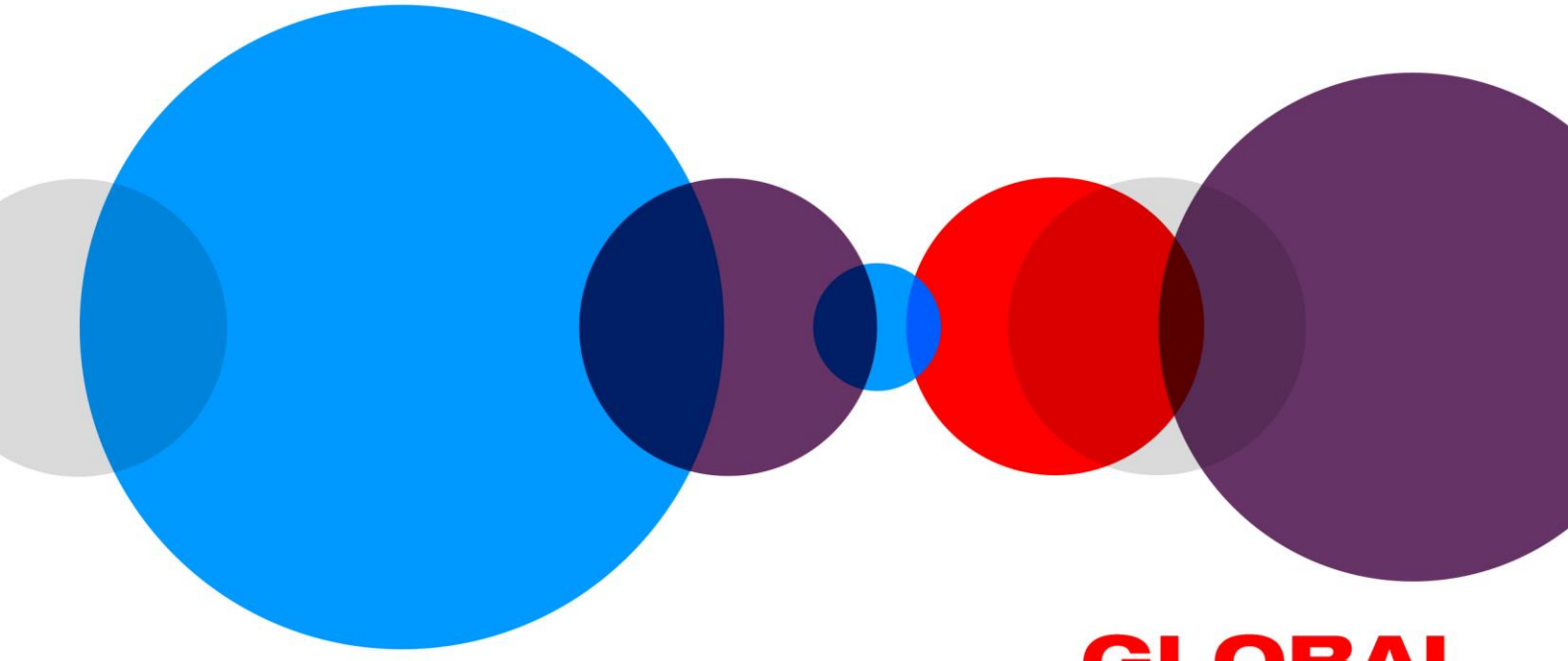
METHOD GUIDE 3

Survey sampling and administration



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GLOBAL KIDS ONLINE

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November 2016

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GLOBAL KIDS ONLINE

Global Kids Online is an international research project that aims to contribute to gathering rigorous cross-national evidence on children's online risks, opportunities and rights by creating a global network of researchers and experts and by developing a toolkit as a flexible new resource for researchers around the world.

The aim is to gain a deeper understanding of children's digital experiences that is attuned to their individual and contextual diversities and sensitive to cross-national differences, similarities, and specificities. The project was funded by UNICEF and WePROTECT Global Alliance and jointly coordinated by researchers at the London School of Economics and Political Science (LSE), the UNICEF Office of Research-Innocenti, and the EU Kids Online network.

The preferred citation for this report is:

Barbosa, A., Pitta, M., Senne, F., and Sózio, E. M. (2016) *Survey Sampling and Administration.* London: Global Kids Online. Available from: www.globalkidsonline.net/sampling

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ABSTRACT

Measuring the impact of digital technologies and devices – particularly the use of the internet – on children's lives through reliable statistical data is essential to the design of effective public policies to promote children's rights in the digital age and to protect them online. Policy-makers need high-quality data to underpin evidence-based policy decisions. Although it is clear that reliable statistics are needed for effective policies, and that the impact of evidence-based policies can only be measured by good statistics, most countries lack systematic and comparable statistics on the online risks and opportunities experienced by children.

This Methodological Guide provides a framework for the production of high-quality, reliable statistics to measure access to and use of the internet and digital devices by children. Although this framework is aligned with the good practice of official statistics agencies, it does not replace theoretical and practical guidance or informed expertise on survey methodologies. The proposed framework provides practical guidance for activities related to administering the Global Kids Online (GKO) survey in the field, from planning to implementation.

KEY ISSUES

The rapid dissemination of digital devices among children to access the internet has created many opportunities to engage them in an increasingly connected world. Researchers and policy-makers acknowledge that the use of digital devices, particularly in the spread of mobile devices such as tablets, smartphones and console games, as well as access to broadband networks, has important social implications for children's lives. Digital media has transformed how children socialise and relate to their peers, families and schools (CGI.br, 2014).

There are challenges in designing policies that ensure universal access to digital technologies while at the same time promoting children's participation and protection in the online environment. We therefore need to measure the potential influences of digital media on children's development, particularly in terms of online risks and opportunities. Measurement and statistical data play an essential role in designing and evaluating public policies.

The literature on public policies converges on the idea that policy should be based on the best possible statistical data. Othman (2005) argues that if a policy cannot be measured, it is not a good policy. Statistical data should also be useful to other stakeholders (such as industry, the media and educators) who may use them in their efforts to design new products, convey new media messages, create effective educational and pedagogical content, or even come up with more effective mediation strategies for parents and educators.

It is important to note that measurement means different things in different social and cultural contexts (Pedhazur & Schmelkin, 1991). The production of reliable, comparable and high-quality statistics for measuring social phenomena related to children's use of the internet therefore requires a transparent and sound methodological framework. Cultural diversity and socioeconomic disparities within nations, especially in the global south, also pose challenges to generating representative outcomes. The framework proposed in this Methodological Guide is designed to prevent discrimination and ensure inclusiveness in local contexts where the guidelines are applied, enhancing international comparability.

