Multiple Indicator Cluster Surveys: Delivering Robust Data on Children and Women across the Globe

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This article provides an overview of the Multiple Indicator Cluster Surveys (MICS) as a data source. MICS—one of the largest household survey programs focused on children and women—has covered 116 countries, many over several rounds of surveys producing trend data. Data are collected on a range of indicators for children, adolescents, women, and in recent years, men. Topics include fertility, mortality, contraceptive use, unmet need, maternal and newborn health, female genital mutilation, menstrual hygiene management, child illness and treatment, and child development and nutrition, among others. The surveys are cross-sectional and use multistage probability designs to develop representative samples of households at the national and subnational levels. Survey interviews are conducted with: a household respondent who provides data on the household status; women and men aged 15–49 who provide current status and retrospective data on themselves; and mothers (or caregivers) who provide data on children under age 18. Data can be compared across countries and time for the most part, provide a wealth of indicators across research fields, and are open access. Data can be accessed on the MICS website where users are granted access to the MICS datasets for research purposes.

The Multiple Indicator Cluster Surveys (MICS) program is a UNICEF-supported household survey program whose key objective is to monitor the situation of children and women. MICS came into existence during the mid-1990s, providing countries with key survey tools (e.g., questionnaires, a manual for implementation, and sampling guidance). Today, MICS is a full-fledged survey program providing a complete suite of tools

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TABLE 1   Number of MICS surveys by round and region[a]

Round	East Asia and the Pacific	Eastern and Southern Africa	Europe and Central Asia	Latin America and the Caribbean	Middle East and North Africa	South Asia	West and Central Africa	Total
				Region				
MICS1	8	13	5	2	10	7	18	63
MICS2	7	11	10	7	13	4	14	66
MICS3	6	6	13	6	8	1	13	53
MICS4	9	7	10	10	7	5	12	60
MICS5	7	6	9	9	4	6	11	52
MICS6[b]	10	5	17	10	6	7	12	67
Total	47	48	64	44	48	30	80	361

[a]Data as of February 2019, from https://mics.unicef.org/surveys.
[b]Includes surveys planned, completed, and in progress.

and technical assistance for all stages of implementation at the country, regional, and global levels to improve survey capacity. MICS operates in multiyear rounds, generally releasing new tools at the start of a round. The program is currently in the sixth and largest round of surveys (MICS6), with the largest share of surveys in Europe and Central Asia (17 surveys) and West and Central Africa (12 surveys). Further details are provided in Table 1.

SUBJECT AREA AND SUBFIELD

The first two rounds of MICS (mid-1990s and around 2000) provided countries with tools to generate standardized data on World Summit for Children goals, as well as other topics pertinent to child well-being. These surveys covered birth histories, fertility, water and sanitation, breastfeeding, immunization, salt iodization, diarrhea, and other topics (UNICEF 2015). The third round of MICS (2005–09) focused on World Fit for Children goals, Millennium Development Goals (MDGs), and other global frameworks among country-specific topics. The fourth round (2009–13) fulfilled the ever-increasing country need to monitor the MDGs, and the fifth round (2013–16) served as the MDG final assessment. MICS6 focuses on coverage of the Sustainable Development Goals, key frameworks such as WHO's Every Newborn Action Plan, and emerging child and adolescent issues including the use of technology, literacy skills, and child functioning. The alignment of MICS to global goals established the survey program as a trusted mechanism for monitoring. Countries throughout the history of MICS use the surveys to measure localized indicators relevant to children and women, ensuring national ownership and expanding the overall utility of data. The selection of modules (localized or from the standard MICS questionnaires) is done through technical and steering committees at the country level, with technical input from UNICEF. The changing nature of MICS content reflects MICS's priority to remain relevant to the national and global landscape. As a consequence, some key indicators may not be present over all survey rounds, though major topics remain fairly constant.

Most data measure objective, outcome-level indicators. A set of objective tests conducted in the field is also part of these indicators, and includes water-quality testing for *E. coli*, anthropometric measurements for children under age five, and testing cooking salt for iodine. Children aged 7–14 years also participate in a short literacy and numeracy assessment. Usually, data reflect the current status of respondents, though data on some topics such as

