



Bioko Island Malaria Elimination Project (BIMEP)

Malaria Indicator Survey 2025



MCD Global Health, Equatorial Guinea



The 2025 Bioko Island Malaria Indicator Survey (BIMIS) was implemented by MCD Global Health through the Bioko Island Malaria Elimination Project (BIMEP) and in close collaboration with the Equatorial Guinea National Malaria Control Program (NMCP). The BIMEP is funded by a public-private partnership between the government of Equatorial Guinea and Oil Companies operating in Equatorial Guinea including Marathon Oil Corporation (a ConocoPhillips Company), Noble Energy (a Chevron Company), SONAGAS, and GEPetrol. For more information about the BIMIS contact:

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ACRONYMS AND ABBREVIATIONS

AL	Artemether-Lumefantrine
AMPCO	Atlantic Methanol Production Company
ANC	Antenatal Care
ASAQ	Artesunate-Amodiaquine
BIMCP	Bioko Island Malaria Control Project
BIMEP	Bioko Island Malaria Elimination Project
BIMIS	Bioko Island Malaria Indicator Survey
CIMS	Campaign Information Management System
DBS	Dried Blood Spot
EA	Enumeration Area
EGMVI	Equatorial Guinea Malaria Vaccine Initiative
EIR	Entomological Inoculation Rate
GDP	Gross Domestic Product
GIS	Geographic Information System
HIS	Health Information System
HLC	Human Landing Catch
ICF	Inner City Fund
IEC	Information Education Communication
IHI	Ifakara Health Institute
IMR	Infant Mortality Rate
IPTp-SP	Intermittent Preventive Treatment In Pregnancy with Sulphadoxine-Pyrimethamine
IRB	Institutional Review Board
IRS	Indoor Residual Spraying
ITN	Insecticide Treated Net
KAP	Knowledge, Attitude and Practices
LLIN	Long-Lasting Insecticidal Net
LRF	Local Residual Fraction

LSHTM	London School of Hygiene and Tropical Medicine
LSM	Larval Source Management
LSTM	Liverpool School of Tropical Medicine
LT	Light Trap
M&E	Monitoring And Evaluation
MAUP	Modifiable Areal Unit Problem
MCD	Medical Care Development Global Health
MDA	Mass Drug Administration
MDG	Millennium Development Goals
MoHSW	Ministry of Health And Social Welfare
NGO	Non-Governmental Organization
NMCP	National Malaria Control Program
ODK	Open Data Kit
PfPR	<i>Plasmodium falciparum</i> Prevalence
PfSPZ	<i>Plasmodium falciparum</i> Sporozoite
PMI	President's Malaria Initiative
PSU	Primary Sampling Unit
RDT	Rapid Diagnosis Test
SBCC	Social Behavioral Change Communication
SOP	Standard Operational Procedure
SP	Sulphadoxine-Pyrimethamine
SRS	Simple Random Sampling
Swiss	Swiss school of Tropical Public Health
TF	Travel Fraction
TFR	Total Fertility Rate
U5MR	Under Five Mortality Rate
USM	University of Southern Maine
WI	Wealth Index

FOREWORD

This report presents findings of the 2025 Bioko Island Malaria Indicator Survey (BIMIS) conducted on a representative sample of 5,169 households. The survey was implemented by MCD Global Health under the auspices of the National Malaria Control Program (NMCP) within the Ministry of Health and Social Welfare (MoHSW) of the Republic of Equatorial Guinea. This is a follow-up to previous surveys that have been conducted on the island since 2004. The survey provides updated estimates on population-based malaria indicators that complement other routine data to inform Bioko Island's strategic planning of malaria control.

The survey was designed to collect specific information on (1) malaria knowledge, attitude, and practice - (2) ownership, access, and use of long-lasting insecticide-treated net (LLIN) - (3) Intermittent Preventive Treatment in pregnancy using Sulphadoxine-Pyrimethamine (IPTp-SP) - (4) fever management in children aged less than five years - (5) malaria prevalence - (6) anemia among children age six months - 14 years and pregnant women. Blood samples were also collected on filter papers for molecular surveillance and further research on malaria.

The NMCP is highly indebted to the various parties that contribute to the malaria control and elimination efforts on Bioko Island and especially to the success of this survey. Special recognition to the government of Equatorial Guinea and private donors for continuously funding the malaria control and elimination efforts on Bioko Island. Appreciation to MCD Global Health for restless commitment and efforts to free Bioko from malaria. Gratitude to the London School of Hygiene and Tropical Medicine (LSHTM) for technically assisting the implementation of control interventions and the organization of the MIS on Bioko for over 15 years. Acknowledgments to MCD's staff for the front-line efforts against malaria on Bioko Island and all other individuals who contributed to the survey's success. The NMCP thanks the administrative, local, and military authorities who granted access to the population. High appreciation to the survey participants for providing answers to the questions, adhering to malaria and anemia testing, and providing blood samples.

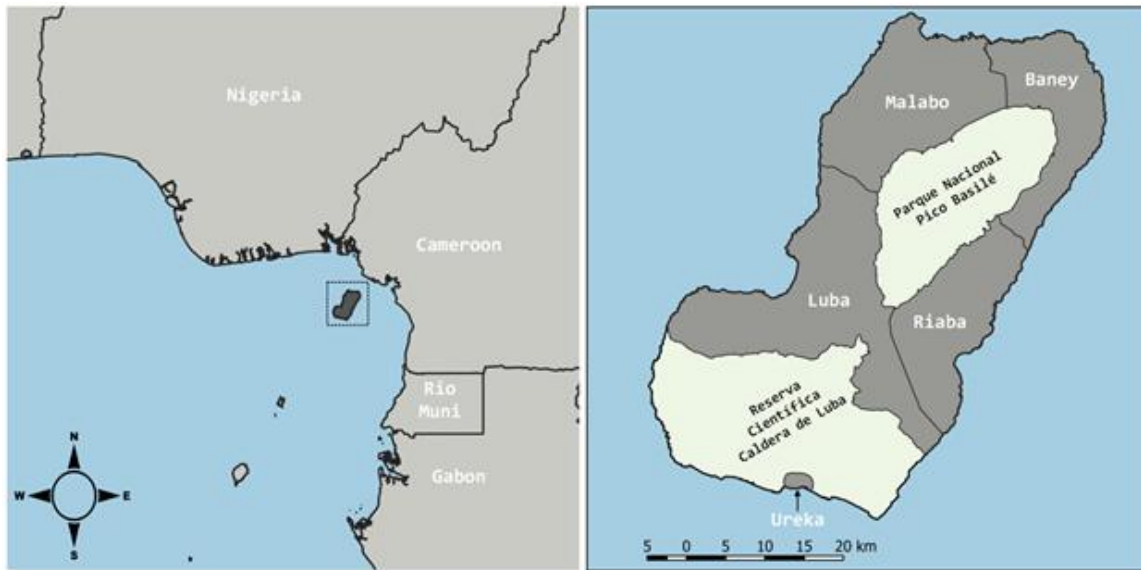
The NMCP, together with MCD, has the pleasure of presenting the findings of the 2025 MIS on Bioko Island and hope that all stakeholders, decision-makers, data users use these findings to contribute to improving the health of populations.

Sincerely,

Dr. Matilde Riloha Rivas

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BIOKO ISLAND MAP



I INTRODUCTION AND SURVEY METHODOLOGY

I.1 Brief presentation of Bioko Island

Bioko island, formerly Fernando Po, is located on the West African continent shelf, precisely in the Gulf of Guinea, and separated from Cameroon by no more than 32 kilometers of shallow ocean. With its total land surface of 2000 km², Bioko forms part of the nation of Equatorial Guinea. The rest of the country consists of a mainland part, Rio Muni, located between Cameroon and Gabon, and four other small islands: Annobon, Corisco, Elobey Grande, and Elobey Chico. Formerly a Spanish colony, Equatorial Guinea became independent in 1968; therefore, Spanish remains its primary language, even though French was later introduced as a second official language.

Bioko island is home to two of the six provinces of the Republic of Equatorial Guinea: Bioko Norte, divided into two districts, Malabo (the country's capital) and Baney, and Bioko Sur, also divided into two districts, Luba and Riaba. Bioko has two natural reserves, *Parque Nacional Pico Basilé* and *Reserva Científica caldera de Luba*. The original inhabitants of Bioko are the Bubi, descendants of Bantu migrants from the mainland, although significant numbers of mainlanders, mostly the Fang, colonized the island since the mid-1960s. Bioko was also home to Nigerian workers and Fernandinos, descendants of former slaves liberated by the British from Sierra Leone and Cuba.

Bioko island has a typical equatorial climate, with high temperatures, high humidity, and heavy rainfall.¹ The temperature in Malabo ranges from 16°C to 33°C, meanwhile on the southern Moka plateau, average high temperatures are only 21°C. The primary wet season lasts between April and October, and annual rainfall varies from 193 cm in Malabo to 1,092 cm in Ureka, the extreme south point of the island.

I.2 Fundamental economic and demographic indicators

In the past, three commodities (cocoa, coffee, and timber) mainly sustained the economy of Equatorial Guinea. Because Bioko possessed the suitable soil and climate for intensive cultivation, the high-quality cocoa cultivated on the island was the primary source of the country's income. However, after the departure of Nigerian workers, cocoa and coffee production dropped significantly, and exports almost ceased. In the early 2000s, the petroleum business grew outstandingly to become the pillar of the country's economy. However, fishing and timber production on the mainland continued to contribute. Despite the considerable increase in its Gross Domestic Product (GDP) related to the petroleum business, the most significant proportion of Equatorial Guinea's population still lives under the threshold of poverty.

I.3 Malaria control on Bioko Island

Bioko island's population was estimated to be about 335,000 in 2015.¹ Of the total 97,000 households enumerated in 2018, almost 80% were located in the capital city of Malabo.² Bioko's population is relatively young, with nearly 15% less than five years old and 40% below 15 years old.^{3,4} The male and female gender are balanced, and life expectancy at a national level is estimated to be 67 years for women and 65 years for men.⁵

I.3.1 General Overview

Because malaria is endemic on Bioko, with year-round transmissions, a public-private consortium was established between the government of Equatorial Guinea and petroleum businesses to sponsor malaria control on the island. These private partners included Marathon Oil Corporation (a ConocoPhillips Company), Noble Energy (a Chevron Company), SONAGAS, and GEPetrol. As a

result, the Bioko Island Malaria Control Project (BIMCP) was implemented in 2004 by Medical Care Development International (MCDI, since renamed MCD Global Health) under the auspices of the National Malaria Control Program (NMCP) within the Ministry of Health and Social Welfare (MoHSW). In addition, implementation received advisory and technical support from academic institutions, including the London School of Hygiene and Tropical Medicine (LSHTM), the Institute for Health Metrics and Evaluation (IHME) at the University of Washington, and Texas A&M University (TAMU).

At inception, the BIMCP conducted one to two annual rounds of indoor residual spraying (IRS) throughout the island as the primary intervention to curb malaria transmission. In 2015, the project changed its vector control strategy, introducing Long-lasting insecticide-treated nets (LLINs) across the island, while focalizing IRS deployment only to high-risk areas. In 2021, the strategy again changed, with a return of island-wide IRS (though at varying levels of coverage) and the implementation of LLIN pick-up points in Malabo. Starting in 2015, LLINs were also distributed to pregnant women during their antenatal care visits (ANC). Larval Source Management (LSM) was piloted in construction sites in 2013 to complement IRS and LLINs, and has been implemented in response to malaria outbreaks⁶, and on a modest scale in 2021-2023. In 2024, delays in the negotiation of a new phase prevented the implementation of vector control for much of the year, but control activities resumed after the 2024 MIS and continued as planned in 2025. The BIMCP also established a malaria case management and diagnostics framework to support prompt and early diagnosis of suspected cases, appropriate treatment of confirmed cases, and prevention in pregnancy. Furthermore, a comprehensive Social and Behavioral Change Communication (SBCC) strategy was initiated to promote Knowledge, Attitudes, and Practices (KAP) towards malaria within the population.

The BIMCP built a robust Monitoring and Evaluation (M&E) system to support implementation and enable data-driven decision-making. Components of this system include the Geographic Information System (GIS) based mapping and enumeration of households on the entire island, vector monitoring, passive cases surveillance through the Health Information System (HIS), and the periodic evaluation of outcomes against targets through the annual Bioko Island Malaria Indicator Survey (BIMIS).

The BIMCP registered outstanding progress during the first 5-10 years of the project. Malaria transmission, anemia in children, all-cause U5MR, and Entomological Inoculation Rate (EIR) fell drastically.^{3,4,7-9} Moreover, two of the four dominant malaria vector species, *An. funestus* and *An. gambiae* s.s. disappeared from the island.¹⁰ Despite these notable victories, malaria transmission remains at moderate levels, as evidenced by prevalence estimates, incidence estimates, and their age distribution.^{3,4,11}

Largely in response to the level of transmission remaining despite intense control efforts, the Equatorial Guinean Malaria Vaccine Initiative (EGMVI) was established in 2013 with a goal of testing the safety and efficacy of a whole, inactivated *Plasmodium falciparum* sporozoite (PfSPZ) vaccine. This live, attenuated, whole sporozoite vaccine manufactured by Sanaria Inc., with an established safety record and technical profile, was identified as a potential game-changer for malaria elimination on Bioko Island. The EGMVI established critical clinical research capacities in Equatorial Guinea necessary for a Phase III clinical trial through development of personnel, infrastructure, regulatory processes, an ethical committee, clinical laboratory, and a vision for a national research institute. Given the common goals of malaria elimination from Bioko Island, the EGMVI project merged with the BIMCP in 2019 to become the Bioko Island Malaria Elimination Project (BIMEP). As a result, new partners became involved in supporting implementation, including the Ifakara Health Institute (IHI), Sanaria Inc., and the Swiss Tropical and Public Health Institute (Swiss TPH). With the onset of the COVID-19 pandemic, however, vaccine-related activities were suspended indefinitely, and have not resumed.

1.3.2 Summary of 2025 BIMEP activities

Indoor residual spraying (IRS) has significantly reduced malaria transmission on Bioko Island. Data from Bioko Island have shown that IRS had similar effects in sectors sprayed at 50% coverage compared to those sprayed at 80% coverage.^{12,13} Based on these findings, since 2023 IRS targets on Bioko have been set at 50% in urban Malabo (with the exception of some areas not targeted for IRS), and 80% or more outside Malabo. In 2024, due to a delay in funding negotiations, IRS was implemented after completion of the 2024 MIS, from September-December instead of as originally planned (February-July as in other years). In 2025, IRS returned to the February-July timeline, meaning many areas received two spray rounds in less than 12 months. In total, in 2025 36,584 houses were sprayed between 13 March and 17 July 2025, protecting a population of 140,029, including 17,836 children under age five and 2,227 pregnant women.

Since 2015, LLINs have been a core component of vector control on Bioko Island. BIMEP conducted the first LLINs mass distribution campaign on Bioko Island in 2015. In 2017, BIMEP collaborated with the Ministry of Basic Education to organize a school-based distribution campaign during which pupils of all primary schools on Bioko Island received LLINs. For pregnant women, continuous distribution channels were maintained through ANC clinics in Government health institutions. The latest mass distribution campaign took place in 2018, followed by a top-up distribution in high transmission areas in 2020. However, besides efforts to sustain LLIN ownership on Bioko Island, historical data reveals high attrition rates and poor adherence to the intervention, especially in Malabo. Given the high cost (both in materials in personnel) of door-to-door distributions, in 2021 a new strategy was adopted: continue door-to-door distributions outside of Malabo, but stop community distributions in the greater Malabo area, and instead open LLIN pick-up points. In theory this should provide access to those who actually use LLINs, while minimizing use of resources to distribute nets that will not be used. As such, there was a mass distribution in 2021 to the areas outside of Malabo, while from 2021-2023 pick-up points have been active within Malabo, and starting in 2025 pick-up points were opened in Luba and Riaba. In 2025 no community distribution campaigns were conducted, but over the course of the year 60,185 LLINs were distributed in pick-up points, and 4,654 LLINs were distributed to pregnant women at ANC clinics.

1.4 The Bioko Island Malaria Indicator Survey

The aim of eliminating malaria worldwide encouraged the scale-up to measure key malaria indicators through nationally representative household surveys. Malaria indicator surveys (MIS) measure indicators related to the Roll Back Malaria (RBM) Global Malaria Action Plan, the Millennium Development Goals (MDG), and the President's Malaria Initiative (PMI) targets.¹⁴ The first MIS was conducted on Bioko island in late 2004 as a benchmark. Since then, follow-up surveys have been conducted yearly during the high transmission (August to October) season.

The Bioko Island MIS (BIMIS) design has undergone several modifications over the years. Before 2015, samples were drawn from 18 areas on the island that served as sentinel surveillance sites. These sites were selected in part based on their higher transmission levels but also covered the majority of the population. The availability of reliable census information in 2015 facilitated the expansion of the sample to the entire island, using communities as Enumeration Areas (EA). From 2015-2018, a somewhat complex sampling strategy was applied to maintain statistical power in the sentinel sites for historical comparison. From 2019 onwards, primary sampling units (PSUs) were defined based on map areas (1 km x 1 km grid cells)², since unlike communities map areas have consistent boundaries and thus reduce issues related to the Modifiable Areal Unit Problem (MAUP).

The survey questionnaire has been standardized to collect similar data each year, where possible using identical question prompts, with additional modules added as necessary. Initially, only children

between the ages of 2 and 14 years were tested for malaria and anemia. However, starting in 2008 one random adult was included in malaria testing in each targeted household, and since 2012 all consenting household members present were tested for malaria.

I.4.1 Survey Objectives

The objective of the 2025 BIMIS was to provide current estimates of population-based key malaria indicators, specifically:

- Key LLIN indicators including household ownership, household access, population access and use
- Coverage of preventative interventions for pregnant women, including ANC, LLIN use and IPTp
- Health-seeking behaviors for fever and treatment practices, in particular the use of antimalarial medications
- Diagnosis and treatment of children under age five in any health facility, clinic or pharmacy
- Prevalence of malaria
- Prevalence of anemia in children age six months to 14 years and pregnant women
- Knowledge of malaria and related attitudes and practices (KAP)

I.4.2 Survey Questionnaire

The BIMIS questionnaire is adapted from the standard MIS toolkit developed by the Roll Back Malaria Monitoring and Evaluation Reference Group (RBM-MERG).^{15,16} BIMEP and the NMCP translated and adjusted the questionnaires into Spanish to match the local context. The 2025 BIMIS questionnaire was divided into three sections: the household section, the household members and visitors' sections, and the bed nets section. A single adult household member provided answers to the questions related to the household and all the other household members. In addition, women aged 15 – 49 responded to specific questions related to malaria prevention in pregnancy if they were present at the time of the survey and willing to participate.

The household section captured information on housing characteristics, knowledge, attitude, practice on malaria, and household assets (radio, television, washing machine, and others). After completing the household section, primary information about household members and short-term visitors was collected, including name, age, sex, and pregnancy status. This information determined eligibility for anemia testing, and to identify women of child-bearing age (15-49). Individuals who normally live in the household and others who slept in the household on the night preceding the survey and who had been living in the household for at least two weeks were classified as household members (i.e., permanent members), while those who do not normally live in the household but had slept there for a period of less than two weeks were classified as short-term visitors. After collecting this basic information, surveyors proceeded with malaria and anemia testing.

Once testing was complete, the interview continued with the household members and visitors' section. For each permanent household member, surveyors collected demographic information (age, sex, relation to the household head, level of education, and work status); recent travel history within or outside of Bioko Island; bed net use; history of illness in the last two weeks, and treatment-seeking behavior in the case of a recent fever; details of treatment for children under age five with a recent fever; use of malaria in pregnancy prevention measures in the most recent pregnancy; and malaria and anemia testing results. For short-term visitors, only basic demographic information (age, sex) and malaria testing results were collected.

The bed net section comprised the final stage of the interview, enumerating and collecting information on all bed nets present in the household. Where possible, surveyors observed the bed nets and classified them according to brand, color, physical condition, and source. Where observation was not possible the respondent was asked for this information. Finally, surveyors enumerated which bed nets were used by which household members and reasons for not using any other bed nets existing in the household on the night before the interview.

The BIMIS questionnaire was programmed into tablet devices, which enabled computer-assisted interviewing. Data were captured and processed using the Campaign Information Management System (CIMS). The CIMS is an in-house Android application that maintains a database of real-world entities, including an administrative and organizational hierarchy of provinces, districts, sub-districts, localities, map areas, and map-sectors, within which households are located. Using this system enables linking every survey to a household by its unique code, and thereby to a map-sector, map area, community, district and province.

The CIMS comprises two related applications, CIMS-Mobile and CIMS-Forms, and is used to identify and locate households targeted for interventions/surveying and capture data.^{4,17} The CIMS-Mobile application has an interface through which authorized fieldworker logs in with a unique identifier and password. After logging in, the fieldworker selects an assigned module (MIS, IRS, LLIN, among others); and then navigates through the organizational hierarchy (province – district – sub-district – community – map area – map sector) to an assigned location (household) and launches a questionnaire (blank form). The CIMS-Forms application then takes control of data entry using Open Data Kit (ODK) software protocols.¹⁸ In the background, the CIMS tags every form with a universally unique identifier (UUID), the unique fieldworker identifier, and data collection date and time.

1.4.3 Survey design and sampling strategy

As noted above, the sampling strategy for the BIMIS changed in 2019. Previously, survey samples were taken using communities as the primary sampling unit, but this became problematic for year-to-year comparisons because community boundaries often change, while higher-level administrative boundaries such as district do not provide sufficiently disaggregated data for detailed intervention planning. Given the existence of a relatively mature grid-based mapping system,² the logical choice was to begin using map areas for constructing the sample. However, many map areas are sparsely populated, so it was necessary to group map areas into primary sampling units (PSU). This was done using a fried-egg approach. First, map areas with at least 100 independent households were considered separate PSUs. Those with less than 100 households were joined with geographically contiguous (if possible) map areas, or their closest neighbors, considering the spatial distribution of houses within them. Based on this approach, a total of 109 unique PSUs were defined.

Given the observed heterogeneity in malaria prevalence and other related metrics, defining strata was also necessary to improve the quality of analysis. Previous work had already shown that recent travel off of Bioko Island was a significant risk factor for malaria.^{4,19,20} When taken with the substantial geographic variation in frequency of off-island travel (much more common in urban Malabo than elsewhere), this suggested that observed malaria prevalence may not be the best metric to approximate local malaria transmission. Hence, a more robust analysis was performed using human mobility data collected in the BIMIS and malaria transmission models to infer the proportion of malaria infections which were attributable to local transmission (LRF, the local residual fraction).²¹ Overall, the LRF was low in urban Malabo, and substantially higher in the rural areas outside of Malabo, in particular the west and southwest coasts. In fact, this distribution closely mirrored the population density, which is much higher in Malabo (with around 80% of the households) than the rest of the island.² Thus, each of the PSUs were assigned to one of two strata based on a composite score of population density and LRF:

- Stratum 1 (53 PSUs): low population density (< 250 inhabitants per km²) and high LRF (above median; LRF ≥ 7.6%)
- Stratum 2 (56 PSUs): high population density (≥ 250 inhabitants per km²) and low LRF (below median; LRF < 7.6%)

In 2025 an additional PSU was defined to include in the sampling frame the relatively isolated community of Balachá de Riaba, while the geographical definition of some PSUs has been gradually expanded as new areas become inhabited. The resulting stratification framework is shown in Figure 1.1. For each PSU, the target sample size was defined as 25% of the total number of inhabited households in stratum 1, and 5% in stratum 2, in order to ensure sufficient power in stratum 1. To account for households which have become uninhabited since they were last visited by BIMEP, or which are not available to be surveyed, the sample size was increased by 30%. Using this increased sample size, households were selected in each PSU by simple random sampling. The resulting sample included 6,836 households (2,493 in stratum 1 and 4,343 in stratum 2), with a target of at least 5,193 to be surveyed (1,859 in stratum 1 and 3,334 in stratum 2).

