

*Office of the Auditor General of Canada*

# **Conducting Surveys**

**June 1998**



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## Requirements and Expectations for Conducting Surveys

The requirements highlighted in **bold** throughout the manual and summarised in Appendix A must be complied with in order to meet Office Policy and Standards, as well as scientific and professional requirements. Also highlighted in **bold** are expectations that should be adhered to.

The terms "must" and "should", as used in this guidance, do not necessarily have the status of Office policies and standards. Nonetheless, any exception to these requirements and expectations must be approved by the responsible Assistant Auditor General.

Before undertaking a survey, there must be a reasonable basis for believing that the survey can be completed in accordance with these requirements and expectations. It is expected that the (functional responsibility leader) FRL for Surveys will be consulted.

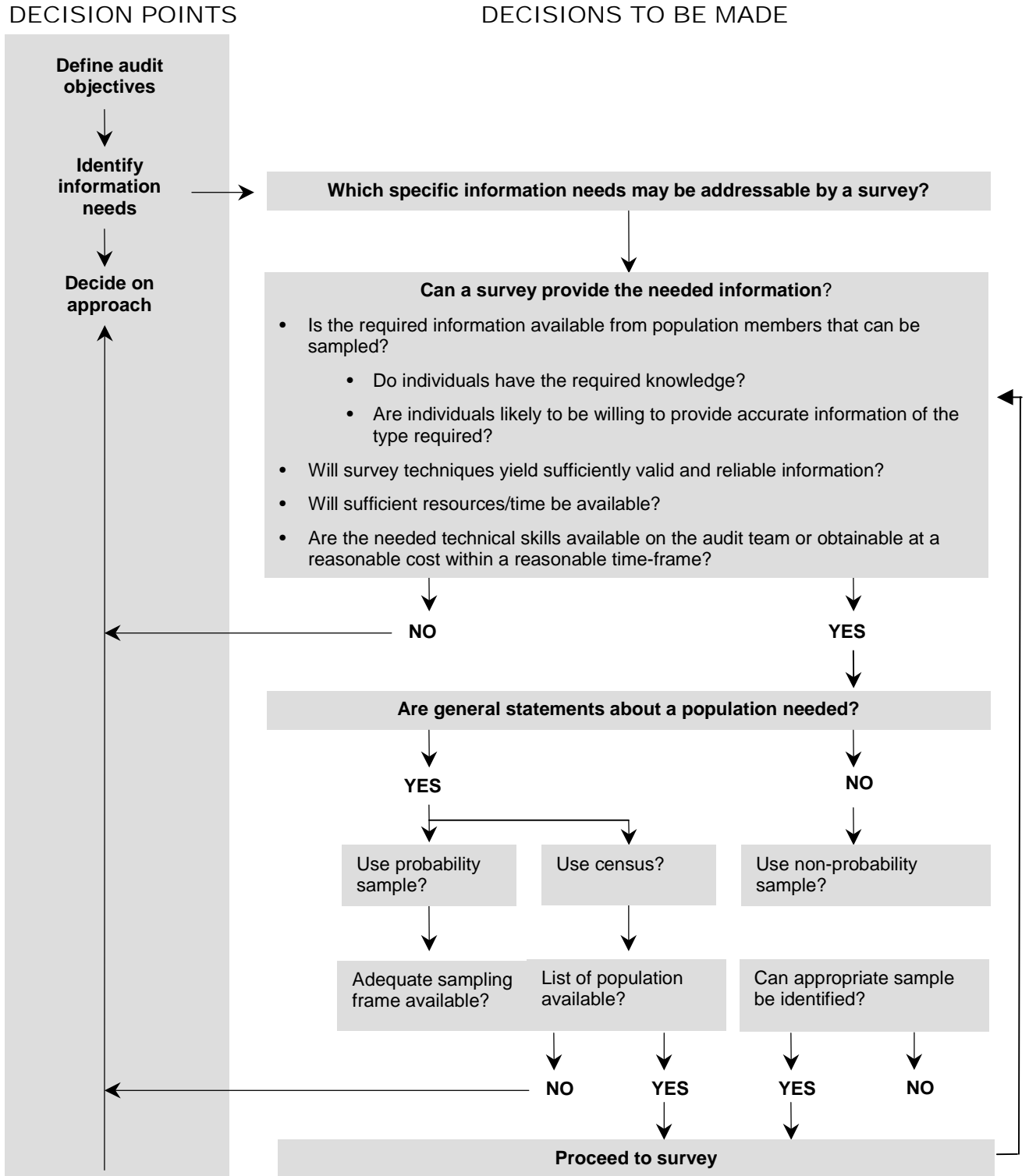
Surveys are conducted to obtain information that is needed to support the accomplishment of audit objectives. They are conducted when they are the best available means, considering cost and respondent burden, for collecting the required information. In reporting observations drawing on survey evidence, readers are provided with sufficient information to allow a judgement of the weight that can be placed on the survey evidence.

The maps below will help you in determining whether or not to use a survey.

<b>Map 1</b>	<b>Map 2</b>	<b>Map 3</b>
<b>Audit Planning Phase</b>	<b>Audit Examination Phase</b>	<b>Audit Reporting Phase</b>

