box represents the achieved sample. Excluded from the achieved sample are the cases that could not be contacted for a variety of reasons, for example because they were never at home (denoted as access denied), or because there was insufficient time during the enumeration period (denoted as physical barriers) as well as cases that were contacted but not interviewed because they refused, or were otherwise unable. Also excluded are cases that may be contacted and possibly interviewed, but, for whatever reason, are out of the target population (i.e., too old, etc.)

**Figure: Sample components**



172. Survey researchers should consult a much more comprehensive discussion of sample design in developing a victimization survey in order to ensure that the sample selected will be statistically representative of the target population. It should be noted that a survey can incorporate more than one type of sample design, for example a stratified sample of addresses and a probability sample of telephones. When such a technique is used, a means for ensuring no duplication of respondents must be incorporated to account for the probability that the sampled units may be present in both sampling frames.

173. There are two broad types of sample designs: probability samples and non probability samples. Probability samples, with their property of random selection and its basis in probability theory, provide the ability to estimate population statistics with a known level of confidence. Non-probability sampling provides data that is not necessarily representative of an entire population. For probability samples it is possible to assess the validity and significance of estimates based on probabilistic tools, while for non probability samples it is not possible, despite the fact that some sort of evaluation of results are reported. A non probability sample theoretically could be representative of the population, but it is very hard to evaluate it. When the survey aim is to provide representative estimates at some territorial level, a probability sample is required.

## Probability samples

174. A probability sample is one based on a sampling plan that has the characteristic that every element in the population has a known and non-zero probability of being included in the sample. In order to use probability sampling, a list, or sampling frame, is needed.

175. In using probability samples, the intention is to gather useful information from the sampled units to allow inferences about the survey population. Probability sampling implies a probabilistic selection of units from the frame in such a way that all survey population units have known and positive *inclusion probabilities*. Sample size is determined by the required precision and available budget for observing the selected units. The probability distribution that governs the sample selection, along with the stages and units of sampling, the stratification, and so on, are collectively called the *sampling design* or *sample design*. A combination of sampling design and estimation method (see section on Estimation) is chosen so that the resulting estimates attain the best possible precision under the given budget, or so as to incur the lowest possible cost for a fixed precision. Information collected for sampled units may, where appropriate, be supplemented at the estimation stage, with auxiliary information from other sources than the survey itself, (such as administrative records and census projections) to improve the precision of the estimates. The choice of sampling design will take into account the availability of such auxiliary information. These concepts are discussed in Särndal, Swensson and Wretman (1992) and Tillé (2001).

176. There are many forms of probability samples. A number are appropriate for use in a victimization survey. These include simple random samples, systematic random sample, cluster samples, stratified samples and multistage sampling.

### *Simple random samples*

177. Simple random samples are the simplest sample design and they offer unbiased estimators of population statistics. However, when the population list from which the sample is drawn is large, simple random sampling may not be practical and more systematic sampling procedures should be considered.

178. A simple random sample is a sample from a population in which each element has the same probability of selection. This probability is  $n/N$  – the ratio of the sample size ( $n$ ) to the population size ( $N$ ). Random samples are often generated using random number tables. Random numbers from 1 to  $N$  are assigned to the population list, and the selected numbers are chosen from the list.

$$f = \frac{n}{N} = \frac{\text{sample } n^{\circ} \text{ of units}}{\text{population } n^{\circ} \text{ of units}}$$

179. Simple random sampling yields *unbiased* estimators of the corresponding population means, totals, and proportions. About one quarter of the surveys identified in the 2005 UNODC-UNECE victimization survey inventory were conducted using simple probability samples.

180. Simple random samples are generally created without replacement, meaning that no person or sample unit is selected more than once for inclusion. Selecting without replacement produces a more efficient sample. For example, the sample mean for simple random samples is an unbiased estimator for the population mean, but the corresponding variances for estimates derived from a without replacement sample is lower than the variances for

equivalent estimates from with replacement sample. The variance of an estimator is inversely related to the information capacity of that estimator; having a higher variance means having a lesser capacity of information. The higher variance for a random sample with replacement is associated with the fact that a specific unit can be sampled more than one time, always providing the same information and nothing more. So avoiding having repetitive units in a sample provides better information, that is, estimates with lower variances. In probability theory, with replacement sampling the selection probability for each unit are constant, while in sampling without replacement the selection probability for each subsequent unit depends from what has happened before. The induced dependency decreases as the sampling fraction decreases. When considering an infinite population (or one akin to such) the two sample designs are equivalent.