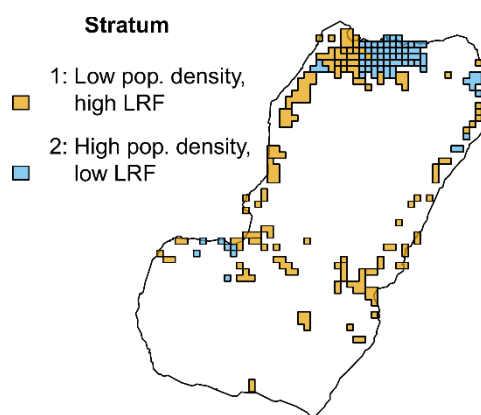


Figure 1.1: Map of PSU by stratum

I.4.4 Training of survey staff

Survey training took place between July 17 - 26 at the Ministry of Civil Aviation in Malabo. Candidates were selected from fieldworkers who had an excellent performance in previous activities organized by BIMEP in addition to an open call for applicants. Technical BIMEP staff with substantial field experience, including in vector control, GIS/operations, and previous surveys were selected and trained to be field supervisors and coordinators. In total, 46 people participated in the training. BIMEP's M&E team led the training with the support of other staff. Training consisted of classroom lectures, mock interviews in class and field, and field practice. The following topics were covered during classroom lectures:

- Map reading
- Overview of malaria and anemia
- Overview of M&E concepts applied to malaria programs and the importance of the BIMIS in decision making
- Ethical considerations when conducting a survey
- Map reading for fieldwork
- Survey materials
- Completing the household members, visitors' rosters, the anemia and malaria referral forms, and signing the informed consent document
- Interview techniques

- Overview of the survey questionnaire

Throughout the training, significant time was dedicated to practical sessions. One group of practice sessions focused on improving familiarity with the questionnaire through mock interviews. A second set of sessions was dedicated to malaria and anemia testing, including: informed consent procedures, anemia testing with the HemoCue system, malaria testing using a Rapid Diagnostic Test (RDT), blood sample collection on filter papers, treatment referral procedures for positive malaria cases, and procedures to refer anemia cases for follow-up. For these sessions, students were grouped around workstations to practice malaria and anemia testing.

As part of the training and as a final evaluation for candidate surveyors, the survey was piloted from July 28-30 on a random sample of 450 households selected in the 4-3.1 Banapa III, 5-13 Sampaka I and 5.7 Santa María IV communities in Malabo. Pilot data were revised and discussed by the implementation team before launching the survey on August 1.

I.4.5 Survey deployment plan

The 2025 BIMIS deployment plan was developed using QGIS,²² and Figure 1.2 shows an overview. In brief, deployment units were map sectors (virtual grids of 100 m x 100 m), which were grouped into four distinct clusters, A, B, and C of approximately equal sizes located in Bioko Norte province, and P located in Bioko Sur province. The field team was similarly divided into three groups. Each group was assigned one of the three Bioko Norte clusters (A, B, or C), while cluster P was treated specifically and assigned to the entire survey group. Each group was composed of a field coordinator, two supervisors, ten surveyors (five under each supervisor), and two drivers. Map sectors within each cluster were grouped into roughly equal sized work zones, which were then grouped into deployments. In order to ensure equity of workload, work zones with extended distances between inhabited map sectors had fewer households to survey. Overall, the distribution of work was:

- 2,083 sampled households in cluster A, grouped into 210 work zones (3 - 31 households per zone; median: 9) and 21 deployments
- 2,030 sampled households in cluster B, grouped into 130 work zones (5 - 42 households per zone; median: 11) and 13 deployments
- 1,946 sampled households in cluster C, grouped into 165 work zones (2 - 30 households per zone; median: 10) and 17 deployments
- 777 sampled households in cluster P, grouped into 86 work zones (5 - 24 households per zone; median: 8) and 3 deployments

Entry and exit dates from each deployment were estimated based on an anticipated average of 4 surveys completed per surveyor per day, an attendance rate of 95%, an estimated five rainy days with no possibility of going to the field, and six labor days per week. Cluster P was surveyed in the last two weeks of the survey by the entire team.

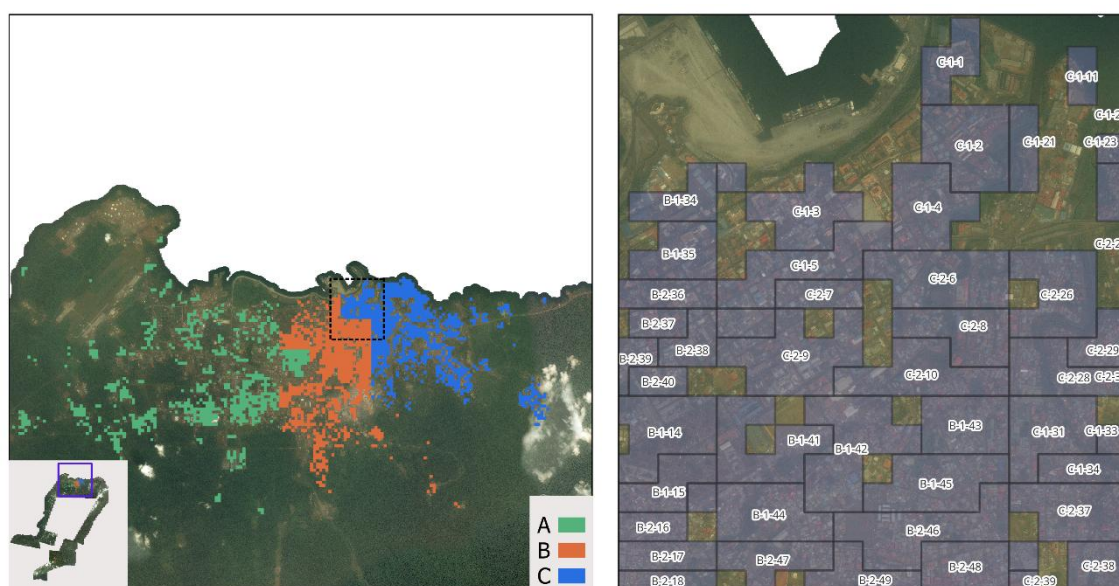


Figure 1.2: BIMIS deployment plan

Sectors in Bioko Norte were divided into three groups (left) and further into work zones (right). Work zones are named by the group (A, B or C) and supervisor (1 or 2) responsible, followed by the number of the zone for that supervisor (e.g. A-1-1)

1.4.6 Data collection

Thirty surveyors collected the data between August 1 and October 2. Before surveyors entered the field, data collection, the field coordinators sought authorizations from administrative, local, and military authorities of the respective districts, communities, and military barracks. The survey team visited the households six days weekly, from Monday to Saturday, between 8 AM and 4 PM. Due to lack of availability during these days and times, the work hours were changed on an *ad hoc* basis where necessary. Call-back visits were done on weekends to increase the chances of participation of the working class who are not present at home during working hours. Surveyors used high-resolution paper maps to locate the assigned households in the field, using the NMCP/BIMEP door sticker for confirmation.² In case of missing or unreadable door stickers on the assigned household, neighboring households were used to guide confirmation. In the absence of the household members, three to four callback visits within at least 4 hours were done. Before anemia and malaria testing, surveyors carefully explained the procedures, risks and benefits, and the voluntary and confidential nature of the survey to the household members. The household heads or their designee duly signed the informed consent document to authorize children below 18 to be tested for malaria and anemia. All adult members and visitors willing to be tested for malaria and anemia also signed the informed consent document. Surveyors listed household members, and short-term visitors on the various rosters. Body temperature was also measured, and when possible, drops of blood were collected on filter paper for further investigations. The household head or a responsible household member provided answers to the questions related to the household and each member. Women aged 15 to 49 were also interviewed on malaria prevention in pregnancy.

1.4.7 Malaria and anemia testing

Blood samples for malaria and anemia testing were taken by finger-prick using a sterile lancet. One drop of blood was collected in a sterile microcuvette for anemia testing. Hemoglobin concentration was measured on-site with a battery-operated portable HemoCue[®] analyzer (HemoCue 801 AB, Angelholm, Sweden) providing results within 30 seconds. Participants with hemoglobin concentrations below WHO defined thresholds for moderate anemia were referred to a health facility for follow-up care.

Malaria was tested using the Standard Q Pf/PAN Ag Combo RDT (SD BIOSENSOR). Each test kit included a disposable sample applicator, an assay buffer solution, a disposable lancet, the testing device, and an alcohol swab that comes in a standard package. A small volume of blood was collected with the sample applicator and placed into the sample well on the testing device. Buffer solution was added to the testing device's indicated well according to the manufacturer's protocol. The result was available within 15 minutes, and subjects who tested positive for malaria were offered age-appropriate doses of Artemether-Lumefantrine (AL).

When possible, additional drops of blood were collected on a Whatman™ 3MM chromatography paper (Cytiva Life Sciences) from consenting participants of all ages. The cards were uniquely barcoded, with a duplicate affixed to the corresponding RDT. The cards were air-dried in a dust-free environment, appropriately packed in gas-free zip lock bags with desiccant, and then stored at -20°C before shipment for lab analyses.

I.4.8 Data quality control, processing and validation

Completed and valid questionnaires were uploaded to the server using a wireless internet connection. Each survey was tagged unique identifiers for the surveyor who performed the interview, household where the survey was conducted, and date and time of the questionnaire creation to ease performance tracking and quality control. Tablets with completed questionnaires were transferred to the BIMEP office daily for quality control. Coordinators and supervisors carefully checked the data for inconsistencies and outliers, revised the informed consent forms for completeness of signatures, and checked the consistency of the barcode identifiers on RDTs and filter papers. The information on the household members and short-term visitors' rosters was scrutinized and compared with the data entered in the tablets. Contradicting information was investigated, discussed, corrected appropriately, and documented for follow-up and coaching. RDTs and filter papers were processed and stored following standard protocols. Completed surveys were finalized and uploaded to the server, and consent forms, rosters, and other field materials were stored appropriately. The repackaging team prepared consumables and materials for the next day, charged batteries and tablets, and synchronized the CIMS with the latest household database signature.

I.4.9 Fieldwork supervision

Supervisors used a checklist form to evaluate surveyors by direct observation (Appendix C). Similarly to the survey questionnaire, the supervision checklist was programmed to run using the CIMS. Supervisors evaluated all surveyors on their team once weekly on four sets of criteria: mapping and household identification, presentation to the household and consent administration, malaria and anemia testing, and survey questionnaire administration. Supervision data was analyzed, and follow-up was provided to poor-performing surveyors.

An online dashboard was programmed using Power BI to enable real-time monitoring of the survey and track the performance of surveyors. The dashboard was connected to views created on the BIMEP PostgreSQL server and described the overall survey metrics, field work progress, malaria prevalence, and productivity by fieldworkers. In addition, the implementation team held a weekly meeting to interpret and discuss the dashboard data in order to identify realistic solutions to sustain productivity and increase the performance (both in terms of productivity and quality) of the surveyors.

I.4.10 Ethical considerations

The protocol for the 2025 BIMIS was approved by the Ethical Review Committee (ERC) of Equatorial Guinea's MoHSW and the Institutional Review Board (IRB) of the LSHTM. Surveyors carefully explained related information to participants, as presented on the information notice

(Appendix A). This information included: survey purpose, participation risks and benefits, and the voluntary and confidential nature of the survey. A signed authorization (Appendix A) was requested from the primary informant before commencing the interview and from all consenting participants, or in the case of children their parent or legal guardian, before malaria and anemia testing and blood collection. Data access was restricted, and personally identifying information (e.g. names) of the participants were removed from the final datasets before sharing. Malaria RDTs and filter papers were stored with only barcode identifiers to protect participant confidentiality

I.4.1.1 Statistical analysis

Analysis of the survey data was performed using the R package survey.^{23,24} For analysis, a two-level stratified cluster design was declared using PSU and household as clusters. Throughout this report, unless otherwise specified, estimates presented are weighted according to sampling probability. This is necessary because the sampling design preferentially sampled households in stratum 1 (Table 1.1), so crude estimates are not representative of Bioko Island. For each PSU, the sampling probability was set to 1 (i.e., a certainty PSU), and the household sampling probability was defined as the number of households sampled in a PSU divided by the number of inhabited households in that PSU, according to the sampling frame. In addition, a finite population correction was performed to account for the fact that all PSUs were sampled.

Table 1.1: Sampling by strata

Percentage of houses in sampling frame, sample, and among those surveyed which fall into each stratum			
Stratum	Sampling Frame	Sample	Surveyed
1: Rural/high transmission	10.3%	36.5%	35.6%
2: Urban/low transmission	89.7%	63.5%	64.4%
Total households	74,205	6,836	5,169

This represents an analytical change which has been implemented in BIMIS reports since 2022, so it is important not to directly compare the weighted estimates presented in this report with those presented in pre-2022 BIMIS reports. However, in order to provide consistent, comparable historical estimates this report presents re-analysis of survey data from 2004-2024 using probability weights. Sampling frames were available for all BIMIS since 2015, but not for 2004-2014. For these years, this analysis uses the 2015 health census as a sampling frame, following the approach adopted in previous historical analysis.⁹ Probability weights and finite population corrections were defined as described above, but the PSU varied by year. From 2004-2015, sentinel sites were used as PSUs (without strata); for 2016-2018, communities were used and PSUs (without strata); and for years since 2019 the stratified, map area-based PSUs described above were used.

2 CHARACTERISTICS OF POPULATION AND HOUSEHOLDS

This chapter presents information on basic sociodemographic parameters, including the composition of the household population and wealth. Socioeconomic characteristics of the population are briefly presented, which comprise one important factor influencing the burden and treatment of malaria or other health conditions, as well as health-related behaviors. An overview of the demographics of survey respondents is included in the chapter, since these parameters (e.g. age, gender, education) are essential in interpreting key health indicators presented in later chapters.

2.1 Population and household composition

Household

A person or group of related or unrelated persons who live together in the same dwelling unit(s), who acknowledge one male or female adult as their leader, who share the same housekeeping arrangements, and who are considered a single unit.

De jure household members

All persons who are permanent residents of a selected household, regardless of whether they stayed in the household the night preceding the survey interview. Long-term visitors who had stayed in the house for at least the two weeks preceding the survey were considered permanent residents.

De facto household members

De jure household members who stayed in a selected household the night preceding the survey interview.

The age and sex structure of the population is essential in interpreting health indicators, in particular the age-structure of the population can have significant implications for malaria prevalence. Table 2.1 describes the distribution of the *de jure* household population by 5-year age groups, according to sex and district of residence. In total 19,481 residents were registered in the 5,169 households surveyed, with valid age information for 19,284 individuals. Overall, the population was well balanced by sex and very young (36.5% under age 15). Riaba and especially Luba districts had comparatively older populations than Malabo and Baney districts.

Table 2.1: Household population by age, sex and district

Percent distribution of the household population by 5-years age groups, according to gender and district of residence.															
Age	Malabo			Baney			Luba			Riaba			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
<5	12.0	11.4	11.7	12.1	11.6	11.9	9.9	12.6	11.2	10.5	14.5	12.3	11.9	11.5	11.7
5-9	11.7	11.7	11.7	14.9	11.9	13.5	12.1	10.6	11.4	10.0	15.0	12.3	12.2	11.8	12.0
10-14	12.5	12.7	12.6	13.8	14.4	14.1	16.1	10.4	13.3	12.3	9.3	10.9	12.8	12.9	12.8
15-19	8.7	9.3	9.0	10.3	11.9	11.1	4.8	4.8	4.8	6.3	7.0	6.6	8.8	9.6	9.2
20-24	10.7	11.3	11.0	9.0	10.0	9.5	6.3	7.8	7.0	5.7	6.4	6.0	10.2	10.9	10.6
25-29	6.4	6.9	6.6	4.2	6.0	5.1	4.5	6.5	5.4	4.7	4.1	4.4	6.0	6.7	6.3
30-34	9.6	10.2	9.9	7.5	8.2	7.9	7.5	7.1	7.3	11.4	7.5	9.6	9.3	9.8	9.5
35-39	6.6	6.8	6.7	6.1	6.3	6.2	2.6	4.6	3.6	6.8	7.1	6.9	6.4	6.7	6.5
40-44	7.7	7.2	7.5	7.7	6.2	7.0	9.2	5.9	7.6	7.5	7.2	7.4	7.7	7.0	7.4
45-49	3.8	2.9	3.3	3.7	2.9	3.3	4.9	2.8	3.9	4.7	4.6	4.6	3.8	2.9	3.4
50-54	3.9	3.3	3.6	3.8	2.8	3.3	6.8	7.8	7.3	6.2	6.9	6.6	4.0	3.3	3.6
55-59	1.9	1.5	1.7	2.1	1.8	2.0	2.5	5.1	3.8	3.7	2.3	3.1	2.0	1.7	1.8
60-64	1.6	1.7	1.7	1.8	1.8	1.8	4.9	4.7	4.8	3.4	3.8	3.6	1.7	1.8	1.8
65-69	0.6	1.0	0.8	0.9	1.5	1.2	1.6	2.6	2.1	2.3	1.2	1.7	0.7	1.1	0.9
70-74	0.5	0.7	0.6	0.6	1.6	1.1	2.4	1.7	2.1	1.5	0.9	1.2	0.6	0.9	0.7
75-79	0.2	0.3	0.3	0.2	0.3	0.3	0.9	2.7	1.8	1.2	0.9	1.1	0.2	0.4	0.3
80+	1.6	1.1	1.3	1.2	0.7	0.9	2.8	2.4	2.6	1.8	1.4	1.6	1.5	1.1	1.3

The overall population distribution by age group and gender is shown in Figure 2.1. As in previous years, the population of Bioko Island was quite young, with a broad base and sharp peak to the population pyramid. Only 13.8% of the population was age 45 or older. The larger populations in ages 20-24, 30-34, 40-44 and 50-54 compared to 25-29, 35-39, 45-49 and 55-59 may be at least partially caused by respondents approximating age to the nearest round number (e.g. reporting 30 when true age is 28), since dates of birth were not collected.

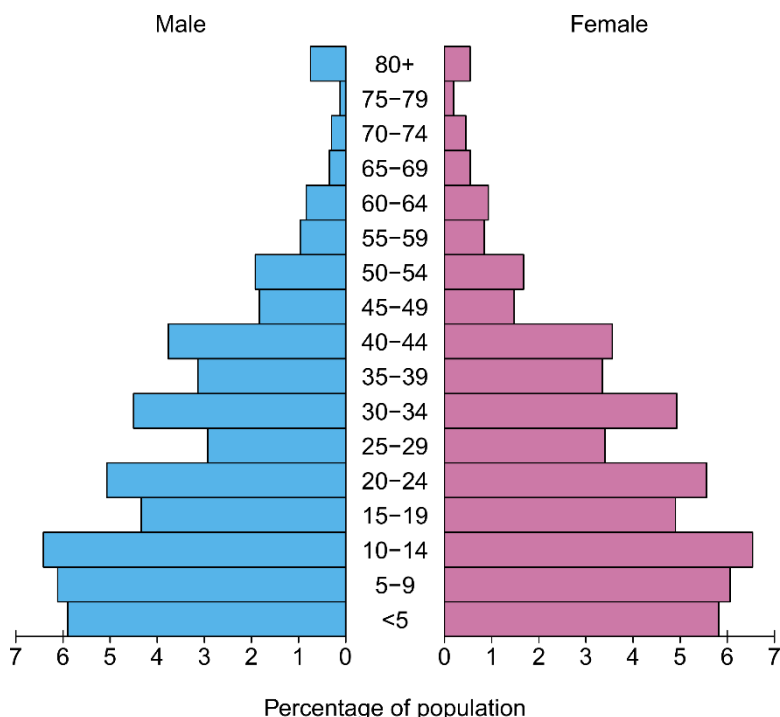


Figure 2.1: Population pyramid

Table 2.2 describes the household composition, including gender, age and education of household heads and household size by district of residence. In all districts, most households had a male head (overall 65.1%). In nearly all other respects, there was a clear difference in the characteristics of households in Bioko Norte province (Malabo and Baney districts) and Bioko Sur province (Luba and Riaba districts). In Bioko Norte, most household heads were aged 25-44 years, while in Bioko Sur there were more older heads of households, with the 55 or older group comprising the largest share. The mean household size was substantially higher in Bioko Norte (3.8-4.3 persons per household) than Bioko Sur (2.9-3.0 persons per household). Finally, for interpreting estimates presented in later chapters by stratum, it is important to note that households in Malabo and Baney overwhelmingly fall into the Urban/low transmission stratum, while Luba is well balanced between the two strata and Riaba falls entirely into the Rural/high transmission stratum.

Table 2.2: Household Composition

Percent distribution of the households by characteristics of the household head (gender, age and education level) and household size by district.

	Malabo	Baney	Luba	Riaba	Total
Gender of household head					
Male	64.7	67.3	59.8	76.3	65.1
Female	35.3	32.7	40.2	23.7	34.9
Age of household head					
15-24	4.4	3.9	1.8	3.2	4.2
25-34	26.4	20.9	18.1	21.1	25.4
35-44	34.3	33.7	18.7	27.4	33.6
45-54	18.3	20.1	21.9	20.2	18.6
55+	16.6	21.4	39.5	28.0	18.1
Level of education of household head					
At most primary	9.7	13.9	31.4	28.1	11.2
Secondary	48.7	47.0	61.7	54.2	48.9
Post-secondary	41.6	39.1	6.9	17.7	39.9
Size of household					
1	22.4	18.0	38.1	40.2	22.5
2	18.6	13.2	20.2	21.4	18.0
3	13.5	14.1	10.5	6.5	13.4
4	11.1	11.8	8.2	6.5	11.0
5	10.1	12.1	8.8	9.0	10.3
6	7.8	11.2	7.0	4.5	8.2
7	5.9	7.6	2.5	4.9	6.0
8	4.1	4.4	2.1	2.0	4.0
9+	6.5	7.6	2.6	4.9	6.5
Stratum					
Rural/high transmission	8.0	5.8	53.6	100.0	10.3
Urban/low transmission	92.0	94.2	46.4	0.0	89.7
Mean household size	3.8	4.3	2.9	3	3.9
Total Households	3,944	633	346	246	5,169

2.2 Household possessions and Wealth Index (WI)

Wealth Index (WI)

Households are assigned a score using principal components analysis (PCA) based on the type of assets and amenities they own (stereo, television, fan, air-conditioning, car, among others). This score provides a surrogate of socio-economic status (SES) and is used to rank households and group them into SES quintiles. The first quintile corresponds to households with the lowest wealth index (i.e., least wealthy) and the fifth to the highest (i.e., most wealthy). Based on the household they reside in, *de jure* household members were also assigned a wealth index quintile, though this represents the household they live in, and not necessarily their personal socio-economic status.

Ownership of domestic goods such as furniture, electronics, land and livestock provides one measure of comparative household wealth and general well-being and can be used to construct a wealth index using principal components analysis. Table 2.3 summarizes ownership of household assets and crowding variable which were used in constructing the wealth index. Crowding was defined as having more household members than sleeping rooms, which provided a relatively balanced division. Most households had a television (85.8%), telephone able to access internet (i.e. smartphone, 90.2%), stove (83.8%), and refrigerator (83.1%), though households in Bioko Sur had lower ownership of nearly all items.

Table 2.3: Household possessions

Percentage of households possessing various amenities according to the district of residence.

	Malabo	Baney	Luba	Riaba	Total
Air-conditioning	38.5	37.0	8.2	5.8	37.0
Car	26.8	32.8	12.0	11.9	27.0
Computer	33.7	33.2	10.6	10.6	32.7
Crowding	39.2	33.7	52.3	54.4	39.0
Fan	76.7	61.3	32.4	42.6	72.8
Microwave	30.5	33.7	6.6	6.5	29.9
Own household	46.8	64.2	63.4	54.6	49.8
Refrigerator	84.0	85.7	54.8	61.3	83.1
Stereo	64.3	64.4	57.3	45.7	63.9
Stove	85.0	83.3	64.9	56.3	83.8
TV	87.1	86.3	60.7	56.0	85.8
Telephone	92.5	85.2	60.9	64.1	90.2
Washing machine	36.7	40.5	11.8	9.8	36.1

Table 2.4 presents the distribution of households and *de jure* population by wealth index according to district of residence. Notably, Malabo and Baney households scored much higher in the wealth index, while more than 70% of households in Luba and Riaba were in the lowest two quintiles. Although the overall proportion of households in each quintile is nearly equal, the population distribution was not equal due to differing household sizes, with only 12.1% in the lowest quintile and 26.7% in the highest.