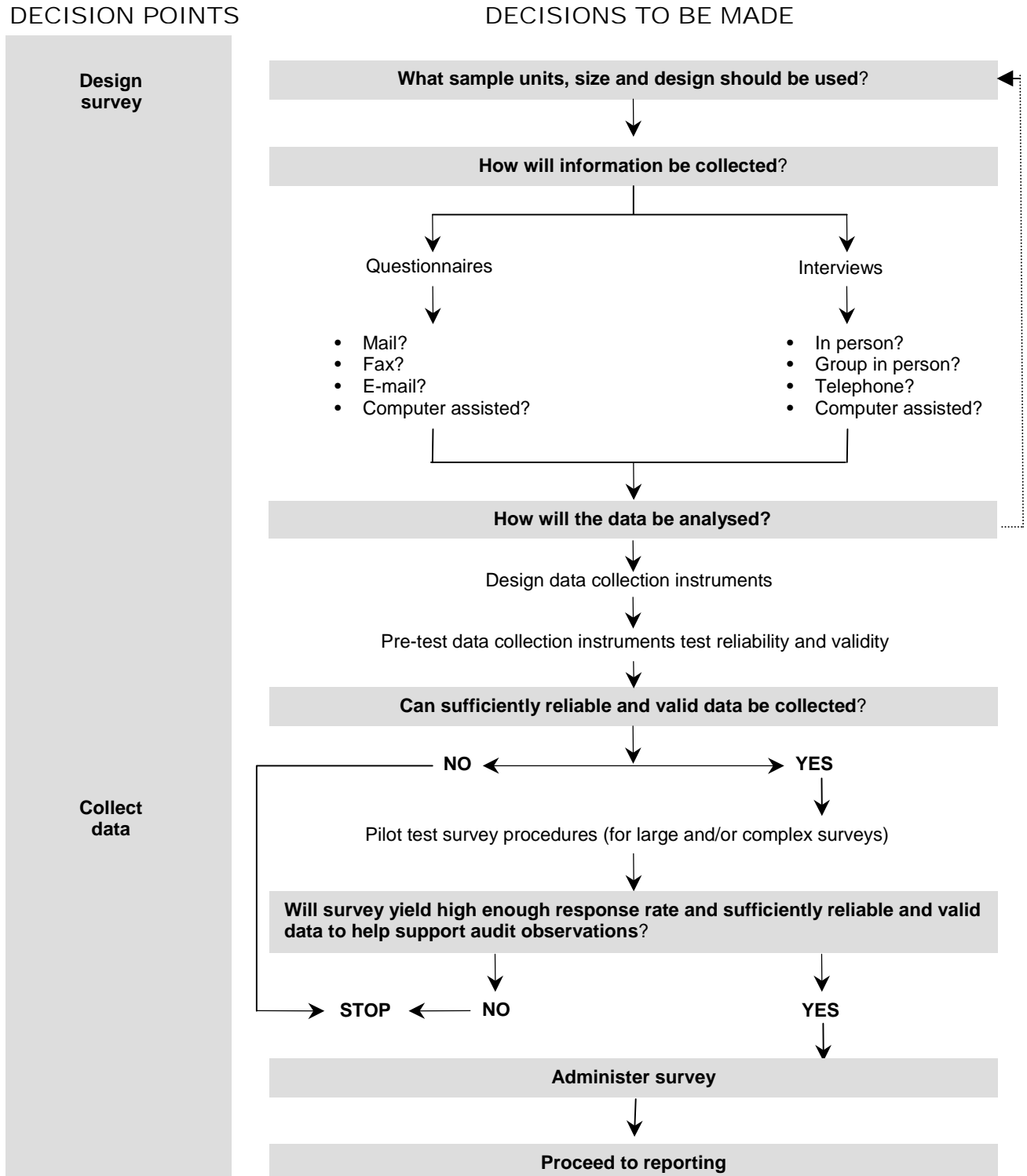
**Survey Decision Map 1**

**Deciding whether and how to conduct a survey: audit planning phase**



## Survey Decision Map 2

### Deciding whether and how to conduct a survey: audit examination phase

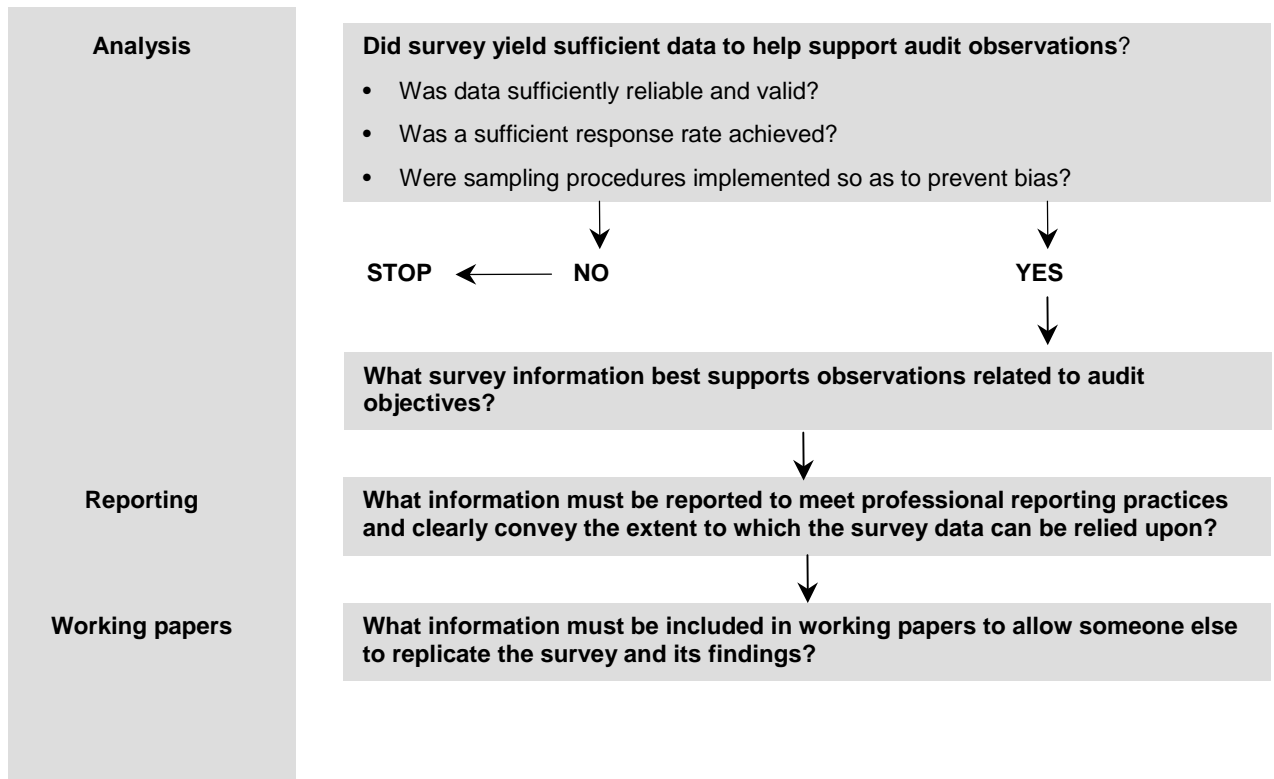


### ***Survey Decision Map 3***

#### **Deciding whether and how to conduct a survey: audit reporting phase**

##### DECISION POINTS

##### DECISIONS TO BE MADE





## **Purpose of the Guide**

Surveys are increasingly a part of the auditing tool kit. The purposes of this guide are to: set out requirements and expectations for the conduct and reporting of surveys by the Office of the Auditor General (OAG); identify some critical choices that must be made in deciding whether or not and how to conduct a survey; and, to provide information relevant to these choices. This guide is intended to ensure that surveys conducted in the OAG meet reasonable requirements and expectations of survey professionals as well as the VFM audit standards of the Office of the Auditor General. The use of the terms “must” and “should” in this guidance document do not necessarily have the status of OAG standards and policies. However, they reflect methodological requirements and expectations in the conduct of surveys.

Although some references are made to data analysis and reporting matters that are pertinent to the conduct of surveys, these are major topics on their own and are not dealt with in any detail here.

This guide is set out in 13 self-standing sections

### **Section 1: Definition and Required Practices**

Sets out general requirements and expectations for the conduct and reporting of surveys.

### **Section 2: Uses of Surveys**

Discusses the advantages of surveys and factors that can affect the decision as to whether or not to conduct a survey.

### **Section 3: Planning the Survey**

Outlines the questions that must be answered during audit planning in deciding whether and how to conduct a survey.

### **Section 4: Sampling**

Discusses basic considerations in sampling, i.e. deciding which individuals, documents or observations to include and how to select them.

### **Section 5: The Reliability and Validity of Survey Information**

Defines reliability and validity, two critical technical issues that determine whether survey results will contribute to the provision of necessary and sufficient evidence in support of audit observations.

### **Section 6: Corroboration**

Discusses the need for corroboration of survey evidence.

**Section 7: Advantages/Disadvantages of Different Approaches to Collecting Data from Individuals**

Presents information to help guide the choice of approaches to collecting survey information from individuals.

**Section 8: Developing and Verifying Data Collection Instruments**

Discusses basic considerations in developing survey data collection instruments that are critical to assuring the reliability and validity of survey information.

**Section 9: Anonymity and Confidentiality**

Discusses the issues of anonymity and confidentiality of survey information.

The following sections describe basic survey practices that are essential to maintaining the reliability and validity of survey information.

**Section 10: Maintaining Survey Integrity**

Presents basic principles for managing surveys so as to maintain the integrity of the survey.

**Section 11: Managing, Processing, and Analyzing Survey Data**

Identifies precautions that must be taken in managing, processing and analyzing survey data.

**Section 12: Pre-Testing Data Collection Instruments**

Presents basic principles for pre-testing data collection instruments

**Section 13: Managing Non-response**

Provides advice on managing challenges to reliability and validity that occur when sample members do not provide all the required information.

## Section 1: Definition and Required Practices

**Note:** This guide is intended to ensure that surveys conducted in the Office meet reasonable requirements and expectations of survey professionals as well as the value-for-money (VFM) audit standards of the Office of the Auditor General (OAG). The use of the terms "must" and "should" in this guidance document do not necessarily have the status of OAG standards and policies. However, they reflect methodological requirements and expectations in the conduct of surveys.

**What is a survey?** The administration of standardized procedures, such as questionnaires or structured interviews, to obtain information on 25 or more individual cases with the intention of making aggregate statements about the matters surveyed.

The aggregate statements based on survey information may be quantitative, e.g. "Only 10 of 20 departments identify priorities systematically and formally," or they may be qualitative, e.g. "The time taken to finalize departmental structures has made planning difficult."

Surveys are used to ask individuals about factual situations, their views and perceptions, and actual behavior. Great caution should be exercised in considering the use of a survey to obtain reactions to hypothetical situations.

Survey techniques, such as questionnaires, can be used when there is no intention to make an aggregate statement. At times, some survey techniques, such as probability sampling, can be used in obtaining factual information from documents and direct observations rather than from individuals, with the intention of generalizing to a population. Although not surveys per se, the use of these techniques in other contexts raises many of the same considerations that apply to their use in surveys.

### Requirements

**Methodological advice is required** because of the critical importance of technical issues. The conduct of surveys is both an art and a highly technical speciality. Advice should be obtained from the FRL Surveys. Advice can also be obtained from expert external advisors and internal methodological advisory committees.

Internal and external advice should be reviewed with the FRL Surveys. Consideration may be given to consulting the FRL surveys when survey techniques are used in other contexts than surveys as defined above.

Consideration should be given to consulting the FRL Quantitative Measurement when quantitative statements are or will be made based on survey information.

**The principal (PX) is responsible for ensuring that the audit team has available sufficient technical expertise (see VFM manual, section on Competence of the Audit Team) and experience when surveys are conducted.** Expertise and experience are required in the following areas:

- Sample design and statistics;

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- Data collection instrument design;
- Data management and statistical analyses;
- Survey administration, including interviewer training, logistics, and managing non-responses; and
- Reporting of survey results.

The FRL Surveys should be consulted when external expertise is sought.

### **Evidentiary requirements and expectations**

**Quality Assurance. The PX is responsible for ensuring that appropriate procedures are followed to ensure that survey information is valid and reliable (see VFM manual, section on Sufficient Evidence).** The evidence provided by surveys is no stronger than the information sources surveyed. Survey procedures should ensure that conclusions are drawn from survey information that is sufficiently precise, accurate and consistent and are not affected by limitations in:

- Data collection instruments;
- Sampling;
- Survey administration;
- Non-responses; and
- Data processing and analyses.

### **In particular:**

**All data collection instruments are required to be pre-tested.** Pre-testing is the administration of the instrument to a small set of respondents from the population for the full-scale survey in order to identify potential problems with the instrument.

**Procedures for administering large surveys are expected to be pilot-tested.** Pilot-testing is the implementation of all aspects of the survey, from identifying the sample, through preparing mail out packages, to analyzing data on a small sample from the population. The purpose is to identify potential problems in administering the survey.

**Probability sampling is required to be used whenever the auditor intends to make a quantitative statement about a larger population based on the results of a sample (see VFM manual, section on Auditing the Control Systems).**

The quality assurance procedures applied and their results should be part of the working papers for the audit.