### *Systematic random sampling*

181. Systematic random sampling is a technique used to achieve a random sample and is often more convenient and feasible than simple random sampling. This approach is useful when a list of elements is available, when the sample is large, or when lists of sampling units are already grouped into subgroups or classes. Compared to simple random samples, this method is easier, saves time and money, and yields accurate estimates.

182. There are many possible systems to create a systematic random sample. For example if the sampling frame is of  $N$  units and a number between 1 and  $N$  is randomly associated to each unit, and the sample is of  $n$  units, then a number  $k$  among the first  $\text{int}(N/n)$  integers can be randomly selected. One unit every  $k$  starting at  $k$  itself will be included in the sample.  $K$  is the sampling step. It is very important to be careful not to introduce bias, for example, by using a sampling step which is related in some way to particular unit characteristics relevant to the problem under study. Systematic sampling is almost identical to simple random sampling if the population list is randomized.

183. For large scale surveys such as national victimization surveys, simple random samples may not be viable options. They can be more expensive than other sampling methods particularly when the units are dispersed or when they are difficult to trace due to migration or marriage etc. In addition, they may not be viable because complete lists of the sampling frame may not exist. For telephone surveys, the geographic dispersion issue may not be as important.

184. Other forms of probability samples discussed below, including cluster samples, stratified samples, and multistage samples, offer economies and may be less costly to enumerate.

### *Cluster Samples*

185. When it is difficult to gather a complete list of elements in the target population or when the population is geographically dispersed, grouping elements into subpopulations, called clusters, and sampling within the clusters is an efficient way to draw a sample. When a complete list of elements in the population is not available, clusters can be substituted. A disadvantage of this sampling method is the loss of accuracy in the results, as each cluster is characterized by sampling error. In general, the total error increases as does the number of clusters.

186. Clusters are usually defined by geographical boundaries, which can also include particular social categories. The main assumption in cluster sampling is that there should be similarity across clusters and heterogeneity within each cluster. In this sample design, clusters are sampled and the elements within each cluster can also be sampled. Simple one-stage cluster sampling is where elements are grouped into clusters and the clusters are chosen by simple random sampling. All the listing units in each chosen cluster are selected in the sample.

187. Because items within clusters tend to be similar, a better option could be more sample clusters and fewer measurements within clusters. A simple two-stage cluster sample is when clusters are selected at first stage by simple random sampling and the listing units within each cluster are also selected by simple random sampling. The sampling fraction is the same for each sample cluster. There are more complex cluster sampling methods that involve multistage and various stratifying methods. Cluster sampling can be efficient and less expensive, but can lead to higher standard errors. Whereas a simple random sample is subject to a single sampling error, a two-stage cluster sample is subject to two sampling errors.

188. When geographical boundaries also imply particular different characteristics in the populations they contain, special care should be taken to ensure the sample in each area is representative. In this case a telephone interviewing technique can be a reasonable solution.

#### *Stratified random samples*

189. Stratified random sampling combines the simplicity of simple random sampling with gains in precision. A reduction in sampling error yields from the fact that the samples are drawn from subsets of the population with homogeneous, meaningful characteristics. A stratified random sample derives from a sampling plan in which the population is *first* divided into *mutually exclusive* and *exhaustive* groups, called strata, and *then* a simple random sample is taken from the stratum.

190. The choice of strata is determined based on the objective of the survey, the distribution characteristics of the variable of interest, and the desired precision of the estimates. Most surveys are used to produce estimates for various *domains* of interest (e.g., provinces, counties, etc.). If feasible, this should be taken into account in the design by stratifying appropriately (e.g., by province, county, etc.). Otherwise, it will be necessary to consider special methods at the estimation stage to produce estimates for these domains (see section on Estimation). To achieve statistical efficiency, strata should be created in such a way that each stratum contains units that are as homogeneous as possible with respect to the information requested in the survey. For longitudinal surveys, stratification variables should be chosen that correspond to characteristics that are stable through time.

191. For highly skewed populations, some strata can be included in the survey with certainty. For example, in the United States, some large counties and cities form their own strata in the NCVS and are in the sample with certainty. Large areas included in the sample with certainty would normally account for a significant part of the estimates of the population totals. This may also be the case in surveys on crimes against businesses; particularly in smaller countries very large enterprises may be selected with certainty, since excluding them might make the results unrepresentative to reality.

192. By stratifying on subdomains of special interest, the desired precision within those domains can be managed. To estimate population values, such as mean or proportion, the strata results must be combined. In the surveys in the 2005 UNODC-UNECE inventory that

utilized stratified samples, the most common stratifiers used are geographical areas, degrees of urbanization, and respondent age and gender.

