Malawi - Malaria Indicator Survey 2012

National Malaria Control Programme - Ministry of Health

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Sampling

Sampling Procedure

SAMPLING FRAME AND STRATIFICATION
Malawi is administratively divided into 3 regions and 28 districts. The 2012 MMIS sample was designed to provide estimates for the country as a whole, for urban and rural areas separately, and for each of the regions:
Northern Region: Chitipa, Karonga, Likoma, Mzimba, Nkhata Bay, and Rumphi
Central Region: Dedza, Dowa, Kasungu, Lilongwe, Mchinji, Nkhotakota, Ntcheu, Ntchisi, and Salima
Southern Region: Balaka, Blantyre, Chikhwawa, Chiradzulu, Machinga, Mangochi, Mulanje, Mwanza, Neno, Nsanje, Mwanza, Neno, Nsanje, Phalombe, Thyolo, and Zomba

Each district is subdivided into traditional authorities. For statistical purposes, each traditional authority is subdivided into standard enumeration areas (SEAs). The 2008 National Population and Housing Census demarcated these SEAs and determined the number of households in each one. The sampling frame of the 2012 MMIS is the list of SEAs developed from the 2008 census, stratified by region and urban and rural strata.

To improve the precision of the trend analysis, the 2012 MMIS was conducted in the same 140 standard enumeration areas (SEAs) selected for the 2010 MMIS.

SAMPLE ALLOCATION AND SELECTION
Sample Allocation
To meet the objective of providing reliable estimates for key indicators of the sample domains, a total sample of 140 SEAs-44 in urban areas and 96 in rural areas- and 3,500 households was allocated among regions in proportion to the 2008 population of each region. Urban areas were over-sampled within regions in order to produce robust estimates for that domain. Therefore, the MMIS sample was not proportional to the population for residence (urban-rural area) and required a final weighting adjustment to provide valid estimates for every domain of the survey.

The SEAs were selected with probability proportional to size from a list of approximately 12,474 SEAs covered in the 2008 census. The SEA size was the number of residential households recorded in the census. Once the households were allocated to the different strata, the number of SEAs to be selected was calculated based on an average cluster take of 25 completed interviews of all respondents.

In the second stage, 25 households were selected in each selected SEA using systematic sampling from a list of households in the SEA. Because it has been almost four years since the census, a fresh household listing was undertaken before the survey was fielded. The National Statistical Office (NSO) assisted in listing the households in the SEAs. As part of this exercise, the listing teams also drew up the necessary maps and recorded the geographic coordinates of each SEA.

SELECTION OF HOUSEHOLDS
The frame of households was obtained from the listing of all households in the selected SEAs. Upon completion of household listing, the households were given new numbers, which were sampling serial numbers assigned to each household in the cluster. The sampling numbers were assigned sequentially within each SEA starting from 1. The total number of households in the SEA was equal to the last serial number assigned.

In summary, the following steps were used to select the households:
- The sampling interval for each category was calculated:
$I = B/b$

where B is the number of households listed in the selected SEA and b is the number of households to be selected in that SEA.
- A random number (R) between 1 and the interval I was generated; the first selection will hence be R.
- The interval to the random number to get the next selection was added.
- The interval was repeatedly added until the desired sample size was achieved.

The sampling procedures are fully described in Appendix A of "Malawi Malaria Indicator Survey 2012 - Final Report" pp.49-52.

Response Rate

Of the 3,500 households selected for the sample, 3,432 were occupied at the time of fieldwork. Sixty-eight dwellings were abandoned and, therefore, were not included in the response rate. Among the occupied households, 3,404 were successfully

interviewed, yielding a total household response rate of 99 percent. In the interviewed households, 2,955 eligible women were identified to be eligible for individual interview and 2,906 were successfully interviewed, yielding a response rate of 98 percent.

Weighting

The Malawi MIS sample was not self-weighted. Due to the disproportional allocation of the sample to the different strata, sampling weights were required to ensure that the sample was representative at the national level. The sampling probabilities at first-stage selection of SEAs and probabilities of selecting the households were used to calculate the weights. The weights of the sample were equal to the inverse of the probability of selection.

Questionnaires

Overview

Three questionnaires were used in the 2012 Malaria MIS: a Household Questionnaire, a Biomarker Questionnaire, and a Woman's Questionnaire. The Household and Woman's questionnaires were based on the model MIS questionnaires developed by the RBM and DHS programs, as well as the 2010 MIS. The model questionnaires were modified to reflect relevant issues of malaria in Malawi in consultation with the Steering Committee, the NMCP, and staff from ICF International. The questionnaires were translated into the two main local languages of Malawi: Chichewa and Tumbuka.

The Household Questionnaire was used to list all the usual members and visitors in the selected households. Some basic information was collected on the characteristics of each person listed, including age, sex, and relationship to the head of the household. The main purpose of the Household Questionnaire was to identify women who were eligible for the individual interview and children age 6-59 months who were eligible for anaemia and malaria testing. The Household Questionnaire also collected information on characteristics of the household's dwelling unit, such as the source of water, type of toilet facilities, materials used for the floor, roof, and walls of the house, ownership of various durable goods, and ownership and use of mosquito nets.