**Bias. The PX is responsible for assuring that data collection instruments, sampling and procedures are not subject to and are not perceived as subject to undue bias.** Error is introduced into survey information as a result of limitations in data collection, sampling and other survey procedures. Error can result in unintentional biases and incorrect audit observations and conclusions. Unintended or intended biases can have negative consequences for the validity of survey information and for the perceived objectivity of the Office.

**Corroboration. When surveying individuals, consideration is required to be given to the need for an appropriate form of corroboration of written and verbal responses to surveys (see VFM manual, guide section on Sufficient Evidence).** The written and verbal responses given by individuals represent their views on the matter at hand. Therefore, individual responses constitute the same kind of evidence as provided by audit interviews. Managers' written or verbal responses to questionnaires on management practices, program results and financial matters constitute their views on these matters. Therefore, the responses of individual managers must be treated as management representations. As a result, the auditor must give the same consideration to the need for corroboration as would be the case with audit interviews and management representations.

#### **Reporting Requirements and Expectations:**

**The PX is responsible for ensuring that professional practice is relied on in reporting survey findings (see VFM manual, section on Due Care).** Professional practice in conducting surveys has evolved a set of accepted practices for reporting survey information. These practices are intended to provide the reader with sufficient information to judge the weight that can be placed on survey information. In an audit context, this information allows an assessment of the extent to which survey information is sound, consistent, objective and contributes to the provision of necessary evidence (see VFM manual, section on Audit Evidence).

Professional practice requires the reporting of the target population, sample size, sampling procedures, survey response rates, estimates of sampling error, frequencies of specific responses to individual questions and the specific wording of questions whose results are reported. It also requires the reporting of potentially significant limitations in survey information or procedures.

"About the Audit" should describe the target population, the method by which the sample was selected, the means by which data was collected, the overall response rate and an overall confidence interval (where appropriate). The description of findings should include actual question wordings for selected questions supporting key findings. The description of findings should also discuss the implications for audit observations of any significant limitations to survey procedures or data. More detailed information on sampling procedures, survey administration, specific question wordings, analyses, response frequencies, error estimates for individual questions, and approaches to dealing with significant limitations in survey procedures and data must be included in substantiation binders.

### **Professional requirements and expectations relating to respondent burden and informed consent**

A set of professional practices have also evolved that are intended to protect survey practice and survey respondents through minimizing respondent burden and ensuring that respondents have sufficient information to understand fully the implications of agreeing to participate in the survey.

**The PX is responsible for ensuring that requirements for minimizing respondent burden and for informed consent are met.** These include ensuring that:

- a survey is the best available means, considering cost (see VFM manual, section on Sufficient Evidence), for collecting the information required;
- surveys request only information needed to address audit objectives;
- information that identifies or permits the identification of individuals is collected only when absolutely necessary and that measures are taken to ensure confidentiality to the extent possible; and
- questions are non-sexist, respectful of minorities and protect language rights.

Respondents should be adequately advised of the following:

- the purposes of the study;
- the uses to which the information will be put;
- the fact that the Office of the Auditor General is conducting or has commissioned the survey;
- the intent to publish the findings of the survey in the Report of the Auditor General of Canada to Parliament;
- the extent to which the identity of respondents and their responses can and will be kept confidential;
- the name and telephone number of a person to contact if they have questions or complaints; and
- the survey findings.

The auditor cannot guarantee respondent confidentiality if the survey gathers identifying information of any sort. This is due to a number of factors, including questioning of the Auditor General by parliamentary committees or the discovery of fraud, abuse or other illegal behaviors. Therefore, whenever the Office (or any person exposed to the material) can identify individuals from their responses, great caution should be exercised in making any commitment regarding confidentiality or anonymity. Any such commitment must be approved by the responsible Assistant Auditor General.

Questions regarding requirements for the confidentiality of survey information are expected to be brought to the attention of the FRL for Access to Information. The specific wording of any pledge of confidentiality or anonymity and any issues regarding the potential of survey questions to elicit legally sensitive information should be brought to the attention of Legal Services. Procedures for maintaining the confidentiality of individual responses are expected to be discussed with the FRL Surveys.

Publication of survey findings in the Report of the Auditor General of Canada must meet the requirements for informing respondents of survey findings. If findings are not published, consideration should be given to some other means of informing respondents (e.g. management letters, briefing sessions, etc.).

### **Key Survey Decisions**

The audit decisions outlined in the following survey - decision maps - will help the responsible auditor to decide on the appropriateness of the use of a survey, and ensure that the requirements and expectations discussed in this Guide are met.

#### **Survey Decision Map 1: Audit Planning Phase**

#### **Survey Decision Map 2: Audit Examination Phase**

#### **Survey Decision Map 3: Audit Reporting Phase**

## Section 2: Uses of Surveys

*Note:* This guide is intended to ensure that surveys conducted in the OAG meet reasonable requirements and expectations of survey professionals as well as the VFM audit standards of the Office of the Auditor General. The use of the terms "must" and "should" in this guidance document do not necessarily have the status of OAG standards and policies. However, they reflect methodological requirements and expectations in the conduct of surveys.

### Introduction

The chief advantage of surveys is that they allow the auditor to make aggregate statements on a topic relevant to audit objectives; for example, "Overall, there has been a loss of resources to ..." or, "A quarter of managers had difficulty distinguishing between..."

Two key preconditions for making general statements are the following:

- the use of a sample that allows an unbiased estimate of the situation about which the general statement will be made; and
- the use of a standardized approach and questions to all members of the sample surveyed.

### Generalizing to a population

One of the most common purposes of a survey is to allow the auditor to reach a general conclusion (generalize) about a population on a topic relevant to audit objectives. This is a useful approach when the significance of a condition depends upon how widespread the condition is, for example on how frequently certain deficiencies in human resource management practices occur in an organization. When individual instances may in and of themselves be significant, other approaches, such as case studies may be more appropriate. For example, in examining controls over operations in a given program area, there may be a few operations that involve significant physical hazards for the public or employees, warranting individual attention.

In generalizing to a population, it is vital that the survey uses a representative sample of the entire population. Surveys of this type are only feasible where the relevant population of interest can be clearly identified and a means exists to identify individual members of the population for the purposes of sampling. In the case of a small population, it may be feasible to get an unbiased measure by accessing the entire population (census), if identifiable.

### When is a survey appropriate?

Surveys of individuals may request a variety of information, such as the following:

- the characteristics of the respondent (e.g. age, position within an organization, education or other qualifications, etc.);
- prior or current actions (what they have done in the past);
- the reasons for actions;



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- factual information related to the program (expenditures, management practices);
- satisfaction with policies, programs and practices; and
- views regarding the effectiveness of programs or practices.

The data collection techniques employed in surveys of individuals are similar to audit interviews or management representations (when information is obtained from managers) in that they represent respondents' views regarding facts. Therefore, they may require corroboration to confirm the existence of factual situations. It may be difficult to ask corroborating questions as part of questionnaires and structured interviews. Therefore, additional techniques may be required to obtain corroboration. Where independent corroboration is considered essential, other techniques, such as case studies or document review, may be preferable. In some cases it may be possible to combine a survey approach with other approaches. For example, a survey questionnaire may ask respondents to provide corroborating documentation for review by the auditor.

Public opinion polls and marketing surveys conducted by others have asked respondents about their response to hypothetical or future situations, e.g. what they would buy under given circumstances or how they will vote. It is very difficult to corroborate individual responses to hypothetical situations. Therefore, great caution must be exercised in the use of hypothetical questions in surveys.

Many of the considerations that apply to the design and use of questionnaires, structured interviews and samples in surveying individuals apply to the use of these techniques for other purposes as well. Consideration should be given to consulting the FRL for surveys in these circumstances.

For instance, questionnaires and structured interviews may be used for other purposes than generalizing to a larger population. They may be used to obtain information from program staff, management or clientele in a particular location as part of a case study or series of case studies. Or, they may be used to identify suitable recommendations regarding deficiencies revealed by an audit.

Rather than obtaining information from individuals, survey techniques may also be used to make general statements based on examination of documents, direct observations and items on data bases. For example, a survey of all program evaluation reports produced by departments and agencies over a seven-year period resulted in general statements about the types of evaluation issues addressed within that time frame. The Office frequently surveys information about transactions, such as loans, contracts, payments to personnel, contained in department and agency data bases.

### **Practical considerations**

It is not possible for surveys to provide the breadth and depth of information available from case studies and audit interviews. Consequently, use of a survey to generalize to a larger population requires careful planning and specification of the information to be collected. This can only be accomplished when sufficient knowledge exists to develop a standard set of questions that can be

administered in a standard fashion. For these reasons, surveys are best suited when matters of potential significance have already been well elaborated and the survey can be well focussed.

Because of the amount of planning involved, surveys require several months from the time planning is started until final results are available, and they can be resource intensive. The development cost will be greater the less well understood the issue area, the greater the difficulty in identifying individual population members for sampling, and the more complex the issue area to be examined.

