Malaria Behavior Survey

Guidelines for Design and Implementation

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PMI U.S. PRESIDENT'S MALARIA INITIATIVE
LED BY USAID FROM THE AMERICAN PEOPLE CDC

Breakthrough ACTION FOR SOCIAL & BEHAVIOR CHANGE

Table of Contents

Acronym List

ANC	Antenatal care
CCP	Johns Hopkins Center for Communication Programs
IPTp	Intermittent preventive treatment in pregnancy
IRS	Indoor residual spraying
MBS	Malaria behavior survey
PMI	U.S. President's Malaria Initiative
SBC	Social and behavior change
SMC	Seasonal malaria chemoprevention
USAID	United States Agency for International Development

Introduction

Despite considerable investments in malaria prevention and treatment efforts through the decades, malaria continues to be a major cause of morbidity and mortality among various age groups in low-resource settings. With funding from the United States Agency for International Development (USAID) through the Breakthrough ACTION (Cooperative Agreement #AID-OAA-A-17-00017) and Health Communication Capacity Collaborative (HC3) projects, the Johns Hopkins Center for Communication Programs (CCP) worked with governmental agencies and country-based social and behavior change (SBC) partners to design the Malaria Behavior Survey (MBS). This survey is designed to measure and assess malaria-related behavioral outcomes and their ideational or psychosocial determinants using a theory-driven and standardized methodology. The survey is not intended to serve as a source of questions for other surveys. Instead, it is designed to be a stand-alone survey, with minimal modifications across countries, to be administered in its entirety as part of efforts to standardize malaria SBC data collection. The tools for the survey and suggested sampling strategy and analysis plans are described in this document.

MBS Use Cases

The MBS is a cross-sectional household survey designed using the Ideation Model of Behavior Change (Kincaid, 2000) and explores the behavioral determinants associated with malaria-related behaviors. It is designed to address critical data needs across malaria programs by providing insights into the cognitive, emotional, and social factors associated with behavioral outcomes across malaria technical areas. There are multiple use cases in which the MBS can be informative to malaria programs, as outlined below.

Strategic planning and program design: The MBS is a valuable resource for strategic planning and program design, particularly in developing or updating National Malaria Strategic Plans and SBC strategies, which are often revised every five years. MBS data can inform tactical shifts to strategies in response to changing contexts and priorities. Additionally, the MBS helps guide new programs by identifying priority areas for intervention, such as planning ITN distribution campaigns. In situations where robust quantitative behavioral data are unavailable—whether at the national, regional, or population level—the MBS fills this gap by providing actionable insights for program design and implementation.

Program effectiveness and adaptive management: While the MBS is not intended as a monitoring tool, it provides baseline behavioral indicators that programs can monitor through appropriate data sources. The survey is particularly useful for diagnosing challenges, such as stagnant or negative behavioral uptake rates, unmet targets, or informing mid-term project adjustments. MBS data can support adaptive management, helping programs shift strategies during implementation or inform national malaria program reviews. The survey also provides rich data to triangulate with other complementary data collection methods, such as health facility surveys, ITN durability monitoring, and entomological surveillance.

Support for funding applications: MBS data strengthen funding applications, including Global Fund proposals, by justifying strategies with robust behavioral evidence. The MBS also complements Malaria Matchbox assessments, which primarily explore health equity through qualitative methods. Together, these tools provide a broader understanding of barriers to accessing malaria prevention and treatment services, ensuring that funding proposals are grounded in comprehensive data and tailored to meet equity goals.

How to use these guidelines

The goal of this document is to provide guidance in implementing the MBS in moderate to high malaria transmission areas. These guidelines are designed to: (1) describe standard survey instruments for researchers and implementers working in the area of malaria SBC; (2) help SBC program and research staff understand the importance of adequate sample size and appropriate sampling strategy for the MBS; (3) propose a sampling strategy for the MBS; (4) explain how the data collected through the MBS can be used to compute standard RBM Partnership to End Malaria indicators for SBC; and (5) enhance understanding of the potential uses of quantitative research in developing, refining, and implementing malaria strategic plans as well as accompanying social and behavior change strategies. Low malaria transmission zones, defined as annual parasite incidence (API) of 100-250 cases per 1000 population, and very low transmission (<100 API per 1000 population), are distinct from other transmission contexts; as such, specific low transmission MBS implementation guidelines are available in the MBS toolkit online.

These guidelines can be used to design and implement the MBS to:

- Determine and understand the demographic, psychosocial, and contextual factors associated with—
    - Net use
    - Net acquisition intentions
    - Access to and uptake of intermittent preventive treatment of malaria in pregnancy (IPTp)
    - Prompt and appropriate diagnosis and treatment of fever in children
    - Indoor residual spraying (IRS)
    - Seasonal malaria chemoprevention (SMC)
- Identify focus areas for programs to promote appropriate malaria prevention and treatment behaviors.
- Estimate the association of program activities with malaria-related determinants and behavioral outcomes.

These guidelines include the following sections:

1. Brief overview and survey objectives—The overview explains the model and theoretical constructs underlying the development of the survey tools. This section includes a description of the ideation model, its dimensions, and theoretical constructs, and the objectives of the MBS.
2. Sampling strategy—This strategy provides an explanation of the suggested approach to sample size determination and sample selection techniques.
3. Ethical considerations—Important considerations with regards to survey participant risks, benefits, privacy and confidentiality are described in this section.
4. Data analysis—An overview of steps for data analysis are included in this section, with reference to more detailed resources.
5. Collaboration—Several important decisions regarding the implementation of the MBS will need to be made in each country. This section lists some of these decisions and recommends the formation of an advisory group of stakeholders for country decision-making.

Additional documents accompany these guidelines:

1. Household questionnaire—The questionnaire collects information on household members, household characteristics and assets, characteristics of available nets within the household, source of nets, and the use of nets by household members.
2. Caregiver's (male and female) survey questionnaires—These include the following modules: respondent's background characteristics, mosquito net-related outcomes, use of health services (for women only), media habits and recall of malaria messages, and ideation related to insecticide-treated nets, IPTp, care-seeking, IRS, and SMC.
3. Indicator mapping and data analysis plan—This plan maps questions in the survey tools to standard RBM Partnership to End Malaria indicators and explains how the questions can be used to derive the indicators.
4. Illustrative timeline for implementing the MBS

Brief Overview of Theoretical Basis of the Survey Tools

The tools presented in this document are developed based on an adaptation of the ideation model of strategic communication and behavior change (Kincaid, 2000). Since it first appeared in family planning literature about 20 years ago, the ideation model has been adapted for other health areas and has been successfully used in the design and evaluation of communication interventions targeting HIV/AIDS, child immunization, water and sanitation, and, more recently, malaria (Nguyen et al., 2012; Storey & Figueroa, 2012; Ricotta et al., 2015; Babalola et al., 2016; Do et al. 2017; Awantang et al. 2018). The ideation model (Figure 1) recognizes three dimensions of psychosocial factors influencing the decision to engage in health-protective behaviors: cognitive (e.g., knowledge, attitudes, perceived risk (comprised of perceived severity and susceptibility], perceived response-efficacy, and descriptive norm), emotional (e.g., perceived self-efficacy), and social interaction (e.g., interpersonal communication, personal advocacy, and decision-making autonomy). The theoretical constructs

included in the ideation model are borrowed from other theories and models of behavior change, including the Health Belief Model, Theory of Reasoned Action, Theory of Planned Behavior, and the Expanded Parallel Processing Model. Furthermore, the ideational variables have long been recognized in various health domains as important determinants of behaviors (Fishbein et al. 2001).