Surveys, usually questionnaires, are the most commonly used tools to understand social behaviour and to gather relevant information. According to Groves et al. (2009, p. 2), a survey can be seen as 'a systematic method for gathering information from (a sample) of entities for the purpose of constructing quantitative descriptors of the attributes of the larger population.' A survey is a set of several interconnected steps: planning; development of concepts, methods and survey design; data collection; data processing; production of estimates and projections; data analysis; and dissemination to stakeholders.

"It is important to note that measurement means different things in different social and cultural contexts."

The production of internationally comparable data related to access to and use of new digital technologies has been widely discussed, but we do not yet have sufficient systematic and comparable statistics on the online risks and opportunities experienced by children (especially in the global south). The Global Kids Online (GKO) framework is therefore an important contribution to the international debate about protecting children online.

Carrying out surveys involving multiple countries, cultures and languages provides a strong reason to adopt a commonly agreed methodological framework. Administering a field survey and producing quality data requires the following steps:

- clearly defining the survey objectives;
- defining timetable and costs for the survey, funding sources, and the primary users and uses of the survey data;
- ensuring the availability of good survey frame(s);
- designing samples and defining weighting procedures;
- building, customising and testing data collection instruments (questionnaires);
- defining a database for information gathering and storage;
- defining data collection procedures;

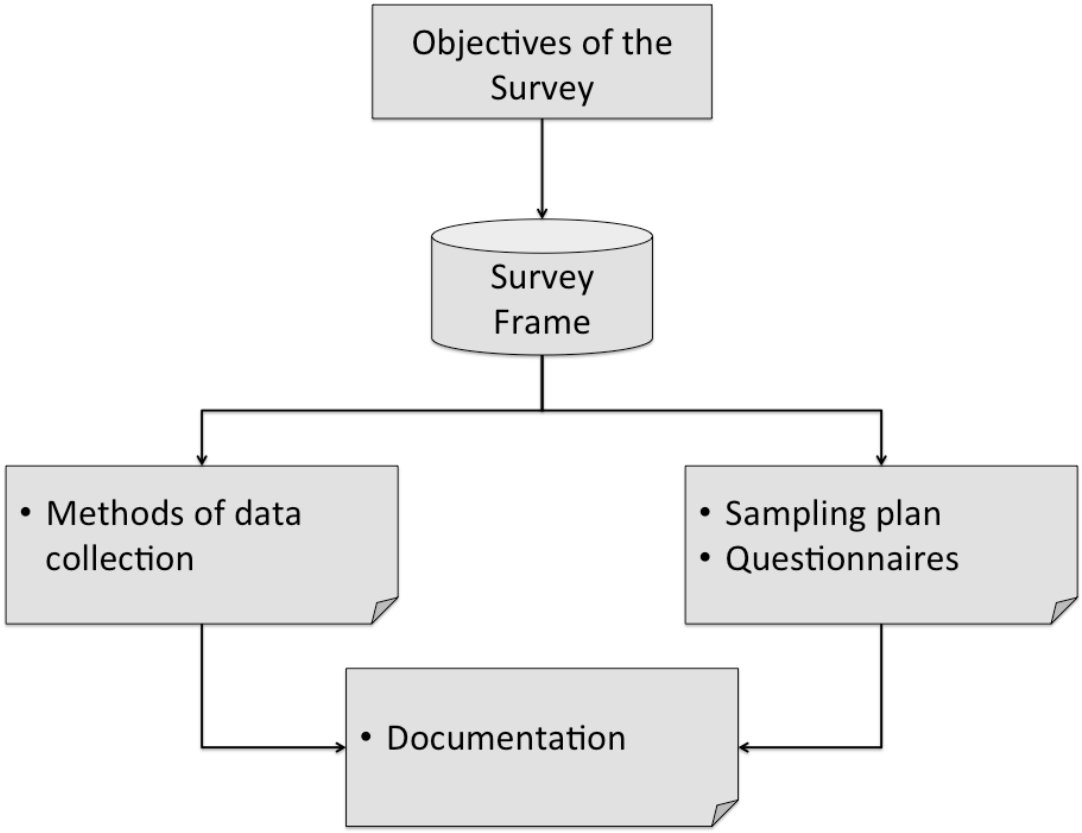
- ensuring proper documentation of the whole survey process.

This Methodological Guide is part of the GKO toolkit. It provides practical guidance for activities related to administering the GKO survey, from planning to implementation. It highlights the importance of sound survey sampling and describes the key principles and best practice for administering a survey in the context of the GKO survey.

The guidelines presented here are aligned with the good practice of official statistics agencies, but they do not replace theoretical and practical guidance or informed expertise on survey methodologies. Groves et al. (2009) argue that survey methods deal with the sources of errors that arise from the survey process. Methodological rigour and transparency in all stages of a survey are positively correlated with the quality of the data produced.

This Methodological Guide is also aligned with the principles and concepts of internationally accepted methodological frameworks used to measure access to and use of the internet and digital devices (also referred to as information and communication technologies, or ICT). Such frameworks include those set forth by the Partnership on Measuring ICT for Development,[1] an international multi-stakeholder alliance created to improve the availability and quality of data and indicators in this growing field of study. The Partnership plays an important role in providing methodological frameworks, concepts and definitions to guide the production of ICT-related statistics (see Figure 1).

Figure 1: Basic concepts in administering surveys



[1] See www.itu.int/en/ITU-D/Statistics/Pages/intlcoop/partnership/default.aspx

MAIN APPROACHES AND IDENTIFYING GOOD PRACTICE

Defining objectives is the first task in planning a survey, because a clear understanding of the objectives will guide all subsequent steps, and problems may arise if the survey objectives are not clearly defined. According to Statistics Canada (2003), the objectives not only establish the broad information needs of the survey, but also provide the operational definitions required to carry out the survey, including the definition of the target population. Furthermore, the objectives also determine the scope of the survey, that is, what is to be included.

Ideally, the task of developing survey objectives should engage a range of stakeholders (including government, academia and civil society organisations). This ensures that the concepts and operational definitions of the objectives meet the needs of data users as well as stated needs for information.

"The guidelines presented here are aligned with the good practice of official statistics agencies, but they do not replace theoretical and practical guidance or informed expertise on survey methodologies."

Broadly speaking, the main objective of the GKO survey is to understand how the population aged 9–17 uses the internet and digital devices, and how young people deal with the opportunities and risks arising from the use of digital media. For countries interested in collecting data from parents and legal guardians, the objectives may include understanding how adults mediate their children's use of the internet. Stakeholders involved in the survey project may require broader objectives to meet local needs and specific requirements for data production.

Box 1: Expanding the objectives of the Brazilian Kids Online survey (CGI.br, 2014)

As a result of local stakeholders' needs, in 2013 the Brazilian Kids Online survey, conducted by the Regional Center for Studies on the Development of the Information Society (Cetic.br), has expanded its initial objectives. It now monitors the exposure to advertising aimed at children as well as investigating online activities and communication practices.