193. Sometimes the information needed to stratify the population is not available on the frame. In such cases, a *two-phase sampling* scheme may be used, whereby a large sample is selected in the first phase to obtain the required stratification information. This first sample is then stratified and in the second phase, a subsample is selected from each stratum within the first sample. Implementing such a sampling strategy should involve consideration of the cost of sampling at each phase, the availability of the information required at each phase, and the gain in precision obtained by stratifying the first-phase sample.

#### *Multistage sampling*

194. In multistage sampling, samples are selected and sub-selected from the resulting sample, in stages. This technique is useful in reducing costs and assuring a better representativeness of the sample. The first stage involves selecting clusters (called primary sampling units or PSU's). A list of these PSU's is compiled and perhaps, stratified. A sample of those units is then selected. The selected units are then listed and perhaps, stratified. The list of secondary sampling units is then sampled, etc... This sampling technique is often used when a list of population elements is incomplete as it reduces the size of the list by choosing sub-samples.

195. Multistage sampling is useful, particularly in case of area frames, in situations where it is difficult or not cost-effective to select or inconvenient to directly select the sample for the survey. In large areas, for example, it would be very expensive to conduct a face-to-face survey using a random sample because of the distance between selected respondents. Multistage sampling allows for clustering of respondents to reduce costs of enumeration. Budgetary or other constraints may necessitate more than two stages. Designing such a sample involves determining how many stages of sampling are needed and which sampling units are appropriate at each stage. For each possible type of unit, decisions must be made concerning the availability of a suitable frame of such units at each stage or the possibility of creating such a frame for the survey, ease of contact and of data collection/measurement, the quality of the data provided by the unit, and the cost of collection.

196. About 2/3 of the surveys identified in the 2005 UNODC-UNECE victimization survey inventory were conducted using a multistage stratified sample. Stratified multistage samples were also the most common type of sample used for surveys on a variety of subjects in developing and transitional countries, according to a 2005 study completed for the United Nations.

197. One survey that utilizes a multistage sample design is the Italian victimization survey conducted by telephone. This survey uses a two stage stratified sample. First, using a telephone technique, the sample can be more scattered without increasing costs, and enumeration can be controlled more easily and efficiently. Clusters of units are identified according to demographic characteristics but also considering particular urban and metropolitan definitions; clusters are stratified, that is classified, according to those characteristics considered relevant to the victimization phenomenon, and numbers are ordered by territorial characteristics.

198. At the first stage in each defined stratum a sample of households is randomly selected using a systematic random sample design, where telephone numbers are the units to be selected based on the phone number list. Different sampling steps are randomly selected in each stratum. At this stage telephone numbers are over sampled, to assure the possibility to

substitute numbers not belonging to the target population until an eligible household is selected. Units with numbers close to those of selected units are selected as reserves, to assure that reserves are as similar as possible to the first choice, in case of substitution. Finally an individual is randomly selected to interview in the eligible household.

199. The random selection is based on a selection matrix of  $l$  random numbers defined as follows:  $l$  is the maximum households dimension, each record of the selection matrix represents a household, and each selection matrix element has  $l$  digits. The first digit refers to households of two members, the second of three members, the  $l$ th of  $l+1$ . In the first digit a random number between 1 and 2 is inserted, in the second a random number among 1,2 and 3 is inserted, and so on, in the  $l$ th digit a random number among the  $l+1$  integers 1,2,...,  $l+1$ , is inserted. When calling a household the respondent will be asked to indicate the number of the household members, and the main demographic characteristics of each member, in the order he/she will provide. So a table of the household eligible members is made. The member in the table corresponding to the random number in the selection matrix digit corresponding to the actual household size will be then interviewed. Another way to select the individual when interviewing only one member in the household is the *first birth* method, that is, interviewing the member whose birthday is next.

#### *Random walk*

200. Random walk technique is one example of a sampling technique that can be used when no lists are available to identify sample units, because, for example they are not reliable, or don't exist. In this technique, the interviewer follows specific instructions: take the  $h$ th road on the left, then the  $j$ th house on the right and so on. When this method is used, procedures must be created a priori in how to canvass the area to avoid bias, for example ignoring very small side streets and alleys.

201. The most recent Polish victimization survey utilized random walk sampling to gather their sample, as well as EU-MIDIS in most EU Member States. In this exercise, the sampling was based on a list of regions and districts and did not require personal addresses. The Polish national sample was selected in multiple stages. The sampling frame was based on information created by Central Statistical Office and covered the most updated set of statistical regions and census districts.