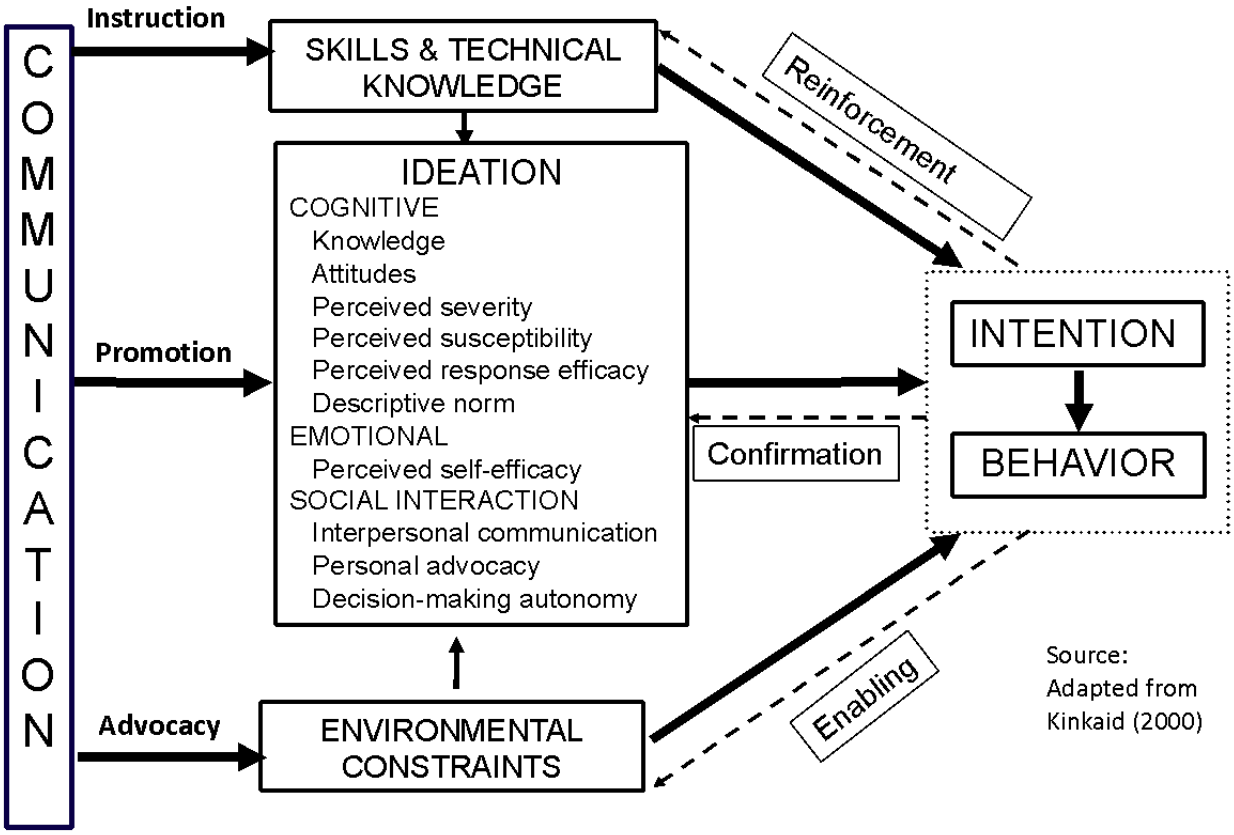

Figure 1: Ideation model of strategic communication and behavior change

The ideation model posits that SBC affects individual behaviors mainly through its impact on the ideational determinants of behaviors. The implication of this assumption for SBC programming is that potentially effective behavior change interventions should target ideational determinants for maximum impact.

The survey tools include tested questions on the ideational constructs shown in Figure 1 and described below for each malaria-related behavior.

A. Cognitive Dimension

Knowledge

This construct encompasses knowledge about the causes and ways of preventing malaria, symptoms of malaria, malaria testing, prompt care-seeking for malaria, recommended doses of IPTp, recommended number

of antenatal care (ANC) visits, and the ideal timing of first antenatal visit. Some of these indicators are assessed with multiple questions while others require only one question.

Attitudes

This construct measures the beliefs and values that individuals hold about a behavior. The survey tools include sets of questions to assess beliefs and values related to ITNs, case management of fever, malaria diagnostic testing, IPTp, SMC, and IRS. The attitudes construct is assessed through multiple questions.

Perceived threat

Perceived threat includes **perceived severity** of malaria (perceptions about how serious a problem malaria is) and **perceived susceptibility** to malaria (perceptions about one's chances of being infected with malaria). Each of these two constructs is measured through a set of questions that require respondents to indicate their level of agreement with specific statements.

Perceived response efficacy

This construct assesses the belief in the effectiveness of a recommended solution or treatment for a problem. Specifically, the survey tools include questions on the perceived effectiveness of ITNs, IPTp, malaria diagnostic tests, SMC, antimalarial drugs provided in health facilities, and IRS. This construct is assessed through multiple questions.

Descriptive norm

Descriptive norm refers to an individual's belief about the prevalence of a behavior in one's immediate environment. In the survey tools for the MBS, descriptive norms are assessed regarding the use of ITNs, prompt care-seeking for fever, use of malaria diagnostic testing in health facilities, ANC visits, IPTp uptake, obtaining SMC for children, and IRS.

Injunctive norm

Injunctive norms are people's beliefs about how people should behave, and what others approve of or expect them to do. The MBS survey tools include questions to assess injunctive norms regarding consistent use of bed nets, prompt care-seeking for children with fever, and use of IPTp.

B. Emotional

Perceived self-efficacy

Perceived self-efficacy is the level of confidence in one's ability to take specific actions related to malaria prevention and treatment. Relevant questions in the survey tools assess perceived self-efficacy to use a mosquito net consistently, obtain the recommended number of doses of SMC for one's child, and take a child

with fever to the health facility promptly. Other questions focus on the perceived self-efficacy to attend several ANC visits during pregnancy, take the recommended doses of IPTp, and ensure that a child diagnosed with malaria takes all the recommended doses of antimalarial treatment. Most of these indicators required multiple questions to measure.

C. Social Interaction

Interpersonal communication

Interpersonal communication or discussion of an issue with others has been found in many studies to be a key antecedent of normative and behavioral change. In the survey tools, some questions ask respondents if they have talked about specific malaria-related behaviors with a spouse, friends, or other relations.

