# **Health Information System Strengthening:**
Standards and Best Practices for Data Sources

## MODULE 8:

# Population-Based Surveys

This module is one of 12 HIS data source modules in *Health Information System Strengthening: Standards and Best Practices for Data Sources*. The full series of modules (available at https://www.measureevaluation.org/resources/publications/tr-17-225) is intended to provide health authorities and other health information stakeholders with a reference guide that, along with other sources, can help align the HIS data sources with international standards and best practices.

# Type of Data Generated: Risk Factors, Service Coverage, and Knowledge, Attitude, and Practices

## Description

National population surveys produce nationally representative and internationally comparable estimates of demographic, health, and social indicators. The data collection methodology consists of trained enumerators administering interviews using standardized questionnaire instruments to eligible individuals selected in a scientifically designed sample. Interviewers may record responses using paper-and-pencil interviewing (PAPI) or capture them electronically through computer-assisted personal interviewing (CAPI).

Measures derived from these survey data consist of point estimates for indicators expressed as rates, ratios, and probabilities. Each survey estimate has defined confidence bounds that represent the known margin of uncertainty and should be considered when interpreting the significance of key indicators.[17] Confidence bounds take into account sampling error, which is a statistical error associated with any probabilistic sample. Non-sampling errors, on the other hand, are a result of human errors committed while conducting the survey, such as failure to elicit or record correct responses, or mistakes in data entry. The latter type of error cannot be reliably quantified, and great care should be taken to minimize errors through conscientious design, training, and implementation.

## Survey Implementers

The national statistics office (NSO) is usually the agency responsible for conducting a national survey, because it is most likely to have the logistical capacity needed for large-scale data collection operations, including sampling expertise, access to the sample frame, and experience with data entry and database management. The NSO also usually has a roster of available short-term agents to employ for enumeration and data entry. Finally, because the NSO is the producer of official statistics, the results automatically comprise part of the evidence base owned by the government. This is in contrast to an outside entity, independent of the government, whose results may not be readily accepted.

However, the NSO does not have the specialized knowledge of specific areas of health to develop the questionnaire content. Therefore, it is important that specialists from the Ministry of Health and other sectors are involved in the early design stages and in the analysis and interpretation phases.

## Advantages

- **Internationally comparable time-series information.** Survey data can provide health, nutrition, and demographic information on populations, even when national administrative structures are weak, for example, in the absence of a functioning routine health information system or civil registration and vital statistics system.
- **Health inequalities.** Survey data can provide indicators disaggregated by background characteristics that reveal inequalities between geographic areas, socioeconomic groups, and other subpopulations.
- **Determinants of health.** Survey data can link respondents' characteristics to their health outcomes, offering the potential to estimate independent effects of various determinants on health, ill-health, and mortality outcomes.
- **Unique source of population-based information.** Surveys are the most appropriate, if not the only, data source for monitoring health trends in the population, including nonmedical determinants of health, such as exposure to chronic disease risk factors, knowledge about disease transmission and treatment, self-reported health and prevalence of symptoms, and coverage of services.

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[17] Smaller-scale surveys are sometimes conducted using simpler sampling approaches, such as the lot quality assurance sampling approach. Although this is a cost-effective way to establish whether a certain indicator falls above or below a preestablished level, it is not designed to measure trends over time, because population parameters cannot be calculated with statistical precision.

- **Validation of independent data collection mechanisms.** Survey data can produce fertility and mortality measures independent of those generated by the routine vital statistics system. They can therefore validate the completeness of other national data collection systems by comparing levels of comparable measures.

### Disadvantages

Measures generated from national household surveys cannot replace reliable administrative systems for routine data collection for the following reasons:

- **Only a periodic data source.** Surveys provide data usually only about once every five years. The ideal timing of the implementation of a survey may be compromised by weather factors affecting field conditions, availability of financial and human resources, or an election period.
- **Labor and cost intensive.** Surveys are an expensive and labor-intensive operation, and they often rely on external assistance at various phases of implementation, notably for sample and questionnaire design, data processing, and analysis of final data.
- **Imprecision caused by sampling error.** Even the best-designed and best-resourced surveys are subject to sampling error, with imprecision increasing at smaller subnational levels.

## Types of Indicators

Survey data are a unique source of nationally representative information about the population's social and behavioral determinants, health knowledge and healthcare-seeking behavior, and coverage of health services. Core indicator categories include the following:

- Household characteristics, including water and sanitation
- Household members' characteristics, including education level
- Fertility, fertility preferences, and proximate determinants of fertility
- Contraceptive method knowledge and use
- Early childhood mortality
- Maternal and child health and nutrition
- Early childhood development and child disability
- Child protection
- Malaria and HIV/AIDS

Survey modules can also derive information related to domestic violence, health expenditures, maternal mortality, noncommunicable disease risk factors, disabilities, and newborn care.

National household surveys are also a vehicle to collect biomarkers of nutritional status and prevalence of conditions such as anemia, HIV, malaria parasites, and other conditions (MEASURE Evaluation, 2000).

### Alternative Data Sources

The civil registration and vital statistics system should be the primary source of data for the fertility and mortality indicators; the census provides household and household member characteristics every 10 years.

