

# Malaria Behavior Survey

## Analysis Plan

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U.S. President's Malaria Initiative

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## Acronym List

ACT	Artemisinin-based combination therapies
ANC	Antenatal care
HMIS	Health management information system
ICT	Information and communications technology
IPTp	Intermittent preventive treatment of malaria in pregnancy
IRB	Institutional review board
IRS	Indoor residual spraying
ITN	Insecticide-treated net
MDA	Mass drug administration
MOH	Ministry of health
NGO	Non-governmental organization
NMCP	National Malaria Control Program
NSP	National Strategic Plan
PMI	U.S. President's Malaria Initiative
RDT	Rapid diagnostic test
SBC	Social and behavior change
SMC	Seasonal malaria chemoprevention
SP	Sulfadoxine pyrimethamine
USG	United States Government
USAID	United States Agency for International Development

# Introduction

To be effective, malaria social and behavior change (SBC) interventions must be theory-informed and based on empirical, formative data on behavioral determinants (1, 2). The Malaria Behavior Survey (MBS) is a population-based, theory-informed survey that aims to: (i) provide a better understanding of the socio-demographic and ideational (psychosocial) characteristics associated with malaria-related behavioral outcomes in a given country, and (ii) determine the appropriate focus of programmatic activities designed to improve malaria-related behavioral outcomes.

Typically, the study adopts a cross-sectional design and uses structured questionnaires to collect relevant information from a random sample of women and men. The survey targets men and women of reproductive age (15-49 years for women and 15-59 years for men) recruited through a multi-stage sampling process. The sampling design involves successive and random selection of clusters, households, and individuals. Included in the data collection tools are questions about the ideational factors of knowledge, perceived severity, perceived vulnerability, perceived response efficacy, attitudes, perceived self-efficacy, norms, and social interactions related to key malaria-related behavioral outcomes. Such outcomes include access to and use of insecticide-treated nets (ITNs), acceptance of indoor residual spraying (IRS), uptake of intermittent preventive treatment of malaria in pregnancy (IPTp), appropriate care-seeking behaviors for fever in children under-five years of age, and uptake of seasonal malaria chemoprophylaxis (SMC) (3, 4, 5, 6). The data collection tools also include questions on media habits and exposure to SBC interventions with a focus on malaria prevention and treatment.

The data analysis plan for the MBS provides guidance on data management, processing, and reporting to highlight survey results in a manner that will be useful to program managers, implementers, donors, and other stakeholders. It also provides guidance for preparing the indicators presented in the survey report, and the level of analysis expected. It is expected that this analysis plan will help MBS researchers ensure standardized and timely analysis, synthesis, and dissemination of survey results. Before using this Analysis Plan, MBS implementing teams should read all of the documentation provided in the [MBS Toolkit](#), including the Implementation Plan, to ensure robust implementation of the survey and fidelity to the standard methodology.

To understand the role of sociodemographic characteristics associated with malaria-related behavioral outcomes, it is recommended to stratify the data by age, sex, education, economic status, urban/rural residence, and region of the country, as applicable. This plan includes the descriptive analyses to be done, the construction of indices/scores for specific variables, the generation of key indicators, and recommended cross-tabulations and regression analyses using the MBS data.

# Data Processing

The basic approach of the MBS is to collect data that are comparable across countries using standard model questionnaires. Once data have been collected and entered into an electronic database, data cleaning and editing may be required to make the data available for analysis in a coherent and consistent form. The first step towards producing the MBS report tables is to create new variables from the original ones in the data set. New variables are created from existing ones so that the variable names and definitions are, wherever possible, consistent across all surveys without changing the original variables. Also, missing responses are recoded as applicable. In addition, the survey sampling weight and wealth index are created. At this point, a decision will need to be made about what to do with invalid responses, for example, assign them as missing or change them to the median for that variable. It is recommended that the data entry program includes appropriate checks to minimize the occurrence of invalid responses.

## Missing Values

A missing value is defined as a variable that should have a response but does not have a response. There are various ways to deal with missing data depending on the pattern and amount of missing data. Note that responses such as “missing” and “DON’T KNOW” codes should NOT be excluded and instead recoded as the median value of the valid responses on the variable. For response codes such as “not applicable” and “blank”, these values should be excluded when calculating statistics such as means or medians so they do not skew the results. The data entry program should have included appropriate checks to minimize as much as possible the occurrence of missing values.

## Response Rates

In order to calculate survey response rates, the data collection organization should provide detailed information on the number of enumerated eligible households/respondents, as well as the numbers approached and enrolled into the study. The survey response rate is the total number of households/respondents enrolled divided by the numbers approached. This value should be included in the MBS report. If the survey response rate is lower than expected, there may be a non-response bias in which there are distinct differences between survey participants and those who did not participate. This information is useful in determining ideal sample size for future similar surveys in the country. More importantly, a lower-than-expected survey response rate implies that efforts to promote awareness and cooperation of households and respondents should be increased in future community entry process.

Response rates for individual questions can be explored from the frequency distribution of participant responses. The majority of the questions in the MBS include a “DON’T KNOW”/“don’t remember” as well as a “refused to answer” option. Thus, a frequency distribution of the response options can help the data managers and other stakeholders compare non-response rates across subgroups and identify if certain types of questions seem to be better less

understood or more sensitive in certain areas or among certain subgroups of respondents. The decision about how to handle the respondents with “no response”, will depend on the non-response rate. Where the non-response rate is high (e.g., higher than 10%), data analysts may decide to attribute the median response (for quantitative responses) or the modal response (for qualitative responses) to respondents with non-response. Where the non-response rate is low, data analyst may exclude these cases from the analysis.

## Sampling weights

Sampling weights are adjustment factors applied to the data to adjust for differences in the probability of selection and interview between cases in a sample. Sampling weight can be calculated from the inverse probabilities of clusters, households and individuals being selected (7). The research firm should supply you with the numbers needed to calculate these probabilities. The sampling weight is typically applied to survey data in order to estimate behavioral and ideational outcomes at a population level. The MBS sample is a multi-stage stratified clustered sample, therefore weights are calculated based on the sampling probabilities for each stage and also account for non-response. In addition, the weights should be calculated differently for men and women surveyed based on the differential sampling strategies.

### Women’s Survey Weights

Sampling strategy: In the MBS, all women are sampled from all households selected within each cluster. Thus the household and women’s individual weights are the same.

For the calculation, the following notations are used:

$P_{1i}$ : first stage’s sampling probability of the  $i^{th}$  cluster

$P_{2hi}$ : second-stage’s sampling probability of  $h^{th}$  households within the  $i^{th}$  cluster

$c_i$  is the number of clusters selected in each district/region and  $\sum C_i$ , the total number of clusters in the district/region.

The probability of selecting the  $i^{th}$  cluster is calculated as follows:

$$P_{1i} = \frac{c_i}{\sum C_i}$$

$h_i$  is the number of households selected in the  $i^{th}$  cluster .

$\Sigma_{hi}$  the total number of households in the  $i^{th}$  cluster according to the sampling frame.

The second stage's selection probability for each household in the cluster is calculated as follows:

$$P_{2hi} = \frac{h_i}{\Sigma_{hi}}$$

The overall selection probability of each household in cluster  $i$  is therefore the product of the selection probabilities:

$$P_{hi} = P_{1i} \times P_{2hi} = \frac{C_i h_i}{\sum c_i \Sigma_{hi}}$$

The sampling weight for each household in cluster  $i$  is the inverse of its selection probability:

$$W_{hi} = 1/P_{hi}$$

The survey targets all women in the selected households. As such, the probability of selecting any woman is the same and equal to the probability of selecting the household ( $W_{hi}$ ).

### Men's Survey Weights

Sampling strategy: Only one man was selected in every third household selected within each cluster. Therefore, an adjustment of the sampling weights for men was necessary to account for the individual probability of being selected within the household as well as the probability of the household being selected from the cluster.

For the calculation, the following notations were used:

$P_{1i}$  1<sup>st</sup> stage's sampling probability of the  $i^{th}$  cluster

$P_{2hi(m)}$  2<sup>nd</sup> stage's sampling probability of  $h^{th}$  male survey household within the  $i^{th}$  cluster

$P_{3jhi(m)}$  3<sup>rd</sup> stage's sampling probability of  $j^{th}$  man in the  $h^{th}$  male survey household within the  $i^{th}$  cluster

The total selection probability of men is the product of the selection probability for the household and the individual. Thus, the second stage's selection probability for each household where a man is surveyed in the cluster is calculated as follows:

$$P_{2hi(m)} = \frac{h_{i(m)}}{M_{hi}}$$

where  $h_{i(m)}$  is the number of the households selected for a men’s survey (typically a third of all households selected for the women’s survey).  $M_{hi}$  remains the total number of households within the cluster.

The third stage’s selection probability for the individual man surveyed is calculated as follows:

$$P_{3jhi(m)} = P_{1i} \times P_{2hi(m)} \times \frac{j_i}{\sum j_i}$$

where  $j_i$  is the number of men surveyed in each household and  $j_i=1$  for all households selected (per MBS protocol) while  $\sum j_i$ , the total number of eligible men within the household.

The sampling weight for each man in each cluster is the inverse of its selection probability:

$$W_{jhi(m)} = 1/P_{3jhi(m)}$$

A spreadsheet containing all relevant sampling parameters and selection probabilities will need to be constructed by the researchers to facilitate the calculation of the sampling weights. Cluster, household and individual sampling weights are obtained from the above calculations. These weights are further normalized at the national (for nationally representative samples) or regional (for regionally representative samples) levels to produce weighted cases for both households and individuals at national level. The normalized weights are valid for estimation of proportions and means at any aggregation levels; for example, provincial or zonal levels.

## Data Structure

It is important to note that the three questionnaires used in the MBS will yield three different datasets. It is imperative to be able to link these three datasets to allow for a comprehensive analysis of the data. For each household, a unique household identifier should be present in the household, women’s, and men’s datasets. This is important because the analysis requires importing variables from household questionnaire into the women’s and men’s dataset. This should be done automatically during data collection using a data capture program that allows for all the interviews conducted in a household to be entered as components of a single large questionnaire for that household. Upon review of several data entry programs available, SurveyCTO or CPro are recommended as the best options for the MBS for this reason.

# Data Analysis

This section presents an overview of the data analysis methods for key indicators generated from the standard MBS. It includes the following sub-sections: study population description, cross-cutting determinants of behavior, ITNs, malaria in pregnancy, case management, IRS, and SMC. In certain instances, there may be country-specific modules outside the scope of the standard MBS questionnaire, which are not included in this analysis plan. In such situations, some of the procedures described below can be adapted. For these instances, in the case where the Johns Hopkins Center for Communication Programs implements the particular survey, that implementing team can provide guidance on analysis of country-specific modules not included here.

When carrying out the data analysis procedures described below new variables should be created, and the original variables should remain unedited. In all instances where clone or recode is mentioned, please note that new variables should be created. Data disaggregation of variables is required to identify particular subgroups of interest in relation to behavioral antecedents as well as outcomes. It is recommended to stratify the data by age, sex, education, socio-economic status, urban/rural residence, and region of the country, as applicable.

## Study Population Description

### Household Characteristics

Indicator/Information	Question No.	Notes on Calculation
Total number of household members	Household member listing form	This is the sum of people on the household listing form. In most MBS datasets, the information derived from the household listing form comes in a wide format with individual household members and their characteristics listed one after the other. The data analysis procedure starts with extracting the individual household member information from the household data set and reshaping the data to make the household member the observation rather than the household.
Number of sleeping rooms	Household Questionnaire (HH): HH101	Clone the variable and examine distribution of non-missing data. Recode <sup>1</sup> missing data or “DON’T KNOW” as described above.
Number of people per sleeping room	HH101, Household member listing form	Divide the number of rooms used for sleeping by the total number of household members
Main material of the dwelling floor.	HH102	Clone the variable and examine distribution of each response option.
Main material of the roof.	HH103	Clone the variable and examine distribution of each response option.

<sup>1</sup> In all instances where clone or recode is mentioned, please note that new variables should be created.

Distance in kilometers to various health facilities	HH104A	Clone the variable and examine distribution of non-missing data. Replace missing data with an applicable value. Recode the data by grouping responses as appropriate.
Time (minutes) to walk to various health facilities	HH104B	
Time (minutes) by car/bus to nearest health facilities	HH104C	
Proportion of households that are near health facilities	HH104A-C	The best measure of access to facility (distance versus time) should be decided in collaboration with NMCP or key stakeholders and should reflect the context of the communities. Conditions for determining nearness to a facility should be discussed and agreed with NMCP or other relevant MOH agencies. For example, households near health facilities can be defined as those located less than 5 kilometers away OR less than 30 minutes on foot, OR less than 10 minutes by car. The numerator is all households near health facilities according to the locally defined definition of “near” and the denominator is all households.
Main material of the exterior walls	HH105	Clone the variable and examine distribution of each response option.
Proportion of respondents who have closed eaves on their house or building.	HH106	Clone the variable and recode 1 and 2 as 0 and 4 as 1. The numerator is all respondents who have a closed eaves. The denominator is all respondents.
Proportion of respondents who have a complete and sealed ceiling for their house	HH107	Clone the variable and recode 1 and 2 as 0 and 3 as 1. The numerator is all respondents who have a complete and sealed ceiling. The denominator is all respondents.
Proportion of respondents who have a completely sealed house against mosquito entry.	HH108	Clone the variable and recode 2,3,4 as 0. The numerator (hh108=1) is all respondents who have a completely sealed house against mosquito entry. The denominator is all respondents.
Primary material used to board up, glaze or screen windows or airbrick gaps.	HH109	Clone the variable and examine distribution of each response option.
Proportion of respondents who have electricity in the household	HH110	Clone the variable and recode 2 as 0. The numerator is the total number of respondents who have electricity in the household. The denominator is all respondents.
Appliances in the household that are in good working order	HH111	Clone each variable and recode 2 as 0. Examine distribution of each response option.
Items owned by members of the household	HH112	Clone each variable and recode 2 as 0. Examine distribution of each response option.
Proportion of respondents whose household members own agricultural land.	HH113	Clone the variable and recode 2 as 0. The numerator is total number of respondents whose household members own agricultural land and the denominator is all respondents.
Number of hectares of agricultural land that household members own	HH114	Clone variable. Assign the median of the numerical values to “DON’T KNOW” responses.