202. In the first-stage of sampling, first stage sampling units (FSU) were designated. Poland was divided into sampling units in which city and rural areas were accounted for. The cities were divided into census units called census clusters (CC) and the rural areas were accounted using enumeration districts (ED). The basic assumption was made that the first stage sampling units (FSU) should consist of minimum 5 dwellings. In some cases this assumption was too restrictive and the original sampling units did not contain 5 dwellings. Therefore in some cities, two or more "original" city clusters were joined into one, and in rural areas, districts which contained less than 5 dwellings were merged with the neighbouring ones so that the joint enumeration district contained at least 5 dwellings.

203. FSU were then sorted by strata. The strata were related to location size (i.e., village – up to 20,000 inhabitants; town - 20,001 to 100,000 inhabitants; city - 100,001 to 500,000 inhabitants; large city - over 500,000 inhabitants) or to a given city/town in the voivodship (administrative unit of Poland).

204. To begin the random walk sampling, starting points had to be designated. Starting points selected using multistage random sampling of household addresses were determined. The

interviewers had strict instructions on how to move from the starting point to the target respondent. The interviewers were not allowed to interview at the starting point, but only in the first (or the second or the following) household which was chosen in compliance with the specified rules (for example: the fifth address - dwelling to the right from starting point). According to the rules of the sampling frame only one interview in one address could be done. In case of difficulties (wrong address, no one at home, upfront refusal, selected respondent's refusal, respondent unable to be interviewed etc.), the interviewer continues his/her route (according to the ascribed digit) to the next household as long as he/she is successful in completing the interview. These digits are specified as follows: five for urban areas and three for rural areas (villages).

205. After the household is selected via random walk, a respondent within the household must be selected for the interview. In the case of the Polish victimization survey, one respondent in each household was selected for interview. Sampling within each household was conducted using random numbers according to the Lesley Kish grid. This step was performed by the interviewer<sup>1</sup>. The interviewer's task was to enumerate all household members who were eligible respondents (i.e., at least age 18) on a special table in a particular order: from the oldest male to the youngest female. Then, using the random digits table, the respondent to be interviewed was identified. If the selected person was unavailable or refused the interview, the interviewer was not allowed to interview any other household member.<sup>2</sup> Instead the field representative was instructed to arrange an appointment with the unavailable respondent. If the selected respondent refused, the random route walk was continued to the next household.

### **Non probability samples**

206. *Non probability sampling* cannot produce estimates that are representative of the population being measured, but can be useful, especially when it is difficult or impossible to create a probability sample for the population of interest. For example, when studying the victimization experience of a very particular and sparse group of people, such as the homeless or prostitutes, a non-probability sample is advised. Non probability sampling methods can be divided into two broad categories: Purposive and accidental/haphazard/convenience.

#### *Purposive samples*

207. A purposive sample is done with a particular purpose in mind. In other words, the research needs to sample a predefined group such as non-Hispanic white females between the age of 16 and 24. There are several types of purposive samples. One commonly used type is *snowball sampling*. Snowball sampling begins by identifying a person who meets the criteria for inclusion in the study. This individual is interviewed and then asked to identify other people who also meet the criteria. These other people are contacted and (hopefully) interviewed, and so on. The sample increases in size in a snowballing fashion. A related

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<sup>1</sup> The Kish grid (random digits table) consists of combination of digits, which is unique or almost unique for every household. They are generated through a randomized process (there are more than 3,5 millions of possible combinations), assuring random selection of a respondent. This process takes place for each sample (project) independently. The randomly selected numbers are put into grids and each grid is randomly ascribed to the specific initial address and delivered to respondents.

<sup>2</sup> See: Nemeth, R. "Respondent selection within the household – A modification of the Kish grid"  
<http://www.math.uni-klu.ac.at/stat/Tagungen/Ossiach/Nemeth.pdf>

approach is *network sampling*, where people who are contacted are asked to list other people they know who might be interviewed. Network sampling may be conducted in two stages, where in the first stage people are contacted and asked to provide information on other eligible respondents they know of. In relatively small settings this can be continued up until practically all such persons have been identified. Sampling for the actual study can then be based on the list of eligible respondents which was collected based on the network mapping stage. Sometimes the number of times that an individual has been referred to may be used to adjust sampling probabilities, so that persons who are part of many peoples' networks would not be overrepresented in the sample. Another approach is *location-based sampling*, where people are interviewed in selected places. This may be useful for interviewing hard-to-contact populations, who can be characterised as using specific services or visiting certain places. For example, in some studies this approach has been used to interview immigrants at shops, call centres or underground stations. Adjustments can be made according to factors such as the number of times respondents say they visit the location of interview or the time of day in an effort to reduce selection bias.

