Breakthrough ACTION Sierra Leone

Malaria Behavior Survey Report

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Breakthrough ACTION FOR SOCIAL & BEHAVIOR CHANGE

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Table of Contents

Acronyms

ACT	Artemisinin-based combination therapy
ANC	Antenatal care
CCP	Johns Hopkins Center for Communication Programs
CDC	U.S. Centers for Disease Control and Prevention
CHW	Community health worker
CM	Case management
DHMT	District Health Management Team
DHS	Demographic and Health Survey
EA	Enumeration area
GOSL	Government of Sierra Leone
IPTp	Intermittent preventive treatment in pregnancy
IPTp-SP	Intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine
IPTi	intermittent preventive treatment in infants
IRB	Institutional Review Board
IRS	Indoor Residual Spraying
ITN	Insecticide-treated net
MBS	Malaria Behavior Survey
MIS	Malaria Indicator Survey
MOHS	Ministry of Health and Sanitation
NMCP	National Malaria Control Program
OR	Odds Ratio
PHU	Peripheral health unit
PMI	U.S. President's Malaria Initiative
PPE	Personal Protective Equipment
RDT	Rapid diagnostic test
SBC	Social and behavior change
SBCC	Social and behavior change communication
SP	Sulfadoxine-pyrimethamine
TBA	Traditional birth assistant
USAID	United States Agency for International Development
WHO	World Health Organization

Preface

Malaria remains one of the leading public health problems in Sierra Leone, even though over the past years, the country has made significant progress in defining the effort required to control the impact of malaria among its citizens. The development of the NMCP Strategic Plan 2016–2020 and revision of guidelines in December 2011 ensure that program implementation is evidence-based and will be effective. Success in malaria prevention and control relies on solid partnerships among all key players. The Ministry of Health and Sanitation (MOHS) of Sierra Leone has partnered with PMI/USAID through Breakthrough ACTION to support social and behavior change communication (SBCC) interventions.

We contracted the Dalan Development Consulting firm to conduct the MBS in Bo and Port Loko districts of Sierra Leone in 2019; Dalan Development Consulting carried out the survey independently, though NMCP and other health staff served as supervisors. The MOHS/NMCP and partners reviewed and locally adopted the MBS protocol. The purpose of the MBS was both to understand the socio-demographic and behavioral determinants associated with the uptake of malaria-related behaviors in Sierra Leone and to determine appropriate program activities to improve prevention and healthcare-seeking behaviors, specifically behavioral determinants of malaria.

The report provides contextual data about behavioral determinants both at the community and facility levels for malaria, which will inform the program and other partners implementing malaria prevention and control interventions. This includes both providing data for standard malaria indicators and using that data to understand and validate evidence-informed priorities for malaria behaviors, audiences, and messages. The result also includes data for the development of malaria control interventions, including health messages, and facilitating trend analyses of key behavioral outcomes. Key malaria interventions include insecticide-treated nets (ITNs), intermittent preventive treatment in pregnancy (IPTp), intermittent preventive treatment in infancy (IPTi), malaria case management (CM), and intermittent residual spraying (IRS); these were piloted in four districts (Bo, Bombali, Kono, and Western Area Rural) in 2010/2011. The results provided evidence on how to design, implement, and evaluate malaria SBCC activities related to the use, maintenance, and repair of ITNs; adoption of IPTp during pregnancy; appropriate treatment of malaria in children and acceptance of IPTi; acceptance of IRS, and adoption of environmental behaviors.

The MOHS is grateful for and extends appreciation to all those who exhibited their expertise and commitment to the design, conduct, and validation of the MBS report. The result of this report will be used to determine appropriate program activities to improve prevention and health care seeking behaviors for malaria control in Sierra Leone.

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Executive Summary

Breakthrough ACTION implemented a Malaria Behavior Survey in 2019 and collected malaria-related information from 2,003 households, 3,209 women, and 627 men. The data collected are representative at two district levels: Bo and Port Loko. By highlighting the behavioral variables that influence the adoption of malaria-related behaviors and services, the survey provides results that inform the design, implementation, and evaluation of SBCC for decision-makers and malaria implementing partners. The recommendations from the survey results are summarized below.

Media Exposure

Radio ownership was widespread among surveyed respondents (73.9%). Weekly radio use among those with access to radio within their households was significantly higher among men, older (> 45 years) respondents, those with higher educational attainment, and from households in the highest wealth quintile and urban areas. The most popular time to listen to the radio was late evening (between 8:00 p.m. and midnight), and this preference did not vary by sex.

Television ownership among respondents was limited. While 22% overall reported owning a television, 57.8% of respondents in urban areas had access to television within their households. Overall, weekly television viewership (20.0%) was substantially less widespread than radio listenership (69.3%). A higher proportion of respondents younger than 25 years (22.5%) and those 45 years and older (25.6%) reported watching television weekly compared to respondents between the ages of 25–44. Weekly television viewership was highest in urban areas (49.5%) among respondents with secondary or higher education (32.9%) and those from households in the highest wealth quintile. Television viewing was most popular in the late evening hours for both men (67.8%) and women (63.7%).

Nearly three-fourths (74.5%) of respondents reported that they had heard at least one malaria-related message through the media or from interpersonal sources in the past six months. Reported message exposure was significantly higher in women (77.1%) than men (71.6%) and in rural areas (79.2%) compared to urban areas (63.4%). Message exposure also was significantly higher among 25–-34-year-olds (79.0%) and those who were 45 years and older (79.2%), compared to younger (15–24 years) respondents (72%). Among media sources, radio was the most widely reported channel through which respondents recalled hearing malaria-related messaging (59.1%). Other popular sources of malaria-related messages were community health workers (62.1%), friends and family (45.2%), and government healthcare facilities (38.6%).

Cross-Sectional Behavioral Determinants

Overall, 85.7% of respondents know that fever is a symptom of malaria, and almost all of them (97.6%) know that the disease is transmitted through mosquito bites. A higher proportion of rural residents, residents from poorer households, and residents in Bo had correct knowledge of fever as a symptom of malaria compared to residents from households in the highest wealth quintile, urban respondents, and respondents in Port Loko. No substantial differences in knowledge of malaria were observed by sex.

Approximately one-quarter (27.7%) of respondents believed that people only acquire malaria during the rainy season, and a higher proportion of these respondents resided in Port Loko (42.6%) compared to Bo (15.3%). There was a significant sex-based difference in perceived vulnerability to malaria. Specifically, a higher proportion of men (81.1%) had a high perceived vulnerability to malaria compared to women (68.4%). Similar findings were evident at district level in Bo (men: 81.6%, women: 62.7%) but not in Port Loko (men: 80.5%, women: 74.8%) were the difference was not statistically significant.

There was a moderate amount of malaria-related discussion among married and cohabiting respondents, with room for improvement. More than half (56.9%) of respondents reported that they had discussed malaria with their spouse or partner in the past six months. A higher proportion of respondents in Port Loko (61.9%) had discussed malaria with their partners or spouses compared to respondents in Bo (52.7%). Similarly, over half (54.2%) of respondents reported that they had discussed malaria with a friend or family member in the six weeks preceding the survey. A significantly higher proportion of men (59.8%) reported having malaria-related discussions with friends and family members compared to women (49.1%).

The overall perception of health workers was positive. Most respondents indicated that health workers in health facilities (87.8%) and community health workers (83.6%) treated their patients with respect. Many respondents thought that those seeking treatment at health facilities were well-cared for (86.6%). Significantly higher proportions of women had positive perceptions of health workers than men. Specifically, more women had positive perceptions of facility (91.5%) and community (86.6%) health workers compared to men (83.6% and 80.3%, respectively).

Ownership and Use of ITNs: Behavioral Determinants

Almost all participants (96.5%) were aware of the use of mosquito nets for malaria prevention, irrespective of socio-demographic differences. Although most respondents endorsed nets as a malaria-prevention method, only about 58% mentioned ITNs specifically. The terms “nets” and “ITNs” may be similar to informants. Overall, awareness about where to buy nets was very limited (8.3%). In Port Loko, only about 2.0% of residents indicated that they were aware of where to buy nets compared to about 13% in Bo. Limited availability of nets for distribution and retail in some areas may contribute in part to limited visibility of nets in public spaces, and decreased awareness of where to obtain nets.

Attitudes of women and men favored the use of mosquito nets. Most perceived they sleep better at night under a mosquito net (95.7% of women, 90.0% of men); that nets are easy to use (95.3% of women, 93.6% of men), safe to sleep under (91.4% of women, 93.0% of men), and are a valued item (93.8% of women, 91.7% of men). Nonetheless, around half of those surveyed indicated that they preferred not to sleep under a net when the weather was very warm (45.6% of women, 54.2% of men) and more than half reported that the smell of the insecticide used on treated nets made it uncomfortable to sleep under such nets (51.0% of women, 57.4% of men).

Overall, 86.3% of participants perceived mosquito net use to be a norm in their communities. No significant differences in perceived norms about mosquito net use were observed by sex or district.

Ownership and Use of ITNs: Practices and Behaviors

A total of 2,940 ITNs were identified in participating households. Less than three-quarters of households have at least one net. Household ownership of at least one ITN was significantly higher in Bo (80.7%) than in Port Loko (66.9%). The majority of identified nets were obtained free of charge (99.1%) and during a distribution campaign (70.2%), and almost a quarter (24.1%) were obtained during an antenatal care (ANC) visit. The average duration of ITN ownership was over two years (mean: 27.8 months). Over half of ITNs identified during the survey were white (56.4%), although many also were blue (43.4%).

Most ITNs (94.6%) available in homes were used for sleeping the previous night by at least one household member. A significantly higher proportion of ITNs in Bo (96.6%) were used for sleeping the night before the survey compared to ITNs in Port Loko (92.7%). Among households with at least one ITN, 72% of household members reported that they had slept under an ITN the previous night. A statistically significant relationship was seen between the number of ITNs in the household and member use of ITNs the night before the survey. Urban residence was associated with lower use of nets compared to the rural residence. Increasing household size was negatively correlated with nightly net use. Each one-person increase in household size was associated with a 5% reduction in the odds of participants reporting consistent net use. Similarly, for each additional ITN in the household, the odds of nightly ITN use increased by almost 80%. Last, participants in Port Loko had 59% reduced odds of nightly ITN use compared to participants from Bo.

About a third of the MBS participants reported that they had slept under an ITN consistently when they slept away from their home or traveled, indicating increased risk among a substantial proportion of the study population.

Treatment of Fever in Children: Behavioral Determinants

Overall, attitudes towards prompt (within 24 hours of the onset of fever) and appropriate treatment of malaria were positive. The majority of respondents believed that health workers are the best source for consultation when children develop a fever (95%) and that children should be taken to health workers the same day that they develop a fever (91.3%). Similarly, the majority agreed that a blood test was necessary to confirm that fever was caused by malaria (92.8%) and that the full course of prescribed antimalarial drugs should be taken by the patient (96.8%). Nevertheless, some negative attitudes relating to self-medication and seeking care at the health facility as a last resort were evident. Attitudes towards self-medication for fever were notably widespread, with 41.4% of respondents agreeing with antimalarial medication at home as a first treatment recourse when children develop a fever. Agreement with self-medicating practices was significantly higher among respondents in Port Loko (49.7%) compared to Bo (34.6%) district. In addition, about a quarter (24.6%) of respondents stated that if their child had a fever, they would go to the pharmacy to buy medicine for their child first. Costs for care received at health facilities, long wait times, and a lack of drugs at some facilities may contribute in part to self-medicating behaviors, use of home and herbal remedies, and overall delayed care-seeking for malaria.

Nearly two-thirds (64.0%) of surveyed respondents agreed that artemisinin-based combination therapy (ACT) involves effective drugs for the treatment of malaria. Women (71.8%) demonstrated significantly higher knowledge of ACT compared to men (55.5%). A significantly higher proportion of respondents in

Bo (68.5%) had knowledge of ACT compared to Port Loko respondents (58.6%). However, there were no significant differences in knowledge of ACT among households in rural and urban settings.

Perceptions about the capacity of health workers to treat malaria in children were overwhelmingly positive. Most respondents indicated community health workers (86.5%) and facility-based health workers (93.3%) were knowledgeable about how to treat malaria in children under five years of age. However, over one-third (34.2%) of respondents reported that some health workers at some of the facilities within their communities charged a fee for the malaria treatment medication for children, and a significantly larger proportion of surveyed respondents in Port Loko (39.5%) indicated this compared to Bo respondents (29.8%). It is possible that some costs may be for associated non-malaria services and supplies. For the majority of cases of fever in children under five years of age, care was sought at some point during the illness (93.0%), and most received care the same day or the day after the onset of fever (81.6%). About three-quarters (74.5%) of children with fever were first taken to a health facility (government or private). Significantly more children with fever (79.7%) in the rural areas were taken promptly to a health facility compared to children with fever in urban areas (58.8%). However, prompt care-seeking did not vary significantly across wealth quintiles.

The behavioral determinants most strongly correlated with prompt care-seeking for fever included self-efficacy to seek care for fever in a child promptly, positive attitudes towards prompt care-seeking, and to discuss malaria with a spouse in the past six months. Women who were confident in their ability to get their child with a fever to the health facility promptly (Odds Ratio [OR]: 4.33) and had positive attitudes towards prompt care-seeking (OR: 3.58) were more likely to report that they sought care promptly for a sick child, at a health facility. In addition, women who reported recently discussing malaria with a spouse or partner were about three times more likely to report that they had sought care promptly at a health facility the last time their child had a fever (OR: 2.98). Prompt care-seeking was reported significantly less frequent among women in urban settings compared to respondents in rural settings and Bo district.

Of the children with fever in the two weeks preceding the survey, 78.9% received a malaria test. However, a significantly higher proportion of the Bo district children were tested (89.9%) compared to the Port Loko district (68.0%).

ANC/IPTp

Across districts, about two-thirds (66.7%) of the surveyed population had knowledge about the timing of the first ANC visit during pregnancy, with significant differences in knowledge between men and women. Fewer than two-thirds (61.7%) of respondents knew that women should have at least four ANC visits during their pregnancy.

Compared to knowledge regarding ANC timing, and recommended number of visits, knowledge of the recommended number of doses of sulfadoxine-pyrimethamine (SP) to be taken during pregnancy to prevent malaria was substantially low. Overall, only one-third (33.7%) of all respondents knew women should receive three or more doses of SP during pregnancy. Knowledge was significantly higher among respondents in Port Loko (39.4%) compared to Bo (28.9%) district. Significant differences were observed across respondents' sex and educational attainment. On average, a significantly higher proportion of women (49.8%), demonstrated knowledge of recommended SP dosing during pregnancy compared to

men (16.1%). Similarly, a higher proportion of respondents with no education (34.9%) demonstrated correct knowledge of SP dosing during pregnancy compared to respondents with secondary or higher education (29.8%).

Across districts, 91.7% of women and 88.4% of men indicated that when a pregnant woman gets malaria, the effect on the woman and the unborn baby is serious. However, only half (50.9%) of respondents indicated that pregnant women are more likely to die from malaria than non-pregnant women. Overall, the perceived severity of malaria in pregnant women was significantly higher among women in Port Loko (61.6%) compared to women in Bo (54.8%) district.

The majority of respondents agreed that SP was safe for pregnant women and the fetus (93.9%) and indicated women should take several doses of SP to prevent malaria during pregnancy (80.4%). Very few women (15.3%) and men (12.1%) believed that a woman can take SP on an empty stomach.

Shared decision-making with spouse or partner regarding ANC attendance among women who were pregnant or had given birth in the last two years was suboptimal. Fewer than half (45.4%) indicated that the final decision on their ANC attendance was made jointly with their spouse or partner. However, women in Bo (55.6%) were significantly more likely to support shared decision-making practices than women in Port Loko (35.1%).

IPTi

Across districts, one-third (34.4%) of women knew that infants should receive at least three doses of preventive medication for malaria in their first year of life. A higher proportion of women in rural areas (41.8%) and women with no formal education (43.0%) had correct knowledge of the recommended number of IPTi doses compared to those residing in urban areas (16.1%) and those with primary (36.0%) and secondary education (21.7%). Among women with children under the age of one year, the knowledge that infants should receive at least three doses of preventive medication for malaria in their first year was lower than the estimate for the overall population of women of reproductive age.

Overall, half (57.0%) of participating women had positive attitudes towards IPTi. Nearly two-thirds of women believed IPTi was safe to give to infants (63.9%), with a significantly higher proportion of women in Port Loko (73.5%) agreeing with this statement compared to Bo (55.6%) district. However, less than half (47.5%) of women perceived that religious and secular leaders in their communities supported IPTi administration, and about one-third of women reported that health workers at health facilities sometimes coerced parents to administer IPTi to children (31.8%). Last, one-fifth of women expressed that healthy babies do not need to see health providers to receive IPTi (20.3%). Approximately one-third of women (36.0%), believed than an infant that receives IPTi has a similar chance of getting malaria as an infant that does not receive the preventive treatment; a significantly larger proportion of women in Port Loko (52.1%) than in Bo (21.8%) agreed with this sentiment.

Results for women's self-efficacy to take actions to acquire and administer IPTi were variable. While over two-thirds (68.8%) of women believed that they could ensure that their infants received all of the IPTi medicine prescribed, only about one-third (35.2%) indicated that they could find the money for travel to the health facility to access IPTi. Among married and cohabiting women, overall, fewer than half (43.2%) reported that they had discussed IPTi with their spouse or partner. Among women who

discussed IPTi with their spouses or partners, only 10% reported that they had decided to accept IPTi jointly with their partners.

IRS

Attitudes towards the use of IRS were variable. Overall, two-thirds (66.2%) of respondents reported positive attitudes towards IRS. Positive attitudes, however, varied significantly by district with a higher proportion of respondents in Bo (84.3%) compared to Port Loko (44.3%) district. Nearly three-fourths (75.4%) of informants expressed willingness to have their homes sprayed during an IRS campaign. However, in Bo, the proportion was significantly larger (89.1%) compared to Port Loko (58.9%). Overall, the perceived effectiveness of IRS was moderate (53.5%). Significantly higher proportions of respondents in Bo (58.7%) had positive beliefs about the perceived effectiveness of IRS compared to respondents in Port Loko (47.3%) district. Respondents with primary-level education (47.1%) agreed that IRS was effective for malaria control at significantly lower proportions than respondents with no formal education (57.3%) ($p = 0.0043$). A higher proportion of respondents with prior IRS knowledge (67.9%) agreed with measures on the effectiveness of IRS compared to respondents with no prior knowledge (48.9%).

Among married or cohabiting respondents, decisions regarding the use of IRS in respondent's homes appeared to be made by male partners. Most men (63.1%) reported that they would be responsible for decisions about allowing the walls of their houses to be sprayed by insecticide, and almost half of women (45.2%) reported that the decision to spray their home would be made by their spouses.

Introduction

Through the Breakthrough ACTION Sierra Leone program, PMI, led by USAID and co-implemented by the U.S. Centers for Disease Control and Prevention, is supporting activities to increase the capacity of Sierra Leonean institutions to effectively address high-risk behaviors associated with malaria prevention and control. The Johns Hopkins Center for Communication Programs (CCP) is the lead organization for Breakthrough ACTION, which is funded by USAID.

Malaria transmission is stable and perennial in all geographic areas of Sierra Leone. Transmission peaks twice a year, with both peaks occurring during the rains from May to November (PMI, 2017, p. 9). This seasonality affects several dimensions of health, including the transmission of malaria and other aspects of infectious diseases epidemiology, delivery of malaria drugs, and access to health facilities, among others (GOSL MOHS, 2016). Malaria is responsible for a quarter of morbidity among the general population and in 38 percent of children under five years in Sierra Leone. Over two million outpatient visits are attributed to malaria every year, of which half are for children under five years of age (GOSL MOHS, 2017).

According to the 2016 Malaria Indicator Survey (MIS), one in four children under five, and four in ten aged between six and 59 months in Sierra Leone tested positive for malaria, and parasitemia ranged from 6% in Western Area Urban to 59% in the northwest Port Loko district. The 2019 Demographic and Health Survey (DHS) estimated that on average, there is one ITN per household and 47% of the household population has access to an ITN. In addition, 68% of individuals had at least one ITN, and 74% of rural households compared to urban households (60%) had at least one ITN (DHS, 2019). Thus, many individuals do not have access to an ITN. In addition, and only a third of pregnant women received three doses of recommended IPTp. Specifically, according to the 2016 Sierra Leone MIS, overall, 39% of the household population, 4% of children under five, and 44% of pregnant women slept under an ITN the night before the survey. However, among households owning at least one ITN, 63% of the household population, 71% of children under five, and 75% of pregnant women slept under an ITN the previous night. In addition, data from sub-Saharan Africa show that by 2018, household ownership of at least one net had decreased from 80% in 2016 to 72%. However, the proportion of households with sufficient nets (i.e., one net for every two people) remained below expectations at 40%.

An important consideration for malaria prevention programs regarding net ownership and use is that appropriate and consistent use of ITNs in malaria-endemic areas often lags behind net ownership. While this may be true generally, the use: access report shows very good use given access in Sierra Leone. Reasons for non-use include discomfort, heat, perceived ineffectiveness or necessity, cost, inconvenience to set-up and dismantle, smell, safety concerns, sleeping arrangements, humidity, and type of accommodation. Consequently, Sierra Leone's National Malaria Strategic Plan 2016–2020 aims to reduce malaria morbidity through the achievement of the following five objectives:

1.a. All suspected malaria cases should have access to confirmatory diagnosis

1.b. All malaria cases to receive prompt effective treatment

2.a. Provide access to 100 percent of the population at risk with preventive measures by 2017

2.b. Protect at least 80 percent of pregnant women and children under one year with three doses of intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine (IPTp-SP), by 2020.

3. Provide knowledge to the population such that at least 80 percent of the population practices malaria prevention and treatment measures by 2018

The MBS adds to the formative data that has been collected by other partners and provides detailed insight into additional behavioral factors. It will supplement information needed to prioritize program needs and develop appropriate evidence-informed key recommendations and strategic interventions. Understanding the drivers of individual behaviors regarding the adoption of different malaria interventions will support the attainment of Sierra Leone's National Malaria Strategic Plan 2016–2020.

Health System in Sierra Leone

Sierra Leone's health service delivery system is pluralistic with the Government, faith-based missions, non-governmental organizations, and the private sector all providing health-related services. District health services form the core component of primary health care, composed of a network of peripheral health units (PHUs), the district hospital, and the DHMTs. The effect of the Ebola epidemic (2014–2016) in Sierra Leone on malaria was significant, largely because the two diseases have similar symptoms and posed high demand on the weak health system.

The NMCP is the national coordinating body responsible for overseeing malaria control operations in Sierra Leone. The program determines malaria prevention and treatment priorities, harmonizes the work of local partners, and provides guidance to strengthen the work and synergize the efforts of malaria control programs at central, regional, district, and community levels.

Socio-Behavioral Determinants and Drivers of Malaria

A growing body of evidence supports the role of social and behavioral change (SBC) programs as a practical approach for increasing the prevalence of many positive health behaviors, including those related to malaria prevention and treatment. To be effective, however, SBC program activities need to target both latent and objective behaviors, including behavioral determinants that influence individuals' decisions related to these behaviors. There is evidence from the 2017 Multiple Indicator Cluster Survey and 2019 DHS in Sierra Leone on the behavioral outcomes related to malaria, including the use of mosquito nets, and prompt and appropriate treatment of malaria in children, and IPTp. Data on the behavioral determinants of these outcomes are limited and constitute a gap in the published literature.

The MBS

The MBS is the first standardized, malaria-related behavioral tool developed for all malaria interventions among a representative sample of the population, including ITNs, IRS, IPTp, IPTi, and CM. The survey in Sierra Leone aims to provide a better understanding of the determinants of malaria-related behaviors and strengthen the evidence base for malaria control program activities.

Goal and Objectives of the MBS

The goal of the MBS is to provide rich contextual data about behavioral determinants for malaria to improve programming. This includes providing data for standard malaria indicators, using data to understand and validate evidence-informed priorities for malaria behaviors, audiences, and messages, providing data for the development of malaria control interventions, including health messages, and facilitating trend analysis of key behavioral outcomes.

The purpose of this study is twofold: (1) to further the understanding of the socio-demographic and behavioral determinants associated with the uptake of malaria-related behaviors in Sierra Leone, and (2) to determine appropriate program activities to improve prevention and care-seeking behaviors, specifically behavioral determinants, of malaria. The study's specific objectives were to

- Identify factors related to the use, maintenance, and repair of ITNs
- Identify factors related to the adoption of IPTp
- Highlight factors associated with the rapid and appropriate treatment of malaria in children
- Evaluate factors related to the acceptance of IRS
- Evaluate factors related to the acceptance of IPTi
- Understand the reasons preventing the adoption of appropriate malaria prevention and treatment behaviors
- Identify key SBC strategies to promote appropriate malaria prevention and treatment behaviors in Sierra Leone
- Evaluate factors related to adoption of environmental sanitation behaviors

Value of the MBS

The MBS, in its entirety, is different from other behavioral surveys and provides information that makes new contributions to what is already known about malaria-related behaviors for all areas of malaria prevention. While the MBS does provide estimates for behavioral outcomes, it is important to note that it is not a coverage survey. The MBS makes the following contributions to understanding malaria-related behaviors for net use, and other malaria interventions, and the design of behavior change and net distribution campaigns:

- Provides a standardized approach to systematically explore the influence of psychosocial factors on outcomes for all the components of the NMCP. The scope and details of the assessment are consistent across all identified program areas
- Includes net use estimates account for population access to an ITN within their household (the UAR; not all surveys use this preferred access indicator)
- Reports net use every night in the past week (a proxy for consistent net use and a more rigorous indicator compared to net use last night, as most surveys collect)
- Provides behavioral (latent and objective) determinants for national malaria strategies such as net use every night, (other surveys do not do this and also may not be as comprehensive or systematic in collecting information on each determinant), IPTp, IPTi, CM, and IRS
- Includes multivariable regression analysis of behavioral determinants highlights the most statistically significant drivers of expected malaria program outcomes such as consistent net use, receipt of IPTp, and prompt care-seeking for fever (other surveys do not do this)

- Includes details on each of the specific determinants and where there is room for improvement by location are shown (this information is not usually generated by other surveys). There is guidance on what to prioritize when there are limited resources
- Includes information on residual transmission or malaria risk when net use is not feasible is important to consider for consistent use. The survey looks at rates of net use when away from home (other surveys do not do this)
- Measures net care behaviors (other surveys do not do this). This is important for net longevity and effectiveness. Furthermore, positive net care attitudes are measured (other surveys do not measure this, other than durability monitoring which has not been done in Sierra Leone) are relatively high and provide new information about perceptions of nets
- Explores net preferences in greater depth through the MBS
- Provides insights with strong potential to explain discordance between high ANC attendance and low acceptance of IPTp-SP
- Includes assessments of delivery of malaria-related services at health facilities and perceptions of health workers (other population-based surveys do not do this)
- Provides evidence to inform other complementary malaria prevention programs such as net distribution, services delivery, chemoprophylaxis, and vector control activities
- Provides information about media consumption behaviors and preferred channels of communication to support behavior change activities
- Repeated administrations of the MBS provide trend data for behaviors over time that are useful for evaluating progress towards long-term goals

MBS data provides information on the relative prevalence of socio-behavioral determinants in the overall population and among specific population subgroups. MBS data allows researchers to isolate the independent effect of specific behaviors on outcomes and show how different behaviors may combine to influence behaviors. Comprehensive data on the determinants of malaria-related behaviors are useful to identify underlying behavior-related factors that program planners can address and help programs prioritize their activities. Findings related to health workers and services from the MBS also will provide PMI information to improve malaria CM in the two districts which can be extended to the other PMI focus districts. Results will increase understanding of the barriers and facilitators of malaria-related behaviors, identify appropriate audience segments, and determine potential tailored SBC activities, including health messages. The survey also will provide guidance regarding prioritizing and harmonizing the activities of multiple malaria-related programs and will provide data to compare some standard malaria SBC indicators across different malaria endemic countries. The MBS provides additional data to inform national policy, strategy, and future interventions designed to improve the adoption and uptake of malaria interventions among individuals, families, health providers, and communities.

The MBS tool was developed by CCP and adapted to the Sierra Leone context in collaboration with the Sierra Leone NMCP, and other Sierra Leonean governmental and non-governmental agencies.

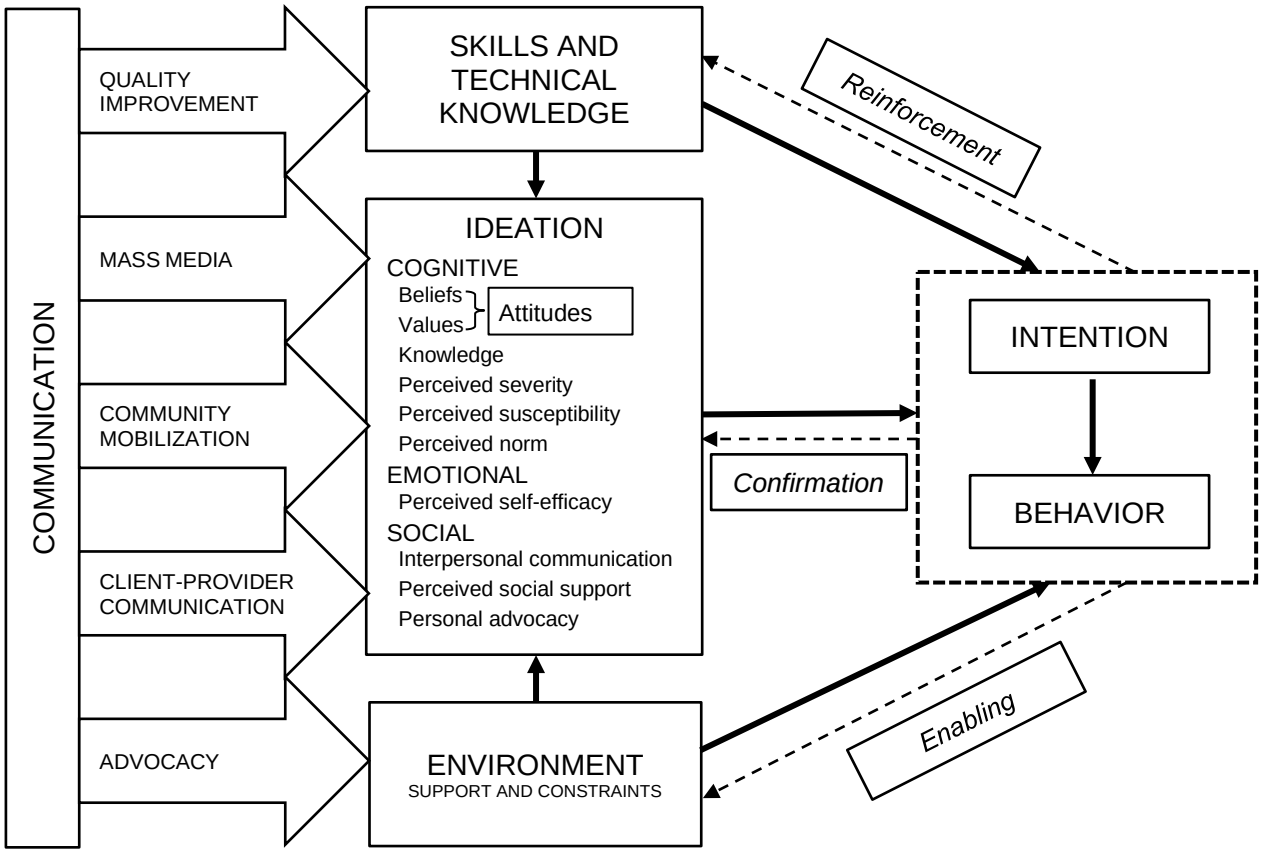
Framework

A growing body of evidence supports the role of SBC programs as a practical approach for increasing the prevalence of many positive health behaviors, including those related to malaria prevention and treatment. To be effective, however, SBC program messages need to target both latent and objective

behaviors, including behavioral determinants that influence individuals' decisions related to these behaviors.

The theoretical premise underlying the MBS is the Ideation Model of Strategic Communication and Behavior Change (Kincaid, L. et al., 2012). CCP researchers developed measures of ideation shown in **Figure 1** below. These measures include a cluster of inter-related psychosocial variables, such as attitudes, perceived behavioral norms, perceived vulnerability, emotional response, self-efficacy, response efficacy, approval, discussion, intentions, and other social influences in one's family and community. Ideational or psychosocial factors help define what should be measured during a program's formative research phase. In the context of malaria, this might mean: what do people perceive about bed net use norms among their peers; how do they perceive the risk of contracting malaria; what do they think are the benefits of net use; who in the family or community influences household net use? Measuring these factors can help determine which are most strongly correlated with the changes in behavior the program is targeting, and thus, what topics should be the focus of the program's messages. These function like risk-factors for disease, but in a positive way: the more of these factors a person has working in his/her favor, the greater the likelihood of positive behaviors. Linear correlations and a dose response relationship between these psychosocial factors and behavioral intentions have consistently been found in analysis of data on ideation. The ideation framework forms the basis for the design of the MBS data collection tools.

Figure 1: Theoretical Premise: The Ideation Model



Source: Kincaid, D.L. (2000). Social networks, ideation, and contraceptive behavior in Bangladesh: a longitudinal analysis. *Social Science and Medicine* 50:215-231.

Methods

Study Design

This survey used a cross-sectional design. A stratified randomly selected sample of women and men were interviewed at one point in time using a structured quantitative questionnaire.

Study Sites

The determination for where to focus the MBS survey was based on the identification of the largest gaps in desired behaviors and the most at-risk population groups among PMI interventions. Breakthrough-ACTION determined this by reviewing DHS/MIS data and other available information in the country.

The primary geopolitical subdivision in Sierra Leone is the district. The districts of Bo and Port Loko were selected with input from NMCP, MOHS, and PMI. Both districts are PMI focus districts and will benefit directly from implementation of the MBS with PMI funding. Bo District was an area where NMCP recommended all PMI partners focus district-level operations on harnessing synergies between the projects for maximum implementation and impact. Port Loko District was recommended due to it having similar socio-demographic characteristics to Bo, which allowed comparisons between the two districts. Both districts also offered easier access than some harder to reach districts such as Koinadugu and enabled the project to maximize limited project resources. Target constituencies, communities, and enumeration areas (EAs) within each district were randomly selected by Sierra Leone Statistics per the sampling calculations.

The MBS will produce programmatically useful data to inform both NMCP programming and Breakthrough ACTION demand creation activities for these districts. The survey also will inform areas of greater collaboration and coordination between implementing partners to facilitate the uptake of behaviors, such as the collaboration between service delivery and SBC.

Sample Size Estimation

The sample size was calculated for a cross-sectional survey with parameters to detect statistically significant differences between the two districts and to produce programmatically useful data.

To determine the required sample size for this survey, we estimated the sample size needed to measure each of the relevant malaria-related outcomes, including caregivers' use of mosquito nets, incidence of fever among under-five children, and prevalence of positive attitudes towards consistent use of mosquito nets. Incidence of fever among children under five years of age was obtained from the MIS 2016 report. We assumed the level of caregiver's mosquito net use, and prevalence of positive attitudes towards consistent use of mosquito nets to be 50% as there is no recent population-based publicly available estimate for these indicators; this level of prevalence provided estimates for maximum variability. The following formula was used to calculate the required sample size:

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

Where:

n is the required sample of individuals (e.g., women)

Z is the Z value corresponding to the desired 95% confidence level

d is the design effect due to departure from simple random sampling (assumed to be 2.0 based on estimates from the 2016 MIS report)

p is the estimated (expected) outcome indicator. For example, the proportion of women of reproductive age that slept under a net on the night before the survey; proportion of under-five children that had fever in the last two weeks. The estimates for the proportion of children under five years of age that had fever in the last two weeks was derived from the Sierra Leone MIS 2016 report. For other outcomes not available in the report, we derived the required sample size under the assumption that *p*=0.5 (for maximum variability)

δ is the desired margin of error. We derived the various sample sizes with δ = 5%

$\mathbf{R_h}$ is the response rate for households. We assume 90% for this parameter

$\mathbf{R_i}$ is the response rate for women in selected households. We assume 96% for this parameter

The results for sample size calculations are presented in **Table 1** below.