Personal advocacy

Personal advocacy is a form of interpersonal communication. It is defined as encouraging other people to adopt a recommended behavior. Evidence has shown that engaging in personal advocacy in favor of a behavior is a key correlate of the behavior.

Decision-making autonomy

This construct is assessed by asking individuals about the persons involved in making decisions related to specific health issues in their household. Specifically, we included questions related to adult women's health, care-seeking for a sick child, ANC attendance, and net allocation within the household. In addition, specifically for ANC/IPTp, we included a set of questions to assess spousal communication and negotiation around ANC attendance.

Objectives of the Malaria Behavior Survey

The objectives of the MBS will depend on the country context, the behaviors of interest to program planners and policy makers, and the primary purpose of the survey (i.e., formative, baseline, supplementing other data sources, or to inform qualitative research). In other words, the objectives and sampling strategy should be closely linked to the goal(s) of the survey. In general, the MBS has a two-fold goal: to provide a better understanding of the socio-demographic and ideational characteristics associated with malaria-related behavioral outcomes and to determine the appropriate focus of programmatic activities designed to improve malaria-related ideational and behavioral outcomes. Related to this two-fold goal were the following objectives:

- Assess the prevalence of various malaria-related behaviors, including use of bed nets, IPTp, prompt and appropriate treatment of malaria in children, SMC, and IRS;
- Determine the ideational factors that are related to bed net use and care; uptake of IPTp; prompt and appropriate treatment of malaria in children; and acceptance of IRS

- Understand reasons for not adopting appropriate malaria prevention and treatment behaviors; and,
- Determine what should be the focus of future programs designed to promote appropriate malaria prevention and treatment behaviors.

While the MBS is primarily a formative assessment tool, it is possible to use the MBS for the purpose of evaluating SBC programs using repeated cross-sectional surveys and following an evaluation-specific study design. In this case, in addition to the objectives listed above, the survey could also seek to: (1) assess exposure to, and participation in, program activities; and (2) determine the association between exposure and malaria-related ideational and behavioral outcomes. Additional sampling and research design considerations, beyond those presented in these implementation guidelines, are needed to evaluate a program implemented in certain areas using the MBS.

Ultimately, the objectives of the MBS will determine the sampling design and questions that will be included in the data collection tools. The MBS tools include several modules with questions related to specific behaviors. If a country is not interested in a particular outcome (for example IRS), there will be no need to include the module containing the ideational or behavioral questions related to that topic. We discourage programs from selecting questions from sections of the MBS; instead, entire modules should be selected as relevant. It is strongly recommended that once programs have identified the behavioral outcomes of interest, all questions (ideational and behavioral) in the MBS related to the outcomes should be included in the data collection questionnaire.

Collaboration & Planning

Successful implementation of the MBS requires partnerships and close collaboration among many governmental and non-governmental organizations. The project or government agency that is leading the implementation of the survey should involve local research/academic institutions and relevant arms of the government (e.g., NMCP, Division of Family Heath, Division of Community Health, Ministry of Education, etc.). The project or agency should also involve donors and development partners implementing, or intending to implement, malaria control programs in the implementation of the survey. Prior to finalizing the survey protocol, it is important for survey implementers to:

- Have a good understanding of the malaria control landscape in the study country, including key actors.
- Know what the policy guidelines and strategic objectives are.
- Understand what activities have been implemented, are ongoing, or are planned, as well as the current status of any existing malaria SBC strategies, and when these strategies could be updated.
- Be familiar with what data already exist and what relevant data collection activities are ongoing or planned for the near future (e.g., Demographic and Health Survey, Malaria Indicator Survey, Multiple Indicator Cluster Survey).

It is critical to ensure ownership of the survey by the NMP. Holding an initial meeting with NMP and PMI is a key first step; this meeting serves to describe the MBS, objectives, types of data it will produce, and how the

data is useful to inform SBC strategies. One important outcome of the meeting is the identification of an NMP focal point for the survey. It is equally important to negotiate the scope of the survey with other relevant government agencies, PMI, and other donors (where relevant) and to agree on a survey strategy.

Setting up a research advisory group early in the planning phase of the survey is highly recommended (see illustrative timeline below). Putting in place an advisory group should be a priority as soon as the key study partners are identified and before the survey protocol is finalized. The research advisory group should include representatives of the organization primarily responsible for the survey, the National Malaria Program, other relevant government agencies, PMI in the country (if relevant), local researchers/academic partners with experience in malaria-related behavioral research, and eventually, the research firm contracted to conduct the survey. The research advisory group should meet regularly before, during, and after data collection. This group should be responsible for final decisions concerning the scope of the survey, geographic areas/zones for the survey (see Sampling Considerations above), survey design, data collection tools, timing of the survey (taking into account the rainy season, elections or other major dates), coordination of fieldwork, data analysis, and reporting. The research advisory group should also make decisions regarding ownership of the data, where the dataset will be housed, and how data will be shared.

Finally, it is recommended to identify any other stakeholders to inform about the survey (e.g., Global Fund prime recipient, SBC implementing partners) and meet with them to describe the survey, listen to their interests, and ensure there is a contingent that will be able to make use of the data. These can eventually be involved in data dissemination and use activities after data collection is complete.

Data Collection Tools

The MBS builds upon previous surveys that explore factors related to malaria prevention and treatment behaviors in Liberia, Madagascar, Mali, Nigeria, and other African countries. Three survey tools are suggested for data collection: household schedule, female caregiver's questionnaire and male caregiver's questionnaire. The questionnaires collect information on socio-demographic characteristics, malaria prevention and treatment, ideational characteristics of adult men and women, and bed nets available for household use. The ideational characteristics assessed are described above and include perceived threat (perceived severity and perceived vulnerability), knowledge, response efficacy of recommended behaviors, attitudes, descriptive norm, injunctive norm, perceived self-efficacy, interpersonal communication, personal advocacy, and decision-making autonomy related to each of the behavioral outcomes of interest to the study. The questionnaires also include questions about media consumption (e.g., radio, TV, print media, social media) habits as well as exposure to relevant SBC interventions that focus on malaria prevention and treatment. In addition, the survey asks about several behavioral outcomes, including the following:

- Use of a bed net the previous night by all household members, including children, youth, and adults.
- Acquisition of bed nets, intention to acquire nets, net care, and net repair.
- Receipt of IPTp among women who were pregnant in the past two years.

- Care seeking for fever among children with fever in the past two weeks.
- Acceptance of household IRS and behaviors related to the success of that intervention (e.g., repainting walls).
- Uptake of SMC.

In 2023, Breakthrough ACTION, in collaboration with PMI, conducted survey validation exercises. In line with best practices for survey design, the validation was conducted to iteratively improve the survey and its ability to effectively measures the intended ideational characteristics per behavior change theoretical constructs. The goals were to enhance internal and construct validity of the questions, reliability of the scales computed for each ideational characteristic, and streamline the questionnaire.