According to the Brazilian Internet Steering Committee – CGI.br (2014), the rapid spread of use of the internet among children makes them a key target audience for advertising and online merchandising strategies. Exposure to advertising that targets this young population may be linked to phenomena such as consumerism, childhood obesity and child sexualisation. Sophisticated forms of marketing communication (such as online games associated with brands and products) are becoming current practice among companies offering products to children.

In order to generate input for this discussion in the Brazilian context, the goal of the new module on consumption is to measure the exposure of children who use the internet to different types of marketing content broadcast in digital and other media (CGI.br, 2014).

Based on the survey objectives, the findings and data analysis will be valuable for a wide range of stakeholders, but they will be especially relevant for policy-makers, to help them make informed decisions, and in the design of effective policies to promote children's use of the internet and to protect them in the online environment.

Survey frame and sources of information

In order to design a probability sample, previous information on the target population is needed – a sampling frame – where each unit of the population of interest is available for selection with a probability greater than zero.

To conduct a household survey following a probabilistic approach, it is necessary to have a frame that enables a randomised selection of households and individuals. This may be in the form of a list of units (rarely available in most countries) or in the form of a list of clusters of units (such as blocks, census tracts and enumeration areas). In many countries, this information is provided by National Statistical Offices (NSOs), and is periodically updated by means of national household surveys and censuses.

When such a frame is not available, alternative sources must be used, keeping in mind that the entire target population must have a positive probability of being selected for the sample. One possible alternative for developing a frame consists of adopting the smallest administrative divisions (municipality, county etc.) of the country and listing their clusters/households, covering the entire target population needed for selection for the survey.

In cases where there is no possible frame information or it is not possible to develop a frame, an alternative method of selecting a probability sample should be used. In the context of the GKO framework, an alternative might be to carry out the survey in schools. Other public locations where a large number of children may be concentrated (such as parks or shopping malls) are not suitable, since it is not possible to conduct a sample selection in a probability fashion, so results would not be internationally comparable.

If the school setting is adopted as a sample selection strategy, it can be assumed that almost every country has a list of existing schools (public and private). Using this list as the frame, the survey sample can be randomly selected and children who are internet users interviewed. In this particular case, the selection stages would be:

- Select a probability sample of schools in the whole country.
- Select a probability sample of classes in each of the selected schools, according to a probability process.
- List all children in the selected classes who are internet users, and select a random sample of them to interview.

This approach has some disadvantages, however:

- Perhaps not all the children in a country are enrolled as students in schools, resulting in under-coverage of the target population.
- Conducting the survey in the school setting might yield a response bias related to the context of the interview, especially with respect to sensitive questions.

Where surveys are conducted in schools, a method must be found to test the assumption that most of the internet-using children are regular students. If this assumption is found to be true, the difference in bias between this type of selection and typical household surveys could be small.

Methods of data collection

Data collection is the process of gathering the information needed to answer a particular research question. This requires extensive resources and thorough planning, as the choice of method for data collection has direct and indirect implications on overall survey costs and data quality.

In recent years, the development of new data collection methods has largely been associated with the introduction of new information and communication technologies (ICT) to the survey process (Groves et al., 2009). In this context, the collection of empirical data can encompass a wide variety of modes, including the combination of different methodological approaches or mixed-mode designs to minimise costs and errors.

Historically, the most common modes of data collection in survey research are:

- paper-and-pencil interviewing (PAPI), in which interviewers administer paper questionnaires in face-to-face interviews;

- self-administered questionnaires (SAQ), in which paper questionnaires are handed or posted to respondents and completed without interviewer involvement.

With the proliferation of computerised interviewing methods, survey researchers can additionally rely on the following:

- computer-assisted personal interviewing (CAPI), in which interviewers follow a script provided by a software application, and administer the questionnaire in face-to-face interviews using tablets or handheld personal data devices;
- computer-assisted telephone interviewing (CATI), in which interviewers follow a script provided by a software application, and administer the questionnaire by telephone;
- computer-assisted self-interviewing (CASI), in which respondents are handed a data device, read the questions on the screen, and complete the questionnaire without interviewer involvement;
- audio computer-assisted self-interviewing (ACASI), in which respondents are handed a data device, listen to recordings of the questions, and complete the questionnaire without interviewer involvement;
- computer-assisted web interviewing (CAWI), in which respondents access the questions by means of an internet browser application, and complete the questionnaire without interviewer involvement.

Choosing an appropriate method of data collection

Various issues should be considered when planning a survey (Groves et al., 2009; Statistics Canada, 2003), including the following:

- characteristics of the target population;
- availability of survey frames;
- coverage properties;
- non-response rates;
- availability of resources;
- degree of privacy required.

It is vital that the characteristics of the target population are taken into account. In countries where literacy rates of the target population are low or where linguistic variation is high, interviewer-assisted modes (rather than self-administered questionnaires) are advisable. Surveying children also poses distinctive methodological challenges for data collection (see also Methodological Guide 5), but there are valid methods of data collection that rely on visual cues and audio presentation of questions to keep children's attention and overcome literacy-related issues (Borgers et al., 2000).

Another key concern in survey research is how well the survey frame covers the target population. The availability of survey frames and their coverage properties should be considered when defining an appropriate method of data collection for a given survey project.

"The availability of resources – including the budget, human resources, equipment and time frame – for a survey project will affect the chosen method for data collection."

In this context, household surveys typically adopt face-to-face interviewing. Although this method is often restricted to the civilian, non-institutionalised household population – with some sub-groups of the population excluded for cost or efficiency reasons – the combination of face-to-face interviewing and area sampling can be an efficient strategy.

In countries where there is no updated list of residents to be used as a sampling frame for people, household surveys may be conducted through CATI or CAWI based on sampling frames of telephone numbers or email addresses. However, coverage errors might arise, as households and individuals with access to the internet and telephones differ considerably from those with no access, especially in terms of socioeconomic variables (e.g., elderly and less-educated populations, rural areas and impoverished households).

The method chosen for data collection can significantly affect non-response rates. Research has shown that there are both inherent differences across methods and differences related to methods used to elicit respondents' cooperation, for example, the use of incentives and other legitimising materials (Groves et al., 2009). Overall, face-to-face interviewing tends to yield the highest response rates, followed by telephone

interviewing; email and web surveys yield the lowest rates.

The availability of resources – including the budget, human resources, equipment and time frame – for a survey project will affect the chosen method for data collection.

The costs of data collection involve a number of operational details, and can typically be related to fixed costs (e.g., the costs of developing, pre-testing and programming the questionnaire) and variable costs (e.g., the costs of contacting and interviewing all sample cases).