Proportion of respondents whose household owns any livestock, herds, other farm animals, or poultry.	HH115	Clone the variable and recode 2 as 0. The numerator is total number of respondents whose household owns any livestock, nerds, farm animals or poultry and the denominator is all respondents.
Number of livestock in household	HH116	Clone each variable and recode 00 as 0. Calculate the frequency of each response.
Household wealth quintile	HH102- HH105; HH110-HH116	Clone and recode each question so that the distribution of responses is captured within a smaller number of response categories. Use principal component analysis to assign each household a wealth quintile Please see <a href="#">Steps to constructing the new DHS Wealth Index</a> for more information on wealth indices (8).
Proportion of respondents who reported that someone asked to spray the interior walls against mosquitos within the last 12 months.	HH118	Clone the variable and recode 2 and 8 as 0. The numerator is total number of respondents who reported that someone asked to spray the interior walls against mosquitos within the last 12 months and the denominator is all respondents.
Proportion of respondents who reported that their interior walls were sprayed against mosquitos within the last 12 months.	HH119	Clone the variable and recode 2 and 8 as 0. The numerator is total number of respondents whose interior walls were sprayed against mosquitos within the last 12 months and the denominator is all respondents.
Organizations that sprayed the dwelling	HH120	Clone variable and examine distribution of responses.
Proportion of respondents who reported that they repainted, replastered, or washed the walls since they were sprayed against mosquitos.	HH119, HH121	Among respondents whose dwelling was sprayed (HH119=1), clone HH121 and recode 2 and 8 as 0. The numerator is total number of respondents who repainted, replastered, or washed the walls since they were sprayed against mosquitos and the denominator is all respondents whose dwelling was sprayed.
Main reasons why the dwelling was not sprayed	HH122	Clone variable and examine distribution of responses.
Time that houses in the community were last sprayed.	HH123	Clone variable and examine distribution of responses.
Proportion of respondents who report that their household has mosquito nets that can be used while sleeping,	HH124	Clone variable and recode 2 as 0. The numerator is all respondents who have mosquito nets that can be used while sleeping and the denominator is all respondents.
Number of mosquito nets in household.	HH125	Clone variable and examine distribution of responses.

## SECTION 1: Respondent's Characteristics

Indicator/Information	Question No.	Notes on Calculation
Woman/man's age	Woman's Questionnaire (W) 101. Men's Questionnaire (M) 101	Clone variable and examine distribution of data. Replace missing responses with an appropriate value.
Woman/man's highest level of formal education completed	W102-W103, M102-M103	Consider combining categories, as appropriate. Calculate the frequency of each response option.
Woman/man's religion	W104, M104	Calculate the frequency of each response option.
Woman/man's current marital status	W105, M105	Consider combining categories, as appropriate. For example, married and cohabiting can be combined. Also, divorce, separated, widowed can be put in the same category. Calculate the frequency of each response option.
Number of live births among women	W106-W107	Clone variable and recode to 0 if 106 is 2 or if 107 is 00.
Number of children born among men	M106-M107	Clone variable and recode to 0 if 106 is 2 or if 107 is 00.
Proportion of women with live births that are still alive	W108	Clone variable and recode to 0 if 108 is 00. All other responses should be recoded to 1. The numerator is all respondents who have at least one living child and the denominator is all respondents.
Proportion of men who accompanied their pregnant spouse/partner to the health facility for ANC	M108	Clone variable and recode to 0 if response is 2 or 3. The numerator is all respondents who accompanied their pregnant spouse/partner to the health facility for ANC and the denominator is all respondents whose spouse has ever been pregnant.
Proportion of women with live births in the past five years.	W109	Clone variable and recode to 0 if 109 is 00. Recode all the other responses to 1. The numerator is all respondents who have had at least a child in the last five years and the denominator is all respondents.
Proportion of women with live births in the last two years	W110	Clone variable and recode to 0 if response is 2. Divide the number of women with live births in the past two years by the total number of respondents.
Proportion of currently pregnant women	W111	Clone variable and recode to 0 if response is 2 or 9. The numerator is currently pregnant women, and the denominator is all respondents

## SECTION II: Use, Purchasing, Repurposing, and Disposal of Nets

Indicator/Information	Question No.	Notes on Calculation
Proportion of respondents who sleep under a mosquito net every night	W201, M201	Clone variable and recode every night as 1, and all other options as 0. The numerator is all

		respondents who sleep under a mosquito nets every night and the denominator is all respondents.
Mean sleep time and wake time <sup>3</sup>	W202, W203; M202, M203	Clone variables. Calculate the mean sleep time and wake time. If the response uses a 24-hour clock, subtract 12 from the hour that the respondent went to bed in the evening to convert it to a 12-hour system. For example, 22H00 is same as 10PM.
Proportion of respondents who slept only or partly outdoors <sup>2</sup>	W204; M204	Clone variable and recode 1 as 0 and 2 or 3 as 1. The numerator is the number of respondents who slept only or partly outdoors the previous night while the denominator is all respondents.
Proportion of respondents by sleeping location and time <sup>2</sup>	W202-W206 M202-M206	Clone variables. For each hour of the day, generate a variable that equals 1 if the respondent is asleep. Also, for each hour of the day, generate a variable that equals 1 if the respondent is indoors. Use these two groups of variables to create a 24-hour spectrum and calculate the proportion of respondents in the following categories: outdoors and asleep, indoors and asleep, outdoors and awake, indoors and awake. This indicator categorizes respondents based on their potential exposure and when they could potentially be protected by an ITN. (9, 10)
Proportion of respondents who spent nights away from their house in the past 2 weeks.	W207, M207	Clone variable and recode “NO” and “DON’T KNOW” responses as 0. The numerator is the number of respondents who spent nights away from their house in the past 2 weeks and the denominator is all respondents.
Number of nights respondents spent away from their houses in the past two weeks.	W208, M208	Clone variable and calculate the mean of the responses. Assign the median of the numeric responses to “DON’T KNOW” responses.
Proportion of respondents who slept only or partly outdoors when they spent time away from their houses in the past two weeks.	W209, M209	Among respondents who spent nights away from their houses in the past 2 weeks (207=1), Clone variable and recode 2 or 3 as 1. The numerator is the number of respondents who slept only or partly outdoors when they spent nights away from their houses in the past two weeks while the denominator is all respondents spent time away from their houses in the past two weeks.
Proportion of respondents who slept under a mosquito net every night when away from their house in the past 2 weeks.	W210, M210	Among respondents who spent nights away from their houses in the past 2 weeks (207=1), Clone variable and recode options 2, 3, 4 and 9 as 0. The numerator is all respondents who sleep under a mosquito nets every night when away from their house in the past 2 weeks and the denominator is

<sup>2</sup> The rationale for these indicators is to be able to categorize respondents based on their potential exposure and when they could potentially be protected by an ITN. This can subsequently be overlaid with ITN use. These questions are also designed to capture the time people went inside to sleep at night and/or came outside for the day in the morning. This allows for estimates of hours during which they may be exposed to vectors. If entomological data from the study location on mosquito biting rates and times is available, this data may be triangulated to assess risk of vector exposure.

		all respondents who spent nights away from their house in the past 2 weeks.
Proportion of respondents who sleep outside during various months of the year.	W211, M211	Clone variable and create a variable for each response option that equals 1 if that option is selected. The numerator is all respondents who sleep outside during various months of the year, and the denominator is all respondents
Proportion of respondents who use a mosquito net every night when sleeping outside	W212, M212	Among respondents who sleep outside anytime of the year (211 is not equal to “no months”), Clone variable and recode options 2, 3, 4, and 99 as 0. The numerator is all respondents who sleep under a mosquito net every night when sleeping outside and the denominator is all respondents.

### Net Purchasing and Replacement

Indicator/Information	Question No.	Notes on Calculation
Proportion of respondents who know where they can purchase mosquito nets in their community.	W213, M213	Clone and recode “NO” response as 0. The numerator is the number of respondents who know where they can purchase mosquito nets in their community and the denominator is all respondents.
Average number of months respondents use mosquito nets before replacing them.	W213B, M213B	Calculate the mean of the numeric responses. Assign the median to “DON’T KNOW”.
Proportion of respondents who immediately start using free new nets when received from mass campaign or elsewhere.	W214, M214	Clone variable and recode 2 as 1. Recode all other responses as 0. The numerator is the number of respondents who immediately start using free new nets when received from mass campaign or elsewhere and the denominator is all respondents.
Proportion of respondents willing to buy a mosquito net if they are not available for free.	W214a, M214b	Clone and recode “NO” responses as 0. The numerator is the number of respondents willing to buy a mosquito net if they are not available for free and the denominator is all respondents.
Proportion of respondents who repurpose nets once they are no longer useful for sleeping under	W215, M215	Create a variable that equals 1 if “reused for other purpose” is selected. The numerator is all respondents who repurposed nets once they were no longer useful for sleeping under and the denominator is all respondents who had a net that was no longer useful for sleeping under.
Proportion of respondents who repurpose nets for various uses once they are no longer useful for sleeping under	W216, M216	For each response option, create a variable that equals one if that option is selected. The numerator is all respondents who repurposed nets for specific uses and the denominator is all respondents who repurposed nets once they were no longer useful for sleeping under.

Reasons for which respondents repurposed nets	W217, M217	For each response option, create a variable that equals one if that option is selected and 0 if not selected.
Proportion of respondents who report that they roll up or tie their nets when not in use.	W218, M218	Clone variable and assign 1 for responses where option C was selected. Assign all others as 0. The numerator is all respondents who report that they roll up or tie their nets when not in use and the denominator is all respondents.

### SECTION III: Use of Health Services

Indicator/Information	Question No.	Notes on Calculation
Proportion of women who reported going to ANC when pregnant with their youngest child.	W110, W302	Among women with at least one child in the last 2 years (W110=1) Clone W302 and recode "NO" and "DON'T KNOW" responses as 0. Numerator is all women with at least one child in the last 2 years who reported going to ANC during their last pregnancy and the denominator is all women with at least one child in the last 2 years
Proportion of women who reported not going to ANC for various reasons when pregnant with their youngest child.	W302B	Among women who reported "NO" for W302, create a variable for each response and code as 1 if that response is selected. The numerator is all women with at least one child in the last 2 years who reported not going to ANC for various reasons and the denominator is all women with at least one child in the last 2 years.
Proportion of women who reported seeing various health professionals during their ANC visit.	W303	Among women with at least one child in the last 2 years (W110=1) who reported going to ANC when pregnant with their youngest child (W302=1), create a variable for each response and code as 1 if that response is selected. The numerator is all women with at least one child in the last 2 years who reported seeing various health professionals during their ANC visit and the denominator is all women with at least one child in the last 2 years.
Proportion of pregnant women with at least one child in the last 2 years who obtained antenatal care from a health facility or a community health worker.	W110, W304	Among women with at least one child in the last 2 years (W110=1), clone W304 and recode as 1 if the response to 304 is health facility or community health worker (W304=11-13, 21-23 or 31-33), otherwise recode as zero. The numerator is the number of women with at least one child in the last 2 years who obtained prenatal care from a health facility or community health worker during their last pregnancy and the denominator is all women with at least one child in the last 2 years