The scale validation analysis included descriptive analysis of three country datasets to examine the distribution and skewness of each item, reliability tests to examine the internal consistency of each scale, construct validity tests to assess whether the hypothesized structure of the scales is supported by the data, and criterion validity tests to evaluate how well each scale is measuring what it is intended to measure. These efforts led to a more streamlined and validated survey with acceptable internal reliability for all scales.

MBS 10-point response scale

Starting in 2024, in response to the validation exercises noted above, the MBS transitioned from a three-point response scale (agree/disagree/don't know) to a 10-point response scale that is implemented as a continuum from strongly disagree to strongly agree. The aim of the 10-point response scale is to add more nuance compared to the three-point scale, reduce skewing to questions, while at the same time taking care to minimize both interviewer burden and the complexity of the instrument.

In the 10-point scale, the extreme endpoints are labeled to represent "strongly disagree" (1) and "strongly agree" (10), and values 1–5 indicate disagreement and 6–10 agreement. Unlike a discrete interval scale, which would require detailed explanation of all 10 points, the continuum format streamlines the interview process and is expected to support consistency across diverse contexts, especially among populations with low literacy levels. An accompanying visual aid for interviewers to help illustrate the response scale to survey respondents is recommended with survey implementation (Annex 3). Adapting the response scale to locally meaningful units (i.e., local currency or measurements) may also be considered by survey stakeholders for improved contextual relevance. To ensure consistent implementation, field workers should receive thorough training and refresher trainings as needed to deliver the scale prompts accurately.

Real-time monitoring of digital data collection

Real time monitoring is recommended as a best practice to quickly identify and address any issues during data collection and is commonly implemented in survey research. Monitoring participant responses is critical to ensure that no data collector is skewing too far toward the extremes of the response scale (1 or 10) or overusing "don't know." Additionally, survey duration should be monitored to ensure that adequate time spent actively conducting the survey is within reason for each of the questionnaires. Other important real time

monitoring activities include verifying key behaviors and skip patterns to ensure that questions aren't missed, comparing against quality assurance data to identify discrepancies, confirming that all surveyed households included all eligible participants, and looking at the percentage of "other" responses to identify any patterns or overuse.

Sampling Considerations

In survey research, both the sample size and the sampling procedure are critical issues that could affect data quality and use. Sampling too few respondents has implications for the ability to make inferences based on the data. On the other hand, sampling too many respondents can be an unnecessary use of resources. Just like for any research study, the way the sample is selected for the MBS has implications for representativeness. Non-probability or convenience sampling is not likely to yield a sample that accurately represents the population from which it is sampled. Therefore, it is important when implementing the MBS to adopt a probability sampling method; that is, one where every eligible person in the population has a known probability of being sampled. While it is not necessary to limit sample selection to households with at least one child under the age of five years, this document recommends ensuring that the MBS sample includes enough households with children under five to allow the estimation of the prevalence of fever among under-five children in the two weeks preceding the survey. This section provides suggestions for determining sample size and designing sampling procedures using a multi-stage sampling design with selection at more than one stage (e.g., district, cluster). For the MBS conducted in moderate and high malaria transmission areas, this guide recommends interviewing all eligible women (aged 15–49 years) and one eligible man (the husband of one of the eligible women) in one third of households.

Required sample size

The number of respondents needed for the MBS will depend on three factors: 1) the level at which a program desires to make inferences which is usually geography-based (i.e., zone or region), 2) the prevalence of the behavioral or ideational indicators that the program plans to measure, and 3) whether the sample is for a one-time cross-sectional design or for a longitudinal design (repeated cross-sectional). These factors will in turn be influenced by the objectives of the survey and whether it is used for formative or baseline/endline evaluative purposes. For example, if a country is interested in assessing the uptake of IRS in a particular district, there may be a need for a booster sample for that district to have enough statistical power to assess the outcome.

With regards to the level at which inferences will be made with MBS data, the decision will depend on the intended use of the data, available resources, and what is known about variations in key malaria indicators. The intended use of MBS results is typically to provide formative data to guide malaria program activities. Additionally, countries with variable malaria transmission can consider the relative importance of collecting data in higher and lower prevalence areas, to develop tailored SBC strategies for such settings as needed. The results of MBS will be influenced by malaria prevalence among the surveyed population and the timing of the

survey with regards to malaria transmission patterns. Therefore, the sampling strategy for level of inference may take into account differences in malaria transmission across the country that might affect behavior.

Resources available to conduct the survey will also influence the level of inference decision. Given these considerations, programs may decide to collect data that provide representativeness at the national, regional, or malaria transmission zone level. For example, a 2019 MBS in Cameroon was conducted in two project-supported regions. Since the expectation was that malaria-related behaviors and ideation will vary by region, the sampling design was such that it assured representativeness at the state level. In contrast, stakeholders planning the 2018 MBS in Côte d'Ivoire decided to field a national survey with representativeness across four geographic zones that reflected known variations in malaria transmission.

With the regards to the prevalence of the behavioral or ideational indicators that the program plans to measure for sample size calculation, the indicator(s) that will inform the determination of sample size for the MBS should be relevant to the malaria SBC program. In most cases, one or more of the following indicators will be relevant:

- Percent of women of reproductive age sleeping under a bed net.
- Percent of children under five years old with fever in the last two weeks.
- Percent of women with positive attitudes toward consistent use of bed nets.
- Percent of women pregnant in the last two years who obtained at least three doses of IPTp. Note that, depending on the fertility rate in the study population, using this indicator might yield an exceedingly large sample size.

If the value of the selected indicator is unknown, assume it to be 50% as this choice will provide maximum variability and yield the largest sample size for the scenario.

One-time cross-sectional MBS

Like any cross-sectional quantitative survey, this type of survey assesses malaria-related behaviors and ideational variables at one point in time. To calculate the required sample size for each unit (e.g., national, regional, district) for which a program plans to make inferences, survey planners need the following information:

- A key indicator to estimate with the sample. If the value of this indicator is not known, choose 50%, as this value provides maximum variability and yields the largest possible required sample.
- The desired confidence level for the prevalence estimates of this indicator; for example, 90%, 95%, 99%.
- The desired margin of error; for example, 10%, 5%, 1%.
- The level of non-response (refusals) anticipated at the household and individual respondents' levels.
- If applicable, an acceptable design effect to compensate for the fact that clusters are sampled, and that a simple random sample is not being used.

Using the parameters above, apply the following formula to generate the required sample size for each unit (e.g., household, women) for which inferences are desired:

$$n = d * \frac{z^2_{1-\frac{\alpha}{2}} * p(1-p)}{\delta^2 * R_h * R_i}$$

Where:

n is the required sample of households with the desired characteristics.

z is the Z value corresponding to the desired confidence level. For example, 1.96 corresponds to the 95% confidence level while 2.56 corresponds to the 99% confidence level.

d is the design effect due to departure from simple random sampling (for example, 3.0 for rural and 2.0 for urban areas).

p is the estimated (expected) outcome indicator. For example, the proportion of mothers reporting that a child under five years had fever in the last two weeks. Alternatively, this indicator can be assumed to be 50% as explained above.