Table 2.4: Wealth quintiles

Percentage of household and *de jure* household population by wealth quintiles, according to the district of residence.

	Malabo	Baney	Luba	Riaba	Total
Households					
Lowest	17.9	21.5	54.9	57.9	20.1
Second	23.3	16.6	22.2	21.2	22.3
Middle	17.8	18.3	11.7	9.1	17.6
Fourth	20.4	21.3	10.0	6.1	20.0
Highest	20.5	22.3	1.2	5.7	20.0
Population					
Lowest	10.7	13.9	38.9	39.8	12.1
Second	19.6	15.6	27.0	29.9	19.3
Middle	18.6	19.2	19.5	11.8	18.7
Fourth	23.4	24.5	12.8	7.6	23.2
Highest	27.6	26.8	1.7	10.9	26.7

2.3 Characteristics of survey respondents

Table 2.5 presents the distribution of survey respondents by gender, age, education level and relationship to head of the household, according to district of residence. The majority of survey respondents were female (58%) and most were heads of household (57.5%). There were more respondents with a lower level of education in Luba and Riaba than Malabo and Baney, though in all districts most had attended at least secondary education. Corresponding to their older population, there were more older respondents in Luba and Riaba, while most respondents in Malabo and Baney were aged 25-44.

Table 2.5: Respondent Characteristics

Percent distribution of the survey respondents by gender, age, education level and relation to household head by district.

	Malabo	Baney	Luba	Riaba	Total
Gender					
Male	42.0	39.7	47.3	54.3	42.0
Female	58.0	60.3	52.7	45.7	58.0
Age					
15-24	18.5	17.5	6.7	11.8	17.9
25-34	32.6	30.1	19.8	24.5	31.8
35-44	27.2	25.9	21.0	24.0	26.8
45-54	11.5	12.0	19.6	17.9	11.9
55+	10.2	14.5	32.9	21.8	11.6
Level of education					
At most primary	9.7	13.9	31.4	28.1	11.2
Secondary	48.7	47.0	61.7	54.2	48.9
Post-secondary	41.6	39.1	6.9	17.7	39.9
Relation to household head					
Head	57.5	52.5	74.5	66.5	57.5
Spouse	22.2	25.9	15.6	21.6	22.5
Child	9.5	10.6	6.3	4.5	9.5
Other	10.7	11.0	3.6	7.3	10.5

3 MALARIA PREVENTION

Key Findings

- **Household ITN ownership and access:** 32.8% of households on Bioko Island owned at least one ITN, and 19.7% owned at least one ITN for every two *de facto* members
- **Population access to ITNs:** 26.1% of the population had access to an ITN, assuming that one ITN serves two individuals
- **ITN use:** 19.9% of the *de facto* household population, including 25.0% of children under age five slept under an ITN the night preceding the survey
- **Prevention in pregnancy:** 21.8% of pregnant women slept under an ITN the night preceding the survey and 48.0% of women who gave birth in the last two years received at least three doses of IPTp-SP during their last completed pregnancy

This chapter presents results on some key malaria control indicators on Bioko Island, including household ownership of, population access to, and use of insecticide-treated bed nets (ITN), and coverage of malaria prevention in pregnancy.

Due to a lack of acquired immunity, the burden of malaria in holoendemic areas such as Bioko Island is highest in children under age five, who are more likely to experience severe malaria with life-threatening symptoms such as coma, respiratory distress and severe anemia.²⁵ Similarly, pregnant women are a vulnerable group with elevated risk for serious complications for both the mother and fetus. Particularly in a woman's first and second pregnancies, if infected with malaria she is more likely to have placental malaria (i.e., parasite sequestration in the placenta) and thus also anemia. These conditions in turn increase risk for low birth weight, premature birth, and intrauterine growth retardation, thus increasing the risk for neonatal and infant mortality.²⁶ Given these risks, effective prevention of malaria is particularly important among children under age five and pregnant women. For this reason, particular attention is paid to the coverage of malaria prevention interventions among these groups.

3.1 Household ownership and access to Insecticide-Treated Nets

Ownership of insecticide-treated nets (ITN)

Percentage of households that have at least one insecticide-treated net (ITN)

Denominator: Number of households

Household ITN access

Percentage of households that have at least one ITN for every two *de facto* household members

Denominator: Number of households with at least one *de facto* member

ITNs are physical barriers against mosquito bites that also repel and kill mosquitoes and thus are an important tool to reduce malaria transmission. Importantly, ITNs provide both personal protection to

those sleeping under nets, as well as community protection (i.e., provide protection even for those who do not use ITNs) when high coverage is achieved.^{27,28}

Given the fact that many people may spend a possibly significant number of nights sleeping away from home, or with visitors in their home, it is important to define a clear denominator to calculate ITN access and use indicators. Here, we use the *de facto* surveyed population, that is, individuals who reported sleeping at home the night preceding the survey, or for household-level indicators the number of households where at least one member reported sleeping at home the night preceding the survey. Of the 5,169 households surveyed, 5,056 reported having at least one member sleep at home the previous night, for a total *de facto* surveyed population of 18,236. Table 3.1 details household ownership of mosquito nets and ITNs on Bioko Island. More than one quarter of households owned at least one ITN (32.8%), while substantially fewer had full access to ITNs (19.7%). Ownership and access varied by district, with Malabo and Baney having lower access compared to Luba and Riaba, even though ITN distribution activities in Bioko Sur have been relatively limited since 2021. Differences between ownership and access of ITNs and untreated nets were somewhat larger than in previous surveys, but remain relatively small, indicating that there may be introductions of non-ITN nets in the market, but the vast majority of nets were still ITNs.

Table 3.1: Household ownership of ITNs

Percentage of households with at least one bed net of any type (treated or untreated), percentage of households with at least one insecticide-treated net (ITN), average number of nets and ITNs per household, and percentage of households with adequate access to nets and ITNs, by district of residence and wealth quintile. adequate access to nets is defined as having at least one net per two <i>de facto</i> members, so households with no <i>de facto</i> members are excluded from this calculation								
	Household owns net (%)		Mean number of nets per household		Households surveyed	Household has access to nets for all members (%)		Households with at least one person who stayed the previous night
	Any net	ITN	Any net	ITN		Any net	ITN	
District								
Malabo	41.4	33.1	0.90	0.64	3,944	27.6	19.6	3,867
Baney	34.9	27.6	0.80	0.55	633	22.2	15.3	618
Luba	50.8	43.4	1.11	0.91	346	40.9	35.5	330
Riaba	55.5	46.2	1.02	0.82	246	42.9	35.5	241
Wealth Quintile								
Lowest	38.3	29.1	0.63	0.44	1,308	30.7	22.1	1,253
Second	43.5	35.0	0.83	0.61	1,101	29.1	21.4	1,075
Middle	47.1	38.2	1.04	0.72	864	29.3	21.3	854
Fourth	43.4	34.9	1.16	0.85	938	29.1	20.3	929
Highest	32.9	27.1	0.84	0.59	958	19.3	13.4	945
Gender of household head								
Male	39.3	31.3	0.85	0.60	3,495	25.9	18.3	3,412
Female	44.2	35.6	0.99	0.70	1,674	30.4	22.4	1,644
Age of household head								
15-24	30.0	22.2	0.53	0.32	208	24.0	16.6	197
25-34	32.4	24.6	0.53	0.39	1,274	21.8	15.7	1,228
35-44	39.1	31.7	0.83	0.59	1,687	25.0	17.4	1,654
45-54	46.2	37.3	1.26	0.86	963	31.1	20.7	952
55+	53.6	44.2	1.24	0.93	1,037	36.8	29.1	1,025
Education of household head								
At most primary	46.8	36.5	0.88	0.61	588	32.5	24.3	566
Secondary	41.9	34.3	0.89	0.66	2,051	28.7	21.5	2,003
Post-secondary	35.1	27.9	0.81	0.57	1,611	24.2	16.6	1,577
Unknown	46.8	36.9	1.10	0.75	820	29.3	19.7	812
Stratum								
Rural/high transmission	41.5	33.2	0.84	0.63	1,841	29.0	22.5	1,787
Urban/low transmission	40.9	32.8	0.90	0.64	3,328	27.3	19.4	3,269
Total	41.0	32.8	0.89	0.64	5,169	27.5	19.7	5,056

As Figure 3.1 shows, the trends in household ownership and access to ITNs vary by district. In Malabo ownership and access have been gradually decreasing since the last mass distribution campaign in 2018, with the exception of 2020 when a top-up distribution campaign was conducted in high-transmission areas. Luba and Riaba show a similar trend of decreasing access since the last mass

distribution in these districts in 2021, although the introduction of Health District-led fixed point ITN distributions in 2025 may have contributed to reduced rates of decline in Luba and small increases in Riaba. Baney presents similar trends, with overall ownership and access declining since the last island-wide distribution in 2018, but significantly increasing in 2020 and 2021, corresponding to the top-up and periphery-only campaigns in 2020 and 2021, respectively. In particular, the effect of the 2021 mass distribution in non-urban areas is interesting, given that the majority of households in Baney correspond to the urban stratum.

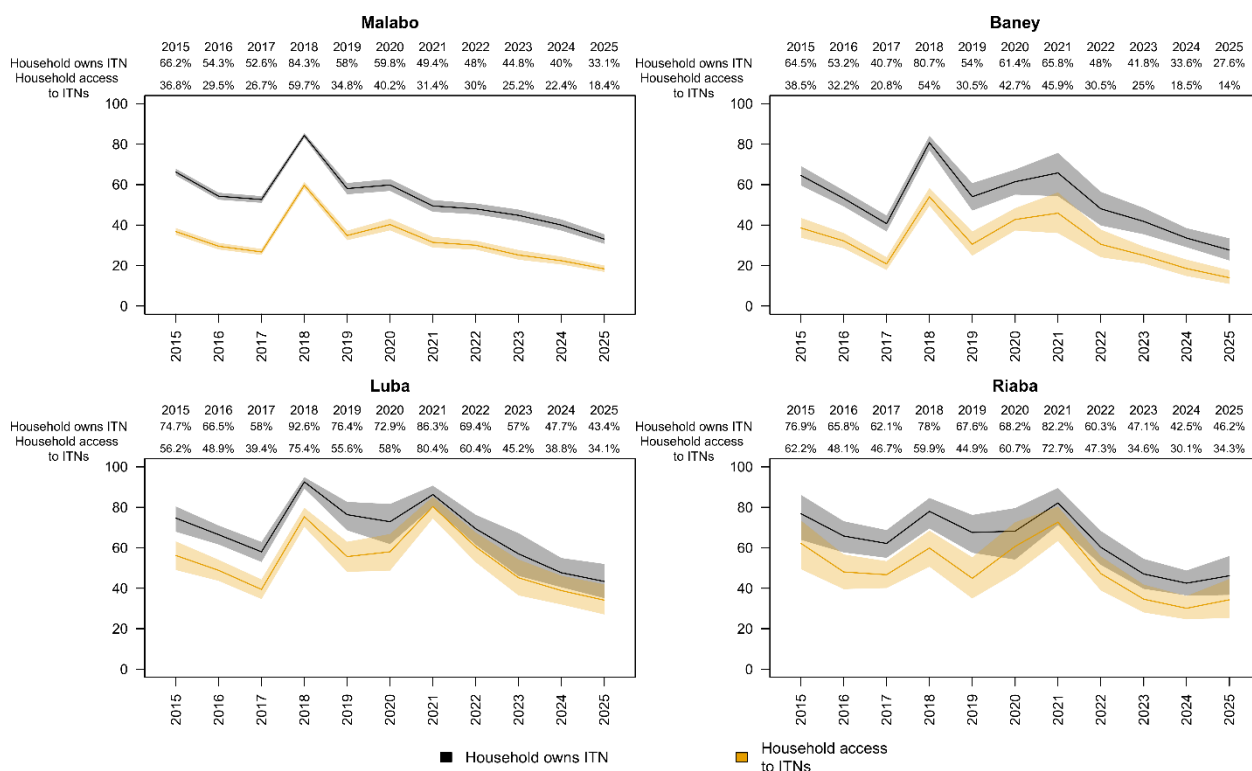


Figure 3.1: Historical trends in household ownership and access to ITNs

Percent of households which owned at least one ITN, and which had adequate access to ITNs for all members, (i.e., at least one ITN for every two household members) by district. Access is based on the *de jure* population here, since *de facto* household population has only been collected since 2019.

3.2 Population access and use of ITNs

Population ITN access

Percentage of the *de facto* population that had access to an ITN if each ITN in the household was used by up to two people.

Denominator: *De facto* household population

ITN use

Percentage of the *de facto* population who slept under an ITN on the night preceding the survey.

Denominator: *De facto* household population

ITN use:access

Ratio between ITN use and ITN population access, which approximates the percentage of the *de facto* population with access to an ITN that used an ITN the night preceding the survey. However, ITN use:access can take a value greater than 100 in the case that, on average, more than two people used an ITN.

3.2.1 Population ITN access

Population access to ITNs estimates the proportion of the total population that could have slept under an ITN, assuming no more than two people use each ITN. Population ITN access varied within Bioko, from a low of 20.8% in Baney to 39.8% in Luba (Table 3.2). Population access was consistent across wealth quintiles, with the exception of the wealthiest quintile where access was much lower (18.4% compared to 27.8-30.1% in the other four quintiles). This may be related to higher housing quality and/or ownership of air conditioning in this group, reducing the perceived need for or desirability of bed nets. Similarly, households headed by individuals with higher education levels had lower levels of access.

Table 3.2: Population access to bed nets

Percentage of the *de facto* population with access to any net or an ITN, by district of residence, household wealth and stratum. Access is defined as having a net in the household which would be shared with no more than one other person

	Access to any net (%)	Access to ITN (%)
District		
Malabo	35.5	26.6
Baney	28.7	20.8
Luba	46.2	39.8
Riaba	43.4	36.7
Wealth Quintile		
Lowest	39.4	27.8
Second	38.3	30.1
Middle	38.9	29.0
Fourth	37.1	28.4
Highest	25.1	18.4
Gender of household head		
Male	33.7	25.0
Female	36.6	28.1
Age of household head		
15-24	33.0	23.1
25-34	28.7	21.4
35-44	33.2	24.6
45-54	37.7	27.6
55+	39.7	31.5
Education of household head		
At most primary	40.0	30.3
Secondary	36.8	28.1
Post-secondary	29.7	22.2
Unknown	37.3	27.5
Stratum		
Rural/high transmission	34.7	26.6
Urban/low transmission	34.8	26.1
Total	34.8	26.1

3.2.2 Use of ITNs

The use of mosquito nets, especially by members of high-risk groups, is an important measure to protect against malaria. The 2025 BIMIS collected mosquito net use information for all *de facto* household members (Table 3.3). Of the total household population, 19.9% slept under an ITN the night before the survey, including more than half (53.8%) of those in households with at least one ITN, and nearly three in four (70.4%) of those in households with access to ITNs for all *de facto* members. ITN use varied by district similarly to trends in access, with use lowest in Baney and highest in Luba. Likewise, use was notably lower in the highest household wealth quintile, and in households

where the head had post-secondary education. ITN use also varied notably by age, with individuals aged 5-44 using ITNs less often (16.1-22.9%) than younger children (25%) or older adults (30%).

Table 3.3: Use of bed nets in the general population

Percentage of the *de facto* population who slept under a bed net (treated or untreated) or an insecticide-treated net (ITN) the night before being surveyed in all households, households with at least one ITN, and households with full access to ITNs (i.e., at least one ITN per two *de facto* members), by age, gender, education level of household head, district of residence, household wealth and stratum.

	All households			Households with at least one ITN			Households with full access to ITNs		
	any net (%)	ITN (%)	# individuals	any net (%)	ITN (%)	# individuals	any net (%)	ITN (%)	# individuals
Age									
<5	35.0	25.0	2,178	67.4	58.9	922	79.3	75.4	255
5-14	24.3	19.5	4,615	57.2	51.5	1,755	79.1	76.3	559
15-24	20.9	16.6	3,406	49.3	44.9	1,246	64.1	63.2	507
25-34	20.5	16.1	2,786	58.3	53.6	842	66.4	64.5	410
35-44	25.2	18.7	2,421	64.3	55.5	815	70.7	66.8	400
45-54	29.4	22.9	1,243	67.8	60.9	469	78.7	76.0	269
55+	37.2	30.0	1,330	72.6	66.2	603	80.2	76.3	398
Gender									
Female	27.3	21.2	9,073	62.8	56.2	3,449	75.7	73.1	1,395
Male	23.8	18.5	8,906	56.9	51.1	3,203	70.3	67.6	1,403
Household head education level									
At most primary	29.4	22.9	1,637	54.7	50.6	717	77.6	75.3	353
Secondary	28.7	23.0	6,656	63.9	57.9	2,604	76.4	73.4	1,129
Post-secondary	20.0	14.9	5,841	56.4	49.5	1,802	67.1	64.0	745
Unknown	28.1	21.5	3,453	60.5	54.1	1,377	74.5	72.9	523
District									
Malabo	26.4	20.5	14,070	60.7	54.1	5,207	73.7	70.9	2,084
Baney	19.5	14.4	2,346	52.4	48.2	717	65.6	64.3	268
Luba	37.3	32.8	866	72.3	67.9	396	80.7	76.1	262
Riaba	30.8	26.2	697	58.0	54.7	332	70.3	68.6	184
Wealth Quintile									
Lowest	32.5	23.9	2,772	72.9	65.3	1,049	77.8	76.0	567
Second	30.6	24.9	3,465	65.0	60.1	1,445	77.9	76.1	646
Middle	29.3	23.5	3,307	60.0	54.6	1,356	80.1	77.2	489
Fourth	26.6	20.5	3,842	58.7	52.9	1,473	71.5	69.5	671
Highest	15.5	11.4	4,593	48.7	40.6	1,329	57.3	52.0	425
Stratum									
Rural/high transmission	26.1	20.5	6,016	61.2	55.9	2,226	74.7	72.1	1,013
Urban/low transmission	25.6	19.8	11,963	59.8	53.6	4,426	72.9	70.2	1,785
Total	25.6	19.9	17,979	60.0	53.8	6,652	73.1	70.4	2,798

Patterns in ITN use among children less than five years old (Table 3.4) were similar to those in the general population. ITN use in this group is particularly important for decreasing the morbidity and mortality of malaria, since young children are at high risk for severe malaria and resulting death. In total, 25.0% of children in this age group slept under an ITN, and substantially more slept under any bed net (35%). ITN use in children varied significantly by district, and was much lower in Baney (16.5%) than other districts (26.4-30.8%).

Table 3.4: Use of bed nets among children under age five

Percentage of children under age five who slept under a bed net (treated or untreated) or an insecticide-treated net (ITN) the night before being surveyed in all households, households with at least one ITN, and households with full access to ITNs (i.e., at least one ITN per two *de facto* members), by age, gender, education level of household head, district of residence, household wealth and stratum.

	All households			Households with at least one ITN			Households with full access to ITNs		
	any net (%)	ITN (%)	# individuals	any net (%)	ITN (%)	# individuals	any net (%)	ITN (%)	# individuals
Age in months									
<12	52.3	34.7	454	79.3	69.9	232	90.3	85.0	67
12-23	34.3	23.0	407	69.0	56.0	165	78.9	69.9	44
24-35	30.3	21.0	425	62.8	54.3	161	78.6	74.9	39
36-47	27.5	20.4	471	61.0	54.5	177	69.2	68.1	55
48-59	30.0	25.4	421	61.9	56.7	187	78.2	77.6	50
Gender									
Female	34.4	24.5	1,095	66.3	57.0	470	76.6	72.2	138
Male	35.5	25.4	1,083	68.6	60.9	452	82.6	79.3	117
Head of household education level									
At most primary	39.8	29.0	165	57.1	50.4	93	77.7	65.8	26
Secondary	39.8	30.7	799	73.8	66.2	355	86.8	84.9	95
Post-secondary	28.9	19.1	686	66.0	55.7	241	73.1	66.8	71
Unknown	33.6	22.4	481	61.9	53.2	211	80.0	79.4	58
District									
Malabo	36.8	26.4	1,722	68.5	59.3	746	81.9	77.9	187
Baney	24.9	16.5	273	59.3	56.3	87	64.3	64.3	20
Luba	36.5	28.3	98	70.1	57.2	45	73.8	59.3	24
Riaba	34.3	30.8	85	61.6	59.4	44	66.9	66.9	24
Wealth Quintile									
Lowest	48.9	34.8	265	74.0	64.6	141	78.7	78.7	44
Second	39.5	31.6	457	72.0	66.2	221	89.9	87.0	70
Middle	38.9	28.7	428	66.8	62.4	188	91.7	86.5	41
Fourth	34.7	23.7	478	65.1	56.0	200	78.2	74.3	65
Highest	23.6	14.5	550	61.2	46.4	172	54.5	46.5	35
Stratum									
Rural/high transmission	34.4	24.9	749	67.1	59.6	315	79.7	76.0	105
Urban/low transmission	35.0	25.0	1,429	67.5	58.9	607	79.3	75.3	150
Total	35.0	25.0	2,178	67.4	58.9	922	79.3	75.4	255

More than two in three nets owned by households were used the night preceding the survey (Table 3.5). However, this was higher in Malabo (60.9%) than other districts (49.9-54.2%). This may partly be explained by the self-selection effects of net pick-up points in urban Malabo. Interestingly, the proportion of nets used was much more consistent across household wealth and education of the household head than use of nets. This provides further evidence of self-selection for net ownership, whereby households who do not want to use nets are much less likely to keep nets after receiving them. In an environment with pick-up points, this is intensified since individuals who do not want to use nets are unlikely to spend resources to visit the distribution point to obtain nets. Self-selection of net ownership has important implications when considering future ITN distribution or communication activities, since it means net use among households that do not currently have nets is unlikely to reach the level currently observed in households with nets, even if perfect access were achieved.

Table 3.5: Use of existing bed nets

Percentage of existing bed nets which were used the night preceding the survey by net type, district of residence age, gender and education level of the household head, household wealth, stratum.

	Nets used (%)	Number of nets
Net type		
LLIN	60.5	3,305
Untreated	54.6	1,079
District		
Malabo	60.9	3,476
Baney	52.9	476
Luba	49.9	355
Riaba	54.2	249
Age of household head		
15-24	52.3	100
25-34	60.5	668
35-44	60.6	1,398
45-54	56.2	1,126
55+	61.2	1,264
Gender of household head		
Male	58.5	2,903
Female	60.6	1,653
Education of household head		
At most primary	63.0	507
Secondary	60.2	1,781
Post-secondary	54.9	1,290
Unknown	62.9	882
Wealth quintile		
Lowest	67.6	855
Second	62.9	960
Middle	62.2	899
Fourth	56.2	1,026
Highest	51.2	816
Stratum		
Rural/high transmission	59.0	1,558
Urban/low transmission	59.3	2,998
Total	59.3	4,556

3.2.3 Net use:access ratio

The ratio between use of bed nets and population access to bed nets (use:access) can be used as an approximation of the proportion of those with access to nets that use those nets. This is a key piece of information in evaluating and planning future ITN distribution strategies, since it can provide some information about what net use could be given perfect access. In the case of low use:access (i.e., a large gap between population access and use of ITNs), malaria programs may need to investigate drivers or barriers to ITN use and emphasize designing appropriate behavioral change interventions. However, a large caveat here is that since access estimates are based on survey data and not distribution data, the data may be subject to the net ownership self-selection effect discussed above. Thus, particularly in an environment with ITN pick-up points, net use:access likely overestimates the true willingness of the population to use nets given access.