TABLE 1: TOTAL REQUIRED SAMPLE SIZE, BY DISTRICT AND OUTCOME

INDICATOR	BO	PORT LOKO	ALL
% of women of reproductive age sleeping under mosquito net	814	1,252	2,066
% of children with fever in last two weeks	1,069	586	1,655
% of women with positive attitudes towards consistent use of mosquito nets	622	640	1,262

Given the range of sample sizes required for each outcome, the final sample size was 2,080 (2,066 rounded up to the closest number that is a multiple of 20) households. The sample size considered potential non-response at the household and individual levels.

The total sample size was 2,080 households with at least one ITN: 814 in Bo and 1,252 in Port Loko.

Sampling

Sample Size and Justification

The number of clusters, households, women, and men to include in the study is provided in **Table 2**. The respondents were selected from a sample of households for each district as follows: 820 from Bo, 1,260 from Port Loko. The respondents were selected from urban and rural areas. The total number of participants for the study is 3,618 individuals from 2,080 households.

TABLE 2: TOTAL REQUIRED SAMPLE SIZE, BY DISTRICT AND OUTCOME

ZONE	CLUSTERS	HOUSEHOLDS	WOMEN	MEN
Bo	41	820	1,173	273
Port Loko	63	1,260	1,752	420
Total	104	2,080	2,925	693

The government office of statistics in the country, Sierra Leone Statistics, assisted with the multi-stage random selection of constituencies, chiefdoms, communities, and EAs for the required sample. Enumeration area sketch maps were used to identify the location and boundaries of selected study areas.

Study Participants

The survey targeted men and women of reproductive age (15–49 years for women and 18–59 years for men) in Bo and Port Loko districts. Inclusion criteria for the study were as follows:

1. Aged 15—49 years for women and 18—59 years for men
2. Usual resident of the selected household
3. Ability to communicate in English or the predominant language within the district

Eligible men and women with the following characteristics were excluded from the study:

1. Inability to consent to participate in the study
2. Inability to understand the questions and/or respond intelligibly in English or predominant language within the district

Household Selection and Recruitment

At selected sites, the study team updated the EA sketch map for the area. The study team then conducted a census of the households in the EA using a household listing form. The study team then selected 20 households from the list using a systematic random sampling approach with a sampling interval proportional to the total number of households in the cluster. For the purpose of the MBS survey, a household was defined as a group of people who live in the same dwelling and share meals. If a selected EA did not have the required number of households needed for the survey, the study team mapped and listed households from an adjoining EA to make up the required number.

Once the household listing was completed, interviewers visited each of the 20 selected households and after obtaining all the required informed consents, administered the household questionnaire. After the completion of the household questionnaire, the interviewer used the list of members to select women aged 15–49 for individual interviews. All consenting women aged 15–49 years old who were usual residents of the household were interviewed. The refusal rate was negligible at this stage. In every third household that agreed to participate in the survey, the spouse or partner of one of the women interviewed in the house was also consented and interviewed using a men's questionnaire.

The Research Team

The research team consisted of a study principal investigator, a senior research data analyst, and assisting graduate researchers from CCP's office in Baltimore. A local contractor conducted field work with a team of 60 data collectors, a program manager, two research leads, a data quality manager, an information technology officer, ten field team supervisors, and a project logistics manager.

The local field research team completed a five-day training workshop conducted by the principal investigator in September 2019. The training workshop focused on research ethics for fieldwork and the research protocol, including study methods, procedures, and tools. Training content included

information on research ethics in the field, rights of human subjects during research, research study design and protocol, sampling procedures, informed consent, data collection tools, electronic data collection, interviewing techniques, and data management, security, and quality.

A key component of the training was opportunities to practice using the study methods and the forms and tools in English as well as their local versions. Training on processes and logistics for field management, supervision, communication, and documentation was conducted by the local contractor. The local project manager, field team leaders, and supervisors received additional training on the protocol, supervision, quality assurance, communication, and reporting requirements for the study.

Data Collection, Management, and Analysis

Data Collection Tools

The survey included three data collection tools, specifically a household questionnaire, and a women's and a men's questionnaire.

The household questionnaire included a listing of all household members, questions about household characteristics and assets, and a net roster. In addition, the interviewer also asked to see all nets in the household, to assess whether they were hung or not. If permission was not granted, the interviewer did not count or inspect the nets.

The individual (male and female), theory-informed questionnaires draw on CCP's experience measuring behavioral determinants of malaria prevention and treatment. In addition to questions on socio-demographic characteristics, the questionnaire included questions on net access and use, presence of window netting in houses, IRS, receipt of IPTp and IPTi, the prevalence of fever among children under-five years, and actions taken to treat the fever. In addition, consistent with the focus on behavioral determinants, the questionnaires included questions on knowledge, perceived severity, perceived vulnerability, perceived efficacy of prescribed interventions, attitudes, perceived self-efficacy, norms, social interactions and influence, and emotional response related to each of the behavioral outcomes of interest to the study. Furthermore, questions about exposure to relevant SBC interventions that focus on malaria prevention and treatment were assessed.

Data Collection

Data were collected in Bo and Port Loko districts during the rainy season, over a period of six weeks during September to October 2019.

Data were secured on password-protected mobile devices and transferred to computers and to the team in Baltimore using encryption procedures. Access to the data was restricted to members of the research team who had, at the time, role responsibilities to collect the data or to process and analyze it. Databases did not contain personal identifiers, and participants were identified by their assigned unique study participant codes only.

A local research firm, selected through a competitive bidding process, assisted with the data collection. Data was collected over a period of six weeks from September to October 2019.

The data were cleaned and then weighted to permit generalization to the district population.

Descriptive, bivariate, and multivariate analysis were conducted on the data. The analysis focused on deriving baseline estimates for outcomes of relevance to the national malaria control efforts, specifically for ITN use, CM, IPTp, IPTi, and IRS. Indicators of interest included but were not limited to the following:

- Use of a mosquito net the previous night, by all household members, including children, youth, and adults
- Receipt of IPTp among women who were pregnant in the past two years
- Receipt of appropriate treatment for fever among children who had a fever in the past two weeks and in the past six months
- Perceptions regarding the threat of malaria, the perceived effectiveness of mosquito nets and treatment, attitudes towards the outcome behaviors, participants perceived self-efficacy for adopting these behaviors, and perceptions regarding the social norms associated with these behaviors
- Exposure to messages promoting malaria prevention and treatment behaviors

The behavioral determinants for the indexes for knowledge, attitudes, self- and response- efficacy, perceived severity and susceptibility, and community norms, were analyzed separately and collectively. A collated overall score for each index was created using the following process: the responses to all the variables in the index were recoded between -1 and +1, with positive integer values reflecting more favorable attitudes towards the behavior. The recoded values were then aggregated, and their total was dichotomized at the value of "0" to distinguish participants with a favorable endorsement or the desired behavior (score < 0) from those with unfavorable endorsement or undesired behavior (score ≤ 0).

Results were summarized for the overall sample and disaggregated where applicable for the following subgroups: district, sex, residence (urban, rural), and age. Tables and graphs were used to present data for the overall sample and for subgroups. Where possible, composite scores were created for scale data to better understand group estimates for knowledge and attitudes, and behavioral determinants.

Logistic regression analysis was used to examine the relationship between behavioral determinants and the outcome behaviors of interest. Regression models also tested whether socio-demographic characteristics and exposure to malaria messages were associated with the desired behavioral outcomes.

Permissions and Ethics

The study protocol was reviewed and approved by the Sierra Leone Ethics and Scientific Review Committee at the MOHS, and the Johns Hopkins Bloomberg School of Public Health Institutional Review Board (IRB) in Baltimore. All key study personnel had active completion certificates for human subjects' research and ethics training, and the study co-Investigators were registered with the Johns Hopkins University IRB. The five-day training workshop held in September 2019 included a comprehensive component related to ethics for data collectors in the field.

The Office of the Chief Medical Officer at Sierra Leone MOHS provided a letter of support and cooperation for the study. This was presented to the DHMT, chiefs, and community leaders in the participating districts to facilitate community entry. Authorities were notified of the presence of the data collection teams prior to the start of data collection. Leaders were provided with information about

the study, their questions were answered, and their permission sought prior to approaching households. No leaders refused to have data collected from their communities.

Results

Description of the Sample

This section presents the characteristics of households and individuals participating in the MBS to provide context for interpreting the results. Information described includes the housing characteristics, property possessed, socio-economic level, and demographic characteristics of respondents and the members of their households.

Population and Household Characteristics

The results are summarized for 2,003 participating households, 3,209 women, and 627 men.

Housing Characteristics

Table 3.1.1 presents the characteristics of the dwelling units surveyed. Overall, the average number of rooms used for sleeping was 2.8 rooms, and on average, 2.5 people were reported to sleep in one room. There were significantly more sleeping rooms in Bo (3.0) compared to Port Loko (2.5) however the difference in the number of people sleeping in a room in Bo (2.4) and Port Loko (2.6) was not substantial. About a quarter of the households had access to electricity, and significantly more people in Bo (29.2%) compared to Port Loko (18.90%) indicated that they had access to electricity. For both districts, the flooring material was primarily earth or mud (61.4%) and the second most common material was cement (35.4%). However, significantly more people in Bo had cement (42.6%) and ceramic tiled (4.3%) floors compared to Port Loko where 27.5% had cement and 0.5% had ceramic tiled floors. Significantly more people in Port Loko (71.4%) had floors in their homes that were made with soil, sand, or mud compared to the homes in Bo (52.1%).

TABLE 3.1.1: HOUSING CHARACTERISTICS, BY DISTRICT, SIERRA LEONE, 2019 (N = 2003)

INDICATOR	BO	PORT LOKO	ALL
Average number of rooms used to sleep in the accommodation***	3.0	2.5	2.8
Number of people per room used to sleep***	2.4	2.6	2.5
Percentage of households with electricity*	29.2	18.9	24.3
Flooring material			
Soil/sand/mud***	52.1	71.4	61.4
Cement***	42.6	27.5	35.4
Ceramic tiles***	4.3	0.5	2.5
Other	1.0	0.6	0.8

Adjusted Wald test p-value: *p < 0.05; ***p < 0.001

Household-owned Durable Goods

A description of household ownership of consumer goods (e.g., radio, television, fan) and means of transportation (bicycles, motorcycles, etc.) are presented in **Table 3.1.2**, by district.

The common items possessed within households were mobile phones (72%) and radios (69%). Households in Bo district were more likely than those in Port Loko district to have a television (26.6% vs. 11.9% respectively; $p < 0.001$), fan (20.6% vs. 7.7% $p < 0.001$), refrigerator (13.2% vs. 3.5%; $p < 0.001$), motorcycle or scooter (11.5% vs. 7.0%; $p = 0.0289$), and computer (3.9% vs. 0.5%; $p < 0.001$).

TABLE 3.1.2: HOUSEHOLD ASSETS (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 2,003)

TYPE OF HOUSEHOLD ASSET	BO	PORT LOKO	ALL
Radio	69.1	69.0	69.0
Television***	26.6	11.9	19.6
Refrigerator***	13.2	3.5	8.6
Fan***	20.6	7.7	14.4
Air conditioner	0.07	0.05	0.06
Mobile phone	68.5	75.7	72.0
Bicycle	5.5	4.5	5.0
Motorcycle/scooter*	11.5	7.0	9.3
Car	2.4	1.6	2.0
Computer***	3.9	0.5	2.3

Adjusted Wald test p-value: *p < 0.05; ***p < 0.001

Composition of Household Members

Table 3.1.3 below summarizes information on age and sex of all household members, overall and by district. A little more than half (52.9%) of the respondents were women, and 73.6% of the sample lived in rural areas. Significantly higher proportions of children in households were between the age of zero to four years (15.7%) and five to 17 years in Port Loko compared to Bo (zero to four years: 13.6%; five to 17 years: 35.2%). Conversely, there was a higher proportion of adults (18 years and older) in households within Bo (51.2%) compared to Port Loko (46.5%) ($p < 0.001$).

TABLE 3.1.3: CHARACTERISTICS OF MEMBERS OF SURVEYED HOUSEHOLDS, BY DISTRICT, SIERRA LEONE, 2019 (N = 12,674)

SOCIO-DEMOGRAPHIC CHARACTERISTICS	BO	PORT LOKO	ALL
Percentage of females	52.8	53.0	52.9
Percentage residing in urban areas	29.2	23.3	26.4
Age Distribution			
% aged zero to four years*	13.6	15.7	14.6
% aged five to 17 years*	35.2	37.8	36.4
% aged 18 years and above***	51.2	46.5	49.0
Average age***	22.2	20	21.1

Adjusted Wald test p-value: *p < 0.05; ***p < 0.001

Household Wealth

This survey assessed the standard of living of households using principal component analysis, Households were assigned a score based on 16 variables related to housing characteristics (rooms, floor, roof, wall, ceiling, and electricity) and household assets (radio, television, fridge, fan, mobile phone, watch, bicycle, motorcycle, livestock, and agricultural land). Next, each household member was assigned their household score and rank within the household population that was based on their score. Wealth quintiles were obtained for each individual by dividing the household population into five equal categories based on the frequency distribution of the household scores.

Table 3.1.4 presents data on wealth quintiles by residence and district. The majority of the population from urban areas (86.6%) were in the upper two wealth quintiles. In the rural areas, there was a somewhat even spread of the population across wealth quintiles, except for the highest quintile which had the lowest proportion (11.1%) of individuals. Within Bo, the highest proportion of individuals were within the highest category (33.4%) while in Port Loko the highest percentage of the population was in the middle and fourth quintiles.

TABLE 3.1.4: DISTRIBUTION OF HOUSEHOLD WEALTH (%), BY RESIDENCE AND DISTRICT, SIERRA LEONE, 2019

	WEALTH QUINTILE					NUMBER OF PERSONS
	LOWEST	**SECOND**	**MIDDLEE**	**FOURTH**	**HIGHEST**	
Residence						
Rural	25.4	24.1	20.1	19.4	11.1	10,487
Urban	1.2	3.0	9.3	18.0	68.6	2,187
District						
Bo	20.6	18.4	12.2	15.4	33.4	5,015
Port Loko	17.2	18.6	22.9	23.0	18.3	7,659
Total	20.0	20.0	20.0	20.0	20.0	12,674

Socio-demographic Characteristics of Respondents

This section describes the demographic profile of the men and women surveyed. **Table 3.1.5** shows the weighted and unweighted percent distributions and the unweighted numbers of individuals who participated in the 2019 Sierra Leone MBS.

TABLE 3.1.5: BACKGROUND CHARACTERISTICS OF MEN AND WOMEN SURVEYED (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,836)

BACKGROUND CHARACTERISTIC	WEIGHTED PERCENT	UNWEIGHTED PERCENT	UNWEIGHTED NUMBER
Sex			
Male	47.8	16.4	627
Female	52.2	83.7	3,209
Age			
15–24 years	22.9	34.5	1,322
25–34 years	26.2	31.3	1,202
35–44 years	28.8	24.5	939

TABLE 3.1.5: BACKGROUND CHARACTERISTICS OF MEN AND WOMEN SURVEYED (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,836)			
BACKGROUND CHARACTERISTIC	WEIGHTED PERCENT	UNWEIGHTED PERCENT	UNWEIGHTED NUMBER
45+ years	22.1	9.7	373
Religion			
Christian	19.9	16.2	622
Muslim	80.1	83.8	3,214
Educational attainment			
None	45.4	49.0	1,879
Primary	18.0	21.8	835
Secondary or higher	36.6	29.3	1,122
Residence			
Rural	70.2	80.63	3,093
Urban	29.8	19.37	743
District			
Bo	54.8	39.7	1,521
Port Loko	45.2	60.4	2,315

About half (49.1%) of the respondents were less than 35 years, and the majority were Muslim (80.1%) and resided in rural areas (70.2%). There were significant differences in individual demographic characteristics by district. Port Loko had a higher proportion of women (54.1%) compared to Bo (50.6%) ($p = 0.0452$) and significantly more Muslims (92.7%) compared to Bo (69.8%) ($p < 0.001$). More respondents between the ages of 15–24 years were in Port Loko (25.2%) compared to Bo (21.0%) ($p = 0.0021$), and significantly more respondents had secondary or higher education in Bo (39.4%) compared to Port Loko (33.2%) ($p = 0.0428$).

Media Consumption Habits and Exposure to Messages

In this section, results on media consumption habits and exposure of household members to messages are presented below, stratified by sex, residence type, age group, educational attainment, district, and household wealth.

Media Consumption Habits

Radio Ownership and Listenership

Table 3.2.1 shows characteristics of people who listen to the radio at least once weekly who participated in the 2019 Sierra Leone MBS.

Radio ownership was widespread among surveyed respondents (73.9%). When restricted to households with radios, the proportion of respondents who reported that they listened to the radio weekly was higher (69.3%) than for the sample. Weekly radio use among those with access to radio within their households was significantly higher among men, older (≥ 45 years) respondents, those with higher educational attainment, and those from wealthier households and urban areas.

Men (73.7%) reported weekly radio listenership at significantly higher proportions than women (52.2%) ($p < 0.001$). Likewise, a higher proportion of respondents with secondary or higher education (76.6%) and those who live in urban areas (73.2%) reported that they listened to the radio weekly compared to respondents with no formal education (57.0%) and rural residents (57.9%). In addition, more respondents from wealthier households and older respondents reported significantly higher radio listenership than poorer households and younger respondents.

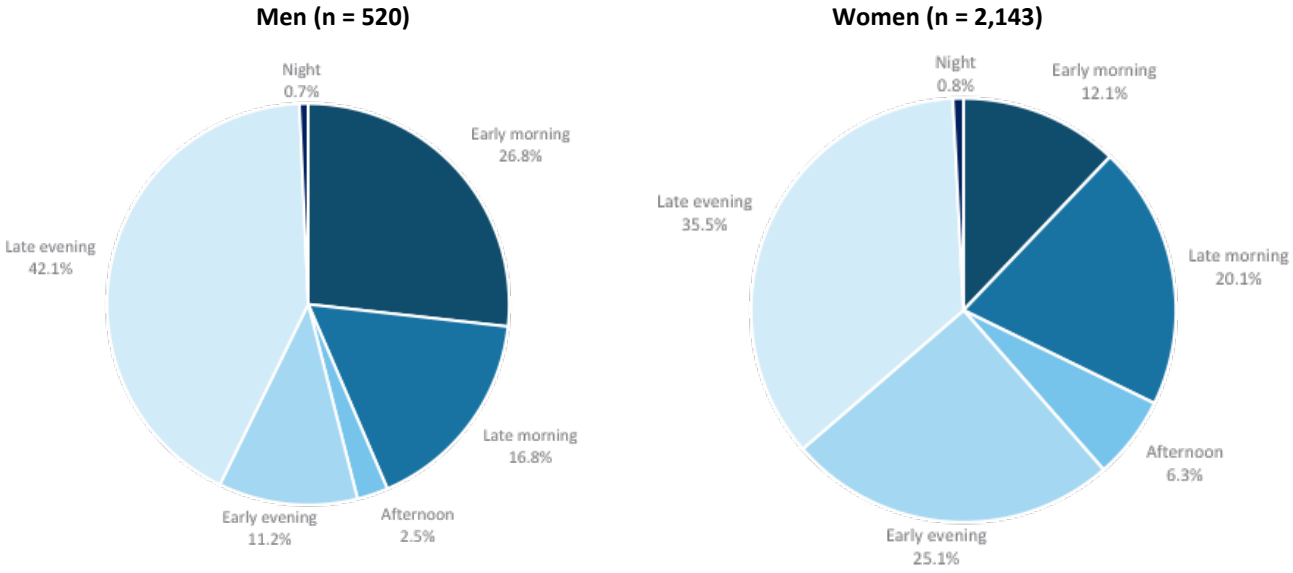
TABLE 3.2.1: RESPONDENTS WHO LISTEN TO THE RADIO AT LEAST ONCE WEEKLY (%), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019

SOCIO-DEMOGRAPHIC CHARACTERISTICS		PERCENTAGE (%)	
		ALL RESPONDENTS (N = 3,836)	RESIDENTS WITH TELEVISION ACCESS (N = 2,695)
Sex	Men	73.7	82.0
	Women	52.2***	56.9***
Residence type	Rural	57.9	42.2
	Urban	73.2***	66.3
Age group	15–24 years	59.8	63.3
	25–34 years	57.0	64.9
	35–44 years	59.5	68.0
	45 years and older	75.5***	80.7***
District	Bo	63.5	71.5
	Port Loko	61.2	66.6
Educational attainment	None	52.9	60.4
	Primary	57.8	64.4
	Secondary or higher	76.6***	80.0***
Household wealth quintile	Lowest	43.0	53.7
	Second	57.1**	63.0
	Middle	57.3**	64.0
	Fourth	67.0***	69.0
	Highest	77.2***	77.9**
Total		62.5	69.3

Adjusted Wald test p-value: ** p < 0.01; *** p < 0.001

The most popular time to listen to the radio was late evening (between 8 p.m. and midnight), and this preference did not vary by sex (**Figure 2**). Peak listening time for men was during late evening (42.1%), however some respondents listened to radio during early morning (between 4 a.m. and 8 a.m.) (26.8%), and late morning (between 8 a.m. and noon) (16.8%) hours. Women's preferences for listening to the radio were during early (between 4 p.m. and 8 p.m.) (25.1%) and late (between 8 p.m. and midnight) (35.5%) evening.

Figure 2: Time preferences for radio listening among respondents who report ever listening to the radio (%), by sex, Sierra Leone, 2019 (N = 2,663)



Distribution of radio listening preferences also varied slightly by age, though late evening remained the most popular listening time across all age groups (**Table 3.2.2**).

TABLE 3.2.2: PREFERRED TIMES TO LISTEN TO THE RADIO (%), BY AGE GROUP, SIERRA LEONE, 2019 (N = 2,663)

AGE GROUP	EARLY MORNING	LATER MORNING	AFTERNOON	EARLY EVENING	LATE EVENING	NIGHT
15–24 years	13.7	22.0	5.6	25.1	32.6	1.0
25–34 years	21.9	18.4	5.0	19.1	34.4	1.2
35–44 years	22.4	13.7	3.8	17.0	43.4	0.1
45 years and older	20.1	20.9	3.0	10.9	44.3	0.8

Television Ownership and Viewership

Television ownership among respondents was limited. While 22% overall reported owning a television, 57.8% of respondents in urban areas reported having access to televisions within their households. Overall, weekly television viewership (20.0%) was substantially less widespread than radio listenership (**Table 3.2.3**). Among respondents with access to television, weekly television viewing increased to 55.5%. Weekly television viewing also was significantly higher in Bo (24.1%) than in Port Loko (15.1%) (p

= 0.0476). When restricted to households with televisions, watching television remained significantly more widespread in Bo (66.0%) than Port Loko (26.7%).

A higher proportion of respondents younger than 25 years (22.5%) and those 45 years and older (25.6%) reported weekly television watching compared to respondents between the ages of 25–44 years. Weekly television viewing was greatest in urban areas (49.5%), among respondents with secondary or higher education (32.9%), and among those from wealthier households.

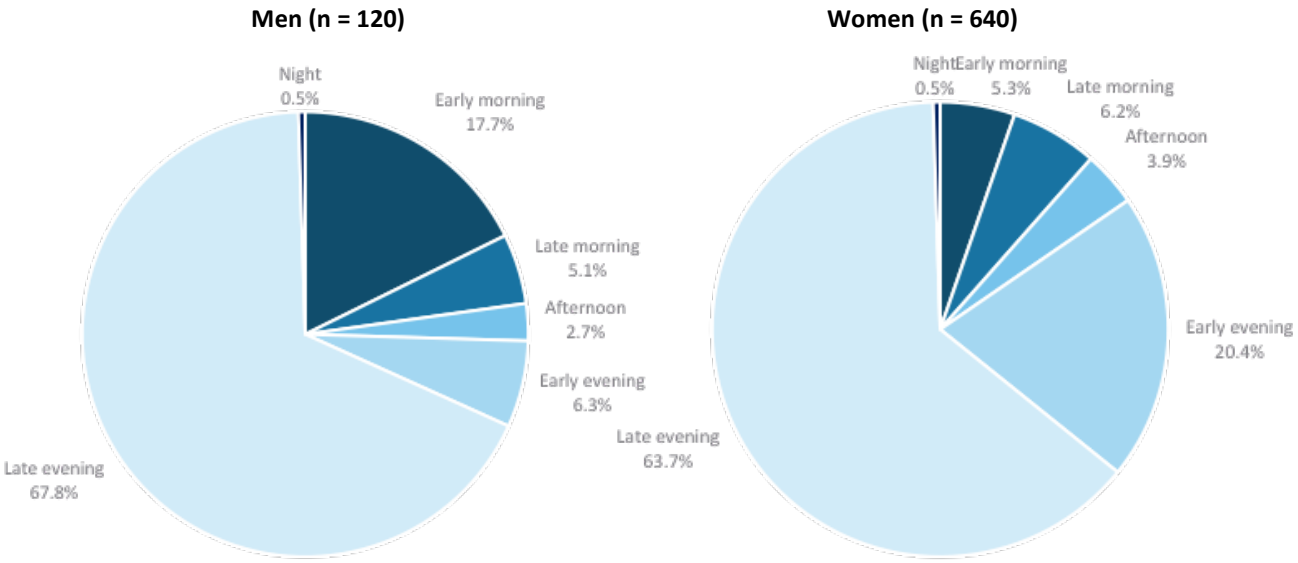
TABLE 3.2.3: RESPONDENTS WHO WATCH TELEVISION AT LEAST ONCE WEEKLY (%) BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019

SOCIO-DEMOGRAPHIC CHARACTERISTICS		PERCENTAGE (%)	
		ALL RESPONDENTS (N = 3,836)	RESIDENTS WITH TELEVISION ACCESS (N = 577)
Sex	Men	20.1	55.7
	Women	19.9	55.2
Residence type	Rural	7.5	42.2
	Urban	49.5***	59.1
Age group	15–24 years	22.5	52.6
	25–34 years	17.3*	49.0
	35–44 years	16.3*	46.5
	45 years and older	25.6	71.3
District	Bo	24.1	66.0
	Port Loko	15.1*	26.7***
Educational attainment	None	11.5	59.4
	Primary	15.3	44.9
	Secondary or higher	32.9***	55.7
Household wealth quintile	Lowest	4.1	n/a
	Second	3.7	n/a
	Middle	7.3*	n/a
	Fourth	20.3***	22.9 (n = 2)
	Highest	46.8***	55.6
Total		20.0	55.5

Adjusted Wald test p-value: * p < 0.05; *** p < 0.001

Television viewing was most popular in the late evening hours for both men (67.8%) and women (63.7%) (**Figure 3**). Watching television was more popular among men (17.7%) also during the early morning hours compared to women (5.3%), while among women, watching television also was more popular during the early evening hours (20.4%) compared to men (6.3%).

Figure 3: Time preferences for television watching among respondents who report ever listening to the television (%), by sex, Sierra Leone, 2019 (N = 760)



Exposure to Messages on Malaria

The survey measured recent (past six months) exposure to any malaria-related communications (**Table 3.2.4**) among respondents. Nearly three-fourths (74.5%) of respondents reported that they had heard at least one malaria-related message through the media or from interpersonal sources in the past six months. Reported message exposure was significantly higher in women (77.1%) than men (71.6%) and in rural areas (79.2%) compared to urban areas (63.4%). Message exposure was also significantly higher among 25–34-year-olds (79.0%) and those who were 45 years and older (79.2%), compared to younger (aged 15–24) respondents.

TABLE 3.2.4: RESPONDENT WHO REPORTED EXPOSURE TO ANY MALARIA-RELATED MESSAGING IN THE PAST SIX MONTHS, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 3,836)

SOCIO-DEMOGRAPHIC CHARACTERISTICS		PERCENTAGE (%)
Sex	Men	71.6
	Women	77.1*
Residence type	Rural	79.2
	Urban	63.4**
Age group	15–24 years	72.0
	25–34 years	79.0*
	35–44 years	68.7
	45 years and older	79.2*

TABLE 3.2.4: RESPONDENT WHO REPORTED EXPOSURE TO ANY MALARIA-RELATED MESSAGING IN THE PAST SIX MONTHS, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 3,836)		
SOCIO-DEMOGRAPHIC CHARACTERISTICS		PERCENTAGE (%)
District	Bo	75.3
	Port Loko	73.5
Educational attainment	None	76.0
	Primary	74.1
	Secondary or higher	72.8
Household wealth quintile	Lowest	80.9
	Second	76.0
	Middle	76.8
	Fourth	73.1
	Highest	68.8*
Total		74.5
Adjusted Wald test p-value: * p < 0.05; ** p < 0.01		

Among media sources, radio was the most widely reported channel through which respondents recalled hearing malaria-related messaging (59.1%). Other popular sources of malaria-related messages were community health workers (62.1%), friends and family (45.2%), and from government healthcare facilities (38.6%).

Respondents were asked to complete the malaria national campaign slogan, "*Yu get Wambodi?*" that the NMCP has used for its campaigns since 2019. Over half (53.9%) of respondents correctly completed the campaign slogan. There were no significant differences in message exposure by sex, district, however, residents in rural (60.1%) compared to urban (39.4%) areas were more likely to correctly complete the campaign slogan ($p < 0.001$). Among those who recalled hearing the slogan, most recalled hearing the slogan from community health workers (64.7%), on the radio (61.3%), government health facilities (39.8%), and friends and family (34.3%).

Cross-Cutting Behavioral Determinants

In this section, the results for behavioral variables that may influence cross-cutting malaria-related behaviors are presented. This section focuses on knowledge about malaria, perceived severity of malaria, perceived vulnerability to malaria, perceived self-efficacy for malaria prevention, and interpersonal communication about malaria. Cross-cutting relationships with gender norms and perceptions of health providers are also included.

Knowledge of Malaria

To assess knowledge about malaria, respondents were asked questions about the symptoms and causes of malaria (**Table 3.3.1**). Knowledge of fever as a symptom of malaria was widespread but not universal (85.7%). By comparison, almost all the respondents (97.6%) acknowledged that mosquitoes transmit malaria. No substantial differences in knowledge of malaria were observed by sex. Compared to rural residents, fewer urban respondents (78.2%) had correct knowledge of fever as a symptom of malaria compared to rural residents (88.8%) ($p = 0.0159$). Likewise, a higher proportion of respondents in Bo, compared to those in Port Loko, had correct knowledge of fever as a symptom of malaria (90.6% vs. 79.7%) ($p < 0.001$).

A moderate proportion of respondents (64.9%) cited mosquito bites as a cause of malaria without mentioning at the same time, an incorrect cause of malaria. Incorrect causes for malaria mentioned included eating dirty food, unripe fruits, cold corn, and too much oil, drinking dirty water, beer, or palm wine, getting soaked in the rain, cold or changing weather, witchcraft, teething, indigestion, and stepping in urine. Differences in knowledge were noted by urban-rural residence, level of education, and wealth quintiles. Significantly more people in urban areas (75.3%) compared to rural areas (60.4%) had the knowledge of mosquito bites as the cause of malaria without mentioning an incorrect cause ($p < 0.001$). Similarly, more people with secondary and higher education level (75.4%) compared with those with no formal education (60.1%, $p < 0.001$) and primary education (55.3%, $p < 0.001$) had this correct knowledge of the cause of malaria. Furthermore, compared to those in the lowest (54.0%) wealth quintiles, a higher proportion of individuals in the fourth (66.8%, $p = 0.0074$) and highest (77.8%, $p < 0.001$) wealth quintiles had correct knowledge of the cause of malaria. However, the difference was not significant between the lowest and second (59.6%, $p = 0.2019$), or middle wealth quintiles (59.6%, $p = 0.5363$). No significant differences were noted by sex or district.

TABLE 3.3.1: RESPONDENTS WITH KNOWLEDGE OF MALARIA SYMPTOMS AND ETIOLOGY (%), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 3,836)

SOCIO-DEMOGRAPHIC CHARACTERISTICS		KNOWS THAT FEVER IS A SYMPTOM OF MALARIA	KNOWS THAT MALARIA IS TRANSMITTED THROUGH MOSQUITO BITES
Sex	Men	87.3	97.4
	Women	84.1	97.7
Residence type	Rural	88.8	98.5
	Urban	78.2*	95.4
District	Bo	90.6	99.0
	Port Loko	79.7***	95.9*

TABLE 3.3.1: RESPONDENTS WITH KNOWLEDGE OF MALARIA SYMPTOMS AND ETIOLOGY (%), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 3,836)			
SOCIO-DEMOGRAPHIC CHARACTERISTICS		KNOWS THAT FEVER IS A SYMPTOM OF MALARIA	KNOWS THAT MALARIA IS TRANSMITTED THROUGH MOSQUITO BITES
Educational attainment	None	88.3	97.6
	Primary	82.5	95.4
	Secondary or higher	83.9*	98.5
Household wealth quintile	Lowest	90.6	98.4
	Second	90.0	98.0
	Middle	85.1	96.7
	Fourth	80.3**	95.8
	Highest	83.4	98.4
Total		85.7	97.6
Adjusted Wald test p-value: * p < 0.05; ** p < 0.01; *** p < 0.001			

Perceived Vulnerability to Malaria

Perceived vulnerability refers to one's perception of their susceptibility to a disease or illness. This behavioral determinant was assessed by measuring respondents' agreement with four statements related to perceived vulnerability to malaria. **Table 3.3.2** below summarizes the proportion of respondents perceiving vulnerability to malaria for specific questions.