TABLE 2   Modules available by questionnaire in MICS6

Household	Individual women aged 15–49	Individual men aged 15–49[c]	Children under age five	Children aged 5–17[e]
Household information panel	Woman's Information Panel	Man's Information Panel	Under-Five Child Information Panel	5–17 Child Information Panel
List of household members	Woman's Background	Man's Background	Under-Five Background	Child's Background
Education [3+]	Mass Media and Information and Communication Technology	Mass Media and Information and Communication Technology	Birth Registration	Child Labor
Household characteristics	Fertility/Birth History	Fertility	Early Childhood Development	Child Discipline [5–14]
Social transfers	Desire for Last Birth	Attitudes Toward Domestic Violence	Child Discipline [1–4]	Child Functioning
Household energy use	Maternal and Newborn Health	Victimization	Child Functioning [2–4]	Parental Involvement [7–14]
Insecticide-treated nets	Postnatal Health Checks	Marriage/Union	Breastfeeding and Dietary Intake [0–2]	Foundational Learning Skills [7–14]
Water and sanitation	Contraception	Adult Functioning [18–49]	Immunization[d] [0–2]	
Hand washing	Unmet Need	Sexual Behavior	Care of Illness	
Salt iodization	Female Genital Mutilation	HIV/AIDS	Anthropometry	
Water Quality Testing[a]	Attitudes Toward Domestic Violence	Circumcision		
GPS[b]	Victimization	Tobacco and Alcohol Use		
	Marriage/Union	Life Satisfaction		
	Adult Functioning [18–49]			
	Sexual Behaviour			
	HIV/AIDS			
	Maternal Mortality			
	Tobacco and Alcohol Use			
	Life Satisfaction			

[a]Covered in a separate questionnaire for selected households per cluster and added to the household questionnaire.
[b]Added at the household level.
[c]Usually implemented in a 50 percent subsample of households.
[d]For countries where all immunization records are kept in health facilities, an additional Form for Vaccination Records at Health Facility is used.
[e]One randomly selected child aged 5–17 was selected for this questionnaire.

marriage, births, and maternal and newborn health reflect past and current status. For example, women report all births in their lifetime and provide the dates of their first marriage, which may have occurred in the distant past. Further data on knowledge and attitudes are also covered for selected topics, such as knowledge of HIV transmission, attitudes toward child discipline, and feelings of safety at home and in the neighborhood. Determinants and background variables, such as household characteristics, wealth, and religion/ethnicity, are also included in surveys.

Questionnaires for MICS6 cover a wide range of topics (see Table 2). Modules found in the questionnaire for children under age five, and for individual women and for individual men, are especially important for population and public-health scientists. These topics include fertility and mortality, contraceptive use and unmet need, maternal and newborn health (capturing numerous continuum of care indicators), female genital mutilation, menstrual hygiene management, child illness and treatment, and child development and nutrition. An outline of modules by round can be found online for comparison over time (UNICEF 2019a).

Due to the range of topics covered, different respondents must be interviewed during the face-to-face interviews. A knowledgeable respondent 18 years of age or older provides data on the entire household. Individual women and men aged 15–49 provide self-reported data, whereas data on children under 5 years of age and aged 5–17 years come from their mothers (or caregivers if mothers do not live in the household or are deceased). The inclusion of caregivers ensures that children, even if orphaned or who do not live with their mothers in the same household are included in estimates.

SAMPLE SELECTION AND SIZE

MICS surveys are representative household surveys; the selected samples reflect the populations from which they are drawn. The surveys are typically designed to have sufficient sample to be representative at the national level and first subnational level (e.g., region), though a growing number of surveys are designed to only cover subnational areas, such as counties and provinces (e.g., Turkana County in Kenya, and Sindh Province in Pakistan) and among special populations such as the Roma (e.g., Bosnia and Herzegovina, Montenegro, and Serbia) and Palestinians in Lebanon (UNICEF 2019b) without covering the entire country.

The MICS approach to sampling is that countries define a set of key indicators for the survey, the domains of reporting, and the desired levels of precision for these domains, and then determine a range of sample sizes to achieve these parameters. These sample sizes are then considered in conjunction with several additional factors related to implementation, such as costs, length of fieldwork, and amount of time available to work on the MICS survey. A final sample size carefully balances these considerations. Sampling tools, which are online (UNICEF 2019c), consider a 95 percent level of confidence and a relative margin of error of 12 percent (which may be relaxed at the subnational level).

The MICS surveys use a multistage sample design based on an existing sample frame, such as the latest population and housing census or a suitable master sample frame. Sample frames are first evaluated for quality (e.g., there are no duplicates, they are complete and up to date). Further, the sample frame must have clearly defined area units, and must include geographic codes, measure of size (households or population), and auxiliary information for stratification. In the first stage of the sample design, census enumeration areas (EAs) are selected using probability proportional to size (though other allocations can be considered). In the second stage, households in the selected EAs are listed to ensure that the measures of size are fully updated (except in cases where an updated list is available from a master sampling frame, another survey, or a recent census, within the last 12 months). From the updated listing, households are selected using random systematic sampling, forming the survey clusters. Clusters have a moderate size of 20–25 households, which reduces design effect. In the final stage, certain individuals are selected (e.g., a random child aged 5–17). Such random selections reduce interview burden and sample sizes, which can become an issue for low-prevalence indicators.