Table 3.6 shows use:access ratios by various demographic breakdowns. Around three of every four individuals who had access to an ITN used it the night preceding the survey. Use:access was highest in Luba district (0.82), and similar across other districts (0.7-0.77). Notably, this trend is different than the trends in access, with Riaba in particular having access similar to Luba but substantially lower use:access, a possible indication of a need for sensitization on the use of ITNs in these communities.

Table 3.6: Net use:access ratio

Ratio between net use (percentage of the *de facto* population using a net) and the proportion of the *de facto* population with access to any net or an ITN, by district of residence, household wealth, household head education level and stratum. Access is defined as having at least one net per two *de facto* household members, so a value of 1.0 corresponds to every net being used on average by two persons.

	Any net	ITN
District		
Malabo	0.74	0.77
Baney	0.68	0.70
Luba	0.81	0.82
Riaba	0.71	0.71
Wealth Quintile		
Lowest	0.82	0.86
Second	0.80	0.83
Middle	0.75	0.81
Fourth	0.72	0.72
Highest	0.62	0.62
Education of household head		
At most primary	0.74	0.76
Secondary	0.78	0.82
Post-secondary	0.67	0.67
Unknown	0.75	0.78
Stratum		
Rural/high transmission	0.75	0.77
Urban/low transmission	0.74	0.76
Total	0.74	0.76

3.2.4 Trends in ITN population access and use over time

As noted above, there have been changes in the ITN distribution strategy in recent years, particularly since the most recent mass distribution campaign in 2018. Trends in key ITN indicators since 2015 (Figure 3.2) are important in evaluating whether these changes to the distribution strategy have been effective. Although ITN ownership, access and use were very high in all districts in 2018 (due to that year's mass distribution campaign), these quickly declined in 2019. In 2020, the top-up campaign had small effects in Malabo and Baney, increasing population access much more than use, while the 2021 mass distribution in the periphery dramatically increased access, and somewhat increased use in Baney, Luba and Riaba. However, as with the 2018 island-wide distribution, these gains were short-lived, with use and access declining to previous levels within one year. Since the most recent distribution campaign in 2021, both use and access have declined substantially in all districts.

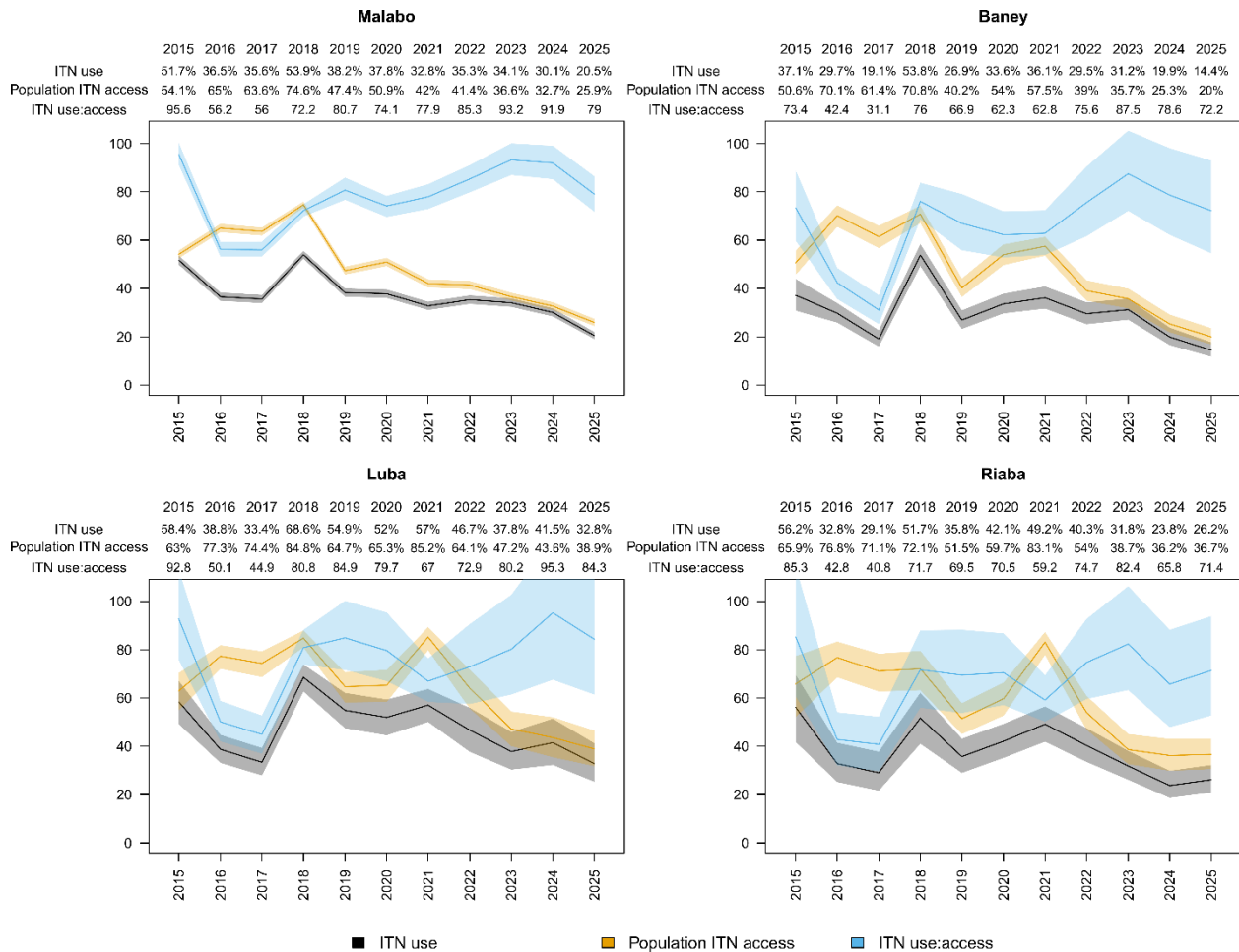


Figure 3.2: Historical trends in ITN population access, use, and use:access

Population access to ITNs, use of ITNs, and ratio between use and access (use:access) since 2015. Note that population access to ITNs, ITN use and use:access are based on the *de jure* population here, since *de facto* household population has only been collected since 2019. The use:access ratio has been multiplied by 100 and can be interpreted similar to percentages, but values above 100 are possible, corresponding to more than two persons using an ITN on average.

3.2.5 Assessment of fixed-point ITN distribution

While island- or district-level trends can be informative about the impact of implementing fixed-point distributions, even districts hide much complexity. On the other hand, the BIMIS collects other information which, when merged with net indicators, can be more well-suited to assessing the implementation of ITN distribution points in Malabo since 2021. A straightforward analysis of how net use among households which have access to ITNs differs by whether the household had nets from a distribution point shows that households which go to pick-up points have generally been more likely to use nets (Figure 3.3), although the difference has narrowed since 2024. This result provides some evidence that the pick-up point strategy plausibly increases the efficiency of distributions (in terms of net use and resources required), as compared to a mass distribution campaign, although the non-significant differences in 2024-2025 cast some doubt on this interpretation.

	2021	2022	2023	2024	2025
Houses with ITN access and a net from fixed point	75.5%	82.5%	87.1%	82.3%	76.5%
Houses with ITN access but no nets from fixed points	68.2%	71.7%	77.9%	79.4%	69.7%

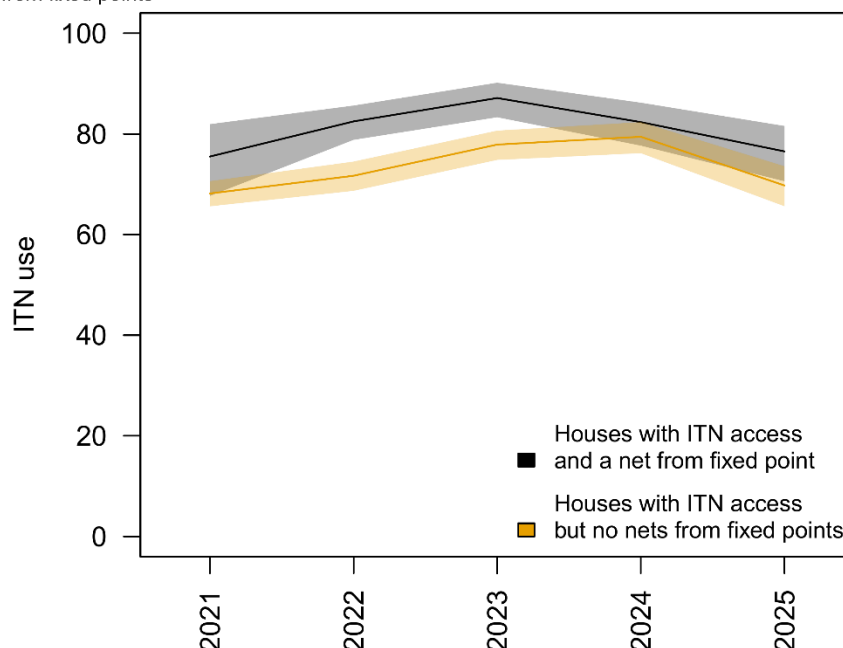


Figure 3.3: Use of ITNs by source of nets

Use of ITNs from 2021-2025 among households with access to ITNs, in those which had at least one net from a fixed distribution point and those with only nets from other sources.

3.3 Reasons for not using bed nets

As discussed in sections above, ownership or even access to ITNs does not always correspond to use. Hence, for each existing mosquito net not used on the night preceding the survey, the BIMIS collected information on why the net was not used. This information is crucial to identify and potentially overcome barriers to use of mosquito nets. Saving the nets for later was by far the most common reason reported for not using nets (42.2%), although this may be partially due to response bias. Other notable reasons provided for not using nets were that they were too uncomfortable (8.3%), not needed this season (7.4%), too hot (5.5%) or in bad condition (3.4%).

Table 3.7: Reasons for not using a net

Among nets which were not used, the percentage for which respondents indicated various reasons for not using.

	Number of unused nets	Reason for not using net (%)															
		Not effective	Too hot	Bad odor	Too uncomfort able	Irritate body	In bad condition	House sprayed	Not needed this season	None available	Have AC	Windows are screened	User did not sleep in house	Saving for later	Used by visitor	Other	Don't know
District																	
Malabo	1,313	0.2	6.2	0.3	9.5	3.1	3.0	0.2	8.3	2.0	2.1	0.1	8.5	40.6	0.3	13.8	6.7
Baney	205	0.0	2.7	0.0	4.4	2.2	5.7	0.0	2.6	2.2	6.2	0.0	5.9	45.5	0.4	16.2	7.1
Luba	180	0.0	4.1	0.0	2.6	0.0	2.3	0.0	8.9	0.5	0.0	0.0	10.9	59.6	0.0	5.8	5.9
Riaba	112	0.0	4.7	0.0	3.7	0.7	3.4	0.0	15.6	1.0	0.0	0.0	6.4	42.7	1.7	18.9	3.6
Age of household head																	
15-24	44	1.1	4.6	0.0	4.1	4.5	0.0	0.0	1.5	0.0	0.0	0.0	13.6	51.7	2.4	7.0	9.4
25-34	263	0.0	5.1	1.0	10.5	3.5	3.6	0.0	2.6	3.3	0.4	0.5	11.3	39.4	0.0	16.3	7.5
35-44	532	0.3	7.0	0.1	8.1	4.1	3.3	0.4	7.0	2.6	2.5	0.0	5.9	36.2	0.5	18.8	7.3
45-54	464	0.0	3.1	0.1	7.3	1.4	3.1	0.0	6.9	1.1	6.0	0.0	7.3	46.7	0.3	12.2	6.2
55+	507	0.0	6.8	0.0	8.9	2.2	4.4	0.0	12.8	1.8	0.7	0.0	9.4	44.9	0.2	9.4	5.8
Gender of household head																	
Male	1,172	0.2	5.1	0.2	9.3	2.9	2.9	0.1	7.7	1.9	3.6	0.0	8.0	39.3	0.5	14.9	7.6
Female	638	0.0	6.1	0.1	6.4	2.7	4.4	0.2	7.0	2.2	1.2	0.2	8.4	47.3	0.2	12.5	5.2
Education of household head																	
At most primary	187	0.0	5.6	1.2	5.6	0.0	9.5	0.2	10.4	5.3	0.0	0.0	5.7	29.4	0.0	25.5	5.2
Secondary	702	0.3	5.4	0.0	8.9	2.2	3.5	0.3	8.2	1.8	0.2	0.0	8.6	44.7	0.3	13.1	4.9
Post-secondary	553	0.1	3.6	0.3	7.3	2.6	2.7	0.0	6.8	1.2	6.6	0.2	10.3	41.3	0.5	12.4	8.0
Unknown	336	0.0	6.7	0.0	8.0	3.9	1.9	0.0	5.7	2.6	2.1	0.0	4.3	45.8	0.4	14.6	8.3
Wealth quintile																	
Lowest	300	0.0	6.5	0.0	5.1	1.9	3.2	0.1	10.4	1.4	0.0	0.0	7.7	48.0	0.2	12.8	5.3
Second	371	0.0	4.7	0.6	7.7	0.9	5.6	0.0	5.7	2.3	0.0	0.0	9.1	43.1	0.1	14.4	7.2
Middle	339	0.0	5.2	0.0	6.3	1.3	4.1	0.0	7.7	1.5	2.4	0.0	13.0	38.6	0.4	12.8	8.4
Fourth	434	0.5	3.9	0.2	9.1	3.2	1.5	0.4	9.3	2.5	0.3	0.0	5.7	44.9	0.6	16.4	5.4
Highest	366	0.0	7.6	0.2	10.8	5.6	3.5	0.0	5.1	1.8	9.0	0.3	6.4	38.9	0.4	12.6	7.1
Stratum																	
Rural/high transmission	634	0.4	5.7	0.6	4.4	1.7	5.9	0.5	8.8	2.2	1.7	0.0	9.7	38.4	0.8	16.5	6.4
Urban/low transmission	1,176	0.1	5.4	0.2	8.7	2.9	3.2	0.1	7.3	2.0	2.8	0.1	8.0	42.6	0.3	13.8	6.8
Total	1,810	0.1	5.5	0.2	8.3	2.8	3.4	0.1	7.4	2.0	2.7	0.1	8.1	42.2	0.4	14.0	6.7

3.4 Source and condition of bed nets

In addition to collecting information about the use of bed nets, surveyors collected information about the source, color, type and physical condition of bed nets, where possible by direct observation. As summarized in Table 3.8, most nets were reported as being received from a public health facility (38.8%), pick-up point (27.3%) or distribution campaign (8.7%). While efforts were made to avoid mis-coding responses, public health facility responses may be elevated due to conflation with distribution points, since points were mostly located at public health facilities. In contrast to Malabo and Baney, a high percentage of nets in Luba and Riaba were reported as sourced from a distribution campaign (36.6% and 36.5%, respectively), a possible indication that alternative distribution strategies have been less effective in these districts.

Table 3.8: Source of nets

Proportion of nets which respondents indicated came from various sources.

	Total number of nets	Net Source (%)										
		Distribution campaign	School- based distribution	Government clinic/ hospital	Point of distribution	BIMEP office	Retail shop	Pharmacy	Workplace	Gift	Other	Don't know
District												
Malabo	3,478	6.5	0.2	37.2	30.5	1.1	7.5	0.1	0.5	8.2	2.8	5.4
Baney	477	12.7	0.0	47.9	16.0	1.2	4.0	0.0	0.2	8.4	2.2	7.3
Luba	356	36.6	0.0	33.7	8.8	0.1	3.0	0.0	0.0	12.6	2.7	2.5
Riaba	250	36.5	0.0	41.6	2.4	0.5	5.2	0.0	1.5	5.6	3.9	2.8
Age of household head												
15-24	100	8.0	0.0	31.0	22.3	0.0	8.6	0.0	0.0	18.9	2.1	9.2
25-34	669	4.9	0.0	34.1	26.3	0.5	8.0	0.0	0.4	15.0	5.2	5.6
35-44	1,398	6.8	0.0	40.3	26.2	1.5	8.9	0.0	0.9	7.9	2.4	5.2
45-54	1,128	10.3	0.0	39.3	30.0	1.4	5.2	0.2	0.0	5.8	1.9	5.9
55+	1,266	11.9	0.8	40.2	27.1	0.4	4.8	0.0	0.2	6.4	2.7	5.4
Gender of household head												
Male	2,905	8.7	0.3	37.6	27.4	1.3	7.7	0.0	0.6	7.4	3.1	5.8
Female	1,656	8.7	0.0	40.8	27.2	0.7	5.2	0.0	0.0	9.9	2.2	5.2
Education of household head												
At most primary	508	12.7	0.0	27.9	29.1	1.5	5.6	0.0	0.3	11.3	3.1	8.5
Secondary	1,782	9.0	0.0	38.0	28.8	0.3	6.4	0.1	0.3	10.9	2.5	3.7
Post-secondary	1,291	8.0	0.6	41.2	25.6	1.7	7.9	0.0	0.9	5.9	3.4	4.9
Unknown	883	7.8	0.0	42.7	26.9	1.4	5.9	0.1	0.0	5.0	1.5	8.7
Wealth quintile												
Lowest	855	16.2	0.0	32.3	22.1	0.3	5.2	0.2	0.1	16.0	3.0	4.5
Second	962	7.2	0.8	34.5	30.5	1.2	6.4	0.0	0.7	12.4	2.0	4.3
Middle	899	7.0	0.0	41.3	29.1	0.5	4.4	0.0	0.5	7.4	1.6	8.2
Fourth	1,028	6.4	0.0	44.0	29.4	0.9	7.3	0.1	0.0	4.9	2.2	4.8
Highest	817	10.0	0.1	38.0	23.1	2.1	10.1	0.0	0.8	4.7	5.3	5.9
Stratum												
Rural/high transmission	1,559	24.7	0.0	38.4	12.3	0.1	6.6	0.0	0.8	7.0	6.1	4.0
Urban/low transmission	3,002	7.0	0.2	38.8	28.9	1.1	6.8	0.1	0.4	8.5	2.4	5.8
Total	4,561	8.7	0.2	38.8	27.3	1.0	6.8	0.0	0.4	8.3	2.8	5.6

Overall, around three quarters of nets observed were in good condition with no holes (74%, Table 3.9). However, nets in Riaba were in notably poorer condition, an indication of possible need for renewed ITN distribution and further outreach on net maintenance.

Table 3.9: Condition of nets

Percentage of nets observed with no holes, only thumb-sized holes, at least one head-sized hole, and never used.						
	Nets observed	Net condition (%)				
		No holes	Only thumb-sized holes	Head-sized hole	Never used	Don't know
District						
Malabo	1,596	73.8	10.4	3.3	12.4	0.1
Baney	176	74.8	11.2	5.5	8.0	0.5
Luba	145	80.4	8.0	4.0	7.3	0.3
Riaba	121	64.9	17.2	8.8	8.1	1.0
Age of household head						
15-24	49	79.8	7.1	5.6	7.5	0.0
25-34	325	74.2	11.4	2.5	11.9	0.0
35-44	618	74.3	8.5	3.2	14.0	0.1
45-54	501	72.1	12.7	4.0	10.9	0.2
55+	545	74.9	10.5	4.4	9.9	0.3
Gender of household head						
Male	1,302	76.3	9.7	3.3	10.5	0.1
Female	736	70.2	11.8	4.1	13.7	0.2
Education of household head						
At most primary	216	74.3	13.8	7.3	3.9	0.8
Secondary	905	73.8	11.0	3.2	12.0	0.0
Post-secondary	498	76.1	7.9	2.5	13.3	0.3
Unknown	388	71.9	12.1	4.8	11.1	0.1
Wealth quintile						
Lowest	423	70.6	16.6	5.3	7.1	0.5
Second	452	69.5	12.8	6.8	10.9	0.1
Middle	413	80.3	9.2	3.0	7.5	0.0
Fourth	430	73.9	8.9	1.4	15.7	0.0
Highest	320	74.4	6.3	2.1	16.8	0.4
Stratum						
Rural/high transmission	692	70.3	16.3	3.8	9.4	0.3
Urban/low transmission	1,346	74.4	9.9	3.6	12.0	0.1
Total	2,038	74.0	10.5	3.6	11.7	0.2

3.5 Malaria prevention in pregnancy

Antenatal care (ANC) coverage

Percentage of women who attended at least one (ANC-1) or three (ANC-3) ANC visits in their last completed pregnancy

Denominator: Women 15-49 years old who had a live birth in the two years preceding the survey

ANC bed net coverage

Percentage of women who received a bed net at an ANC visit during their last pregnancy

Denominator: Women 15-49 years old who had a live birth in the two years preceding the survey and attended at least one ANC visit during their last pregnancy

Intermittent preventative treatment during pregnancy (IPTp-SP) coverage

Percentage of women who took three or more doses of Sulphadoxine/Pyrimethamine (SP) during their last pregnancy

Denominator: Women 15-49 years old who had a live birth in the two years preceding the survey and attended at least one ANC visit during their last pregnancy

Pregnant women are at significantly higher risk for malaria complications than non-pregnant adult women, and malaria infection can impact the health of the mother and fetus during pregnancy. The World Health Organization (WHO) recommends a three approaches package to reduce the effect of malaria in pregnancy. This package includes prompt diagnosis and effective treatment of malaria infections, the use of ITNs, and IPTp-SP as part of ANC services.²⁹ IPTp-SP is a highly cost-effective approach in reducing maternal morbidity and low birth weight.³⁰ The WHO recommends administering three or more doses of IPTp-SP to pregnant women living in moderate-to-high malaria transmission areas in Africa, starting as early as possible in the second trimester and continuing at monthly intervals up to delivery time.²⁹ All of these approaches have been adopted on Bioko Island, and this section summarizes coverage of the different aspects of malaria prevention in pregnancy based on the BIMIS.

3.5.1 Antenatal care coverage

Women attending ANC clinics get access to a complete package of interventions to improve the outcome of their pregnancy. ANC services should ideally be delivered by skilled health providers capable of assessing the pregnancy status, delivering the package of interventions, and providing additional clinical management when necessary. Women aged 15 to 49 who had a live birth within the past two years preceding the survey were directly interviewed on ANC attendance and IPTp-SP during that pregnancy.

Nearly all (95.9%) women with a live birth in the last two years reported receiving ANC care of some kind, while coverage of the minimum recommended three ANC visits was only moderately lower (88.4%, Table 3.10). Among those who received ANC, half (49.6%) received that care in a public hospital, and three of every four (74.1%) in a public facility. Use of private facilities for ANC was much less common in Luba and Riaba than Malabo and Baney, and increased with household wealth and education level. ANC coverage was similar across districts but increased with age, education level and household wealth quintile.

Table 3.10: Coverage of antenatal care for pregnant women

Number and percentage of women who gave birth in the two years preceding the survey who reported attending one or more ANC visit during their last pregnancy, and among those who attended ANC the percentage who received care at specific types of facilities, by age, education level, district of residence, wealth quintile, and stratum.