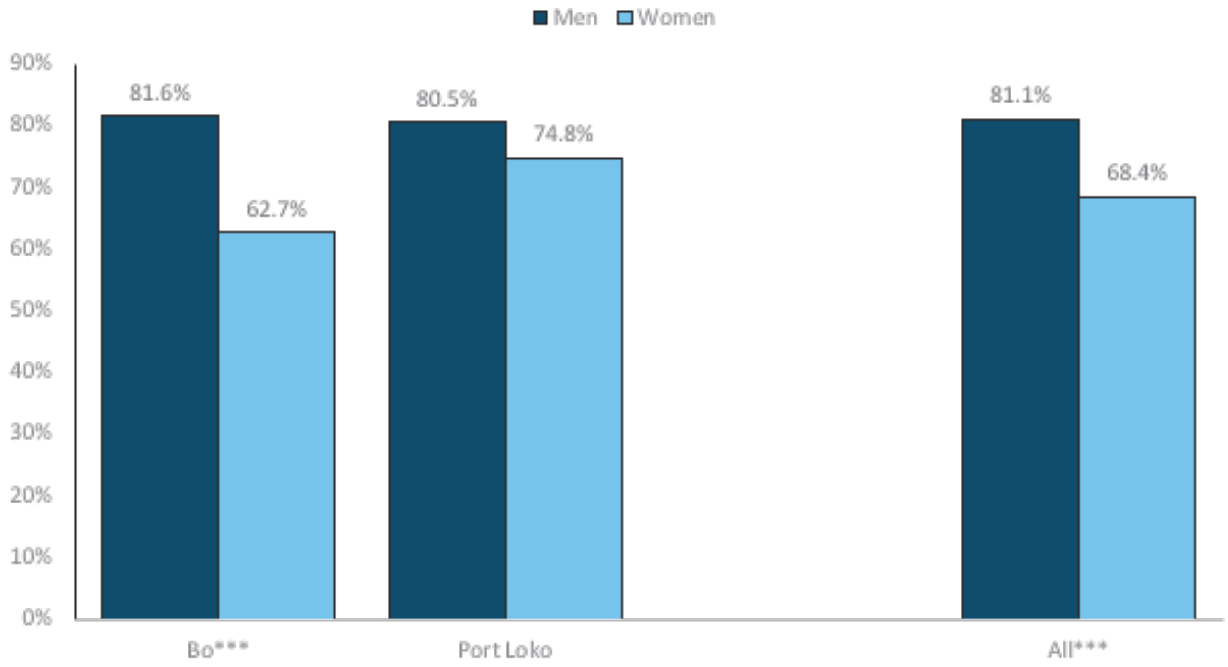
TABLE 3.3.2 AGREEMENT WITH ITEMS FOR PERCEIVED VULNERABILITY TO MALARIA (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,836)			
INDICATOR	BO	PORT LOKO	ALL
People in this community only catch malaria during the rainy season***	15.3	42.6	27.7
Almost every year, a person in this community catches severe malaria*	70.5	75.5	72.7
When your child has a fever, you're almost always afraid it's malaria***	78.0	86.2	81.8
During the rainy season, you're afraid almost every day that a member of your family will suffer from malaria***	59.6	74.4	66.3
Total reporting perceived high vulnerability towards malaria*	72.0	77.4	74.5
Adjusted Wald test p-value: * p < 0.05; ** p < 0.01; *** p < 0.001			

Overall, most respondents reported high perceived vulnerability to malaria (74.5%), with a significantly higher proportion of respondents in Port Loko (77.4%) than Bo (72.0%) agreeing with the perceived vulnerability indicators. The majority of respondents reported the following items: people in their communities acquire malaria annually (72.7%); fearing children have malaria each time they develop a fever (81.8%); and having daily fears during the rainy season that a member of their family may get sick

with malaria (66.3%). Approximately one-quarter (27.7%) of respondents, however, believed that people only acquire malaria during the rainy season, and a higher proportion of these respondents resided in Port Loko (42.6%) compared to Bo (15.3%).

There was a significant sex-based difference in perceived vulnerability to malaria. Specifically, a higher proportion of men (81.1%) had high perceived vulnerability to malaria compared to women (68.4%) ($p < 0.001$) (**Figure 4**). Similar findings were evident at district level in Bo (men: 81.6%, women: 62.7%) ($p < 0.001$) but not in Port Loko (men: 80.5%, women: 74.8%) ($p = 0.0711$).

Figure 4: **Respondents with perceived high vulnerability to malaria (%), by sex and district, Sierra Leone, 2019 (N = 3,836)**



Adjusted Wald test *p*-value: *** $p < 0.001$

Perceived Severity of Malaria

Perceived severity refers to one's perception of the seriousness or potential negative consequences of a disease or illness. This behavioral determinant was assessed by measuring respondents' agreement with four statements related to perceived severity of malaria. **Table 3.3.3** below summarizes the proportion of respondents perceiving high severity of malaria for specific questions.

TABLE 3.3.3: AGREEMENT WITH PERCEIVED SEVERITY OF MALARIA (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,836)

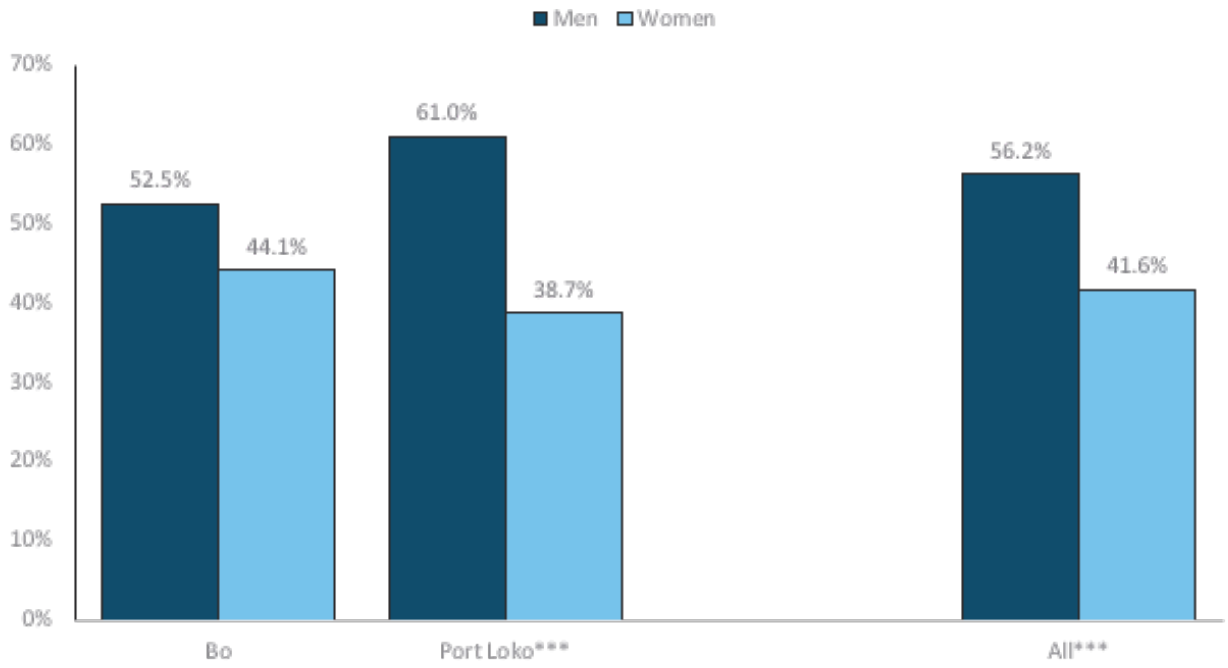
INDICATOR	BO	PORT LOKO	ALL
You don't worry about malaria because it can be easily treated	38.1	36.1	37.2
Only weak children can die of malaria***	8.90	19.3	13.6
Each case of malaria can potentially lead to death	58.7	59.0	58.9

TABLE 3.3.3: AGREEMENT WITH PERCEIVED SEVERITY OF MALARIA (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,836)			
INDICATOR	BO	PORT LOKO	ALL
When someone you know has malaria, you usually expect them to recover completely within a few days	64.0	68.5	66.0
Total reporting perceived high severity of malaria	48.3	48.9	48.6
Adjusted Wald test p-value: *** p < 0.001			

Perceptions of severity of malaria were variable. Fewer than half (48.6%) of respondents reported perceived high severity of malaria, and this was supported by nearly two-thirds (66.0%) of respondents who indicated that they expect someone with malaria to recover after a few days. Similarly, over one-third (37.2%) reported they do not fear malaria because it can be easily treated. A few (13.6%) respondents agreed with the statement that only weak children die of malaria, however over half (58.9%) also believed that each case of malaria could potentially lead to death. Few differences were observed across districts, although the perception that only weak children can die of malaria was significantly more widespread in Port Loko (19.3%) than in Bo (8.9%) ($p < 0.001$).

For sex differences, a significantly higher proportion of men (56.2%) compared to women (41.6%) reported items measuring perceived severity of malaria ($p < 0.001$) (**Figure 5**). A similar difference also was evident at district level where significant differences in men's and women's endorsement of perceived malaria severity was observed in Port Loko (men: 61.0%, women: 38.7%) ($p < 0.001$) but not Bo (men: 52.5%, women: 44.1%).

Figure 5. Respondents reporting perceived severity of malaria (%), by sex and district, Sierra Leone, 2019 (N = 3,836)



Adjusted Wald test *p*-value: *** *p* <0.001

Interpersonal Communication about Malaria

Malaria was discussed by a moderate proportion of married and cohabiting respondents (**Table 3.3.4**). More than half (56.9%) of respondents reported that they had discussed malaria with their spouse or partner in the past six months. A higher proportion of respondents in Port Loko (61.9%) had discussed malaria with their partner or spouse compared to respondents in Bo (52.7%) ($p = 0.0397$). Few other differences across socio-demographic characteristics were observed.

Similarly, over half (54.2%) of respondents reported that they had discussed malaria with a friend or family member in the six weeks preceding the survey. A significantly higher proportion of men (59.8%) reported that they had discussed malaria with friends or family members compared to women (49.1%) ($p < 0.001$). Few other socio-demographic differences in interpersonal communication were observed.

TABLE 3.3.4: PREVALENCE OF INTERPERSONAL COMMUNICATION IN PAST SIX MONTHS (%), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019

SOCIO-DEMOGRAPHIC CHARACTERISTICS		TALKED ABOUT MALARIA WITH SPOUSE/PARTNER (N = 2,938)	TALKED ABOUT MALARIA WITH A FRIEND OR FAMILY MEMBER (N = 3,836)
Sex	Men	60.5	59.8
	Women	52.3*	49.1***
Residence type	Rural	59.5	55.0
	Urban	49.6	52.5
District	Bo	52.7	54.8
	Port Loko	61.9*	53.5
Educational attainment	None	53.7	52.2
	Primary	58.6	52.1
	Secondary or higher	61.2	57.8
Household wealth quintile	Lowest	58.0	54.5
	Second	50.3	42.0*
	Middle	59.3	54.4
	Fourth	58.5	56.5
	Highest	58.0	60.3
Total		56.9	54.2

Adjusted Wald test p-value: * $p < 0.05$; *** $p < 0.001$

Perception of Health Workers Providing Malaria-Related Services

The overall perception of health workers was positive (**Table 3.3.5**). Most respondents indicated that health workers in health facilities (87.8%) and community health workers (83.6%), treated their patients with respect. In addition, many respondents perceived that people who sought treatment at health facilities were well-cared for (86.6%). Of note, women had positive perceptions of health workers at significantly higher proportions than men.

TABLE 3.3.5: PROPORTION WITH POSITIVE PERCEPTIONS OF HEALTH WORKERS BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 3,836)				
SOCIO-DEMOGRAPHIC CHARACTERISTICS		HEALTH WORKERS IN THE HEALTH CENTER TREAT PATIENTS WITH RESPECT	COMMUNITY HEALTH WORKERS IN YOUR COMMUNITY TREAT PATIENTS WITH RESPECT	PEOPLE SEEKING TREATMENT IN A HEALTH FACILITY ARE WELL-LOOKED AFTER
Sex	Men	83.6	80.3	80.0
	Women	91.5**	86.6*	92.6***
Residence type	Rural	88.2	87.2	86.5
	Urban	86.6	75.1***	86.8
District	Bo	88.3	81.9	85.3
	Port Loko	87.1	85.7	88.0
Educational attainment	None	88.6	86.7	85.6
	Primary	87.4	86.3	85.9
	Secondary or higher	86.9	78.4***	88.1
Total		87.8	83.6	86.6
Adjusted Wald test p-value: * p < 0.05; ** p < 0.01; *** p < 0.001				

Gender Norms

Measures of gender norms showed a tendency towards gender-equitable attitudes regarding malaria prevention and treatment **(Table 3.3.6)**. A majority (88.8%) of respondents indicated that pregnant women should feel comfortable asking their spouse or partner to accompany them to the health facility for ANC. More men (91%) than women (86.78%) had this belief, how the difference between the two estimates is not substantial. In addition, few (11.1%) respondents overall agreed that male children should be preferentially treated for malaria when there were insufficient resources to pay for drugs. Conversely, one-fifth (21.5%) of respondents felt that female children should be given priority to sleep under a net when there were insufficient nets available in the household. While results do not support the reverse statement that boys are prioritized over girls to use ITN, caution must be taken to not create gender-inequity by focusing on boys more than girls.

Overall, positive gender norms were widespread across districts (87.9%), however a significantly higher proportion of respondents supported positive norms in Bo (92.6%) compared to Port Loko (82.2%) ($p < 0.001$). There were no significant differences in the proportions that supported gender-equitable norms for malaria prevention among men (87.3%) and women (88.4%).

TABLE 3.3.6: SELECTED MEASURES OF EQUITABLE GENDER NORMS (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,836)			
INDICATOR	BO	PORT LOKO	ALL
If there are not enough mosquito nets, it is more important that female children sleep under the available mosquito nets than male children	21.1	21.8	21.5

TABLE 3.3.6: SELECTED MEASURES OF EQUITABLE GENDER NORMS (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,836)			
INDICATOR	BO	PORT LOKO	ALL
A pregnant woman should feel comfortable asking her spouse/partner to go with her to the health facility for ANC check-up.	89.4	88.0	88.8
If there is not enough money, it is more important that male children with fever be able to have drugs than female children*	7.6	15.3	11.1
Total reporting equitable gender norms***	92.6	82.2	87.9
Adjusted Wald test p-value: * p < 0.05; *** p < 0.001			

ITNs

ITNs are one of the most important tools for preventing malaria, and the World Health Organization (WHO) recommends the consistent and correct use of ITNs in malaria-endemic areas. In this section, the results for psychosocial and behavioral variables and ITN-related behaviors are presented.

Behavioral Determinants

Knowledge

Two ITN-knowledge-related themes are described in this report; knowledge of mosquito nets as a method of preventing malaria and knowledge of where to purchase mosquito nets. **Table 3.4.1**. shows that almost all participants (96.5%) were aware of mosquito nets as a malaria prevention method, irrespective of socio-demographic differences. There were significant differences by residence type, and participants in Bo (98%) had higher levels of knowledge compared to Port Loko (94.6%) participants ($p<0.05$). It is important to note that although most respondents endorsed nets as a method of preventing malaria, only about 58% mentioned ITNs specifically, as a method of preventing malaria, however, the terms “nets” and “ITNs” may be similar to informants. The proportion of respondents who cited ITNs as a means of preventing malaria was significantly higher in Bo (62.9%) compared to Port Loko (51.4%) ($p < 0.01$).

Overall, awareness about where to buy nets was very limited (8.3%). In Port Loko, only about 2% of residents indicated that they were aware of where to buy nets compared to about 13% in Bo.

TABLE 3.4.1: KNOWLEDGE THAT USE OF MOSQUITO NETS IS A METHOD FOR PREVENTING MALARIA, SIERRA LEONE, 2019 (N = 3,836)		
PARTICIPANT CHARACTERISTICS		(%)
Sex	Men	96.5
	Women	96.5
Residence type	Rural	97.8
	Urban*	93.5
District	Bo	98.0
	Port Loko*	94.6
Educational attainment	None	96.3
	Primary	95.0

TABLE 3.4.1: KNOWLEDGE THAT USE OF MOSQUITO NETS IS A METHOD FOR PREVENTING MALARIA, SIERRA LEONE, 2019 (N = 3,836)		
PARTICIPANT CHARACTERISTICS		(%)
	Secondary or higher	97.5
Total		96.5
Adjusted Wald test p-value: * p < 0.05		

Attitudes

Attitudes related to the use of mosquito nets were assessed through 13 attitudinal statements on the use, preferences, and perceived benefits of ITNs. Participants were asked to indicate whether they agreed or did not agree with each statement. Sex-disaggregated responses to these statements are presented in **Appendix 1**.

Women's attitudes favored the use of mosquito nets. Most women perceived they sleep better at night under a mosquito net (95.7%); that nets are easy to use (95.3%), safe to sleep under (91.4%), and are a valued item (93.8%). Nonetheless, nearly half of surveyed women indicated that they preferred not to sleep under a net when the weather was very warm (45.6%) and that the smell of the insecticide used on treated nets made it uncomfortable to sleep under such nets (51.0%). A substantial proportion of women felt that nets made with nylon material were too hot to sleep under (63.1%), and that treated nets could produce skin rashes on users (42.1%). In addition, 17% of women believed that more expensive nets were more effective than free or cheaper nets. While the combined attitude variable was universally positive towards mosquito net use, participants from Bo (96.9%) reported these attitudes with significantly higher frequency compared to participants from Port Loko (91.6%) ($p < 0.001$).

Attitudes among men also generally favored the use of mosquito nets. Similar to women, most men perceived that they sleep better at night under a mosquito net (90.0%); nets are easy to use (93.6%), safe to sleep under (93.0%), and are a valued item (91.7%). Nonetheless, over half of the men indicated that they preferred not to sleep under a net when the weather was very warm (54.2%) and that the smell of the insecticide used on treated nets makes it uncomfortable to sleep under such nets (57.4%). Furthermore, more than half of surveyed men felt that nets made with nylon material were too hot to sleep under (62.4%) and that treated nets could produce skin rashes on users (35.2%). In addition, 27% of women believed that more expensive nets were more effective than free or cheaper nets. While positive attitudes towards mosquito net use were universal among the sample, male participants from Bo (90.3%) endorsed these attitudes with significantly higher frequency compared to participants from Port Loko (80.7%) ($p < 0.5$).

Overall, participants reported favorable attitudes towards mosquito nets (90.5%). Positive attitudes, however, differed significantly across some socio-demographic characteristics (**Table 3.4.2** below). Women (94.4%), and Bo (93.6%) residents had positive attitudes at significantly higher proportions than men (86.1%) and Port Loko (86.6%) residents, respectively ($p < 0.001$).

TABLE 3.4.2: FAVORABLE ATTITUDES TOWARDS MOSQUITO NETS, SIERRA LEONE, 2019 (N = 3,836)		
PARTICIPANT CHARACTERISTICS (%)		(%)
Sex	Men	86.1
	Women***	94.4
Residence type	Rural	90.9

TABLE 3.4.2: FAVORABLE ATTITUDES TOWARDS MOSQUITO NETS, SIERRA LEONE, 2019 (N = 3,836)		
PARTICIPANT CHARACTERISTICS (%)		(%)
	Urban	89.4
District	Bo	93.6
	Port Loko***	86.6
Educational attainment	None	90.0
	Primary	88.0
	Secondary or higher	92.3
Household wealth quintile	Lowest	90.8
	Second	87.2
	Middle	92.0
	Fourth	88.9
	Highest	92.5
Total		90.5
Adjusted Wald test p-value: *** p < 0.001		

Preferred Mosquito Net Color

Figure 6 below summarizes participant preferences for mosquito net color, stratified by district. Overall, blue nets (39.4%) were the most popular color across both districts (Bo: 37.0%, Port Loko: 42.4%). However, color was of little importance to more than one-third (38.3%) of participants. White was the preferred net color for fewer than one-fifth (19.2%) of participants. There were no substantial differences in net color preferences by district.

Figure 6: Distribution of participants' preferred mosquito net color, by district — Sierra Leone, 2019 (N = 3,822)

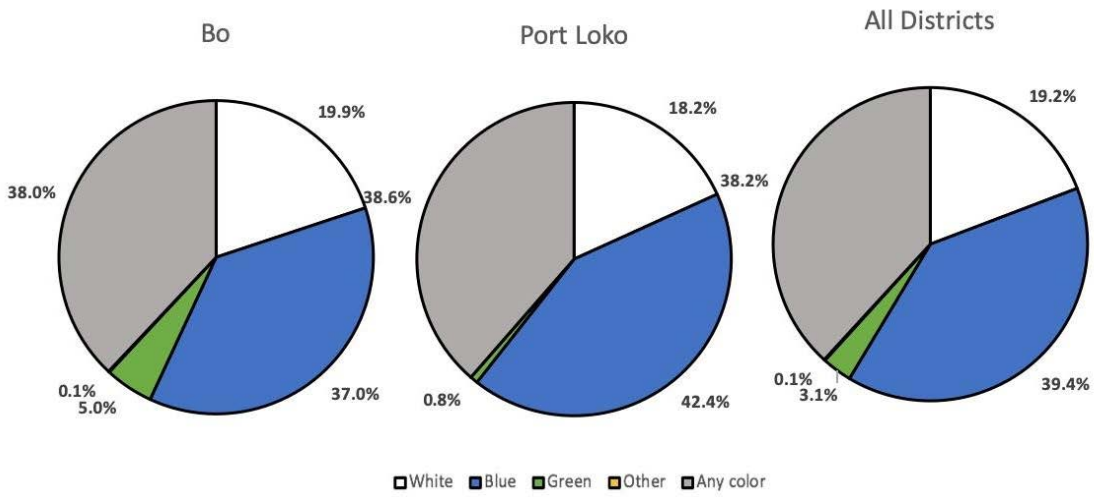
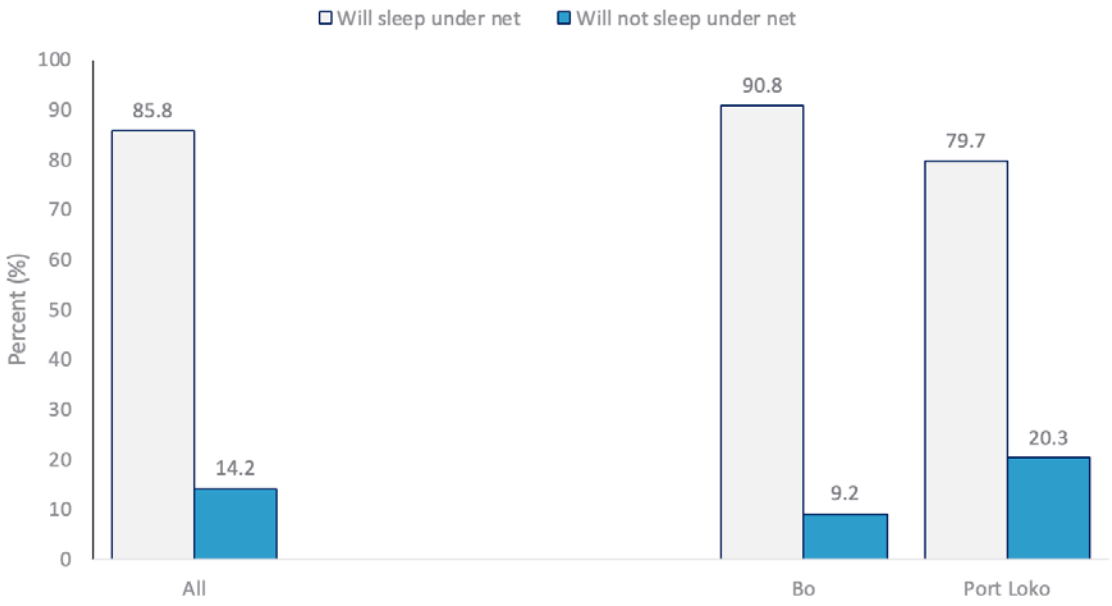


Figure 7 below shows preference to sleep under a mosquito net if only a white net was available. Regardless of mosquito net color preferences, most participants were not opposed to sleeping under a white mosquito net if that was the only color of net that was available. Overall, the majority (85.8%) of participants were not averse to sleeping under a white net if that was the only color available. Only 14.2% of participants agreed with the statement that they would not sleep under a net if only white nets were available. Participants in Port Loko (20.3%), compared to participants in Bo (9.2%), were more

likely to indicate their preference to not sleep under a mosquito net if only a white net was available ($p < 0.001$). Of the individuals who indicated that they would not sleep under a white mosquito net, most stated that their preferred net color was blue (40.6%).

Figure 7: Preference to sleep under a mosquito net if only a white net were available, Sierra Leone, 2019 (N = 3836)



Perceived Response-Efficacy

Response-efficacy refers to a person's beliefs about whether the recommended action step will actually avoid the threat, or in the case of ITNs, about how effective nets are in preventing malaria. Five questions measured perceived effectiveness of mosquito nets to prevent malaria. Responses to efficacy-related questions for men and women are summarized in **Appendix 2**. A majority of participants agreed that sleeping under mosquito nets every night was the most effective way of preventing malaria (men: 85.5%, women: 90.2%). Nevertheless, a notable proportion of participants perceived that their chances of getting malaria were the same regardless of their use of mosquito nets (men: 28.1%, women: 40.6%); that many people who sleep under a mosquito net still get malaria (men: 68.1%, women: 69.1%); and that getting malaria is ultimately in the hands of God (men: 40.0%, women: 45.0%). Additionally, 30.1% of men and 25.7% of women indicated that nets can only prevent mosquito bites when used only with certain types of beds. Perceived effectiveness of mosquito nets based on a score from all five variables, was significantly higher among participants from Bo (67.5%; men: 66.8%, women: 68.2%) than among participants from Port Loko (58.7%; men: 56.4%, women: 60.6%) ($p < 0.05$).

Perceived Self-Efficacy

Self-efficacy refers to one's belief or confidence in one's ability to succeed in specific situations or accomplish a task, in this case, sleeping under a mosquito net. Six questions measured perceived self-efficacy to use mosquito nets. Responses for men and women are summarized in **Appendix 3**. Overall, responses for both men and women indicated high confidence in their ability to use mosquito nets.

More than 90% of men and women indicated they could get all their children to sleep under a mosquito net every night of the year; ensure that all pregnant women in the home sleep under a mosquito net every night during the pregnancy; and get all members of their household to sleep under a net every night of the year if there were sufficient nets. A majority of participants also indicated they could sleep under a mosquito net every night of the year (men: 87.2%, women: 93.5%), on nights with many (men: 92.5%, women: 82.8%), and with few (men: 87.9%, women: 79.4%) mosquitoes. Overall, high perceived self-efficacy to use nets derived from all six items was high, but a significantly higher proportion of individuals from Bo (96.1%; men: 97.4%, women: 94.9%) had high self-efficacy to use nets compared to individuals from Port Loko (88.1%; men: 86.4%, women: 89.6%).

Descriptive Norms

Descriptive norms refer to perceptions of what the majority of people in a group think, feel, or do. **Table 3.4.3** below summarizes perceived norms about mosquito net use in communities (descriptive norms). Overall, 86.3% of participants perceived mosquito net use to be a norm in their communities. No significant differences in perceived norms about mosquito net use were observed by sex or district.

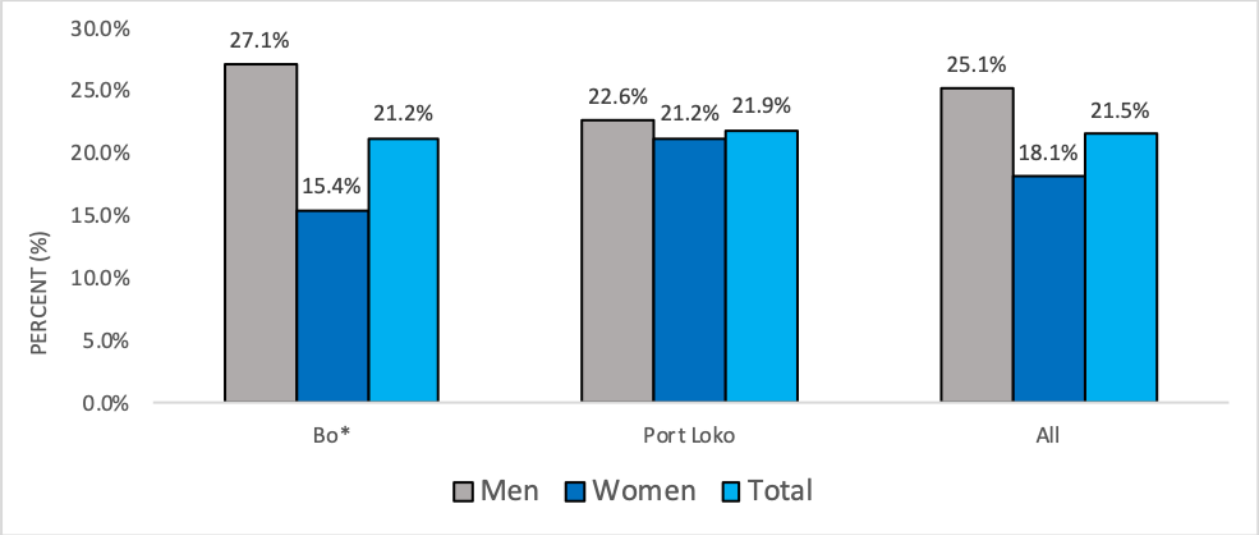
TABLE 3.4.3: DESCRIPTIVE NORMS ABOUT MOSQUITO NET USE, BY SEX AND DISTRICT, SIERRA LEONE, 2019 (N = 3,836)

INDICATOR		BO (%)	PORT LOKO (%)	TOTAL (%)
The use of mosquito nets is a norm in the community	Women	89.8	85.9	87.9
	Men	85.0	83.9	84.5
	Total	87.4	84.9	86.3

Gender Norms

Figure 8 below shows a relatively high proportion of participants reported gender-equitable norms in terms of preferences for children to sleep under mosquito nets. In all, 21.5% of participants indicated they would prefer that female children sleep under a net, compared to male children, if there were insufficient nets in the home. Men were significantly more likely to endorse this attitude compared to women (25.1% vs. 18.1%).

Figure 8: Preference for female children to sleep under available mosquito nets over male children when there are not enough nets, by sex and district, Sierra Leone, 2019 (N = 3,836)



Adjusted Wald test *p*-value: * $p < 0.05$

Practices and Behaviors

This section presents results on indicators including the ownership of mosquito nets, use by household members, use-access ratio, use by survey respondents, and the determinants of use.

Access and Possession of ITNs Within Households

Within the framework of reducing malaria-related morbidity and mortality, WHO recommends the promotion, distribution, and use of mosquito nets, specifically ITNs. This strategy includes the distribution of ITNs to households during mass distribution campaigns. Results presented in **Table 3.4.4** below indicate that 73.9% of participating households had at least one ITN. Household ownership of at least one ITN was significantly higher in Bo (80.7%) than in Port Loko (66.9%) ($p < 0.001$).

Access to ITNs within households is closely related to the proportion of household members sleeping under an ITN. For every member to have access to mosquito nets, the household must have at least one net for every two members of that household. This indicator measures the universal coverage of ITNs within households. Results show that less than a fifth (17.1%) of households have universal coverage. The indicator for the population with access to ITNs in households indicates the proportion of the population that could potentially sleep under an ITN provided that one ITN is shared by two household members. According to this indicator (see **Table 3.4.5** below), less than half (47.3%) of the population in households have access to an ITN, indicating a shortfall in the provision of nets within households. This shortfall is more apparent in Port Loko compared to Bo. When examining population net use behavior, the latter indicator of net access is preferred.

TABLE 3.4.4: ACCESS TO ITNS IN HOUSEHOLDS, BY DISTRICT			
INDICATOR	BO	PORT LOKO	ALL
% of households with at least one ITN***	80.2	66.9	73.9

TABLE 3.4.4: ACCESS TO ITNS IN HOUSEHOLDS, BY DISTRICT			
INDICATOR	BO	PORT LOKO	ALL
% of households with at least one ITN for two persons***	21.2	12.6	17.1
% of population with access[a] to ITN in households***	53.2	40.9	47.3
[a] Assuming that two members share an ITN. Adjusted Wald test p-value: ***p < 0.001			

Characteristics of Mosquito Nets Available in Households

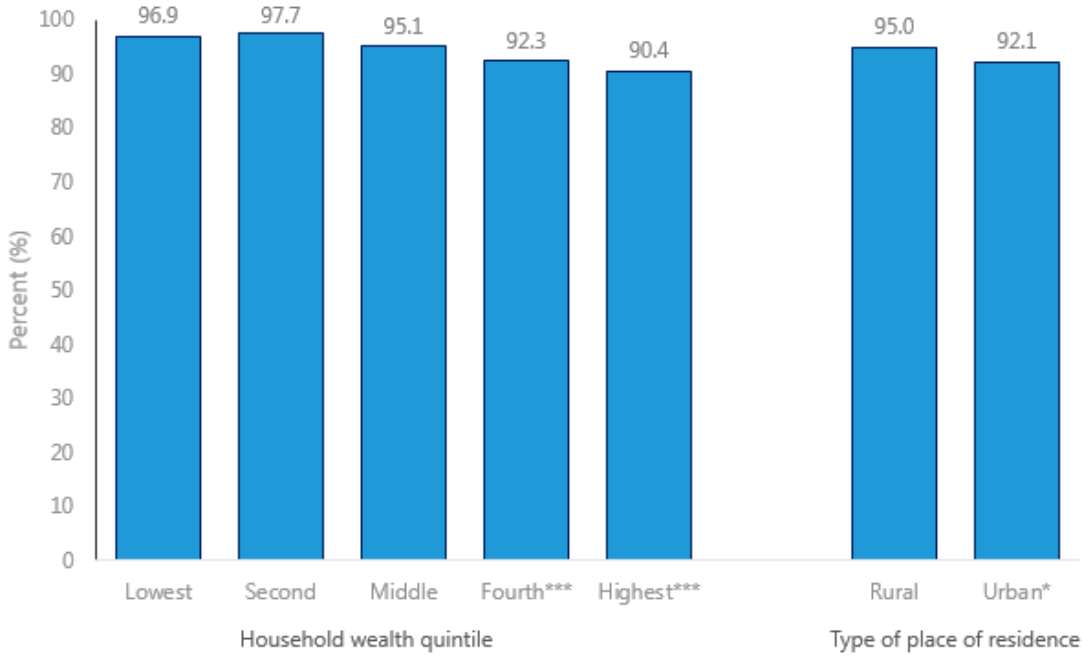
Table 3.4.5 below summarizes results for attributes of mosquito nets that were available in surveyed households. A total of 2,940 ITNs were identified in participating households. The majority of these nets were obtained free of charge (99.1%) and during a distribution campaign (70.2%), and almost a quarter (24.1%) were obtained during an ANC visit. Among participants who recalled, the average duration of ITN ownership was over two years (mean: 27.8 months). Over half of ITNs identified in surveyed households were white (56.4%), although many also were blue (43.4%).

TABLE 3.4.5: CHARACTERISTICS OF ITNS IN HOUSEHOLDS, BY DISTRICT, SIERRA LEONE, 2019				
		% WITHIN DISTRICT		TOTAL (%)
		BO	PORT LOKO	
% of nets that are ITNs**		99.3	100	99.7
% of ITNs used the previous night***		96.6	92.7	94.6
% of ITNs obtained free of charge		98.8	99.3	99.1
Source of ITN	Distribution campaign***	74.7	65.0	70.2
	ANC visit***	20.1	27.9	24.1
	Immunization visit	3.0	4.2	3.6
	Other	2.2	1.9	2.1
Average age of ITN, in months (n = 2,747)		27.7	30.0	27.8
ITN Color	White	55.0	57.7	56.4
	Blue	44.5	42.3	43.4
	Other*	0.4	0.0	0.2
Total number of ITNs***		1,430	1,510	2,940
Adjusted Wald test p-value: * p < 0.05; ** p < 0.01; *** p < 0.001				

Regarding net use behaviors, most ITNs (94.6%) available in homes were used for sleeping the previous night by at least one household member. A significantly higher proportion of ITNs in Bo (96.6%) were used for sleeping the night before the survey compared to ITNs in Port Loko (92.7%) ($p < 0.001$).

Figure 9 below summarizes results for use of available ITNs the night before the survey among participating households. The majority of available nets were used among households across wealth quintiles and residence types, with the highest use among the households in the lowest quintile (96.9%) and rural households (95.0%).

Figure 9: Available ITNs used the night before the survey, by household wealth quintile and residence type, Sierra Leone, 2019 (N = 2,940)



Adjusted Wald test *p*-value: * $p < 0.05$; *** $p < 0.001$

Use of ITNs by Household Members

Among households with at least one ITN, 72% of household members reported that they had slept under an ITN the previous night. **Table 3.4.6** below shows the use of ITNs by household members the night before the survey. These results are limited to households with at least one ITN and among those who slept in the house the night before the survey. The data shows variations by district, place of residence, wealth quintile, age group, and sex.