208. *Quota sampling* is yet another approach. *Quota sampling* specifies the proportion of the sample that has particular characteristics. Interviewers interview respondents of particular characteristics until they have reached the quota for that category of respondent. Quota sampling can be proportional or non-proportional. Quota sampling is a valuable tool when fielding a pilot victimization survey. For instance, this method was used in Italy to evaluate questionnaire wording and performance across different ages in the target population. However, it is not normally suitable to provide a representative sample for the full survey

209. A third purposive approach is *expert sampling*. With this approach, the researcher assembles a sample of persons with known or demonstrable experience in the topic of interest. In the case of victimization surveys, the researcher may wish to gather victimization researchers or research methodologists. This approach is useful in the development phase of fielding a victimization survey, and may also be useful in evaluating particular initiatives or policies alongside the results from a full probability-based victimisation survey.

210. Fourth, *heterogeneity sampling* is another purposive sample. This purposive approach views ideas, not people, as the main interest of the study. Thus, in order to include as many diverse and relevant ideas as possible, a broad and diverse range of participants is sampled. Heterogeneity sampling is valuable in the development phase of fielding a victimization survey.

211. And finally, another form of purposive sampling is termed *modal instance sampling*. This approach involves identifying the most frequent or 'typical' case, classified by some variables arbitrarily chosen and related with the phenomena under study.

#### *Accidental/haphazard/convenience samples*

212. The second broad class of non probability samples are referred to as accidental, haphazard or convenience samples. These samples are developed by interviewing any person willing to be interviewed. An example of a convenience sample would be to provide a telephone number for people to call to express his or her experience with victimization. Convenience samples are often used in internet surveys which allow anyone accessing a website to complete a questionnaire. These samples are not useful in producing representative estimates because they are representative only of the people who choose to participate in the survey. And unless those who chose to participate differ in no theoretically important way

from those who chose not to participate, the information gathered cannot be generalized to the general population.

### **Cross-sectional versus longitudinal designs**

213. An important decision in designing a victimization survey based on a probability sample regards the time dimension. One may choose to field a cross-sectional victimization survey. This type of study is a one-time survey in which data are gathered at a single point in time. A second option is that of a longitudinal study. Longitudinal studies gather data over an extended period of time. There are three types of longitudinal studies: Trend studies, cohort studies and panel studies. Trend studies examine some phenomenon in the general population over time. An example of this is found in police records. These data reveal trends in crime over time. A cohort study also examines something of interest over time, but it does so with a more specific population such as graduating college students. One may for instance wish to investigate fear of crime over time by those graduating college. The third type of longitudinal study is a panel study. This type of study gathers information from the exact same set of people over time. That is, the same respondents are interviewed over time. With the panel design, sample attrition is a concern.

214. The U.S. National Crime Victimization Survey utilizes a rotating panel design. The sample is an address sample selected using a stratified multistage design. Households selected for the survey remain in sample for 3 years and are interviewed seven times at 6 month intervals. Interviews are conducted with all household members age 12 or older. Movers are not followed; the survey is address based, and interviews are conducted with whoever is residing at the address during the particular enumeration period.

### **Sampling theory**

215. Sampling theory provides ways of determining sample selection that achieve the goals of the survey. Probability sampling theory is based on a random selection process. Random selection reduces bias and is based on probability theory. As multiple samples are drawn from a population, a sampling distribution develops. If the samples are independent and random, the sample will be distributed around the population parameter. The resulting estimate can be described using probability theory by either a point estimator or an interval estimator.

216. The purpose of research is to learn something about a population. For instance, the research may be interested in understanding the extent to which a population is victimized. Because gathering information from every element, or person, in the population is not feasible, the research draws a sample. Using this sample, statistics are calculated. Sample statistics are used to estimate the unknown population values, also called population parameters. Population parameters include values such as the mean, total, proportion, ratio, and percentile.

217. Probability sampling methods seldom produce sample statistics that are exactly equal to the population parameters they are used to estimate. Probability theory allows for the estimation of the degree of error to be expected for a given sample design. There are two types of sampling error: Sampling bias and sampling variance.