# Standards

National household surveys have their roots largely in the World Fertility Survey (WFS) program, established by the International Statistical Institute in 1973 with funding from USAID and the United Nations Population Fund to complete 42 surveys (Grebenik, 1981). In 1984, the WFS evolved into the USAID-funded DHS Program, which has supported more than 300 surveys conducted in about 90 countries (DHS, n.d.). The DHS Program updates the methodology and instruments continuously according to developments in national and international priorities, new technologies, and ways to obtain the most efficient, high-quality results. Since the mid-1990s, the United Nations Children's Fund (UNICEF) Multiple Indicator Cluster Survey (MICS) is another large-scale household survey program that has supported about 300 surveys conducted in more than 100 countries, focusing on the situation of women and children (United Nations Children's Fund [UNICEF], 2014). The DHS and MICS methodologies and the indicators that are common to both surveys are largely harmonized. In the 2000s, other large-scale surveys using similar methodologies have been the WHO World Health Survey, implemented in 70 countries between 2002 and 2004 (WHO, 2017a); the WHO STEPwise approach to noncommunicable disease risk factor surveillance survey for monitoring noncommunicable disease risk factors, implemented in 102 countries since 2004 (WHO, 2017b); and Eurostat's European Health Interview Survey that member states of the European Union conduct regularly (Eurostat, 2015).[18]

These large-scale surveys apply standard approaches in each phase of survey implementation to obtain reliable data, described as follows:

**Sample design.** A probability sample of households provides valid data, and a two-stage cluster procedure is a typical, cost-efficient approach. In the first stage, primary sample units (PSUs) are selected from an official sampling frame, commonly a census frame, containing a complete and up-to-date list of enumeration areas for the entire target population. Primary sample units are selected randomly using a probability proportional to size method. For each selected PSU, a household listing field operation should be conducted before the survey to update the dwellings and households within the boundaries. In the second stage, a predetermined number of households—usually 20–30—is selected systematically (with a random start) from the final lists of households in each PSU, or cluster (ICF International, 2012; UNICEF, n.d.a).

The sample design provides for sample weights, which are inflation factors that permit the results to be extrapolated to the target population. Sample weights also include a design weight that corrects for nonresponse to reduce response bias. Sample weights are calculated separately for household and individual records.

**Questionnaire design.** The major survey programs such as the ones mentioned above have largely harmonized questionnaire instruments, including the wording of questions, composition of question sets, and questionnaire modules. The International Household Survey Network developed and maintains a question bank to disseminate standard questions and questionnaire modules (International Household Survey Network, n.d.). Indicator definitions and computations are also increasingly aligned among the various survey programs. The standard instruments, usually consisting of a household questionnaire and individual questionnaires, are available online and can be adapted for use in each country (for example, ICF International, n.d.; UNICEF, n.d.b; WHO, n.d.; Eurostat, 2010).

**Data processing and analysis.** Principles of data processing that are currently widely applied are deeply rooted in WFS, DHS, and MICS practices. These major survey programs, as well as censuses and many other surveys, use the Census and Survey Processing System (CSPro) software to process survey data, including data entry, automated consistency checks, editing and imputation, tabulation, and computing sample errors. CSPro has evolved with survey and census data collection and is designed to handle a multitude of complex applications with hierarchical data entry. CSPro applications for processing PAPI or CAPI data are available to download for free from the U.S. Census Bureau International Programs website (United States Census Bureau, 2017).

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[18] EHIS wave 1 was implemented in 17 countries between 2006 and 2009. Wave 2 is under way in 2014. Retrieved from http://ec.europa.eu/eurostat/statistics-explained/index.php/European_health_interview_survey_-_methodology

PAPI data entry should be verified by two different data clerks who enter data independently from all questionnaire instruments (double data entry). The results of both entries are then compared, and any discrepancies are manually resolved.

Final datasets should be recoded into standard recode files for dissemination to outside users. Standard recode files started with the WFS and have been continued by the DHS in order to facilitate cross-country comparisons (ICF, 2013). For example, recode data have allowed multiple DHS datasets to be analyzed efficiently using common variable names, definitions, and comparable response categories.

Standard routines for editing incomplete and inconsistent data, including flagging imputations where necessary, are documented by DHS (Croft, n.d.). Standard calculations of national and global indicators are also published by DHS (Rutstein & Rojas, 2006; Rutstein & Johnson, 2004).

## Best Practices

- A **probabilistic sample** is designed based on an updated sampling frame, with a sample size large enough to ensure adequate precision of key indicators for defined populations.
- Questionnaire instruments are designed based on **standard question sets** to ensure that indicators can be properly computed and are comparable across other data sets.
- In order for field staff to adequately assimilate information, to carry out field practices effectively and design questionnaire instruments correctly (for example, skip patterns and translations), they must receive adequate trainings: include a thorough **pretest training** for senior survey staff and then a **main training** for all field staff.
- As part of data quality assurance during data collection, regular **field check tables** are produced for central office staff to monitor progress and minimize non-sampling errors.
- Software used for **processing survey data** handles complex applications (such as skip patterns), hierarchical files (for example, linking individuals to households), and PAPI or CAPI routines, and it includes automatic consistency checks.
- Final survey data sets disseminate clean and consistent data in **standard recode files,** with any imputed data clearly flagged and described in accompanying documentation.
- **Sample weights** take into account nonresponse rates and are applied separately to household and individual records.
- For users to properly interpret survey results and microdata, **survey metadata** are available that describe the design, implementation, data processing, and analysis.

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This publication was produced with the support of the United States Agency for International Development (USAID) under the terms of the MEASURE Evaluation cooperative agreement AID-OAA-L-14-00004. MEASURE Evaluation is implemented by the Carolina Population Center, University of North Carolina at Chapel Hill in partnership with ICF International; John Snow, Inc.; Management Sciences for Health; Palladium; and Tulane University. Views expressed are not necessarily those of USAID or the United States government. TR-17-225H

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