Proportion of women with at least one child in the last 2 years who attended at least four/eight <sup>3</sup> ANC visits during last pregnancy	W110, W305	Among women with a live birth in the last two years (W110=1), clone and recode W305 as 1 if they attended four (or eight) or more ANC visits during last pregnancy depending on country policy. Code other women with live birth but fewer than four (or eight) visits as 0. The numerator is all women with at least one child in the last 2 years who attended at least four/eight ANC visits (as applicable) during their last pregnancy and the denominator is all women with at least one child in the last 2 years.
Proportion of male caregivers who accompanied wife/partner to ANC visit the last time she was pregnant	M105, M108	Among men who are partnered (M105=1), clone variable and recode 2 as 0 and 3 or 8 as missing. The numerator is the number of partnered men who accompanied their wife/partner to an ANC visit during the last pregnancy and the denominator is the number of partnered male respondents whose wife/partner attended antenatal care.
Average reported month of gestation at first ANC attendance.	W306	Among women with a live birth in the last two years (W110=1), clone variable and calculate the mean months of pregnancy. Assign the median of the numeric response options to "DON'T KNOW".
Proportion of women with at least one child in the last 2 years who reported attending first ANC during the first trimester of pregnancy.	W306	Among women with a live birth in the last two years (W110=1), clone variable and assign the median of the numeric response options to "DON'T KNOW". Recode 0 – 3 as 1 and other response options as 0. The numerator is women with a live birth in the last two years who reported going to ANC within the first three months of pregnancy and the denominator is all women who reported a live birth in the last 2 years.
Proportion of women who reported not going to ANC earlier during their last pregnancy for various reasons.	W307	Among women with a live birth in the last two years (W110=1), who reported going to first ANC after 3 months of pregnancy (W306>3), create a variable for each response and code as 1 if that response is selected and 0 if not selected. The numerator is women with a live birth in the last two years who reported going to first ANC after 3 months of pregnancy for various reasons and denominator is all women with a live birth in the last two years who reported going to first ANC after 3 months.
Proportion of women with at least one child in the last 2 years whose husband/partner accompanied them to an ANC visit	W105, W110, W302, W308	Among women who are partnered (W105=1) with at least one child in the last 2 years (W110=1) and at least one ANC visit (302=1), clone W308 and recode 2 as 0. The numerator is the number of

<sup>3</sup> Number of ANC visits used in this indicator should reflect the country policy.

		partnered women with at least one child in the last 2 years who attended at least one ANC visit and had their husband/partner accompany them and the denominator is the number of partnered women with at least one child in the last 2 years who attended at least one ANC visit
Proportion of pregnant women who received a mosquito net during ANC	W309	Clone variable and recode 2 and 9 as 0. The numerator is all pregnant women who received a mosquito net during ANC and the denominator is all women who gave birth in the last 2 years.
Proportion of women who do not take IPTp for various reasons	W311, W312	Among women who did not take IPTp (W311=2 or 9), clone W312 and for each response option, create a variable that equals 1 if that option is selected or 0 if not selected. The numerator is the number of women who did not take IPTp for specific reasons (as applicable) and the denominator is the number of women with at least one child in the last 2 years who did not take IPTp in their last pregnancy.
Number of SP doses received by women with at least one child in the last 2 years during their last pregnancy	W110, W311, W313	Among women with a live birth in the last two years (W110=1), clone W313. Assign 0 to women that did not take any dose of SP (W311=2 or 9). Calculate the median number of SP doses base on the numeric responses. Assign the median of the numeric response options to "DON'T KNOW".
Proportion of pregnant women with at least one child in the last 2 years who obtain SP from various sources	W110, W311, W314a-W314f	Among women with at least one child in the last 2 years (W110=1) who received SP (W311=1), clone W314a- W314f and create a variable that equals one if that option is selected or 0 if not selected. The numerator is the number of women who took SP from specific sources (as applicable) and the denominator is the number of women with at least one child in the last 2 years who took SP in their last pregnancy.
Average cost women paid for SP at the health facility, among those who paid	W314a, W314b, W315, W316	If woman received the SP at a health facility (W314a or 314b =1) and paid for it (315=1), calculate the mean of all non-missing prices values of W316. Assign the median of the numeric responses to "DON'T KNOW".
Proportion of women who intend to have more children.	W317	Clone variable and recode 2 and 9 as 0. Numerator is all women intend to have more children and the denominator is all women respondents.
Proportion of women who intend to attend at least four (or eight) ANC visits during their next pregnancy in the next two years.	W317, W317b	Clone W317b and create a variable among women who responded yes to W317. This indicator will depend on the country policy. If country policy mandates at least 4, then recode 4 or higher as 1 and 3 or lower as 0. If the policy mandates at least 8, then recode 8 and higher as 1

		and 7 and lower as 0. "DON'T KNOW" responses should be assigned as missing.
Proportion of women who intend to attend first ANC during the first trimester of pregnancy in the next two years.	W317, W317c	Among women who intend to have more children (W317=1), clone W317c and recode "DON'T KNOW" as missing. Recode 0 – 3 as 1 and other response options as 0. The numerator is women who intend to go to ANC within the first three months of pregnancy and the denominator is all women who intend to have another child.
Proportion of women who intend to take IPTp in their next pregnancy	W317, W318	Among women who intend to have more children (W317=1), clone W318. Responses of 2 and 9 should be recoded as 0. Responses of 1 or "yes" should be left as 1.  The numerator is all women respondents who intend to have more children and will take IPTP for their next pregnancy and the denominator is all women respondents who intend to have more children.

### Behavioral Outcomes Related to Malaria Case Management

Indicator/Information	Question No.	Notes on Calculation
Number of children less than five years old for whom the respondent is the primary caretaker.	W319	Calculate the mean of the numeric responses.
Proportion of women with at least one child under five years old with fever in the past two weeks.	W320	Clone W320 among those with at least one child under 5 years old (W319=1 or more). Recode "no" and "DON'T KNOW" as 0. The numerator is number of women who reported that at least 1 child in their care has been sick with fever in the past 2 weeks and the denominator is all women respondents.
Number of children under five years old with fever in the past two weeks	W321	Clone W321 and assign as missing if the response is "DON'T KNOW".
Age of child under five years old with fever most recently in the past two weeks.	W323	Among women with a child under five years old with a fever in the past two weeks (W321=not 0 or missing), clone the variable. Convert the responses to months by dividing the weeks by 4 and multiplying the years by 12. Calculate the mean of the numeric responses.
Proportion of children under five years old with fever in the past two weeks for whom treatment was sought the same or next day following the onset of fever	W324, W324a	Clone both variables and create a new variable among women with a child less than five with a fever in the past two weeks (W321= not 0 or missing). For women that meet this condition, then create a variable that is equal to 1 if either W324=1 or W324a =1. Recode this variable as 0 if W324=2 and W324a =2. The numerator is the number of women who responded that they sought treatment for their child

Indicator/Information	Question No.	Notes on Calculation
		under five years old with fever in the past two weeks and the denominator is number of women who had a child with fever in the last two weeks.
Proportion of children under five years old with fever in the past two weeks for whom treatment was not sought for various reasons.	W324b	Among women with children less than five with a fever in the past two weeks (W321=not 0 or missing) and who did not seek advice or treatment for the febrile child (W324=2 and W324a =2), clone and create variables for each response option that equals one if that option is selected. The numerator is number of women who responded that they did not seek treatment for various reasons for their child under five years old with fever in the past two weeks and the denominator is number of women with children under five years old with fever in the past two weeks that did not seek advice or treatment.
Proportion of women that sought care for their febrile children the same or next day as the onset of fever.	W325	Clone W325 among women with children less than five with a fever in the past two weeks (W321= not 0 or missing). Recode the variable as 1 if W325=1 or 2 and recode as 0 if advice or treatment was not at all sought (W324=2 and W324a =2) or W325= 3 or missing. Assign "DON'T KNOW" as missing. The numerator is the number of women who responded that they sought treatment for their child under five years old with fever in the past two weeks on the same or next day following the onset of fever and the denominator is number of women with a child with fever.
Proportion of children under five years old with fever in the past two weeks for whom treatment was sought from various sources.	W326	Along children less than five with a fever in the past two weeks (W321=not 0 or missing), Clone and create variables for each response option that equals 1 if that option is selected. The numerator is number of women who responded that they sought advice or treatment for their child under five years old with fever in the past two weeks from various sources and the denominator is number of women children under five years old with fever in the past two weeks
Proportion of children under five years old with fever in the past two weeks who were taken to a health facility or community health worker <u>first</u>	W327	Clone W327 among women with children less than 5 years old with a fever in the past two weeks (W321=not 0 or missing). Recode W327 as 1 if health facility or CHW was selected (W327=11-13, 21,22 or 31, 33). Recode this variable as zero for other W327 options. The numerator is the number of women who responded that they sought care for their child under five years old with a fever in the past two weeks at a health facility or from community health worker (as applicable) and the denominator is the total number of women with a child with fever.

Indicator/Information	Question No.	Notes on Calculation
Proportion of children under five years old with fever in the last two weeks who had a malaria blood test	W329	Clone all variables and create a new variable among children less than five with a fever in the past two weeks (W321=not 0 or missing). Recode "NO" as 0 and "DON'T KNOW" as missing. The numerator is the number of women who responded that their child children under five years old with a fever in the past two had a malaria blood test, and the denominator is the total number of women with a child with fever in the last two weeks.
Proportion of children under five years with fever tested that have a positive malaria blood test result	W329, W330	Clone both variables among women with children less than five with a fever in the past two weeks with blood test done (W329=1). Recode W330 as 0 if the response is "CHILD DID NOT HAVE MALARIA". Recode "DON'T KNOW/NOT TOLD" as 3. The numerator is the number of women who reported their child under five years old with a fever in the past two weeks had a positive malaria blood test result and the denominator is the total number of women with a child with fever that was tested for malaria (W329=1).
Proportion of children under five years old with confirmed malaria who received medication for the fever	W331	Clone variable and recode "NO" and "DON'T KNOW" responses as 0. The numerator is number of women who responded that their child under five years old with confirmed malaria received medication for the fever and the denominator is all women who responded that their child under five had a positive malaria test.
Proportion of children under five years old with confirmed malaria receiving an ACT	W330, W333	Clone W333 among women with children less than five with a fever in the past two weeks that have confirmed malaria (W330=1). Recode W333 =1 option D is selected. Otherwise assign as 0. The numerator is the number of women who responded that their child under five years old with a fever in the past two weeks received ACT (option D selected) and the denominator for this indicator is all women who responded that their child under five had a positive malaria test (W330=1).
Proportion of children under five with fever with confirmed malaria in the last two weeks who received an ACT from a health facility	W335	Clone W335 among women with children less than five with a fever in the past two weeks that have confirmed malaria (W330=1). Recode W335 as 1 if health facility was selected (W335=11-13, 21,22 or 31, 33). Otherwise recode as 0. The numerator is the number of women who responded that they sought care for their child under five with fever with confirmed malaria in the last two weeks at a health facility or from community health worker (as applicable) and the denominator is all women who responded that their child under five had a positive malaria test (W330=1).

Indicator/Information	Question No.	Notes on Calculation
Proportion of children under five with fever with confirmed malaria in the last two weeks received an ACT promptly (same or next day)	W330, W333, W337	Clone W337 among women with children less than five with a fever in the past two weeks that have confirmed malaria (W330=1). Recode the new variable as 1 if W337=1 or 2 and 333 indicates they took an ACT (option D selected). The numerator is number women who responded that their child under five years old with a fever in the past two weeks received ACT promptly and the denominator is all women who responded that their child under five had a positive malaria test (W330=1).
Average cost women paid for ACT among those that paid.	W336	Clone W336 among women that indicate in W333 that their febrile child took an ACT (option D selected). Assign the median of the numeric responses to "DON'T KNOW". Assign to missing if the response to W336 is "FREE". Calculate the mean of all non-missing values.
Proportion of women who responded that they would seek treatment for their child less than five years promptly if they had a fever today	W338	Clone W338 among women with children less than five (W319=not 0). Recode the new variable as 1 if 338=1 or 2. All other responses should be recoded as 0. The numerator is number women who responded that they would seek treatment for their child less than five years promptly if they had a fever today or tomorrow and the denominator is all women with a child less than five years old.
Proportion of women who responded that they would first seek treatment for their child less than five years at a health facility or community health worker if they had a fever today	W339	Clone W339 among women with children less than five (W319=not 0). Recode W339 as 1 if health facility or community health worker (W339=11-13, 21,22 or 31, 33) is selected. Otherwise recode as 0. The numerator is the number of women who responded that they would first seek treatment for their child less than five years at a health facility or community health worker if their child had a fever today and the denominator is the total number of women with children less than 5 years old.

## SECTION IV: Seasonal Malaria Chemoprevention

### Behavioral Outcomes

Indicator/Information	Question No.	Notes on Calculation
Proportion of respondents aware of SMC (knowledge)	W401	Clone variable and recode 2 as 0. The numerator is the number of respondents aware of SMC and the denominator is all women.
Proportion of women who reported SMC distribution in their community or health facility in the recent rainy season	W402, W402A	Among respondents who responded "YES" to W401, create a new variable that is equal to 1 if W402=1 or W402A=1, and equal to 0 if otherwise. The numerator is the number of respondents who report SMC distribution in their community or health facility

Indicator/Information	Question No.	Notes on Calculation
		in the last rainy season and the denominator is all women.
Proportion of women who reported visit from the SMC health worker to their household in the last rainy season	W403, W404	Among women with children under 5 years old (W403=1), clone W404 and recode 2 and 9 as 0. The numerator is the number of respondents who report a visit from the SMC health worker to their household in the last rainy season and the denominator is all women with children under 5 years old.
Proportion of women who reported distributors last visited their household at varying months to distribute SMC	W405	Clone variable among women who reported a visit from the SMC health worker to their household in the last rainy season. Recode "DON'T KNOW" as missing. Calculate the frequency of each response option.
Proportion of women who reported being present when a distributor visited their household	W406	Clone variable and recode 2 as 0. The numerator is the number of women respondents who were present when a distributor visited their household and the denominator is all women who reported a visit from the SMC health worker to their household in the last rainy season.
Proportion of women who reported that the distributor explained the benefits of SMC	W410	Clone variable and recode 2 as 0. The numerator is the number of women respondents who reported that the distributor explained the benefits of SMC and the denominator is all women who reported that they were present when a SMC health worker visited their household in the last rainy season (W406=1).
Proportion of women who reported that the distributor informed them of SMC side effects	W411	Clone variable and recode 2 as 0. The numerator is the number of women respondents distributor informed them of SMC side effects and the denominator is all women who reported that they were present when a SMC health worker visited their household in the last rainy season (W406=1)..
Proportion of women whose child under five took the first dose of SMC	W403, W412-W414, W416, HH member listing	Among women with eligible children under 5 years (W403=1, W412=not missing and W413 is less than 60 months), create a new variable that is equal to 1 if W414 =1 or W414=2 AND W416 = 1. The numerator is the number of women with children under five in the household member listing who took the first dose of SMC and the denominator is all women with children under 5 years old.
Proportion of children under five who did not take the first dose from the distributors for various reasons	W417	Among women with eligible children under 5 years (W403=1, W412=not missing and W413 is less than 60 months), clone and create variables for each response option that equals 1 if selected and 0 if not selected. The numerator is number of women with children under five who did not take the first dose from the distributors for various reasons and the denominator is all women with children under 5 years old.