### **When to use a survey**

Surveys are most useful and efficient when

- significance depends upon the frequency and extent to which a condition occurs in the population being studied
- the population of interest can be clearly defined and individual members identified for the purposes of sampling
- matters of potential significance have been well elaborated so that the survey can be well focussed
- independent corroboration of each individual's responses is not required
- several months are available to plan, conduct and analyze the survey

Other approaches, such as audit interviews, case studies, and document review are often better suited when

- significance can be demonstrated by identification of deficiencies in a few important cases
- the issue area is less well understood
- identifying matters of potential significance
- independent corroboration of each individual's responses is required
- time frame for the audit is extremely short (less than five to six months)

### **Section 3: Planning the Survey**

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Surveys often impose a significant burden on respondents and can be costly and time consuming to conduct. It is important to ascertain during audit planning whether a survey can provide information that is sufficiently sound, consistent, objective and relevant to contribute to the provision of necessary evidence (see VFM Manual, section on Audit Evidence) and whether a survey approach is feasible in the light of circumstances. In deciding whether or not to conduct a survey, the auditor needs to answer three key questions (see Survey Decision Map 1: Planning):

- Which specific information needs may be addressable by a survey?
- Can a survey provide the needed information in time at a reasonable cost?
- Are general statements about a population needed to support audit observations?

#### **Which specific information needs may be addressable by a survey?**

In order to decide whether a survey is appropriate, it is important to be as specific as possible in identifying information required for addressing audit objectives that can be collected by this approach.

Once the specific information requirements have been determined, a decision needs to be made about the feasibility of a survey.

#### **Can a survey provide the needed information?**

In determining whether a survey can contribute to the auditability (see VFM Manual, section on Auditability) of a subject, a number of additional questions will have to be considered. Foremost is whether the information will be available from sources that are amenable to survey. If individuals are unlikely to have the required knowledge, or if the matter is so sensitive that they will be unwilling to respond or to provide accurate information, a survey is inappropriate.

There may also be practical constraints; surveys may be too expensive or time consuming and not achievable within time limits or resource constraints due to the size of the sample required or the complexity of the issues to be assessed. Timeliness becomes more critical as the time frame for completing the planning and examination phases approaches nine months.

Another consideration is the availability of the appropriate expertise. There are a significant number of technical issues that must be resolved in planning and conducting a survey, and there is professional practice that must be followed to arrive at credible survey findings. Many auditors do not have specific training or experience in conducting surveys and in related methodological topics. The FRL surveys can assist in the identification of appropriate expertise.

**The PX is responsible for ensuring that the audit team has available sufficient technical expertise(see VFM Manual, section on Competence of the Audit Team) and experience when surveys are conducted.** The expertise is required to be available on the team, or obtainable externally. Depending upon the specific nature of the survey, expertise and experience are required in the following areas:

- Sample design and statistics;
- Data collection instrument design;
- Data management and statistical analyses;
- Survey administration, including interviewer training, logistics, and managing non-responses; and
- Reporting of survey results.

In addition to expertise in these areas being required during audit examination, some may also be required during audit planning to help determine the feasibility and appropriateness of a survey approach. It is important to seek the advice of the FRL surveys during planning (as well as throughout the survey) and consult other experts as required.

A key consideration in deciding whether or not to use a survey approach is whether or not it will be necessary to make aggregate or generalised statements about a larger population; in particular quantitative statements about a population of government officials, programs, transactions or citizens (e.g. program clientele).

### **Are aggregate statements about a population needed?**

If the intention is to make an aggregate statement about a population (e.g. 50% of all managers believed that the department's automated information system contains important errors), there must be an appropriate logical or statistical basis for the statement. If the population is small (e.g. all agency directors general), surveying all members of the population (i.e. conducting a census) would be appropriate and provide a reasonable basis. If the population is large, a representative sample using statistically based sampling procedures will be necessary. In either case, it will be feasible to proceed with a survey only if a list of population members, or other means of identifying them, is available that is adequate for selecting and contacting them.

If the audit statement is neither quantitative in nature nor is intended to be descriptive of a general population, probability based sampling procedures may not be necessary. For example, if the intention is to summarize and describe the types of problems management faces in setting targets, it may be sufficient to identify a sample of managers who can reasonably be expected to reflect a wide diversity of experiences and views .

Decisions as to whether to proceed with the survey will also have to be made early in the examination phase (see Survey Decision Map 2), during the design and testing of survey instruments and procedures. It is also very important to decide upon a data analysis plan as early

as possible. The analytic approach chosen will affect a number of aspects of the survey such as: sample-size, and the design of the data collection instrument.

**Can sufficiently reliable and valid data be collected?**

A critical question in deciding whether to proceed is whether data can be collected that will contribute to a sound basis for audit observations. Although an assessment can often be made early in audit planning, often the decision cannot be made until survey instruments and procedures are being developed and tested. In particular, it is important to conduct tests of survey data collection instruments and procedures to ensure that they will provide information that is reliable and valid.

Despite careful planning and survey administration, problems may occur that result in data that is not sufficiently reliable and valid. During analysis, the responsible auditor will have to decide whether the data can be used in support of audit observations (see Survey Decision Map 3). Information necessary to support the reliability and validity of the data should be reported and/or included in audit working papers.

## Section 4: Sampling

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The purpose of a survey is to gather the information needed to make aggregate or general statements about the topic being audited. Doing this requires gathering information from a sufficient number of individuals with the appropriate characteristics to have a reasonable degree of confidence (assurance) that the general statements are warranted. Choosing the right number of the right population members using the right methods is known as sampling. The decision about the number of individuals to select and how to select them is critical to the survey process. The same is true when the intention is to make aggregate or general statements based on a sample of documents, direct observations, or computer based case records.

### Census or sample?

The extent to which a sample represents in kind and proportion the general population from which it is drawn is particularly vital when the intention is to make general statements about the population. The greatest assurance as to representativeness is to conduct a census; that is, select all individuals or cases that make up the population of interest. In many audits, lower, but reasonable, assurance can be obtained by selecting a subset of the population.

### A census is appropriate when

- the individual instances that make up a population are important in and of themselves or the information is of a critical nature and the population is small enough to make a census feasible
- when statistical requirements dictate a sample almost as large as the population (when the population is very small or the matter of interest occurs too rarely in a small population for sampling to yield a sufficient number of cases for study; e.g. the performance reports of all FAA Schedule I departments)

Sampling can be more efficient and less costly than a census when the population of interest is very large. However, when the auditor intends to generalize to an entire population, rather than simply describe the sample, the sampling process adds an additional source of error to audit observations. Error occurs because a sample, regardless of how well constructed and implemented, is only an approximation of the population. The resulting error, known as sampling error, requires that the auditor estimate the degree of confidence that can be had as to whether the sample results are a reasonable estimate of the results that would have been obtained from a census of the entire population.

### Types of sampling

Sampling approaches are generally divided into two types: probability sampling (also known as random or statistical sampling) and non-probability sampling (also known as non-random, judgmental or purposive sampling).

**Probability Sampling.** Probability sampling involves selecting individuals using accepted non-biased procedures, thereby helping to ensure that the sample is typical of the larger group (population) from which it is drawn. This is accomplished by using one of a variety of established procedures for drawing sample members at random. When using procedures that ensure randomness, the auditor can estimate statistically the amount of error and the likelihood that error is greater than acceptable limits. This in turn assists judgements as to the appropriateness of the survey evidence. **Probability sampling must be used whenever the auditor intends to make a quantitative statement about a larger population based on the results of a sample.**

In order to use probability sampling, the auditor must be able to do the following:

- clearly define the population able to provide the information required to address audit objectives;
- be able to identify members of the population for the purposes of sampling (establish a sampling frame);
- have access to individual members of the sample (i.e. they must be reachable by telephone, have mailing addresses, etc. depending upon the approach to be used); and
- ascertain the appropriate sample size.

In some cases, the auditor may not be able to identify all population members, e.g., income tax evaders. Instead it may be necessary to rely on a sampling frame that includes only a portion of the population, e.g. lists of tax filers being pursued for non-payment of taxes. The auditor must decide whether the population represented by an available sample frame is sufficient for meeting audit objectives.

Probability sampling can be a highly technical area requiring the use of staff or external assistance with appropriate training and expertise. Sampling techniques vary considerably in the expertise required to design the sample and to estimate sampling error. Sampling designs become more complex, requiring greater expertise, when

- there is a need to examine differences among sub-groups in a population
- key characteristics of sample members are not uniformly allocated across the population, e.g. there are a very few transactions with high materiality and a large number with a very low materiality
- individual sample members can only be identified based on their membership within different groups, or their characteristics differ according to group membership ( e.g. contracts administered by different departments)

The FRL Surveys can provide advice on options available when complex samples (e.g., stratified random samples) are required, and on the selection of the required expertise.

The results of a well-executed probability sample are objective and defensible and can be replicated. Poor execution in the sampling process or in survey administration can reduce the defensibility of the sampling approach taken and even invalidate the results of the survey. One critical factor is the extent to which information is collected from all members of the sample. Failure to obtain a full response can affect the estimation of error and introduce significant bias. More detail can be found in the sections 10, 11, and 12.

The use of even a well-executed probability sample does not protect against errors in information collection (measurement error). Care must be taken in the development of information collection procedures (e.g. questionnaires or structured interviews) to ensure that the data collected are valid and reliable.

**Non-probability sampling.** Non-probability sampling may be appropriate when a sample of interest for audit purposes can be identified and the auditor does not intend to reach conclusions about other cases than those in the sample; for example, when the audit will examine management practices for all large transactions, without any intention of applying the audit findings to management practices for smaller transactions. It may also be appropriate when general statements are qualitative rather than quantitative in nature.

For instance, the intention may be to identify the types of views possible without commenting on the frequency with which they are held, e.g. listing the types of problems managers encounter when trying to put in place performance measurement systems without enumerating how often each problem was identified by managers, or how many managers encountered problems.