218. Sampling bias refers to the degree to which the sample does not exactly represent the target population. If some members of the population have no chance or a reduced chance of being selected for the sample, the resulting statistics will be a biased representation of the

population because some members have been excluded. This would occur, for example, if a victimization survey used a list of telephone numbers as a sampling frame. People without telephones would have no chance of being selected for the survey and hence, any estimates of crime produced by the survey would be biased in the event that the experience of crime among people without telephones differs from that of people with telephones.

219. Sampling variance refers to the variation in estimates that would arise from different samples selected from the same sampling frame. Each sample would have its own set of estimates. Sampling theory dictates that the estimates from each sample have a distribution with a mean and standard deviation. If the sampling variance is low, the survey means will be close to those of the true population mean. If the sampling variance is high, the sample means will be relatively far from the true population mean.

220. The design of the sample influences the survey's sampling error. The design effect relates the variance of the estimate from the sample design selected compared to the variance of the estimate if a simple random sample was used. The ratio between these two variances is called the design effect or *deff*. In deciding how large a sample is needed when examining a certain attribute, *deff* can be used as a multiplier with the sample size needed for a simple random sample. Sampling attributes such as clustering and stratification contribute to design effects. Stratified and clustered samples generally have design effects greater than 1 meaning that the variances around survey estimates will be greater than those derived from a simple random sample of equal size.

### **Sample size considerations**

221. Victimization surveys differ from many other surveys in that only a fraction of the overall sample will possess the characteristics of interest. In other words, only a percentage of the sample will have been a victim of a measured offense during the survey's reference period. For this reason, victimization sample sizes must generally be quite large to achieve the survey's goals. How large a sample is needed for any survey depends primarily on the desired precision of the survey estimates and time and monetary resources available for the survey. Within these overarching concerns are a number of issues that must be addressed before the survey's sample size can be determined. There are many issues that determine the desired sample size.

#### *Survey goals*

222. For what purpose is the survey being conducted and what measures are desired? Because victimization surveys measure relatively rare events, larger samples are necessary to produce crime rate estimates or measure year to year change than are required to examine characteristics of crime events. If one of the survey's goals is to produce a measure of rape with a given level of precision, the sample will have to be larger than if the goal is to produce a measure of overall violent crime.

#### *Available resources*

223. The amount of money available for the survey will ultimately drive the sample size determination. If insufficient funding is available, the goals or sampling methodologies will

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have to be altered. Generally, sample size is a compromise between what the survey designer would really like to accomplish and what the available level of funding will support.

#### *Sample design*

224. As discussed above, the sample design has an impact upon the precision of the estimates. Multistage, stratified samples have larger variances than do simple random samples, and hence will require larger samples to achieve the same precision of the estimates.

#### *Desired precision of estimates*

225. What level of precision is desired for the primary estimates to be produced by the survey? For example, if a primary goal of the survey is to measure year to year changes in the rate of violent crime, the decision must be made as to what degree of change in the violent crime rate will be accepted as a real change.

#### *Anticipated response rate*

226. If a high response rate is expected, the initial sample can be smaller than if a lower response rate is expected and still provide the same number of completed interviews. The anticipated response rate can be calculated through a variety of techniques, including pilot tests, past experience, or the experience of other similar surveys.

#### *Anticipated victimization rate*

227. This is a fundamental issue for victimization surveys. If the goal is to measure specific types of crime at a given level of precision, more sample cases will be required than if the goal is to measure aggregated categories of crime. Similarly, it will require a larger sample to produce a reliable estimate of a more rarely occurring crime such as rape than it will to produce an estimate of theft at the same level of statistical precision.

228. The length of the survey's reference period will impact the size of the sample. The shorter the reference period, the larger the sample that is required to obtain sufficient number of cases to produce reliable estimates for any given crime or population characteristic.

#### *Subpopulation estimates*

229. If it will be important to examine the experiences of subpopulations such as minorities or respondents by gender or age or other characteristics, these subpopulations must be accounted for in the evaluation of required sample size. It may be possible to oversample subpopulations of interest to reduce overall costs and still achieve the survey's goals.

#### *Key variable yield*

230. As with subpopulation estimates, if it is important to have estimates for key variables, these variables must be accounted for in the evaluation of required sample size. For example,

one of the goals of a survey on violence against women might be to evaluate the use of victims' services. The developers must determine how many cases they might expect to obtain in order to estimate the overall number of sample cases required for the survey.

#### *Anticipated sample loss for panel surveys*

231. Sample loss or attrition is the loss of respondents that occurs in later waves of a panel or longitudinal survey. Some respondents participating in earlier iterations of the survey might not be willing or able to participate in subsequent surveys. The developer must, therefore, estimate whether later waves will have sufficient numbers of sample cases for the panel to continue, and possibly add cases to the earlier waves to anticipate the sample loss.