Face-to-face interviews incur substantially higher variable costs than telephone or web surveys. A central component of the overall cost of face-to-face interviews is training, hiring and travel expenses for interviewers. Conversely, when computer-assisted interviewing is adopted, fixed costs are likely to increase due to expenses for both the programming of the questionnaire and the acquisition of appropriate equipment.

"Social surveys – such as the GKO survey – have been increasingly employed to address questions regarding private behaviour."

Deciding which method of data collection to use will also depend on the time available for fieldwork. Telephone and web surveys require a shorter period for data collection than face-to-face interviewing, which may involve listing and approaching widely dispersed households before conducting interviews. When considering face-to-face data collection, sufficient time must be allowed for the interviewer to return to households if necessary to carry out the interview on a different day or at a different time of day.

On a related note, social surveys – such as the GKO survey – have been increasingly employed to address questions regarding private behaviour, uncomfortable situations or sensitive topics. Survey interviews can be conducted in a variety of settings that differ in the degree of privacy they offer to the respondents. The presence of the interviewer and/or other people (parents or legal guardians) may affect respondents' answers to sensitive questions.

In fact, collecting sensitive data through structured questionnaires represents a major challenge in terms of social desirability, that is, the tendency to present oneself in a favourable light by under-reporting undesirable attributes and over-reporting desirable ones. When addressing subjects such as sexual behaviour, exposure to pornographic content or substance abuse, social desirability can yield high non-response rates and also motivate misreporting.

In order to reduce the influence of social desirability, survey researchers are advised to increase the level of privacy during data collection. The use of self-administered questionnaires[2] (SAQ, CASI, CAWI or ACASI) rather than face-to-face interviewing is a common technique employed to improve the accuracy of answers. Another appropriate solution is employing the randomised response technique, in which the interviewer does not know the question the respondent is answering. Both solutions are likely to provide the respondents with more comfortable and private environments for reporting on sensitive topics.

Overall, in order to increase the quality of data produced for the GKO survey, within time and budget constraints, the properties of different data collection methods and their relative implications must be taken into account. While face-to-face interviewing (PAPI or CAPI) implies high costs, a very long data collection period and high to very high response rates, self-administered questionnaires on the web (CAWI) implies very low costs, a very short data collection period and low to very low response rates. Table 1 compares methods of data collection with regard to cost, time frame and response rates.

For in-depth reading on methods of data collection, please refer to the *Further Readings* section.

[2] The characteristics of the target population – including education and literacy rates – might limit the use of self-administered modes across populations and countries, especially when SAQ and CASI are employed (Pennell et al., 2010). Nonetheless, it is worth noting that evidence from studies among rural youth in Kenya suggests that the use of ACASI modes tend to perform well in populations with low literacy rates (Hewett et al., 2004).

Table 1: Methods of data collection

Differences in methods of data collection					
	Face-to-face		CATI	SAQ	
	PAPI	CAPI		CASI	CAWI
Cost	High	High	Medium/ low	High	Very low
Data collection period	Long	Long	Medium/ short	Long	Very short
Response rates	Very high/ high	Very high/high	High/ medium	Very high/ high	Low/very low
Degree of privacy	Very low	Very low	Medium	High	Very high

Adapted from Groves et al. (2009).

Sampling plan

The sampling plan phase should include the following activities: defining the target population, unit of analysis, and domain results of interest; selecting a sample; and defining weighting procedures. It is strongly advised that activities related to sample selection adopt generally accepted statistical methods (e.g., probability sampling methods) that can provide estimates of the sampling error. Non-probability sampling methods must be avoided since they will not allow measurement of the estimated error.

Target population

The survey's target population comprises children who use digital devices and are internet users. The age scope may vary according to local policy and/or research needs. The GKO project, for instance, looks at children aged 9–17.

If a different age range is defined, it is important that the dataset be processed in such a way as to make international comparability possible. Therefore, the age range must include the range required for that comparability.

The present section presents methods for sampling when the target population is at least 10% of the whole population.

In some countries the target population – children aged 9–17 who are internet users – is considered rare, a hard-to-reach population. In such cases some adjustments must be done (Kalton, 2009).

Unit of analysis

The unit of analysis of the GKO survey consists of children aged 9–17 who are internet users. A definition commonly adopted by countries conducting ICT household surveys is the one used by the International Telecommunications Union (ITU): internet users are defined as those individuals who have used the internet at least once in the three months prior to the interview. In the context of the GKO survey, the use of a common definition and concepts are essential to enable cross-country comparability.

For countries interested in collecting data from parents and legal guardians, these individuals are considered to be 'responding units' since they provide information on their children. The selection of parents and legal guardians typically depends on the selection of their children. As a result, they cannot be considered units

of analysis and do not constitute a representative sample of the overall population of parents and legal guardians.

Domains of interest for analysis and dissemination

The domains of interest for data analysis and dissemination must be defined before sample selection begins, because they are crucial for defining the sample size and design. It is recommended that survey estimates be made with controlled or specified precision for the following variables and domains:

- *Geographical regions:* These correspond to national geographical divisions (macro regions) in accordance with NSOs. Alternatively, the sample could be designed by providing estimates exclusively at the national level, which reduces costs but also limits analysis of inequalities within countries.
- *Sex of child:* Male or female.
- *Level of education of parents and legal guardians:* Divided according to the national educational system classification.
- *Age group of child:* Divided into those aged 9–10, 11–12, 13–14 and 15–17.
- *Household or family per capita income levels:* Divided according to nationally defined criteria. Usually NSOs have nationally defined standards for this information.
- *SES (socioeconomic status):* Calculated according to nationally defined criteria. Categories should be grouped into high, medium and low SES.

Sampling design

The sampling design should include descriptions of the survey frame, the sampling method, selection mechanisms and weighting procedures. According to best practice from official statistics agencies, the sampling design should adopt a probabilistic approach. Probability sampling is the only approach that allows the production of statistics with appropriate reliability, sampling errors, and confidence intervals. Use of probability samples allows results to be generalised to the entire target population.

Different sampling methods are associated with the type of frame available and the objectives of the sampling. Methods of sampling schemes include simple random sampling (SRS), cluster sampling, stratified sampling and multi-stage stratified cluster sampling.

A SRS is carried out by selecting a probabilistic sample of units from a list of the target population. But this type of sampling is rarely used, since the spread of the sampling distribution tends to be very large (which increases costs), and a complete list of target population units may not be available.

> **"Probability sampling is the only approach that allows the estimation of statistics with appropriate reliability, sampling errors and confidence intervals."**

Cluster sampling is carried out by selecting a probability sample of groups of elementary units. This type of sampling deals with the following issues:

- Where a complete list of units of the target population is not available, but there is a list of entities that group these units, as in the case of households (clusters of individuals) or census enumeration areas (clusters of households).
- The high cost of a widely spread sample. Instead of selecting households across the country, a group of neighbouring households (a cluster) is selected and some are sampled for the survey (near or in the same location). The use of sampling clusters makes data collection less costly. The clusters may be constructed based on a list of elementary units.