	Women with live birth in last two years	ANC-1 coverage (%)	ANC-3 coverage (%)	Women receiving ANC	Public		Any public facility	Private				Any private facility	Other
					Hospital	Health center		Private clinic	Laboratory	Chinese consultation room	Traditional practitioner		
Age													
15-24	302	93.9	84.0	279	55.1	29.4	84.5	13.2	0.2	0.0	0.0	13.4	2.1
25-34	470	96.3	88.8	445	48.8	23.4	72.1	25.1	0.0	0.0	0.0	25.1	2.8
35-44	218	97.6	93.6	211	43.0	20.6	63.6	35.1	0.0	0.0	0.0	35.1	1.3
45-54	4	100.0	100.0	4	100.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Education level													
At most primary	67	93.7	88.8	64	53.1	29.6	82.7	17.3	0.0	0.0	0.0	17.3	0.0
Secondary	379	95.2	86.7	356	53.3	26.7	80.0	17.3	0.0	0.0	0.0	17.3	2.7
Post-secondary	296	98.4	93.6	286	39.4	18.9	58.4	39.1	0.1	0.0	0.0	39.2	2.4
Unknown	229	95.2	83.8	214	54.7	27.7	82.4	15.6	0.1	0.0	0.0	15.7	1.9
District													
Malabo	795	95.4	87.1	744	49.5	24.9	74.4	23.4	0.1	0.0	0.0	23.5	2.1
Baney	117	98.2	93.6	115	45.9	22.9	68.8	28.4	0.0	0.0	0.0	28.4	2.8
Luba	43	98.5	93.3	42	72.1	19.7	91.8	6.4	0.0	0.0	0.0	6.4	1.8
Riaba	39	97.4	96.7	38	71.1	20.9	92.1	5.4	0.0	0.0	0.0	5.4	2.6
Wealth Quintile													
Lowest	144	93.5	80.9	133	59.7	30.4	90.0	8.6	0.0	0.0	0.0	8.6	1.3
Second	220	96.3	87.6	210	51.7	33.0	84.7	13.9	0.0	0.0	0.0	13.9	1.4
Middle	202	94.9	86.3	190	57.3	24.2	81.5	16.9	0.0	0.0	0.0	16.9	1.7
Fourth	199	96.5	90.0	189	51.3	20.7	72.0	26.2	0.1	0.0	0.0	26.3	1.7
Highest	229	97.0	93.4	217	34.2	16.6	50.8	44.6	0.1	0.0	0.0	44.8	4.4
Stratum													
Rural/high transmission	351	90.7	83.7	319	58.6	23.2	81.9	15.5	0.7	0.0	0.0	16.2	2.0
Urban/low transmission	643	96.4	88.9	620	48.7	24.6	73.2	24.5	0.0	0.0	0.0	24.5	2.2
Total	994	95.9	88.4	939	49.6	24.4	74.1	23.6	0.1	0.0	0.0	23.7	2.2

3.5.2 ANC services provided

In collaboration with the NMCP, BIMEP distributes ITNs and provides IPTp-SP free of charge to pregnant women receiving ANC care in public facilities. Table 3.11 summarizes the proportion of women with a live birth in the last two years who attended ANC that received an ITN or IPTp-SP during ANC. Overall, over half (58.8%) received an ITN, though this was (unsurprisingly) much higher for those attending ANC in public facilities (71%) than private (22.5%). Public and private facilities provided IPTp at similar rates, with 48.0% overall receiving three doses or more, as recommended by the WHO and stipulated in the National Malaria Control Strategy. The coverage of three doses of IPTp was similar across strata, but higher in Luba and Riaba, likely due to the lower use of private facilities for ANC in these districts.

Table 3.11: Coverage of antenatal services

Among women with a live birth in the two years preceding the survey who attended at least one ANC visit, the proportion who reported receiving a bed net, and among those who could recall the number of IPTp-SP doses received in their last pregnancy, the proportion that received at least one, two or three doses of IPTp-SP by age, education level, district of residence, wealth quintile, stratum, and ANC facility type.

	Received bed net (%)	Number of women with one or more ANC	Number of IPTp-SP doses received (%)			Number of women with known number of IPTp doses
			One or more	Two or more	Three or more	
Age						
15-24	67.0	278	79.7	63.8	47.9	202
25-34	53.3	442	84.9	65.7	48.1	344
35-44	58.3	208	86.6	67.6	47.7	164
45-54	93.8	4	100.0	68.8	62.6	4
Education level						
At most primary	69.6	64	89.3	61.5	53.2	47
Secondary	62.8	351	81.6	64.9	47.7	281
Post-secondary	45.4	284	84.5	65.7	47.8	217
Unknown	68.0	214	84.1	67.6	47.8	157
District						
Malabo	59.7	738	82.5	64.8	47.4	563
Baney	51.9	115	88.1	65.6	48.5	89
Luba	66.2	42	92.9	87.5	60.5	36
Riaba	78.3	37	100.0	80.8	65.6	26
Wealth Quintile						
Lowest	63.5	133	84.3	68.7	46.2	100
Second	66.3	208	86.8	69.8	44.1	153
Middle	63.5	189	81.2	63.0	48.1	143
Fourth	59.6	187	84.2	62.3	50.4	148
Highest	44.5	215	82.7	65.3	50.2	170
Stratum						
Rural/high transmission	62.3	317	85.8	69.5	52.6	239
Urban/low transmission	58.4	615	83.6	65.2	47.6	475
ANC facility type						
Private	22.5	200	79.3	58.2	51.9	148
Public	71.0	713	85.0	67.4	46.3	554
Total	58.8	932	83.8	65.6	48.0	714

3.5.3 Use of ITNs

While measuring the coverage of ANC and related services requires considering previously completed pregnancies, it is possible to directly observe the use of mosquito nets by currently pregnant women. However, this indicator may change more quickly in response to changes in malaria control activities than ANC-related indicators, since ANC-related indicators are calculated based on a moving two-year window. Table 3.12 summarizes use of mosquito nets among women pregnant at the time of the survey. Use of ITNs among pregnant women was similar as in the general population (21.8%), and substantially higher in Luba and Riaba than Malabo and Baney.

Table 3.12: Use of bed nets among currently pregnant women

Percentage of pregnant women who slept under a bed net (treated or untreated) or an insecticide-treated net (ITN) the night before being surveyed in all households, households with at least one ITN, and households with full access to ITNs (i.e., at least one ITN per two *de facto* members), by age, education level, district of residence, household wealth and stratum.

	All households			Households with at least one ITN			Households with full access to ITNs		
	any net (%)	ITN (%)	# individuals	any net (%)	ITN (%)	# individuals	any net (%)	ITN (%)	# individuals
Age									
15-24	37.5	28.6	102	66.4	59.5	50	88.1	86.8	25
25-34	21.8	16.7	132	57.4	51.9	43	63.0	63.0	17
35-44	35.2	19.7	53	73.6	55.9	21	76.0	76.0	9
45-54	19.6	19.6	2	100.0	100.0	1			
Education level									
At most primary	28.0	19.8	17	66.8	66.8	6	100.0	100.0	4
Secondary	31.9	24.3	110	67.6	59.7	49	77.9	76.2	23
Post-secondary	22.6	16.1	87	57.4	46.6	31	82.2	82.2	11
Unknown	41.0	27.3	61	68.5	60.6	24	64.9	64.9	10
District									
Malabo	31.2	22.4	234	64.0	57.6	91	79.4	78.7	43
Baney	19.7	12.2	31	61.8	38.4	10	0.0	0.0	1
Luba	54.1	54.1	10	86.6	86.6	5	100.0	100.0	3
Riaba	43.3	43.3	14	67.0	67.0	9	100.0	100.0	4
Wealth Quintile									
Lowest	27.7	14.8	53	57.1	44.2	23	83.8	83.8	9
Second	23.2	18.9	67	59.5	59.5	23	69.6	69.6	15
Middle	43.2	36.5	60	76.3	69.4	29	97.1	94.3	11
Fourth	40.0	24.6	60	71.1	54.7	26	74.4	74.4	11
Highest	15.2	11.9	49	42.6	40.7	14	65.3	65.3	5
Stratum									
Rural/high transmission	32.8	23.5	131	63.4	56.1	55	72.7	69.0	26
Urban/low transmission	29.7	21.5	158	64.5	56.4	60	78.8	78.8	25
Total	30.1	21.8	289	64.4	56.3	115	77.7	77.1	51

3.5.4 Trends of malaria prevention in pregnancy over time

Coverage of different aspects of malaria prevention in pregnancy have remained relatively stable since 2015 (Figure 3.4). Consistently, more than 90% of women with a live birth in the two years preceding the survey received some ANC, while the proportion of those who received an ITN from their ANC modestly increased from 2016-2022, notably declined in 2024 and marginally increased in 2025. ITN use broadly follows historical patterns of ITN use in the general population. In 2022, there was a decrease in ITN use, maintained in 2023-2025, but this has not translated into sustained increases in malaria prevalence among pregnant women (see Chapter 5). Nevertheless, falling use of ITNs among pregnant women is concerning and points towards the possible need for more targeted outreach to this population.

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ITN use	57.2%	36.2%	32%	58.5%	37.3%	45.8%	43%	38.1%	33.7%	32.4%	21.8%
ANC-1 Coverage	96.4%	97.1%	98%	97.3%	98.1%	98.7%	97.6%	96.3%	95.1%	96.4%	95.9%
ANC Bednet Coverage	59.3%	51%	56.7%	61.5%	65.5%	64.5%	64.7%	67.1%	65.9%	56.8%	58.8%
IPTp3 Coverage	52.2%	44%	48.4%	46.2%	48.2%	50.9%	41.5%	44.1%	40.5%	48%	48%

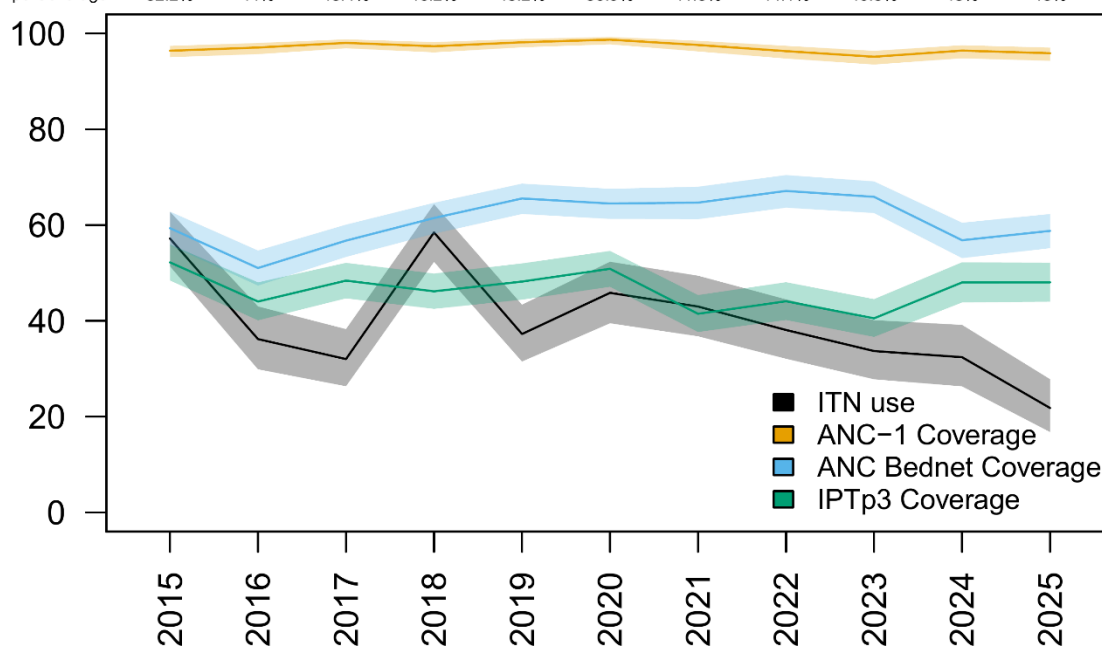


Figure 3.4: Historical coverage of malaria prevention in pregnancy

Percentage of pregnant women who slept under an ITN the night preceding the survey, percentage of women with a live birth in the last two years who received any ANC care, and percentage of those who attended ANC that received a bed net, and three or more doses of IPTp, from 2015-2025.

4 MANAGEMENT OF FEVER AND HEALTH SYSTEM UTILIZATION

Key Findings

- Fever prevalence:** 5.3% of all individuals, including 6.1% of children under age five reported having a fever in the two weeks preceding the survey
- Care seeking:** Advice or treatment was sought for 55.5% of individuals with fever in the two weeks preceding the survey, including 62.3% of children under age five
- Testing:** A blood sample was taken for testing from 72.9% of children under age five seeking care with a fever in the two weeks preceding the survey, including 86.9% of those for whom treatment was sought in public facilities
- Antimalarial treatment:** 74.4% of febrile children under age five testing positive for malaria received an antimalarial, including 66.6% of those who received treatment in a public facility
- Type of antimalarial received:** Among children under age five with recent history of fever who received an antimalarial, approximately two thirds (66.8%) received an artemisinin-based combination therapy (ACT)

The NMCP and BIMEP promote malaria case management through prompt diagnosis and treatment using appropriate and effective medicines to reduce malaria-associated morbidity and mortality on Bioko Island. The national malaria treatment guidelines of Equatorial Guinea recommend that all suspected malaria cases be confirmed either by microscopy or RDT and treated with adequate antimalarial drugs. The 2019 revised guidelines recommend Artemether/Lumefantrine (AL) as the first-line treatment for uncomplicated malaria.³¹

This chapter presents indicators related to management of fever in the general population and (in more detail) among children less than five years old. The findings can help design advocacy, communication, and social mobilization programs to support effective case management of fever and malaria. Importantly, the BIMIS is also currently the only source of information about adherence to national guidelines in private health facilities, and as such is crucial in designing a case management supervision and action plan to improve the quality of services provided beyond public health facilities.

4.1 Fever prevalence and treatment seeking

Fever prevalence

Percentage of individuals who reported having had a fever in the two weeks preceding the survey

Denominator: *De jure* household population

Care seeking

Percentage of individuals with a fever in the two weeks preceding the survey for whom advice or treatment was sought from a health provider, health facility, or pharmacy

Denominator: *De jure* household members who had a fever in the two weeks preceding the survey

Fever is a key symptom of malaria and other acute infections, particularly among children. Malaria-related fevers require prompt and effective treatment to prevent malaria morbidity and mortality. Table 4.1 describes the prevalence of fever and related treatment seeking behavior observed in the BIMIS. In total 5.3% of individuals registered reported having fever in the two weeks preceding the survey. Treatment of some kind was sought for around half (55.5%) of those with recent fever, including almost two thirds (62.3%) of children under five years old. Treatment seeking increased with household wealth and education of the household head. The relationship between household wealth and treatment seeking may be driven by increased ability to seek care at private facilities, which comprised a larger share of treatment seeking for wealthier households. Overall, public facilities accounted for only 36.5% of all treatment seeking for fever, but the majority of treatment seeking in Luba and Riaba was in public facilities (62.2% and 84.3%, respectively). This continues a trend seen since at least 2015 of increasing use of private facilities for fever treatment, particularly in Malabo and Baney districts (Figure 4.1).

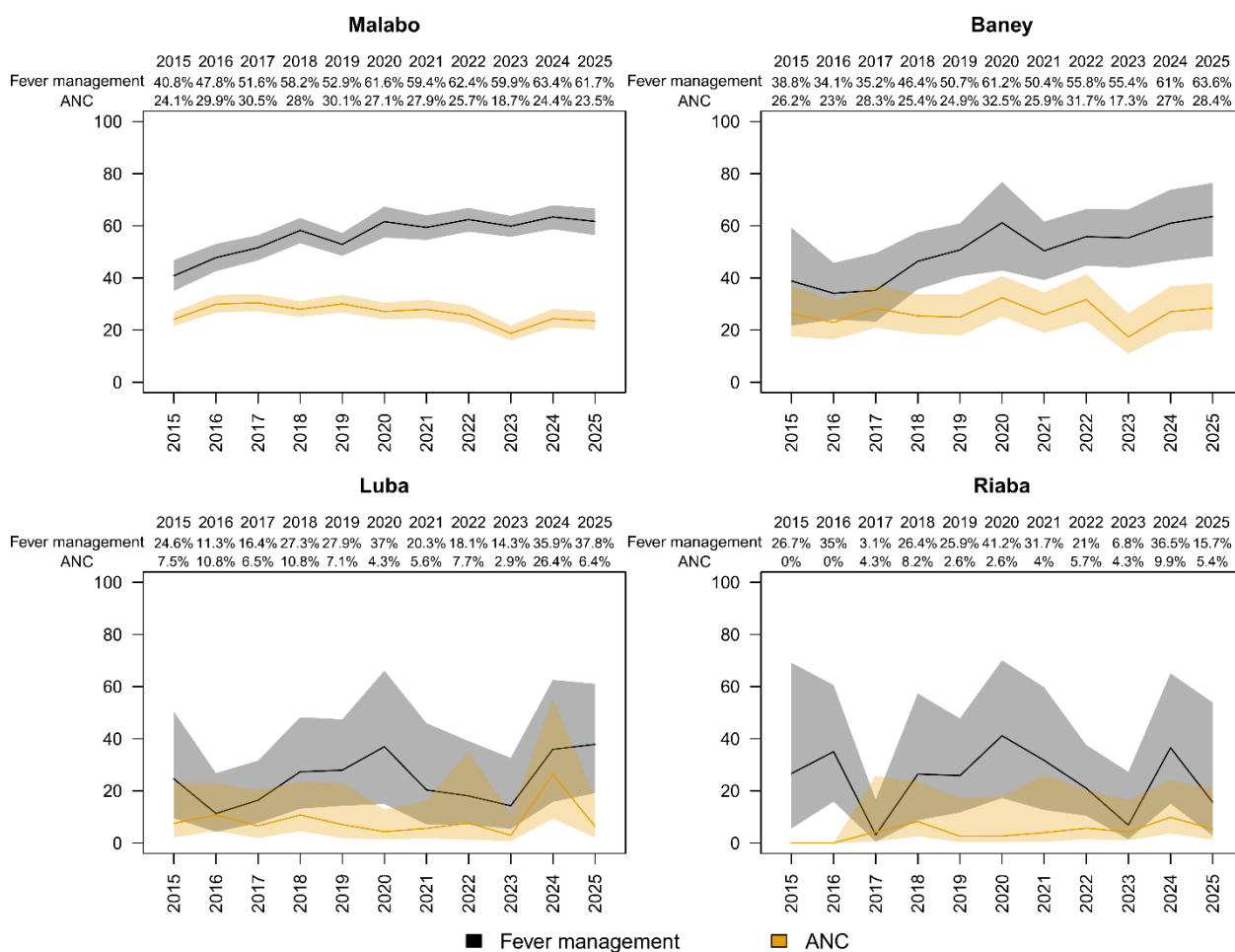


Figure 4.1: Historical trends in use of public and private facilities for fever treatment seeking and antenatal care

Percentage of use of private sector health facilities for fever among individuals (all ages) reporting seeking treatment for fever in the two weeks preceding the survey and for antenatal care (ANC) among women who reported attending any ANC during their last pregnancy completed within the last two years.

Table 4.1: Treatment seeking for fever

Number of individuals with fever in the two weeks preceding the survey, the percentage of these for whom treatment was sought, and among those who sought treatment the percentage who sought treatment in specific types of facilities.

	Fever prevalence	Number of febrile individuals	Sought treatment (%)	Sought treatment (#)	Public		All public facilities	Private						All private facilities	Other	Don't know
					Hospital	Health center		Private Clinic	Pharmacy	Retail store	Laboratory	Family practitioner	Traditional healer			
Age																
<5	6.1	139	62.3	86	35.1	13.1	48.2	29.6	20.6	0.0	0.0	0.0	0.0	50.2	1.6	0.0
5-14	3.2	158	52.7	89	26.5	10.5	37.0	23.7	38.6	0.0	0.0	0.0	0.0	62.4	0.7	0.0
15-24	4.8	185	56.5	99	25.8	10.1	35.9	13.8	47.4	0.0	0.0	0.0	0.0	61.2	2.9	0.0
25-34	6.7	208	51.0	101	24.5	4.5	28.9	31.3	37.1	0.0	0.0	0.0	0.0	68.5	2.6	0.0
35-44	6.3	164	58.4	88	22.7	11.1	33.8	24.3	40.3	0.0	0.0	0.0	0.0	64.7	1.6	0.0
45-54	6.4	102	53.4	55	31.4	4.2	35.6	30.7	30.2	0.6	0.0	0.0	0.0	61.4	3.0	0.0
55+	6.4	88	54.8	46	26.7	11.5	38.2	28.6	26.6	0.0	0.0	0.0	0.0	55.3	6.6	0.0
Gender																
Female	5.7	555	54.3	293	31.8	8.8	40.6	26.0	32.1	0.0	0.0	0.0	0.0	58.1	1.3	0.0
Male	4.8	489	57.0	271	21.5	10.0	31.6	24.4	40.3	0.1	0.0	0.0	0.0	64.8	3.7	0.0
District																
Malabo	5.6	850	53.8	448	27.4	9.2	36.7	24.7	37.0	0.0	0.0	0.0	0.0	61.7	1.7	0.0
Baney	3.8	105	68.8	66	18.8	10.5	29.3	31.5	32.1	0.0	0.0	0.0	0.0	63.6	7.2	0.0
Luba	4.2	58	63.1	37	52.6	9.6	62.2	11.9	23.5	2.4	0.0	0.0	0.0	37.8	0.0	0.0
Riaba	4.2	31	42.1	13	76.6	7.7	84.3	7.8	7.8	0.0	0.0	0.0	0.0	15.7	0.0	0.0
Education of household head																
At most primary	6.0	109	51.7	52	24.8	8.0	32.8	27.1	33.2	0.0	0.0	0.0	0.0	60.4	6.8	0.0
Secondary	5.6	406	56.0	222	24.4	8.3	32.7	18.6	46.8	0.0	0.0	0.0	0.0	65.4	1.9	0.0
Post-secondary	5.1	327	57.5	185	29.4	8.6	38.0	36.0	23.6	0.0	0.0	0.0	0.0	59.6	2.4	0.0
Unknown	4.7	184	55.1	99	27.3	15.0	42.3	19.7	36.4	0.3	0.0	0.0	0.0	56.3	1.4	0.0
Wealth quintile																
Lowest	6.9	197	43.0	82	23.1	7.7	30.8	18.1	48.5	0.0	0.0	0.0	0.0	66.6	2.6	0.0
Second	5.8	217	49.0	106	30.5	6.4	36.8	11.5	48.9	0.3	0.0	0.0	0.0	60.6	2.6	0.0
Middle	4.8	183	59.2	103	23.9	11.8	35.7	24.2	37.2	0.0	0.0	0.0	0.0	61.4	3.0	0.0
Fourth	4.8	207	57.5	120	24.8	13.9	38.7	23.4	35.7	0.0	0.0	0.0	0.0	59.1	2.2	0.0
Highest	4.9	240	64.9	153	30.2	7.2	37.4	39.1	21.5	0.0	0.0	0.0	0.0	60.6	2.0	0.0
Stratum																
Rural/high transmission	6.0	374	50.7	189	41.0	7.3	48.3	23.6	25.1	0.5	0.0	0.0	0.0	49.2	2.5	0.0
Urban/low transmission	5.2	670	56.1	375	25.6	9.6	35.2	25.4	37.0	0.0	0.0	0.0	0.0	62.4	2.4	0.0
Total	5.3	1,044	55.5	564	27.1	9.4	36.5	25.3	35.8	0.0	0.0	0.0	0.0	61.2	2.4	0.0

4.2 Fever diagnosis and treatment for children

Fever diagnosis in febrile children under 5 years old

Percentage of febrile children under age five who had blood taken from a finger or heel for testing (this is a proxy measure of diagnostic testing for malaria)

Denominator: Children under age five with a fever in the two weeks preceding the survey for whom advice or treatment was sought

Antimalaria treatment for children under age five

Percentage of febrile children under age five testing positive for malaria who received an antimalarial treatment of any kind

Denominator: Children under age five with a fever in the two weeks preceding the survey who tested positive for malaria while seeking treatment

Artemisinin-based combination therapy for children under age five

Percentage of children under age five with recent fever and that received an antimalarial treatment of any kind who received an artemisinin-based combination therapy (ACT)

Denominator: Children under age five with a fever in the two weeks preceding the survey who received any antimalarial drugs as treatment for fever

Among children under five years with a recent fever who also were taken to a facility for treatment, the BIMIS collects additional indicators about the type of care that facility provided. These data give some insight into the adherence of facilities to national guidelines, but it is important to remember that they are reported by the patient, up to two weeks after care was provided. As such, recall bias may alter the absolute levels of adherence in these estimates, but is less likely to alter trends between groups significantly.

With these caveats, Table 4.2 summarizes reported diagnosis and treatment of malaria among febrile children under five. More than two thirds (72.9%) of febrile children seeking care were tested for malaria, and a large majority of those who tested positive received an antimalarial (74.4%). Testing febrile children for malaria was more common in public health facilities (86.9%) than private facilities (62.8%). The number of children in households surveyed reporting a positive malaria test in the last two weeks was too low for a meaningful comparison of adherence to treatment guidelines in public and private facilities.