TABLE 3.4.6: USE OF ITNS ON THE NIGHT BEFORE THE SURVEY AMONG MEMBERS OF HOUSEHOLDS WITH AT LEAST ONE ITN, BY SOCIO-DEMOGRAPHIC AND HOUSING CHARACTERISTICS, SIERRA LEONE, 2019 (N = 12,674)

INDICATOR		PERCENTAGE (%)
Sex	Male	69.5
	Female***	74.8
Age group	< Five years	82.8
	Five–17 years***	60.0
	18 years or above**	78.1
Number of ITNs in household	One	53.6
	Two***	76.9
	Three or more***	81.0
Household wealth quintile	Lowest	80.0
	Second***	72.4
	Middle**	71.4

TABLE 3.4.6: USE OF ITNS ON THE NIGHT BEFORE THE SURVEY AMONG MEMBERS OF HOUSEHOLDS WITH AT LEAST ONE ITN, BY SOCIO-DEMOGRAPHIC AND HOUSING CHARACTERISTICS, SIERRA LEONE, 2019 (N = 12,674)		
INDICATOR		PERCENTAGE (%)
	Fourth**	69.1
	Highest**	68.4
Residence type	Urban	68.6
	Rural	73.3
Area	Bo	73.3
	Port Loko	71.0
Total (n = 9,160)		72.3
Adjusted Wald test p-value: ** p < 0.01; *** p < 0.001		

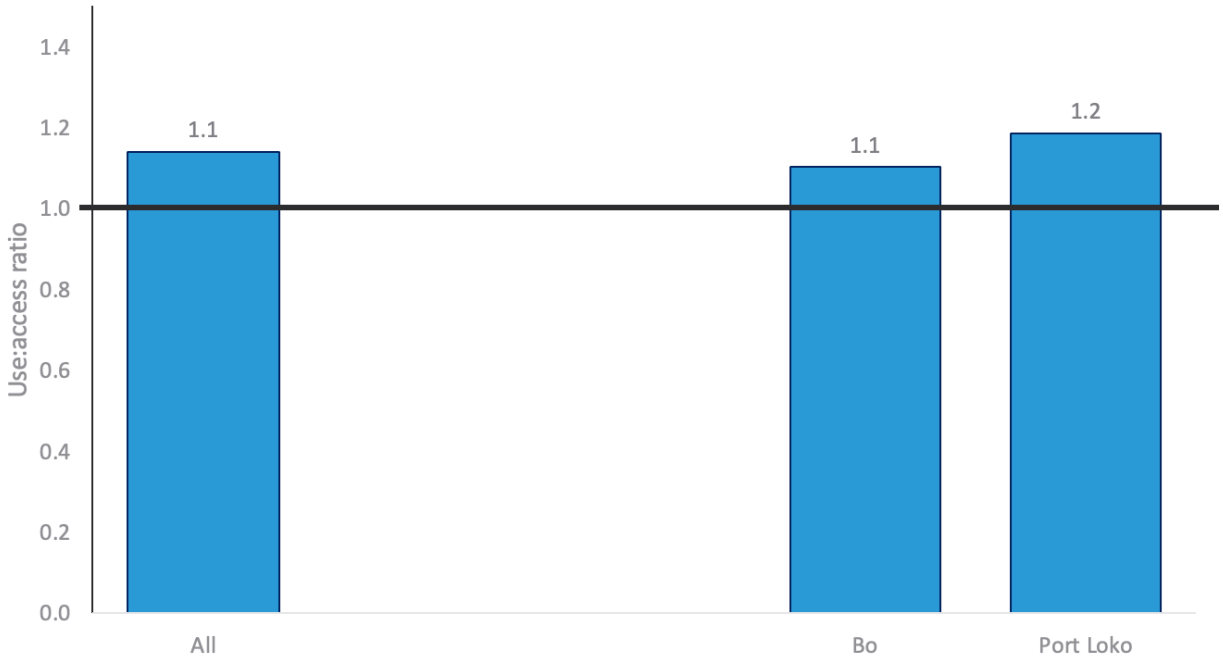
Overall, a significantly higher percentage of female household members (74.8%), that is children and adults, slept under an ITN the night before the survey than did males (69.5%), within households with at least one ITN ($p < 0.001$). Utilization rates were highest among children under the age of five years (82.8%) and there were no significant differences in use of the ITNs by under-five girls (81.7%) and under-five boys (84.0%) ($p = 0.2326$), while children aged five or older and adolescents had the lowest utilization rates (60.0%). The use of ITNs the night before the survey was inversely correlated with wealth. Lower utilization rates were seen among the higher wealth quintiles compared to the lowest.

A statistically significant relationship was seen between the number of ITNs in the household and member use of ITNs the night before the survey. Also, urban residence was associated with lower utilization of nets among household members compared to rural residence.

Population Use-Access Ratio for ITN

Figure 10 below summarizes data on the use-access ratio for nets by district. The use-access ratio is the ratio of mosquito net utilization to mosquito net access in the community. If every person who has access to a net (i.e., at least one ITN for two household members) uses it, the use-access ratio would be at least 1.00. The indicator can exceed 1.00 if there is a tendency for two or more people to sleep under a net. As it compares population use to population access, this is the preferred ITN use indicator and it allows us to identify the problems related to net use behavior rather than the unavailability of mosquito nets. Calculations were performed using the methodology proposed by Koenker & Killian (2014). The data below indicate a use-access ratio of 1.1 which shows good use of mosquito nets, when available, in households.

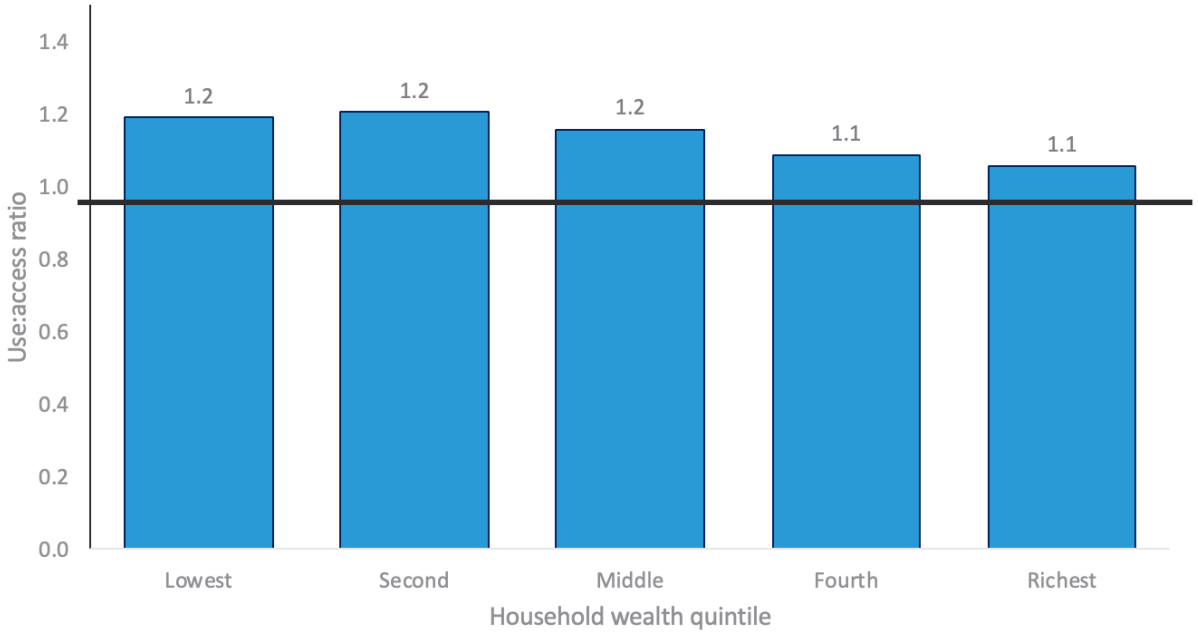
Figure 10: Use-access ratio, by district, Sierra Leone, 2019 (N = 12,674)



** Black line represents the threshold at which ITN use equals access*

Figure 11 below shows that the use-access ratio remained above 1.0 across all wealth quintiles, however the results also show a downward trend in the use-access ratio as wealth increases and indicates a tendency towards more users per nets within poorer households. Overall, results show that the mean number of users per ITN used the previous night was 2.6. Significantly fewer users per ITN were noted in the higher wealth quintiles compared to the lower wealth quintiles.

Figure 11: Use-access ratio, by household wealth quintile, Sierra Leone, 2019 (N = 12,674)



** Black line represents the threshold at which ITN use equals access*

Use of ITNs also is influenced by household members who travel away from the home (a population of interest for the NMCP), as is common among residents of some Port Loko communities in Sierra Leone. ITN use and the burden of malaria in mobile working populations is poorly documented in Sierra Leone, however, according to discussions of results with the malaria community in Sierra Leone, using an ITN consistently is especially relevant to mobile working populations that may lose the benefit of their household access to nets when away from home. About a third of the MBS participants reported that they had slept under an ITN consistently when they slept away from their home or traveled, indicating increased risk among a substantial proportion of the study population.

Determinants of ITN Use among Men and Women

Table 3.4.7 presents the odds for factors associated with ITN use every night among those surveyed. Among socio-demographic and household characteristics, completing primary education was negatively correlated with nightly ITN use. Specifically, participants who had attained at least a primary level education had 33% reduced odds of using an ITN every night compared to participants with no formal education. The odds for nightly ITN use among participants with secondary education or higher followed a similar direction (20% reduced odds) but was not significantly different from participants with no formal education. Increasing household size was negatively correlated with nightly net use. Each one-person increase in household size was associated with at 5% reduction in the odds of participants reporting consistent net use. Similarly, for each additional ITN in the household, the odds of nightly ITN use increased by almost 80%. Among participants in households with windows that were fitted with nets, the odds of nightly ITN use more than doubled (Adjusted Odds Ratio: 2.42). Last, participants in Port Loko had 59% reduced odds of nightly ITN use compared to participants from Bo. Other socio-

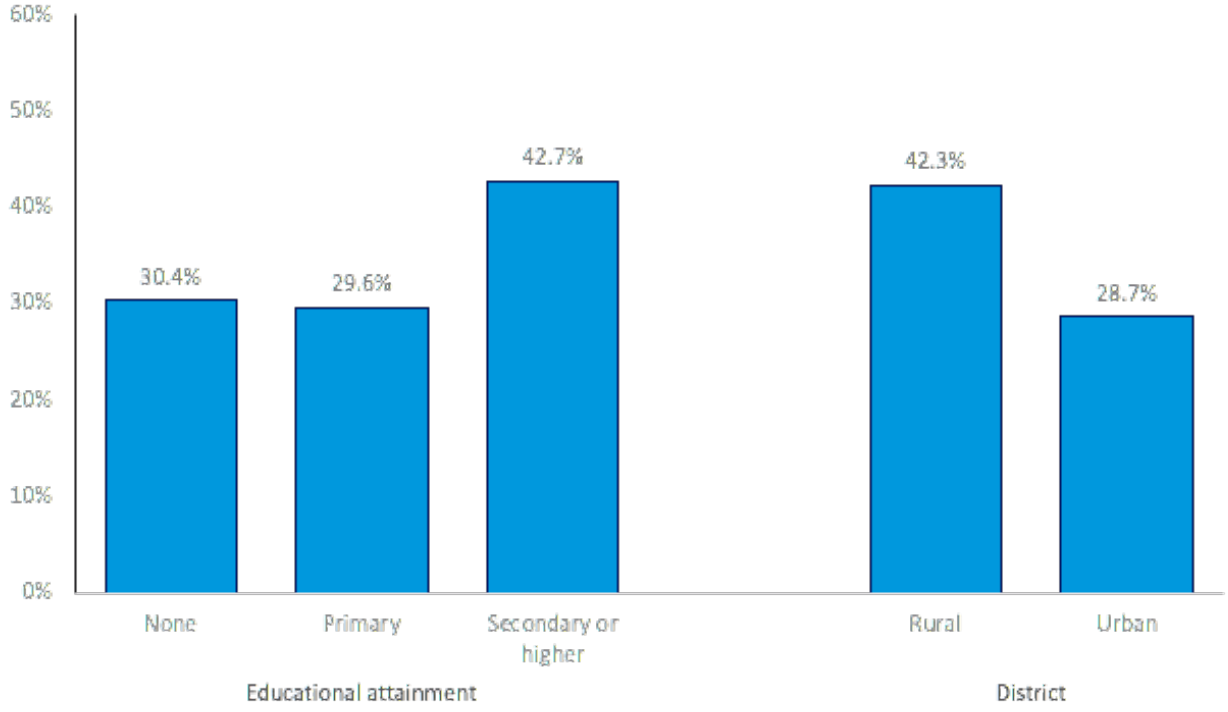
demographic and household characteristics in the table were not significantly correlated with correct and consistent ITN use.

TABLE 3.4.7: LOGISTIC REGRESSION OF FACTORS ASSOCIATED WITH USE OF ITNS EVERY NIGHT, SIERRA LEONE, 2019 (N = 3,836)		
INDICATOR		ADJUSTED ODDS RATIO (SE)
Sex	Male	1.00 (*Ref.*)
	Female	0.89(0.16)
Age, in years		1.00 (0.01)
Educational attainment	None	1.00 (*Ref.*)
	Primary*	**0.67 (0.12)**
	Secondary or higher	0.78 (0.17)
Household size*		**0.95 (0.02)**
Number of ITNs in household***		**1.80 (0.13)**
Household has at least one child under five years		1.23 (0.21)
Ceiling of house is complete and watertight		0.76 (0.17)
Windows of the house are equipped with nets to prevent mosquitoes from entering**		**2.42 (0.68)**
Household wealth quintile	Lowest	1.00 (*Ref.*)
	Second	0.93 (0.17)
	Middle	1.01 (0.28)
	Fourth	0.82 (0.21)
	Highest	0.95 (0.31)
Residence type	Rural	1.00 (*Ref.*)
	Urban*	**0.54 (0.15)**
Area	Bo	1.00 (*Ref.*)
	Port Loko***	**0.41 (0.08)**
Favorable attitudes towards use of mosquito nets		1.50 (0.42)
Perceived severity		1.22 (0.20)
Perceived vulnerability		1.03 (0.17)
Discussed malaria with others		0.98 (0.15)
Perceived effectiveness of mosquito nets*		**1.40 (0.23**)
Perceived self-efficacy for mosquito net use*		**2.40 (0.89)**
Use of mosquito nets perceived as a norm in the community**		**1.85 (0.40)**
Mentioned at least one incorrect method of transmitting malaria		1.08 (0.14)
Heard a message about malaria in the media		1.25 (0.19)
Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001		

To be more effective in preventing malaria, the use of ITNs must become habitual: it is important to sleep under ITNs correctly every night of the year. The results support the important role of psychosocial determinants in nightly ITN use. For instance, participants who agreed that mosquito nets were effective in preventing malaria had 40% higher odds of nightly ITN use. Likewise, among participants with perceived self-efficacy to use mosquito nets, their odds of nightly ITN use was more than double (adjusted OR: 2.40) that of participants with limited/low self-efficacy to use bed nets.

Individual perception of net use as the norm also contributed significantly to nightly ITN use. Participants who perceived the use of mosquito nets was a norm in their communities had 85% higher odds of nightly ITN use compared to participants who did not perceive mosquito net use as a norm in their communities.

Figure 12: Participants that slept under a net every night while traveling, by education level and district, Sierra Leone, 2019 (N = 522)



To protect themselves from malaria, people need to not only sleep under an ITN every night when at home, but also use the ITN during every night one spends outside their usual dwelling. Of the 522 participants who spent at least one night outside their homes in the past two weeks (**Figure 12**), only one-third (35.5%) slept under an ITN every night away from their home. More women (40.6%) reported sleeping under an ITN every night during travel than did men (33.3%). ITN use every night while traveling was more common among participants with secondary or higher education (42.7%), compared to participants with no formal (30.4%) or primary only (29.6%) education. Participants from Bo (42.3%) were more likely to report sleeping under an ITN every night during their trip compared to participants from Port Loko (28.7%).

Net Care and Maintenance

Prolonging net durability has important implications for reducing malaria transmission and the frequency of net replacement. Proper care for and maintenance of mosquito nets is vital for their effectiveness in malaria prevention. The following section presents results related to behavioral determinants for net care and maintenance.

Behavioral Determinants

Knowledge about Net Care

Respondents were asked about their knowledge of what they could do at home to prevent nets from tearing or getting holes. Results showed that nearly the majority of participants (95.5%) knew at least one method of preventing nets from tearing or getting holes (**Table 3.4.8**). A significantly higher proportion (97.7%) in Bo compared to Port Loko (92.7%) knew at least one method of preventing nets from tearing (p<0.001). The most commonly cited ways to prevent holes in nets was tying it up daily when not in use (73%), handling the net with care (46.7%), and keeping children from playing with the net (40.3%). Few respondents mentioned not soiling the nets with food as a way to care for the nets (8.8%).

TABLE 3.4.8: KNOWLEDGE OF WAYS TO PREVENT NETS FROM TEARING OR GETTING HOLES (%), BY DISTRICT, SIERRA LEONE, 2019

INDICATOR		BO	PORT LOKO	ALL
Knowledge of any method to prevent nets from tearing***		97.7	92.7	95.5
Knowledge of specific methods	Tie up daily when not in use***	81.4	63.6	73.3
	Handle net with care**	52.3	39.9	46.7
	Keep children from playing with the net	37.5	43.6	40.3
	Wash only when dirty*	43.7	36.0	40.2
	Wash gently	34.0	28.0	31.3
	Repair small holes quickly	25.2	25.6	25.4
	Inspect nets regularly for holes	20.8	24.4	22.4
	Keep away from flame or fire**	18.7	25.8	21.9
	Keep away from pests***	6.4	16.4	10.9
	Do not soil with food**	6.2	12.0	8.8

Adjusted Wald test *p*-value: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

Attitudes Towards Net Care and Repair

Table 3.4.9 presents attitudes and beliefs related to net care and maintenance. Overall, most participants (95.0%) believed there are steps that can be taken to maintain their nets. This perception was significantly more widespread in Bo than Port Loko (96.8% vs. 92.7%; $p < 0.01$). Similarly, a majority of respondents (94.2%) endorsed the statement that they could protect their family from malaria by taking care of their nets. On the other hand, overall, a little over a quarter (26.7%) of participants indicated it was not possible for them to fix holes in their mosquito nets and about a third (35.9%) reported that they did not have time to repair holes in nets. Significantly higher proportions of participants in Bo (43%) stated that they did not have the time to repair their nets compared to those in Port Loko (27.1%) ($p < 0.001$).

TABLE 3.4.9: RESPONDENTS ENDORSING SPECIFIC ATTITUDES TOWARDS NET CARE AND REPAIR (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,836)				
INDICATOR		BO	PORT LOKO	ALL
There are actions I can take to make my net last long**		96.8	92.7	95.0
It is not possible to repair holes in nets		28.5	24.5	26.7
I do not have time to repair a hole in my net***		43.0	27.1	35.9
I can help protect my family from malaria by taking care of my net*		95.5	92.6	94.2
Total endorsing positive attitudes towards net care	Women	79.2	74.9	77.2
	Men	77.3	82.0	79.3
	Total	78.3	78.1	78.2
Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001				

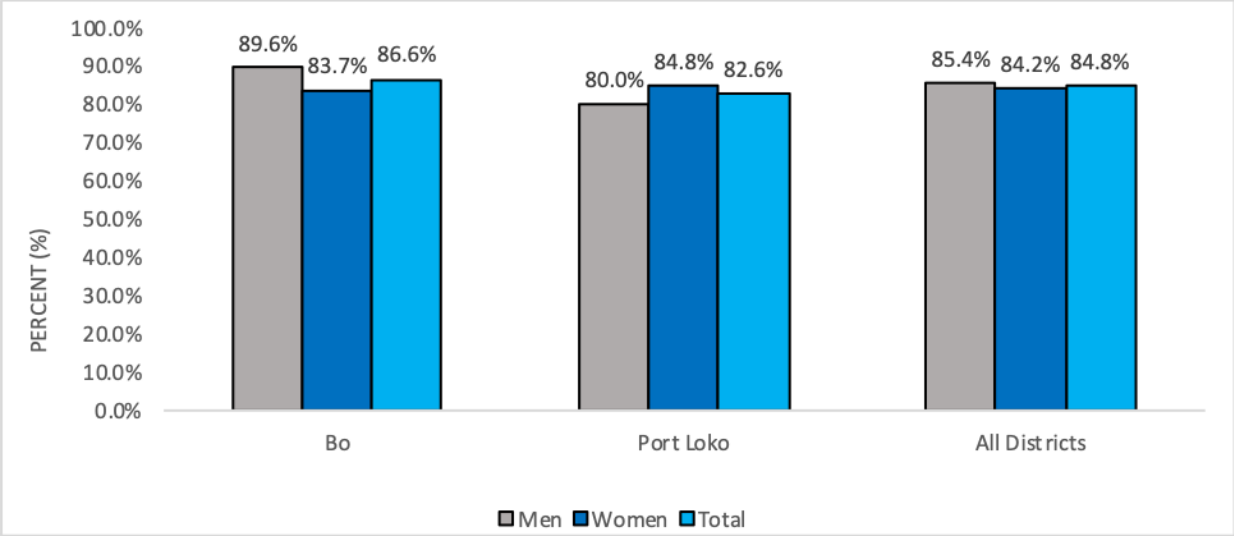
Perceived Response Efficacy of Repaired Nets

Approximately three-quarters (76.7%) of respondents believed that repaired nets could still be effective against mosquitoes. A significantly higher proportion of individuals in Port Loko (81.2%) compared to Bo (73.1%) perceived that repaired nets could still be effective against mosquitos ($p < 0.01$).

Self-Efficacy to Repair Nets

Regarding self-efficacy to maintain mosquito nets (**Figure 13** below), most (84.8%) participants reported the ability to immediately fix defective mosquito nets (men: 85.4%, women: 84.2%). Overall, the participants from Port Loko had less self-efficacy to repair holes in ITNs however, in Bo, women reported significantly lower levels of self-efficacy to repair holes in mosquito nets than men.

Figure 13: Perceived self-efficacy to promptly repair holes in mosquito nets, by sex and district, Sierra Leone, 2019 (N = 3,836)



Descriptive Norms About Net Repair

Table 3.4.10 below summarizes descriptive norms about mosquito net maintenance. Overall, 61.3% perceived fixing mosquito nets to be normative behavior in their communities. More women (66.8%) and participants from Port Loko (71.1%) perceived fixing mosquito nets to be a community norm.

TABLE 3.4.10: DESCRIPTIVE NORMS ABOUT NET MAINTENANCE (%), BY SEX AND DISTRICT, SIERRA LEONE, 2019 (N = 3,836)

INDICATOR		BO (%)	PORT LOKO (%)	TOTAL (%)
Fixing mosquito nets is a norm in the community	Women**	60.5	74.0	66.8
	Men**	45.7	67.8	55.3
	Total***	53.2	71.1	61.3

Adjusted Wald test *p*-value: **$p < 0.01$; ***$p < 0.001$

Practices and behaviors

ITN management and maintenance

Experts recommend washing ITNs gently with soap and water when they are dirty but not more than four times per year. **Table 3.4.11** below shows that most ITNs (71.4%) had been washed at least once, and the proportion of washed ITNs was significantly higher in Port Loko (84.8%) than in Bo (57.1%). In most cases, ITNs were washed with bar soap (69.5%), and approximately a quarter of ITNs were reportedly washed with powdered or liquid soap (26.7%).

TABLE 3.4.11: ITN MAINTENANCE AND CARE PRACTICES (%), BY DISTRICT, SIERRA LEONE, 2019

INDICATOR		BO	PORT LOKO	ALL
% of ITNs already washed (N = 2,940)***		57.1	84.8	71.4
Product used to wash ITN (n = 2,098)	Bar soap*	66.5	71.4	69.5
	Power/liquid soap	26.4	26.9	26.7
	Mix***	4.4	0.0	1.7
	Bleach	0.7	1.6	1.3
	Nothing***	2.0	0.1	0.8
Location where ITN was dried (n = 2,098)	Outside in the sun***	86.7	78.6	81.7
	Outside on bush***	4.7	13.9	10.3
	Outside in the shade	8.7	7.5	8.0
Location of ITN in household	Suspended, folded, or tied***	76.9	63.2	69.8
	Suspended at sleeping place***	20.6	32.0	26.5
	Not suspended but not stowed**	0.7	1.8	1.3
	Unpacked but stowed***	0.1	2.3	1.2
	Still stowed under packaging*	1.6	0.8	1.2

Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001

After washing, ITN owners should dry it outside in the shade. Few ITNs that had been washed were dried in accordance with these recommendations (8.0%). A majority (81.7%) of washed ITNs were dried outside in the sun, and 10.3% were dried outside on a bush.

A majority of ITNs (69.8%) were found hanging, folded, or tied up over the sleeping area, while about one-quarter (26.5%) of the nets were suspended in sleeping areas but neither folded nor tied, putting them at risk of damage when not in use. Households in Bo (76.9%) were significantly more likely to have ITN suspended in sleeping areas, folded, or tied up compared to households in Port Loko (63.2%) ($p < 0.001$). Fewer than 2% of ITNs identified during the household survey were unsuspended and unstowed, unpacked but stowed, or stowed in original packaging.

Treatment of Malaria Cases in Children

WHO recommends that all children with fever be brought to a health center within 24 hours for early diagnosis and quick effective treatment. In this section, behavioral variables related to care-seeking and the care of children under five years old suffering from fever were analyzed.

Behavioral Factors

Studies have identified psychosocial variables as key determinants of early care-seeking, appropriate testing for malaria, and treatment of malaria for children under the age of five years. These behavioral variables include knowledge related to care seeking for fever, attitudes towards point-of-treatment services, perceived effectiveness of diagnostic testing for malaria, self-efficacy of taking relevant actions for appropriate CM, perceptions of clinical standards of care, and descriptive norms related to malaria CM. These factors will be discussed in this section.

Knowledge

Respondents were asked about their knowledge of the drugs recommended for the treatment of confirmed malaria. Results showed that nearly two-thirds (64.0%) of surveyed respondents believed that ACTs were effective drugs for the treatment of malaria. Women (71.8%) demonstrated significantly higher knowledge of ACTs compared to men (55.5%) ($p = 0.0006$). A significantly higher proportion of respondents in Bo (68.5%) had knowledge of ACTs compared to Port Loko respondents (58.6%) ($p = 0.0117$), however, there were no significant differences for knowledge of ACTs among households in rural and urban settings ($p = 0.3835$).

Attitudes Towards Prompt and Appropriate Treatment of Malaria

Overall, attitudes towards prompt (within 24 hours of a fever) and appropriate treatment of malaria were positive (**Table 3.5.1**). The majority of respondents believed that health workers are the best consultation sources when children develop symptoms of malaria (95%), and that children should be taken to health workers the same day that they develop a fever (91.3%). Similarly, the majority agreed that a blood test was necessary to confirm that the fever was caused by malaria (92.8%) and that the full course of prescribed antimalarial drugs should be taken by the patient (96.8%). Nevertheless, some negative attitudes about self-medication and seeking care at the health facility as a last resort were noted. Attitudes towards self-medication for fever were notably widespread with 41.4% of respondents supporting the provision of antimalarial medications at home as a first treatment recourse when children developed fever. Self-medication was reported at a significantly higher degree among

respondents in Port Loko (49.7%) compared to Bo (34.6%) (p = 0.0018). In addition, about a quarter (24.6%) of respondents stated that if their child had a fever, they would go to the pharmacy to buy medicine for their children *first*.

Overall, the collate score for positive attitudes towards prompt and appropriate treatment which consists of all seven attitudes was high across both districts (96.7%). However, the respondents in Bo (99.0%) reported positive attitudes at significantly higher proportions than Port Loko respondents (93.9%) (p = 0.0003).

TABLE 3.5.1: RESPONDENTS FAVORING SPECIFIC ATTITUDES TOWARDS MALARIA TREATMENT (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,821)

INDICATOR		BO	PORT LOKO	ALL
The health worker is always the best person to talk to when you think your child has malaria		96.2	93.6	95.0
A person should only take malaria drugs if a health worker says that their fever is really caused by malaria		92.7	89.6	91.3
A person should take a child to a health worker the same day the child has a fever		91.0	89.6	90.4
When my child has a fever, it's better to start treatment by giving him the antimalarial medications I have at home**		34.6	49.7	41.4
A person sick with fever is supposed to receive a blood test to confirm that the sickness is malaria before taking malaria medicine***		97.6	87.1	92.8
It is important to take all prescribed antimalarial medication to ensure that the patient is fully treated***		99.1	94.1	96.8
When my child has a fever, I first go to the pharmacy or chemist to buy medicine for him/her		22.1	27.5	24.6
Total endorsing positive attitudes towards malaria treatment	Women***	99.3	96.4	97.9
	Men**	98.6	91.0	95.3
	Total***	99.0	93.9	96.7
Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001				

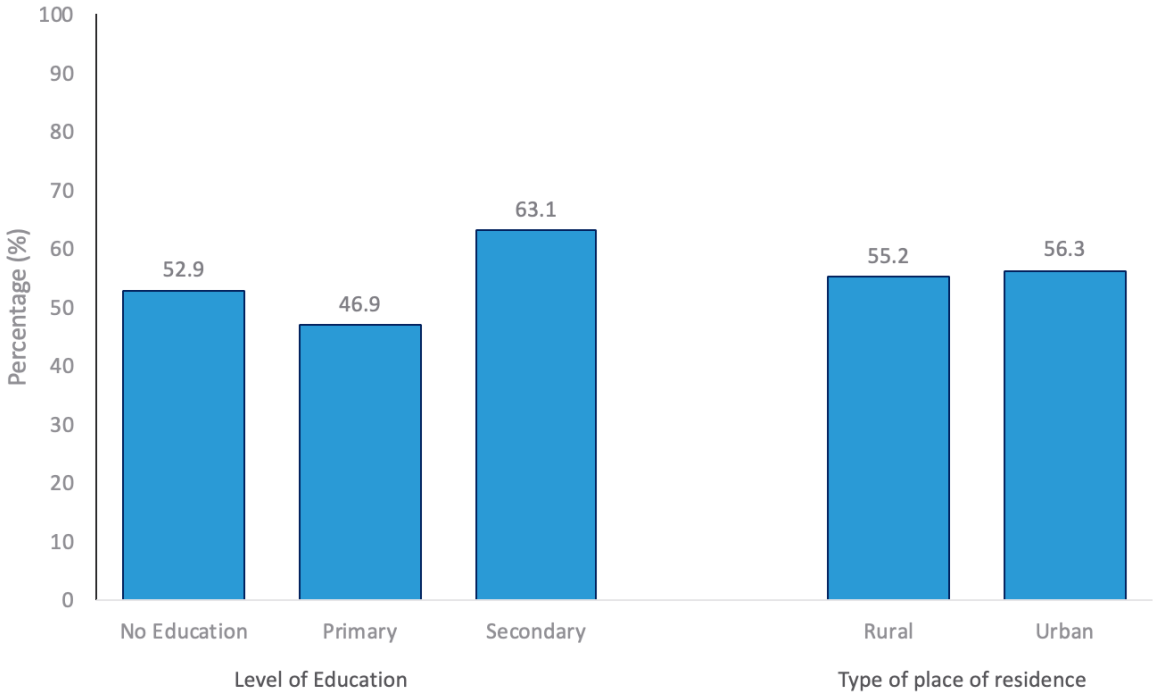
Perceived Response Efficacy of Malaria Diagnostic Tests

Respondents' perceptions of the response efficacy of malaria diagnostic testing were mixed (**Table 3.5.2**). A majority of women and men, 88.9% and 84.5% respectively, reported that a blood test was the only way to know if someone actually had malaria. However, a substantial proportion of women (43.6%) and men (29.3%) believed that antimalarials should be taken even when results of a blood test suggest that a fever was not caused by malaria. Perceived response efficacy of malaria diagnostic testing varied by sex (women: 50.8%, men: 60.7%, p = 0.0220) and location, with a significantly higher proportion of Bo respondents (60.9%) perceiving high response efficacy of the blood test for malaria compared to Port Loko residents (49.0%) (p = 0.0089).

TABLE 3.5.2: RESPONDENTS FAVORING PERCEIVED EFFECTIVENESS OF MALARIA DIAGNOSTIC TESTING (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,821)				
INDICATOR		BO	PORT LOKO	ALL
A blood test to confirm malaria is the only way to know if someone really has malaria or not	Women*	90.9	86.6	88.9
	Men***	94.2	71.8	84.5
	Total***	92.5	79.8	86.8
A person should take antimalarial drugs even though the results of the malaria test indicate that the fever is not caused by malaria	Women	40.6	47.0	43.6
	Men	29.3	29.3	29.3
	Total	35.0	38.8	36.7
Total endorsing effectiveness of malaria diagnostic testing	Women*	55.3	45.6	50.8
	Men	66.6	53.0	60.7
	Total**	60.9	49.0	55.5
Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001				

While perceived efficacy of malaria diagnostic testing did not vary between urban and rural households (**Figure 14**), there were significant differences by educational status, with a higher proportion of respondents that had completed secondary or higher education perceiving high efficacy of the blood test (63.1%) compared to respondents with primary (46.9%) ($p < 0.0008$) or no formal education (52.9%) (0.0099).

Figure 14: Respondents perceiving the efficacy of malaria diagnostic testing, by educational status and residence type, Sierra Leone, 2019 (N = 3,821)



Perceived Response Efficacy of Malaria Treatment

There were notable variations in respondent's perception of the efficacy of malaria treatment (Table 3.5.3). While most respondents (96.0%) perceived that malaria medicines obtained from the health facility were effective in treating malaria, almost half (45.3%) felt that the medicines purchased from the market were as good as those distributed in the clinic and about 13% believed that traditional herbs were as good as medicines obtained from the clinic. Comparing responses across the districts, significantly more people in Bo (50.0%) compared to Port Loko (39.6%) believed that the malaria medicines from the market were equally as good as those obtained from the clinic ($p < 0.001$). Conversely, a higher proportion in Port Loko (17.8%) compared to Bo (9.6%) agreed that traditional herbs were just as good as medicines distributed in the clinic ($p < 0.001$).

Analysis combining all three variables into a score showed that a high proportion of respondents had high perception of the effectiveness of malaria treatment (86.6%) with significantly more respondents in Bo (90.2%) compared to Port Loko (82.2%) endorsing the effectiveness of malaria medicines. No significant differences were noted across urban-rural residence, sex, or level of education in the perceived effectiveness of malaria treatment.

TABLE 3.5.3: RESPONDENTS FAVORING PERCEIVED EFFECTIVENESS OF MALARIA TREATMENT (%), BY DISTRICT,SIERRA LEONE, 2019 (N = 3,821)

INDICATOR	BO	PORT LOKO	ALL
The malaria medicines obtained from the health facility are effective in treating malaria**	97.9	93.8	96.0

TABLE 3.5.3: RESPONDENTS FAVORING PERCEIVED EFFECTIVENESS OF MALARIA TREATMENT (%), BY DISTRICT,SIERRA LEONE, 2019 (N = 3,821)			
INDICATOR	BO	PORT LOKO	ALL
The malaria medicine that you buy in the market is as good as the one distributed at the clinic***	50.0	39.6	45.3
The traditional herbs for malaria that you get from the herbalist/traditional healer is as good as the medicines distributed at the clinic***	9.6	17.8	13.3
Total favoring effectiveness of malaria treatment***	90.2	82.2	86.6
Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001			

Perceived Self-Efficacy for Malaria Treatment

Almost all respondents (92%) reported they could take their child to the health center the same day or the day after onset of fever (**Table 3.5.4**), however only 68.9% believed they could access money needed to take a child with a fever to the health center. The overwhelming majority (96.4%) reported they had the capacity to have their children complete the full series of prescribed antimalarials, but only about half (50.4%) of respondents reported they had capacity to perform all six actions to support obtaining treatment for malaria that are described in **Table 3.5.4**, with no significant variation by district (p = 0.2969). A significantly higher proportion of men (69.0%) than women (33.3%) reported capacity to take all six actions (p < 0.0001). Self-efficacy to carry out activities related to malaria treatment also varied significantly by residence type, with urban residents (69.4%) reporting higher capacity to perform all six actions compared to rural residents (42.4%) (p < 0.0001).