Indicator/Information	Question No.	Notes on Calculation
Proportion of children under five who received all three recommended doses of SMC	W412-W413, W418	Among women with eligible children under 5 years (W403=1, W412=not missing and W413 is less than 60 months), clone W414 and W416. The indicator is equal to 1 if (414 = 1 OR if 416 = 1) AND (418 = 2). The numerator is the number of women whose child under five in the household member listing who received all three recommended doses of SMC and the denominator is all women with children under five in the household member listing.
Proportion of children under five who did not take all additional doses for various reasons among those who took the first dose	W419A-X	Among women with eligible children under 5 years (W403=1, W412=not missing and W413 is less than 60 months), and whose child did not take any medicine after the distributors first visit (418=0), clone and create variables for each response option that equals 1 if selected or 0 if not selected. The numerator is number of women with children under five who did not take all additional doses from the distributors for various reasons and the denominator is all women with children under 5 years old who took the first dose.
Proportion of children under five who had various undesirable side effects after taking at least 1 dose of SMC	W426, W427A-X	Among women with eligible children under 5 years (W403=1, W412=not missing and W413 is less than 60 months) who took at least 1 dose of SMC (414 = 1 or 416=1) , recode 426 to 0 for “NO” or “DON’T KNOW” responses. Create a variable for each response option for W427 that equals 1 if that response is selected or 0 if not selected. The numerator is number of women with children under five that had various undesirable side effects after taking at least 1 dose of SMC and the denominator is all women with children under 5 years old who took the first dose.

## SECTION V: Ideation - General Perceptions about Malaria

Indicator/Information	Question No.	Notes on Calculation
Proportion of respondents who know the main symptom of malaria is fever (knowledge)	W501, M501	Create a variable and code as 1 if respondent selected “fever.” Code as 0 if they did not select this response and irrespective of whatever other symptoms they mentioned. The numerator is all respondents who cite fever as the main symptom of malaria and the denominator is all respondents.
Proportion of respondents who name mosquitoes as the cause of malaria (knowledge)	W502, M502	Create a variable and code as 1 if respondent selected “mosquito bites.” Code as 0 if respondent did not mention this response irrespective of whatever other causes they mentioned. The

Indicator/Information	Question No.	Notes on Calculation
		numerator is all respondents who cite mosquitoes as the cause of malaria and the denominator is all respondents.
Proportion of respondents who know at least one major proven preventive measure for malaria (knowledge)	W503, M503	Create a variable and code as 1 if respondent selected any of the following: sleeping under a mosquito net, sleeping under an ITN, taking preventive medication, or having their house sprayed. Code as 0 if respondent did not indicate one of these responses. The numerator is all respondents who know at least one of the major proven prevention measures of malaria (as applicable to the context) and the denominator is all respondents.
Proportion of respondents who discussed malaria with a spouse/partner (discussion about malaria with others)	W505, M505	Clone variable and recode "NO" as 0. The numerator is all respondents who discuss malaria with a spouse/partner and the denominator is all respondents.
Proportion of respondents who discussed malaria with a friend/relation during the last six months (discussion about malaria with others)	W506, M506	Clone variable and recode "NO" as 0. The numerator is all respondents who discussed malaria with a friend/relation and the denominator is all respondents.
Proportion of respondents who feel that the that they are susceptible to getting (perceived susceptibility)	W508a-W510	Clone the variable and recode "DON'T KNOW" as the mid-point of the scale. Sum the scores and divide by the number of items. Split the score at 5. Respondents who score greater than 5 are considered to perceive a high level of susceptibility to malaria. The numerator is all respondents who perceive a high level of susceptibility to malaria. The denominator is all respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of respondents who feel that consequences of malaria are serious (perceived severity)	W511-W514, M511-M514	Clone variables and recode "DON'T KNOW" as the mid-point of the scale. Sum the scores and divide by the number of items. Split the score at 5. Respondents with an index score greater than 5 are considered to perceive the consequences of malaria as severe. The numerator is all respondents who perceive the severity of malaria, and the denominator is all respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.

## Section VI: Insecticide-treated nets (ITNs)

### Net Ownership, Sources and Characteristics

Indicator/Information	Question No.	Notes on Calculation
Proportion of nets that are insecticide treated nets (ITN)	HH135C, H135D, HH135F net roster	This indicator combines 135C, D, and F in the net roster to determine if the net is an ITN or not. If 135D is "DON'T KNOW" then refer to 135C to determine if net was an ITN. Code ITN brands as listed in HH135C as 1; also, code as 1 if the response to 135D is "YES". If 135C is 96 (other) or 99 (DON'T KNOW) and if 135D is 8 (DON'T KNOW) then refer to 135F. If 135F response indicators a government source (Campaign, ANC or Immunization), then the net is ITN. Code all other responses as 0. The numerator is all nets that are ITN and the denominator is all nets surveyed in the net roster.
Number of ITNs in the household	H135D HH135C, HH135F net roster	Confirm that the household data includes unique identifier. Separate the net roster data with unique identifier and reshape the dataset from wide to long such that the unit of analysis becomes the net. Then create a variable that counts the number of nets per household.
Proportion of ITNs from various sources	HH135F, HH135G	Clone the variable HH135F among ITNs only. For those who answered "NO" in 135F, replace this new variable with 135G. The numerator is all ITN from the specific source (as applicable) and the denominator is all ITNs surveyed.
Proportion of ITNs that are three or more years old	HH135F	Using the net roster data, clone 135B among nets that are ITN. Recode this new variable as 1 if HH135B is 95, recode 98 and nets 35 months or younger as 0. The numerator is all ITNs that are at least 3 years old, and the denominator is all ITNs surveyed in the net roster.
Proportion of ITNs that were obtained free of charge	HH135H	In the net roster, clone 135H for nets that are ITN. Recode as 1 if net is ITN and the response to HH135H is "NO". Recode as 0 if net is ITN and the response to HH135H is "YES". Assign "DON'T KNOW/NOT SURE" as missing. other responses as zero. The numerator is all ITNs that were obtained for free and the denominator is all ITNs surveyed in the net roster.
Average cost of mosquito nets	HH135H, HH135I	Clone HH135I among nets that are ITN and for which the response in HH135H is "YES". Assign the median of numeric responses to "DON'T KNOW" responses. Calculate the mean net cost across nets that were purchased.

Indicator/Information	Question No.	Notes on Calculation
Proportion of ITNs that were used for sleeping last night.	HH135J	Clone HH135J among nets that are ITN. Recode the new variable 0 if the response is "NO". Assign "DON'T KNOW/NOT SURE" as missing. The numerator is all ITNs that were used for sleeping last night and the denominator is all ITNs surveyed in the net roster.
Reasons for which a net was not used	HH135M	Clone HH126M. Calculate the frequency for each response option.
Reasons why nets were not hung for sleeping	HH135OA-X	For each response option, create a variable that equals i if that option is selected or 0 if not selected.
Proportion of ITNs of various colors	HH135Q	Clone the variable HH135Q among nets that are ITN. The numerator is all ITN with the specific color and the denominator is all ITNs surveyed.
Proportion of households that have sufficient ITNs (at least 1 net for every 2 people)	Number of ITNs in the household.  Number of household members derived from HH member listing	Using the household nets dataset, create a small data set that includes the household unique identifier and the number of ITNs in the household. Merge this small dataset into the household members' data set using the unique household identifier.  The number of nets per household member is obtained by dividing the number of nets by the number of household members. Households where this number is at least 0.5 ITN per household member are considered to have sufficient ITNs.

### Behavioral Outcomes Related to Insecticide-Treated Nets

Indicator/Information	Question No.	Notes on Calculation
Population ITN access	Household members' schedule and net roster	The following procedures are implemented in the household members' data into which has been merged the number of ITNs in the household. First, an intermediate variable of "potential ITN users" is created in the household members' dataset by multiplying the number of ITN in each household by a factor of 2.0. In order to adjust for households with more than one net for every two people, the potential ITN users is set equal to the de-facto population in that household if the potential users exceeded the number of people in the household. Next, the population access indicator is calculated by dividing the potential ITN users by the number of de-facto members for each household and determining the overall sample mean of that fraction (11, 12).
The proportion of the population using ITNs the previous night	Household schedule and net	The procedures for creating this indicator involve manipulating the household members and the nets

	<p>roster HH135C, HH135J, HH135L</p>	<p>datasets to identify who sleeps under which ITN the previous night. First, in the household members dataset, create a unique identifier for each person by concatenating the unique household identifier and the person identification number (line number). Verify that the resulting identifier is unique and save your dataset.</p> <p>In the nets dataset, create a smaller dataset with the household unique identifier, the ITN status of the net, and the sleeper identification number (line number); derived from HH135L as sleeper1, sleeper2, sleeper3, sleeper4). Reshape this smaller dataset from wide to long such that the observation is not the net but the sleeper. Each observation in the reshaped dataset should include household unique identifier, the ITN status of the net, and the sleeper identification number (line number). In the reshaped dataset, delete all cases without a valid sleeper identification number, which will occur if the net was not used by up to 4 persons. Then create a unique identifier for each person by concatenating the unique household identifier and the sleeper identification number (line number). In this dataset, create a variable called itnuser that is equal to 1 for everyone in the dataset.</p> <p>Then merge the data into the household members' dataset using the unique identifier for each person. In the merged dataset assign itnuser=0 for those for which this variable is not equal to 1. The numerator is the household members who slept under an ITN the previous night (itnuser=1) and the denominator is the number of household members who stayed in the household the previous night.</p> <p>If you are interested in all forms of nets and not just ITNs, repeat the procedures above using all nets in the nets dataset.</p>
<p>Population level ITN use to access ratio</p>	<p>Household member listing and net roster HH135C, HH135J, HH135L</p>	<p>This indicator is derived from the two indicators above: i) Population ITN access and ii) The proportion of the population using ITNs the previous night.</p> <p>Divide the proportion of the population using ITNs the previous night by the proportion of population with access to an ITN (11, 12).</p>
<p>NET CARE</p>		
<p>Proportion of nets found in various locations of the household</p>	<p>HH135N</p>	<p>In the net roster, clone HH135N and tabulate. The numerator is the number of nets found in different</p>

		locations and the denominator is all nets surveyed in the net roster.
Proportion of nets that have been washed in the last six months	HH135R, HH135S	Clone 135R and recode as 1 if the response is "YES" and 0 if the response is "NO" or "DON'T KNOW". Clone 135S and recode the new variable as 0 if the response to 135R is "NO" or "DON'T KNOW". Recode the new variable as 1 if the response to 135S is greater than 0. The numerator is the number of nets washed at least once in the last six months and the denominator is all ITNs surveyed.
Proportion of nets that were washed with various products during the last wash.	HH135R, HH135T	For nets that have ever been washed, 135R = "YES", clone 135T and tabulate the response options. The numerator is the number of ITNs washed with each product and the denominator is all washed nets surveyed.
Proportion of washed nets dried in different locations	HH126U	Clone variable and tabulate. The numerator is the number of washed ITNs dried in different locations and the denominator is all washed ITNs surveyed.

## Net Ideation

Indicator/Information	Question No.	Notes on Calculation
Proportion of respondents with a favorable attitude towards sleeping under a bed net (attitudes)	W602-W610, W612G, W612I M602- M610, M612G, M612I	Clone variables and reverse code 603-606, 608, 610. Recode "DON'T KNOW" as the median point of the 10-point scale. Sum all the scores, divide by number of items and split it at 5. Respondents, after reverse coding, with an index score greater than 5 are considered to have a favorable attitude toward sleeping under a bed net. The numerator is all respondents with favorable attitudes towards sleeping under a bed net and the denominator is all respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of respondents who perceive barriers to net use (perceived barriers)	W603-W606, W608, W610; M603-M606, M608, M610	Clone variables. Recode "DON'T KNOW" as the median point of the 10-point scale. Sum all the scores, divide by number of items and split it at 5. Respondents with an index score greater than 5 are considered to perceive barriers to net use. The numerator is all respondents with perceived barriers towards sleeping under a bed net and the denominator is all respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of respondents with positive attributes of nets (positive attributes)	W602, W607, W612G, W612I;	Clone variables. Recode "DON'T KNOW" as the median point of the 10-point scale. Sum all the scores, divide by number of items and split it at 5.