Cluster sampling involves at least two stages. The first is the selection of the clusters, and the second is the selection of the elementary units. Elementary units are selected after the construction of a complete list of the elementary units in the sampled clusters. Sometimes clusters are selected within primary selected clusters, again, after a complete list is made.

Cluster sampling minimises the problems of selected units being too widespread, and it may be used when the only available frame for a survey is a list of clusters of elementary units. Mostly, however, the units within a cluster have similar characteristics: people living in the same census enumeration area usually have similar

levels of education, income, etc. This causes loss of precision, since cluster sampling usually has greater error than SRS sampling.

In most surveys, information about specific domains – geographical regions, classification into rural/urban areas, gender, etc. – is needed. In order to achieve good results for these domains, the sample must cover these characteristics. Geographical division, which is within the scope of GKO domains of interest, is usually available in the survey frame. A stratified sample is the way to select a sample of elementary units or clusters for each geographical region; this ensures that all regions will be represented in the final sample. Typically, stratifying a sample helps to improve the quality of the estimates.

"Cluster sampling minimises the problems of selected units being too widespread, and it may be used when the only available frame for a survey is a list of clusters of elementary units."

Household surveys usually use multi-stage stratified cluster sampling, a method which, as its name suggests, combines stratification and cluster sampling. As an example of best practice, the Brazilian Kids Online survey uses four-stage stratified cluster sampling. The population target units are stratified into five geographical regions and the state capitals. The selection of the sample in each region is done in the following stages:

- *First stage:* Selection of a probability sample of municipalities (municipality = cluster of census enumeration areas).
- *Second stage:* Selection of a probability sample of census enumeration areas in each selected municipality (census enumeration area = cluster of households).
- *Third stage:* Building a complete list of households in each selected census enumeration area and selecting a probability sample of households (household = cluster of individuals).
- *Fourth stage:* Building a list of people aged 9–17 who are internet users in each selected household, and randomly selecting one of those individuals to participate in the survey.

Box 2: Sample selection stages in the Brazilian Kids Online survey (CGI.br, 2014) conducted by the Regional Center for Studies on the Development of the Information Society (Cetic.br)

The complexity of the Brazilian survey reflects the size of the country, its complex geographical characteristics, its socioeconomic disparities and the frames available. In Brazil, there is a complete frame of municipalities and census enumeration areas. It would be possible to do the sample selection in three stages:

First stage: Selecting a probability sample of census enumeration areas in each stratum.

Second stage: Building a complete list of households in each selected census enumeration area and selecting a probability sample of households based on this list.

Third stage: Listing all children aged 9–17 who are internet users, and selecting one of them to respond to the survey questionnaire.

This design would spread the sample in the strata, increasing the costs of data collection.

Sample selection in each stage

The main objective of the GKO framework is to produce quality estimates for indicators in order to understand how children aged 9–17 use the internet, and how they deal with the opportunities and risks arising from its use.

These estimates are generalisations from the sample to the target population with their respective errors (measures of quality). The only method that makes this possible is probability sampling.

In the previous section we described the stages of sampling design. But how do we use probability sampling? Probability sampling uses samples drawn in such a way that every population unit has a known probability (which is greater than zero) of being selected. Samples can be selected with or without replacement. In practice, methods without replacement

are mostly used. To use probability sampling, it is necessary to:

- have a frame/list of clusters or elementary units
- assign a probability of selection to each unit in the frame (cluster or elementary).

The probabilities assigned to each unit (cluster/elementary) may be the same (equal probabilities) or different (unequal probabilities). Unequal probabilities are commonly defined as being based on a measure of the size of the unit. A probability proportional to size (PPS) sampling may result in more precise estimates. The gain in precision will be larger when the correlation of the size measurement and the survey of interest variables is strong.

The different stages of a sampling plan may use either equal or unequal probability sampling selections. In the Brazilian Kids Online survey we have:

- *First stage:* Selection with a probability proportional to the 9–17 population in the municipality.
- *Second stage:* Selection with a probability proportional to the 9–17 population in the census enumeration area.
- *Third stage:* Selection with equal probabilities.
- *Fourth stage:* Selection with equal probabilities.

Regardless of the sampling method used, some steps must be followed to accomplish a good-quality survey (as described earlier, in Section 2.3). The listing stage is particularly important for the selection process, and the listing process must follow rules that ensure that the entire sample space is covered. It may be difficult to construct the list, but doing it properly is crucial to ensuring that it is possible to design a probabilistic sample.

A discussion of resources is outside the scope of this guide. We focus instead on the quality of the estimates, which can be determined by measuring the sampling error.

The error in a sample estimate is the difference between the estimate and the population parameter it is trying to estimate. When the sampling estimator is unbiased, the sampling error can be measured by the variance of the estimate. The larger the sample, the smaller we expect the error in the estimate to be.

Sample size influences the variance of the estimate, which also depends on the sample design. The simplest sampling methods (SRS, cluster sampling and stratified sampling) have readily available formulas to calculate the sample size, given a measure of the population variance (obtained from a previous survey or from a pilot sample, for example). More complex sampling methods, such as stratified cluster PPS sampling and multi-stage stratified cluster sampling do not have readily available formulas.

To determine the sampling size for a complex sample design, we can use information from past studies or pilot surveys for the population variance of the main interest indicator, and the formula for the size determination used by SRS.

“The listing stage is particularly important for the selection process, and the listing process must follow rules that ensure that the entire sample space is covered.”

In that case, however, we should take into account the fact that cluster elements are very similar, that is, individuals in the same cluster (e.g., city block) have similar incomes, similar access to household infrastructure, similar education levels, and so on. This reduces the precision of cluster samples compared to simple random samples. This effect is the so-called design-effect:

> *“The design effect represents the factor by which the variance of an estimate based on a simple random sample of the same size must be multiplied to take account of the complexities of the actual sample design due to stratification, clustering and weighting. It is defined as the ratio of the variance of an estimate based on the complex design relative to that based on a simple random sample of the same size.” (UN, 2005, p. 19).*

Thus, in order to keep the desired precision, the SRS size needs to be enlarged to account for loss due to clustering.

The sample size in a simple random sample would be defined by Formula 1:

$$n_{SRS} = \frac{1}{\frac{1}{N} + \frac{V}{\hat{\sigma}_E^2}}$$

where

n_{SRS} is the sample size

N is the population size

$V = \left(\frac{d}{z_{\alpha/2}}\right)^2$ is the square of the ratio between the maximum acceptable sampling error (d) and $z_{\alpha/2}$ is the abscissa of the normal curve that defines the confidence level (usually 95%)

$\hat{\sigma}_E^2$ is an estimate of the population variance.