This approach to sampling may be appropriate

- the auditor can identify a number of individual cases that are material in and of themselves
- the identification of any individual departure from criteria is significant, e.g. in determining vulnerability to fraud
- the auditor is interested in the range of practices or deficiencies possible, and is not interested in enumerating them

The amount of error and the likelihood that error exceeds acceptable limits cannot be estimated as readily for non-probability as for probability sampling.

Non-probability sampling is not an abandonment of systematic approaches to choosing individual instances. It requires careful assessment of the information required and sufficient knowledge of the population for identifying those instances capable of providing the breadth and quality of information required to address audit objectives.



### **Unacceptable sampling procedures**

Haphazard sampling procedures, such as using volunteers, whoever seems typical or whoever happens to be available, constitute neither random sampling nor adequate non-probability sampling procedures. Haphazard approaches are not likely to result in appropriate evidence because a high degree of bias is likely. In addition, the auditor will not know what population these samples represent, and cannot be assured that those who will be sampled represent a population pertinent to meeting audit objectives.

## Section 5: The Reliability and Validity of Survey Information

*Note:* This guide is intended to ensure that surveys conducted in the OAG meet reasonable requirements and expectations of survey professionals as well as the VFM audit standards of the Office of the Auditor General. The use of the terms "must" and "should" in this guidance document do not necessarily have the status of OAG standards and policies. However, they reflect methodological requirements and expectations in the conduct of surveys.

### Introduction

The concepts of reliability and validity are core issues in determining the quality of survey information. Determining the reliability and validity of survey data is a highly technical undertaking that is key to assessing the adequacy (see VFM Manual, section on Sufficient Evidence) of the information for supporting audit observations.

### Reliability, validity and significant error

In order for a survey to provide sufficiently sound, consistent, and relevant evidence, the information it provides must be both reliable and valid. **The concept of reliability has a specific meaning within survey research that is narrower than the general use of the term in audit.** To be reliable, measurement must be consistent from individual to individual surveyed, across settings and at different times. Consistency of information is essential for making general statements.

Validity is the extent to which the survey information is relevant to the conclusion being drawn and is sufficiently accurate and complete to support the conclusion. Validity is commonly thought of as the answer to the question "Are you actually measuring what you want to measure?" For example, employees may be asked whether promotion processes are "fair". Their answers may reflect not their view of the processes themselves, but with the results, i.e. whether or not they received a promotion.

Reliability requires the use of standardized information collection instruments and survey procedures [10, 11, 12] that are designed to enhance consistency. Relevant information requires careful planning to ensure that the information is clearly related to audit objectives, and is collected from the individuals best suited to providing the information. Obtaining information that is complete and accurate requires well planned information collection instruments and survey administration procedures.

Error in survey data can result in poor reliability and validity. Error, i.e. inaccuracies or missing information, can arise at various points in the collection, maintenance, processing, and reporting of data. At data collection, information can be recorded incorrectly. For example, in a structured interviewing situation, interviewers may incorrectly record information provided by a respondent. Inadequate procedures for maintaining data, such as on computer information systems, can result in the loss or alteration of data. For instance, data from client survey forms can be incorrectly entered into computer information systems. Processing and reporting of data can also add error; for example, through the incorrect transfer of data from computerized databases into analysable or reportable forms.

In addition to error being introduced through errors in survey data, error is also added in sampling. Summary data from a sample is only an approximation of what would be found by examining the entire population. The discrepancy between sampled values and population values is known as sampling error. This type of error can be larger or smaller depending upon sample size and sampling procedures. Sampling error can be statistically estimated when using probability based samples.

### **Error as a source of bias**

No survey data are completely free from error. However, in order for survey information to be reliable and valid, the information needs to be free from significant error. Error is significant when it is of such a nature or magnitude that it would affect audit conclusions. Bias especially creates a risk of significant error. Bias is error that is caused by a systematic source. Because it is systematic in nature, bias it is likely to lead to incorrect conclusions. For example, in surveying small businesses receiving federal contributions or grants, those businesses that have failed might be less reachable than those that are successful. Because the sample would contain a lower proportion of failed businesses than is actually the case, the success of the contributions and businesses satisfaction with them could be overestimated.

In surveys, an important source of potential bias occurs when information cannot be obtained from some of the population members sampled. For this reason, the survey must implement procedures to reduce and compensate for non-response and estimate its impact.

Another important source of potential bias can occur when non-probability sampling procedures are used or when probability sampling is not properly administered. Sampling error of this type often cannot be estimated statistically.

### **Controlling error**

Although error can never be completely eliminated, it can be reduced to acceptable levels through the careful design of standardized data collection instruments, the implementation of appropriate sample designs and sampling procedures, the implementation of adequate survey administration procedures, and the implementation of data verification and correction procedures, especially procedures for corroborating answers received in response to questionnaires or survey interviews. In particular, data collection instruments are required to be pretested in order to minimize flaws in their design.

Error is more difficult and expensive to control in some data than others. **In planning the audit, the auditor must determine the potential for significant error and whether the value to be obtained from the survey data merits the cost and time required to reduce survey error to acceptable levels (see VFM Manual, section on Sufficient Evidence).**

## Section 6: Corroboration

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Corroboration is an important means of minimizing the risk of faulty observations or conclusions (see VFM Manual, section on Sufficient Evidence). In surveys, corroboration is important for estimating the risk of significant error due to problems with the accuracy and relevance of survey information. The need for corroboration is high when using questionnaires or interviews to obtain information from individuals. When individuals are asked to provide information, their uncorroborated answers reflect their views, not necessarily the factual conditions of interest. For example, when asked about resources expended, the accuracy and relevance of the answers depends upon the respondents' motivation, their awareness of the correct facts, their interpretation of the question, and so forth. Answers to survey questionnaires, however administered, are subject to the same concerns about appropriateness as are audit interviews in general (see VFM Manual, section on Sufficient Evidence). **In planning the audit, the auditor is expected to determine the need for, and the nature of, corroboration for survey information.**

### Approaches to corroborating survey information:

There are a variety of approaches to corroborating, i.e., testing, the validity of information provided by survey interviews and questionnaires. One approach that has been used in the Office is to request, as part of the survey, specific items of documentation that support the responses to key questions, especially where the risk of inaccurate responses is high. For example, in the audit of Evaluation in the Federal Government, evaluation managers were asked to provide financial documents, evaluation plans, evaluation committee minutes, etc. in support of specific survey questions.

Other approaches to corroborating survey data include the following:

- Telephoning or interviewing a random sample of respondents to ascertain the extent to which they consulted appropriate records in providing factual information on such matters as expenditures, staffing levels, activity levels, etc.;
- Telephoning or interviewing respondents whose responses seemed "out of line" with information provided by other similar respondents;
- Verifying responses with other data sources, records or reports;
- including consistency checks in the questionnaire by asking for the same or similar information in more than one question (this should be used with caution; if respondents notice similarities among questions, their willingness to cooperate may decrease);
- comparing results to the results of similar studies; or

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- having the results reviewed by independent experts with in-depth knowledge of the program or topic measured.

No single approach to corroboration of a survey is likely to be sufficient. In many cases different corroboration techniques will be required for different survey questions.

## Section 7: Advantages/Disadvantages of Different Approaches to Collecting Data from Individuals

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### General considerations

Auditors are often familiar with challenges in the collection of information from documents, direct observations, computer data bases and individuals. However, special technical considerations apply when collecting information from individuals as part of a survey.

There are a variety of approaches to surveying individuals, each with their particular strengths and weaknesses. The most common approaches include the following:

- structured or semi-structured questionnaires;
- structured face to face interviews; and
- structured telephone interviews

As well, there is growing experience with the use of newer approaches to contacting individuals, such as the distribution of questionnaires via fax, e-mail and the internet.

### Questionnaires

**Advantages.** The central advantage of questionnaires over interviews is that they allow for the collection of information from a large number of individuals relatively inexpensively. The savings result from the reduced need for staff and, possibly, travel expenses. The savings are most important where a large sample is needed.

Another advantage of questionnaires in comparison to interviews is that they contribute to reliability by promoting greater consistency. This is achieved through eliminating the variation in questioning that can occur when a number of different interviewers are used. They also reduce the introduction of bias by eliminating the ability of interviewers to influence answers either intentionally or inadvertently.

**Disadvantages.** Unlike survey interviews, questionnaires do not provide an opportunity for the auditor to clarify questions, verify that answers are understood, seek clarification or elaboration of answers or ensure that the respondent answers all questions on the form. There may not be an opportunity to go back to respondents if all the information needed to support a conclusion was not asked for or provided, or if it becomes evident that questions were not clear. Nor is it possible in most instances to seek corroboration of answers. In general, the same depth of information is not available from a questionnaire as through interviews. In addition, the respondents being surveyed must have the requisite literacy skills.

**Questionnaire development.** Because of the difficulty of obtaining or giving additional clarification and information, careful questionnaire development is essential to ensure that questions will elicit all the required information, and that the questions are clear and unambiguous. In particular, it is essential that the auditor examine closely the audit objectives to clarify what specific items of information are required that can be reasonably obtained through a questionnaire approach.

Furthermore, development of a quality questionnaire requires knowledge of the area being questioned and of the capability of respondents to provide the information required. It also requires that the auditor have enough understanding of the respondents to word questions so that they will be understood.