Indicator/Information	Question No.	Notes on Calculation
	M602, M607, M612G, M612I;	Respondents with an index score greater than 5 are considered to have positive attributes of nets. The numerator is all respondents with positive attributes of bed nets and the denominator is all respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of respondents who believe treated mosquito nets attract bed bugs and other insects.	W612F, M612F	Clone the variable and recode "DON'T KNOW" as the mid-point of the scale. Split at 5. Respondents who score greater than 5 are considered to believe that treated mosquito nets attract bed bugs and other insects. The numerator is all respondents who believe that treated mosquito nets attract bed bugs and other insects. The denominator is all respondents.
Proportion of respondents who report they would sleep under a mosquito net regardless of its material.	W612H, M612H	Clone the variable and recode "DON'T KNOW" as the mid-point of the scale. Split at 5. The numerator is all respondents who would sleep under a mosquito net regardless of its material. The denominator is all respondents.
Proportion of respondents with a favorable attitude towards ITN care (net care attitudes)	W611, W612, W612C, W612E; M611, M612, M612C, M612E	Clone variables and recode "DON'T KNOW" as the mid-point of the scale. Sum the score for the questions, divide by the number of items and split it at 5. Respondents with an index score greater than 5 are considered to have a favorable attitude toward ITN care. The numerator is all respondents with favorable attitudes towards ITN care and the denominator is all respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of respondents who believe that other people in their community take care of their mosquito nets (net care descriptive norm – individual item)	W612A, M612A	Clone variables and recode "DON'T KNOW" as the mid-point of the scale. Respondents with an index score greater than 5 are considered to believe that other people in their community take care of their mosquito nets. The numerator is all respondents who believe that other people in their community take care of their mosquito nets. The denominator is all respondents.
Proportion of respondents who are confident in their ability to take care of bed nets (net care perceived self-efficacy)	W612B, W612D, W612J; M612B, M612D, M612J;	Clone variables and recode "DON'T KNOW" as the mid-point of the scale. Sum the score for the questions, divide by the number of items and split it at 5. Respondents with an index score greater than 5 are considered to be confident in their ability to take care of a bed net. The numerator is all respondents with perceived self-efficacy towards net care and the denominator is all respondents. For further guidance about how to assess the internal

Indicator/Information	Question No.	Notes on Calculation
		reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of respondents who believe that sleeping under a bed net will reduce their risk of malaria (perceived response-efficacy of nets)	W613, W615, W615a; M613, M615, M615a;	Clone variables and recode "DON'T KNOW" as the midpoint of the scale. Sum the score for the questions, divide by the number of items and split it at 5. Respondents with an index score greater than 5 are considered to perceive bed nets as an effective method of reducing their risk of malaria. The numerator is all respondents with perceived response-efficacy of ITN and the denominator is all respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of respondents who believe the chances of getting malaria are the same whether or not someone sleeps under a mosquito net (individual item)	W614, M614	Clone variable and recode "DON'T KNOW" as the midpoint of the scale. Respondents with an index score greater than 5 are considered to perceive that the chances of getting malaria are the same whether or not someone sleeps under a mosquito net. The numerator is all respondents who believe the chances of getting malaria are the same whether or not someone sleeps under a mosquito net. The denominator is all respondents.
Proportion of respondents who are confident in their ability to sleep under nets (perceived self-efficacy to use nets)	W616-W618, M616-M618	Clone variables and recode "DON'T KNOW" as the midpoint of the scale. Reverse code 614. Sum the score for the questions, divide by the number of items and split it at 5. Respondents with a score greater than 5 are considered to be confident that they can sleep under a net. The numerator is all respondents with perceived self-efficacy of ITN and the denominator is all respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of respondents who perceive that ITN use is the norm in their community (descriptive norm)	W620, M620	Clone variable and recode 1, 2, and 3 as 1 and other response options as 0. The numerator is all respondents who perceive ITN use as the norm in their community and the denominator is all respondents.
Proportion of respondents who perceive that community members disapprove the use of ITN (injunctive norm)	W621, M621	Clone variable and recode 1, 2, and 3 as 1 and other response options as 0. The numerator is all respondents who perceive community members disapprove the use of ITN and the denominator is all respondents.

## SECTION VII: Intermittent Preventative Treatment In Pregnancy (IPTp)

### Antenatal Care and Intermittent Presumptive Treatment in Pregnancy (ANC/IPTp) Ideation

Indicator/Information	Question No.	Notes on Calculation
Proportion of respondents who have comprehensive ANC/IPTp knowledge (knowledge)	W701-W703; M701-M703	Create an indicator for each of the three knowledge items by coding as 1 each of the following: (1) response 3 in 701; (2) responding that the number of ANC visits is 4 or higher in 702 <sup>4</sup> ; and (3) responding that the number of times a woman should receive medicine to keep her from getting malaria is 3 or more, consistent with the country's policy. Combine the three indicators to derive an index. Respondents with an index score of 3 are considered to have comprehensive ANC/IPTp knowledge. The numerator is all respondents with comprehensive ANC/IPTp knowledge, and the denominator is all respondents.
Proportion of respondents that believe malaria in pregnancy has severe consequences (perceived severity)	W704; M704	Clone variable and assign the midpoint of the 10-point scale to "DON'T KNOW" response. Split at 5. Respondents with an index score greater than 5 are considered to perceive malaria as serious condition in pregnancy. The numerator is all respondents who perceive the severity of malaria in pregnancy and the denominator is all respondents.
Proportion of respondents with favorable attitudes towards ANC and IPTp (attitudes)	W708-W710a; M708-M710a	Clone variables and for each item, assign midpoint of the 10-point scale to "DON'T KNOW" responses. Sum the scores, divide by the number of items, and then split at 5. Sum the score for the questions to obtain an index for positive attitudes. Respondents with an index score greater than 5 are considered to have a favorable attitude toward ANC and IPTp. The numerator is all respondents with favorable attitudes towards ANC/IPTp and the denominator is all respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of respondents who believe that the medicine given to pregnant women to prevent malaria is effective (perceived response-efficacy)	W711, 711a, 712, 712a, 712b;  M711, 711a, 712, 712a, 712b	Clone variables and for each item, assign the midpoint of the 10-point scale to "DON'T KNOW" responses. Sum the scores, divide by the number of items, and then split at 5. Respondents with an index score greater than 5 are considered to perceive IPTp as effective for reducing a pregnant woman's risk of malaria. The numerator is all respondents perceived response-efficacy regarding IPTp and the denominator is all respondents. For further guidance about how to assess the internal reliability of these

<sup>4</sup> Number of ANC visits should reflect the country policy. In some countries, it is 4 ANC visits and others, it is 8 visits.

Indicator/Information	Question No.	Notes on Calculation
		items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of women who are confident in their ability to go to ANC (perceived self-efficacy)	W714, 715, 717	Clone variables and for each item, assign the midpoint of the 10-point scale to “DON’T KNOW” responses. Sum the scores, divide by the number of items, and then split at 5. Respondents with a score greater than 5 are considered to be confident that they can go to ANC. The numerator is all women with perceived self-efficacy regarding ANC and the denominator is all women respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of women who are confident in their ability to take medicine to prevent malaria during pregnancy (perceived self-efficacy)	W719, 719a, 719b	Clone variables and for each item, assign the midpoint of the 10-point scale to “DON’T KNOW” responses. Sum the scores, divide by the number of items, and then split at 5. Respondents with a score greater than 5 are considered to be confident that they can take medicine to prevent malaria during pregnancy. The numerator is all women with perceived self-efficacy regarding IPTp and the denominator is all women respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of men who are confident in their ability to support their wife/partner to go to ANC (perceived self-efficacy)	M714, 715, 717	Clone variables and for each item, assign the midpoint of the 10-point scale to “DON’T KNOW” responses. Sum the scores, divide by the number of items, and then split at 5. Respondents with a score greater than 5 are considered to be confident that they can support their wife/partner to go to ANC. The numerator is all men with perceived self-efficacy to support their wife/partner regarding ANC and the denominator is all men respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of men who are confident in their ability to support their wife/partner to take medicine to prevent malaria during pregnancy (perceived self-efficacy)	M719, 719a, 719b	Clone variables and for each item, assign the midpoint of the scale to “DON’T KNOW” responses. Sum the scores, divide by the number of items, and then split at 5. Respondents with a score greater than 5 are considered to be confident that they can support their wife/partner to take medicine to prevent malaria during pregnancy. The numerator is all men with perceived self-efficacy to support their wife/partner regarding IPTp and the denominator is all women respondents. For further guidance about how to assess the internal reliability of these items

Indicator/Information	Question No.	Notes on Calculation
		and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of respondents who believe the majority of women in their community go to ANC at least four/eight times when they are pregnant <sup>5</sup> (descriptive norm)	W720, M720	Clone variable and recode 1, 2, and 3 as 1 and 4 and 5 as 2 and "DON'T KNOW" as 3. The numerator is all respondents who believe majority of the pregnant women in their community attend ANC four/eight times (as applicable) and the denominator is all respondents.
Proportion of people that would criticize the respondent if they knew that she went for ANC four or more times during pregnancy.	W720b, M720b	Clone variable and Recode 1, 2, and 3 as 1 and 4 and 5 as 2 and "DON'T KNOW" as 3. The numerator is all respondents who believe at least half of the people in their community would criticize the respondent if they knew that she went for ANC four or more times during pregnancy and the denominator is all respondents.
Proportion of respondents who believe the majority of women in their community take IPTp when pregnant (descriptive norm)	W721, M721	Clone variable and Recode 1, 2, and 3 as 1 and 4 and 5 as 2 and "DON'T KNOW" as 3. The numerator is all respondents who believe majority of the pregnant women in their community take IPTp and the denominator is all respondents.
Proportion of respondents who perceive that community members approve of IPTp (injunctive norm)	W721b, M721b	Clone variable and Recode 1, 2, and 3 as 1 and 4 and 5 as 2 and "DON'T KNOW" as 3. The numerator is all respondents who perceive community members approve of IPTp and the denominator is all respondents.
Proportion of respondents who perceive that the majority of women in their community go to ANC within the first 3 months of pregnancy.	W721c, M721c	Clone variable and recode 1,2, and 3 and 1 and 4 and 5 as 2 and "DON'T KNOW" as 3. The numerator is all respondents who perceive that the majority of people in their community go to ANC within the first 3 months of pregnancy and the denominator is all respondents.
Proportion of respondents who perceive that the majority of people in their community would criticize them if they knew that they went to ANC in the first 3 months of pregnancy (injunctive norm)	W721d, M721d	Clone variable and recode 1, 2, and 3 and 1 and 4 and 5 as 2 and "DON'T KNOW" as 3. The numerator is all respondents who perceive that the majority of people in their community would criticize them if they knew that they went to ANC in the first three months of pregnancy and the denominator is all respondents.
Proportion of currently married or cohabiting respondents who are usually involved in making decisions regarding ANC attendance (decision-making)	W105, W722; M105, M722	Among all married or cohabiting respondents (Q105=1 or 2), clone 722 and recode 1 and 3 as 1, 7 and 9 as missing, and all other options as 0. The numerator is all currently married or cohabiting respondents usually involved in decision making regarding ANC and the denominator is all currently married or cohabiting respondents.
Proportion of currently married or cohabiting respondents who discussed	W105, W723, W724;	Clone variables and among all married or cohabiting respondents (Q105=1 or 2), create a new variable as

<sup>5</sup> Number of ANC visits used in this indicator should reflect the country policy

Indicator/Information	Question No.	Notes on Calculation
ANC attendance with their spouse/partner in the last six months (decision-making)	M105, M723, M724	1 if 724 is 1 but zero if 723 is 2 or 9 or 724 is >1. The numerator is all currently married or cohabiting respondents who discussed ANC attendance with their spouse/partner in the last six months and the denominator is all currently married or cohabiting respondents.
Proportion of currently married or cohabiting respondents who had the final say in the decision about ANC attendance in the last 6 months.	W105 W723, W724, W729; M105, M723, M724, M729	Clone variables among all married or cohabiting respondents, (Q105=1 or 2). Create a new variable that is equal to 1 if 723=1 and 724=1 and 729=1 or 3. The numerator is all currently married or cohabiting respondents who had the final say in a recent decision about ANC attendance and the denominator is all those that had a discussion in the last six months.