δ is the desired margin of error. Assume this to be 0.05 (5%).

R_h is the response rate for households. Use 90% for this indicator.

R_i is the response rate for women. Use 96% for this indicator with the assumption that refusal among household members is likely to be minimal once the head of household has agreed that the household can participate in the survey.

This formula can be applied for each level at which a program wishes to make inferences; for example, state, district, regional, or transmission/ecological zones. Its application is illustrated below with data from Country A with four geographic regions. Assume that the program wants to obtain a representative sample for each geographic region. In the sample calculations reported below, the interest is not just in households with under-five children. Rather, the interest is in all households irrespective of the number of under-five children in the household. For example, the program might be interested in the use of ITNs among all households, including those without under-five children. Nonetheless, because many of the indicators of interest in the MBS pertain to under-five children, Country A is interested in obtaining a sample that includes a large enough number of households with under-five children. Table 1 shows the required regionally representative sample size by key indicators. Details about how the required sample size was obtained are presented in Annex 1.

TABLE 1. TOTAL REQUIRED SAMPLE SIZE BY KEY INDICATORS: ONE-TIME CROSS-SECTIONAL SURVEY IN COUNTRY A

Indicator	Sample Size Required by Geographic Region				
	Region 1	Region 2	Region 3	Region 4	TOTAL

% of women of reproductive age sleeping under a bed net	977	1006	1272	841	4096
% of children with fever in the last two weeks	589	777	860	1021	3247
% of women with positive attitudes toward consistent use of bed nets	806	855	874	604	3139

Given these required sample sizes, it is reasonable to assume that a total sample size of 4100 households is sufficient for all relevant malaria-related indicators of the MBS in Country A. Indeed, this sample size takes into account the potential non-response at the household and individual levels, provides a representative sample at the regional level, and allows valid estimation of key malaria behavioral and ideational indicators.

Repeated cross-sectional MBS

Programs may desire to repeat implementation of an MBS several years after an initial implementation. There is no set guidance as to how frequently an MBS can be repeated. This point can be discussed and decided on by country stakeholders. A typical use-case for a repeated MBS is the desire for updated formative data on behavioral determinants to design malaria programs based on recent data. Those data may be analyzed and utilized on their own like a one-time cross-sectional survey, or they may be analyzed in comparison to the prior survey. This decision will have implications for sample size calculations. In a repeated cross-sectional design (also called time-series design), the survey is conducted among comparable (equivalent) samples of individuals at two or more points in time. The idea is not to target the same individual survey respondents over time (as would be the case in a panel study design), but to select a different yet comparable sample each time.

If the program wishes to compare results between an initial and repeat MBS of time, then additional considerations for sample size are recommended. The required sample size for a repeated cross-sectional design, in this case, will depend not only on the current level of the key indicators to be estimated but also on the expected change in the indicator. To calculate the required sample size, the following parameters are needed:

- A key indicator to estimate with the sample. If the value of this indicator is unknown, choose 50% as this value provides maximum variability.
- The expected change in this indicator, or the prevalence of this indicator expected in subsequent surveys.
- The confidence level desired for estimates of this indicator; for example, 90%, 95%, 99%.
- The level of non-response (refusals) anticipated at the household and individual respondent levels.
- If applicable, an acceptable design effect that compensates for cluster sampling and not using simple random sampling.

The following formula can be applied to calculate required sample size:

$$n = \frac{D[[z_{1-\alpha}\sqrt{2P(1-P)} + z_{1-\beta}\sqrt{(P_1 * (1-P_1)) + (P_2 * (1-P_2))}]^2]}{(P_2 - P_1)^2 * R_h * R_i}$$

Where:

n is the required sample of households with the desired characteristics.

$Z_{1-\alpha}$ = is the Z value corresponding to the desired confidence level. For example, 1.96 corresponds to the 95% confidence level; and 2.56 corresponds to the 99% confidence level.

$Z_{1-\beta}$ = Z value associated with the desired power. For example, the Z for a power of 80% is 0.84 and for a power of 90% it is 1.28.

P_1 = the indicator at baseline.

P_2 = the indicator at end-line (last survey).

$P = (P_1+P_2)/2$.

D is the design effect due to departure from random sampling (for example, 3.0 for rural and 2.0 for urban areas).

R_h is the response rate for households. Use 90% for this indicator.

R_i is the response rate for women. Use 96% for this indicator.

Table 2 displays sample size calculations for a repeated cross-sectional survey in Country A with four regions. Details about the calculations are presented in Annex 2.

TABLE 2. TOTAL REQUIRED SAMPLE SIZE BY KEY INDICATORS - REPEATED CROSS-SECTIONAL SURVEYS IN COUNTRY A

Indicator	Sample Size Required by Geographic Region				
	Region 1	Region 2	Region 3	Region 4	TOTAL
% of women of reproductive age sleeping under a bed net (p1 ranges between 30% and 55%; assume an increase of 15 percentage points over two years)	914	688	728	913	3242
% of children with fever in the last two weeks (p1 ranges between 25% and 40%; assume an increase of 10 percentage points over two years)	910	1225	1107	1356	4598
% of women with positive attitudes toward consistent use of bed nets (Baseline value not known, so assumed 50% at baseline; assume an increase of 15 percentage points over two years)	582	499	455	476	2012

When conducting a repeated cross-sectional MBS, there will also be questionnaire development and data analysis considerations to bear in mind (see Data Analysis below).

Sampling design

The sample size calculations above assume a multistage sampling design with selection at more than one stage, including for example, districts, enumeration area (cluster), household, and then individual respondents. It is essential that each respondent has a known probability of being selected. To illustrate the sampling procedure that we recommend for the MBS, we assume that a researcher is interested in selecting the sample for Region 3 on Table 1 above: 1272 households (derived from the percentage of women of reproductive age sleeping under a bed net). Assuming that the population of Region 3 is 40% urban, a sample of 509 urban households (40% of 1272) and 763 rural households is needed. Assuming that the region is divided into districts or communes, one can use the following steps to select a representative sample:

1. Obtain a list of all the districts in the region with their population size (number of households) and their urbanization status. Also, obtain a list of all the enumeration areas (clusters) in each district. The government agency responsible for conducting the census in the country should be able to provide these lists.

2. Divide the region into urban and rural strata using the list of districts. Remember that sampling will need to be done separately for urban and rural strata. Thus, the following steps should be applied separately for urban and rural districts. If stratifying by transmission or ecological zone, apply the sampling steps for each transmission/ecological zone.

Select districts with probability proportional to size

3. Without sorting the districts in each stratum by population size, prepare a table that shows the name of the district, its population or number of households, and the cumulative population or number of households.

4. Assuming that in the stratum (urban or rural) the plan is to select five of fifteen districts for the survey, divide the total cumulative number of households in the stratum by five to obtain a sampling interval (k).

5. Then select a starting point, a number between 1 and k. For example, if k is 20500, select a random start between 1 and 20500. For those familiar with the statistical software Stata, the following command will generate a random start: ***display runiformint(1,20500)***.