232. In calculating the desired sample size for each of the subpopulations, types of crime and other important variables, the survey designer may find that the desired sample size will not be supported by available financial or other resources. In such a case, the designer must reevaluate whether to reduce the sample size, which will reduce precision, or revise the goals of the survey. In the end, survey designers must understand that the final sample size will be suitable for some estimates but insufficient to produce reliable estimates for every subpopulation or type of crime for which an estimate is desired. For example, in the United States, when producing annual victimization estimates by race of victim, the data can support estimates for white and black victims, but not for Asian and American Indian victims. For Asian and American Indian victims the data must be aggregated and displayed a joint "Asian or American Indian" category.

#### **Oversampling**

233. It is often necessary to produce estimates for subpopulations that represent very small proportions of the overall sample. In many instances, the number of sample cases for the subpopulation will be inadequate to produce estimates possessing the desired precision. One solution is to oversample the subpopulation, using a larger sampling fraction to select the cases for the sample.

234. If oversampling is used, the researcher must account for the higher probability of some portions of the population to be included in the sample by adjusting the weights used to make the estimates representative of the total population.

#### **Sampling unit selection**

235. The samples used for victimization surveys are composed of households or individuals. When the sample is comprised of a sample of households, additional decisions are needed regarding who is interviewed in the household. One option is to interview all household members. A second option is to interview all household members within a specified age range. A third approach is to interview household members with specific demographic characteristics, such as women. And finally, one may select to interview only one person in the household.

236. Each of these options has advantages and disadvantages. Interviewing everyone in the household (or everyone within a specified age range) enables both household and person measures of crime. For example, crimes such as burglary and motor vehicle theft impact

everyone in a household, and therefore, it may be useful to understand how these offenses impact the household as a whole. Moreover, the person selected for the sample may not be knowledgeable of such offenses, whereas another household member might be a better respondent for events that impact the entire household.

237. Interviewing one person about the victimization experiences of all household members can contribute to non sampling error, because people also may not be knowledgeable about the experiences of other household members and may either filter information or not know what victimization experiences they have had. Research conducted for the development of the National Crime Victimization Survey found that interviewing the entire household produced higher victimization rates than interviewing one person per household. This is true for crimes against the household in general, such as burglary as well as crimes against other household members.

238. Attempting to interview everyone in the household (or everyone within specified age ranges) can be quite expensive, however. The need to conduct multiple follow up interviews for the additional household members is costly, and the increased non-response associated with the additional household members increases the overall non response rate for the survey which is the sum of the household and individual non-response rates. Moreover, it is necessary when interviewing multiple household members to unduplicate events that both might report. For example, two respondents may both report that the burglars broke into the house and stole some property. The survey protocol must include some procedure to evaluate and compare the information to determine whether the events were the same event or different events.

239. If the survey involves personal interviews, interviewing more than one household member can achieve economies because of the costs associated with travel to and from the sample address. However, if multiple visits are required to complete interviews with additional household members the costs of the survey can increase dramatically.

240. Interviewing one person per household eliminates the need to unduplicate information provided by more than one respondent, and also eliminates the need for follow-up attempts to obtain interviews with remaining household members. A pre-test conducted in Italy found that despite the inability to obtain information about the victimization of all household members, interviewing one person provided more accurate estimates of victimization.

**Box: Practices on respondents' selection in past victim surveys**

Out of 60 surveys in the UNODC-UNECE inventory, the sample was composed of households in 42 surveys (70%) and of individuals in 18 surveys (30%). The type of survey seems to influence at a certain extent the respondents' selection procedure: for ad hoc victimisation surveys the sample composed of households seems to be the prevailing practice (74% of the surveys), while for multipurpose surveys with a victimisation module the sample is based on households only in 56% of the surveys.

Among the 42 surveys with household based sample, in 29 surveys (69%) only one person was interviewed in each household. The person was selected randomly in 14 surveys, while in 10 surveys the birthday method was used (that is, the person was selected whose birthday was next or last). In 9 surveys all households' members were interviewed, generally with a

minimum age comprised between 14 and 16 years, while in 4 surveys there was a limit to the number of households' members interviewed.

### **Addressing survey error associated with sample design**

241. As discussed above, sampling bias and sampling variance are two types of sampling error. Sampling bias is caused when some members of the sampling frame have reduced or no chance of being selected for the sample. If a subpopulation is completely omitted from the sampling frame, there are no adjustments that can be done to produce an estimate for them. The overall estimates will be biased to the extent that the omitted population differs in the variables of interest from the overall population. In such cases, it is the responsibility of the survey developer to acknowledge the existence of the potential bias when presenting the results of the survey.