## SECTION VIII: Ideation – Care Seeking and Treatment

Indicator/Information	Question No.	Notes on Calculation
Proportion of respondents who know that care seeking for children with fever should begin the same day or next day. (knowledge)	W801; M801	Clone variable; recode as 1 if respondent selected options 1 or 2; recode other responses as 0. The numerator is the number of respondents who know that care seeking for children with fever should begin the same day or next day and the denominator is all respondents.
Proportion of respondents who mention blood test as the best way to know if someone has malaria. (knowledge)	W802; M802	Clone variable; recode as 1 if respondent selected option 1. The numerator is the number of respondents who know mention blood test as the best way to know if someone has malaria best way to know if someone has malaria and the denominator is all respondents.
Proportion of respondents who know that the best source to get treatment for malaria is a health facility or community health worker depending on country context. (knowledge)	W803; M803	Relevant response options should be verified with the advisory group. Clone variable and recode as 1 if respondent selected options 11-13, 21,22, 31, 33. The numerator is the number of respondents who know that the best place to get treatment for malaria is a health facility or community health worker and the denominator is all respondents.
Proportion of respondents who have comprehensive knowledge of malaria care-seeking and treatment (knowledge)	W801-W803; M801- M803	Sum up the scores for the three previous indicators (1. Knowledge that care seeking for children with fever should begin the same day or next day; 2. knowledge that blood test as the best way to know if someone has malaria; 3. Knowledge that the best source to get treatment for malaria is a health facility or community health worker). Comprehensive knowledge is defined as a composite score of 3. The numerator is the number of

Indicator/Information	Question No.	Notes on Calculation
		respondents with comprehensive knowledge of malaria care-seeking and the denominator is all respondents.
Proportion of respondents with a favorable attitude toward care-seeking for children for fever and treatment of malaria (attitudes)	W804, 810, 812; M804, 807, 810, 812	For each item, assign the midpoint of the 10-point scale to “DON’T KNOW” responses. Sum the scores for the four items, divide by the number of items, and then split at the 5 to denote positive vs negative attitudes. Respondents with an index score greater than 5 are considered to have a favorable attitude toward care-seeking and treatment of malaria. The numerator is the number of respondents with favorable attitudes towards care seeking and treatment for malaria and the denominator is all respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of respondents who prefer that their child receives the medicine to treat malaria by injection rather than swallow it by pills (individual item)	W807a, M807a	Clone variable and assign the midpoint of the 10-point scale to “DON’T KNOW” responses. Respondents with an index score greater than 5 are considered to prefer that their child receives the medicine to treat malaria by injection rather than swallow it by pills. The numerator is the number of respondents who prefer that their child receives the medicine to treat malaria by injection rather than swallow it by pills and the denominator is all respondents.
Proportion of respondents with a favorable attitude towards adherence to malaria treatment	W805a, W811a; M805a, M811a	For each item, assign the midpoint of the 10-point scale to “DON’T KNOW” responses. Sum both scores, divide by the number of items, and then split at 5 to denote positive vs negative attitudes. Respondents with an index score greater than 5 are considered to have favorable treatment adherence attitudes. The numerator is the number of respondents with favorable attitudes towards treatment adherence of malaria and the denominator is all respondents.
Proportion of respondents with perceived response-efficacy of malaria testing ( perceived response-efficacy)	W815,W816,W818; M815,M816,M818	For each item, assign the midpoint of the 10-point scale to “DON’T KNOW” responses. Sum the scores, divide by the number of items, and then split at 5. Respondents with a score greater than 5 are considered as perceiving the response-efficacy for malaria testing. The numerator is the number of respondents with perceived response-efficacy regarding malaria testing and the denominator is all respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.

Indicator/Information	Question No.	Notes on Calculation
Proportion of women with perceived self-efficacy to seek care and treatment for their child with fever/malaria at a health facility. (perceived self-efficacy)	W819, 821, 822,824	For each item, assign the median of the scale to “DON’T KNOW” responses. Sum the scores, divide by the number of items, and then split at 5. Respondents with a score greater than 5 are considered to have perceived self-efficacy regarding malaria care-seeking and treatment. The numerator is the number of women respondents with perceived self-efficacy to seek care and treatment for malaria and the denominator is all women respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of women who believe they could get permission from their husband or other family member to take their child to the health facility/health provider (doctor, nurse) when their child has fever (individual item)	W820	Clone and assign the median of the scale to “DON’T KNOW” responses. Respondents with a score greater than 5 are considered to believe they could get permission from their husband or other family member to take their child to the health facility/health provider (doctor, nurse) when their child has fever. The numerator is the number of women believe they could get permission from their husband or other family member to take their child to the health facility/health provider and the denominator is all women respondents.
Proportion of respondents who believe the majority of caregivers in their community take their children to a health provider on the same day or day after they develop a fever (descriptive norm)	W825; M825	Clone and recode 1, 2, and 3 as 1 (all people, most people, at least half of the people), 4 and 5 as 2, and 9 as 3. The numerator is the number of respondents who believe at least half of all care givers in their community take their children to a health provider on the same day or the day after they develop a fever, and the denominator is all respondents.
Proportion of respondents who believe the majority of children with fever in their community are taken to a health facility to get tested for malaria (descriptive norm)	W826; M826	Clone and recode 1, 2, and 3 as 1 (all children, most children, at least half of the children), 4 and 5 as 2, and 9 as 3. The numerator is the number of respondents who believe at least half of all care givers in their community take their children to get tested at a health facility after they develop a fever and the denominator is all respondents.
Proportion of respondents who perceive that community members disapprove of prompt care seeking for malaria in children (injunctive norm)	W827, M827	Clone variable and recode 1, 2, and 3 as 1 (all people, most people, at least half of the people), 4 and 5 as 2, and 9 as 3. The numerator is all respondents who perceive community members disapprove of prompt care seeking and the denominator is all respondents.
Proportion of married or cohabiting respondents who are involved in making decisions about going to the health facility when their child has a fever (decision-making)	W105, W828; M105, M828	Clone 828 among married and cohabiting respondents (105=1 or 2). Recode 1 and 3 as 1, and all other options as 0. The numerator is the number of married or cohabiting respondents involved in making decisions about going to the health facility

Indicator/Information	Question No.	Notes on Calculation
		when their child has a fever and the denominator is all married or cohabiting respondents.
Proportion of married or cohabiting respondents who are involved in making decisions about purchasing medicine when their child has a fever (decision-making)	W105, W829; M105, M829	Clone 829 among married and cohabiting respondents (105=1 or 2). Recode 1 and 3 as 1, and all other options as 0. The numerator is the number of married or cohabiting respondents involved in making decisions about purchasing medicine when their child has a fever and the denominator is all married or cohabiting respondents.
Proportion of married or cohabiting respondents who are involved in the decision about what to do when they themselves are sick (decision-making)	W105, W830; M105, M830	Clone 830 among married and cohabiting respondents (105=1 or 2). Recode 1 and 3 as 1, and all other options as 0. The numerator is the number of married or cohabiting respondents involved in making decisions when they are sick, and the denominator is all married or cohabiting respondents.

## SECTION IX: Seasonal Malaria Chemoprevention (SMC)

### SMC ideation

Indicator/Information	Question No.	Notes on Calculation
Proportion of respondents with knowledge of the number of days per month of SMC administration (knowledge)	W902 M902	The correct response varies by country context. Verify country policy for number of months of SMC administration. Taking this into account, create a variable if the correct number of days was provided for 902 depending on the country context. The numerator is the number of respondents with knowledge of the timing of SMC and the denominator is all respondents.
Proportion of respondents with knowledge of the common side effects of SMC administration (knowledge)	W902A; M902A	For each option in 902A, create a variable that equals 1 if the option is selected or 0 if the option is not selected. The numerator is the number of respondents with knowledge of the specific SMC side effect and the denominator is all respondents
Proportion of respondents with knowledge of what to do in case of repeated vomiting after taking SMC medicine (knowledge)	W903; M903	The correct response is option A – “SEEK ADVICE OR TREATMENT FROM A HEALTH PROVIDER OR COMMUNITY HEALTH WORKER”. Create a variable that is equal to 1 if option A is selected or 0 if not. The numerator is the number of respondents with comprehensive knowledge of what to do in case of repeated vomiting after SMC administration and the denominator is all respondents.
Proportion of respondents with a favorable attitude toward SMC (attitudes)	W904-W910A M904-M910A	Clone variables and reverse code 905, 906, 909, 910. Assign the midpoint of the 10-point scale to “DON’T KNOW”. Sum the scores, divide by the number of items, and split at 5. Respondents with an index score greater than 5 are considered to have a favorable attitude toward SMC. The numerator is the

Indicator/Information	Question No.	Notes on Calculation
		number of respondents with favorable attitudes towards SMC and the denominator is all respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of respondents with perceived response-efficacy towards SMC (response-efficacy)	W912,W913 M912, M913	Clone each variable and assign the midpoint of the 10-point scale to "DON'T KNOW". Sum the scores, divide by the number of items, and split at 5. Respondents with a score greater than 5 are considered as perceiving a response-efficacy for SMC. The numerator is the number of respondents perceived response-efficacy of SMC and treatment and the denominator is all respondents.
Proportion of women with perceived self-efficacy to ensure their child receives SMC (self-efficacy)	W914, M914	Clone the variable, assign the midpoint of the 10-point scale to "DON'T KNOW" and split at 5. Respondents with a score greater than 5 are considered to have perceived self-efficacy regarding SMC. The numerator is the number of respondents perceived self-efficacy regarding SMC and the denominator is all respondents.
Proportion of respondents who perceive that the majority of their community members give all required doses of SMC to their children (descriptive norm)	W921; M921	Clone variable. Recode 1,2,3 as 1, 4 and 5 as 2, and 9 as 3. The numerator is all respondents who perceive community members give all required doses of SMC to their children and the denominator is all respondents.
Proportion of respondents who perceive that community members give SMC to children older than 5 years (descriptive norm)	W921A, M921A	Clone variable. Recode 1,2,3 as 1, 4 and 5 as 2, and 9 as 3. The numerator is all respondents who perceive community members give SMC to children older than 5 years and the denominator is all respondents.
Proportion of respondents who are involved in making decisions about SMC (decision-making)	W105, W923, M105, M923	Among married and cohabiting respondents (105=1 or 2), clone 923. Recode 1 and 3 as 1 and all other options as 0. The numerator is the number of respondents involved in making decisions about SMC and the denominator is all respondents currently married or living with someone.

## SECTION X: Ideation – Perceptions of providers, community health workers, and health facilities

Indicator/Information	Question No.	Notes on Calculation
Proportion of respondents that community health workers treat their patients with respect (perceptions of health workers).	W1001; M1001	Clone variables and recode "DON'T KNOW" as the midpoint of the 10-point scale. Split the score at the median point of 5. Respondents with a score greater than 5 are considered to have positive perceptions towards community health workers' general

Indicator/Information	Question No.	Notes on Calculation
		treatment of their patients. The numerator is all respondents with positive perceptions towards community health worker's treatment of their patients and the denominator is all respondents.
Proportion of respondents that facility-based health workers treat their patients with respect (perceptions of health workers)	W1002; M1002	Clone variables and recode "DON'T KNOW" as the midpoint of the 10-point scale. Split the score at the median point of 5. Respondents with a score greater than 5 are considered to have positive perceptions towards facility-based health workers' general treatment of their patients. The numerator is all respondents with positive perceptions towards facility-based health worker's treatment of their patients and the denominator is all respondents.
Proportion of respondents that have positive perceptions towards health facilities and community health workers in relation to their malaria case management capacity (perceptions of health system capacity for malaria case management)	W1003, W1005, W1006, W1007; M1003, M1005, M1006, M1007	Clone variables and for each item, assign the midpoint of the 10-point scale "DON'T KNOW" responses. Sum the scores, divide by the number of items, and then split at 5. Respondents with an index score greater than 5 are considered to have positive perceptions towards health facilities. The numerator is all respondents with positive perceptions towards malaria case management services in health facilities and the denominator is all respondents.
Proportion of respondents who perceive that health facilities always have the medicine to treat malaria (individual item)	W1004, M1004	Clone variable and assign the midpoint of the 10-point scale "DON'T KNOW" responses. Respondents with an index score greater than 5 are considered to perceive that health facilities always have the medicine to treat malaria. The numerator is all respondents who perceive that health facilities always have the medicine to treat malaria and the denominator is all respondents.
Proportion of respondents who perceive that health facility-based workers know how to treat malaria in children (individual item)	W1008; M1008	Clone variable and assign the midpoint of the 10-point scale "DON'T KNOW" responses. Respondents with an index score greater than 5 are considered to perceive that that health facility-based workers know how to treat malaria in children. The numerator is all respondents who perceive that that health facility-based workers know how to treat malaria in children and the denominator is all respondents.
Proportion of respondents who perceive that community health workers make parents pay for the medication to treat malaria in children less than five years old (individual item)	W1009; M1009	Clone variable and assign the midpoint of the 10-point scale "DON'T KNOW" responses. Respondents with an index score greater than 5 are considered to perceive that community health workers make parents pay for the medication to treat malaria in children less than five years old. The numerator is all respondents who perceive that community health workers make parents pay for the medication to

Indicator/Information	Question No.	Notes on Calculation
		treat malaria in children less than five years old and the denominator is all respondents.
Proportion of respondents that have positive cost-related perceptions towards community and facility-based health workers' provision of malaria case management (cost related perceptions of malaria case management)	W1010, W1011, W1012;  M1010, M1011, M1012	Clone variables and assign the midpoint of the 10-point scale to "DON'T KNOW" responses. Sum the scores, divide by the number of items, and then split at 5. Respondents with an index score greater than 5 are considered to have positive perceptions towards facility-based health workers that provide care for children with malaria. The numerator is all respondents with positive perceptions towards the malaria case management services of facility-based health workers and the denominator is all respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of respondents with positive perceptions towards community-based health workers regarding seasonal malaria chemoprevention (perceptions of health workers)	W1013-W1014f; M1013-M1014f	Clone variable and reverse code 1014, 1014a, 1014b, 1014e. Clone variables and assign the midpoint of the 10-point scale to "DON'T KNOW" responses. Sum the scores, divide by the number of items, and split at 5. Respondents, with a score higher than 5 are considered to have positive perceptions towards community health workers regarding seasonal malaria chemoprevention. The numerator is all respondents with positive perceptions towards community health workers regarding seasonal malaria chemoprevention and the denominator is all respondents. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of women that believe that health providers make pregnant women pay for SP.	W1015; M1015	Clone variable, assign the midpoint of the 10-point scale to "DON'T KNOW" and split at 5. The numerator is all respondents who believe that health providers make pregnant women pay for SP and the denominator is all women who responded to the question.
Proportion of women who believe that antenatal health providers in the community treat pregnant women with respect (perceptions of health workers)	W1016; M1016	Clone variable, assign the midpoint of the 10-point scale to "DON'T KNOW" and split at 5. The numerator is all respondents who believe that antenatal health providers in the community treat pregnant women with respect and the denominator is all women respondents.
Proportion of women who believe that health providers always offer medicine to prevent malaria for pregnant women.	W1017; M1017	Clone variable, assign the midpoint of the 10-point scale to "DON'T KNOW" and split at 5. The numerator is all respondents who believe that health providers always offer medicine to prevent malaria for pregnant women and the denominator is all women respondents.