6. The district associated with the cumulative population that includes the random start will be the first selected district.

7. Select the other sample districts by subsequently adding k, 2k, and so on, to the starting point. For example, assuming the starting point is 8746, after selecting the districts associated with the cumulative population that includes 8746, select the districts associated with the cumulative population that includes the following numbers: 29245, 49745, etc.

Select enumeration areas and households

8. The following example assumes that based on the total survey sample size, 10 enumeration areas from each district and 20 households from each enumeration area are needed.

9. Divide the number of enumeration areas in each district by the number of enumeration areas needed to determine the sampling interval to apply on the list. For example, given the need to select ten enumeration areas per district, if the district includes 140 enumeration areas, sample $1/14^{th}$ of all the enumeration areas; that is, k would be 14.

10. Select a number randomly between 1 and k as the starting point. The enumeration area with that number will be the starting point. Add 14 to that number each time to select subsequent enumeration areas. For example, if the starting point cluster is 6, then select enumeration areas with the numbers 6, 20, 34, 48, 62, 76, 90, 104, 118, and 132 on the list.

11. Obtain the sketch maps of the selected clusters from the governmental agency responsible for conducting the census.

12. Upon arrival in each selected cluster, start by updating the map, adding new structures, and deleting non-existent ones.

13. Then perform a listing of all the households in the cluster using a household listing form. The household listing form should include cluster number, building/compound number, compound/building address or location description, household number, nickname of head of household, and any other relevant information about the household.

14. Once household listing is complete, proceed to household selection. Use the systematic sampling method described in bullet points 8–10 above to sample the required number of households.

Alternatively, for random selection of districts, clusters or households, a random selection app, such as Random Number Generator, can be used. These apps are available free of charge and generally easy to use.

Ethical Considerations

The survey planning team for the MBS should familiarize itself with the ethical standards set by the local research ethics committee or authority. Whenever data are collected from human subjects, study teams must consider the potential burden, risks, and benefits posed by participation in the study. This is formally done by submitting and/or presenting one's study application to a relevant research ethics authority in the country of study. It should be noted, however, that ensuring the study is conducted ethically is an ongoing process that does not end with obtaining ethical approval from a relevant authority.

During recruitment and enrollment, adult participants should be made aware of why they, in particular, are being approached, what the study is about, how the information they provide will be used, the duration and

nature of their involvement, any potential risks, and any potential benefits of taking part in the survey. This information can be clearly communicated to participants with the help of recruitment scripts and consent forms. These materials should be in a language that participants will clearly understand. If a potential participant is illiterate or low literate, then reading the script and consent forms to them as part of the consent process will be necessary. The research team member should ensure that the potential respondent completely understands the content of the consent script. It is important that potential participants are given opportunities to ask questions throughout the consent process. The consent process should also emphasize voluntary participation and specify that participants can decide whether or not they want to participate in the study, end their participation at any time, or not respond to specific questions. The information collected during the MBS is personal but not sensitive. While it is possible that a study participant may feel uncomfortable when asked certain questions, this has not been noted during previous surveys of malaria-related behaviors. On the other hand, participants stand to contribute to a better understanding of what factors best explain malaria-related behaviors which in turn helps efforts to promote improved prevention, case management, diagnosis, and treatment of malaria. In countries where the local research ethics committee does not object, survey teams should offer participants a small gift (e.g., mobile phone airtime, bar soap) as a token of appreciation for their time. The token of appreciation is typically given per participant such that if two people are interviewed from each household, then two gifts (e.g., bars of soap) will be given to the household. A receipt as evidence that the token has been received is not required.

Appropriate steps should be taken to protect participants' confidentiality during and after data collection. For reasons related to both ethics and data quality, it is important to conduct consent discussions and administer the questionnaires in a private location, out of hearing of third parties, including others in the household. It is also important for data collectors to refrain from discussing participants' responses with other people. It is equally important to ensure data security and restrict access to identified data to only relevant members of the research team.

Appropriate training in research ethics is a critical component of making sure participation in the MBS is voluntary and that ethical procedures are followed consistently during data collection. For this reason, survey planners and data collection field teams will complete a comprehensive research ethics training before piloting or rolling out the MBS questionnaires. These trainings will consist of the topics covered in online courses on human research ethics that are available for survey team trainers.[1] Such content should also be incorporated into training for data collection teams. For example, data collection teams should have a firm grasp on how issues of privacy, informed consent, and voluntary participation relate to their implementation of the MBS. Data collection teams may find practicing role plays of potential scenarios helpful to master these concepts. Data collection staff should be able to recognize and appropriately respond to potential participants who are hesitant, unwilling, or unable to consent to participation.

[1] See Research Ethics Online Training available through the Global Health Network's Global Health Training Centre and Research Ethics and Compliance Training hosted by CITI Program.

Data Analysis

The MBS Analysis Plan 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. This Analysis Plan will help MBS researchers ensure standardized and timely analysis, synthesis, and dissemination of survey results. The Analysis 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 MBS data. If conducting a repeated cross-sectional design, data analysis will need to take into consideration any desired comparisons between surveys and pay attention to any questions that have been modified between the two surveys, interpreting such indicators appropriately.

Prior to data analysis, each MBS data set should be labeled and cleaned for consistency among questions and questionnaires. 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; detailed guidance can be found in the MBS Analysis Plan. 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 bias the results.

Once this is done, certain variables can be computed from the household data set including household wealth, household size, the number of children under the age of five years in the household, total number of nets in the household, and the acceptance of IRS in households. Some of these variables can then be added to the individual data sets containing responses from the men's and women's questionnaires. Adding these variables to the individual data set allows researchers to determine how ideational characteristics of individuals are associated with household wealth quintile, the number of household members, the number of children under the age of five in the household, or IRS acceptance. In addition, the household and bed net rosters can be re-shaped to produce files in which the unit of observation is the total household population and total number of household nets. These data files can be used to derive further information about the use of nets and the composition of the surveyed household population.

It is strongly recommended to conduct a factor analysis and check the internal reliability for every MBS ideational construct to determine the extent to which the survey items are relevant and consistent in the country context. If conducting scale analysis is not feasible for the MBS analytical team, the team can proceed with construction of the scales according to the standard MBS Analysis Plan. This approach has been utilized in several MBSs and a scale validation analysis conducted in three countries indicated relevance of all the items for the majority of the scales.

The individual data set is a rich source of information on adults' net use, women's uptake of IPTp, adult care-seeking behaviors for young children, diagnosis and treatment of fever for those children, and the ideational factors potentially correlated with each of these behaviors. Behavioral and ideational indicators of interest should be calculated using the most recent version of the RBM SBC Indicator Reference Guide in addition to

the MBS Analysis Plan. Furthermore, specific guidance on how to compute the indicators is provided in the accompanying indicator mapping document.

Once the frequency or distribution of various behavioral and ideational indicators has been examined, advanced analyses can be conducted. Multivariable logistic regression analysis can be used to examine the relationship between the ideational factors and the behaviors of interest. These regression models should also adjust for socio-demographic characteristics, geographic area, transmission/ecological zones, and individual exposure to communication messages as these may be associated with the desired behavioral outcomes.