The Biomarker Questionnaire was used to record haemoglobin measurements for children age 6-59 months and results of malaria testing for children under age 5 years. The questionnaire was filled in by the health technician and transcribed into the tablet computer by the team supervisor.

The Woman's Questionnaire was used to collect information from all women age 15-49 years and covered the following topics:
- Background characteristics (age, residential history, education, literacy, religion, dialect)
- Full reproductive history and child mortality
- Prenatal care and preventive malaria treatment for most recent birth
- Prevalence and treatment of fever among children under 5
- Knowledge about malaria (symptoms, causes, ways to prevent it, and types of antimalarials)
- Cost incurred for the treatment of fever in children

No formal field pretest was done for the survey questionnaires because most of the MIS questions had been included in previous surveys in Malawi and the field staff had experience with anaemia and malaria testing in the field and with the use of PDAs for data collection.

Data Collection

Data Collection Dates

Start	End	Cycle
2012-04-02	2012-05-15	N/A

Data Collection Mode

Face-to-face [f2f]

DATA COLLECTION NOTES

Training
The NMCP in collaboration with the DHOs identified 20 interviewers (1 male and 19 females), 20 laboratory technicians (13 males and 7 females), and 10 field team supervisors (9 males and 1 female). In addition, 7 national supervisors from NMCP, Public Health Laboratory, and other stakeholders were identified for overall supervision.

The participants attended a two-week interviewer and supervisor training which took place from 6-23 March 2012 at Kalikuti Hotel in Lilongwe. All the field staff participated in a one-week joint training session, focusing on how to fill out the Household and Woman‘s Questionnaires, mock interviews, and interviewing techniques, as well as on how to locate selected households. Two quizzes were administered to assess how well the participants absorbed the training materials.

During the second week of training, two sessions were done in parallel, one for the interviewers and field supervisors and one for the laboratory technicians. The training of interviewers and field supervisors focused on the use of PDAs for data collection, assigning of households to interviewers using computer tablets, sharing of data among interviewers and supervisors, and submission of data to the central data processing centre at NMCP.

The training of laboratory technicians focused on preparation of blood samples and testing for anaemia using the HemoCue equipment and malaria testing using SD Bioline RDT. The training involved presentation, discussion, and actual testing for anaemia and malaria. The technicians were trained in identifying children eligible for testing, administering informed consent, conducting the anaemia and malaria rapid testing, and making a proper thick blood smear. They were also trained in storing the blood slides, recording test results on the Biomarker Questionnaire, and providing the results to the parents/guardian of the children tested. Finally, the laboratory technicians received a briefing on the epidemiology of malaria in Malawi and correct treatment protocols.

All participants took part in a field practice exercise in households living close to the training site. Finally, all field staff received specific instructions on how to calculate the correct dose of antimalarial medications for children who tested positive for malaria, using the portable scales to determine the child’s weight. Health technicians were also trained on how to record children’s anaemia and malaria results on the respective brochures and how to fill in the referral slip for any child who was found to be severely anaemic.

Fieldwork
Ten teams were organized for field data collection. Each team consisted of one field supervisor, two community health nurses as interviewers, two laboratory technicians, and one driver. The national supervisors were paired; one to focus on the interviewing and the other to perform laboratory procedures.

The NMCP arranged for printing the questionnaires, manuals, consent forms, and other field forms. It also assisted with fieldwork logistics such as obtaining backpacks, identification cards, umbrellas, and other field supplies.

Field data collection for the 2012 Malawi MIS started on April 2, 2012. In order to allow for maximum supervision, all ten teams were visited by the national supervisors at least once in the first two weeks. Fieldwork was completed by mid-May of 2012.

Data Collectors

Name	Abbreviation	Affiliation
National Malaria Control Programme	NMCP	

SUPERVISION

There is one supervisor for each of the 10 data collection teams in the field.

Data Processing

Data Editing

Data for the 2012 Malawi MIS was collected through questionnaires programmed onto personal data assistants (PDAs). The PDAs were programmed by ICFI data processing specialists and loaded with the Household, Biomarker, and Woman's Questionnaires in English and the two main local languages. They were Bluetooth-enabled to facilitate electronic transfer of files, e.g., data from the Household Questionnaires transferred among survey team members and transfer of completed questionnaires to the team supervisor's tablets. The field supervisors transferred data on a daily basis to the central data processing using the Internet. To facilitate communication and monitoring, each field worker was assigned a unique identification number.

The Census Survey Processing Software (CSPro) was used for data editing, weighting, cleaning, and tabulation. In the NMCP central office, data received from the supervisor's tablets were registered and checked against any inconsistencies and outliers. Data editing and cleaning included range checks and structure and internal consistency checks. Any anomalies were communicated to the respective team through their team supervisor. The corrected results were resent to the central processing unit.