Indicator/Information	Question No.	Notes on Calculation
Proportion of women that believe that health providers offer medicine to prevent malaria for pregnant women only if she has eaten beforehand.	W1018; M1018	Clone variable, assign the midpoint of the 10-point scale to “DON’T KNOW” and split at 5. The numerator is all respondents who believe that health providers offer medicine to prevent malaria for pregnant women only if she has eaten beforehand.
Proportion of women with positive perceptions towards facility-based health workers’ acceptance of early ANC initiation (perceptions of health workers)	W1019, W1020; M1019; M1020	Clone variables, assign the midpoint of the 10-point scale to “DON’T KNOW” and split at 5. Sum the scores, divide by number of items and then split at 5. Respondents with an index score greater than 5 are considered to have positive perceptions towards facility-based health workers’ acceptance of early ANC initiation. The denominator is all women respondents.
Proportion of respondents that have favorable gender norms regarding malaria prevention and treatment (gender norms)	W1023; M1023	Clone variables and recode “DON’T KNOW” as the midpoint of the 10-point scale. Split the score at 5. Respondents with an index score greater than 5 are considered to have favorable gender-related attitudes regarding malaria prevention and treatment. The numerator is all respondents with favorable gender norms regarding malaria prevention and treatment and the denominator is all respondents.

## SECTION XI: Recall of Malaria Messages

Indicator/Information	Question No.	Notes on Calculation
Proportion of respondents who listen to the radio at least once a week	W1101, M1101	Clone variable and recode 1, 2, and 3 as 1 and other response options as 0. The numerator is all respondents that listen to the radio at least once a week and the denominator is all respondents.
Proportion of respondents who listen to the radio at various times during the day.	W1102, M1102	Calculate the frequency of each response option. The numerator is all respondents who listen to the radio at specific times (as applicable) and the denominator is all respondents.
Proportion of respondents who watch television at least once a week	W1103, M1103	Clone variable and recode 1, 2, and 3 as 1 and other response options as 0. The numerator is all respondents that watch television at least once a week and the denominator is all respondents.
Proportion of respondents who watch television at various times during the day	W1104, M1104	Calculate the frequency of each response option. The numerator is all respondents who watch television at specific times and the denominator is all respondents.
Proportion of respondents with a mobile phone or tablet	W1105, M1105	Clone variable and recode 2 as 0. The numerator is all respondents with a mobile phone or tablet

		(as applicable) and the denominator is all respondents.
Proportion of respondents with a phone or tablet capable to receive specific media	W1107, M1107	Clone each option among the respondents with a mobile phone or tablet (1105 = 1) and recode 9 (DK) as missing. Calculate the proportion that has a phone or tablet capable of receiving each of the stated media. The numerator is all respondents who reported that their phone/tablet is capable of receiving the medium and the denominator is all respondents.
Proportion of respondents with a mobile device that can access the internet.	W1107A, M1107A	Clone variable and recode 2 and 0. The numerator is all respondents with a mobile device that can access the internet and the denominator is all respondents with a mobile device.
Proportion of respondents with a mobile device that can access the radio	W1107B, M1107B	Clone variable and recode 2 and 0. The numerator is all respondents with a mobile device that can access the radio and the denominator is all respondents with a mobile device.
Proportion of respondents who have heard or seen any malaria messages within the last six months	W1108, M1108	Clone variable and recode 2 as 0. The numerator is all respondents who had heard or seen any malaria messages and the denominator is all respondents.
Number of sources to which an individual is exposed to any malaria message	W1109, M1109	For each respondent, create a variable that indicates how many response options were selected.
Specific sources (media channels) of malaria messages	W1109, M1109	Calculate the frequency distribution for each source of malaria messages.
Proportion of respondents who can correctly recall communication campaign messages <sup>6</sup>	W1110, M1110	For each respondent, create a variable that indicates how many response options were selected. The numerator is all respondents who recall campaign messages and the denominator is all respondents.
Proportion of respondents who can complete communication campaign slogan <sup>1</sup>	W1111A, M1111A	Clone variable and recode 2 and 9 as 0. The numerator is all respondents who correctly completed the slogan and the denominator is all respondents.
Number of sources to which an individual is exposed to a specific slogan <sup>1</sup>	W1111B, M1111B	For each respondent, create a variable that indicates the number of response options selected.
Proportion of respondents who recognize communication logos/images <sup>1</sup>	W1113, M1113	Clone variable, recode 2 as 1, and 3 and 4 as 0. The numerator is all respondents who recognize communication logos/images, and the denominator is all respondents.
Number of sources by which an individual is exposed to logos/pictures <sup>1</sup>	W1114, M1114	For each respondent, create a variable that indicates the number of correct response options selected.

<sup>6</sup> This indicator is only applicable if there has been a recent communication campaign prior to the survey.

## SECTION XII: Indoor Residual Spraying (IRS)

### Behavioral Outcomes Related to IRS

Indicator/Information	Question No.	Notes on Calculation
Proportion of households that have received IRS in the last 12 months.	HH119	Clone variable and recode 2 and 8 as 0. The numerator is the number of households that received IRS in the last 12 months and the denominator is all households.
Proportion of households that were sprayed by various actors	HH119, HH120	Among households who received IRS (HH119=1) only, calculate the frequency of each response option in HH120. The numerator is the number of households that received IRS from specific actors (as applicable) and the denominator is all households that received IRS.
Proportion of households that have repainted, re-plastered or washed walls since their household was sprayed	HH119, HH121	Among households who received IRS (HH119=1) only, clone and recode HH121 responses 2 and 8 as 0. The numerator is the number of households that received IRS that repainted, re-plastered or washed the walls and the denominator is all households that received IRS.
Proportion of households that did not spray dwelling for various reasons	HH119, HH122	Among households who did not receive IRS (HH119=2) only. For each response option, create a variable that equals one if that option is selected. The numerator is the number of households that did not receive IRS for different reasons and the denominator is all households who did not receive IRS.
Timing of last IRS within the community	HH123	Clone the variable and analyze the frequency of the response options.

### IRS ideation

Indicator/Information	Question No.	Notes on Calculation
Proportion of respondents who are aware of IRS (knowledge)	W1201; M1201	Clone variable and recode 2 as 0. The numerator is the number of respondents aware of IRS and the denominator is all respondents.
Proportion of respondents with prior awareness about IRS who are willing to accept IRS (intention)	W1202; M1202	Clone 1202 among those that had heard about IRS (1201 = 1) and recode 2 or 9 as 0 for 1202. The numerator is the number of respondents willing to accept IRS and the denominator is all respondents.
Proportion of respondents without prior awareness about IRS who are willing to accept IRS (intention)	W1203; M1203	Clone 1202 among those that had not heard about IRS (1201 = 2 o) and recode 2 or 9 as 0 for 1202. The numerator is the number of respondents willing to accept IRS and the denominator is all respondents.

Indicator/Information	Question No.	Notes on Calculation
Proportion of respondents with favorable attitudes towards IRS (attitudes)	W1204-W1210; M1204-M1210	This indicator is only relevant for those with prior awareness of IRS (1201=1). Clone the variables and reverse code 1204, 1206, 1208, 1210. Assign the midpoint of the 10-point scale to “DON’T KNOW”. Sum the scores, divide by the number of items, and split at 5. Respondents with a score greater than 5, after reverse coding, are considered to have favorable attitudes toward IRS. The numerator is the number of respondents with favorable attitudes towards IRS and the denominator is all respondents aware of IRS. For further guidance about how to assess the internal reliability of these items and evaluate scale dimensionality, please see the section on Advanced Analysis below.
Proportion of respondents who believe that IRS is an effective way to prevent malaria (perceived response-efficacy)	W1211-W1212; M1211-M1212	This indicator is only relevant for those who are aware of IRS (1201=1). Clone the variables and assign the midpoint of the 10-point scale to “DON’T KNOW”. Sum the scores, divide by the number of items, and split at 5. Respondents with a score greater than 5 are considered to perceive IRS as effective for preventing malaria. The numerator is the number of respondents with perceived response-efficacy regarding IRS and the denominator is all respondents who are aware of IRS.
Proportion of respondents that believe they could take actions for their house to be sprayed (perceived self-efficacy)	W1213-1214; M1213-1214	This indicator is only relevant for those who are aware of IRS (1201=1). Clone the variables and assign the midpoint of the 10-point scale to “DON’T KNOW”. Sum the scores, divide by the number of items, and split at 5. Respondents with a score greater than 5 are considered to perceive the self-efficacy to take actions for their house to be sprayed. The numerator is the number of respondents with perceived self-efficacy regarding IRS and the denominator is all respondents who are aware of IRS.

## Tabulation Templates

The tables and charts for the MBS report are produced according to a set of standard tables and charts that can be found in the **accompanying table templates in Excel**, also found in the [MBS Toolkit](#). The purpose of the accompanying excel sheet is to provide model tables and charts which display the major findings of the survey in a manner that will be

useful to program managers. In most instances, the indicators are stratified by region (or applicable geographic administrative unit), as well as by other sociodemographic factors such as sex, residence, age, education, and wealth quintile. The templates also provide guidance on the most important indicators to present in the survey report, the recommended level of stratification, and suggested data visualization. The analysis plan described above provides guidance to calculate the values needed to populate the table templates in Excel. The corresponding values from the data analysis for each cell should be entered by the data analyst directly into the templates. Once the tables are populated, and charts are generated, these can be incorporated into the MBS report, for which a template is also available in the [MBS Toolkit](#). Please note that the table templates are suggestions, as the data generated from the analysis plan can also be included in the report as charts, figures or as text.

## Advanced Analysis

In addition to descriptive analysis, the design and scope of the MBS provides opportunities for more rigorous exploration of meaningful patterns in the MBS data that are critical for ensuring the results of the MBS are relevant and informative for programming. These advanced analytical methods include scale analysis and regression analysis and are explained below. Where the Johns Hopkins Center for Communication Programs implements the particular survey, the research team can provide guidance on advanced analysis.

### Overview of Scale Analysis

The MBS utilizes a set of multiple question items to measure each of the psychosocial constructs that are posited as factors driving behavior within the ideation model of behavior change. Examples of these constructs include perceived self-efficacy, perceived response-efficacy, and attitudes. During data analysis, most of these items are compiled into a composite variable to produce a single measure of the ideational construct. As described in the analysis plan above, this is done by forming a scale comprised of all the items for that construct; each factor (cluster of items in the results) can be referred to as a dimension of the underlying construct. It is generally considered a best practice in survey research to examine the structure of the construct using exploratory **factor analysis**, at a minimum. The aim is to ensure that the items being used to construct each scale form a statistically viable scale, indicating they are relevant in the country context as a measure of the factor.

Factor analysis is a data reduction statistical method that attempts to assess relationships among items used to measure a specific construct and how the items relate to an unobserved latent variable. As mentioned above, the MBS datasets include multiple items designed to measure a single construct. The basic assumption in factor analysis is that for a set of observed variables there are a set of underlying unobserved variables (factors; fewer than the observed variables), that

can explain the linkages among the observed variables. Factor analysis aims to extract the maximum number of factors from a set of variables in order to reduce the number of variables that need to be analyzed.

There are multiple types of factor analysis. In the context of the MBS, exploratory factor analysis is used. Exploratory factor analysis is used to explore the underlying structure of the proposed scales and reveals constructs to further understanding about the construct and validate which items are relevant to form the scale. While it can be statistically complex, factor analysis is strongly recommended for every MBS dataset because it will help to gauge the validity (that is, the extent to which the items are measuring the underlying construct) thereby facilitating the construction of the most robust and context-relevant scales to measure the psychosocial ideational outcomes of the MBS.

It is equally important to check the internal reliability (the extent to which the items measure the scale consistently) of the scales using an appropriate statistic such as Cronbach alpha.

If conducting scale analysis is not feasible for the MBS analytical team, the team can proceed with construction of the scales according to the analysis plan described above. This approach has been utilized in several MBSs and a scale analysis conducted in three countries indicated relevance of all of the items for the majority of the scales.