242. If, however, a subpopulation is underrepresented in the sampling frame, it may be possible to apply weights to the sample cases to compensate for the unequal representation in the sample. The weights are used in the estimation process and also in the calculation of standard errors of survey estimates.

243. Sampling variance is associated with doing a sample survey rather than a census. It is beyond the scope of this chapter to provide a detailed discussion of sampling variance. There are many texts that can provide instruction on the impact on sampling variance of various kinds of sample designs. The survey designer must understand the design effects so that they can be taken into account during the analysis stage.

### **Summary of guidelines for designing survey samples**

244. The sample design is an integral part of any survey. In order for survey results to be generalizeable representations of the population of interest, the sample must be designed to accurately represent the population. The following summarizes the general guidelines for designing survey samples.

- Samples can be probability and non-probability samples. Probability samples can produce estimates that are generalizeable to the population. Non-probability samples cannot produce such representative estimates, but may be useful under certain conditions.
- Samples can be stratified to achieve statistical efficiency by dividing the population into subsets (called strata) within each of which an independent sample is selected.
- When determining sample size, take into account the required levels of precision needed for the survey estimates, the type of design and estimator to be used, the availability of auxiliary information, budgetary constraints, as well as both sampling factors (e.g., clustering, stratification) and nonsampling factors (e.g., nonresponse, presence of out-of-scope units, attrition in longitudinal surveys). For periodic surveys, take into account expected births and deaths of units within the changing survey population.
- It is important to remember that most surveys produce estimates for many different variables, and optimizing the sample for one particular variable may have detrimental effects on other important variables. Handle this problem by first identifying the most important variables and then using this subset of variables to determine the sampling

strategy to be adopted, which often requires a compromise between optimum strategies for the variables in the subset.

- In determining sample allocation and size for stratified samples, account for expected rates of misclassification of units and other deficiencies on the frame. If not properly considered at the sampling stage, survey estimates will not be as precise as planned. This problem can be addressed at the estimation stage.
- Conduct studies to evaluate alternative sampling methods, stratification options and allocation possibilities. The usefulness of these studies depends on the availability and vintage of data used to conduct the studies, whether from previous censuses, surveys or administrative data and their relation to the variables of importance to the survey.
- At the implementation stage, compare the size and characteristics of the actual sample to what was expected. Compare the precision of the estimates to the planned objectives.
- For periodic surveys that use designs in which the sample size grows as the population increases, it is often appropriate to develop a method to keep the sample size and therefore collection costs, stable. The *precision* of survey estimates is usually influenced more by the total sample size than by the *sampling fraction* (ratio of the sample size to the population size).
- For periodic surveys, make the design as flexible as possible to deal with future changes, such as increases or decreases in sample size, restratification, resampling and updating of selection probabilities. If estimates are required for specified domains of interest (e.g., subprovincial estimates), form the strata by combining small stable units related to the identified domains (e.g., small geographical areas), if possible. Future changes in definitions of the strata would then be easier to accommodate.
- For periodic surveys, if efficient estimates of change are required or if response burden is a concern, use a *rotation* sampling scheme that replaces part of the sample in each period. The choice of the rotation rate will be a compromise between the precision required for the estimates of change, and the response burden on the reporting units. Lowering the rotation rate will increase the precision of the estimates of change, but may lower the response rate over time. A low rotation rate has the additional benefit of reducing costs if the first contact is substantially more expensive than subsequent contacts (e.g., first contact is made in person, and later interviews are done by telephone or using mail-back questionnaires).
- For periodic surveys, develop procedures to monitor the quality of the sample design over time. Set up an update strategy for selective redesign of strata that have suffered serious deterioration.
- For longitudinal panel surveys, determine the length of the panel (its duration of time in the sample) by balancing the need for duration data versus attrition and conditioning effects. Use a design with overlapping panels (i.e., with overlapping time span) when there is a need to produce cross-sectional estimates along with the longitudinal ones.
- Use generalized sample selection software instead of tailor-made systems. One such system is the Generalized Sampling System (GSAM) developed by Statistics Canada. GSAM is especially useful for managing sample selection and rotation for periodic surveys. Another option is the software MICROSTRATE developed by Eurostat to control sample overlap. By using generalized systems, one can expect fewer programming errors, as well as some reduction in development costs and time.

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