In the case of estimating proportions, we have

$$\hat{\sigma}_E^2 = p(1-p)$$

where p is the proportion of interest.

The size is usually calculated by using Formula 1 multiplied by the design effect to account for loss in precision. NSOs usually study this effect in regular household survey estimates, which can be used to adjust the sample sizes for the GKO survey.

Sample allocation

Sample allocation is the distribution of the sample size across strata. The size of the sample selected in each stratum depends on the information needs, costs and expected precision of stratum level estimates, if required.

If the main goal is the production of national estimates, the sample allocation could be made proportional to the size of the 9–17 population within the whole population. If stratum level results must satisfy precision constraints, the sample allocation should be carried out in each stratum, as if each stratum was the population of interest. Typically, this is needed in order to achieve satisfactory precision for less populated areas, where strictly proportional allocation might result in samples that would be too small to meet the stratum-level precision requirements.

After the first wave of the survey, results regarding the willingness of respondents to participate in the survey may lead to some allocation adjustments. Such adjustments could help to cope with differential non-response rates across strata in the second wave of the survey.

Weighting process

The weighting process is the stage of the survey in which a value greater than one is applied to every sampling respondent unit. This value reflects the number of units in the population that are represented by the sampling respondent unit.

The basic weight is the inverse of the sampling respondent unit probability of selection. This number reflects the whole design: stratification, clustering and selection type (PPS/SRS). It is very important that the steps in sample selection be kept well documented in order to use the correct basic weights.

To keep the sample representative of the target population, it is necessary to take non-responses into account. Non-responses may happen because:

- the unit refused to give information
- the collector did not reach the selected household/respondent.

There are many ways of making adjustments for non-responses (factor multiplication, modelling the non-response etc.). For detailed information see Statistics Canada (2003).

After determining the basic weights and adjusting for the non-responses, it might be useful to calibrate the sampling weights (whenever possible) in order to have sample estimates that match some known values in the target population.

Questionnaire design and database

Questionnaire design

Another critical aspect of administering cross-national surveys such as the GKO project is to agree internationally defined indicators. These may need to be adjusted to ensure that the required information is gathered even if there are local peculiarities.

A well-designed questionnaire consists of questions that:

- are simple and straightforward, using common words that have concise and (if possible) unique meanings;
- are relevant to the survey objectives;
- do not contain the same information twice;
- avoid the combination of two different items at the same time (double-barrelled questions);
- do not lead the respondents to certain answers;
- do not contain double negatives;
- use the mother tongue of the respondent.

To ensure that the content is adapted to the local context and population characteristics, good practice is to establish a group of experts, and to carry out cognitive interviews and field pre-testing.

Group of experts

It is highly recommended that the whole process of carrying out the GKO survey be supported institutionally and methodologically by a multi-stakeholder group. This should consist of experts in social research, with particular experience of the relationship between technology and children. These experts should be associated with academic and government institutions, the non-governmental sector, research institutions and international organisations such as UNICEF.

Experts' insights and contributions to the planning and analysis stages legitimise the process, and enhance the transparency of methodological choices made in response to the local context. Moreover, the experts' network should be an effective means of disseminating the survey findings. The network should also foster dialogue between experts and policy-makers in which initiatives related to child online protection, promotion and participation can be articulated. A productive dialogue among stakeholders is crucial when legal frameworks and policy developments are being discussed, including the role of industry in promoting safety for children, as well as policies to enhance child safety online.

Cognitive interviews and pre-testing

Cognitive interviewing is a qualitative technique used during the planning phase of a survey. It is done with the objective of understanding the cognitive path taken by respondents and their comprehension of the concepts under study with regard to specific questions.

The results of these interviews feed into a review of the survey questionnaires, especially regarding the adequacy, clarity and comprehensibility of the questions in a given social and cultural setting.

In general terms, the procedure consists of presenting the survey question-and-answer options or categories to respondents, and listening to their perceptions of how they managed to answer. New ways of phrasing question-and-answer options can then be tested to establish the most appropriate choices for the respondents.

The Kids Online survey carried out in Brazil conducts regular cognitive interviews and pre-tests before validating the questionnaire and starting the field data collection. This involves all questionnaires – for children (both self-completed and face-to-face interviewer), parents and legal guardians.

Box 3: Cognitive interviews in the Regional Center for Studies on the Development of the Information Society (Cetic.br)[3]

Cognitive interviewing is a technique of evaluating survey questions by using several strategies to find out how the respondents understand the questions and how they arrived at their answers. Since its conception in the mid-1980s, this technique has been particularly useful for evaluating new questions and identifying possible sources of error before administering survey questionnaires. Since 2009, Cetic.br has carried out cognitive interviews with the objective of learning how Brazilian respondents understand the critical concepts of various questionnaires for projects such as ICT Households, ICT in Education, ICT in Health Sector, ICT Kids Online, ICT in Non-Profit Organisations, ICT e-Government.

One of the most important uses of cognitive interviews is to evaluate translation and adaptation issues of cross-national questionnaires, identifying possible sensitivities to specific issues, and ensuring that the questions were appropriate for each target population (see Note 1 in Box 4 below). Due to Brazil's enormous social, economic

[3] The text in Box 3 was prepared by Cetic.br and published in OECD (2015, p. 35).

and cultural diversity, cognitive interviews also play an important role in ensuring the design of data collection instruments is applicable nationwide.

In Cetic.br experience, the cognitive interviews follow at least four complementary procedures:

1. Concurrent or retrospective 'think-aloud' interviews: respondents speak their thoughts while answering questions, or recall their thoughts directly afterwards.

2. Probing: asking a follow-up question after each question or group of questions.

3. Paraphrasing: respondents rephrase the question in their own terms.

4. Definitions: asking for respondents to explain key terms (see Note 2 in Box 4 below).

Based on the Cetic.br experience, and following international standards, the following practical guidelines may be useful:

1. Administer at least 20 interviews using each questionnaire, in order to count on a minimal diversity of respondents.

2. The use of controlled environments (a mirrored room) has brought good results.

3. Cognitive interviews are carried out in two phases, allowing different aspects to be evaluated in each phase, and for a revised version of the questionnaire to be tested.