The amount of advance knowledge is greater to the extent that close-ended questions (yes-no, check off the option, or rating scale) will be used as compared to open-ended questions (fill in the blank, short answer or paragraph answers). The effective use of close-ended questions also requires that the range of possible answers can be correctly anticipated. If respondents do not have the requisite knowledge and if terminology is not clearly understood or defined, there is a heightened risk of incorrect answers.

On the other hand, close-ended questions are more readily tallied and analyzed than open-ended ones. Sorting through a large number of answers to open-ended questions in which respondents will have used widely divergent terminology and may have nearly illegible writing is both technically challenging and time consuming. Many questionnaires will try to strive for a balance between the two types of questions.

**Questionnaire delivery mechanisms.** Questionnaires can be distributed by mail, in person, or through electronic means, including via fax, e-mail, via the internet or through distribution of diskettes.

The most common means of distributing questionnaires is by mail. When delivered by mail, a questionnaire survey may not be as quick to administer as a series of structured interviews. In addition to a longer development time for questionnaires than for interviews, time must be allowed for respondents to receive questionnaires in the mail, and to answer and return them.

Five to six months is a reasonable amount of time to allow for designing questionnaires and obtaining information using mailed questionnaires for the kinds of surveys conducted by the Office. Properly constructed surveys using questionnaires several pages long sent to samples designed to be representative of several sub-groups in a large population can take 9 months or more to develop and complete. Under ideal conditions, it may be possible to complete a simple survey in seven or eight weeks.

Shorter time frames require the following:

- a short questionnaire (a single page or less) asking straightforward factual questions;
- a census of a population of under 100 (representative samples will generally be larger than this);

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- a readily identifiable population (i.e., mailing or courier addresses are readily available);
- the likelihood of an initial response rate of 85% to 95% (minimizing the amount of follow-up required); and
- respondents who are motivated to respond quickly.

The amount of time needed to distribute and receive answers to questionnaires can be reduced through the use of electronic means. Electronic delivery can also be designed to eliminate the need for manual transfer of responses to analysable form.

The development of electronic formats can be time consuming however. In the case of e-mail and internet distribution, adequate means for protecting anonymity and confidentiality are still being developed. Typically, in an internet survey, individuals can be chosen for a sample only after they have decided to access the site through which the questionnaire is being distributed, making it very difficult to apply probability sampling procedures to a population likely to be of interest in an audit.

In choosing a means of delivery, consideration must also be given to the population that can be reached in that way. Mailed questionnaires restrict the survey to individuals who can be reached by mail. Electronic distribution is practical only for respondents who have access to computers, fax, e-mail, the internet etc. Moreover, incompatibilities in software or hardware may hinder or prevent a response.

The FRL Surveys can assist in estimating the amount of time required to conduct a survey that meets audit needs. Because of the amount of time needed to design and complete surveys, it is important to begin planning and contact the FRL at the earliest possible moment.

### **Structured Face-to-Face Interviews**

**Advantages.** Face-to-face interviews may be quicker to conduct than questionnaire surveys because it is not necessary to add time to account for mail delivery and for the respondents to turn their attention to the questionnaire. A major advantage is that they allow more opportunity to assess the respondent's understanding and interpretation of the questions and to clarify any confusion that arises about the meaning of the question or the response. They also allow the opportunity to present material to respondents and obtain their reactions. For example, face-to-face interviews have been used to assess the meaning that non-literate subjects attach to symbols. For these reasons, face-to-face interviews are useful for pilot-testing mail-out questionnaires

Face-to-face interviews can be useful in dealing with certain situations that pose challenges for mail-out questionnaires. They are generally better suited than mail or electronic questionnaires with respondents whose reading and writing skills may not be adequate for the questions being asked. They may also be helpful when sensitive information is being sought. Interviewers may be able to establish a relationship of trust with the respondent and be better able to solicit answers to questions which respondents may otherwise be reluctant to answer or to answer truthfully.



Where less is known about the way in which respondents think about an issue or about the range of possible answers to a question, structured interviews create the opportunity for interviewers to ask supplementary questions, when needed to obtain adequate answers.

**Disadvantages.** However, interviews also create the potential for an interviewer to intentionally or unintentionally influence results and violate consistency in measurement. Survey respondents will be sensitive to cues given by the interviewer's verbal and non-verbal behavior. As well, an interviewer will have to ask additional questions or provide clarifications and may unduly influence responses.

Consequently, adequate interviewer training is essential. Training is needed to ensure that interviewers understand the ways in which they could inadvertently influence responses, the importance of not doing so, and the proper techniques that can be used to assist the respondent or elicit needed information without affecting the integrity of the interview.

Although they may be quicker to conduct than mail questionnaire surveys, face-to-face interviews are costly due to the amount of staff time required to conduct interviews and to the cost of travel.

### **Structured Telephone Interviews**

**Advantages.** Telephone interviews share some of the advantages and limitations of face-to-face interviews, while reducing travel costs. As with face-to-face interviews, it is possible for interviewers to provide clarification, probe for additional information or more complete answers, and to encourage answers to sensitive questions. Telephone interviews are also faster to conduct than questionnaire and face-to-face surveys.

**Disadvantages.** Careful interviewer training is still important, as with face to face interviews. Telephone interviews have to be short however, no more than 20 to 30 minutes in length, so that longer and more complex interviews are not feasible. Unlike in a face to face interview, it is not possible for the interviewer to present material and obtain the respondents' reactions. Nor is it possible for the interviewer to look for non-verbal indications of confusion or uneasiness.

### **Other considerations**

Although interviews provide more opportunity for clarification and elaboration than do mail-out questionnaires, careful data collection instrument design is still critical for ensuring a standard approach that will yield consistent information from respondent to respondent. **Interview guides must be pre-tested.**

In choosing an approach, it is important to consider the distinct characteristics of the population that you are trying to reach. Although interviewers may be successful in generating trust with some types of respondents, other respondents may feel more comfortable with the greater anonymity of a mail-out questionnaire. Some respondents may be impatient with paper questionnaires and prefer the ease of electronic approaches, while others may be intimidated by technology. Pre-testing helps ensure that you have chosen the most appropriate approach.

## Section 8: Developing and Verifying Data Collection Instruments

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The term "data collection instruments" describes the tools used to collect information as part of a survey. Proper design of data collection instruments is essential for reaching reliable and valid conclusions. Information must be obtained on a comparable basis across individuals if the intention is to make aggregate or general statements on the basis of survey information. This is especially true when the intention is to make quantified generalised statements about a larger population (e.g. x%, most, more than, etc.). If the questions or instructions differ among individuals, or are interpreted differently by different members of the audit team, the data will not be reliable, and general statements will be unwarranted.

The adequate and appropriate design of data collection instruments is very important for validity. In the case of questionnaires, the questions posed, their wording, their structure and the order in which they are presented can have significant impact on the relevance and accuracy of the responses and the likelihood that questions will be answered.

For these reasons, **data collection instruments used in a survey should be carefully planned and should ask a standard set of questions that can be administered in a standard fashion to all respondents.**

Developing questionnaires and structured interviews is both a technical skill and an art. For example, there is a sizeable literature demonstrating that the ordering of questions and their placement towards the beginning or end of a questionnaire can have profound effects on the answers received. For some specific topics such as personal background, there is extensive research on the wording and structure of effective questions. **Anyone developing a questionnaire or structured interview needs to be aware of the basic principles of questionnaire design, technical issues and any technical literature on the topic being surveyed (see VFM Manual, section on Competence of the Audit Team).** Of course, substantive knowledge of the topic is also essential.

### **Establishing reliability and validity**

There are a number of approaches to assessing the reliability and validity of survey data. When a questionnaire is used, establishing reliability commonly involves administration of the questionnaire or portions of the questionnaire to the same respondents at different times or under different circumstances in order to assess how stable the answers are.

The basic principle for establishing validity is the same as for corroborating audit observations and conclusions generally, i.e., compared to evidence from different sources and of a different nature (see VFM Manual, section on Sufficient Evidence). Approaches to establishing validity include comparing survey results with behavioral observations, comparing the sample surveyed with groups that are expected to be similar or dissimilar in critical ways, comparison of results to

the results of other data collection instruments expected to measure the same thing, obtaining expert opinion, and internal analyses of the instrument.

The extent to which reliability and validity must be established and the approach(es) to use depends upon the nature of the information collected and the uses to which it will be put. In particular, it is important to establish reliability and validity when there is an attempt to measure individual characteristics, such as knowledge, morale, attitudes, etc. Often, multiple approaches may be required if the subject matter is complex.

**Rating Scales.** The use of rating scales ("on a scale from one to 9, place a check mark on the line, etc.") to compare the responses of individuals or groups of individuals particularly requires examination of reliability and validity. Specific additional corroboration is required when an auditor wants to use a rating scale to compare different respondents to each other, to other groups or to a criterion on a certain topic. For example, meeting audit objectives may require the assessment of staff satisfaction with employment or certain management functions. Alternatively, it may require an assessment of knowledge, such as knowledge of environmental issues.

In these and similar cases, it is often incorrect to interpret literally the level of response on a scaled item or group of items. For example, it is incorrect to assume that a morale rating above the neutral point indicates a satisfactory level of morale. There is a known tendency of survey respondents to give positive answers to some types of questions and negative answers to others. Determining the adequacy of satisfaction ratings and of answers to knowledge questions requires that the answers be compared or anchored to some reference point. For example, employee morale ratings should be compared to those obtained in other similar organizations.