Children under five years of age are a key population for numerous MICS indicators. Thus, particular attention is accorded to ensure that a sufficient sample is available to estimate indicator values. As the MICS program operates in high-, moderate-, and low-fertility

settings, the share of households with children under the age of five varies widely. To compensate for low expected proportions of households with children under age five, the MICS program developed an oversampling method for households with children of this age. The technique was developed in MICS3 and implemented more widely in subsequent rounds, usually in countries in Latin America, the Caribbean, Eastern Europe, and Central Asia. The method involves collecting age information during the household listing, and sampling households with children under age five at a higher rate in the second stage of sampling. Further details and an appraisement of the method's use is available (Megill, Khan, and Hancioglu 2018).

Response rates in MICS are usually high, around 90–95 percent at the household level and child level, and slightly lower at the women's level at around 90 percent. Men's response rates tend to be the lowest, from 70–85 percent, depending on the setting.

HOW AND WHEN DATA WERE COLLECTED

Data from MICS are available from MICS2 to the present, with datasets available for approximately 200 surveys (as of January 2019). MICS data are collected in face-to-face interviews with respondents, based on a set of globally recommended questionnaires that are customized at the country level to meet their specific needs. Country customization can include question deletion or addition along with language customization. MICS surveys are usually implemented by countries every three to five years. Fieldwork takes two to three months and is timed to avoid seasons where transportation is difficult because of weather conditions. As the surveys cover a limited time period, they do not account for seasonality. Trend data is available for about 75 percent of surveys within a country.

All data are now collected using questionnaires on tablets. Paper questionnaires are used only in exceptional circumstances, such as in areas of high insecurity and when there is tablet failure.

DATA QUALITY

MICS utilizes a multipronged approach to data-quality assurance. Interviewers are extensively trained for an average of three to four weeks prior to conducting fieldwork, with only those mastering the tools being selected. Fieldworkers are organized into teams, with a supervisor who coordinates field activities and revisits households for quality control; a driver; three to five interviewers dedicated to collecting data; and a measurer who takes anthropometric measurements of children and tests the quality of the drinking water in households and at the source.

During fieldwork, data are transmitted and stored to a cloud server on a daily basis. Every week, survey managers run field-check tables that measure data-quality indicators, disaggregated by team and interviewer. This allows corrective action to be taken while interviewers are in the field. It is recommended that surveys with major problems halt for interview retraining and other measures as necessary. Field-check tables have been customized and expanded by countries to better suit their field-monitoring needs. In Pakistan, field-check tables have been

automated to create visual results through dashboards, a feature that will soon become the norm for MICS surveys.

Data quality assurance for individual surveys are included as a standard part of the survey process. As part of their survey findings report, countries produce a set of data-quality tables (UNICEF 2018), which cover a range of key indicators that provides users with insight into how well the survey performed.

DATA FORMAT

MICS6 uses several questionnaires: household, women aged 15–49 years, men aged 15–49 years, children under age 5, children 5–17 years, and water-quality testing. Each questionnaire generates at least one microdata file. MICS surveys containing all questionnaire modules produce 10 secondary microdata files: household, household listing, insecticide-treated nets, women, birth history, female genital mutation, maternal mortality, men, children aged 5–17 years, and children under age 5. Each microdata file can be linked to other files based on relationships found in the household listing. Microdata undergo secondary editing that includes structural and consistency checks. No values in the microdata are imputed. Cross-country comparison is preserved by ensuring that country customization uses standard MICS question numbers, even if survey-specific questions are added or removed.

Microdata contain raw and derived variables. Raw variables directly match questions in individual country questionnaires. Derived variables are calculated from various raw variables, or by using external information in the case of sample weights. Sample weights are provided in datasets and are calculated to account for nonresponse, oversampling (where implemented), and subsampling, and are normalized, so that the total number of weighted households is equal to the total number of unweighted households.

Each dataset has anonymous identifiers (cluster number, household number, and line number of the respondent) that are necessary to merge different files (e.g., merge household data into children's datafiles). All cases are provided in datasets, though for replication of figures in MICS tables only completed interviews should be used in analysis.

Datasets are currently made available in SPSS and can be converted easily into other datafile types, such as STATA and R. All data are anonymized and do not include names, locations, and other identifying information. GPS data can be requested directly from countries.