Illustrative timeline

The duration for planning and implementation of the MBS depends on the scope of the survey but can take up to ten or more months. Planning should start about six to seven months before the desired start of data collection, and data collection should take place during or shortly after the rainy season in each area, as accessibility allows. Below is an illustrative timeline with estimated duration of each component of the process:

Task	Business days
Country stakeholder initial meetings and buy-in, establishment of advisory committee, agreement on survey scope	14
Development and finalization of survey protocol and tools	20
IRB processing and approval	45
Competitive bidding of survey implementation (dissemination and processing of request for proposals)	21
Research firm negotiations and contact development and finalization	50
Work plan development with research firm	5
Preparation for data collection	14
Field worker training	7
Data collection and supervision	30 – 45
Data cleaning	7
Data analysis and draft report	30
Final report	20
Total	**263 - 278**

Considerations for Country Adjustments to the MBS Questionnaire:

A Checklist for Stakeholder Dialogue

The MBS is a relatively standard survey, intended to be implemented in much the same fashion across countries. The sampling approach and overall survey methodology will not vary. In addition, the questionnaire is meant to be used in its entirety, except for the IRS and SMC modules, depending on the relevance of these interventions in the local context. This approach allows for comparisons and also ensures optimal use of survey questions that have been field tested. Nonetheless, the MBS questionnaire will require some adjustments to each country's context. These decisions will be made in discussion with country stakeholders, PMI and Breakthrough ACTION. The checklist below provides considerations to guide these country-specific discussions.

When considering the addition of questions or changes to the MBS questionnaire, ask:

1. Does the proposed addition/change align with malaria technical best practices?
- Is it a WHO or PMI recommended intervention?
- Ensure the PMI country and HQ backstopping team is engaged in this discussion.

2. Will the results be programmatically useful for SBC?
- How would the information be used in SBC programs?
- Will the results help us understand the issues behind a behavior?
- Is understanding the behavior and its determinants relevant for the malaria response?
- Does the country have programs (current or intended in the near future) to address the relevant intervention, such that data usage is ensured?

3. Is a quantitative survey an appropriate tool to answer the question?
- Consider the limitations of survey questions.
- Consider qualitative options to understand the deeper "why?" issues and the cultural nuances that may also drive behaviors and social norms.

4. Is the proposed addition/change important for NMP and stakeholder buy-in to the MBS?
- There may be important buy-in value in accepting certain proposed additions/changes; for example, in Cote d'Ivoire, the inclusion of questions to examine attitudes towards white ITNs and willingness to use them was important for buy-in.
- It is important to manage expectations of stakeholders when holding these discussions. While the discussion of additions and changes to the questionnaire is valuable for strong working relationships, the team must be careful not to overpromise. Proposed additions/changes will need to align with the other considerations listed here, especially 1, 2 and 3 above.
- Often, the discussion in and of itself is of goes a long way to establish buy-in and relationships, even if the proposed changes eventually turn out not to be viable.

5. Is the proposed addition/change repetitive or redundant with the existing questionnaire?
- Does the proposed addition/change add new value to the survey? In particular, consider #2 above.
- Is the proposed issue already sufficiently captured with existing questions? Note that there are limited returns in asking many questions about the same issue. In addition, the existing questions in the

questionnaire have been field tested and validated and are based on theories of behavior change. As such, the existing questions will often be preferable.

6. Does the proposed addition/change add a significant burden to the MBS?

- Consider the response burden, or the time for respondents to answer, as well as the time of the interviewer to administer a lengthier questionnaire.
- Consider the time for the research team to develop and test new questions, and whether the investment is worthwhile.

7. What are the contextual tweaks needed to administer the MBS in this country?

- Every implementation of the MBS will require modifications to the questionnaire to ensure it is contextually relevant.
- This will include revisions to the wording or phrasing to ensure questions are understood and are culturally relevant.
- This may also include revisions to questions to match country malaria intervention guidelines (ex: IPTp doses recommended in country guidelines).
- This process will be led by the researchers and only necessary changes will be made; most of these changes will be made at the time of translating and pre-testing the survey in the field.

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.

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Annex 1: Example Calculations of Sample Size for One-time Cross-sectional Surveys (as Shown Table 1)

Formula used:

$$n = D * \frac{z^2_{1-\frac{\alpha}{2}} * p(1-p)}{\delta^2 * R_h * R_i}$$

% of women of reproductive age sleeping under bed net	D	Rh	Ri	Precision	z	Percent sleeping under net (p)	Required women in HH with net	# women per HH	Required # of HH with nets	% of households with net	Required total # of
Region 1	2	0.9	0.96	0.05	1.96	0.610	846	1.103	767	0.78522945	977
Region 2	2	0.9	0.96	0.05	1.96	0.650	810	1.040	778	0.77372715	1006
Region 3	2	0.9	0.96	0.05	1.96	0.540	884	1.017	868	0.68280109	1272
Region 4	2	0.9	0.96	0.05	1.96	0.285	724	1.473	492	0.58471772	841
							2540				4096

% of children with fever in last two weeks	D	Rh	Ri	Precision	z	Percent children with fever	Required number of children	Number of Under-5 children per HH	Reqired total # of HH
Region 1	2	0.9	0.96	0.05	1.96	0.238	645	1.095	589
Region 2	2	0.9	0.96	0.05	1.96	0.340	798	1.027	777
Region 3	2	0.9	0.96	0.05	1.96	0.346	805	0.936	860
Region 4	2	0.9	0.96	0.05	1.96	0.325	780	0.764	1021
							2248		3247

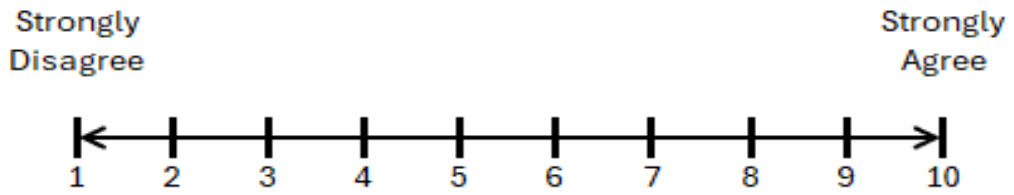
% of women with positive attitudes towards consistent use of bed nets	D	Rh	Ri	Precision	z	Proprotion of women positive attitudes	Required number of women	Number of women per HH	Reqired total # of HH
Region 1	2	0.9	0.96	0.05	1.96	0.500	889	1.103	806
Region 2	2	0.9	0.96	0.05	1.96	0.500	889	1.040	855
Region 3	2	0.9	0.96	0.05	1.96	0.500	889	1.017	874
Region 4	2	0.9	0.96	0.05	1.96	0.500	889	1.473	604
									3139

Annex 2: Example Sample Size Calculations for Longitudinal Surveys (as Shown in Table 2)