Table 4.2: Fever diagnosis and treatment for children under 5

Number of children under 5 years old with fever in the two weeks preceding the survey for whom treatment was sought, percentage of these for whom a blood sample was taken for diagnosis, and the number of children who tested positive for malaria or who did not have a positive malaria test (i.e., either no test was taken or the result was negative) and percentage that received any antimalarial

	Children taken to facility		Tested positive for malaria		No positive malaria test	
	Number of children	Blood sample taken (%)	Number of children	Given antimalarial (%)	Number of children	Given antimalarial (%)
District						
Malabo	60	75.0	18	71.4	32	23.0
Baney	14	64.3	2	100.0	11	20.9
Luba	2	49.1	1	100.0	1	100.0
Riaba	2	100.0	1	100.0	0	
Gender						
Female	37	81.5	10	66.6	17	20.4
Male	41	64.0	12	79.3	27	24.9
Age (months)						
<12	13	72.0	3	33.3	8	0.0
12-23	23	78.8	6	77.2	12	16.6
24-35	16	91.3	6	100.0	8	62.0
36-47	13	60.3	5	70.6	6	23.0
48-59	13	61.6	2	100.0	10	23.2
Education of household head						
At most primary	6	42.2	2	100.0	3	0.0
Secondary	35	77.2	10	56.1	18	18.2
Post-secondary	21	68.9	5	76.2	13	40.6
Unknown	15	81.7	4	100.0	10	16.0
Treatment facility type						
Private	41	62.8	9	84.9	24	30.4
Public	36	86.9	13	66.6	19	15.5
Total	78	72.9	22	74.4	44	22.9

To ensure effective treatment, the WHO recommends that all confirmed uncomplicated *P. falciparum* malaria cases be treated with an artemisinin-based combination therapy (ACT). Despite this recommendation, and despite the national guidelines of Equatorial Guinea specifying Artemether-Lumefantrine (AL), an ACT, as the first-line treatment for uncomplicated malaria, only two thirds (66.8%) of children receiving an antimalarial reported receiving an ACT, while a nearly half reported receiving an artemisinin monotherapy (43.3%), indicating likely deviation from treatment protocols by health practitioners. This potential overuse of artemisinin monotherapy is concerning, as it could contribute to drug resistance pressure, and eventually may result in a decrease in the effectiveness of ACTs.³²

Table 4.3: Type of antimalaria used to treat febrile children under 5

Among children under 5 who had a fever in the two weeks preceding the survey and received an antimalarial treatment of any kind, the percentage who received specific antimalarial treatments, by age, gender, district of residence, education level of the household head, wealth quintile, stratum and the type of facility where treatment was received.

	Number of febrile children that took any antimalarial	Type of antimalarial taken (%)						
		Any ACT	Artesunate	Amodiaquine	Chloroquine	Fansidar	Quinine	Artemether
District								
Malabo	22	61.7	8.1	6.9	1.2	5.8	5.8	25.5
Baney	4	100.0	60.9	0.0	0.0	0.0	0.0	29.8
Luba	2	49.1	0.0	0.0	0.0	0.0	0.0	50.9
Riaba	1	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Age in months								
<12	1	100.0	0.0	0.0	0.0	0.0	0.0	0.0
12-23	7	48.0	21.6	4.3	0.0	0.0	0.0	52.0
24-35	9	76.2	20.5	17.0	3.4	0.0	17.0	23.9
36-47	8	60.6	3.6	0.0	0.0	0.0	0.0	0.0
48-59	4	75.0	24.2	0.0	0.0	25.0	0.0	49.2
Gender								
Female	13	62.1	15.6	2.2	0.0	0.0	11.1	35.6
Male	16	70.2	16.3	8.3	1.7	8.3	0.0	21.2
Education of household head								
At most primary	2	100.0	0.0	16.6	0.0	0.0	0.0	0.0
Secondary	12	64.1	16.5	0.0	2.8	0.0	0.0	35.9
Post-secondary	9	60.9	24.0	0.0	0.0	12.2	12.2	38.5
Unknown	5	64.8	5.9	29.3	0.0	0.0	0.0	0.0
Wealth quintile								
Lowest	2	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Second	7	74.1	3.7	0.0	3.7	0.0	18.5	22.2
Middle	5	92.1	0.0	0.0	0.0	0.0	0.0	7.9
Fourth	7	67.5	15.6	0.0	0.0	16.2	0.0	48.0
Highest	8	61.3	38.7	21.0	0.0	0.0	0.0	3.5
Stratum								
Rural/high transmission	10	51.3	19.5	9.6	9.7	0.0	0.0	39.0
Urban/low transmission	19	68.4	15.6	5.2	0.0	5.2	5.3	26.1
Treatment facility type								
Private	14	79.7	19.9	0.0	0.0	9.2	9.2	36.5
Public	13	65.9	14.6	14.5	2.4	0.0	0.0	21.9
Total	29	66.8	16.0	5.7	1.0	4.7	4.7	27.4

4.3 Use of antimalarials in the general population

To complement the specific information collected for recent fevers presented above, the BIMIS also included questions on the use of antimalarial drugs in the general population in the month preceding the survey (Table 4.4). A very small proportion of the population (3.6%) reported taking any antimalarial in this period. This varied little by district, education, age or gender. Among those who did report using an antimalarial in the last month, most (82.1%) reported completing the treatment regimen, but only half (51.8%) reported taking the treatment for a duration of three days. Many reported taking their antimalarial treatment for four or more days (39.2%) while 8.9% reported taking it for less than three days. These results suggest possible non-compliance to treatment protocol (which for the first-line treatment on Bioko, AL, indicates two daily doses for three days), even for individuals completing the regimen. The levels of possible non-compliance observed here are similar to those identified in a follow-up based evaluation following the 2023 BIMIS.³³ However, as above, interpretation of these estimates should take into account likely recall bias. Respondents may also be less likely to recall use of antimalarial medication by older household members than children if the illness prompting treatment was not as severe or concerning.

Table 4.4: Use of antimalarials in the population

Use of antimalarials in the 4 weeks preceding the survey and percentage of those who reported taking an antimalarial that reported taking the treatment for 1, 2, 3, or 4 days or more, and the percentage that reported completing the treatment regimen, by gender, age, district of residence, household head education level, wealth quintile and stratum

	Took antimalarial in last month (%)	Individuals taking antimalarial(s)	1 day	2 days	3 days	4 days or more	Completed regimen
Gender							
Female	4.0	384	4.0	6.5	51.7	37.8	82.0
Male	3.2	303	4.2	2.7	52.0	41.1	82.2
Age							
<5	3.3	71	1.3	6.9	53.6	38.1	79.5
5-14	2.4	124	2.4	4.5	70.1	23.0	84.2
15-24	2.8	105	6.6	6.4	37.1	50.0	78.3
25-34	4.7	143	6.2	4.2	44.2	45.4	78.9
35-44	5.0	127	1.7	3.6	53.8	40.9	84.8
45-54	4.5	59	3.2	7.6	44.7	44.5	83.4
55+	4.8	58	8.0	2.0	62.0	28.0	88.5
District							
Malabo	3.8	560	3.8	5.6	48.4	42.1	80.3
Baney	3.0	66	5.7	0.4	69.6	24.2	91.6
Luba	3.4	37	4.2	2.1	77.2	16.6	98.1
Riaba	3.4	24	4.6	4.6	63.6	27.2	75.1
Education of household head							
At most primary	4.0	68	2.7	1.5	64.7	31.1	86.1
Secondary	3.6	260	2.3	4.8	54.0	38.9	84.4
Post-secondary	3.8	233	4.2	5.8	51.2	38.8	80.6
Unknown	3.2	118	5.8	5.4	39.5	49.2	78.7
Stratum							
Rural/high transmission	4.5	266	6.0	4.7	47.2	42.1	83.2
Urban/low transmission	3.5	421	3.8	4.9	52.5	38.8	81.9
Total	3.6	687	4.0	4.9	51.8	39.2	82.1

5 MALARIA AND ANEMIA PREVALENCE

Key Findings

- **General malaria prevalence:** Malaria prevalence was 7.5%, 3.3%, and 6.4% in the general population, children < 5 years old, and pregnant women, respectively
- **Spatial heterogeneity:** Malaria prevalence on Bioko Island is highly heterogeneous, with hot spots on the west and southeast coasts
- **Change in malaria prevalence:** The percentage of individuals testing positive for malaria by RDT decreased dramatically from 2024 (15.9%) to 2025 (7.5%)

One of the primary objectives of the BIMIS is to assess malaria prevalence, in order to evaluate the impact of various activities on malaria transmission. Malaria was tested using RDTs, and results were communicated to survey participants on-site. All individuals with positive RDTs were offered free treatment, according to the Equatorial Guinea national malaria treatment guidelines. All individuals between six months and 14 years old and pregnant women were also tested for anemia. Results for anemia were communicated to participants on site and they were directed to a health facility for treatment where necessary. This chapter presents results of both malaria and anemia testing. Note that all estimates presented here are weighted based on the sampling design (see Chapter 1 for details) so somewhat differ from those presented in pre-2022 BIMIS reports. Section 5.3 provides internally consistent comparisons of historical prevalence based on this weighting methodology.

5.1 Malaria prevalence in the general population

Malaria Prevalence

Percentage of people with malaria parasites in their blood, detectable by RDT

Denominator: Total individuals with a valid RDT result

Table 5.1 shows the number of valid RDT results, and the proportion of individuals testing positive for malaria, stratified by various demographic factors. Overall, malaria prevalence was 7.5% (95% CI: 7-8.1%) and *P. falciparum* malaria prevalence (PfPR) was 7.4% (95% CI: 6.9-8%). Malaria prevalence was highest in ages 5-24, moderate in adults 25 and older, and lowest in children under five. Individuals the rural stratum were significantly more likely to be positive for malaria (16.8% versus 6.6% in the urban stratum). Similarly, prevalence varied substantially by district, with Luba and Riaba having much higher prevalence than Malabo and Baney. Household wealth was also an important factor, with malaria prevalence decreasing by wealth quintile.

Table 5.1: Malaria prevalence in the general population

Number of valid rapid diagnostic tests (RDTs) and percentage of the population positive by RDT for any malaria parasite (malaria PR) and for *P. falciparum* (PfPR), weighted according to sampling probability.

	Valid RDTs	Malaria PR (95% CI)	PfPR (95% CI)
Age			
<5	1,761	3.3 (2.5-4.3)	3.1 (2.4-4.1)
5-14	4,144	8.5 (7.5-9.6)	8.3 (7.4-9.4)
15-24	2,705	10.9 (9.6-12.2)	10.7 (9.5-12.1)
25-34	1,953	6.4 (5.4-7.7)	6.4 (5.3-7.6)
35-44	1,631	6.7 (5.5-8.1)	6.6 (5.4-8.0)
45-54	800	6.4 (4.8-8.6)	6.1 (4.5-8.3)
55+	952	5.3 (4.0-7.2)	4.9 (3.6-6.7)
Gender			
Female	7,479	6.7 (6.0-7.4)	6.5 (5.9-7.3)
Male	6,467	8.5 (7.8-9.3)	8.4 (7.7-9.2)
District			
Malabo	10,802	7.3 (6.7-7.9)	7.1 (6.5-7.7)
Baney	1,805	6.6 (5.2-8.4)	6.6 (5.2-8.4)
Luba	712	17.8 (13.4-23.2)	17.6 (13.2-23.0)
Riaba	627	16.9 (14.0-20.3)	16.7 (13.8-20.1)
Wealth quintile			
Lowest	2,279	9.3 (7.9-10.8)	9.2 (7.8-10.7)
Second	2,727	9.0 (7.6-10.5)	8.9 (7.5-10.4)
Middle	2,552	8.1 (6.8-9.5)	7.8 (6.6-9.2)
Fourth	2,992	6.6 (5.6-7.7)	6.5 (5.5-7.6)
Highest	3,396	6.1 (5.1-7.2)	5.9 (4.9-7.0)
Stratum			
Rural/high transmission	4,768	16.8 (15.6-18.0)	16.5 (15.4-17.7)
Urban/low transmission	9,178	6.6 (6.0-7.2)	6.4 (5.8-7.0)
Total	13,946	7.5 (7.0-8.1)	7.4 (6.9-8.0)

5.1.1 Risk factors for malaria

In addition to common demographic factors, the survey collected information about various risk factors for malaria (Table 5.2). Individuals with a recent history of travel were roughly three times as likely to test positive for malaria than those with no recent travel (20.8% versus 6.8% for travel in the last eight weeks). There was also a trend of increasing prevalence for individuals returning indoors later but not for going to bed later, suggesting that outdoor biting could be an important driver of local transmission.

Table 5.2: Malaria prevalence according to risk factors

Number of valid rapid diagnostic tests (RDTs) and percentage of the population positive by RDT for any malaria parasite (malaria PR) and for *P. falciparum* (PfPR) by risk factors for malaria, weighted according to sampling probability.

	Valid RDTs	Malaria PR (95% CI)	PfPR (95% CI)
2-week travel history			
No travel	13,623	7.3 (6.8-7.9)	7.2 (6.7-7.8)
Travel	287	16.6 (11.9-22.6)	16.1 (11.5-22.1)
8-week travel history			
No travel	13,191	6.8 (6.3-7.4)	6.7 (6.2-7.3)
Travel	718	20.8 (17.4-24.6)	20.0 (16.6-23.8)
Most time spent during day			
Inside neighborhood	12,001	7.8 (7.2-8.4)	7.6 (7.0-8.3)
Outside neighborhood	1,905	6.1 (5.0-7.3)	6.0 (4.9-7.3)
Most time spent at night			
Inside neighborhood	13,748	7.6 (7.0-8.1)	7.4 (6.9-8.0)
Outside neighborhood	178	6.9 (3.7-12.3)	6.9 (3.7-12.3)
When came indoors			
Before 6PM	1,325	7.2 (5.7-9.1)	7.2 (5.6-9.1)
6PM-8PM	3,835	7.1 (6.2-8.2)	6.9 (6.0-8.0)
8PM-10PM	4,355	6.9 (6.1-7.9)	6.7 (5.9-7.6)
After 10PM	2,505	9.5 (8.3-10.9)	9.4 (8.1-10.7)
When went to bed			
Before 8PM	467	8.0 (5.5-11.6)	8.0 (5.5-11.6)
8PM-10PM	4,324	7.2 (6.3-8.2)	7.0 (6.1-8.0)
10PM-12AM	5,476	7.4 (6.6-8.3)	7.2 (6.5-8.1)
After 12AM	2,233	7.6 (6.5-8.9)	7.5 (6.4-8.8)
Total	13,946	7.5 (7.0-8.1)	7.4 (6.9-8.0)

5.2 Malaria and anemia prevalence in high-risk groups

As has been noted in Chapter 3, some population groups are at considerably higher risk of contracting malaria and developing severe disease than others. These include pregnant women, infants, children under five years of age, patients with HIV/AIDS, and non-immune migrants, mobile populations, and travelers.³⁴ Therefore, national malaria control programs need to take additional measures to protect these groups from malaria infection, considering their specific circumstances. This section presents malaria and anemia prevalence in these vulnerable groups. Note that anemia prevalence has been defined using WHO thresholds of severe and moderate anemia (see below for details).³⁵

5.2.1 Malaria and anemia prevalence in children

Severe anemia Prevalence

Percentage of people with a hemoglobin measurement below WHO thresholds for severe anemia. This is defined as < 7 grams per deciliter (g/dl) for children under 5 years old and pregnant women.

Denominator: Total individuals with a valid hemoglobin result

Moderate anemia Prevalence

Percentage of people with a hemoglobin measurement below WHO thresholds for moderate anemia. This is defined as < 9.5 grams per deciliter (g/dl) for children under two years old (0-23 months) and pregnant women in the second trimester, and as < 10 g/dl for children 2-4 years old (24-59 months) and pregnant women in the first or third trimester.

Denominator: Total individuals with a valid hemoglobin result

Surveyors obtained authorization from parents or legal guardians before testing children for malaria and anemia. Table 5.3 shows the number of valid malaria and anemia tests, and percentage of positive

results for children under age five, by demographic characteristics. Malaria prevalence in children under five was 3.3% (95% CI: 2.5-4.3%), and *P. falciparum* prevalence was 3.1% (95% CI: 2.4-4.1%). There was a trend of increasing prevalence among children as household wealth decreased, with those in the lowest two household wealth quintiles particularly affected. As for the general population, prevalence among children varied substantially by geography, with much higher levels in rural areas (10.1% versus 2.5% in urban areas). Severe anemia was uncommon, with a prevalence of 0.1% (95% CI: 0-0.5%), but moderate anemia more common (overall prevalence 11.6%).

Table 5.3: Malaria and anemia prevalence in children under 5

Number of valid rapid diagnostic tests (RDTs) performed on children under 5, percentage positive by RDT for any malaria parasite (malaria PR) and for *P. falciparum* (PfPR), and number of valid hemoglobin results and percentage of this group with severe anemia (<7g/dl) and moderate anemia (<9.5g/dl for age 0-23 months, <10g/dl for age 24-59 months). Estimates are weighted according to sampling probability.

	Malaria testing			Anemia testing		
	Valid RDTs	Malaria PR (95% CI)	PfPR (95% CI)	Valid anemia tests	Severe anemia (95% CI)	Moderate anemia (95% CI)
Age in months						
<12	165	0.9 (0.1-6.0)	0.9 (0.1-6.0)	165	0.0	15.6 (10.0-23.6)
12-23	376	3.6 (2.1-6.3)	3.2 (1.8-5.8)	376	0.0	13.7 (10.3-18.1)
24-35	391	3.1 (1.8-5.3)	3.1 (1.8-5.3)	390	0.4 (0.1-2.1)	14.5 (11.0-18.9)
36-47	434	2.7 (1.6-4.5)	2.7 (1.6-4.5)	432	0.0	9.3 (6.6-12.8)
48-59	395	4.8 (3.1-7.5)	4.5 (2.8-7.0)	393	0.0	7.7 (5.3-11.1)
District						
Malabo	1,395	2.9 (2.2-4.0)	2.7 (2.0-3.7)	1,390	0.1 (0.0-0.6)	12.1 (10.2-14.2)
Baney	213	4.6 (2.1-9.9)	4.6 (2.1-9.9)	213	0.0	9.7 (5.9-15.5)
Luba	76	8.3 (4.0-16.4)	8.3 (4.0-16.4)	76	0.0	6.6 (3.0-14.0)
Riaba	77	5.2 (1.8-13.9)	5.2 (1.8-13.9)	77	0.0	10.4 (5.1-20.0)
Wealth quintile						
Lowest	228	5.4 (3.3-8.8)	5.4 (3.3-8.8)	228	0.0	12.9 (8.4-19.4)
Second	378	4.5 (2.6-7.7)	4.5 (2.6-7.7)	378	0.1 (0.0-0.5)	18.1 (13.8-23.4)
Middle	349	2.6 (1.4-4.8)	2.6 (1.4-4.8)	347	0.4 (0.1-2.8)	11.5 (8.2-16.0)
Fourth	394	2.5 (1.3-4.6)	2.5 (1.3-4.6)	392	0.0	9.4 (6.6-13.1)
Highest	412	2.7 (1.3-5.4)	2.1 (0.9-4.6)	411	0.0	7.6 (5.2-11.0)
Stratum						
Rural/high transmission	619	10.1 (8.0-12.6)	10.1 (8.0-12.6)	618	0.2 (0.0-1.1)	12.0 (9.9-14.5)
Urban/low transmission	1,142	2.5 (1.7-3.7)	2.4 (1.6-3.5)	1,138	0.1 (0.0-0.6)	11.6 (9.7-13.7)
Total	1,761	3.3 (2.5-4.3)	3.1 (2.4-4.1)	1,756	0.1 (0.0-0.5)	11.6 (10.0-13.5)

5.2.2 Malaria and anemia prevalence in pregnant women

In total, 245 pregnant women were tested for malaria and anemia (Table 5.4). Based on this sample, malaria prevalence was 6.4% (95% CI: 3.9-10.3%) and *P. falciparum* prevalence was 6.4% (95% CI: 3.9-10.3%). As in children, severe anemia was rare with a prevalence of 0.6% (95% CI: 0.1-4.3%), but moderate anemia much more common (prevalence 24.3%). Subgroup analysis for these indicators is limited in confidence due to low sample size, but malaria prevalence was again much higher in the rural stratum than the urban stratum.

Table 5.4: Malaria and anemia prevalence in pregnant women

Number of pregnant women with a valid rapid diagnostic test (RDT) result, percentage positive by RDT for any malaria parasite (malaria PR) and for *P. falciparum* (PfPR); number of pregnant women with valid hemoglobin results and percentage with moderate anemia (hemoglobin <8 g/dl) and severe anemia (<9.5g/dl for women in first and third trimester, <10g/dl for those in second trimester). Estimates are weighted according to sampling probability.

	Malaria testing			Valid anemia tests	Anemia testing	
	Valid RDTs	Malaria PR (95% CI)	PfPR (95% CI)		Severe anemia (95% CI)	Moderate anemia (95% CI)
Age						
15-24	88	10.1 (5.2-18.6)	10.1 (5.2-18.6)	87	1.6 (0.2-10.7)	34.8 (24.0-47.5)
25-34	107	4.9 (2.0-11.5)	4.9 (2.0-11.5)	107	0.0	18.1 (10.8-28.6)
35-44	49	2.0 (0.7-5.7)	2.0 (0.7-5.7)	49	0.0	18.0 (8.3-35.0)
45-54	1	0.0	0.0	1	0.0	0.0
District						
Malabo	196	7.4 (4.4-12.1)	7.4 (4.4-12.1)	195	0.8 (0.1-5.2)	26.9 (20.1-35.0)
Baney	26	0.9 (0.1-5.7)	0.9 (0.1-5.7)	26	0.0	13.8 (4.2-36.8)
Luba	9	0.0	0.0	9	0.0	0.0
Riaba	14	7.0 (0.8-40.4)	7.0 (0.8-40.4)	14	0.0	8.2 (0.9-47.2)
Education level						
At most primary	16	1.7 (0.2-11.3)	1.7 (0.2-11.3)	16	0.0	21.7 (4.9-60.0)
Secondary	97	4.9 (1.9-11.6)	4.9 (1.9-11.6)	97	0.0	24.6 (16.0-35.7)
Post-secondary	70	8.1 (3.2-18.8)	8.1 (3.2-18.8)	69	0.0	23.3 (13.4-37.3)
Unknown	50	8.8 (3.5-20.4)	8.8 (3.5-20.4)	50	3.6 (0.5-21.9)	19.3 (8.6-37.8)
Wealth quintile						
Lowest	50	5.0 (2.4-10.1)	5.0 (2.4-10.1)	50	0.0	17.8 (7.9-35.3)
Second	55	6.5 (2.4-16.3)	6.5 (2.4-16.3)	55	0.0	32.2 (18.9-49.2)
Middle	50	10.7 (3.9-26.2)	10.7 (3.9-26.2)	50	3.1 (0.4-19.6)	38.4 (23.8-55.3)
Fourth	51	5.9 (1.9-16.5)	5.9 (1.9-16.5)	51	0.0	17.9 (8.3-34.5)
Highest	39	3.4 (0.5-21.1)	3.4 (0.5-21.1)	38	0.0	12.4 (4.5-29.8)
Stratum						
Rural/high transmission	109	18.2 (12.4-26.0)	18.2 (12.4-26.0)	109	0.0	17.1 (11.5-24.6)
Urban/low transmission	136	4.4 (2.0-9.5)	4.4 (2.0-9.5)	135	0.7 (0.1-5.1)	25.5 (18.7-33.8)
Total	245	6.4 (3.9-10.3)	6.4 (3.9-10.3)	244	0.6 (0.1-4.3)	24.3 (18.4-31.3)

5.3 Trends in malaria prevalence

Trends in malaria prevalence can be particularly important in evaluating the impact of interventions or identifying gaps in malaria control. Figure 5.1 shows the evolution of *P. falciparum* prevalence in the general population by stratum since 2015. In both urban and rural strata, PfPR increased substantially in 2024, likely due to the interruption of control activities during much of the year, and dramatically declined in 2025 to around half of the 2024 level. This notable decline in prevalence is likely related to the re-establishment of control activities, but further analyses are necessary to provide causal evidence. Despite similarities in trends, both the increase in 2024 and decline in 2025 were larger in the rural stratum.