TABLE 3.5.4: RESPONDENTS ENDORSING PERCEIVED SELF-EFFICACY RELATED TO MALARIA TREATMENT (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,821)			
INDICATOR	**BO**	**PORT LOKO**	**ALL**
Find money take child to the health center when the child has a fever	69.4	68.3	68.9
Obtain permission from spouse or other family member(s) (women)/give permission to spouse (men) to take child to the health center or to receive health care when the child has a fever	84.1	81.4	82.9
Take child to the health center the same day or the day after (s)he has a fever**	94.6	89.2	92.2
Ask the health center for a blood test if you think your child has malaria***	90.5	79.6	85.6
Make sure your child takes the full dose of medications prescribed for malaria***	98.4	93.8	96.4
Find the money to pay for the medications that the health care provider recommends to treat malaria	68.5	72.9	70.5
Proportion with efficacy to complete all six actions	52.3	48.1	50.4
Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001			

Descriptive Norms

Early diagnosis of malaria helps to prevent the complications associated with the illness. As part of the survey, the respondents' perceptions of community norms regarding prompt care-seeking for fever and testing at the health facility were explored and are reported in **Table 3.5.5** below.

TABLE 3.5.5: DESCRIPTIVE NORMS ABOUT CARE SEEKING FOR MALARIA AND TESTING AT THE HEALTH FACILITY (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,821)

INDICATOR	BO	PORT LOKO	ALL
At least half of the people in their community take their sick child to the health center on the same day or the next day after the onset of fever	83.9	82.7	83.4
At least half of the children taken to a health facility with a fever get tested for malaria**	83.4	89.6	86.8
Adjusted Wald test p-value: ** p < 0.01			

A majority (83.4%) reported it was a norm in their community to take a sick child to the health center the same day or within 24 hours of onset of fever. Little variation was observed in this perceived community norm by sex, district, or residence type. Perceived community norms surrounding prompt care-seeking, however, were inversely and significantly related to educational status with respondents with no formal education (87.6%) favoring the perceived norm at significantly higher proportions than respondents with primary (80.2%) (p = 0.0264) or secondary and higher educational attainment (79.7%) (p = 0.0018). Similar results were seen regarding respondent's perception of norms around testing at the health facility. Majority of the respondents reported that it was a norm in their community for children with fever who were taken to the health facility to get tested for malaria. However, in this case, significant differences were seen across district and educational status. Significantly more people agreed that testing for fever at the health facility was the norm in Port Loko (89.6%) compared to Bo (83.4%) (p = 0.008). In addition, compared to those with primary (83.5%, p = 0.013) and secondary and higher educational attainment (83.5%, p = 0.002), a higher proportion of respondents with no education agreed that testing at the health facility was the norm (90.7%).

Participation in Decision-Making

Respondents were asked who made the decision regarding care-seeking and buying treatment when a child in their household had fever. Results were comparable on both measures and showed that a large proportion of women participated, either by themselves or jointly with their partners in the decision-making process for the care of fever in a child. Overall, 78% of women stated that they had participated in the decision-making process to take their child with fever to a health facility and to buy medicine for their child with fever as shown below **in Table 3.5.6**. Significant differences were however apparent across district and level of education. A higher proportion of women in Bo, and who had completed secondary or higher education stated that they participated in these key decisions regarding malaria care seeking compared to those who were in Port Loko, and who had primary or no education.

TABLE 3.5.6: WOMEN REPORTING PARTICIPATION IN DECISION MAKING FOR MALARIA CARE-SEEKING AND TREATMENT (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 2,926)

INDICATOR		DECISION TO GO TO THE CLINIC	DECISION TO BUY MEDICINE
District	Bo	85.3	85.9

TABLE 3.5.6: WOMEN REPORTING PARTICIPATION IN DECISION MAKING FOR MALARIA CARE-SEEKING AND TREATMENT (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 2,926)			
INDICATOR		DECISION TO GO TO THE CLINIC	DECISION TO BUY MEDICINE
	Port Loko	69.1***	67.3***
Residence type	Urban	81.9	76.4
	Rural	76.6	76.4
Level of education	No education	73.1	80.5
	Primary	74.4	72.6
	Secondary and higher	88.2***	86.3***
Total		78.0	77.5
Adjusted Wald test p-value: ***p < 0.001			

Perceptions About the Availability of Medicines at the Health Facility

Inconsistent availability of medicines at the health facility has been reported as a factor that contributes to delayed care-seeking for malaria. The MBS assessed participants' perception of the availability of medicines at the health facility. Overall, less than a quarter of respondents (22%) perceived that the medicine to treat malaria was always available at the health facility. Significant differences were noted across district, urban-rural residence, and by level of educational attainment. Regarding location, more people in Bo (26.2%) and urban areas (33.2%) compared to those in Port Loko (17.0%, p = 0.012) and rural residence (17.3%, p = 0.0023) perceived that the medicine to treat malaria was always available at the health facility. A higher proportion of respondents who had attained secondary or higher level of education (25.8%) believed that drugs were always available at the health facility compared to those who had attained primary (17.9%, p = 0.0056) or who had not completed any formal education (20.6%, p = 0.0096).

Perceptions of Health Worker Behaviors Regarding the Treatment of Children with Fever

In general, perceptions about the capacity of health workers to treat malaria in children were overwhelmingly positive (**Table 3.5.7**). A majority of respondents indicated community health workers (86.5%) and clinical health providers (93.3%) were knowledgeable about how to treat malaria in children. However, over one-third (34.2%) of respondents reported that health workers at the facilities within their communities charged a fee for the malaria treatment medication for children, and a significantly larger proportion of surveyed respondents in Port Loko (39.5%) indicated this compared to Bo respondents (29.8%) (p = 0.022).

TABLE 3.5.7: ENDORSED PERCEPTIONS OF COMMUNITY- AND FACILITY-BASED HEALTH WORKERS PROVIDING TREATMENT FOR MALARIA I (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,821)			
INDICATOR	BO	PORT LOKO	ALL
Community health workers (CHWs) in your community know how to treat malaria in children	86.0	87.1	86.5
Health workers in the health facility are knowledgeable about treating malaria in children	94.9	91.4	93.3

TABLE 3.5.7: ENDORSED PERCEPTIONS OF COMMUNITY- AND FACILITY-BASED HEALTH WORKERS PROVIDING TREATMENT FOR MALARIA I (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,821)			
INDICATOR	BO	PORT LOKO	ALL
Health workers in the health facility in this community make people pay for medicine to treat malaria in children*	29.8	39.5	34.2
Positive attitudes towards health workers	92.2	91.6	91.9
Adjusted Wald test p-value: *p < 0.05			

Care-Seeking and Treatment Behaviors for Fever in Children Under Five Years of Age

The data presented in this section address female caretaker behaviors related to the diagnosis and treatment of children below the age of five years with a fever. To understand better the context of these behaviors, the analysis first examined the prevalence of fever in children under the age of five, followed by care-seeking, diagnosis, and treatment behaviors.

Prevalence of Fever

Overall, 13.1% of mothers stated that they had a child under the age of five years old with fever within the previous two weeks. When asked the sex of the youngest and most recently ill, we found that 57% were male. No significant differences in fever prevalence were observed across wealth quintiles, residence types, or district of residence (as shown in **Table 3.5.8**).

TABLE 3.5.8: WOMEN REPORTING FEVER AMONG CHILDREN UNDER THE AGE OF FIVE YEARS, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 2413)		
SOCIO-DEMOGRAPHIC CHARACTERISTICS		PERCENTAGE (%)
Household wealth quintile	Lowest	14.9
	Second	12.6
	Middle	11.4
	Fourth	18.9
	Highest	10.4
Residence type	Rural	14.1
	Urban	11.7
District	Bo	13.1
	Port Loko	13.7
Total (n = 307)		13.4

Care-Seeking for Fever

The survey assessed prompt care-seeking for children under five years with fever. Prompt care-seeking was defined as seeking treatment the same day or the next day (24 hours) after the onset of a fever. For the majority of cases of fever in children under five years of age, care was sought at some point during the illness (93.0%), and most received care the same day or the day after the onset of fever (81.6%). About three-quarters (74.5%) of children with fever were taken to a health facility (government or private) *first*. Significantly more children with fever (79.7%) in the rural areas were taken promptly to a

health facility compared to children with fever in urban areas (58.8%) (p = 0.0073). However, prompt care seeking did not vary significantly across wealth quintiles. (**Table 3.5.9**).

TABLE 3.5.9: WOMEN WHO SOUGHT CARE FOR CHILDREN UNDER FIVE YEARS OF AGE WHO HAD FEVER WITHIN 24 HOURS OF ONSET OF FEVER, AT A HEALTH FACILITY, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 307)		
SOCIO-DEMOGRAPHIC CHARACTERISTICS		PERCENTAGE (%)
Household wealth quintile	Lowest	76.5
	Second	72.5
	Middle	72.7
	Fourth	75.9
	Highest	73.9
Residence type	Rural	79.7
	Urban**	58.8
Total (n = 225)		74.5
Adjusted Wald test p-value: **p < 0.01		

Determinants of Prompt Care-Seeking for Fever

The behavioral determinants most strongly correlated with prompt care-seeking for fever included perceived self-efficacy to seek care for fever in a child promptly, positive attitudes towards prompt care-seeking, and discussing malaria with a spouse in the past six months. Women who were confident in their ability to get their child with fever to the health facility promptly (OR = 4.33; p = 0.02), and who favored positive attitudes towards prompt care-seeking (OR = 3.58; p = 0.000) were more likely to report they sought care promptly at a health facility for a sick child with fever. In addition, women who reported recently discussing malaria with a spouse were more than three times more likely to report that they had sought care promptly at a health facility the last time their child had a fever (OR = 2.98; p=0.020). Prompt care-seeking was reported significantly less frequently among women in urban settings compared to respondents in rural settings and Bo (OR = 0.29; p = 0.008) (**Table 3.5.10**).

TABLE 3.5.10: LOGISTIC REGRESSION OF FACTORS ASSOCIATED WITH PROMPT CARE-SEEKING FOR FEVER, AT A HEALTH FACILITY, SIERRA LEONE, 2019 (N = 305)		
INDICATOR		ADJUSTED ODDS RATIO (SE)
Educational attainment	None	1.00 (*Ref.*)
	Primary	0.91 (0.35)
	Secondary or higher	0.97 (0.39)
Residence type	Rural	1.00 (*Ref.*)
	Urban*	**0.33 (0.17)**
District	Bo	1.00 (*Ref.*)
	Port Loko	0.49 (0.20)
Household wealth quintile	Lowest	1.00 (*Ref.*)
	Second	0.73 (0.29)
	Middle	1.05 (0.46)
	Fourth	1.74 (0.73)
	Highest	2.24 (1.28)
Perceived self-efficacy to take child to the health promptly*		**4.33 (2.68)**

TABLE 3.5.10: LOGISTIC REGRESSION OF FACTORS ASSOCIATED WITH PROMPT CARE-SEEKING FOR FEVER, AT A HEALTH FACILITY, SIERRA LEONE, 2019 (N = 305)	
INDICATOR	ADJUSTED ODDS RATIO (SE)
Positive attitudes towards prompt care-seeking* **	**3.58 (1.21)**
[1]Talked about malaria with spouse **	**2.98 (1.1)**
Talked about malaria with anyone[a]	1.84 (0.66)
More than one child in the household had fever	2.38 (1.42)
Perception that health workers charge for malaria treatment drugs for children	0.78 (0.27)
Perceived that prompt care-seeking for fever is the norm	1.60 (0.61)
Perception that health workers know how to treat malaria in children	1.04 (0.66)
Exposure to messages on malaria	1.03 (0.45)
[a] Result from logistic model restricted to only participants in union (n = 274) Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001	

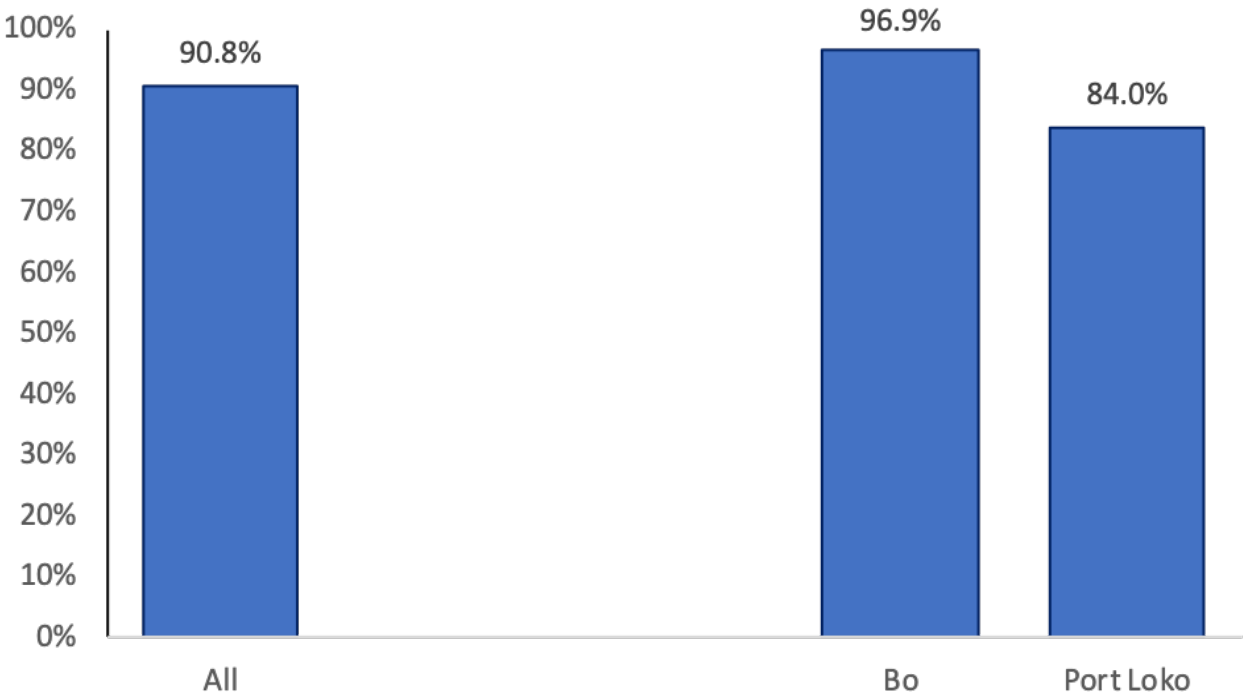
Diagnosing Fever in Children

Of the children with fever in the two weeks preceding the survey 78.9% received a malaria test. However, a significantly higher proportion of the children from Bo district were tested (89.9%) compared to Port Loko district (68.0%) ($p < 0.001$). **Table 3.5.11** shows that among febrile cases that received a malaria diagnostic test, 88.4% were confirmed as malaria.

TABLE 3.5.11: MALARIA TESTING FOR CHILDREN UNDER FIVE WITH FEVER (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 307)			
INDICATOR	BO	PORT LOKO	ALL
Received a malaria diagnostic test***	89.9	68.0	78.9
Test confirmed fever caused by malaria	87.8	89.1	88.4
Adjusted Wald test p-value: ***p < 0.001			

The majority of the children with fever taken to a health facility received a malaria diagnostic test (see **Figure 15** below). A higher proportion of children with fever who were taken to the health facility in Bo (96.9%) received malaria diagnostic testing compared to children in Port Loko (84.0%) ($p = 0.0192$)

Figure 15: Percent of children with fever taken to a health facility who received a malaria diagnostic test, Sierra Leone, 2019 (N = 263)



Treatment of Fever in Children

Overall, a majority (95.9%) of children with fever in the two weeks preceding the survey received some form of treatment for the fever, but only 42.8% of treated children received ACT, most of which (84.7%) received the first dose within 24 hours of onset of the fever.

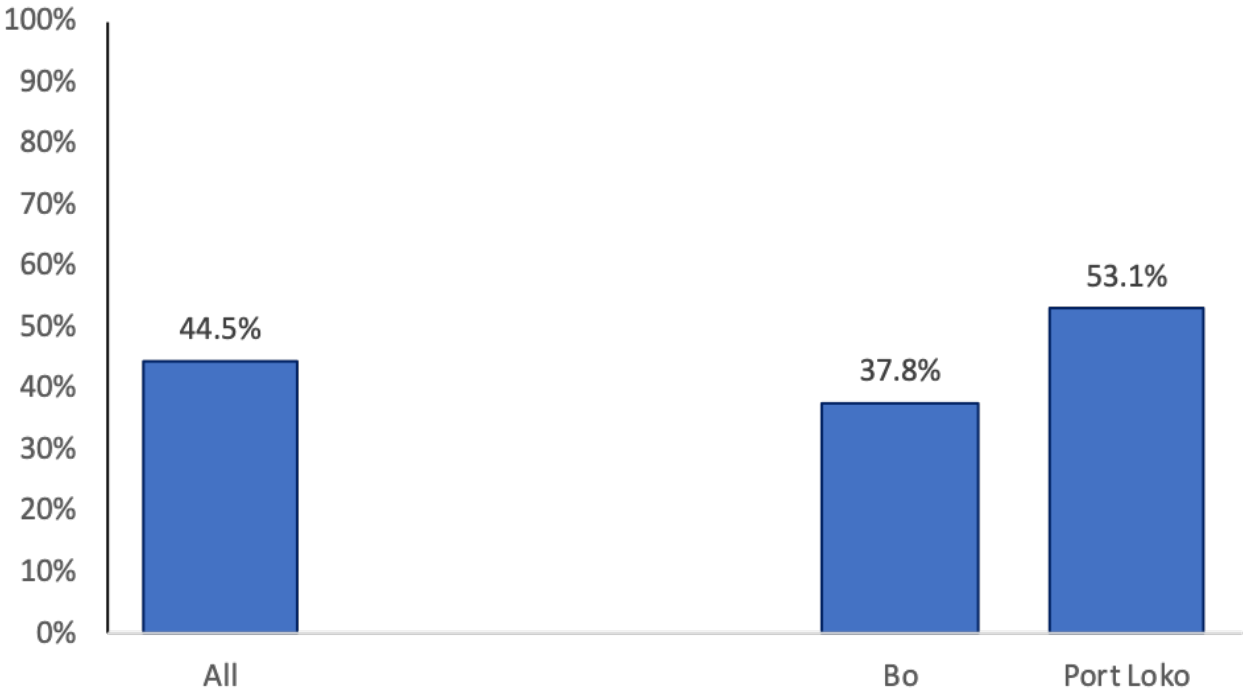
TABLE 3.5.11: MALARIA DIAGNOSIS AND TREATMENT CONTINUUM AMONG WOMEN SEEKING CARE FOR CHILDREN UNDER FIVE WITH FEVER (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 307)

INDICATOR	BO	PORT LOKO	ALL
Child received any treatment for malaria	97.1	94.6	95.9
Child received ACT for malaria treatment*	34.5	51.1	42.8
Child received first dose of ACT within 24 hours	87.6	82.7	84.7

Adjusted Wald test p-value: *p < 0.05

Almost all (97.6%) children who tested positive for malaria received some form of treatment, however, in most cases the child did not receive treatment with ACT. Overall, less than half (44.6%) of the women reported that their most recent child who had a fever and was diagnosed with malaria received ACT (See **Figure 16** below). 4.6 % of women who received medicine for malaria reported they did not know what medicine they were given. Of the children who received ACT, 88.9% received it within 24 hours.

Figure 16: Percent that took ACT among children whose diagnostic test was positive, Sierra Leone, 2019 (N = 213)



Malaria in Pregnancy

Behavioral Determinants

In this section, the results of exploration of behavioral determinants that may influence the use of IPTp are presented. The variables explored included knowledge, attitudes, perceived severity of malaria during pregnancy, perceived response- and self-efficacy of IPTp, communication with spouse, and perceived norms.

Knowledge of ANC

Across districts, about two-thirds (66.7%) of the surveyed population had knowledge about the timing of the first ANC visit during pregnancy, with significant differences in knowledge between men and women ($p < 0.001$). There were no significant differences across residence types, or educational attainment (**Table 3.6.1**). Among urban dwelling respondents, a significantly higher proportion demonstrated correct knowledge of the timing of first ANC visit during pregnancy (in the first trimester) in Bo (73.3%) compared to Port Loko (55.1%) ($p < 0.001$).

TABLE 3.6.1: RESPONDENTS KNOWING THAT PREGNANT WOMEN SHOULD SEEK PREGNANCY CONSULTATION FOR THE FIRST TIME IN THE FIRST TRIMESTER OR AS SOON AS THEY KNOW THAT THEY ARE PREGNANT (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,822)

INDICATOR		BO	PORT LOKO	ALL
Sex***	Women	63.9	58.5	61.2
	Men	75.3	69.1	72.6
Residence type	Rural	67.8	66.4	67.1

TABLE 3.6.1: RESPONDENTS KNOWING THAT PREGNANT WOMEN SHOULD SEEK PREGNANCY CONSULTATION FOR THE FIRST TIME IN THE FIRST TRIMESTER OR AS SOON AS THEY KNOW THAT THEY ARE PREGNANT (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,822)				
INDICATOR		BO	PORT LOKO	ALL
	Urban***	73.3	55.1	65.8
Educational attainment	None	68.6	64.3	66.6
	Primary	69.4	58.6	64.0
	Secondary or higher	70.7	65.0	68.4
Total*		69.6	63.4	66.7
Adjusted Wald test p-value: ***p < 0.001				

Fewer than two-thirds (61.7%) of respondents knew that women should have at least four ANC visits during their pregnancy (**Table 3.6.2**). Knowledge of the recommended number of ANC visits during pregnancy varied significantly by district (Bo: 70.3%, Port Loko: 51.1%; p < 0.001) and sex (Male: 45.3%, Female: 76.8%; p < 0.001). Respondents with secondary or higher education demonstrated significantly lower knowledge of the fact that women should have at least four ANC visits (Secondary or Higher: 55.2%, None: 65.3%; p < 0.001). There was, however, no difference between respondents with primary and no education regarding knowledge of the number of ANC visits pregnant women should attend (Primary: 66.0%, None: 65.3%; p < 0.88). These knowledge disparities were observed across districts, with significantly higher proportions of respondents from Bo district demonstrating correct knowledge of the recommended number of ANC visits for all demographic subgroups compared to Port Loko respondents.

TABLE 3.6.2: RESPONDENTS KNOWING THAT WOMEN SHOULD HAVE AT LEAST FOUR ANTENATAL CONSULTATIONS DURING PREGNANCY (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,822)				
INDICATOR		BO	PORT LOKO	ALL
Sex***	Women**	79.8	73.4	76.8
	Men***	60.5	25.7	45.3
Residence type***	Rural***	69.4	52.9	61.7
	Urban***	72.1	47.4	61.9
Educational attainment	None***	74.3	55.1	65.3
	Primary*	72.3	59.6	66.0
	Secondary or higher***	64.9	41.2	55.2
Total***		70.3	51.4	61.7
Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001				

Compared to knowledge regarding ANC timing and recommended number of visits, knowledge of the recommended number of doses of SP to be taken during pregnancy to prevent malaria was substantially low (**Table 3.6.3**). Overall, only one-third (33.7%) of respondents knew women should receive three doses of SP during pregnancy. Knowledge was significantly higher among respondents in Port Loko (39.4%) compared to Bo (28.9%) (p < 0.001). Significant differences were observed across respondents' sex and educational attainment. On average, a significantly higher proportion of women (49.8%), demonstrated knowledge of recommended SP dosing during pregnancy compared to men (16.1%).

Similarly, a higher proportion of respondents with no education (34.9%) demonstrated correct knowledge of SP dosing during pregnancy compared to respondents with secondary or higher education (29.8%) ($p < 0.04$).

TABLE 3.6.3: RESPONDENTS KNOWING THAT WOMEN SHOULD RECEIVE PREVENTIVE TREATMENT FOR MALARIA THREE TIMES DURING PREGNANCY (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,822)				
INDICATOR		BO	PORT LOKO	ALL
Sex***	Women***	44.1	56.4	49.8
	Men	13.4	19.6	16.1
Residence type	Rural***	25.9	39.8	32.4
	Urban	35.4	38.4	36.6
Educational attainment	None***	27.2	43.6	34.9
	Primary	34.0	43.0	38.5
	Secondary or higher	28.8	31.4	29.8
Total***		28.9	39.4	33.7
Adjusted Wald test p-value: ***p < 0.001				

Perceived Severity

Malaria during pregnancy can result in serious consequences for pregnant women and the fetus. Exploration of respondents' perceptions about the severity of malaria in pregnancy (**Table 3.6.4**) showed moderate awareness of these consequences. Across districts, 91.7% of women and 88.4% of men indicated that when a pregnant woman gets malaria, the effect on the woman and the unborn baby is serious. However, only half (50.9%) of respondents indicated that pregnant women are more likely to die from malaria than non-pregnant women, a finding that is lower that the proportion of women in general (68%) who perceive increased risk for malaria. A significantly higher proportion of women (56.4%) than men (44.9%) favored this measure of malaria severity. A measure of the perceived severity of malaria was constructed using both these variables. Overall, perceived severity of malaria in pregnant women was significantly higher among women in Port Loko (61.6%) compared to women in Bo (54.8%).

TABLE 3.6.4: RESPONDENTS FAVORING MEASURES OF PERCEIVED SEVERITY OF MALARIA IN PREGNANCY (%), BY SEX AND DISTRICT, SIERRA LEONE, 2019 (N = 3,822)				
INDICATOR		BO	PORT LOKO	ALL
When a pregnant woman has malaria, the effect on herself and her unborn child is very serious	Women**	93.4	89.7	91.7
	Men	92.3	83.4	88.4
	Total**	92.8	86.8	90.1
Pregnant women are more likely to die from malaria than non-pregnant women	Women*	52.7	60.7	56.4
	Men	47.7	41.3	44.9
	Total	50.2	51.7	50.9
Total favoring perceived severity of malaria in pregnant women	Women*	54.8	61.6	57.9
	Men	48.8	47.2	48.1
	Total	51.8	54.9	53.2
Adjusted Wald test p-value: *p < 0.05; **p < 0.01				

Attitudes About ANC and IPTp

Attitudes towards ANC and IPTp were mixed (**Table 3.6.5**). The majority of respondents agreed with favorable statements about the safety of SP for pregnant women and the fetus (93.9%) and indicated women should take several doses of SP to prevent malaria during pregnancy (80.4%). Very few women (15.3%) and men (12.1%) believed that a woman can take SP on an empty stomach. Over one-third of respondents (36.0%) indicated it is okay for a woman to wait a few months before seeing a health provider when she thinks she may be pregnant, although this belief was reported by a significantly higher proportion of women (46.5%) compared to men (24.6%). Similarly, 36.5% of women and 16.4% of men believed women who have given birth before do not need to immediately see a health provider when they believe they may be pregnant. Nonetheless, a majority of respondents had favorable beliefs about the safety of SP for pregnant women and the fetus (93.9%) and indicated women should take several doses of SP to prevent malaria during pregnancy (80.4%).

TABLE 3.6.5: RESPONDENT ATTITUDES TOWARDS ANC/IPTP (%), BY SEX AND DISTRICT, SIERRA LEONE, 2019 (N = 3,822)

INDICATOR		BO	PORT LOKO	ALL
It is okay for pregnant women to take the medicine to prevent malaria on an empty stomach	Women***	12.1	18.9	15.3
	Men	11.9	12.4	12.1
	Total	12.0	15.9	13.8
Even if a woman thinks she may be pregnant, she should wait a few months before she sees a health provider	Women	50.0	47.0	46.5
	Men	25.8	23.1	24.6
	Total	36.0	36.0	36.0
A woman who has given birth before does not need to see a health provider as soon as she thinks she might be pregnant	Women***	31.1	42.8	36.5
	Men	19.1	12.9	16.4
	Total	25.1	29.0	26.9
The medicine given to pregnant women to prevent malaria is safe for her and her baby	Women	94.7	93.9	94.3
	Men***	98.7	86.4	93.3
	Total***	96.7	90.4	93.9
A pregnant woman must take several doses of medicine (SP) to prevent malaria during pregnancy	Women*	75.5	82.0	78.5
	Men***	89.3	73.6	82.5
	Total*	82.3	78.2	80.4
Total with positive attitudes towards ANC/IPTp***	Women	67.1	69.5	68.2
	Men	89.0	82.0	85.9
	Total	77.9	75.2	76.7

Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001

Slightly more than three-fourths of respondents (76.7%) had positive attitudes towards ANC and IPTp. Results show that a significantly higher proportion of men (85.9%) had positive attitudes towards ANC and IPTp compared to women (68.2%) ($p < 0.001$) Conversely, there were no statistically significant differences in the proportion of individuals with favorable attitudes towards ANC and IPTp across districts ($p < 0.2663$).

Perceived response efficacy of IPTp

A majority of respondents agreed with positive statements measuring the perceived effectiveness of the drugs given to pregnant women to prevent malaria (**Table 3.6.6**). Over 90% of women and men believed the medicine given to pregnant women to prevent malaria keeps the mother healthy and works well to protect the unborn baby from the effects of malaria. Additionally, a majority of women (92.4%) and men (92.4%) reported that women should still take malaria prevention drugs during pregnancy even when sleeping under a bed net every night.

TABLE 3.6.6: RESPONDENT ENDORSING MEASURES OF IPTP RESPONSE EFFICACY (%), BY SEX AND DISTRICT, SIERRA LEONE, 2019 (N = 3,822)

INDICATOR		BO	PORT LOKO	ALL
The medicine given to a pregnant woman to prevent malaria works well to keep the mother healthy	Women	94.0	94.4	94.2
	Men**	94.0	85.9	90.5
	Total**	94.0	90.5	92.4
The medicine given to a pregnant woman to prevent malaria works well to make sure her baby is protected from the effects of malaria	Women	92.1	94.6	93.2
	Men***	96.3	86.4	92.0
	Total*	94.1	90.8	92.6
Pregnant women should still take the medicine that is meant to prevent malaria even if they slept under nets every night	Women**	94.0	90.6	92.4
	Men***	97.9	85.1	92.4
	Total***	95.9	88.1	92.4
Total with high response efficacy of IPTp	Women*	96.3	95.2	95.8
	Men***	98.9	86.9	93.7
	Total***	97.6	91.4	94.8

Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001

Overall, the proportion of respondents with positive perceptions about the effectiveness of IPTp was significantly higher in Bo (97.6%) than Port Loko (91.4%) ($p < 0.001$). A higher proportion of women (96.3%) and men (98.9%) in Bo agreed with favorable statements about the measures of perceived IPTp effectiveness compared to women (95.2%) and men (86.9%) in Port Loko.

Perceived Self-Efficacy for IPTp

Perceived self-efficacy refers to one's capacity to take relevant actions. This subsection presents results pertaining to respondent self-efficacy regarding ANC and IPTp. As different questions were posed to men and women, data are disaggregated by sex.

TABLE 3.6.7: WOMEN ENDORSING MEASURES OF IPTP SELF-EFFICACY (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,195)

INDICATOR	BO	PORT LOKO	ALL
Could go for a checkup as soon as pregnancy is suspected***	74.4	87.8	80.7

TABLE 3.6.7: WOMEN ENDORSING MEASURES OF IPTP SELF-EFFICACY (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,195)			
INDICATOR	BO	PORT LOKO	ALL
Could convince spouse/partner to accompany them to ANC***	76.5	89.9	82.8
Could attend at least four ANC appointments at the clinic***	58.3	81.7	69.2
Could attend at least eight ANC appointments at the clinic***	74.0	84.2	78.8
Could go for checkup even if religious leader does not agree***	90.5	73.7	82.7
Could take medicine to prevent malaria at least three times during pregnancy*	84.8	88.8	86.7
Could request for the medicine that helps to prevent malaria at ANC checkup	75.0	80.1	77.4
Could find the money for transportation or other costs to go to the clinic as soon as pregnancy is suspected	59.9	60.5	60.2
Could take all eight actions	35.2	30.0	32.8
Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001			

Results for perceived self-efficacy for ANC and IPTp varied among women (**Table 3.6.7**). Eight in ten women (80.7%) believed that they could go for ANC consultation as soon as they suspect that they are pregnant, convince their spouse or partner to accompany them to ANC (82.8%), attend ANC even if not condoned by religious leaders (82.8%), and take medicine to prevent malaria at least three times during their pregnancy (86.7%). Just over two-thirds of women indicated they could attend at least four ANC appointments during their pregnancy (69.2%). While 78.8% of women reported they could attend at least eight ANC appointments during their pregnancy, and over half (60.2%) believed they could find the money to subsidize transportation or other costs to go to the clinic as soon as they thought they were pregnant. However, overall, about one-third of women (32.8%) believed that they could perform all seven actions.

By contrast, over half of men (56.5%) indicated they could perform all eight actions to support their pregnant spouse/partner's engagement with ANC and IPTp (**Table 3.6.8)**. Over 90% of men indicated they could encourage their pregnant spouse/partner to seek care once pregnancy was suspected, take medicine to prevent malaria at least three times during the pregnancy, and make a request for the medicine that helps to prevent malaria during their ANC visit. A majority of men also indicated they could accompany their spouse to at least eight ANC appointments (85.5%), encourage their spouse/partner to go for ANC checkups even when religious leaders do not agree to it, and find the money to subsidize transportation or other costs associated with ANC visits.

TABLE 3.6.8: MEN FAVORING MEASURES OF IPTP SELF-EFFICACY (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 627)			
INDICATOR	BO	PORT LOKO	ALL
Could encourage spouse/partner to go for a checkup as soon as pregnancy is suspected***	97.7	87.1	93.1
Could accompany pregnant spouse/partner to ANC	78.8	69.6	74.9
Could accompany pregnant spouse/partner to at least four ANC appointments at the clinic	92.4	85.8	89.5
Could accompany pregnant spouse/partner to at least eight ANC appointments at the clinic	86.2	84.7	85.5
Could encourage pregnant spouse/partner to go for ANC checkup even if religious leader does not agree*	89.6	80.5	85.6
Could encourage spouse/partner to take medicine to prevent malaria at least three times during pregnancy***	97.3	87.7	93.2
Could encourage spouse/partner to request for the medicine that helps to prevent malaria at ANC checkup**	96.7	87.6	92.8
Could find the money for transportation or other costs for a pregnant woman to go to the clinic as soon as pregnancy is suspected	89.7	85.0	87.7
Could take all actions	57.9	54.6	56.5
Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001			

Communication Between Spouses and Decision-Making on ANC

Table 3.6.9 below shows characteristics of women who have exchanged information on antenatal consultation with their spouses or partners. Sexual and reproductive health outcomes are influenced by communication between spouses and the role of each partner in decision-making. This section shows the characteristics of the communication between spouses in relation to ANC and decision-making regarding the use of health services among respondents.

About 81.3% of married and cohabiting women with recent (within the past two years) or current pregnancies reported discussing ANC with their spouses/partners. This estimate did not vary significantly across districts (Bo: 79.5%, Port Loko: 83.0%), place of residence (rural: 80.8%, urban: 84.0 %), or educational attainment (No education: 79.7%, Primary: 82.4%, Secondary: 83.8 %).

TABLE 3.6.9: WOMEN WHO HAVE EXCHANGED INFORMATION ON ANTENATAL CONSULTATION WITH THEIR SPOUSES/PARTNERS (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 1,067)				
INDICATOR		BO	PORT LOKO	ALL
Residence type	Rural	79.1	82.5	80.8
	Urban	82.1	85.8	84.0
Educational attainment	None	82.1	77.4	79.7
	Primary**	71.3	94.1	82.4

TABLE 3.6.9: WOMEN WHO HAVE EXCHANGED INFORMATION ON ANTENATAL CONSULTATION WITH THEIR SPOUSES/PARTNERS (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 1,067)				
INDICATOR		BO	PORT LOKO	ALL
	Secondary or higher	83.7	83.9	83.8
Total		79.5	83.0	81.3
Adjusted Wald test p-value: **p < 0.01				

Shared decision-making with spouses regarding ANC attendance among women who were pregnant or had given birth in the last two years was suboptimal (**Table 3.6.10**). Fewer than half (45.4%) indicated that the final decision on their ANC attendance was made jointly with their spouse/partner, however, women in Bo (55.6%) were significantly more likely to endorse shared decision-making compared to women in Port Loko (35.1%). There were inequities in estimates for shared decision-making at district level across socio-demographic factors, including place of residence and education.