There are a variety of scale types, each with their particular methodological assumptions, advantages, and disadvantages under specific circumstances. There are also a variety of technical choices, such as the number of points on a scale, whether or not to use a mid-point and how to label the scale, that have all been shown to have a profound influence on the answers received. The FRL surveys should be consulted on these choices.

### **Relying on established instruments**

Establishing validity and reliability can be time consuming and expensive, especially in knowledge testing, the measurement of attitudes or the assessment of employee morale. Confidence is greatest when more than one approach has been used. Considerable effort can be saved by using established instruments of known reliability and validity. The developers of established instruments may require administration by specially trained personnel, perhaps their own staff, purchase of the instruments or payment of royalties.

In determining the extent to which one can rely on established data collection instruments, it is important to consider the following:

- the reputation of the developer;
- the extent to which the instrument has been proven by wide use;

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- the extent to which a variety of approaches have been used to establish reliability and validity;
- whether the validity testing that has been done is pertinent to audit purposes;
- the extent to which the instrument has been tested on groups similar to those included in the audit; and
- the opinion of independent experts.

## Section 9: Anonymity and Confidentiality

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In surveying individuals, a pledge of confidentiality is often used in an effort to increase the rate of response to the survey overall or to individual survey questions or to reduce the likelihood of bias by motivating an accurate and open response. Professional practice for the conduct of surveys generally includes protecting the confidentiality and anonymity of respondents to the extent possible, regardless of whether a pledge of confidentiality is made.

### Pledging anonymity and confidentiality

A pledge of confidentiality or anonymity should be made with great care. The wording of the pledge itself, or the procedures required to guarantee confidentiality may place limitations on the information that can be collected during the course of an audit or the use to which the information can be put. Moreover, *in audits by the Office of the Auditor General, confidentiality often can not be guaranteed if the identity of government officials or agencies are known.* The Auditor General may be required to reveal information under questioning by parliamentary committees, or the survey may reveal possible fraud, abuse or other illegal activities that must be brought to the attention of the appropriate authorities. Under these circumstances, great caution should be exercised in making any commitment regarding confidentiality or anonymity and any such commitment must be approved by the responsible Assistant Auditor General. Confidentiality can only be guaranteed if respondents were never identified, or if any link between individuals and their responses has been permanently broken, so that the responsible auditor can no longer identify specific respondents' answers.

In protecting anonymity and confidentiality, the responsible auditor should consider the sensitivity of the information requested, its processing and the location in which it is held. If the responsible auditor wishes to make a commitment of confidentiality, care should be taken to word data collection instruments so as to minimize the likelihood that they will elicit information about illegal activities, including fraud and abuse. The commitment should be made in such a manner that it can be honored and will not unduly restrict the responsible auditor's access to required information or the reporting of findings. **When a commitment to confidentiality has been made, the responsible auditor must put appropriate procedures in place to ensure that the commitment can be honored.** Again, prior to any pledge of confidentiality being given, the commitment must be approved by the responsible Assistant Auditor General.

### Protecting anonymity and confidentiality

The Office of the Auditor General is excluded from the Access to Information Act and has adequate procedures in place for ensuring the confidentiality of working papers, but this may not be the case with external parties. Documents left with departments or agencies (see VFM Manual, section on Confidentiality and Security), such as copies of completed questionnaires, may be subject to the Access to Information Act and cannot be protected to the same extent as documents

maintained by the Office of the Auditor General. At times, survey information may remain in the custody of external contractors. The responsible auditor should make sure that the contractor has adequate procedures for ensuring the confidentiality of survey responses and has signed an appropriate commitment to maintain confidentiality.

Care should be taken within the Office to put in place appropriate audit procedures to maintain the confidentiality of survey responses. The most direct solution is not to ask for information identifying the respondent. Often, however, the auditor needs to be able to identify respondents and their answers in order to link survey responses to information from other sources, follow-up with the respondent to obtain additional information or obtain respondent verification of interview results.

Maintaining survey data in a form that permits the identification of the responses of sampled individuals increases the risk that confidentiality will be breached. However, survey data can be managed in such a way as to allow the removal of individual identifiers once these links are no longer needed, effectively preventing the auditor from revealing individual responses.

Care must also be taken with the amount and kind of information collected on the characteristics of individuals and with how such information is reported. The risk that confidentiality will be lost increases with the level of detail available on individuals, even if their identity is not recorded. For example, in reporting statistics on answers according to sex, occupational category and region, certain breakdowns may apply to ten or fewer people. With groups this small it may be possible for managers or others to identify those participating in the survey and possibly their answers. **As a general rule, information should not be collected or reported in such a way as to allow the identification of categories containing ten or fewer people.**

Advice on survey techniques for protecting anonymity and confidentiality can be obtained from the FRL. Questions regarding requirements for the confidentiality of information should be brought to the attention of the FRL for Access to Information. The specific wording of any pledge of confidentiality or anonymity and any questions regarding survey questions that have the potential to elicit legally sensitive information should be brought to the attention of Legal Services.

## Section 10: Maintaining Survey Integrity

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Well designed data collection instruments and samples will not yield information with acceptable levels of significant error if survey procedures are not properly implemented.

**Consistency is important.** In order for data collection instruments to yield consistent and valid information, they required to be consistently administered in the fashion intended. In order for a sample to continue to be representative of its population, information must be obtained from as many of those selected as possible.

**Training and supervision.** Maintaining the integrity of the survey requires training those responsible for carrying out survey procedures and supervision and monitoring of the execution of survey procedures. Two problems that are important to address through training, supervision and monitoring are non-response and interviewer bias.

In large or complex surveys, it is extremely advisable to pilot-test survey procedures to avoid the risk of major problems being undetected until all the responses are in.

**Pilot-testing.** All aspects of survey procedures are expected to be tested on a small sample from the population of interest. Pilot-tests of mail surveys should include all phases, from sample identification, through preparation of mail-out packages to data analyses. Problems could occur at any point that could threaten the integrity of the survey. Questionnaires could be missing pages due to inadequate controls, addresses in a sampling frame may be out of date and inaccurate, procedures for tracking returned questionnaires may be inadequate for identifying how much of the sample has been returned or for protecting against lost questionnaires, instructions for data entry may be inadequate etc.

Pilot-tests of interview surveys are expected to include all aspects of the process - from interviewer selection and training through to data analysis. For documents or data-based surveys, pilot tests should start with procedures for obtaining documents or data-bases.

In addition to pilot-testing survey procedures, data collection instruments required to be pre-tested, i.e. administered to a small set of respondents from the full scale survey, in order to identify and find solutions to problems with the instruments.

## Section 11: Managing, Processing, and Analyzing Survey Data

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Error can occur at various points during data collection and analysis. Questionnaire respondents and interviewers can add error while recording information. Error can also be introduced while transferring data from data collection instruments to computerized data bases, writing program routines for statistical programs to read and analyze data from computerized data bases and transferring data from printouts or readouts into project or audit reports.

### Errors in data collection

Major risks to the accuracy of data occur in the initial recording of data. Frequently occurring problems during the completion of data collection instruments include the following:

- unanswered items;
- answers to items that should have been skipped by the respondent, interviewer or document reviewer;
- inappropriate answers because data collection instrument items or instructions were not understood;
- errors in entering the information; or
- illegible answers.

These kinds of errors may result from the following:

- weaknesses in instructions;
- problems in the structure of data collection instruments;
- questions that are difficult for respondents to answer, that require excessive judgement or are sensitive in nature; and
- long or complex data collection instruments that reduce respondent motivation to answer; etc.

**Survey planning, and data collection instrument design are important.** Error from some of these sources can be reduced through careful survey planning and data collection instrument design. Careful consideration of the information needed to support audit objectives, restriction of data collection instruments to essential information items, avoidance of sensitive questions and explanation of the purposes and uses of the survey will help ensure an adequate level of respondent motivation. Complete and clear instructions, definitions of key terms used in



questions, and careful attention to the structure and layout of the instrument will help reduce missed items and inappropriate responses. Errors in entering information and illegible answers can be minimized by improving motivation and by use of instruments that require simple responses, such as ticking off "yes" or "no" boxes.

These considerations also apply in surveys that require office staff or consultants to review and categorize the information contained in agency documents.

Potential errors can be detected and timely adjustments made by pre-testing data collection instruments.

**Interviewer and coder training are vital.** In survey interviews, the interviewer can add error through misunderstanding the respondent or incorrectly transcribing the information onto interview forms. In particular, interviewers can intentionally or unintentionally bias the results of interviews. Research has clearly shown that the interviewer can influence a responses through a variety of subtle verbal and non-verbal cues, even when there is no intention to do so. For example, respondents may use an interviewer's smiles or confirmatory "uh huh"s as cues about what the interviewer wants to hear or believe.

The risk of bias is greater with open-ended questions. Interviewers may have difficulty completely and accurately recording lengthy answers. They will also have to judge when a question has been adequately answered, perhaps asking additional questions for clarification or to ensure a complete response. These circumstances all create the opportunity for bias.

Minimizing these problems requires careful selection and training of interviewers.