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Bioko Island	12.7%	8.9%	10.2%	10.6%	13.4%	11.9%	13.7%	14%	12.6%	15.6%	7.4%
Rural/high transmission	19.2%	10.9%	18.4%	12.5%	18.7%	23.1%	23.7%	24.2%	24.6%	31.3%	16.5%
Urban/low transmission	12.1%	8.7%	9.4%	10.4%	12.9%	10.8%	12.7%	13%	11.5%	14%	6.4%

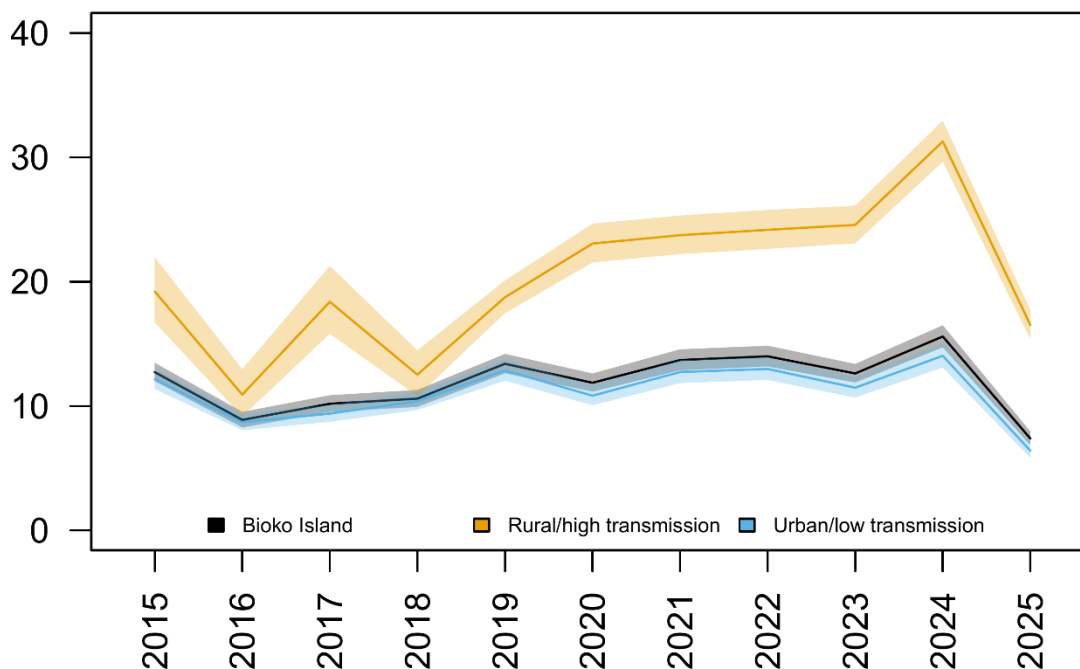


Figure 5.1: Historical trend in PfPR in the general population

All-age weighted prevalence of *P. falciparum* on Bioko Island, and in each of the two strata defined for the BIMIS from 2015-2025. Note that strata have been retroactively applied to data from 2015-2018, when strata were not explicitly used for sampling.

5.3.1 Trends in prevalence among vulnerable groups

Prevalence of *P. falciparum* among the most vulnerable groups show broadly similar trends (Figure 5.2). Children under five have consistently had a lower prevalence of malaria than those age 5-14. In both groups, there were large declines in 2025. Prevalence among pregnant women is more uncertain, due to the small number of pregnant women tested, but appears to have distinct trends from children. From 2019-2021, and especially between 2021 and 2022, PfPR in pregnant women increased, but has declined from 2022-2025.

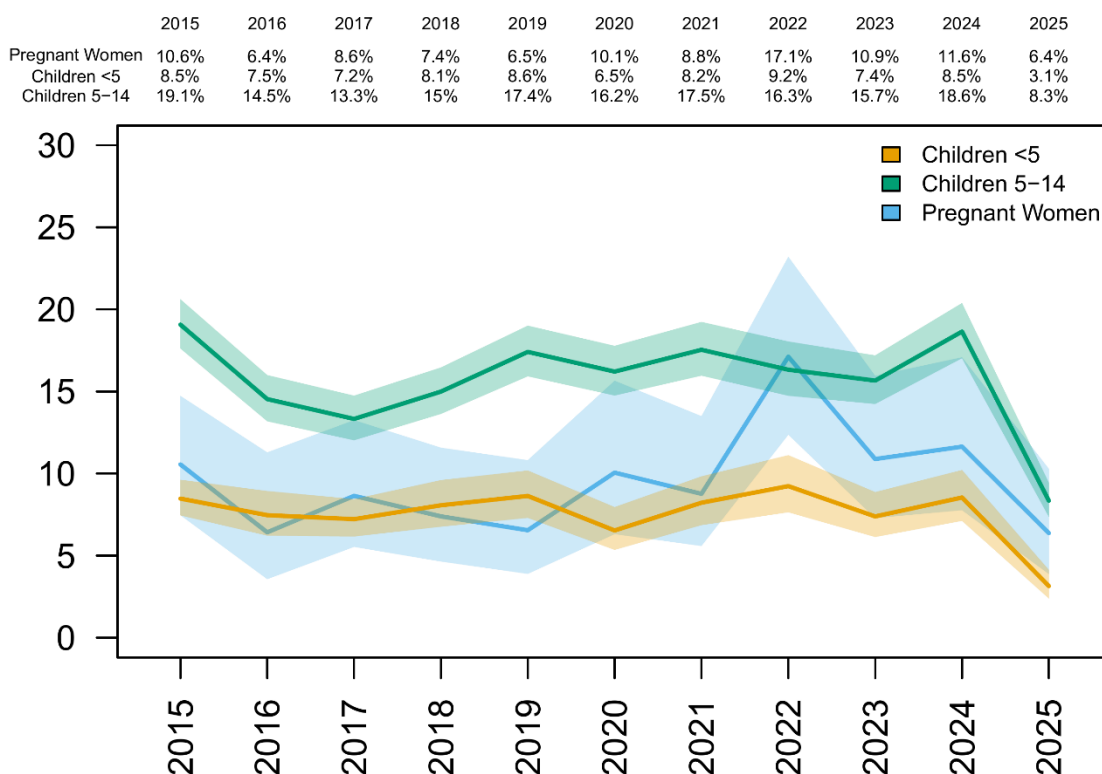


Figure 5.2: Historical trend in PfPR among children and pregnant women

Weighted prevalence of *P. falciparum* among vulnerable groups, including children under five years old, children 5–14 years old, and pregnant women from 2015–2025.

5.3.2 Spatial trends in prevalence

Transmission and risk of malaria is highly spatially heterogeneous, as Figure 5.3 shows. In recent years, much of the west and southeast coasts of the island have been consistent hot-spots for malaria prevalence. By contrast, prevalence is generally much lower in urban Malabo (with some exceptions on the urban periphery) and all of Baney district. As interpretation of longer-term trends at small spatial scales (such as PSUs) is difficult, aggregation into districts can reveal important trends, as shown in Figure 5.4. Widespread resurgence in malaria prevalence was observed in Baney, Luba and Riaba districts from 2018–2021, which was mostly controlled in Baney and Luba districts from 2021–2023. Despite scale-up of interventions island-wide since 2021, prevalence continued to climb in Riaba district through 2023. In 2024, the negative effects of the delay in vector control operations were seen primarily in Malabo and Luba districts, while prevalence declined substantially in all districts in 2025.

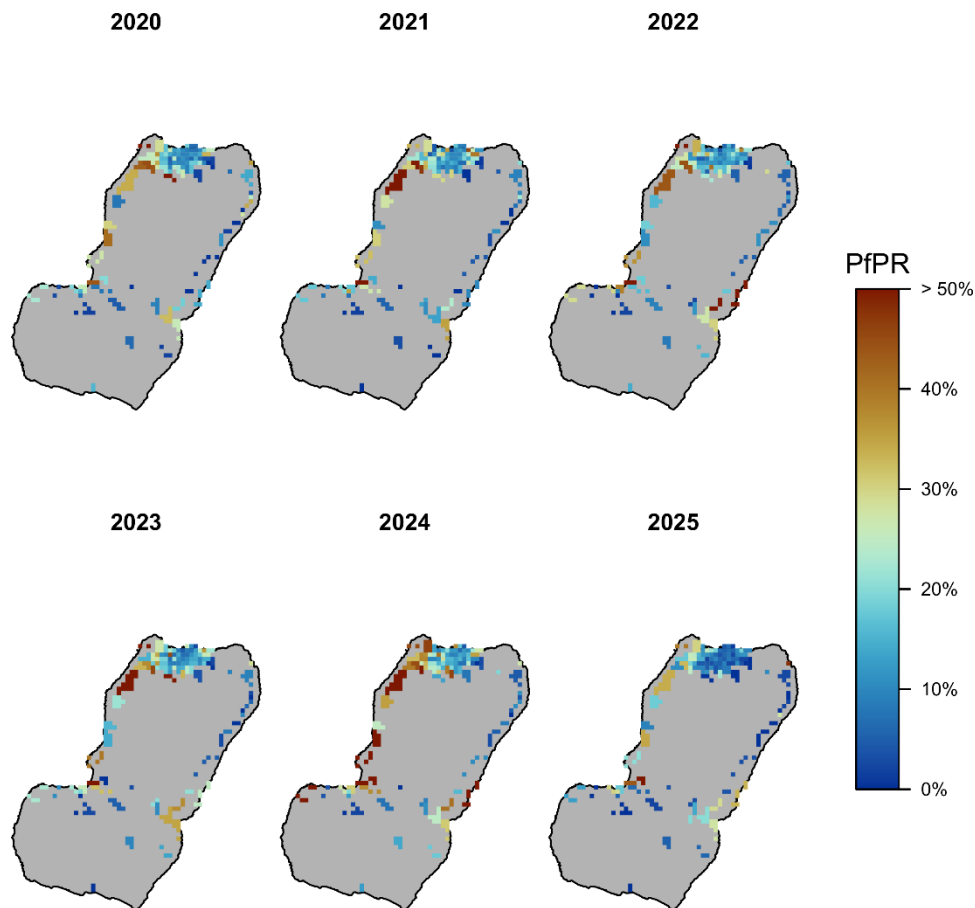


Figure 5.3: Spatial trend in PfPR

Weighted all-age *P. falciparum* prevalence by primary sampling unit from 2019-2024.

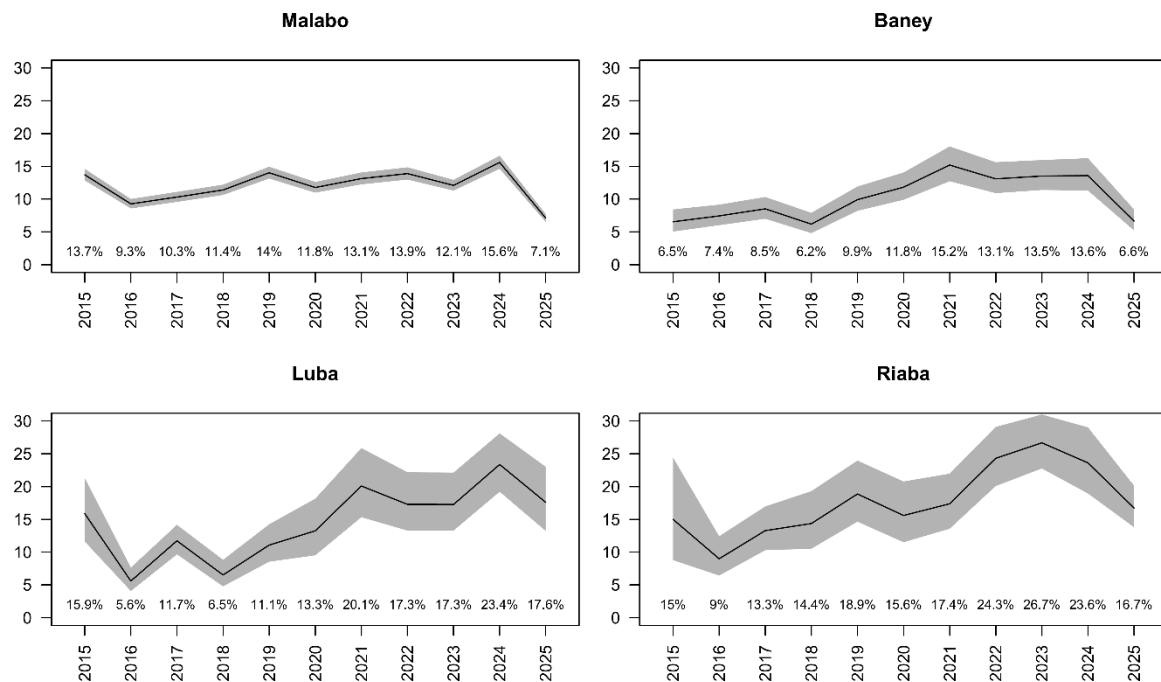


Figure 5.4: Historical PfPR by district

Weighted all-age *P. falciparum* prevalence by district from 2015-2025.

5.3.3 Trends in prevalence in children age 2-14 years

Between 2004 and 2014, malaria prevalence was assessed almost exclusively in children aged 2-14 years living in the historical sentinel sites. From 2015, the MIS was extended to the whole island, and prevalence was measured in all age groups. Hence, for consistent historical comparisons before 2015 it is necessary to consider only prevalence among children aged 2-14 years in sentinel sites (Figure 5.5). Notably, in 2025 the *PfPR* in children was the lowest ever observed, at 8.0%, compared to more than 40% before the beginning of intense control, and around one half of the 2024 level.

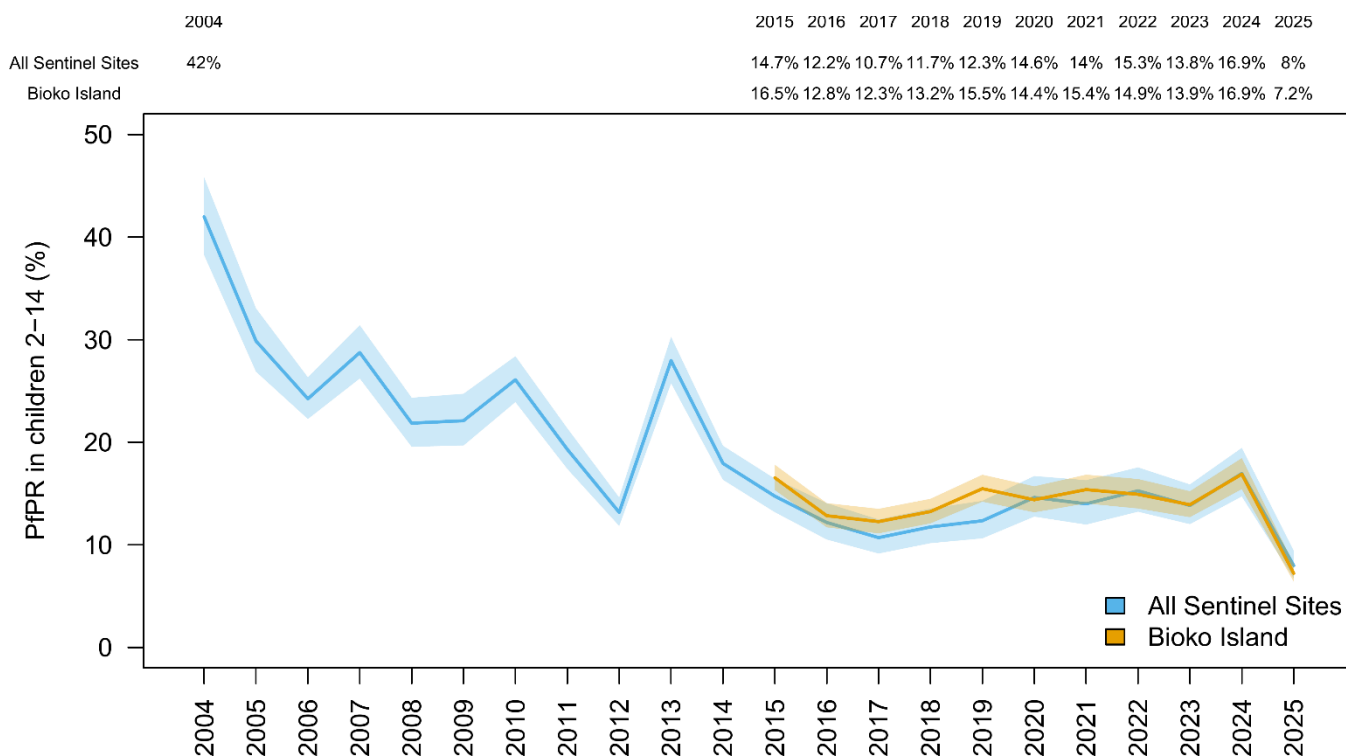


Figure 5.5: Historical trend in *PfPR* among children 2-14 years old

Weighted *P. falciparum* prevalence among children age 2-14 years in sentinel sites from 2004-2025. From 2015, once this information is available island-wide prevalence in the same age group is reported for comparison.

5.4 Malaria and travel

As has been reported above, one of the largest risks for malaria infection on Bioko is a recent history of travel off-island (in most cases to mainland Equatorial Guinea). Travel and imported malaria infections are an important consideration for malaria control programs, especially as they approach elimination and imported infections become more common than locally transmitted infections. Previous studies on Bioko Island have characterized human mobility patterns between Bioko and mainland EG and estimated malaria proportions imported from the mainland. [19-21](#)

In 2020, the Government of EG imposed a travel restriction as a containment measure of the COVID-19 pandemic. As a result, the proportion of the population which traveled outside Bioko Island in the 8 weeks preceding the survey dramatically decreased from 11.3% in 2019 to only 2% in 2020, and has since partially recovered to an estimated high of 8.3% in 2023 (Figure 5.6). Regardless of changing travel patterns, *PfPR* has consistently been significantly higher among survey participants with recent history of off-island travel compared to those without recent travel. In 2025, there was also a reduction in prevalence among travelers, indicating that to some extent the reduction in overall prevalence could be related to larger regional trends, although the relative size of the reduction in travelers was less than that overall.

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Bioko Island	12.7%	8.9%	10.2%	10.6%	13.4%	11.9%	13.7%	14%	12.6%	15.6%	7.4%
Non-travelers	10.7%	7%	8.2%	9.2%	12.1%	11.5%	13.5%	13.1%	11.8%	15%	6.7%
Travelers	25.8%	19.7%	24.4%	25.2%	24.6%	31.3%	21.3%	28.2%	24.5%	27.2%	20%
Travel frequency	15%	18.2%	16.1%	11.3%	11.3%	2%	3.7%	7.1%	8.3%	6.4%	6.7%

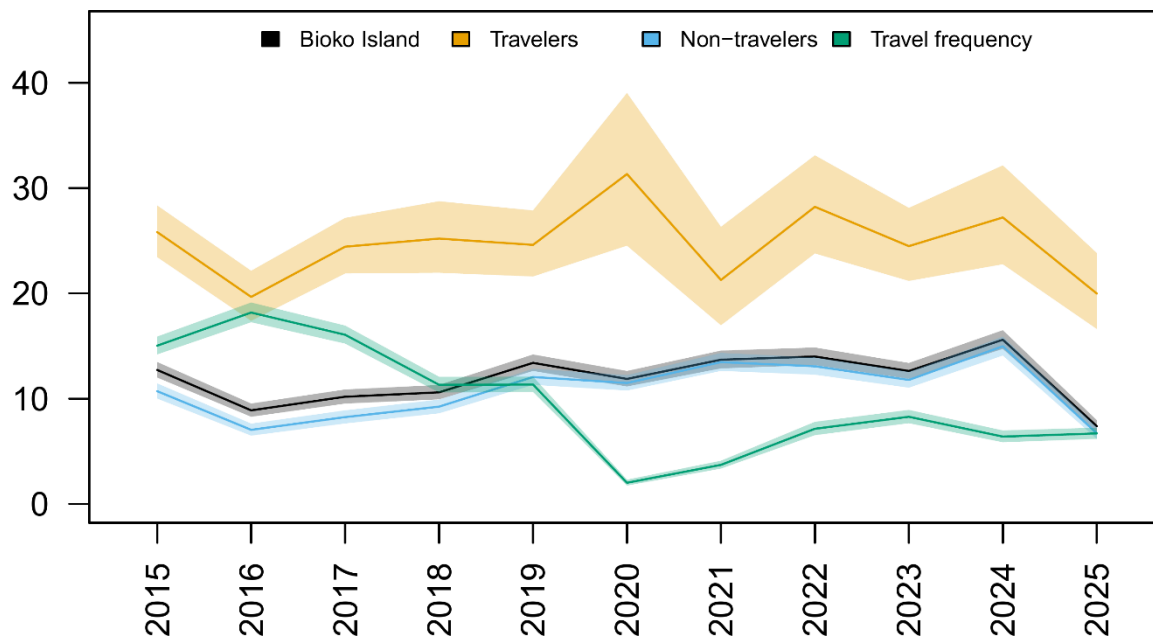


Figure 5.6: Historical trend in malaria prevalence and travel

Weighted all-age *P. falciparum* prevalence among individuals with a history of travel outside of Bioko Island in the last 8 weeks (travelers), those without a recent history of travel (non-travelers), the general population, and the proportion of the population reporting a recent history of travel outside Bioko (travel frequency) from 2015-2025.

6 MALARIA KNOWLEDGE, ATTITUDES AND PRACTICE

Key Findings

- Exposure to malaria messages:** More than one quarter (31.1%) of respondents heard or saw a malaria-related message in the six months preceding the survey
- Knowledge of malaria transmission and symptoms:** More than four in five respondents (81.7%) reported that mosquitoes are responsible for malaria transmission, and 75.9% mentioned fever as a symptom of malaria
- Knowledge of malaria prevention:** Sleeping under an ITN was the most cited method to prevent malaria (68.0%), and IRS was seldom mentioned (20.8%) as a way to prevent malaria
- Awareness of free resources in public health facilities:** Three in five respondents (61.0%) were aware that malaria treatment is available free of charge in public health facilities and 72.3% and 80.0% were aware that pregnant women can receive IPTp and ITNs free of charge in public health facilities, respectively

Information about the knowledge, attitudes and practices (KAP) of the population with respect to malaria is crucial in identifying priorities and designing strategies for social, behavioral change communication (SBCC) and more generally information, education and communication (IEC) activities. These activities are a core aspect of malaria control, since IEC can help increase uptake of interventions and more broadly foster community involvement in malaria prevention and control.

This chapter presents a range of results related to malaria KAP on Bioko Island. This includes exposure to malaria messages, basic knowledge about malaria prevention, transmission, and symptoms, and awareness of interventions available on Bioko Island. Additionally, results are presented for perception of the risk of malaria on mainland EG compared to Bioko and precautions taken during travel, and the acceptability of new (for Bioko Island) interventions.

Exposure to malaria-related messages

Percentage of respondents who reported having heard or seen a malaria-related message in the six months preceding the survey

Denominator: Number of survey respondents

Disseminating malaria-related messages is the primary means for conducting SBCC and IEC, and to diversify possible audiences BIMEP has utilized several dissemination channels. These include radio and television programs, short movies, flyers, posters, billboards, and sensitization in hospitals and churches. In addition, most field interventions deployed to households (e.g., IRS) and the LLIN pick-up points include a sensitization and education component. To understand how the population receives information and determine how widely malaria-related messages are spread into the population, survey respondents were asked how the usually received information (by TV, radio, social media, etc.) and if they heard or saw any message in the last six months preceding the survey. Those who reported seeing or hearing a malaria-related message were asked to name the source of information, and the types of messages they heard.