## Steps to Conduct Factor Analysis

Only those constructs used to form **scales** should be analyzed by factor analysis in the MBS. These scales are:

MBS ideational constructs measured by scales	Questionnaire items to test for each scale
GENERAL MALARIA IDEATION	
PERCEIVED THREAT OF MALARIA	508a 508 509 510
PERCEIVED SEVERITY OF MALARIA	511 512 513 514a 514
ITN IDEATION	
PERCEIVED BARRIERS TO NET USE	603 604 605 606 608 610
POSITIVE ATTRIBUTES OF NET USE	602 607 609 612g 612i
PERCEIVED RESPONSE EFFICACY TO USE NETS	613 615 615a
PERCEIVED SELF EFFICACY TO USE NETS	616 617 618
NET CARE ATTITUDES	611 612 612c 612e
NET CARE SELF-EFFICACY	612b 612d 612j
ANC/IPTp IDEATION	
ANC/IPTp ATTITUDES	708 708a 709 710a
ANC/IPTp PERCEIVED RESPONSE EFFICACY	711 711a 712 712a 712b
ANC SELF-EFFICACY	714 715 717
IPTP SELF-EFFICACY	719 719a 719b
CARE SEEKING AND TREATMENT IDEATION	

ATTITUDES TOWARDS CARE SEEKING AND TREATMENT	804 810 812 812a
PERCEIVED RESPONSE EFFICACY OF CARE SEEKING AND TREATMENT	815 816 818
SELF-EFFICACY FOR CARE SEEKING	819 821 822 824
PERCEPTIONS OF PROVIDERS, COMMUNITY HEALTH WORKERS, AND HEALTH FACILITIES IDEATION	
PERCEPTIONS OF CAPACITY TO MANAGE MALARIA CASES	1003 1005 1006 1007
COST RELATED PERCEPTIONS RELATED TO MALARIA CASE MANAGEMENT	1009 1010 1012

**For any of the above listed constructs that has at least three question items, it is recommended to systematically assess the extent to which the items form a unidimensional or multidimensional scale by the following steps:**

1. Assess the correlation among the items and inspect the inter-item correlation (polychoric correlation for categorical variables and tetrachoric correlation for binary variables) matrix for outliers. Outliers are those items with very low correlations (<.30) with the other items in the scale. These outlier items should be considered for exclusion from the scale, after considering exploratory factor analysis and internal reliability results in steps 2 and 3 below. Analysts may decide to include the outlier items as individual correlates in their regression analysis if there is indication that the items are related to the outcome.
2. Perform exploratory factor analysis to understand the latent structure of the items, determine the optimum number of factors and assess which items load on which factors. The rule of thumb is to retain as many factors as have an Eigenvalue of 1.0 or higher. Alternatively, use a scree plot to determine the number of factors to retain. Items that have a factor loading of at least 0.4 should be considered for inclusion in measuring the scale or subscale.
3. Check the internal reliability of the items or the degree of consistency exhibited when a measurement is repeated under similar conditions. The most common measure of internal reliability is Cronbach's alpha. A Cronbach's alpha of at least 0.70 is considered acceptable. If the result of the reliability test indicates that certain items do not belong in the scale, consider excluding them from the set and rerun the reliability test. Ultimately, some of the items may need to be introduced as individual elements in the regression model.

With the results of the three statistical tests described above in hand, the analytical team will use the three outputs to determine which items to use to measure the scale. Once the items for inclusion have been selected, follow the guidance provided in the analysis plan described above to construct the scales or subscales. If any of the excluded items appear relevant to the behavioral outcomes for statistical or programmatic reasons, they can be introduced as individual elements in the regression model (not as part of a scale). All items, including those excluded from the scales, should be presented in the descriptive analysis tables as they may be programmatically important data to consider.

## Overview of Regression Analysis

Regression analysis is a statistical method that attempts to discern relationships, if any exist, between an outcome variable and a set of predictor variables. It determines the strength of the relationship between one dependent variable

(usually an outcome) and another changing variable or a set of other changing variables (independent variables). In circumstances where the independent variables clearly precede the dependent variable in time, regression analysis can be used to infer causal relationships between the independent and dependent variables. Linear regression analysis is used to assess the relationships between a continuous dependent variable and a number of independent variables. If the dependent variable is dichotomous, then a regression approach suited for binary dependent variables, such as logistic or probit regression, is used. Regression models include a standard error (often a 95% confidence interval) that indicates statistical significance, or the probability that the association is not due to chance. A multivariable regression model allows for determining the variables associated with the outcome of interest, while controlling for the other variables also included in the model.

Applying this type of analysis to the MBS data is valuable to SBC programs; it indicates which socio-demographic, household and psycho-social (ideational) variables are important predictors of the malaria prevention and treatment behaviors we wish to influence.

## Considerations for Regression Analysis using MBS Data

### Variable selection

It can be challenging to know in advance which variables would be most interesting or informative for a regression analysis. Typically, variables of potential interest for regression can be selected based on *a priori* knowledge, from other research or available literature, or based on initial descriptive analyses of the MBS data.

### Dependent (outcome) variables

Key outcome variables include malaria-related behaviors such as use of insecticide treated nets, prompt care seeking for fever, testing for malaria, going for ANC visits, taking IPTp, and receipt of IRS or SMC.

### Independent variables

Independent variables include sociodemographic variables such as age, sex, region, residence, and wealth quintile. In addition, the MBS enables the exploration of the influence of psychosocial (ideational) variables on the outcome variables. Exposure to relevant SBC interventions are important independent variables that can influence key outcomes. Of note, variables considered as independent variables, such as psychosocial variables or exposure malaria messages, can be used as dependent variables depending on the inquiry of interest.

### Building the regression model

Detailed steps to build a regression analysis model is beyond the scope of this document, however the analysis plan above describes how to prepare many, if not all, of the outcome and independent variables that will be of interest to

explore in regression analyses. As such, the guidance above considerably prepares the database for regression analysis. The research team will select and explore various regressions of interest and decide on further analyses based on the results and what will be useful to inform SBC programs. For each outcome of interest, it is critical to base programmatic recommendations on the results of a multivariable regression model. For reasons of parsimony, the independent variables to include in the multivariable (adjusted) regression model should be those that have been found to be associated with the outcome at a significance level of <0.2 in an unadjusted model. Table 1 below is an example of regression analysis results that are useful in identifying variables that SBC programs may wish to promote due to a significant association with consistent net use.

## Annotated Example of Logistic Regression Analysis

Table 1 shows the results of a multivariable regression analysis that explored the factors associated with the use of ITNs every night (dependent or outcome variable) among respondents surveyed in the Côte d’Ivoire MBS (13). The model included several independent variables that might influence ITN use, including sociodemographic variables (such as, age, sex, education, zone, wealth quintile), psychosocial (ideational) variables (such as attitudes, perceptions, interpersonal communication, knowledge) and a variable on exposure to malaria messages on the media. In addition, the model includes household size and supply of ITNs, based on literature that shows that access to ITNs is an important predictor of use.

The multivariable regression results are presented in a table like the one below. For each independent variable included in the model, the association with the behavioral outcome, use of ITNs every night, is shown. The associations are shown as odds ratios because the variable for ITN use is dichotomous (yes/no). The odds ratio represents the odds that an outcome will occur given the presence of a particular variable, compared to the odds of the outcome occurring in the absence of that variable while the adjusted odds ratio represents these odds while controlling for other variables included in the model. In addition, the standard error (in this case, 95% confidence interval) provides a measure of precision for the effect size shown.

The results show that the variables significantly associated with the use of ITNs include a number of sociodemographic and ideational variables. For example, the likelihood of using an ITN every night increases with age and exposure to malaria messages on the media (depicted with the \* sign denoting the level of statistical significance).

<b>Table 1: Results of the logistic regression exploring factors associated with use of LLIN every night – residents of households with at least one LLIN. Côte d’Ivoire, 2018</b>		
<b>Characteristics</b>	<b>% using LLIN every night</b>	<b>Odds ratio (standard error)</b>
Sex		
Male (reference)	65.3	1.000 (n/a)
Female	65.6	1.163 (0.103)

Age in years	n/a	1.010** (0.004)
Level of education		
None (reference)	73.1***	1.000 (n/a)
Primary	64.9	0.764*** (0.064)
Secondary or higher	59.4	0.730*** (0.061)
Household wealth quintile		
Lowest (reference)	80.5***	1.000 (n/a)
Second	73.6	0.789*(0.083)
Middle	68.3	0.736**(0.080)
Fourth	58.1	0.671*** (0.077)
Highest	48.0	0.668** (0.086)
Zone		
North (reference)	72.7***	1.000 (n/a)
Center	72.9	1.213* (0.114)
South	71.2	0.999 (0.093)
Abidjan	38.8	0.355*** (0.043)
Attitudes favorable to the use of mosquito nets		
No (reference)	34.9***	1.000 (n/a)
Yes	68.3	2.772*** (0.335)
Perceived severity		
No (reference)	66.2	1.000 (n/a)
Yes	64.8	0.930 (0.061)
Perceived vulnerability		
No (reference)	67.1	1.000 (n/a)
Yes	65.1	0.758*** (0.061)
Talked about malaria with spouse		
No (reference)	63.7**	1.000 (n/a)
Yes	69.7	1.287** (0.115)
Talked about malaria with friends/family members		
No (reference)	64.5	1.000 (n/a)
Yes	68.2	1.262** (0.114)
Perceived mosquito net effectiveness		
No (reference)	59.7***	1.000 (n/a)
Yes	69.4	1.114 (0.074)
Perceived self-efficacy for mosquito net use		
No (reference)	17.7***	1.000 (n/a)
Yes	74.2	6.581*** (0.480)
Use of mosquito nets perceived as the norm in the community		
No (reference)	56.2***	1.000 (n/a)
Yes	69.3	1.166* (0.084)
Mentioned at least one incorrect method of transmitting malaria		
No (reference)	65.7	1.000 (n/a)
Yes	65.4	0.861* (0.059)
Heard a message about malaria on the media		
No (reference)	64.6	1.000 (n/a)
Yes	67.0	1.285** (0.093)

Household size	n/a	0.948*** (0.013)
Number of LLIN	n/a	1.307*** (0.043)
Pseudo-R <sub>2</sub>	21.4%	
Number of observations	6,060	
Notes: ‡ p<0.1 * p<0.05; ** p<0.01; *** p<0.001. n/a: not applicable		

## Reporting

The MBS report template (an accompanying word document) is also available in the [MBS Toolkit](#) and provides guidance on how to structure the results of the MBS. The use of the report template is strongly encouraged to ensure comprehensive and standardized reporting of MBS results. The report template includes a detailed methodology section highlighting the study objectives, design, data collection process and ethical considerations. The results of the MBS data analysis are presented under the following headings: Description of the study sample, cross-cutting ideational factors, ITNs, malaria case management, malaria in pregnancy, IRS (if applicable), SMC (if applicable), and media consumption habits and message exposure. The country-specific study tools are also typically included as an appendix to the report template.

# References

1. Babalola S, Kincaid DL. New methods for estimating the impact of health communication programs. *Communication Methods and Measures*. 2009;3(1-2):61-83.
2. Fishbein M, Triandis HC, Kanfer FH, Becker M, Middlestadt SE. Factors influencing behavior and behavior change. 2000.
3. Awantang GN, Babalola SO, Koenker H, Fox KA, Toso M, Lewicky N. Malaria-related ideational factors and other correlates associated with intermittent preventive treatment among pregnant women in Madagascar. *Malaria journal*. 2018;17(1):176.
4. Babalola S, Adedokun ST, McCartney-Melstad A, Okoh M, Asa S, Tweedie I, et al. Factors associated with caregivers' consistency of use of bed nets in Nigeria: a multilevel multinomial analysis of survey data. *Malaria journal*. 2018;17(1):280.
5. Kilian A, Lawford H, Ujuju CN, Abeku TA, Nwokolo E, Okoh F, et al. The impact of behaviour change communication on the use of insecticide treated nets: a secondary analysis of ten post-campaign surveys from Nigeria. *Malaria journal*. 2016;15(1):422.
6. Ricotta EE, Boulay M, Ainslie R, Babalola S, Fotheringham M, Koenker H, et al. The use of mediation analysis to assess the effects of a behaviour change communication strategy on bed net ideation and household universal coverage in Tanzania. *Malaria journal*. 2015;14(1):15.
7. Yansaneh IS. Construction and use of sample weights. *Designing Household Surveys Samples: Practical Guidelines*. 2003.
8. Rutstein SO. Steps to constructing the new DHS Wealth Index. Rockville, MD: ICF International. 2015.
9. G MAMSOFKSLNKKS-SEGJK. Methods and indicators for measuring patterns of human exposure to malaria vectors. *Malaria Journal* 2020;(in review).
10. Monroe A, Moore S, Koenker H, Lynch M, Ricotta E. Measuring and characterizing night time human behaviour as it relates to residual malaria transmission in sub-Saharan Africa: a review of the published literature. *Malaria journal*. 2019;18(1):6.
11. Koenker H, Ricotta E, Olapeju B, Choiriyyah I. ITN access and use report—2018. Baltimore: PMI | VectorWorks Project, Johns Hopkins Center for Communication Programs. 2018.
12. Koenker H, Kilian A. Recalculating the net use gap: a multi-country comparison of ITN use versus ITN access. *PLoS One*. 2014;9(5):e97496.
13. Programs JHCfC. Survey on the Determinants of Malaria-Related Behaviors in Côte d'Ivoire. Baltimore, USA: Johns Hopkins Center for Communication Programs; 2019 September 2019.