Data Appraisal

Estimates of Sampling Error

Sampling errors, on the other hand, can be evaluated statistically. The sample of respondents selected in the 2012 Malawi MIS is only one of many samples that could have been selected from the same population, using the same design and expected size. Each of these samples would yield results that differ somewhat from the results of the actual sample selected. Sampling errors are a measure of the variability among all possible samples. Although the degree of variability is not known exactly, it can be estimated from the survey results.

Sampling error is usually measured in terms of the standard error for a particular statistic (mean, percentage, etc.), which is the square root of the variance. The standard error can be used to calculate confidence intervals within which the true value for the population can reasonably be assumed to fall. For example, for any given statistic calculated from a sample survey, the value of that statistic will fall within a range of plus or minus two times the standard error of that statistic in 95 percent of all possible samples of identical size and design.

If the sample of respondents had been selected as a simple random sample, it would have been possible to use straightforward formulas for calculating sampling errors. However, the 2012 Malawi MIS sample is the result of a multi-stage stratified design, and, consequently, it was necessary to use more complex formulae. Sampling errors are computed in either ISSA or SAS, using programs developed by ICF International. These programs use the Taylor linearization method of variance estimation for survey estimates that are means, proportions, or ratios like the ones in the Malawi MIS survey.

In addition to the standard error, the design effect (DEFT) for each estimate is also calculated. The design effect is defined as the ratio between the standard error using the given sample design and the standard error that would result if a simple random sample had been used. A DEFT value of 1.0 indicates that the sample design is as efficient as a simple random sample, while a value greater than 1.0 indicates the increase in the sampling error due to the use of a more complex and less statistically efficient design. Relative standard errors and confidence limits for the estimates are also calculated.

Sampling errors for the 2012 Malawi MIS are calculated for selected variables considered to be of primary interest. The results are presented in this appendix for the country as a whole, for urban and rural areas, and for the three regions in the country: Northern, Central, and Southern. For each variable, the type of statistic (mean, proportion, or rate) and the base population are given in Table B.1. Tables B.2 through B.7 present the value of the statistic (R), its standard error (SE), the number of unweighted (N) and weighted (WN) cases, the design effect (DEFT), the relative standard error (SE/R), and the 95 percent confidence limits (R2SE), for each variable. The sampling errors for mortality rates are presented for the five-year period preceding the survey for the whole country and for the ten-year period preceding the survey by residence and region. The DEFT is considered undefined when the standard error considering a simple random sample is zero (when the estimate is close to 0 or 1). In the case of the total fertility rate, the number of unweighted cases is not relevant, as there is no known unweighted value for woman-years of exposure to childbearing.

The confidence interval (e.g., as calculated for child has fever in last two weeks can be interpreted as follows: the overall average from the national sample is 0.317, and its standard error is 0.013. Therefore, to obtain the 95 percent confidence limits, one adds and subtracts twice the standard error to the sample estimate, i.e., 0.31720.013. There is a high probability (95 percent) that the true average number of children ever born to all women age 40 to 49 is between 0.291 and 0.344.

For the total sample, the value of the DEFT, averaged over all variables, is 1.8. This means that, due to multi-stage clustering of the sample, the average standard error is increased by a factor of 1.8 over that in an equivalent simple random sample.

The sampling errors are fully described in Appendix B of " Malawi Malaria Indicator Survey 2012 - Final Report" pp.55-58.

Other forms of Data Appraisal

A series of data quality tables are available to review the quality of the data and include the following:

- Household age distribution
- Age distribution of eligible and interviewed women
- Completeness of reporting

The results of each of these data quality tables are shown in Appendix C of "Malawi Malaria Indicator Survey 2012 - Final Report" pp.59-60.

Related Materials

Questionnaires

Malawi 2012 MIS Questionnaire

Title	Malawi 2012 MIS Questionnaire
Country	Malawi
Language	English
Filename	MWI_2012_MIS_Questionnaire_EN.pdf

Reports

Malawi 2012 MIS Final Report

Title	Malawi 2012 MIS Final Report
Author(s)	Ministry of Health, National Malaria Control Programme, Lilongwe, Malawi and MEASURE DHS, ICF International, Calverton, Maryland, USA
Date	2012-11-01
Country	Malawi
Language	English
Filename	https://www.dhsprogram.com/pubs/pdf/MIS13/MIS13.pdf

Malawi 2012 MIS Survey Presentations

Title	Malawi 2012 MIS Survey Presentations
Author(s)	MEASURE DHS
Date	2012-11-01
Country	Malawi
Language	English
Filename	https://www.dhsprogram.com/pubs/pdf/PPT34/PPT34.zip

Technical documents

DHS-V Recode Manual

Title	DHS-V Recode Manual
Author(s)	MEASURE DHS
Language	English
Description	The Recode Manual provides the information necessary to understand these datasets. It describes each data file and contains its associated dictionary and documentation. Each data file and its associated dictionary and documentation are distributed in archived ZIP files, for all available formats (hierarchical and flat). ASCII data and System data files are available for CSPro, SAS, SPSS, and STATA. Users are strongly encouraged to download the DHS recode manual for use with all recode files.
Filename	Recode5DHS.pdf