**Quality control practices.** Following up with respondents to verify responses in a sub-set of interviews, having a second interviewer present, or having the respondent verify a transcript of the interview will all help assess the effectiveness of training, detect bias and correct for errors. Conducting a pilot-test will help ensure that interviewer selection and training have been effective.

Error can also be introduced when information obtained from interviews or documents has to be categorized to facilitate analyses. Taking information in a respondent's own words or from an existing document and putting them into categories created by the auditor can involve considerable judgement. For example, in an audit of evaluation in the federal government, auditors reviewed over 600 evaluation reports and made judgements as to whether each evaluation addressed the success, relevance or cost-effectiveness of the program evaluated. Because the reports did not often use this terminology in describing their focus, the auditors were required to judge which categories the evaluations best fit.

In these circumstances, error can be reduced by having each document or interview coded by more than one person and by training coders to make consistent judgements. In the audit of evaluation, each report was reviewed by two auditors. On an initial set of evaluation reports, evaluators discussed their judgements on each report until they reached agreement. This process was repeated until they were agreeing on at least 90% of their decisions without discussion.

***Data must be checked.*** It is essential to check and edit each data collection form to identify inconsistent, incomplete or illegible data. Where possible, respondents, interviewers or original data sources should be contacted to resolve inconsistent or incomplete data. When it is not possible to correct these problems prior to analyses, statistical procedures can sometimes be used to estimate and correct for these problems. These statistical procedures are not substitutes for complete and accurate data and require considerable expertise in their application and interpretation.

### **Transferring information to data bases**

Error can also be introduced in transferring information from data collection instruments to computerized data bases. Errors can result from misinterpretation of difficult to read information, missed items and incorrect keying of data.

Often, questionnaire or interview data on a written form are entered into machine-readable form. Clear instructions to those keying in the data are important for minimizing error. Once entered, data should be verified by comparing a printout of the data with that on an original form. Verification can be conducted on each individual form or, in the case of very large data bases, through statistical samples.

Human error in transferring information to databases can be reduced by using computer assisted techniques. These techniques involve entering data directly into machine-readable form, or directly onto a computer by using a computerized form that allows responses to be transferred to a data base by software. Although using machine-readable forms is efficient and helps minimize error, the Office does not have the required equipment for scanning these forms, and contracting for the required services can be expensive.

Computerized data collection instruments can be designed with built-in checks. For example, software can prevent a respondent from proceeding to the next question until the previous one has been completed, or can direct the respondent to the next appropriate question based on the response to a previous question. This approach is feasible with respondents who have access to compatible computer systems, with face-to-face or telephone interviews and e-mail or internet surveys.

### **Analysis**

Many errors and deficiencies in data collection can be identified during data analysis. Examining frequency distributions of answers to individual questions and comparing answers to different questions may reveal contradictions or unusual patterns that are due to errors in the original data set or weaknesses in the transformation of data into analyzable form. Those responsible for performing the analyses should remain alert to these possibilities. The FRLs for Quantitative Measurement and Surveys can provide advice.

## Section 12: Pre-Testing Data Collection Instruments

*Note:* This guide is intended to ensure that surveys conducted in the OAG meet reasonable requirements and expectations of survey professionals as well as the VFM audit standards of the Office of the Auditor General. The use of the terms "must" and "should" in this guidance document do not necessarily have the status of OAG standards and policies. However, they reflect methodological requirements and expectations in the conduct of surveys.

Pre-testing is the administration of the data collection instrument with a small set of respondents from the population for the full scale survey. If problems occur in the pre-test, it is likely that similar problems will arise in full-scale administration. The purpose of pre-testing is to identify problems with the data collection instrument and find possible solutions.

It is not possible to anticipate all of the problems that will be encountered during data collection. Terminology used in questionnaires or interviews may not be understood by respondents and information to be retrieved from documents may not be readily available. Reducing error to acceptable levels requires the pre-testing of data collection instruments.

Because standardized procedures are essential for ensuring that general statements can be made, it is advisable to make as few adjustments as possible to data collection instruments once data collection has actually started. In the case of mailed questionnaires, adjustments are impossible once the data collection instruments have been distributed. Pre-testing mail questionnaires or other data collection instruments allows adjustments to be made before full scale administration of the instrument, helping to ensure that standardized procedures are applied during data collection.

**If pretesting indicates that there is a low likelihood of obtaining sufficiently sound, consistent and relevant data for addressing audit objectives, troublesome items should be dropped or other techniques for data collection should be pursued.**

### Principles for pre-testing

Pre-testing should be conducted in circumstances that are as similar as possible to actual data collection and on population members as similar as possible to those that will be sampled.

Careful notes should be taken on the problems encountered and possible solutions should be identified.

### Pre-testing questionnaires

One important objective of pre-testing questionnaires is to get at the thinking behind the answers so that the auditor can accurately assess whether the questionnaire is being filled out properly, whether the questions are actually understood by respondents, and whether the questions ask what the auditor thinks they are asking. Pre-testing also helps assess whether respondents are able and willing to provide the needed information.

In pre-testing, the respondents should actually fill out the questionnaire, giving their views along the way or afterward. One approach is to give the questionnaire as an interview, asking for

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clarification of answers and clarifying questions along the way. The respondents' views can also be obtained during a post-questionnaire interview or in a focus group. Another common approach is to have respondents think out loud as they answer.

Pre-testing allows the responsible auditor to test solutions to problems with the questionnaire. For example, if considering different wordings for a question, one wording can be used with half the pre-test sample and a second wording with the remaining sample to see which works best.

### **Section 13: Managing Non-response**

Non-response refers to the unavailability of sampled units. In a survey, it is likely that it will not be possible to reach all members of the sample. For example, individuals may be unavailable because they have moved with no forwarding address. In probability sampling, non-response reduces sample size, affecting the calculation of sampling error and confidence intervals.

More importantly, in both probability and non-probability sampling, non-response is a source of potential bias. For example, in sampling small businesses that received financial aid from the government, a number of them may be unreachable for a variety of reasons, including the fact that they may have gone out of business. The unavailability of unsuccessful businesses will bias efforts to estimate the success of aid to small businesses and to identify characteristics that could be used to develop more successful funding criteria.

The existence of bias resulting from non-response can be difficult, if not impossible, to determine. For example, sampled agency staff may be unavailable for a variety of reasons, including illness, travel status, or having recently changed jobs. The impact of excluding these individuals may be difficult to assess.

Therefore, it is important that every effort possible be made to capture all members of the intended sample. It is difficult to determine what response rate is acceptable. Although a 85% to 95% response rate is generally considered adequate, there is little scientific basis for this "rule of thumb", due to the potential for bias. In some areas of enquiry, or with certain populations, response rates are historically lower. In these areas, the auditor will have to balance the importance of the information, the availability of other approaches and the centrality of the information to audit objectives in order to determine whether a survey is appropriate.

**Non-response is an important weakness in evidence. Therefore the response rate to a survey must be reported in "About the Audit" or in the text of the report (see VFM Manual, Chapter 5).**

#### **Encouraging a high response rate**

The auditor can take several steps to try and ensure an adequate response rate.

**Motivating respondents.** Respondents may be more or less likely to respond to a survey depending upon how important the survey appears to be, how easy it is to complete and the amount of time required. The auditor can maximize respondent motivation by: clearly indicating that the survey is being conducted by or for the Auditor General of Canada; clearly explaining the purposes of the survey and the use to which the information will be put; pre-notifying respondents that they will be surveyed; providing clear instructions; and preparing a short, easy to follow, data collection instrument. Interview surveys are generally considered better than mailed questionnaires for reaching and motivating respondents.

**Using an accurate sampling frame.** If the sampling frame is out of date or inaccurate, many respondents could be unavailable.

**Monitoring and following up on non-responses.** Progress in capturing the sample should be monitored. Interviewers should log their efforts to reach respondents, to ensure that potential respondents are not unnecessarily let slip. Multiple follow-ups should be undertaken with non-respondents. In the case of mail surveys, repeated waves of the questionnaire should be sent if the response rate is not adequate and individual non-respondents cannot be identified. If non-respondents can be identified, telephone follow-ups may be helpful. Interviewers should make a specified number of attempts to contact persons for face-to-face or telephone interviews.

Many people feel inundated by requests to participate in surveys. In following up with non-respondents, auditors should be sensitive to their reactions.

**Pilot-testing survey procedures.** Pilot-tests are important for assessing the adequacy of the sampling frame and for ensuring that sample members or their responses are not "lost" during the administration of the survey.

### **Adjusting for non-responses**

**Sampling with replacement.** At times, a larger sample than is needed may be drawn, or substitutes for non-respondents may be randomly selected from the remaining population. These procedures are useful in maintaining sample size, especially important where respondents with important characteristics are not frequent in the population. However, cases added in this way are still from that portion of the population which is cooperative and reachable. Therefore, these procedures do not necessarily correct for the bias that may result from the loss of non-respondents. The appropriateness of these procedures should be reviewed by the FRL Surveys.

Care should be taken not to use systematic procedures for replacing non-respondents, such as the next document in order from a file, or the house next door to the one with no one home. Population members sampled in this way may not share important attributes with those unavailable.

**Statistical Estimation of the effect of non-responses.** Statistical procedures can be employed to estimate the effect of non-respondents or to provide estimates of their likely response. These procedures can be employed if the auditor can determine characteristics likely to influence response, e.g. relative wealth, age, education and if these are known for the non-respondents.