TABLE 3.6.10: WOMEN REPORTING DECISION TO GO TO THE ANTENATAL CLINIC IS MADE JOINTLY WITH THEIR SPOUSES/PARTNERS (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 821)				
INDICATOR		BO	PORT LOKO	ALL
Residence type	Rural***	59.0	36.5	48.0
	Urban	35.7	28.2	31.6
Educational attainment	None*	51.6	38.4	45.0
	Primary***	67.5	27.6	45.7
	Secondary or higher	52.0	37.8	45.8
Total***		55.7	35.1	45.4
Adjusted Wald test p-value: *p < 0.05; ***p < 0.001				

Descriptive Norms

Overall, a majority of respondents perceived that more than four ANC visits (75.6%) and taking medicine to prevent malaria during pregnancy (80.6%), are norms in their communities (**Table 3.6.11**). Respondents in Bo were significantly more likely to agree that IPTp uptake is a community norm (83.1%) compared to Port Loko residents (77.6%), however endorsement of more than four ANC visits as a community norm was relatively similar across the two districts (Bo: 73.9%, Port Loko: 78.0%). A higher proportion of women agreed that IPTp use during pregnancy was a community norm (84.8%) compared to men (76.2%). Across districts, a significantly lower proportion of women in Bo (69.1%) compared to Port Loko (82.9%) perceived attending more than four ANC appointments to be a norm. Conversely, men in Bo (81.0%) were significantly more likely to support the use of IPTp than men in Port Loko (69.8%).

TABLE 3.6.11: RESPONDENTS ENDORSING PERCEIVED NORMS REGARDING ANC/IPTP (%), BY SEX AND DISTRICT, SIERRA LEONE, 2019 (N = 3,822)				
INDICATOR		BO	PORT LOKO	ALL
Obtaining more than four ANC visits is a norm in their community	Women***	69.1	82.9	75.6
	Men	78.8	72.4	76.1
	Total	73.9	78.0	75.8

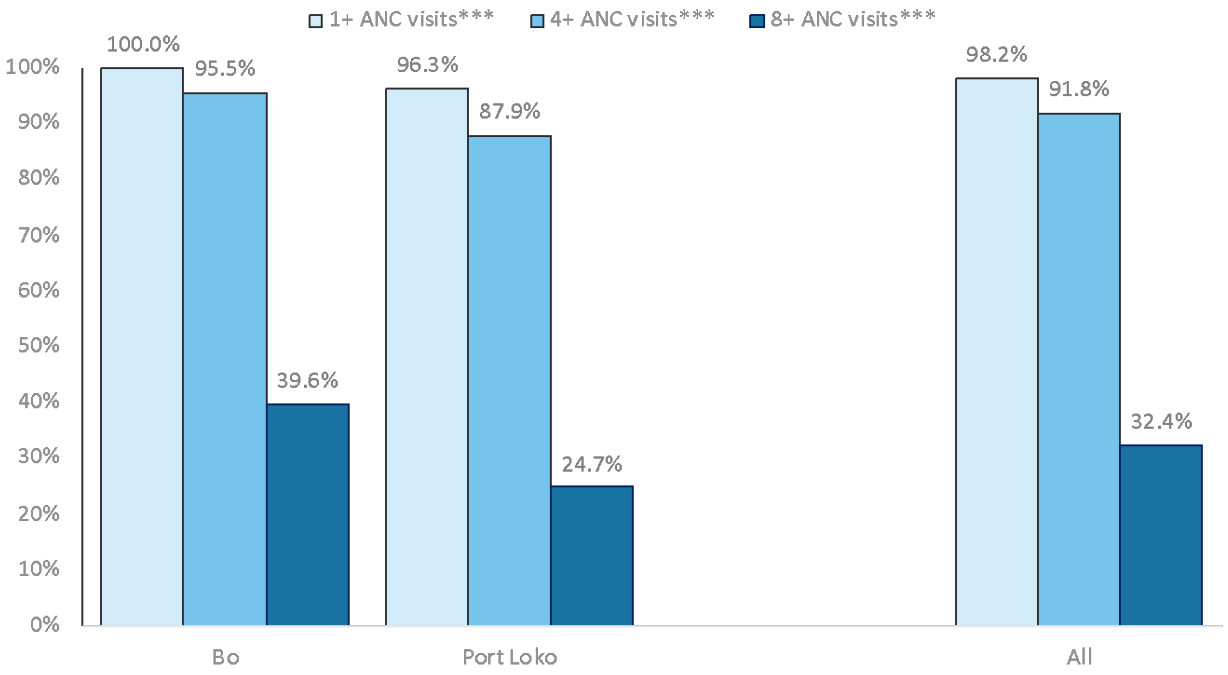
TABLE 3.6.11: RESPONDENTS ENDORSING PERCEIVED NORMS REGARDING ANC/IPTP (%), BY SEX AND DISTRICT, SIERRA LEONE, 2019 (N = 3,822)				
INDICATOR		BO	PORT LOKO	ALL
Taking medicine to prevent malaria during pregnancy is a norm in their community	Women	85.1	84.3	84.8
	Men*	81.0	69.8	76.2
	Total*	83.1	77.6	80.6
Adjusted Wald test p-value: *p < 0.05; ***p < 0.001				

Practices and Behaviors

Antenatal Care (ANC)

Figure 17 shows ANC visits reported in most recent pregnancy within the last two years.

Figure 17: ANC visits reported in most recent (within the last two years) pregnancy among women (%), by district, Sierra Leone, 2019 (N = 1,006)



Adjusted Wald test p-value: * p <0.05; ** p <0.01; *** p <0.001

Among the 1,006 women who reported recent pregnancies (within the past two years), almost all of them (98.2%) reported at least one ANC visit during their pregnancy. A majority (91.8%) also reported having four or more ANC visits during their pregnancy, although a significantly higher proportion of these women were in Bo (95.5%) compared to Port Loko (87.9%) ($p < 0.001$). Overall, the proportion of women reporting eight or more ANC visits during their last pregnancy was substantially lower at 32.4%). However, a significantly higher proportion of women in Bo (39.6%) compared to Port Loko (24.7%) made at least eight ANC visits during their pregnancy.

TABLE 3.6.12: WOMEN WITH RECENT (LAST TWO YEARS) PREGNANCIES REPORTING AT LEAST FOUR ANC VISITS DURING THEIR MOST RECENT PREGNANCY (%), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 1,006)		
INDICATOR		PERCENTAGE (%)
Age group	15–24 years	90.7
	25–34 years	92.8
	35–44 years	91.5
	45 years or older	84.9
Residence type	Rural	91.7
	Urban	92.1
Educational attainment	None	91.0
	Primary	89.4
	Secondary or higher*	95.6
Household wealth quintile	Lowest	92.2
	Second	88.4
	Middle	92.2
	Fourth	91.0
	Highest	95.0
Total		91.8
Adjusted Wald test p-value: *p < 0.05		

Table 3.6.12 summarizes socio-demographic factors associated with at least four ANC visits during women's most recent pregnancy. Reports of four or more ANC visits were universally high, with little differences observed across age groups, place of residence, educational attainment, or household wealth quintile.

TABLE 3.6.13: SOURCE OF ANC AMONG WOMEN WITH PREGNANCY IN THE PREVIOUS TWO YEARS REPORTING ANC VISITS (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 980)			
SOURCE OF ANC	BO	PORT LOKO	ALL
Hospital or public health center	99.0	98.7	98.9
Private hospital or health center	5.6	6.3	6.0
Infirmary/maternity*	2.5	0.3	1.5
Adjusted Wald test p-value: *p < 0.05			

Among the women who reported at least one ANC visit during their most recent pregnancy, a majority (98.9%) received ANC services from a hospital or public health center (**Table 3.6.13**). Few women reported receiving ANC from other sources, including private hospitals or clinics (6.0%) or infirmary/maternity centers (1.5%).

Support for ANC from Spouse

Approximately half (49.0%) of women who accessed ANC services during their most recent pregnancy were accompanied by their spouse when they received services. A significantly higher proportion of these women were in Port Loko (62.8%) compared to Bo (36.4%) ($p < 0.001$).

TABLE 3.6.14: WOMEN WHO RECEIVED A MOSQUITO NET DURING OR AFTER PREGNANCY N (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 1,006)

PERIOD	BO	PORT LOKO	ALL
During antenatal consultation	79.3	78.5	78.9
During child vaccination	44.4	48.1	46.2
On any of these occasions	84.6	81.5	83.1

Obtaining Mosquito Net During or After Pregnancy

A majority of women with pregnancies in the last two years reported receiving a mosquito net during or shortly after their pregnancy (83.1%), with little no significant difference across districts (**Table 3.6.14**). Most women (78.9%) were offered and received a net during ANC services. Nearly half, nonetheless, also reported receiving a mosquito net during routine childhood immunization services.

Use of IPTp

Fewer than two-thirds of women (60.7%) with pregnancies in the past two years reported receiving at least three doses of SP during their most recent pregnancy (**Table 3.6.15**). A higher proportion of women who reported at least four ANC visits during their recent pregnancy received at least three doses of SP (63.3%) compared to women who reported making three or fewer ANC visits (31.5%). No other substantial differences in SP uptake were observed across districts and other socio-demographic characteristics.

TABLE 3.6.15: WOMEN WITH RECENT (LAST TWO YEARS) PREGNANCY WHO RECEIVED AT LEAST THREE DOSES OF IPTP-SP DURING THEIR MOST RECENT PREGNANCY (%), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 1,006)

INDICATOR		PERCENTAGE (%)
Number of ANC visits***	Zero to three	31.5
	Four or more	63.3
Age group	15–24 years	60.6
	25–34 years	62.0
	35–44 years	57.6
	45 years or older	56.5
District	Bo	64.1
	Port Loko	57.1
Residence type	Rural	60.8
	Urban	60.4
Educational attainment	None	66.1
	Primary**	50.6

TABLE 3.6.15: WOMEN WITH RECENT (LAST TWO YEARS) PREGNANCY WHO RECEIVED AT LEAST THREE DOSES OF IPTP-SP DURING THEIR MOST RECENT PREGNANCY (%), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 1,006)		
INDICATOR		PERCENTAGE (%)
	Secondary or higher	60.7
Household wealth quintile	Lowest	58.3
	Second	59.6
	Middle	60.4
	Fourth	56.1
	Highest	70.5
Total		60.7
Adjusted Wald test p-value: **p < 0.01; ***p < 0.001		

Table 3.6.16 shows that among women receiving any SP during their most recent pregnancy, almost all of them reported receiving SP during an ANC consultation (99.0%). Few other sources of SP receipt were reported, with only a minimal proportion of women indicating they received SP during another non-ANC-related visit to a health center (3.9%).

TABLE 3.6.16: SOURCE OF IPTP-SP DOSES AMONG WOMEN WITH RECENT (LAST TWO YEARS) PREGNANCY (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 939)			
INDICATOR	BO	PORT LOKO	ALL
During antenatal consultation	98.4	99.7	99.0
During another visit at the health center	3.6	4.1	3.9

Determinants of IPTp-SP Use

The WHO recommends that women use at least three doses of IPTp-SP starting in the second trimester to prevent malaria-related complications in pregnancy. Multivariable logistic regression identified several demographic and psychosocial determinants of IPTp-SP use among the surveyed women who had been pregnant within the last two years preceding the survey. Demographic factors associated with the use of IPTp-SP include level of educational attainment, urban-rural residence, and wealth quintile. Primary education was associated with a 32% decrease in the odds of taking three doses of IPTp-SP (OR: 0.68, p = 0.026), and secondary education was associated with 38% reduced odds of taking three doses of IPTp-SP (OR: 0.62, p = 0.02). Women in the highest wealth quintile were two times more likely to use three doses of IPTp-SP compared to women in the lowest wealth quintile (p < 0.001). Behavioral factors associated with the use of IPTp-SP include knowledge of the recommended number of doses of IPTp-SP in pregnancy (OR: 2.74, p < 0.001), self-efficacy to use at least three doses of SP (OR: 2.42, p = 0.013), and perception of IPTp-SP as the norm (OR: 1.91, p < 0.001). In addition, results showed that attending four ANC visits was associated with the use of at least three doses of IPTp-SP.

TABLE 3.5.17: LOGISTIC REGRESSION OF FACTORS ASSOCIATED WITH USE OF AT LEAST THREE DOSES OF IPTP-SP, SIERRA LEONE, 2019 (N = 1002)		
INDICATORS		ADJUSTED ODDS RATIO (SE)
Educational attainment	None	1.00 (*Ref.*)
	Primary*	**0.68 (0.12)**

TABLE 3.5.17: LOGISTIC REGRESSION OF FACTORS ASSOCIATED WITH USE OF AT LEAST THREE DOSES OF IPTP-SP, SIERRA LEONE, 2019 (N = 1002)		
INDICATORS		ADJUSTED ODDS RATIO (SE)
	Secondary or higher*	**0.62 (0.13)**
Residence type	Rural	1.00 (*Ref.*)
	Urban	0.70 (0.16)
District	Bo	1.00 (*Ref.*)
	Port Loko	0.80 (0.12)
Household wealth quintile	Lowest	1.00 (*Ref.*)
	Second	1.25 (0.27)
	Middle	1.01 (0.22)
	Fourth	0.99 (0.22)
	Highest***	**2.03 (0.53)**
Age	15–24 years	1.00 (*Ref.*)
	25–34 years	0.89 (0.14)
	35–44 years	0.68 (0.15)
	45 years and older	0.53 (0.38)
Marital status	Not in union	1.00 (*Ref.*)
	In union	1.29 (0.31)
Attending at least four ANC visits***		**2.82 (0.68)**
Knowledge of recommended number of SP doses***		**2.74 (0.42)**
Self-efficacy for SP use*		**2.43 (0.15)**
Perception of SP as the norm***		**1.91 (0.31)**
Positive attitude towards use of multiple doses of SP		1.40 (0.15)
Perceived severity of malaria in pregnancy		1.05 (0.32)
Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001		

IPTi

IPTi is a vital strategy for averting malaria infections and reducing infant mortality. In this section, results for behavioral determinants that may influence the uptake and use of IPTi are presented. The variables evaluated included knowledge, attitudes, perceived self, and response efficacy of IPTi, communication with spouses, perceived norms, and healthcare-seeking behaviors of caregivers.

Behavioral Determinants

Knowledge of IPTi

Across districts, one-third (34.4%) of women knew that infants should receive at least three doses of preventive medication for malaria in their first year of life (**Table 3.7.1**). A higher proportion of women in rural areas (41.8%) and women with no formal education (43.0%) had correct knowledge of the recommended number of IPTi doses compared to those residing in urban areas (16.1%) and those with primary (36.0%) and secondary education (21.7%). Among women with children under the age of one year, knowledge that infants should receive at least three doses of preventive medication for malaria in their first year was lower than the estimate for the overall population of women of reproductive age.

Specifically, less than a third (30%) knew the number of doses of preventive medication their children should receive.

TABLE 3.7.1: WOMEN KNOWING THAT INFANTS SHOULD RECEIVE INTERMITTENT PREVENTIVE TREATMENT FOR MALARIA AT LEAST THREE TIMES IN THE FIRST YEAR OF LIFE (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,194)

INDICATOR		BO	PORT LOKO	ALL
Residence type***	Rural	45.0	38.3	41.8
	Urban***	7.0	27.7	16.1
Educational attainment	None*	49.0	37.3	43.0
	Primary	30.6	41.6	36.0
	Secondary or higher	18.4	26.9	21.7
Total		33.5	35.4	34.4

Adjusted Wald test p-value: * p < 0.05; *** p < 0.001

Attitudes Towards IPTi

Attitudes towards IPTi were variable (**Table 3.7.2**). Nearly two-thirds of women believed IPTi was safe to give to infants (63.9%), with a significantly higher proportion of women in Port Loko (73.5%) agreeing with this statement compared to Bo (55.6%) (p = 0.0036). Overall, few women indicated that they did not trust the health workers who provide and also administer IPTi (11.7%), with a significantly higher proportion in Port Loko (20.0%) than in Bo (4.5%) (p < 0.001). However, less than half (47.5%) of women perceived that religious and secular leaders in their communities supported IPTi administration, and about one-third of women reported that health workers at health facilities sometimes coerced parents to administer IPTi to children (31.8%). Last, one-fifth of women expressed the view that healthy babies do not need to see health providers to receive IPTi (20.3%).

Overall, half (57.0%) of participating women had positive attitudes towards IPTi. The proportion with positive attitudes did not vary significantly by district, with about 58.9% of women in and 54.7% of women in Port Loko having positive attitudes towards IPTi (p = 0.507). However, among the subgroup of women with children under the age of one year, a lower percentage (53.0%) had positive attitudes towards IPTi.

TABLE 3.7.2: WOMEN'S ATTITUDES TOWARDS IPTi (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,194)

INDICATOR	BO	PORT LOKO	ALL
Religious leaders and leaders of my community support the administration of the medicine to prevent malaria in children under one year old	46.4	48.8	47.5
The health workers that give the medicine that prevents malaria in children under one year old at the health facility force parents to accept this medicine***	20.9	44.3	31.8

TABLE 3.7.2: WOMEN'S ATTITUDES TOWARDS IPTi (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,194)			
INDICATOR	BO	PORT LOKO	ALL
Healthy babies do not need to see a health provider to get the medicine that prevents malaria in children under one year old***	9.2	32.9	20.3
I do not trust the people who administer the medicine to prevent malaria in children under one year old***	4.5	20.0	11.7
The medicine given to prevent malaria in children under one year old is safe for the child**	55.6	73.5	63.9
We do not pay for the medicine that prevents malaria in children under one year old that is given at the health facility	45.4	48.5	46.8
Total endorsing positive attitudes towards IPTi	58.9	54.7	57.0
Adjusted Wald test p-value: **p < 0.01; ***p < 0.001			

Perceived Response Efficacy of IPTi

Nearly two-thirds (62.8%) of women endorsed indicators of IPTi effectiveness (**Table 3.7.3**), with a significantly higher proportion of women endorsing IPTi in Port Loko (72.9%) compared to Bo (53.9%) (p = 0.0009). A similar proportion of women from each district agreed that IPTi is effective in preventing malaria in infants (63.1%) and that community burden of malaria would decrease if all children in the community received IPTi (66.3%). Nevertheless, approximately one-third of women (36.0%), believed that an infant that receives IPTi has a similar chance of getting malaria as an infant that does not receive the preventive treatment; a significantly larger proportion of women in Port Loko (52.1%) than in Bo (21.8%) endorsed this sentiment (p < 0.001).

Estimates for response efficacy of IPTi among women with children under the age of one year were similar to estimates derived for all participating women. Specifically, 64% of women with children under one year old endorsed indicators of IPTi effectiveness. In addition, a similar proportion (64.4%) of the women agreed that that the IPTi medication was effective in preventing malaria, and also agreed that children under the age of one year had the same chance of getting malaria whether or not they took the IPTi medication (35.8%). Slightly fewer proportions (63.6%) did not perceive that the community burden of malaria would be lower if all children took the preventive medicine.

TABLE 3.7.3: WOMEN'S PERCEPTIONS OF THE EFFECTIVENESS OF IPTi FOR INFANTS (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,194)			
INDICATOR	BO	PORT LOKO	ALL
The medicine given to children under one year old to prevent malaria is effective in preventing malaria***	53.9	73.5	63.1
If all children under one year old in my community take the medicine to prevent malaria, there will be fewer cases of malaria in children*	59.6	74.0	66.3

TABLE 3.7.3: WOMEN'S PERCEPTIONS OF THE EFFECTIVENESS OF IPTi FOR INFANTS (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,194)			
INDICATOR	BO	PORT LOKO	ALL
A child under one year old has the same chance of getting malaria whether or not he or she takes the medicine to prevent malaria***	21.8	52.1	36.0
Total endorsing perceived effectiveness of IPTi	53.9	72.9	62.8
Adjusted Wald test p-value: *p < 0.05; ***p < 0.001			

Perceived Self-Efficacy for IPTi

Results for women's self-efficacy to take actions to acquire and administer IPTi were variable (**Table 3.7.4**). While over two-thirds (68.8%) of women believed that they could ensure that their infants received all of the IPTi medicine prescribed, only about one-third (35.2%) indicated that they could find the money for travel to the health facility to access IPTi. More than half of women (53.4%) perceived that they could get permission from a partner, spouse, or other family member to procure IPTi, and over two-thirds (69.0%) of them believed they could ensure their child completed all three recommended doses of IPTi (69.0%). Overall, more than a quarter (28.1%) of women reported that they could perform all four of the aforementioned actions. Self-efficacy varied significantly across districts, with a substantially higher proportion of women in Port Loko district reporting they had self-efficacy for IPTi compared to those in Bo.

TABLE 3.7.4: WOMEN'S SELF-EFFICACY FOR IPTi (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,194)			
INDICATOR	BO	PORT LOKO	ALL
Ensure that your child under the age of one year old takes all the medicine to prevent malaria*	60.9	77.9	68.8
Find the money to take your child under one year to a health facility to get the medicine that prevents him/her from getting malaria*	27.8	43.7	35.2
Get permission from your spouse/partner or another family member to take your child under one year old to get the medicine that prevents malaria***	43.0	65.2	53.4
Ensure that your child under the age of one year old takes all doses of the medication given to prevent malaria*	61.4	77.8	69.0
Could perform all four actions**	20.9	36.2	28.1
Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001			

Among the subgroup of women with children under the age of one year, relatively few (26.7%) perceived that they possessed self-efficacy to carry out all four actions. Less than a third of these women reported that they could find the money to take their child to the facility to get the IPT.

Communication About IPTi Between Spouses and Decision-Making

Among married and cohabiting women, overall fewer than half (43.2%) reported that they had discussed IPTi with their spouse or partner (**Table 3.7.5**), and a significantly higher number of women in

Port Loko (57.2%) compared to Bo (30.3%) reported they had discussed IPTi ($p < 0.001$). There were significant differences among women who lived in rural areas (49.1%) compared to urban areas (20.7%), and women with no formal education (46.2%) compared to primary (44.8%) or secondary/higher education (32.5%), reported also that they had discussed IPTi with their spouses or partners.

Noteworthy differences in the proportion having discussions about IPTi were evident among women who had children under the age of one year old compared to the overall sample of women. Specifically, in Bo district, a lower proportion of these women had discussed IPTi with their spouse or partner compared to the overall sample of women, while in Port Loko the proportion of women was higher at 70.0%.

TABLE 3.7.5: WOMEN WHO HAVE ALREADY EXCHANGED INFORMATION ON IPTI WITH THEIR SPOUSES/PARTNERS (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 2,304)

INDICATOR		BO	PORT LOKO	ALL
Residence type	Rural***	36.6	62.6	49.1
	Urban***	7.1	35.8	20.7
Educational attainment	None***	35.4	56.6	46.2
	Primary***	26.5	67.3	44.8
	Secondary or higher***	22.3	46.5	32.5
Total***		30.3	57.2	43.2

Adjusted Wald test p-value: ***p < 0.001

Table 3.7.6 below shows characteristics of women who made the decision to access IPTI jointly with their spouses or partners. Among women who discussed IPTi with their spouses or partners, only 10% reported that they had made the decision to accept IPTi jointly with their partners. No significant differences in joint decision-making were observed across socio-demographic characteristics (i.e., residence type, education) or district. On the other hand, most women (64.5%) mentioned that they alone had made the decision to give their child IPTi medication. The proportion of women who made the decision themselves was higher in Bo (72.9%) compared to Port Loko (46.9%).

TABLE 3.7.6: WOMEN WHO MADE THE DECISION TO ACCESS IPTI JOINTLY WITH THEIR SPOUSES/PARTNERS (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 408)

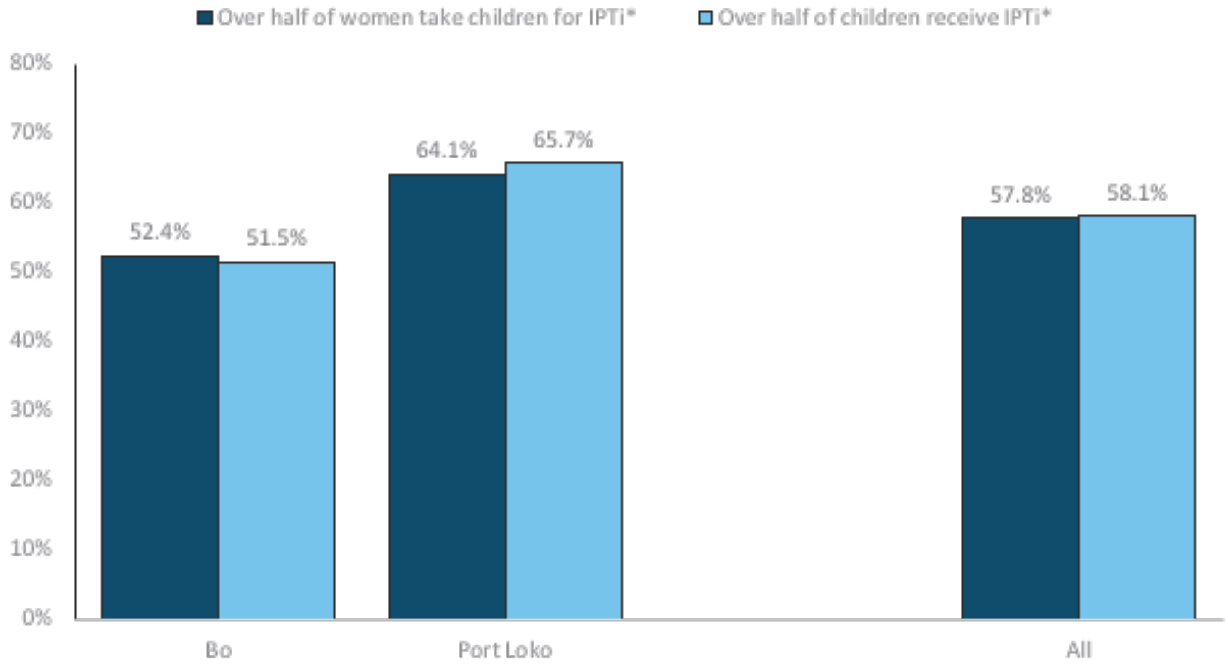
INDICATOR		BO	PORT LOKO	ALL
Residence type	Rural	10.5	13.8	11.4
	Urban	11.5	4.2	6.5
Educational attainment	None	13.4	11.4	12.8
	Primary	7.5	7.8	7.6
	Secondary or higher	6.9	15.0	8.9
Total		10.5	11.0	10.7

Descriptive Norms About IPTi

Positive perceptions of community norms were conducive to acceptability and uptake of IPTi in communities (**Figure 18**). For both districts, over half of women (57.8%) indicated that in their communities most women took their children to receive IPTi, and that most children received IPTi in

their first year of life (58.1%). Overall, a higher proportion of women in Port Loko endorsed these community norms compared to women in Bo, however the difference was negligible.

Figure 18: Proportion of women endorsing community norms regarding IPTi uptake and access (%), by district, Sierra Leone, 2019 (N = 3,194)



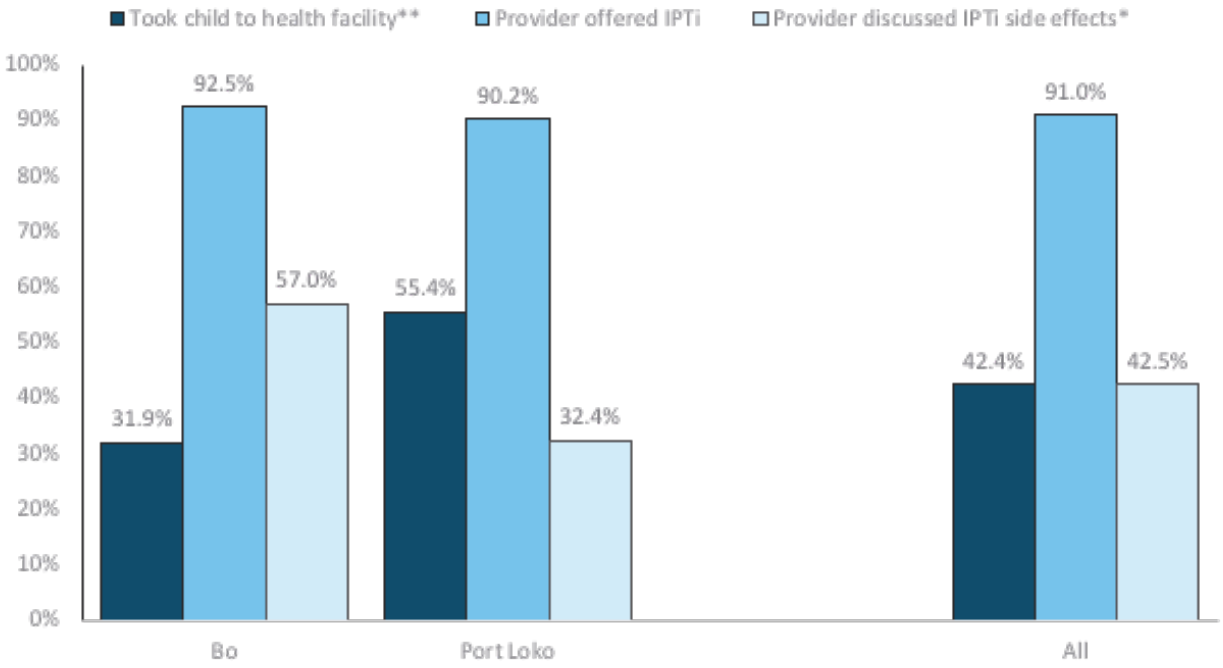
Adjusted Wald test p-value: * p <0.05

Practices and Behaviors Related to IPTi

Care-Seeking and Access to IPTi in Health Facilities

Among women with a child below the age of one year, less than half (42.4%) of them reported taking their infant to the health facility to receive IPTi (**Figure 19**). A significantly higher (55.4%) proportion of women in Port Loko reported taking their infant to the health facility compared to women in Bo (31.9%). Among women who accessed health services for IPTi, over 90% indicated a health care provider offered them the IPTi. However, the provider discussed problems women could anticipate or expect (i.e., side effects) when administering IPTi to their infants in fewer than half of these cases. A higher proportion of women in Bo (57.0%), compared to Port Loko (32.4%) reported these provider interactions.

Figure 19: Care-seeking experiences among women with children under one year of age who sought IPTi in health facilities (%), by district, Sierra Leone, 2019 (N = 304)



Adjusted Wald test p-value: * p <0.05; ** p < 0.01; *** p < 0.001

For women who were offered IPTi at health facilities, the majority of respondents (69.0%) reported that the health provider administered it directly to the infant onsite at the facility, and only one-fourth of women indicating that they were given the IPTi medication to administer to their child (25.5%). In instances where the woman was given the medicine to administer to their child, 39.6% of women reported that the health worker directly observed them administering the medicine to their child. In cases where women were offered the IPTi to administer at their discretion, only 12.6% reported giving the infant the medicine.

Among women who reported intentions to have more children in the future, a majority (80.4%) expressed interest in accessing IPTi after their next pregnancy (**Table 3.7.7**). Significant differences were evident across wealth quintiles. Of note, fewer proportions of women among the lowest and the highest quintiles had interest in future IPTi uptake compared to women in other wealth groups.

TABLE 3.7.7: WOMEN WITH FUTURE FERTILITY DESIRES EXPRESSING INTENTION TO ACCESS IPTI FOR THEIR NEXT CHILD (%), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 359)

INDICATOR		PERCENTAGE (%)
Age group	15–24 years	81.5
	25–34 years	80.8
	35–44 years	75.7
District	Bo	75.1
	Port Loko	83.5
Residence type	Rural	81.0

TABLE 3.7.7: WOMEN WITH FUTURE FERTILITY DESIRES EXPRESSING INTENTION TO ACCESS IPTI FOR THEIR NEXT CHILD (%), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 359)		
INDICATOR		PERCENTAGE (%)
	Urban	76.3
Educational attainment	None	78.3
	Primary	82.1
	Secondary or higher	82.9
Household wealth quintile	Lowest	70.4
	Second*	88.3
	Middle	83.7
	Fourth***	92.4
	Highest	67.7
Total		80.4
Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001		

Determinants of IPTi

A model for determinants of receipt of three doses of IPTi was not a good fit and only explained 17% of the variance in the outcome. An alternate outcome of intentions to use IPTi with a child born in the future was not suitable as almost all respondents responded "yes" to the question and there was little variability in the variable. Several factors may explain poor model fit. The sub-sample of women who had children under the age of one year and who reported they had taken the child to the health facility was very small, at 149 respondents, and only 51 infants completed required doses. The small sample was not sufficient to detect significant differences for multiple model predictors and many of the ideation predictors were not correlated individually with the outcome. Another consideration is not all children under the age of one year were eligible to have received all three doses of IPTi at the time of the survey, for instance two- or six-month-old infants would not have received three doses of IPTi.

Significant predictors of completion of IPTi were knowledge of required IPTi dosing (OR: 9.8 CI: 1.493–4.76) and community norms for IPTi, specifically the belief that more than half of infants under the age of one year in the community do receive IPTi (OR: 5.7, CI: 1.428–7.520). However, the confidence intervals were somewhat wide, usually seen with small samples, and this introduces uncertainty about the true value of estimates. Interpretation of this model should be done with caution.

IPTi availability

Table 3.7.8 below dhows residence type and educational attainment of women with children under one year reporting IPTi availability in health facilities or communities. Availability of IPTi in health facilities is essential for ensuring adequate coverage of life-saving interventions to reduce malaria morbidity and mortality in infants. Among women with children under the age of one year, 46.1% perceived that IPTi medication was available at the facility that served their community. A significantly larger proportion of women in Port Loko (65.2%) perceived IPTi medication was available at their community health facility compared to women in Bo (30.7%) ($p < 0.001$). Women residing in rural areas (49%) compared to urban areas (34.3%), and women with no formal education compared to those with secondary or higher education (38.4%), were significantly more likely to report that IPTi was available at the health facility or in their communities. However, among the 149 women who reported that they took their children to

the facility for IPTi medication, 85% of them agreed that medication given to infants to prevent malaria was available at the health facility within their community during the past 12 months.

TABLE 3.7.8: WOMEN WITH CHILDREN UNDER ONE YEAR REPORTING IPTI AVAILABILITY IN HEALTH FACILITIES OR COMMUNITIES (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 304)				
INDICATOR		BO	PORT LOKO	ALL
Residence type	Rural**	35.2	66.4	49.0
	Urban***	11.5	60.7	34.3
Educational attainment	None**	31.6	64.9	46.9
	Primary**	32.6	76.4	55.4
	Secondary or higher	27.9	46.9	34.3
Total***		30.7	65.2	46.1
Adjusted Wald test p-value: **p < 0.01; ***p < 0.001				

IRS

IRS involves spraying a house with an effective dose of long-lasting insecticide usually on an annual or biannual basis. Insecticide is sprayed on the inner surfaces of walls and ceilings where malaria vectors are likely to settle or rest after their blood meal. Sierra Leone is the first post-Ebola country where IRS will be implemented so the need to assess perceptions, including those for IRS personal protective equipment (PPE) may influence acceptance. The survey collected information on respondent's behavioral determinants regarding IRS.