4. Audio and video recording is an important tool.

5. Interviewers should have experience in qualitative approach, and a background in psychology is desirable.

6. Develop a sound process of documentation, including reports on each phase.

Box 4: Capacity building

Another critical aspect to the consolidation of cognitive interview in the Center is the promotion of high-level capacity building efforts. The most important example is the creation of the NIC.br Workshop on Survey Methodology, an annual event designed with the aim of creating a space for the discussion and training in ICT survey methodologies, both through quantitative and qualitative approaches. The Workshop aims to develop conceptual and theoretical skills among producers and consumers of ICT statistics, focusing on methodological rigour in surveys, the application of qualitative and quantitative methods, and techniques of data analysis and presentation (see Note 3). In 2013, a short course on 'Quality survey outcomes: Planning, testing and implementation', administered by Pamela Campanelli from The Survey Coach UK, covered 'What cognitive interviewing is', 'The full range of cognitive interview techniques', 'How to actually conduct a cognitive interview', 'Sampling for and analysis of cognitive interviews' and 'Highlights of current trends and issues in cognitive interviewing methodology'.

Notes

1. In 2012, CETIC.br conducted the Brazilian Kids Online survey (CGI.br, 2014) for the first time to measure risks and opportunities related to internet use among the population aged 9–16. The questionnaires used in the survey were based on those developed for the EU Kids Online, and followed the framework designed by the London School of Economics (LSE) (see www.lse.ac.uk/media@lse/research/EUKidsOnline/Home.aspx). The European questionnaires were translated into Portuguese from the master questionnaires in English and then adapted to the Brazilian context.

2. Adapted from Groves et al. (2009).

3. For more information see http://cetic.br/semana-metodologias-pesquisas/

In addition, field pre-test interviews are carried out to evaluate the flow of the questionnaire, to assess its complexity and the time required for its completion, and to adjust the question-and-answer categories. In this step it is important to measure the average duration of interviews to assess whether the questionnaire is suitable for the target population.

Interview guidelines

Interviewer training is crucial for successful data collection in the field and for the quality of the data produced by the survey. This activity must therefore be 'carefully planned to guarantee uniform performance and comprehension of survey concepts across all interviewers' (Statistics Canada, 2003, p. 183). Interviewers' field supervisors must be trained first, and then train the interviewers.

> **"Interviewer training is crucial for successful data collection in the field and for the quality of the data produced by the survey."**

Adequate interviewer training comprises in-depth discussion of survey objectives, data collection instruments and field materials (questionnaires, guidelines, field manuals, concepts and definitions). Training should also discuss the implications of any additional support resources to be used during the interview such as visual cues and video in order to avoid the risks of influencing the respondent. A poorly trained interviewer can cause interviewer bias and response errors. Moreover, he or she may not be able to address sensitive topics with children.

Particular attention should be paid to the use of appropriate language. In the introduction phase, interviewers should clarify any doubts related to confidentiality and sensitive questions, ensuring that the child is comfortable replying to questions. Interviewers should be able to conduct the interview at home in the presence of parents or legal guardians, as well as at schools in the presence of teachers or school staff. The presence of a third party may strongly influence the children's response.

The nature of the survey questions may influence data collection. As the GKO survey addresses sensitive subjects, it is important to ensure a method of collection that builds-in anonymity (such as self-completion).

For in-depth reading on interview guidelines, please refer to *Survey methods and practices* (Statistics Canada, 2003).

> **"Particular attention should be paid to the use of appropriate language."**

Database

Once the questionnaire has been constructed, a database should be built to enter, store and process the data. Cross-national surveys should share common standards to enable comparable analysis and tabulation.

There are many ways to develop a database application using well-known tools. Some are readily available and free for use with survey samples, such as Epi Info™ from www.cdc.gov and CSPro from www.census.gov.

For the database, the answers to the questions are translated into:

- variables;
- coding answers for each variable.

The program should run some automatic consistency checking on the answers to the questionnaire. This avoids errors in typing and reported answers. The basic consistency refers to the filters that are present in the survey. For instance, non-internet users should not answer questions about internet use.

Documentation

According to Statistics Canada (2003, p. 6), the documentation of the survey should provide 'a record of the survey and should encompass every survey step and every survey phase.' This, therefore, consists of a set of technical documents clearly describing each phase of the process, including:

- a methodological report containing concepts and definitions, survey population, sample design and selection, design of data collection instrument and data processing
- a data analysis report: coding, data file layout, micro database, variables and tables, metadata dictionary and paradata
- a survey report containing main findings and tabulations

- any other documents relevant for data quality control.

Documentation should also include the results of cognitive interviews, results of the pre-testing to assess the effectiveness of the questionnaire (questions flow and time required to reply), experts' proposals to improve the quality of the process, and all field control reports generated during data collection, including:

- field training manuals for interviewers
- instruction manuals for respondents
- performance reports on interviewers
- survey project management report describing the schedule of activities and actions taken by field managers
- specifications for applications, software and functionalities.

The documentation of the survey should be available to management, data users, interviewers, methodologists and data analysts.

Proper documentation increases the quality of the survey and is crucial for the usability of the results. In this context, existing software packages that generate publishable documentation from the metadata reduce a great amount of work and facilitate the dissemination of the results.

The Data Documentation Initiative (DDI) standard provides a structured way to store and exchange metadata created by the survey process, including the question text, interviewer instructions, lists of response categories, and other elements relevant to the survey.

USEFUL ONLINE RESOURCES

Resources provided by the author

Couper, M.P. (2011). The future of modes of data collection. *Public Opinion Quarterly*, 75 (5), 889–908. http://poq.oxfordjournals.org/content/75/5/889.full.pdf+html

de Leeuw, E. (2005). To mix or not to mix data collection modes in surveys. *Journal of Official Statistics*, 21 (2), 233–55. http://isites.harvard.edu/fs/docs/icb.topic1327921.files/DeLeeuw2005.pdf

Additional resources

Afrobarometer (2014). *Survey manual.* www.afrobarometer.org/sites/default/files/survey_manuals/ab_r6_survey_manual_en.pdf

Blakstad, O. (2008, 3 October). Research methodology. *Explorable.com*. https://explorable.com/research-methodology

Child Care & Early Education (no date). *Research connections: Survey research and questionnaires.* www.researchconnections.org/childcare/datamethods/survey.jsp

Dillman, D. A. (1991). The design and administration of mail surveys. *Annual Review of Sociology*, 17, 225–49. http://faculty.washington.edu/jelmore/articles_online/Dillman-Des%26Admin_Ma.pdf

European Social Survey (ESS) Sampling Expert Panel (2014, 29 January). *Sampling for the European Social Survey Round VII: Principles and requirements. European Social Survey*. Guide Version 2. www.europeansocialsurvey.org/docs/round7/methods/ESS7_sampling_guidelines.pdf

Latin American Public Opinion Project (no date). *Survey design.* www.vanderbilt.edu/lapop/survey-designs.php

OECD (2012). Good practices in survey design step-by-step. In *Measuring regulatory performance: A practitioner's guide to perception surveys*. Paris: OECD Publishing. http://dx.doi.org/10.1787/9789264167179-6-en

UK Data Archive (no date). *Create and manage data.* www.data-archive.ac.uk/create-manage

UNICEF (no date). *Multiple indicator cluster surveys.* http://mics.unicef.org/tools

Willis, G. B. et al. (2005). *The use of cognitive interviewing to evaluate translated survey questions: Lessons learned.* Proceedings of the Federal Committee on Statistical Methodology Research conference. 14–16 November. http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.159.5773

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CGI.br (2014). *ICT Kids Online Brazil 2013: Survey on internet use by children in Brazil*. Comitê Gestor da Internet no Brasil. Sao Paulo: CGI.br.