DATA SOURCE LOCATION AND DATA ACCESSIBILITY

Microdata from the MICS surveys are available from two sources. National implementing partners can grant access upon request, under their country-specific data-release policies. UNICEF holds copies of the microdata, and under agreement with national implementing partners grants free data access for legitimate research purposes via the website mics.unicef.org. Access through UNICEF is granted using a brief sign-in process where users provide basic identification and professional information and a brief description of their

intended research activities. Users are provided access for all MICS surveys within one to two days after sign-up and are requested not to redistribute datasets.

On the MICS website, results for each survey become available when national partners publish them (usually through a final report) and provide UNICEF with permission to disseminate the microdata. Data are available for nearly all countries from MICS2 to present. To improve data accessibility and use, UNICEF works with countries to release results within 6 months of the completion of fieldwork, though actual release times vary and average about 12 months for the latest surveys. Countries release results as a main survey report containing the methodological and technical components of the survey, data quality tables, and standard cross-tabulations of key indicators. Countries also prepare thematic Statistical Snapshots that feature key indicators, disaggregations, and key messages.

USAGE

To assist users in analysis, MICS makes SPSS analysis syntax files available to create all standard tables found in the final reports online (http://mics.unicef.org/tools#analysis). Country-specific syntax may be requested directly from the national implementing partners. Data users can send an ad-hoc request for assistance to mics@unicef.org.

In 2019–20, MICS will be producing a MICS Tabulator, an online data platform that will allow users to generate custom tables for single or multiple surveys from MICS2 to present, without the need to download microdata or use statistical software. The MICS Tabulator does not contain predefined results based on selected indicators. Rather, it analyzes standardized microdata using user-defined parameters, allowing users to vary how indicators and disaggregates are defined, along with how missing and "don't know" cases are treated. Data users can export results as MS Excel spreadsheets and via .pdf and .rft formats.

Value of the Data

- **Coverage**: With more than 310 surveys in 116 countries, MICS is one of the largest sources of comparable data on the situation of children and women and a growing source of data on men. Data are often comparable over time, and trend analysis across countries is a possibility. A feature unique to MICS is that the surveys cover low-, middle- and high-income countries, and special populations and geographic areas, including countries that are or have been through an emergency. This is in line with UNICEF's mission to promote and advocate for the well-being of all children. MICS data are unique to numerous countries that are not covered by other survey programs or for which there is no publicly available data.
- **Comparability**: Indicators captured in MICS use internationally agreed-upon approaches that are shared globally, and in other survey programs such as the Demographic and Health Surveys, making analysis across different surveys possible (Hancioglu and Arnold 2013).
- **Wealth of indicators and analytical capability**: High-quality microdata on a range of indicators are provided within several spheres of academic study that are not included in other reproductive and health surveys. Such additional data can be used to further

understand how these variables affect key reproductive and health outcomes. Because data are available for many countries over time, they provide an ideal platform for cross-country analysis and further work on multilevel approaches. Apart from analysis at the micro-level (individual or household), macro-level analysis at the country level can be performed.

- **Open access**: Data are free and access is provided for legitimate research purposes, contributing to a substantial increase in data and publications for the public-health and child-rights evidence base.

REFERENCES

Hancioglu, Attila and Fred Arnold. 2013. "Measuring coverage in MNCH: Tracking progress in health for women and children using DHS and MICS household surveys," *PLoS Medicine* 10(5): e1001391. https://doi.org/10.1371/journal.pmed.1001391.

Megill, David D., Shane M. Khan, and Attila Hancioglu. 2018. "Oversampling of children under-five in low fertility settings." MICS Methodological Paper No. 7. New York: UNICEF. http://mics.unicef.org/files?job=W1siZiIsIjIwMTgvMDkvMjUvM TUvMzkvMDgvNjQ3L01JQ1NfTWV0aG9kb2xvZ2ljYWxfUGFwZXJfNy5wZGYiXV0&sha=852ad914d823106e.

UNICEF. 2015. "Monitoring the Situation of Children and Women for 20 Years: The Multiple Indicator Cluster Surveys (MICS) 1995–2015." New York.

———. 2018. "Survey Findings Report (15 November 2018)." http://mics.unicef.org/tools#reporting.

———. 2019a. "Contents by Survey - UNICEF MICS." 2019. http://mics.unicef.org/contents-by-survey.

———. 2019b. "Surveys - UNICEF MICS." Surveys-UNICEF MICS. http://mics.unicef.org/surveys.

———. 2019c. "Tools - UNICEF MICS." http://mics.unicef.org/tools.

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