Behavioral Determinants for IRS

The behavioral determinants for IRS assessed during the survey were knowledge, attitudes, and perceived effectiveness of IRS.

Knowledge of IRS

IRS knowledge was limited among the sample (**Table 3.8.1**). Fewer than one-fourth (24.4%) of respondents had knowledge of programs that sprayed insecticide in households for malaria control. Significantly more men (29.4%) than women (19.8%) had correct knowledge of IRS as a malaria control strategy (p = 0.0209). In addition, knowledge of IRS was significantly higher among respondents residing in urban (42.1%) compared to rural (16.8%) areas (p < 0.001, among respondents residing in Bo (31.7%) compared to Port Loko (15.4%) (p < 0.001), and among respondents with secondary or higher educational attainment (33.3%) compared to respondents with no formal education (18.4%) (p < 0.001).

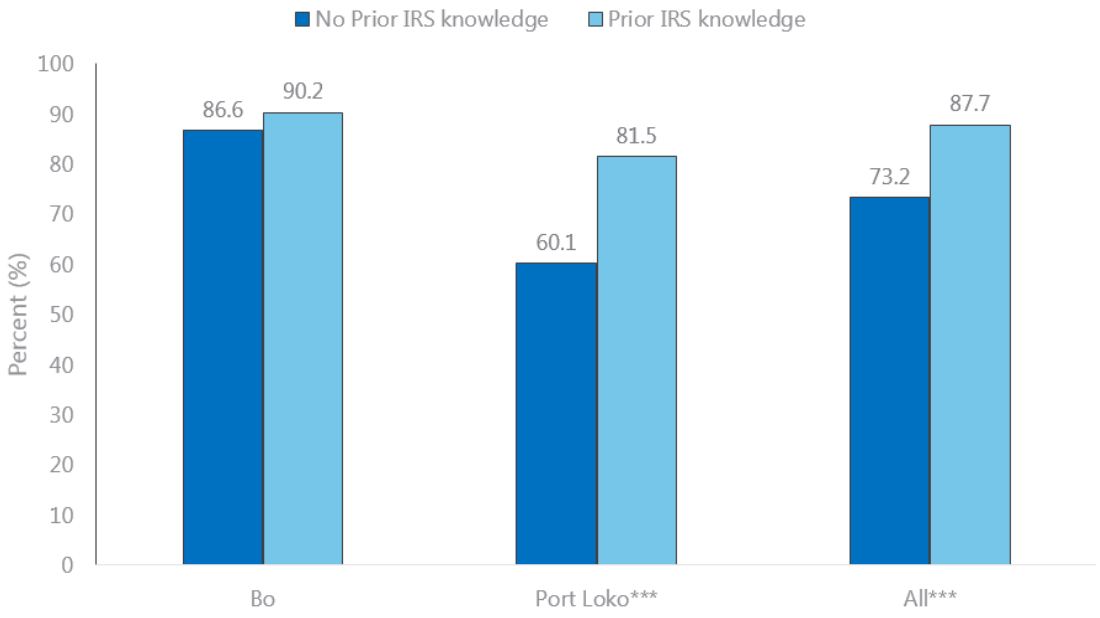
TABLE 3.8.1: RESPONDENTS WITH PREVIOUS KNOWLEDGE OF IRS, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 3,836)		
SOCIO-DEMOGRAPHIC CHARACTERISTICS		PERCENTAGE (%)
Sex*	Men	29.4
	Women	19.8

TABLE 3.8.1: RESPONDENTS WITH PREVIOUS KNOWLEDGE OF IRS, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 3,836)		
SOCIO-DEMOGRAPHIC CHARACTERISTICS		PERCENTAGE (%)
Residence type***	Rural	16.8
	Urban	42.1
District***	Bo	31.7
	Port Loko	15.4
Educational attainment	None	18.4
	Primary	21.3
	Secondary or higher***	33.3
Total		24.4
Adjusted Wald test p-value: *p < 0.05; ***p < 0.001		

Potential Acceptance of IRS

Despite low pre-existing knowledge of IRS, a majority (76.8%) of respondents indicated willingness to use IRS in the future if it is available in the community. The future intent to accept IRS was significantly higher in Bo (87.8%) compared to Port Loko (63.4%) ($p < 0.001$). As shown in **Figure 20**, overall, IRS acceptance was significantly higher among respondents with prior knowledge of IRS (87.7%) compared to respondents who had no prior knowledge (73.2%) ($p < 0.001$). In Bo district, similar proportions of respondents with and without prior knowledge of IRS reported future intention to use IRS, however in Port Loko, a significantly higher proportion (81.5%) of respondents with prior knowledge of IRS reported intentions to accept IRS in the future compared to those without prior knowledge of IRS (60.1%) ($p < 0.001$).

Figure 20: Potential acceptance of IRS among respondents with and without prior knowledge of IRS, by District (%), Sierra Leone, 2019 (N = 3,836)



Adjusted Wald test p-value: *** p < 0.001

Attitudes Towards IRS

Attitudes towards IRS were variable (**Table 3.8.2**). Overall, two-thirds (66.2%) of respondents reported positive attitudes towards IRS. Positive attitudes, however, were disproportionately and significantly reported by a higher proportion of respondents in Bo (84.3%) compared to Port Loko (44.3%) ($p < 0.001$). Nearly three-fourths (75.4%) of informants expressed willingness to have their own homes sprayed during an IRS campaign, however in Bo the proportion was significantly larger (89.1%) compared to Port Loko (58.9%) ($p < 0.001$). Over half of respondents also believed that the benefits of IRS outweighed the efforts required to move furniture outside of the home during spraying (66.1%). Overall, few respondents believed that people develop skin rashes after having their homes sprayed (18.7%) or have problems with insects, bed bugs, or fleas after IRS (15.5%). Conversely, fewer than half (40.0%) of respondents perceived it was safe to touch walls after the spray had dried, but more than half (56.3%) expressed concern about leaving furniture and other possessions outside the home while the walls were being sprayed. Fewer than half (43.0%) believed that IRS would not have any consequences on members of the household, and a similar proportion, 40%, indicated that others in their community had fears about people wearing protective equipment during IRS campaigns. Last, nearly one-third (30.3%) of informants believed that they would not have to sleep under a mosquito net after having their homes sprayed with insecticide.

Compared to women (59.7%), men were more likely to endorse positive attitudes towards IRS (73.2%) ($p < 0.001$).

TABLE 3.8.2: SELECTED MEASURES FOR ATTITUDES TOWARDS IRS (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,836)

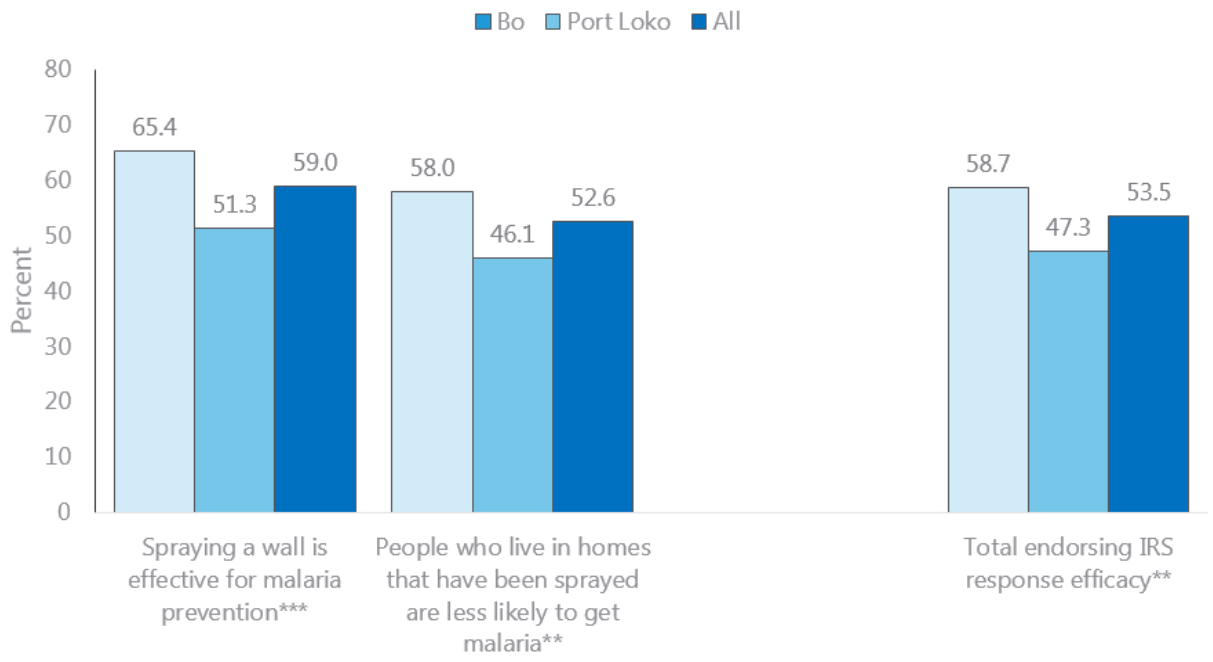
INDICATOR	BO	PORT LOKO	ALL
Many people develop rashes on their skin after the walls inside their houses are sprayed***	12.1	26.6	18.7
It is safe for someone to touch the walls after the spray has dried*	43.7	35.5	40.0
People have problems with insects, bed bugs, or fleas after the walls are sprayed**	11.7	20.0	15.5
The benefits of having my house sprayed is worth the effort needed to move my belongings out***	77.4	52.4	66.1
I would be worried about leaving all of my possessions outside of my house while my walls are being sprayed***	61.3	50.2	56.3
Spraying the inside walls of a house to kill mosquitoes does not cause any health problems for the people living in the house**	48.0	36.9	43.0
There is no need to sleep under a mosquito net once your house has been sprayed	30.9	29.5	30.3
People in this community have fears about people who wear the clothing to protect themselves from the spray they put in our homes***	31.3	50.5	40.0

TABLE 3.8.2: SELECTED MEASURES FOR ATTITUDES TOWARDS IRS (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,836)			
INDICATOR	BO	PORT LOKO	ALL
I would accept to have my house sprayed to help prevent malaria***	89.1	58.9	75.4
Total with positive attitudes towards IRS***	84.3	44.3	66.2
Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001			

Perceived Response Efficacy of IRS

In general, overall perceived effectiveness of IRS was moderate (53.5%). Respondents in Bo (58.7%) endorsed attitudes towards perceived effectiveness at significantly higher proportions compared to respondents in Port Loko (47.3%) (**Figure 21**) (p = 0.0043). Over half of respondents believed that spraying the walls of the house was effective for malaria prevention (59.0%) and that people who live in homes that have been sprayed are less likely to contract malaria (52.6%).

Figure 21: Measures of perceived effectiveness of IRS (%), by District, Sierra Leone, 2019 (N = 3,836)



Adjusted Wald test p-value: ** p < 0.01; *** p < 0.001

There were few differences observed in the perceived effectiveness of IRS across socio-demographic characteristics (**Table 3.8.3**). Respondents with primary-level education (47.1%) endorsed the effectiveness of IRS at significantly lower proportions than respondents with no formal education (57.3%) (p = 0.0043). A higher proportion of respondents with prior IRS knowledge (67.9%), also endorsed measures on effectiveness of IRS compared to respondents with no prior knowledge (48.9%) (p < 0.001).

TABLE 3.8.3: RESPONDENTS ENDORSING PERCEIVED EFFECTIVENESS OF IRS (%), BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 3,836)		
SOCIO-DEMOGRAPHIC CHARACTERISTICS		PERCENTAGE (%)
Prior knowledge of IRS***	No	48.9
	Yes	67.9
Sex	Men	55.2
	Women	52.0
Residence type	Rural	54.6
	Urban	50.9
Educational attainment	None	57.3
	Primary**	47.1
	Secondary or higher	52.0
Adjusted Wald test p-value: **p < 0.01; ***p < 0.001		

Perceived Self-Efficacy for IRS

Three questions measured perceived self-efficacy to take necessary action to support IRS (**Table 3.8.4**). Nearly two-thirds (61.4%) of respondents indicated they could move all their furniture and belongings out of their homes to prepare for IRS. Fewer than half (44%) indicated they could refrain from re-painting or re-plastering the walls of their home for 6 months and up to one year after it had been sprayed, and also sleep in their own homes the night that their homes were sprayed (45.9%). Overall, fewer than one-fourth (23.6%) of respondents reported self-efficacy to perform all three efficacy-related actions related to IRS. For all the indicators of self-efficacy, respondents in Bo district endorsed capacity to take action at significantly higher proportions than respondents in Port Loko, with over twice as many in Bo (30.6%) than Port Loko (15.1%) expressing capacity to perform all three self-efficacy actions.

TABLE 3.8.4: SELECTED MEASURES FOR PERCEIVED SELF-EFFICACY RELATED TO IRS (%), BY DISTRICT, SIERRA LEONE, 2019 (N = 3,836)			
INDICATOR	BO	PORT LOKO	ALL
Move all my furniture and belongings out of my house to prepare the house for spraying***	75.8	43.9	61.4
Not re-plaster or repaint the walls for six months/one year after the spraying***	60.1	25.4	44.4
Sleep in my house on the night it is sprayed***	53.2	37.1	45.9
Total that could perform all three actions***	30.6	15.1	23.6
Adjusted Wald test p-value: ***p < 0.001			

Norms About IRS

Approximately three-fourths (72.3%) of respondents indicated half or more of the households in their communities would accept IRS if available (**Table 3.8.5**). Few differences were observed for perceived acceptance of IRS norms by respondents' socio-demographic characteristics.

TABLE 3.8.5: RESPONDENTS ENDORSING COMMUNITY NORMS RELATED TO UPTAKE OF IRS, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 3,836)		
SOCIO-DEMOGRAPHIC CHARACTERISTICS		PERCENTAGE (%)
Prior knowledge of IRS	No	71.6

TABLE 3.8.5: RESPONDENTS ENDORSING COMMUNITY NORMS RELATED TO UPTAKE OF IRS, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 3,836)		
SOCIO-DEMOGRAPHIC CHARACTERISTICS		PERCENTAGE (%)
	Yes	74.5
Sex	Men	72.3
	Women	72.4
District***	Bo	85.5
	Port Loko	56.4
Residence type	Rural	73.6
	Urban	69.4
Educational attainment	None	77.9
	Primary***	64.6
	Secondary or higher**	69.2
Total		72.3
Adjusted Wald test p-value: **p < 0.01; ***p < 0.001		

Table 3.8.5 above shows that respondents in Bo (85.5%) endorsed community acceptance of IRS at significantly higher proportions than respondents in Port Loko (56.4%). Likewise, perceived community acceptance of IRS decreased significantly by educational attainment, whereas fewer respondents with primary-level (64.6%) and secondary or higher-level (69.2%) education endorsed community norms for IRS compared to respondents with no formal education (77.9%).

Joint Decision-Making for IRS

Among married or cohabiting respondents, decisions regarding the use of IRS in respondent's homes appeared to be made by male partners. Most men (63.1%) reported that they would be responsible for decisions about allowing the walls of their houses to be sprayed by insecticide, and almost half of women (45.2%) reported that the decision to spray their home would be made by their spouses. Fewer than one-third (31.8%) of respondents indicated that they would make decisions regarding the use of IRS in their home jointly with their spouse or partner (**Table 3.8.6**), and a higher proportion of women (37.4%) than men (27.4%) reported joint decision-making (p = 0.0138). No noteworthy differences in joint decision-making were observed across socio-demographic characteristics or districts.

TABLE 3.8.6: JOINT DECISION-MAKING REGARDING IRS AMONG MARRIED/PARTNERED WOMEN, BY SOCIO-DEMOGRAPHIC CHARACTERISTICS, SIERRA LEONE, 2019 (N = 2926)		
SOCIO-DEMOGRAPHIC CHARACTERISTICS		**PERCENTAGE (%)**
Sex**	Men	27.4
	Women	37.4
Age group	15–24 years	31.6
	25–34 years	32.5
	35–44 years	35.2
	45 years and older	26.7
District	Bo	33.0
	Port Loko	30.3
Residence type	Rural	31.5

	Urban	32.6
Educational attainment	None	34.8
	Primary	29.6
	Secondary or higher	28.2
Total		31.8
Adjusted Wald test p-value: **p < 0.01		

Discussion and Recommendations

This section summarizes and discusses key findings from the MBS for each of the malaria prevention interventions (ITN, CM, IPTp, and IPTi, IRS) implemented in Sierra Leone, in the context of underlying behaviors related to the results. Behavioral influences are discussed at multiple levels, primarily at individual, socio-cultural, and services levels.

ITNs

In this section, we discuss ITN related results from the MBS, including behavioral determinants of net use, ITN ownership and use behaviors, predictors of consistent net use, and net care and maintenance. Overall, the results showed high knowledge, acceptance, positive attitudes, self-efficacy, and use of ITNs for malaria prevention in the study area. Significant predictors of consistent net use were high response-efficacy for nets, high self-efficacy to use a net, perceived positive norms around net use, and number of nets in the household.

Behavioral Determinants of Consistent Net Use

Household Ownership of Nets

The MBS showed that the number of nets in the household was a significant predictor of consistent net use. The likelihood of using a net consistently increased by 80% for every additional net in the household. Ownership and availability of nets within households was low within the sampled population. Although almost three-quarters of sampled households had at least one ITN, substantially fewer households (17% overall; Bo: 21%; Port Loko: 13%) had at least one ITN for every two household members. In other words, less than a fifth of households had enough nets for use by all household members. Similar results were derived from the Sierra Leone MIS report (2016) for Port Loko (13.9%) but increased slightly to 27.2% for Bo.

Insufficient nets in the majority of households in the study area (low proportion of households with at least one net for every two people) may be due in large part to the end of the lifespan for some nets distributed during the 2017 net distribution campaign in Sierra Leone. Although few households across both districts had the recommended number of ITNs for all members, the availability of nets was much lower in Port Loko compared to Bo district. Possible explanations for the findings include net misuse, sale of free nets for cash in Port Loko, or not being at home or available during the registration and distribution of nets during the net campaign. In addition, the mobility of Port Loko residents for work and business purposes may have contributed to the relatively lower ownership of nets in this district. According to a study by de Beyl et al. (2016), successful registration of the households was the foremost determining factor for receipt of at least one net from a mass distribution campaign. However, the researchers cited that across 14 countries included in the study, not being present at home was one of the main reasons for non-registration during a mass net distribution campaign.

As described in PMI's 2019 Sierra Leone Malaria Operational Plan, mass distribution of about 4.6 million ITNs was completed by June 2020. This distribution, in conjunction with about 600,000 nets routinely distributed through other channels, is expected to accelerate the achievement of universal net ownership in Sierra Leone and increase the estimate for household ownership of ITNs.

Recommendations

- Increase access to ITNs among households and sub-groups at-risk, by ensuring sufficient time and resources are allocated to communication about household registration and distribution points. This means considering multiple avenues for household registration (more options for places and times), and planning awareness-building activities and dissemination of messages and materials no less than two weeks before the launch of a mass distribution. A focus on communicating with mobile workers in areas like Port Loko will ensure that non-household segments of the population are aware of when and where to obtain ITNs. This might involve prioritizing the use of channels mobile and migrant subgroups are most likely to use (such as ferries and transport hubs) or deliberate alignment of message exposure and human movement.
- Distribution campaigns may consider the inclusion of instructions for net care to improve the durability and effectiveness of nets throughout their expected lifespan to ensure the sustained availability of nets between campaigns. This could take place at distribution points to ensure recipients understand how to use and care for their new ITNs. It may also be beneficial to reinforce care messages two years after distribution, when nets may begin to wear, in order to prolong the lifespan of available nets.
- Include in behavior change communication activities information about misuse or sales of nets obtained during free distribution to help inform behavior change communication strategies to increase net ownership.

Response Efficacy

Perceived effectiveness of nets is an important behavioral precursor to acceptance and sustained use of nets. The MBS showed that positive response efficacy of nets was significantly associated with a 40% increase in consistent net use, a result that is similar (46%) to the estimate from a study in Nigeria (Babalola et al., 2018). In Uganda, a good understanding of the protective effects and benefits of nets (i.e., response efficacy) against malaria increased net use (Acosta et al., 2012). In addition, Sierra Leone MBS results showed that about two-thirds of all participants reported high response efficacy for ITNs, with no differences by sex of the respondent. However, the results identified some factors within the response efficacy index with the potential to undermine this positive finding. Specifically, beliefs prevailed that getting malaria was in the hands of a higher power and that the chance of getting malaria was the same for those who did not use bed nets.

Studies have shown that individual and family experiences with malaria may influence the perceived response efficacy of malaria interventions. For instance, studies report that among those who were not using nets, experience with frequent malaria infection is a stimulus for the use of bed nets, and knowledge or experience of death from malaria is a powerful reinforcer of positive benefits of bed nets (Alorhu et al., 2019: Msellemu et al., 2017; Ernst et al., 2016, Beer et al., 2012). However, other studies have described a high prevalence of malaria among net users compared to non-users of nets (Msellemu et al., 2016), with the potential to influence negative perceptions about the efficacy or protective qualities of bed nets. Perceptions about the poor quality of free nets also may have influenced beliefs about the low effectiveness of ITNs.

In Sierra Leone, a prevailing cultural or perhaps religious belief is that a spiritual power, such as God or Allah for instance, controls and determines one's circumstances, including illness, influencing a general unwillingness among community members to intervene in a matter that they perceive they have no

power over. This external locus of control may influence the perceived response efficacy of nets, leading some to believe that one is at risk of malaria regardless of efforts to protect one's self. In addition, individuals may not be under a net for the full duration of time when mosquitoes usually bite, due to participation in some household, social- and family-related activities. Consequently, to a certain extent, depending on lifestyle, other self-protection measures and behaviors, such as wearing protective clothing, limiting time outdoors at nighttime etc., may be necessary for some in addition to their use of ITN at night. In the context of such beliefs and activities, strategies that increase a sense of empowerment over one's circumstances may strengthen the commitment to act to prevent malaria in the family and community. While structural resources are important to facilitate behavior change intentions, messages are needed to foster beliefs that individuals can have a successful role in preventing malaria infection by using ITNs consistently and correctly.

Recommendations

- Strategies to maintain current high levels of positive perceptions about the benefits of bed nets to help increase consistent net use behaviors. Modeling of behavior with the use of positive deviants may be an effective and concrete method of reinforcing the protective value of consistent ITN use.
- Promoting SBC through community dialogue that focuses on reducing fatalistic attitudes and encourages individuals to take personal responsibility and action for malaria prevention, may be effective in debunking myths that cast doubt on the effectiveness of ITNs. Malaria advocates and champions may also be influential in promoting the benefits of ITNs among community members.
- Explore factors that may increase the exposure of household members to malaria vectors during routine activities in early evening and morning or at times that they cannot be protected by a net, as this reality may also affect perceptions of the effectiveness of nets. Targeted SBC strategies may be developed for these populations or situations.
- Develop messages that encourage personal responsibility for protecting oneself with ITNs.

Self-Efficacy

MBS results showed that overall self-efficacy to use ITNs among respondents was high and that high self-efficacy was associated with a 2.4-fold increase in consistent net use. For women and men, the behavior with the lowest efficacy was the ability to sleep under a net for the entire night when there were a few mosquitos and many mosquitoes. This result is consistent with studies in Mali, Liberia, Madagascar that found varying forms of self-efficacy positively influenced ITN to use (Storey et al., 2018; Babalola et al., 2018; Babalola et al., 2016).

Recommendations

- Reinforce self-efficacy to improve consistent use of ITNs, specifically, by encouraging the use of nets for the entire night and regardless of season or perceived mosquito density.

Descriptive Norms

Overall, there was high acknowledgment regarding the normative use of ITNs within communities. The perception that consistent net use was a norm was associated with an almost two-fold increase in the likelihood of consistent bed net use. Similar findings have been described in several studies across Africa (Storey et al., 2018; Babalola et al., 2018; Babalola et al., 2016). Nonetheless, there also was data

showing that individuals do not use nets due to discomfort from heat, chemical smell, and fears of skin and respiratory reactions.

Recommendations

- Sustaining the perception of ITN use as a community norm will be beneficial to sustaining positive behaviors for malaria control in the community. Designing strategies to reinforce injunctive norms (the perception that behavior is normative even without proof) such as through advocacy and testimonials from respected popular culture, civic, sports, and religious figures. Identifying and involving individual community champions to encourage ITN use within communities may help increase the perception of ITN use as the norm. Establishing champion communities—entire communities that have committed to and proclaim higher ITN use—has the potential to leverage an even higher degree of social influence.
- Further exploration of determinants of net use and non-use, and specifically the barriers to use, may help with the design of specific motivational communication messages that are salient and resonate personally with the experiences of community members.

Additional MBS Findings for ITNs

MBS revealed additional results of relevance to promoting ITNs in Sierra Leone. These included awareness and knowledge, attitudes and beliefs, sources of ITNs, net use behaviors (general, among those with access, consistent net use), and net care.

Awareness and Knowledge of ITNs

In general, the level of awareness of mosquito nets' use as a method of preventing malaria was very high. Programs can build on this success by encouraging sustained and consistent use of treated nets for long-term prevention.

Recommendations

- Promote information and education activities to reinforce the use of treated nets that have both a barrier and mosquito killing properties to create demand for treated nets for malaria prevention.
- A potential strategy for sustaining knowledge within communities and for new generations, is to include information about malaria and the use of ITN in the school health curriculum. Children may be empowered to reinforce malaria prevention behaviors in their homes and hold family members accountable for expected malaria preventive behaviors in households.

Attitudes Toward ITN use

Overall, positive attitudes prevailed towards the use of ITNs (91%), establishing a solid base for community acceptance of ITNs for malaria prevention. However, there remain perceptions about treated nets with the potential to obstruct consistent use. These results revealed barriers to use of ITNs that were consistent with factors identified by other studies conducted in sub-Saharan Africa (Alorhu et al., 2019; Taremwa et al., 2017; Pettifor et al., 2009; Galvin et al., 2011), specifically suffocating heat, irritating smell, skin rashes, and cost of nets. Regarding the color of nets, the MBS showed that most individuals were generally not opposed to using white nets, although some perceived that white nets showed dirt easily (31%) and reminded them of burials (9%). In addition, the results showed that some

believe that expensive nets purchased through retail outlets are more effective than those distributed for free.

Gender-equitable beliefs were prevalent among the sample. However, a substantial proportion still believed that when there are insufficient ITNs, female children should be prioritized over the male child to sleep under an ITN. While results do not support the reverse statement that boys are prioritized over girls to use ITN, caution must be taken to not create gender-inequity by focusing more on either of the sexes.

In Sierra Leone, barriers to consistent use persist among some groups. The success of malaria prevention interventions, including the scale-up of ITN coverage, relies on community perceptions, acceptance, and adoption of malaria prevention interventions, including consistent use of ITNs. To sustain the use of ITNs within communities, communication campaigns need to consider perceptions about ITNs that may undermine acceptance and use and highlight the benefits of ITNs irrespective of the color of net provided for free during a mass campaign distribution.

Recommendations

- Interventions that increase understanding of barriers to sustained and consistent use, including community dialogue, persuasive techniques using cost-benefit scenarios, support, advocacy, special interest groups, and social media, may be effective in fostering positive attitudes towards ITN use.
- Development of SBC materials focusing on year-round susceptibility to malaria may in turn help to change attitudes about seasonable vulnerability and risk and facilitate consistent use of ITNs regardless of the season.
- SBC materials focused on the non-health benefits of ITN use. For example, promoting ITN use to get a good night's sleep or to be perceived as a conscientious individual or parent: someone who cares for and protects their family. Where data indicates this is influential, focus not only on ITN use as a way to avoid danger, but also to obtain personal, psychological, and social benefits.

Sources of ITNs

Overall, this study found that mass distribution remains the main source for ITNs in the study areas, followed by routine distribution through ANC, and to a lesser extent routine distribution through immunization visits. These results are similar to 2016 MIS results and are not surprising, as mass campaigns have been the main channel to deliver ITNs to the population in Sierra Leone for several years. However, there were differences between districts regarding the primary source of ITNs. In Port Loko, routine distribution channels were the primary source of ITNs. This finding may indicate that the more mobile population of Port Loko is not being reached with current mass distribution modalities. It is equally likely that SBC efforts about mass distribution registration and distribution points did not reach mobile populations. This finding also highlights the importance of using routine distribution channels (and SBC to generate demand for these channels) to complement mass distributions.

Ensuring continuous access to ITNs during the COVID-19 epidemic is important in light of anxiety and fear among the general public, precautions that discourage large gatherings such as occur during net distributions, and decreased use of health facilities (where nets also are distributed) for care. Promoting

continuous safe access to ITN distribution points during the epidemic should be considered a part of the ITN distribution strategy.

Recommendations

- An overwhelming majority rely on mass distribution campaigns for nets. Capitalize on this fact to prioritize increasing the reach of mass distribution campaigns (including in communities with mobile populations). This finding justifies significant resources to be allocated to SBC support for mass distributions, ensuring high demand is maintained, especially during and post the COVID-19 pandemic period.
- In Port Loko, SBC support for routine distribution channels may sustain demand among those not reached by mass distributions. In addition, more tailored SBC approaches might be used to reach mobile populations ahead of and after mass distributions.
- Explore the use of supplemental catch-up campaigns to ensure a more widespread and "continuous distribution," including distributing ITNs through structures like schools and through traditional birth assistants (TBAs) and CHWs, in-between mass campaigns to keep ownership high.
- Increase behavior-oriented messaging about the health facility as a source of nets for pregnant women and infants, to encourage pregnant women and caretakers to ask for nets when at the health facility. This will help increase access to nets within a household when new members (births for instance) are added to the family.

ITN Use

The use of ITNs the night before the survey is discussed for household members in general and among those in households with enough nets for all members (among those with access). This section also discusses findings of the MBS related to consistent net use.

Use of ITNs by Household Members

A variable pattern of net use the night before the survey was observed across household member age groups. Results showed that 83% of children under five years of age, 60% of children between the age of five to 17 years, and 78% of adults aged 18 years and older reported sleeping under an ITN the night before the survey. MBS results corroborate findings from other studies that have described relatively lower use of ITNs by older children and adolescents in Sierra Leone (NPC/NMCP/ICF International, 2016) and other African countries (Olapeju et al., 2018; Babalola et al., 2016). However, given that net use rates among school-aged children level out almost entirely when households have enough nets, intra-household supply of nets is likely a key driver (Koenker et al., 2018).

Several factors may account for lower use of nets among older children. Within households in Sierra Leone, school-aged (in, and out of) children are the least prioritized with regards to net use, a common phenomenon that has been reported in other African countries (Olapeju et al., 2018). It also is possible that culturally, there is a lesser emphasis on sleeping arrangements for older children in the household, which puts them at a disadvantage compared to children under five years of age who may still share sleeping spaces with their mothers. Toe et al. (2009) described how sleeping arrangements with their mothers for children under the age of five years offered them direct protection against mosquito bites and prevented crying at night and cited this practice as one of the possible explanations for increased net use among this age group in rural Burkina Faso. In addition, net distribution services also may influence low net use among older children. In some countries there has been a lower priority to provide

nets directly to school-aged children and adolescents compared to children under five years of age and pregnant women (Stuck et al., 2017; de Beyl et al., 2017). Together, these factors may have contributed to the lower use of nets among older children and adolescents.

Mobile populations' use of ITNs when traveling has room for improvement. About one-third of the MBS participants reported that they had slept under an ITN consistently when they slept away from their home or traveled, indicating increased risk among some who sleep away from their home. Mobile workers also are less likely to have access to needed malaria treatment services when traveling, further increasing their risk of poor health outcomes.

Recommendations

- Interventions and messages that promote universal coverage with nets within households should be encouraged to reduce the proportion of the population without access to nets. As most nets are obtained via distribution campaigns, the use of SBC to increase access should be focused on activities individuals can perform, including encouraging household registration, showing up to distribution points, attending ANC and routine immunization, for instance.
- In several countries, positive spousal communication about ITNs was correlated with higher rates of ITN use. Program planners should consider designing materials, or community mobilization approaches, with a focus on initiating partner dialogue about ITN use.
- In addition to routine distribution channels, school-based programs may improve ITN ownership and access.
- While there are ongoing interventions to target school-aged and school-based children, efforts to increase ITN use must also include the out-of-school youth.
- Developing SBC materials that target sub-groups that do not always sleep in their households should reach all at-risk groups in the population.
- SBC to promote consistent use among mobile populations at points of travel, such as transport hubs, plantations, and marketplaces, may increase the reach and robustness of malaria prevention interventions.
- Radio and mobile public service announcement vans at transport hubs and ferries, plantations, and mining communities where there are mobile workers may be appropriate approaches for reaching mobile populations with malaria prevention messages
- Conduct advocacy to encourage employers of mobile workers to supply them with ITNs to decrease sick time and missed work.

ITN Use Among Those with Access

Overall, the MBS showed an excellent culture of ITN use among household members with access to nets. The population use:access ratio was greater than 1.0 in both districts (Bo district at 1.1 and Port Loko district at 1.2). A population net access ratio greater than 1.0 indicates that the majority of individuals with access to nets used the nets and that more than two individuals usually shared a net. This result is similar to estimates in the VectorWorks ITN use and access report (Koenker H. et al., 2018), which showed an overall use:access ratio for Sierra Leone of 1.04 according to data from 2016 MIS. While this, nevertheless, is positive behavior for malaria prevention, the proportion of the population with access to ITNs within households remains below Objective 2a of the national control strategy to provide access to 100% of the population at risk with preventive measures as described in the 2017

PMI/Sierra Leone Malaria Operational plan (GOSL MOHS, 2015). Net use given household access among age groups levels out when there are enough ITNs.

Recommendations

- Increasing access to ITNs in all households will be key to sustaining ITN use among those with access. This can be achieved by ensuring clear and actionable communication about household registration and the time and location of distribution points or routine channels, and by disseminating net care messaging to extend the effective lifespan of distributed ITNs.

Consistent Net Use

Consistent net use is a key outcome behavior for malaria prevention programs and a measure of sustained behavior change and new norms. The MBS assessed behavioral determinants associated with consistent net use within the study population. Significant predictors of consistent net use in the week prior to the survey included community-level factors such as rural location and Bo district; household-level factors such as higher household ITN ownership, smaller household size, possession of screened windows; and individual-level factors such as high self- and response efficacy for ITNs, and perceptions of ITN use as the norm.

ITN availability and household size

Existing literature is consistent about the positive correlation between net use and the number of nets within the household as well as the negative relationship between net use and household size (Fokam et al., 2017; Babalola et al., 2016; Kateera et al., 2015; Deresa et al., 2014). The MBS found that ITN use increased with increasing household ownership of and access to ITNs. Results showed that every increase in the number of nets within households was associated with an almost two-fold increase in consistent net use, while every increase in the number of people in the household was associated with a 5% decrease in the odds of consistent net use. These results underscore the necessity of interventions that supply households with enough nets across both districts.

Recommendations

- Interventions that increase ownership of nets and enable all households to avail themselves of the opportunity to receive enough nets is key. Special attention should focus on working with malaria IPs to design innovative solutions and related SBC materials for larger households with limited sleeping spaces where bed-sharing and sleeping in other places (e.g., chair, floor) are common.

Net Care

Correct net care has been shown to extend ITN lifespan and longevity (Koenker et al., 2015). Net care was primarily defined as gently washing nets with mild soap, drying nets in the shade, and tying or folding up the net over the sleeping space when it is not in use. A key result from the Sierra Leone MBS was that, overall, net care recommendations were not correctly followed. Specifically, nets were not suspended, folded, or tied when not in use, and were also washed and dried inappropriately. Individual, socio-cultural, and environmental factors may account in part for poor net care practices.