Groves, R.M, Fowler, F.J., Couper, M.P., Lepkowski, J.M., Singer, E. & Tourangeau, R. (2009). *Survey Methodology* (2nd ed.). New York: John Wiley.

Hewett, P.C., Mensch, B.S. & Erulkar, A.S. (2004). 'Consistency in the Reporting of Sexual Behavior Among Adolescent Girls in Kenya: A Comparison of Interviewing Methods'. *Sex Transm Infect*, n. 80 (Suppl II), pp. ii43–ii48.

Pennell, B., Harkness, J.A., Levenstein, R. & Quaglia, M. (2010). Challenges in Cross-National Data Collection. In Harkness, J.A., Braun, M., Edwards, B., Johnson, T.P., Lyberg, L.E., Mohler, P.P., Pennell, B. & Smith. (eds). *Survey methods in multicultural, multinational, and multiregional contexts*. New York: John Wiley.

Statistics Canada. (2003). *Survey methods and practices.* Ottawa: Statistics Canada, Social Survey Methods Division, www.statcan.gc.ca/pub/12-587-x/12-587-x2003001-eng.pdf

Survey Research Center (2010). *Guidelines for best practice in cross-cultural surveys*. Ann Arbor, MI: Survey Research Center, Institute for Social Research, University of Michigan, www.ccsg.isr.umich.edu/

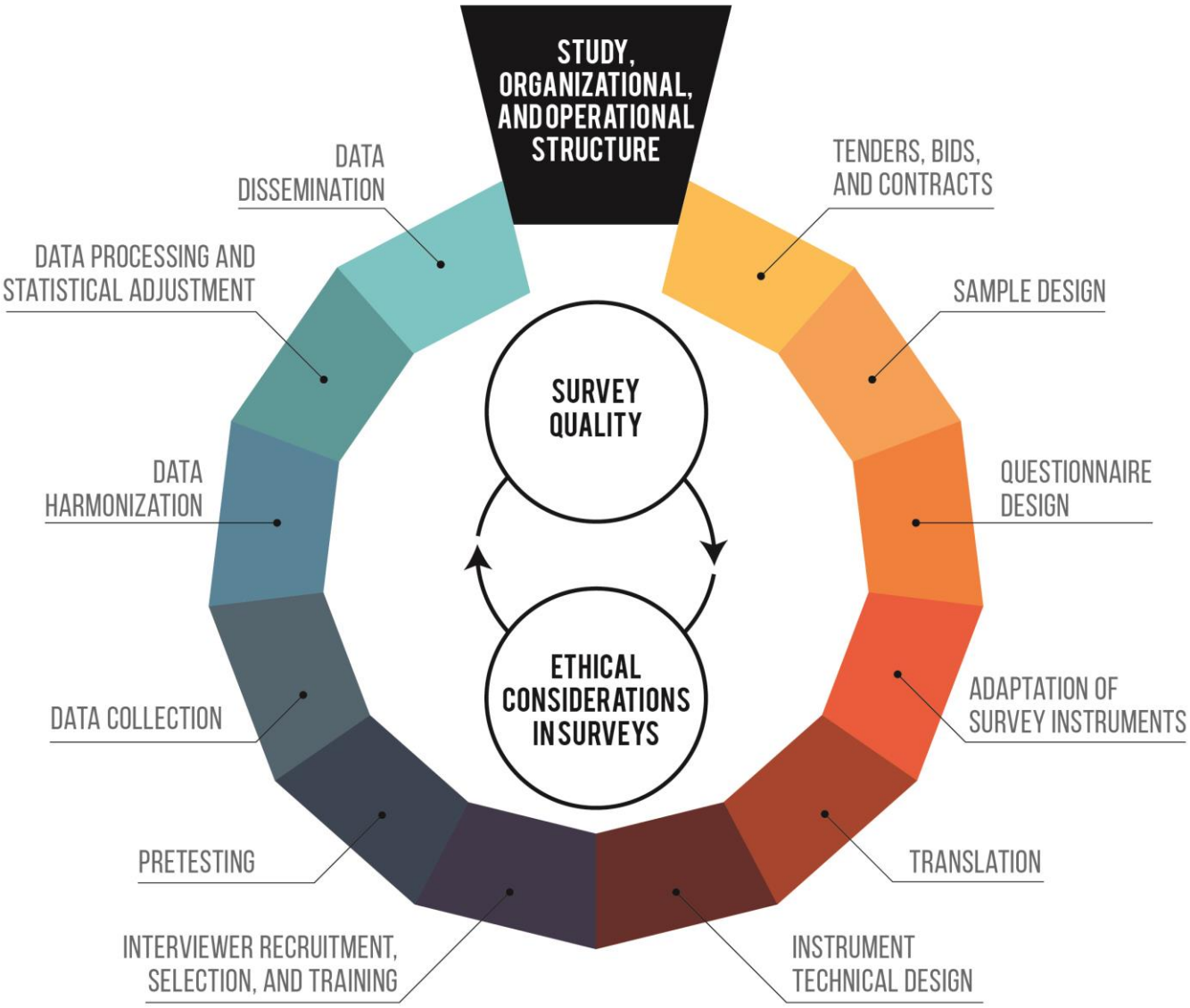
UN (United Nations). (2005). *Household sample surveys in developing and transition countries*. New York: UN.

CHECKLIST

1	DEFINE the objectives of the survey.	☐
2	DEFINE the survey frame and other sources of information.	☐
3	DEFINE an appropriate method of data collection.	☐
4	DESIGN the sampling plan.	☐
5	DEFINE the target population.	☐
6	DEFINE the units of analysis and domains of interest for dissemination.	☐
7	CONDUCT weighting procedures.	☐
8	DESIGN the questionnaire.	☐
9	DISCUSS the questionnaire design with a group of experts.	☐
10	CONDUCT cognitive interviewing and pre-tests.	☐
11	PREPARE the database and data documentation.	☐

For further in-depth reading on the lifecycle of a survey project, please refer to *Guidelines for best practice in cross-cultural surveys* (Survey Research Center, 2010), as shown in Figure 2.

Figure 2: Lifecycle of a survey project



Source: Adapted from Survey Research Center (2010)