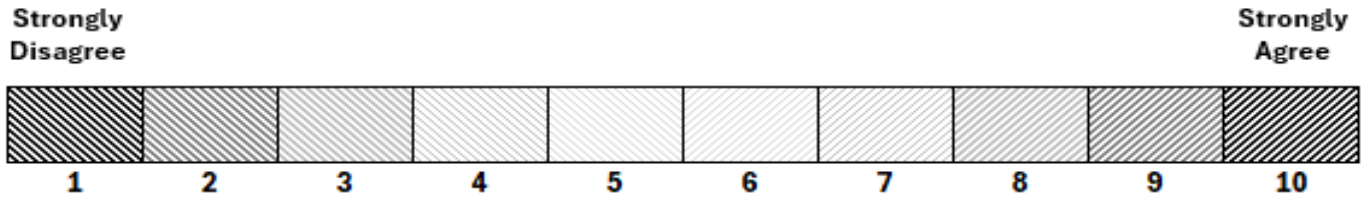
Repeated Crosssectional Surveys																		
Formula Applied:																		
% of women using nets		p1	p2	P	1-P			Numerator							#of women	women/HH	# HH with r	HH with ne	Sample HH
Region 1	1.96	0.4	0.55	0.475	0.525	1.384195795	1.282	0.895107787	10.39045	0.0225	0.9	0.96	n/a	0.01944	534.4882	0.9	593.8757	0.65	914
Region 2	1.96	0.6	0.75	0.675	0.325	1.298268847	1.282	0.838216267	9.129137	0.0225	0.9	0.96	n/a	0.01944	469.6058	1.05	447.2436	0.65	688
Region 3	1.96	0.3	0.45	0.375	0.625	1.341920266	1.282	0.867128727	9.759795	0.0225	0.9	0.96	n/a	0.01944	502.0471	1.15	436.5627	0.6	728
Region 4	1.96	0.55	0.7	0.625	0.375	1.341920266	1.282	0.867128727	9.759795	0.0225	0.9	0.96	n/a	0.01944	502.0471	1.1	456.4064	0.5	913
Total																			3242
% of Under-5 with fever in last two weeks		p1	p2	P	1-P			Numerator							#of under-	Under-5/H	Sample HH		
Region 1	1.96	0.25	0.15	0.2	0.8	1.108743433	1.282	0.719520715	6.6851	0.01	0.9	0.96	n/a	0.00864	773.7384	0.85	910		
Region 2	1.96	0.4	0.3	0.35	0.65	1.322092281	1.282	0.859991744	9.522981	0.01	0.9	0.96	n/a	0.00864	1102.197	0.9	1225		
Region 3	1.96	0.3	0.2	0.25	0.75	1.200249974	1.282	0.779810156	7.841276	0.01	0.9	0.96	n/a	0.00864	907.5551	0.82	1107		
Region 4	1.96	0.35	0.25	0.3	0.7	1.270225177	1.282	0.825870728	8.787236	0.01	0.9	0.96	n/a	0.00864	1017.041	0.75	1356		
Total																	4598		
% of women with positive attitudes towards consistent use of bed nets		p1	p2	P	1-P			Numerator							#of women	Women/H	Sample HH		
Region 1	1.96	0.5	0.65	0.575	0.425	1.370248883	1.282	0.885879625	10.18023	0.0225	0.9	0.96	n/a	0.01944	523.6745	0.9	582		
Region 2	1.96	0.5	0.65	0.575	0.425	1.370248883	1.282	0.885879625	10.18023	0.0225	0.9	0.96	n/a	0.01944	523.6745	1.05	499		
Region 3	1.96	0.5	0.65	0.575	0.425	1.370248883	1.282	0.885879625	10.18023	0.0225	0.9	0.96	n/a	0.01944	523.6745	1.15	455		
Region 4	1.96	0.5	0.65	0.575	0.425	1.370248883	1.282	0.885879625	10.18023	0.0225	0.9	0.96	n/a	0.01944	523.6745	1.1	476		
Total																	2012		
Panel Surveys																			
Formuel Applied:																			
% of women using nets		p1	p2	P	1-P			Numerator							#of women	women/HH	# HH with r	HH with ne	Sample HH
Region 1	1.96	0.4	0.55	0.475	0.525	1.384195795	1.282	0.895107787	10.39045	0.0225	0.9	0.96	0.8	0.015552	668.1102	0.9	742.3447	0.65	1142
Region 2	1.96	0.6	0.75	0.675	0.325	1.298268847	1.282	0.838216267	9.129137	0.0225	0.9	0.96	0.8	0.015552	587.0073	1.05	559.0546	0.65	860
Region 3	1.96	0.3	0.45	0.375	0.625	1.341920266	1.282	0.867128727	9.759795	0.0225	0.9	0.96	0.8	0.015552	627.5588	1.15	545.7033	0.6	910
Region 4	1.96	0.55	0.7	0.625	0.375	1.341920266	1.282	0.867128727	9.759795	0.0225	0.9	0.96	0.8	0.015552	627.5588	1.1	570.508	0.5	1141
Total																			4053
% of Under-5 with fever in last two weeks		p1	p2	P	1-P			Numerator							#of under-	Under-5/H	Sample HH		
Region 1	1.96	0.25	0.15	0.2	0.8	1.108743433	1.282	0.719520715	6.6851	0.01	0.9	0.96	0.8	0.006912	967.173	0.85	1138		
Region 2	1.96	0.4	0.3	0.35	0.65	1.322092281	1.282	0.859991744	9.522981	0.01	0.9	0.96	0.8	0.006912	1377.746	0.9	1531		
Region 3	1.96	0.3	0.2	0.25	0.75	1.200249974	1.282	0.779810156	7.841276	0.01	0.9	0.96	0.8	0.006912	1134.444	0.82	1383		
Region 4	1.96	0.35	0.25	0.3	0.7	1.270225177	1.282	0.825870728	8.787236	0.01	0.9	0.96	0.8	0.006912	1271.302	0.75	1695		
Total																	5747		
% of women with positive attitudes towards consistent use of bed nets		p1	p2	P	1-P			Numerator							#of women	Women/HH	Sample HH		
Region 1	1.96	0.5	0.65	0.575	0.425	1.370248883	1.282	0.885879625	10.18023	0.0225	0.9	0.96	0.8	0.015552	654.5931	0.9	727		
Region 2	1.96	0.5	0.65	0.575	0.425	1.370248883	1.282	0.885879625	10.18023	0.0225	0.9	0.96	0.8	0.015552	654.5931	1.05	623		
Region 3	1.96	0.5	0.65	0.575	0.425	1.370248883	1.282	0.885879625	10.18023	0.0225	0.9	0.96	0.8	0.015552	654.5931	1.15	569		
Region 4	1.96	0.5	0.65	0.575	0.425	1.370248883	1.282	0.885879625	10.18023	0.0225	0.9	0.96	0.8	0.015552	654.5931	1.1	595		
Total																	2515		

Annex 3: 10-Point Response Scale Visual Aid

Option 1



Option 2



Option 3