Individual factors potentially influencing poor net care behaviors in Sierra Leone may include lack of knowledge about the appropriate care of nets, lower perceived value and effectiveness attributed to free nets, the type of net used, and not feeling compelled or motivated to complete on a daily basis the recommended tasks for storing bed nets. In Sierra Leone, there has been less emphasis on

communication regarding the care and storage of bed nets compared to the acquisition and use of the net; this includes knowledge of the effect of harsh soap and direct sunlight on the chemical properties and effectiveness of the net, frequency of washing, what constitutes mild soap, and correct drying and storage of nets. In addition, any instructions on net care that accompany net packaging are usually disposed of when the net is in use, and also may not be useful for groups with low reading literacy.

Daily net care may not be perceived as a priority in the day-to-day activities of low-income families, and laziness and personal negligence were cited as reasons for improper net care in several studies (Mboma et al., 2018). Studies have shown that the source of a net may influence its perceived value or worth and correct care; free nets distributed through national campaigns were perceived to be cheap, less effective, and were valued less than store-bought nets (Moscibrodzki et al., 2018; Ernst et al., 2016).

Discussions about the results with the malaria community in Sierra Leone identified socio-cultural beliefs about cleanliness and community washing practices as potential factors influencing net care practices. This belief is consistent with findings from a study in Tanzania (Mboma et al., 2018). In Sierra Leone, people typically wash their laundry together without sorting by items, for economic reasons and possibly also due to a lack of knowledge about varying wash behaviors by color and fabric. In addition, socio-cultural norms equate cleanliness with white color, coupled with beliefs about the power of certain soaps to clean laundry more effectively, influence vigorous washing of nets with harsh soap shortly after purchase, and more frequently needed during its lifespan. Limited shaded community spaces were also identified as a reason for drying nets in the sun rather than shade. Beliefs about the bleaching properties of the sun may influence practices of drying nets in the sunlight for enhanced cleaning rather than in a shaded area to protect the insecticide.

Recommendations

- SBC promoting appropriate net care should be paired with communication about consistent net use before, during, and after mass distributions. SBC materials that provide clear guidance on appropriate net care should be included in distribution campaign activities and continue after distributions end to reinforce consistent net care behaviors
- Develop opportunities that aim to increase public confidence in the effectiveness of ITNs, regardless of source
- SBC materials that provide clear guidance on appropriate net care should be incorporated into planning for distribution campaigns and continue after distributions end to reinforce consistent net care behaviors with periodic reminders

In summary, SBC promoting ITN care should be paired with efforts to encourage year-round net use. This messaging should be tailored to norms related to cleanliness and sensitivity to the needs and expectations of those responsible for hanging, washing, and caring for ITNs.

Care-Seeking and Treatment of Fever in Children Under Five

Prompt and appropriate care-seeking, diagnosis, and treatment of malaria are the cornerstones of successful malaria control programs, with direct implications for malaria morbidity and mortality. In this section, we discuss the results for seeking care, diagnosis, and treatment of malaria at health facilities focusing on behavioral determinants of prompt care-seeking for fever in young children. Other important findings of knowledge of, and barriers to effective diagnosis and treatment, and insights

about CM from implementing partners also are discussed. **Overall, the predictive correlates for prompt care-seeking were residing in an urban area, having positive attitudes towards prompt care-seeking, high self-efficacy to seek treatment promptly, and among women in union, discussing malaria with spouse or partner.**

Behavioral Determinants of Seeking Prompt and Appropriate Care

Urban Location

Urban residence was negatively correlated with prompt care-seeking at the health facility. Survey results found that urban residents were 67% less likely to seek care promptly for fever in children less than five years of age than rural residents. The existing evidence on the relationship between residence and care-seeking behaviors in Sub-Saharan Africa is variable. The Sierra Leone MBS had results that are similar to findings from Ethiopia (Mtiku & Assefa, 2017) and Uganda (Nabyonga et al., 2013), but contrary to other findings that showed caretakers from rural areas were less likely to seek care for febrile children compared to caretakers in urban areas (Johansson et al., 2014; Romay-Barja et al., 2015; Romay-Barja et al., 2016). A possible explanation may be that urban residents have better access to pharmacies and drug shops and may tend to self-treat illness prior to seeking care at health facilities. Private-sector initiatives to expand ACT access in pharmacies also may have influenced this finding. Nevertheless, implementing partners described that urban areas of Sierra Leone had increased numbers of unauthorized service providers with alternative ineffective treatments and cheaper costs. In addition, members of the malaria community in Sierra Leone believed that the hectic business life in urban areas and the long wait times at some health facilities might discourage caretakers from going to health facilities, and rather encourage them to first self-treat illness in the family. Alternatively, increased program focus in rural areas of Sierra Leone also may have influenced more prompt care-seeking for fever and may be a testament to the success of current program efforts.

The current COVID-19 pandemic may further compound prompt care seeking behaviors when individuals are hesitant to use health facilities and be around sick individuals. Individuals with fever may not know if the fever is due to COVID-19 or malaria and may be afraid to visit the health facility or let others know about their illness because of stigma or other reasons, especially in a post-Ebola setting. Such COVID-19-related and other delays in care-seeking may influence spikes in severe malaria cases and deaths.

Additional qualitative exploration may be needed to understand better the factors negatively influencing prompt care-seeking for malaria.

Recommendations

- SBC should be tailored to reach and influence urban residents in Sierra Leone more effectively. While all residents may benefit from messages encouraging prompt care-seeking, these data indicate that SBC focusing on urban residents should be prioritized.
- SBC programming and materials that convey clear benefits from prompt care-seeking may be useful motivators for expected behaviors. Dialogue through community health committees and advocacy and women's groups also could help reinforce appropriate behaviors.
- National and local programs should reaffirm messaging around prompt care-seeking in the context of COIVD-19 including reassuring the public about safety precautions at health facilities.

- A better understanding of the factors that influence caregiver decisions first to treat fever in children at home may be helpful, especially among (but not limited to) those residing in urban areas. Consideration of standardized procedures for fever management and malaria advice given through pharmacies, drug stores, and informal drug retail outlets (with close supportive supervision) may also help to extend quality services to those unable to get to health facilities, as when engaged appropriately, these shops have potential to contribute to early identification and treatment of malaria cases in Sierra Leone.
- Capitalizing on CHWs and activities and other outreach initiatives that include community-based malaria case identification and rapid diagnostic testing to include safe dispensing of pre-packaged medications for fever management among individuals with confirmed malaria, i.e., a positive rapid diagnostic test (RDT).

Positive Attitudes

Overall, positive attitudes prevailed (96%) regarding prompt care-seeking for fever in children, with little variation between sexes. There were significant differences by district (Port Loko: 93%; Bo: 98%). **MBS results showed that caregivers with positive attitudes towards seeking care promptly for fever in children were 3.6 times more likely to do so**. Similar findings were observed in studies from Rwanda (Ingabire et al., 2016) and Nigeria (Do et al., 2018). Implementing partners described efforts to repair relationships between communities and health systems in the post-Ebola era that may, in part, have influenced this result. While the Sierra Leone MBS survey results found that respondents approve of the quality of care at health facilities, there is no finding related to availability or accessibility of services or commodities.

Recommendations

- SBC materials designed to sustain the current high level of positive attitudes towards prompt care for fever in children is encouraged as this links to quick use of health services. SBC for demand generation should be paired with quality services and available commodities, i.e., reliable supply chains (as creating demand for unavailable services only undermines trust in the health system) to help create positive experiences at, and attitudes about, the health system.
- During the Ebola virus crisis, many Sierra Leonians refrained from going to health centers, and issues with mistrust between communities and health workers were widespread. If and where data suggests this relationship has not been sufficiently re-established (or where COVID-19 transmission raises similar issues), community mobilization activities that initiate positive feedback loops between health centers and the communities they serve may prove beneficial. This should involve close coordination with implementing partners responsible for service provision. One promising practice is sharing facility-level data with communities in the catchment area. Facility-community discussions about increases or decreases in malaria cases may lead to increased trust and improved relationships with health workers.

Self-Efficacy for Seeking Care Promptly

Self-efficacy for prompt care-seeking was translated into action among caregivers in the sample. **Caregivers with high self-efficacy to seek prompt care were more than four times as likely to take their child with a fever to a health facility within 24 hours of the onset of fever.** While self-efficacy is well documented in the literature as a correlate of preventive behaviors and obtaining treatment, there is limited evidence in the literature regarding self-efficacy of caregivers to get to health facilities promptly. This is an important new finding with key insights for programming and additional research.

Recommendations

- Continually assessing and maintaining individual efficacy to seek care promptly has the potential to influence demand for care at health facilities, and timely diagnosis and treatment of malaria in children under five years of age. Community health workers can be trained in interpersonal communication and taught to assess household attitudes regarding prompt care-seeking for fever.
- Increasing caregiver perceived self-efficacy to complete prompt care-seeking should be in concert with health system supports, including drug supply chains, to meet increased demand. This is increasingly important within the context of COVID-19 when individuals may be hesitant to make trips out of the home and to visit health facilities where there are sick people. COVID-19 precautions also may disrupt normal supply chains and health facility operations. Health providers may facilitate supplies being available by being proactive in estimating needed drugs and RDTs and ensuring they are restocked ahead of seasonal peaks in malaria prevalence. This may involve working with PMI program partners to design processes that support a consistent supply of drugs. In Sierra Leone, SBC implementing partners should focus efforts about prompt care-seeking for fever in areas where RDTs and ACT are readily available to meet increased demand.
- Focus SBC materials on the availability of free malaria diagnosis and treatment might mitigate the total cost (reduced to just transportation costs) and motivate more caregivers to seek care.

Discussions with Spouse/Partner

Existing literature also shows that health discussions with spouses and or partners are correlated with not only knowledge of health but also behavior change, including prompt care-seeking for fever (Cavanati et al., 2016). MBS results demonstrated that discussions about malaria among couples were positively correlated with prompt care-seeking at health facilities: **caretakers who had malaria-related discussions were three times as likely to seek care promptly for fever in a young child, compared to those who did not have discussions.** Discussions have been shown to be influential to other aspects of malaria prevention programming (Awantang 2018; Babalola et al., 2016; Killian et al., 2016; Babalola et al., 2015), and additional exploration is needed to confirm associations with prompt care-seeking. A caregiver's autonomy in decision making has been shown to influence healthy behaviors positively.

Recommendations

- To be effective, SBC efforts should promote discussions about prompt care-seeking between spouses and families, and at health facilities. There should be increased involvement of men in promoting the importance of care-seeking and joint decision-making.
- Dialogues about the benefits and consequences of early versus delayed care-seeking may positively influence prompt care-seeking by caretakers.
- Gender transformative approaches that create space for safe spousal communication may also be appropriate ways to initiate these conversations.
- Dialogue that aims to increase caregiver knowledge of the severity of and susceptibility to malaria, efficacy to act appropriately, and advocacy for malaria treatment for children may help to increase early and appropriate care-seeking by caregivers.

Additional MBS Findings for Seeking Care

The Sierra Leone MBS revealed other results of relevance to influencing prompt care seeking behavior. **These include response efficacy for diagnostic testing and for treatment of fever, health worker behaviors regarding treatment of malaria, and caregiver perceptions of health workers providing malaria-related services.** Each of these is discussed below with summary recommendations at the end of the sub-section.

Testing and Treatment of Fever in Children

MBS results identified other relevant behaviors to seeking care for malaria, specifically fever management at home, provision of malaria medications at health facilities, response efficacy for malaria testing and treatment, treatment-costs, and caregiver perceptions of health workers.

Of note, in both districts, caregiver attitudes endorsing self-medication before seeking facility-based care prevail. A sizable proportion (41%) of caregivers support administering any malaria medications at home when their child has a fever. More than a third of participants (and more women than men) believe that children with fever should be treated with malaria drugs regardless of the result of an RDT, a belief with the potential to influence self-treating fever in the home. Consistent with these results, other research has shown that it is common for caretakers to treat children at home before seeking care from a health facility (Mpimbaza et al., 2019; Mtiku & Assefa, 2017; Lovelyn, 2016; Graz et al., 2015). This is an important finding as home management of fever in children was negatively associated with care-seeking and timely care-seeking (Lungu et al., 2020).

The Sierra Leone MBS provided information on the response efficacy of CM interventions, an area that constitutes a gap in the current evidence base for CM. The results showed that reported diagnostic testing for malaria at health facilities was high (79%). However, there were significant differences at the district level (Bo: 90%, Port Loko: 68%), indicative of a need for increased supportive supervision in Port Loko or an assessment of their supply chain. In the context of COVID-19, given the similarity of some symptoms with malaria, and that malaria can coexist with many other infections, including COVID-19 infection, confirming malaria infection with a diagnostic test remains a critical component of malaria CM. Health facilities should be supported with adequate supplies of test kits to continue to diagnose malaria cases.

The perceived effectiveness of diagnostic testing for malaria at health facilities was high. While the overwhelming belief among those surveyed is that a blood test is a gold standard for knowing if a person has malaria, the perceived accuracy of the test may influence individual preferences and decisions related to malaria treatment. Specifically, the MBS showed that some participants believe that even when the diagnostic test results for malaria are negative, the person with the fever still should take malaria medication. Evidence from other countries suggests that both service provider self-image (desire to make clinical diagnostic decisions based on experience), and client expectations for medicine (regardless of test result) are factors that often drive provider behavior to overprescribe (Cundill et al., 2015; Chandler et al., 2014). It is necessary to include service provider behavior change interventions to increase the perceived accuracy and effectiveness of, and consequently, faith in, malaria rapid diagnostic testing.

The response efficacy of malaria treatment yielded interesting results. While there was almost universal agreement that malaria medicines obtained from health facilities were effective, almost half of the survey respondents believed that malaria medicines obtained from the market were just as good as those from the health facility. In addition, some also believed that herbal treatments from the traditional healer also were just as good as treatment from the health facility.

Additionally, reported experiences indicate that health workers may not consistently prescribe ACT for confirmed malaria in children. Less than half of the confirmed malaria cases overall received ACT (41%), and even fewer, especially in Bo, received the first dose of malaria medicine within 24 hours of fever. Implementing partners identified distance to health facilities, drug stock-outs, and inability to pay for drugs prescribed for purchase at drug stores as potential reasons for delays in administering the first dose of malaria medicine.

Caregiver perceptions about health workers' ability to care for malaria patients were overwhelmingly positive. However, many caregivers reported fees were charged for services rendered. Fee-based services have deterred the use of health care services (Klein et al., 2016). This result may be a structural barrier to early and appropriate care-seeking as fewer participants reported having efficacy to act on behaviors related to payment for transportation and treatment when a child had a fever, relative to the other behaviors in the index.

The odds of prompt care-seeking increased with increased level of education (OR: 1.34, SE: 0.55) and **increasing number of children under the age of five years in the household (OR: 3.30**, SE: 2.02), however these were not significant results. The small sub-sample and lower power for this outcome may have influenced the results.

Additional Recommendations

- Explore factors (e.g., facility, health worker, client, supply chain) that may influence low rates of early malaria for confirmed cases of malaria at health facilities. A better understanding of the issues faced by providers during the CM of malaria may help with implementing strategies to increase compliance with recommended clinical standards for diagnosis and treatment of malaria.
- Stock levels for drugs and other supplies at the health facility may need to be re-assessed periodically to be more aligned with changing malaria incidence. Supportive supervision for health workers may help to reinforce expectations for drug dispensing to treat malaria.
- Develop strategies to increase the quality of services and health workers' willingness to follow national diagnosis and treatment guidelines for malaria. Testing for malaria is especially important within the context of COVID-19 to confirm the source of fever and provide prompt and appropriate treatment for either cause. SBC interventions that frame adherence to national diagnosis and treatment guidelines as modern, and a sign of quality services and professionalism, may be attractive motivators for health workers. Data sharing and discussion among different district administrators can leverage social influence and motivate providers to adhere to guidelines. These interventions should be paired with client-focused messaging that models appropriate health facility diagnosis and treatment. Collaboration with PMI implementing partners, such as IMPACT malaria, CHWs, and community leadership could provide opportunities to advance these activities.

- Improved interpersonal communication skills of health workers and clarity of messages about acceptance of blood test results for caregivers is needed. Improved communication between health workers and patients also may increase understanding about malaria treatment and in turn positively influence compliance with treatment regimens among community members.
- Developing clear guidelines for health workers and communication for the general public about malaria-related diagnosis and treatment costs at health facilities. Publicizing and clarifying the national policy for health service costs for malaria may empower the public and help to reduce instances of unwarranted fees for malaria services and medication.
- Supportive supervision of health workers at PHUs and CHWs may help to ensure adherence to guidelines specific to blood test results, costs are appropriate, and that positive perceptions of health workers are not undermined.
- Existing literature suggests that traditional healing remains the first port of call for many Liberians. While this may be related to structural issues, there are SBC approaches that can mitigate this behavior. For example, working with traditional healers to ensure prompt febrile patient referral simultaneously respects tradition and promotes modern medicine.

ANC/IPTp-SP

Malaria in pregnancy is of great concern to the health of mothers and unborn babies and is a priority for malaria prevention programs. Key issues regarding behavioral determinants for the use of IPTp included knowledge, attitudes towards point-of-treatment services, perceived community norms for ANC/IPTp-SP, and decision-making about ANC and IPTp.

Significant predictors for pregnant women receiving three doses of IPTp-SP were the number of ANC visits, knowledge of required SP doses, high self-efficacy to use SP, and community norms.

Behavioral Determinants of IPTp-SP

ANC Visits

The MBS showed that attending four or more ANC visits were positively associated with receiving three doses of IPTp-SP. ANC presents an opportunity to capture women at risk of malaria with malaria prevention interventions.

Recommendations

- Increase availability of SBC resources in facilities for ANC and IPTp interventions including guidelines and job aids for health workers, to support early initiation of IPTp-SP among pregnant women and reduce missed opportunities to provide malaria prevention.
- Increase community-based interventions for IPTp-SP, including activities that target men to support early ANC attendance, by integrating into outreach for ANC to support greater emphasis on the prevention benefits and mitigate perceptions that it is a treatment for an illness.
- Harmonize ANC and IPTp-SP messages to increase women's knowledge of the comprehensive package of essential maternal care for pregnant women. Community engagement to empower women to proactively seek IPTp-SP by addressing misconceptions of the purpose of IPTp-SP may motivate more women to act on their knowledge.

Knowledge of IPTp-SP

The MBS revealed that knowledge of IPTp-SP was an important area that required additional focus. **Women with knowledge of the recommended number of doses of IPTp-SP to take to prevent malaria during pregnancy were almost three times as likely to have used IPTp-SP during their last pregnancy compared to women who did not have this knowledge.** This is consistent with other studies that show that knowledge of IPTp-SP is positively associated with acceptance and uptake of IPTp-SP in several studies (Ayubu et al., 2017; Amoran et al., 2012; Arulogun & Okereke, 2012). Of note, the MBS also showed that knowledge that women should receive preventive treatment for malaria three times during pregnancy was very low overall, and for groups by sex, residence, and education status. Knowledge is important for mitigating common misconceptions that prevent women from seeking treatment in pregnancy, including concerns about using medication in pregnancy, taking drugs on an empty stomach, and fear of adverse effects of IPTp-SP medication (Roman et al., 2019). Conversely, women may be reluctant to receive medication for an illness they do not have (Ayubu et al., 2017; Diala et al., 2013) and need information about the purpose of IPTp-SP.

Recommendations

- Implement knowledge-building activities for timing and number of ANC visits, prevention of malaria during pregnancy, and recommended number of IPTp-SP doses, among men and women.
- Coordinate messages with reproductive health departments, technical working groups, and implementing partners who are providing facility-based quality improvement interventions for malaria prevention (supply chain, health worker capacity and performance, SBC resources and tools development, supportive supervision) to increase knowledge among pregnant women and capacity of facilities to meet increased demand.
- Explore options for community engagement that promotes, and as possible delivers, IPTp-SP. For instance, programs may consider training CHWs in interpersonal communication skills and develop conversation guides that outline key talking points about early and frequent ANC attendance, taking IPTp-SP in the community should not be a substitute for ANC.

Self-efficacy to Use IPTp-SP

Women with high perceived self-efficacy to take three doses of IPTp-SP were more than twice as likely to have taken three doses of IPTp-SP during their last pregnancy. Overall, women's perceived efficacy to complete three doses of IPTp-SP was low, with less than a quarter of women reporting efficacy to complete all actions in the index. There is a gap in the current literature on the self-efficacy of pregnant women to take all doses of IPTp-SP. The MBS contributes to new information in this area. Making four ANC visits, transportation costs, and the **ability to request the medication from providers were key variables negatively influencing overall perceived self-efficacy.** Implementing partners also described that perceived side-effects of IPTp-SP were a common reason for the inability to complete the medication.

Recommendations

- Develop interventions for improving women's confidence to request and take IPTp-SP through services provided by CHWs and TBAs, and simulation through drama.

Community Norms About IPTp-SP

Caretakers who perceived that taking IPTp-SP when pregnant was the norm in their community were almost twice as likely to receive all doses of IPTp-SP during their last pregnancy. Communities appear poised to support and advocate for IPTp. Overall, many women believed that having more than four ANC visits (76%) and taking medicine to prevent malaria during pregnancy (80%), were norms in their community. Studies have shown that community norms were positively related to the intention to practice healthy behaviors (Asingizwe et al., 2019; Babalola et al., 2018), meaning when community members use and accept malaria preventive measures such as ANC and IPTp-SP, then it is more likely that most of the people in the same community will intend to use those measures consistently. Group ANC, an approach that involves multiple women attending ANC together, showed significantly higher IPTp-SP uptake among the intervention arm and concluded that Group-ANC might support better IPTp-SP uptake, possibly through group norms influencing better ANC retention (Noguchi et al., 2020).

Recommendations

- Highlighting existing levels of behavior around malaria in pregnancy has the potential to change perceptions about community norms. Engaging community leaders such as religious leaders, local group leaders, health committee leaders, and men's groups as champions for IPTp-SP may motivate more women to participate in these behaviors.
- Explore possibility of group ANC programs, to reinforce ANC attendance and use of IPTp-SP as a community norm and increase women's agency to advocate for receive IPTp-SP.

Level of Education

MBS results showed that education level was inversely associated with taking IPTp-SP. Several other studies have found similar results about the relationship of education to the uptake of IPTp-P (Buh et al., 2019; Yaya et al., 2018). The reason for this is unclear from the data and may be related to ANC visits; specifically, the knowledge that pregnant women need at least four ANC visits trended negatively with education, which was statistically significant. This has the potential to create missed opportunities to capture more educated women. Conversely, more educated women may have more information about drugs (side effects, interactions) that makes them hesitant to accept IPTp-SP. It may also be that more educated women live in urban areas where there are other options to obtain IPTp-SP such as from pharmacies or private health facilities.

Recommendations

- Additional exploration and understanding of the needs and preferences of educated women and how these factors may influence their participation in malaria prevention and maternal health programs are needed.
- Increased attention to subgroups with higher education (including in urban areas) should be considered. SBC interventions, approaches, and/or focus that communicates about the urgency and benefits of early ANC attendance in ways that respect and mitigate barriers to these kinds of discussions, among more educated women of reproductive age, may offer program insights.

Additional MBS Findings for Use of IPTp-SP

Other findings from MBS related to ANC and the use of IPTp-SP were attitudes and beliefs, knowledge of the timing of ANC, poor involvement of male spouses or partners in ANC. Each of these is discussed below with summary recommendations at the end of the sub-section.

Attitudes and beliefs about IPTp-SP

Positive attitudes towards IPTp-SP overall were moderate with room for improvement. Fewer women had positive attitudes towards taking SP compared to men, and this might be related to perceived side-effects or beliefs that IPTp-SP cannot be taken on an empty stomach. Side-effects of SP are cited in the literature as a barrier to completing IPTp-SP doses (Aziz et al., 2018). Discussions with the malaria community in Sierra Leone also identified side-effects of IPTp-SP as a common reason for women's negative attitudes and reluctance to take the medication.

Timing of ANC Visits

Overall, about two-thirds of participants knew that women should have their first pregnancy consultation with the health worker in their first trimester, with significantly more men than women having this knowledge. A similar overall result was evident for knowledge of the number of recommended ANC visits, however significantly more women than men knew that the pregnant woman should have at least four ANC visits during pregnancy. While more men knew that ANC visits were important during pregnancy, they lacked knowledge of how many ANC visits are recommended. This was true overall and, in both districts, has the potential to be a structural barrier for women who may need permission or financial resources from their spouse or partner to visit the health facility.

Decision-Making

Most decision-making about ANC/IPTp-SP was done by the woman alone, and joint decision making overall was low. A study in Nigeria found IPTp uptake was higher in households where both partners understood the benefits of ANC and IPTp-SP (Aregbeshola & Khan, 2017), underscoring the need to increase spousal communication and mutual decision-making about maternal care and IPTp-SP.

Additional Recommendations

- Interventions to bridge the gap between ANC visits and uptake of IPTp-SP will help decrease missed opportunities for increasing IPTp-SP coverage among pregnant women. Messages about the safety of drugs during pregnancy might be beneficial to increase positive perceptions about IPTp-SP and IPTi. This should be supported by reliable supply chains for drugs to meet increased demand.
- Increase the interpersonal communication skills of health workers to talk about managing potential side effects of IPTp-SP, and work with partners to develop SBC materials on side-effects.
- Interventions to initiate shared dialogue on malaria between spouses and partners and within communities. SBC interventions that target men is an important intervention as well-informed and supportive men encourage their wives to get complete and regular ANC.
- Community-level interventions that promote dialogue, encourage male involvement, and capitalize on men's knowledge and higher perceived efficacy to complete IPTp may support increased uptake of IPTp-SP among women.
- Overall, deeper audience segmentation to understand the behavior profiles and needs of subgroups within the population of individuals of reproductive age may be useful for designing targeted SBC interventions for IPTp.

Malaria Prevention in Infants (IPTi)

Sierra Leone implements a malaria prevention program for infants involving the administration of three doses of malaria prevention medication through the expanded program for immunizations, at health facilities. MBS results showed that caregivers' knowledge of the recommended dosage for IPTi and positive attitudes towards IPTi were low. This may, in part, be influenced by the relatively short time since the 2017 pilot and 2018 scale-up of the IPTi malaria prevention program in Sierra Leone (GoSL MOHS, 2015). The results contrast with earlier findings from five African countries showing largely positive attitudes towards IPTi (Gysels et al., 2009). The review concluded that IPTi could only be considered completely effective if it is also socially and culturally acceptable.

Less than half of the women who had children who were less than a year old believed that IPTi medication was available at the health facility. However, among those with direct experience accessing malaria preventive and treatment services, including drugs, a higher proportion reported the availability of the medication (85%). Among caregivers accessing IPTi services at the health facility, almost all reported that the health worker offered IPTi to their children, however less than half of caregivers reported that they were provided information about what to expect or anticipate (such as side-effects) when administering it to their infants. This has implications for completion of preventive treatment regimens. There also were missed opportunities to increase IPTi coverage among young children. In cases where women were offered the IPTi to administer at their discretion, only 12.6% reported giving their infant the medicine.

Recommendations

- Information for the general public about the need for and benefits of malaria prevention in children should be considered part of a national campaign. Capitalizing on general concern for infant health and good motherhood may increase women's acceptance of and participation in IPTi interventions.
- Increasing knowledge of the availability of drugs and working to manage consistent supply within the health facilities may help decrease the use of inappropriate sources to obtain malaria-related medications.
- Clear expectations on procedures for administering IPTi need to be communicated to health workers and community members. Supportive supervision of health worker behaviors may facilitate increased administration of IPTi and improved interpersonal communication regarding how providers talk about and offer IPTi to families to increase compliance and completion of the preventive treatment.
- Research to explore the community perspectives of IPTi as a malaria prevention intervention may help to identify and also increase understanding of the factors that promote completion of recommended IPTi medication.

IRS

Overall knowledge of IRS was low at less than a quarter of the sample. This is likely related to the lengthy-time interval since the last implementation of the IRS strategy. Those with prior knowledge and prior experience with IRS were more likely to accept IRS for their home. Despite low pre-existing knowledge of IRS, many respondents indicated they were willing to use IRS in the future if it was

available. This shows the environment in Sierra Leone is conducive to this malaria prevention strategy. Overall a moderate proportion of the population had positive attitudes towards IRS. Estimates were generally lower in Port Loko compared to Bo district, and this may be explained in part by Port Loko not being included in the IRS pilot activity in 2011. There were safety and other issues of concern specifically, fears related to the use of PPE by sprayers; safety of the spray used on walls, and potential health hazards from exposure to the spray, and difficulty moving possessions outside the house during spraying. Preparatory interventions and dialogue with men are important considerations for promoting IRS, as in many of the homes, the decision to have the home sprayed or not was made by the man.

Recommendations

- Given the lengthy duration of time since the implementation of the IRS strategy in Sierra Leone, public education may help facilitate the re-introduction of this strategy for malaria control.
- Interventions, including activities that target men, are necessary to help alleviate concerns and increase the support for IRS. Framing IRS as an additional rather than an alternative malaria prevention measure may increase the acceptance of IRS among the population.
- Include in the IRS campaign, educational activities designed specifically to sustain ITN among those who accept IRS.
- About 10 years have passed since the last IRS coupled with the post-Ebola era in Sierra Leone. Special considerations should be given to messaging and implementation, including around the use of PPE and the safety of the chemicals used.

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Appendices

APPENDIX 1. SELECTED MEASURES OF ATTITUDES TOWARDS USE OF MOSQUITO NETS (%), BY SEX AND DISTRICT, SIERRA LEONE, 2019 (N = 3,836)			
INDICATOR	BO	PORT LOKO	ALL
Women (n = 3,209)			
Sleeping under a mosquito net is a good way to get privacy in a crowded house***	31.3	53.4	41.7
It is easier to get a good night's sleep when I sleep under a mosquito net	96.7	94.4	95.7
I do not like sleeping under a mosquito net when the weather is too warm	47.5	43.4	45.6
The smell of the insecticide makes it uncomfortable to sleep under a mosquito net	49.8	52.4	51.0
White nets remind me of burial**	4.0	7.2	5.5
Mosquito nets are generally easy to use	95.5	95.0	95.3
More expensive mosquito nets are more effective than less expensive or free mosquito nets**	14.0	21.0	17.3
ITNs are safe to sleep under***	96.2	86.0	91.4
If the only nets I have are white, I would prefer not to sleep under a net***	7.5	22.1	14.3
Mosquito nets are valuable***	98.4	88.5	93.8
I do not like white nets because they show dirt easily	25.0	29.2	27.0
Nets made with nylon are usually very hot to sleep under***	75.4	49.1	63.1
Treated nets tend to produce skin rashes on the user***	37.9	46.9	42.1
Total with positive attitudes towards mosquito nets*	96.9	91.6	94.4
Men (n = 627)			
Sleeping under a mosquito net is a good way to get privacy in a crowded house***	27.0	58.4	40.6
It is easier to get a good night's sleep when I sleep under a mosquito net	92.2	87.1	90.0
I do not like sleeping under a mosquito net when the weather is too warm	56.1	51.8	54.2
The smell of the insecticide makes it uncomfortable to sleep under a mosquito net**	49.9	67.1	57.4
White nets remind me of burial**	7.7	17.4	11.9
Mosquito nets are generally easy to use*	96.5	89.7	93.6

APPENDIX 1. SELECTED MEASURES OF ATTITUDES TOWARDS USE OF MOSQUITO NETS (%), BY SEX AND DISTRICT, SIERRA LEONE, 2019 (N = 3,836)			
INDICATOR	BO	PORT LOKO	ALL
More expensive mosquito nets are more effective than less expensive or free mosquito nets	24.4	31.4	27.5
ITNs are safe to sleep under***	98.3	86.2	93.0
If the only nets I have are white, I would prefer not to sleep under a net	11.0	18.2	14.1
Mosquito nets are valuable	93.2	89.8	91.7
I do not like white nets because they show dirt easily**	27.4	43.5	34.4
Nets made with nylon are usually very hot to sleep under***	48.7	80.3	62.4
Treated nets tend to produce skin rashes on the user	31.4	40.2	35.2
Total with positive attitudes towards mosquito nets*	90.3	80.7	86.1
Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001			

APPENDIX 2. SELECTED MEASURES OF PERCEIVED RESPONSE-EFFICACY OF MOSQUITO NETS (%), BY SEX AND DISTRICT, SIERRA LEONE, 2019 (N = 3,836)			
INDICATOR	BO	PORT LOKO	ALL
Women (n = 3,209)			
Mosquito nets only prevent mosquito bites when used with certain types of beds*	21.3	30.8	25.7
My chances of getting malaria are the same whether or not I sleep under a mosquito net***	34.4	47.5	40.6
Sleeping under a mosquito net every night is the best way to avoid getting malaria***	86.7	94.2	90.2
Many people who sleep under a mosquito net still get malaria	69.4	68.9	69.1
Whether I use a net or not, getting malaria is in the hands of God	43.7	46.6	45.0
Total endorsing response-efficacy of mosquito nets*	68.2	60.6	64.7
Men (n = 627)			
Mosquito nets only prevent mosquito bites when used with certain types of beds	29.0	31.5	30.1
My chances of getting malaria are the same whether or not I sleep under a mosquito net	25.0	32.0	28.1

APPENDIX 2. SELECTED MEASURES OF PERCEIVED RESPONSE-EFFICACY OF MOSQUITO NETS (%), BY SEX AND DISTRICT, SIERRA LEONE, 2019 (N = 3,836)			
INDICATOR	BO	PORT LOKO	ALL
Sleeping under a mosquito net every night is the best way to avoid getting malaria***	94.4	73.8	85.5
Many people who sleep under a mosquito net still get malaria	71.0	64.3	68.1
Whether I use a net or not, getting malaria is in the hands of God	46.3	31.9	40.0
Total endorsing response-efficacy of mosquito nets	66.8	56.4	62.3
Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001			

APPENDIX 3. SELECTED MEASURES OF PERCEIVED SELF-EFFICACY TO USE MOSQUITO NETS (%), BY SEX AND DISTRICT, SIERRA LEONE, 2019 (N = 3,836)			
INDICATOR	BO	PORT LOKO	ALL
Women (n = 3,209)			
Sleep under a mosquito net for the entire night when there are lots of mosquitoes***	91.6	72.8	82.8
Sleep under a mosquito net for the entire night when there are few mosquitoes***	88.1	69.5	79.4
Sleep under a mosquito net every night of the year	93.2	93.8	93.5
Get all your children to sleep under a mosquito net every night of the year**	93.6	96.3	94.9
Ensure that pregnant women in the family sleep under a net every night during the pregnancy**	98.6	96.1	97.4
Get all members of the family to sleep under a mosquito net every night of the year if we have enough nets in the home***	98.7	89.4	94.4
Total endorsing self-efficacy to use mosquito nets*	94.9	89.6	92.4
Men (n = 627)			
Sleep under a mosquito net for the entire night when there are lots of mosquitoes**	96.1	87.8	92.5
Sleep under a mosquito net for the entire night when there are few mosquitoes	90.7	84.3	87.9
Sleep under a mosquito net every night of the year***	94.2	78.0	87.2
Get all your children to sleep under a mosquito net every night of the year***	96.3	83.2	90.6
Ensure that pregnant women in the family sleep under a net every night during the pregnancy	98.7	90.4	95.1

APPENDIX 3. SELECTED MEASURES OF PERCEIVED SELF-EFFICACY TO USE MOSQUITO NETS (%), BY SEX AND DISTRICT, SIERRA LEONE, 2019 (N = 3,836)			
INDICATOR	BO	PORT LOKO	ALL
Get all members of the family to sleep under a mosquito net every night of the year if we have enough nets in the home***	98.7	89.4	94.5
Total endorsing self-efficacy to use mosquito nets*	97.4	86.4	92.6
Adjusted Wald test p-value: *p < 0.05; **p < 0.01; ***p < 0.001			