6.1 Media used to receive information

Since 2015 there has been a generalized trend in decreasing penetration of traditional media (i.e. TV and radio, Figure 6.1). Notably, penetration of radio was less than 30% in all districts, and very low in Malabo and Baney districts (less than 10%). On the other hand, penetration of TV in Malabo and Baney was fairly high and stable (> 70%), but substantially lower in Luba and Riaba. These trends suggest that radio may have very limited utility in disseminating messaging, while TV programming could have greater success especially in Malabo and Baney. However, the relatively low penetration of both TV and radio in Luba and Riaba point to the importance of incorporating other outreach strategies into the communication approach.

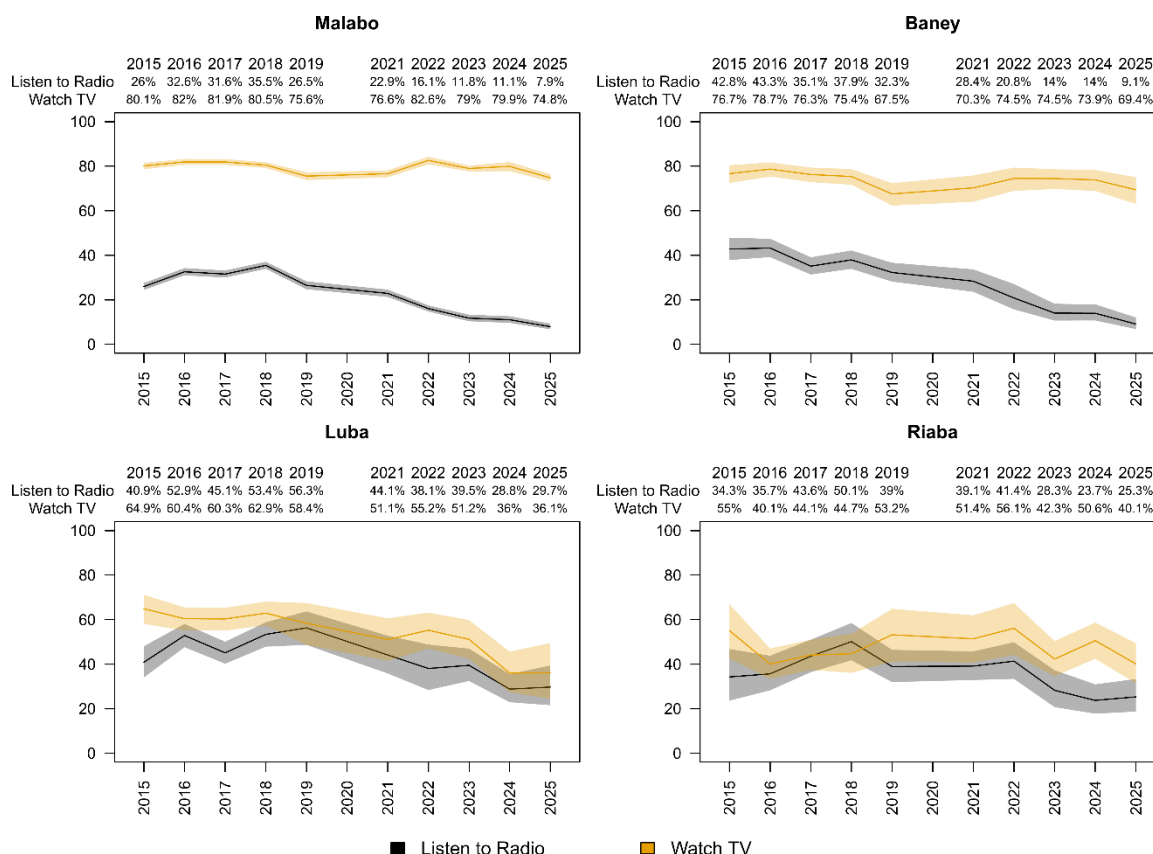


Figure 6.1: Historical trend in use of TV and radio to receive information

Proportion of respondents who reported regularly watching TV or listening to radio to receive information (not only related to malaria), by district of residence from 2015-2025.

6.2 Malaria messages received

Overall, 31.1% of respondents reported hearing a message in the last six months (Table 6.2). This increased with the age and education level of the respondent and household wealth. The most common reported sources were television (38.8%) and home visits by malaria agents (30.8%). However, only 38.8% of those who received a home visit reported hearing a malaria message from the agent who visited their home (Table 6.1). While television was the most commonly reported source of malaria messages, in 2025 the trend of decreasing effectiveness of television to disseminate messages, with an especially large decrease in the proportion of respondents in Malabo who received messages via television (Figure 6.2). This serves as an important indication that mass media approaches alone are not sufficient for SBCC activities.

By far the most common malaria message respondents reported hearing is to sleep under a bed net every night (29.1%). However, few reported hearing related messages about nets, such as that nets

protect against mosquitoes (12%) or that ITNs are available free of charge (5.9%). Despite the fact that an island-wide IRS campaign was conducted in 2025, less than one in five respondents (18.8%) reported having heard the message that IRS protects against malaria. This was much higher (33.5%) among households that reported hearing a message from a home visits — most presumably during the IRS campaign — but was still quite low. Combined, these results suggest it may be necessary to refresh the communication strategy promoting uptake of vector control interventions.

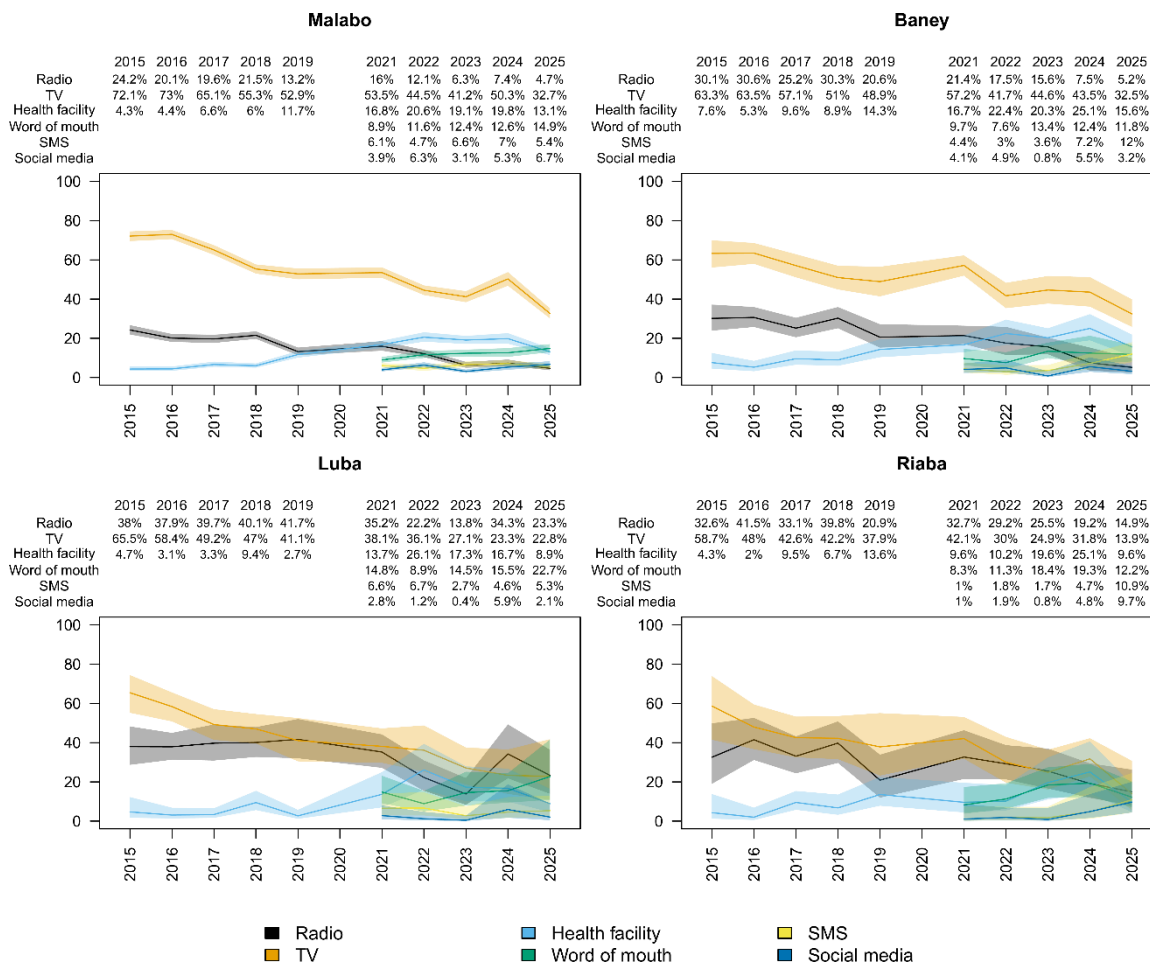


Figure 6.2: Historical trend in where malaria messages are received

Among respondents reporting having heard a malaria message in the six months preceding the survey, the proportion which reported hearing a message in radio and TV programming, in public health facilities, by word of mouth, SMS and on social media, by district of residence from 2015-2025.

Table 6.1: Message received during home visits

Percentage of respondents that reported having received a home visit from a malaria agent who reported having received a malaria message during the home visit.

	Heard Message	Didn't hear message	Not sure
District			
Malabo	35.0	53.0	12.0
Baney	35.7	53.4	10.9
Luba	37.4	58.3	4.2
Riaba	29.2	60.3	10.4
Respondent Gender			
Male	33.9	54.9	11.2
Female	35.9	52.4	11.7
Respondent Age			
15-24	27.0	55.6	17.4
25-34	33.4	54.4	12.2
35-44	42.3	48.8	8.9
45-54	35.8	57.5	6.8
55+	33.4	54.2	12.4
Respondent Education			
At most primary	31.2	57.8	11.0
Secondary	37.8	52.1	10.1
Post-secondary	39.0	49.3	11.6
Unknown	22.9	61.8	15.3
Wealth Quintile			
Lowest	33.6	59.1	7.3
Second	35.2	54.6	10.2
Middle	32.7	56.4	10.8
Fourth	35.4	49.3	15.3
Highest	38.2	47.9	13.8
Stratum			
Rural/high transmission	31.5	55.2	13.3
Urban/low transmission	35.6	53.2	11.3
Total	35.1	53.4	11.5

Table 6.2: Exposure to malaria messages

Percentage of respondents and number of households reporting having heard a malaria message within the last 6 months, and percentage of these households that reported hearing a message in various media. Note that multiple responses could be provided for where messages were heard.

	Heard message (%)	# households that heard message	Where heard message (%)										Other	Don't know
			TV	Radio	SMS	Social Media	Home visit by malaria agent	Word of mouth	Poster/pamphlet	Health Facility	Event	LLIN Distribution Point		
District														
Malabo	30.4	1,167	39.5	5.7	6.5	8.1	30.4	18.0	7.4	15.9	0.2	1.3	12.2	2.2
Baney	35.8	212	38.3	6.0	14.2	3.8	27.7	13.9	2.7	18.4	0.0	1.5	12.9	1.6
Luba	31.6	106	26.8	27.2	6.2	2.4	50.8	26.8	5.4	10.3	0.6	0.0	7.5	1.7
Riaba	21.9	54	18.8	20.2	14.7	13.1	41.2	16.5	1.9	13.0	0.0	0.0	18.8	0.0
Respondent Gender														
Male	31.6	678	39.6	9.6	7.2	8.2	27.4	19.0	8.7	5.4	0.0	0.8	14.9	2.6
Female	30.7	861	38.2	4.2	8.3	6.6	33.2	16.5	4.9	24.0	0.3	1.7	10.2	1.8
Respondent Age														
15-24	26.8	225	29.2	1.8	7.2	8.7	27.0	17.7	6.6	15.9	0.0	0.0	21.1	1.8
25-34	29.7	460	29.4	4.1	9.2	9.7	27.1	19.6	8.1	19.8	0.1	2.3	13.7	2.2
35-44	33.8	443	47.4	6.8	6.6	7.4	37.0	15.6	6.0	14.2	0.3	1.0	8.1	3.3
45-54	35.1	206	45.7	8.5	8.5	4.0	28.8	20.4	3.3	16.2	0.0	1.3	9.1	0.6
55+	31.0	205	46.4	16.0	7.4	2.4	31.5	13.7	7.3	11.2	0.7	1.4	10.3	1.2
Respondent Education														
At most primary	22.2	126	27.2	9.9	5.3	1.8	28.9	29.3	4.3	15.1	0.0	2.4	8.8	2.3
Secondary	29.9	580	40.5	6.6	7.9	5.5	34.8	16.7	5.6	16.0	0.5	1.0	12.5	1.8
Post-secondary	37.3	598	41.1	6.5	7.6	9.3	29.7	18.1	7.8	15.1	0.0	1.7	11.0	1.8
Unknown	27.0	217	34.8	5.0	9.3	9.8	23.8	11.8	5.6	20.4	0.0	0.6	15.8	4.0
Wealth Quintile														
Lowest	22.0	273	27.5	14.5	7.0	3.1	32.6	18.9	7.0	15.4	0.0	0.0	12.9	3.4
Second	29.1	319	36.5	7.9	10.3	8.8	28.9	18.2	5.0	15.0	0.9	2.1	13.8	2.1
Middle	33.6	282	40.2	2.8	4.1	5.8	32.6	22.4	6.1	17.5	0.0	0.9	12.0	1.0
Fourth	31.8	298	42.3	4.8	7.7	6.2	32.8	16.7	7.9	15.6	0.0	1.7	10.7	1.9
Highest	39.3	367	42.9	5.0	9.1	10.4	28.3	13.4	6.6	16.7	0.0	1.4	11.9	2.4
Stratum														
Rural/high transmission	26.7	487	32.7	14.9	10.6	12.9	31.7	17.7	4.0	12.6	0.2	0.4	13.9	1.4
Urban/low transmission	31.6	1,052	39.4	5.7	7.5	6.7	30.7	17.6	6.7	16.4	0.2	1.4	12.0	2.2
Total	31.1	1,539	38.8	6.5	7.8	7.3	30.8	17.6	6.5	16.1	0.2	1.3	12.2	2.1

Table 6.3: Malaria messages heard

Among respondents who reported having heard a message, the percentage which reported hearing various types of messages. Note that multiple responses for the types of messages heard were allowed. Messages for households that reported hearing a message from a household visit included all messages reported, regardless of source.

	Number of households that heard message	Type of message heard (%)																
		Anopheles mosquitoes transmit malaria	Treatment for severe malaria is free	IRS protects against malaria	IRS is safe	Nets protect against mosquitoes	Sleep under a bed net every night	Nets are available free of charge	Nets being distributed are LLINs	Wash nets only when dirty	Don't wash nets more than 4 times/year	Wash nets only with soap/clean water	Dry nets in shade	Pregnant women should take IPT and use LLINs	Start IPT in 4th month of pregnancy	Take at least 3 doses of IPT during pregnancy	Other	Don't know
District																		
Malabo	1,438	13.1	4.8	19.8	9.1	11.6	27.5	5.5	6.4	2.0	0.6	1.3	0.8	2.0	2.7	1.9	29.5	28.8
Baney	256	20.3	9.7	14.1	6.5	14.3	32.5	8.4	7.7	2.7	0.0	0.9	0.0	0.5	0.5	0.6	21.7	30.4
Luba	132	7.8	4.2	19.2	7.5	10.4	55.4	5.1	6.0	5.0	0.0	1.0	0.0	0.0	0.0	0.0	23.4	20.1
Riaba	73	15.1	9.7	16.5	5.4	12.4	31.4	5.4	6.8	1.4	0.0	0.0	0.0	4.2	0.0	1.4	19.3	30.3
Respondent Gender																		
Male	838	13.0	4.9	17.8	7.9	8.7	24.4	5.2	6.1	2.0	0.2	0.4	0.4	1.2	0.8	1.1	32.2	30.8
Female	1,061	14.9	6.2	19.6	9.1	14.5	32.6	6.5	6.9	2.4	0.7	1.9	0.8	2.2	3.3	2.1	24.8	27.3
Respondent Age																		
15-24	267	12.9	5.5	14.4	5.1	10.3	25.1	7.8	4.2	0.0	0.5	0.6	0.5	1.1	3.4	1.0	25.8	37.6
25-34	578	14.7	6.0	20.2	7.2	10.3	26.8	4.5	5.2	2.1	0.7	0.7	0.7	1.7	1.6	0.9	26.6	32.9
35-44	541	12.4	4.1	19.9	10.8	15.9	33.2	7.1	8.7	3.6	0.5	1.8	0.8	2.8	3.0	3.0	28.6	23.3
45-54	253	17.2	8.2	20.0	7.3	12.6	29.4	7.1	7.5	1.0	0.1	2.0	0.7	0.1	0.1	0.8	31.0	25.1
55+	260	14.3	5.8	16.9	12.6	8.7	30.0	3.1	6.9	3.3	0.0	1.4	0.0	2.1	3.1	2.0	29.8	24.6
Respondent Education																		
At most primary	173	16.8	8.1	16.9	7.0	9.1	29.4	5.8	7.5	3.0	0.0	1.2	2.0	2.0	3.0	0.0	20.1	29.7
Secondary	734	12.7	6.3	19.9	8.8	11.1	30.4	4.4	4.4	2.4	0.9	1.9	0.6	2.1	3.0	2.6	25.7	27.5
Post-secondary	708	15.6	4.5	20.8	10.2	13.8	29.1	7.6	9.3	2.4	0.2	0.8	0.4	1.6	2.0	1.2	31.5	26.0
Unknown	263	12.8	6.0	11.2	4.7	11.6	26.7	6.3	5.4	0.7	0.0	0.7	0.6	1.2	0.6	1.1	28.6	39.1
Wealth Quintile																		
Lowest	378	14.1	3.9	16.4	5.8	10.1	28.1	4.3	5.9	0.6	0.9	1.2	0.6	0.1	0.5	1.1	25.2	33.0
Second	391	12.1	8.3	18.1	9.4	13.7	25.1	6.5	7.7	1.1	0.3	0.4	0.3	2.1	2.7	1.7	25.7	32.0
Middle	337	12.7	7.0	19.3	7.8	13.8	36.4	7.0	6.0	4.4	0.9	2.0	1.6	1.3	2.3	1.6	27.8	24.4
Fourth	358	12.9	5.1	21.8	8.4	10.6	32.5	3.9	5.0	1.8	0.0	1.9	0.8	2.5	3.9	1.8	28.5	30.4
Highest	435	17.8	3.7	18.2	10.3	11.6	24.9	7.4	7.8	2.9	0.3	0.9	0.0	2.3	1.6	1.9	31.5	25.5
Stratum																		
Rural/high transmission	642	12.0	5.2	17.9	6.8	13.9	31.2	7.0	8.0	1.4	0.3	0.7	0.4	1.0	0.3	0.6	27.4	31.4
Urban/low transmission	1,257	14.3	5.7	18.9	8.8	11.8	28.9	5.8	6.4	2.3	0.5	1.3	0.6	1.8	2.5	1.8	28.1	28.6
Source of message																		
Message from home visit	768	20.9	6.6	33.5	14.6	14.3	32.4	7.1	8.6	3.9	1.0	1.9	0.7	2.7	4.5	3.3	28.7	20.1
No message from home visit	901	9.8	5.3	9.6	5.1	10.4	27.1	4.7	5.5	1.4	0.2	1.0	0.6	1.2	1.1	0.7	28.5	32.0
Total	1,899	14.0	5.6	18.8	8.6	12.0	29.1	5.9	6.6	2.2	0.5	1.3	0.6	1.8	2.3	1.6	28.0	28.8

6.3 Knowledge of malaria symptoms, transmission and prevention

Knowledge of malaria symptoms

Percentage of respondents who reported that particular symptoms are signs of malaria (note that multiple responses were allowed)

Denominator: Number of survey respondents

Knowledge of malaria transmission

Percentage of respondents who reported that malaria is transmitted by mosquitoes (note that multiple responses were allowed)

Denominator: Number of survey respondents

Knowledge of ways to prevent malaria

Percentage of respondents who reported that malaria could be avoided/prevented in various ways (note that multiple responses were allowed)

Denominator: Number of survey respondents

Awareness of the common symptoms of malaria, how it is transmitted and how to prevent may be important factors in the acceptance and use of malaria prevention and control activities. When asking respondents what knowledge they had in each of these categories, surveyors were instructed to prompt for additional responses, and all responses were recorded in the survey.

As Table 6.4 shows, knowledge of basic malaria symptoms was quite high. Three of every four respondents (75.9%) reported fever as a symptom of malaria, and more than half (58.2%) identified headache as a symptom. Awareness of malaria symptoms was lowest in households with lower wealth and education levels, so also varied by district, but remained relatively high in all demographic groupings. Similarly, as summarized in Table 6.5, awareness that malaria is transmitted by the bite of a mosquito was high (81.7%). This was again only moderately decreased in households with lower wealth or education levels.

When asked about how to prevent or avoid malaria, most respondents reported bed nets (68%). A lower proportion indicated that eliminating solid waste (32.2%) or IRS (20.8%) could help prevent malaria. Given the widespread use of IRS across Bioko Island for the last 20 years, the low awareness of IRS as a malaria prevention measure is concerning. However, this may be partially caused by how the question is worded; respondents are asked what the best ways to prevent or avoid malaria are. It is possible that many respondents interpreted this to mean what they *personally* can do, which does not include spraying their own house with IRS. Nevertheless, the low penetration of IRS-related messages (Table 6.3) is consistent with low awareness of IRS as a malaria prevention measure and is likely to impact the acceptance of IRS.

Table 6.4: Knowledge of malaria symptoms

Percentage of respondents who were aware of various malaria symptoms. Note that multiple responses were allowed.

	Fever	Headache	Vertigo/ dizziness	Joint pain	Chills	Cough	Diarrhea	Vomiting	Pallor/ weakness	Convulsions	Loss of appetite	Sweating	Other	Don't know
District														
Malabo	77.0	58.8	3.3	16.6	12.1	2.5	4.2	21.2	26.3	1.1	6.5	1.5	19.0	7.2
Baney	72.3	54.5	2.8	15.9	15.3	4.5	4.3	17.3	22.0	1.0	6.0	1.2	18.9	8.2
Luba	66.7	60.1	3.4	20.5	16.5	2.8	4.3	16.4	16.7	0.0	5.1	0.4	12.4	10.1
Riaba	66.4	56.6	1.2	14.3	19.6	3.7	3.7	13.9	22.3	2.0	3.7	0.0	18.7	9.0
Respondent Gender														
Male	73.2	52.6	2.5	16.1	11.0	2.7	3.7	15.2	24.9	1.0	5.6	1.6	18.3	9.4
Female	77.9	62.3	3.7	16.9	14.1	2.8	4.7	24.2	25.7	1.1	6.9	1.2	19.1	6.0
Respondent Age														
15-24	75.3	55.5	3.6	8.5	12.1	3.9	3.8	22.0	28.3	0.8	4.8	1.1	23.6	9.8
25-34	77.6	57.2	2.5	14.0	11.3	2.3	4.1	21.3	26.0	1.1	6.1	1.4	18.4	7.6
35-44	79.5	61.5	4.0	18.3	11.6	2.8	5.3	23.0	25.1	1.3	6.5	2.0	16.9	5.3
45-54	74.7	62.0	2.3	23.6	15.7	3.4	3.6	15.3	24.4	0.6	8.3	0.8	17.8	6.9
55+	64.8	54.1	3.4	24.7	17.6	2.1	3.7	15.1	20.8	1.2	7.4	0.8	17.7	8.9
Respondent Education														
At most primary	67.9	48.1	2.9	22.2	18.2	3.2	4.6	13.4	23.0	0.3	6.7	1.5	17.3	9.9
Secondary	76.4	62.0	4.5	15.4	12.3	2.7	4.2	20.7	24.0	1.3	6.6	1.3	18.5	6.7
Post-secondary	81.7	60.9	2.5	17.8	10.8	2.2	4.9	23.8	28.8	1.2	7.3	1.8	19.2	5.0
Unknown	68.7	50.8	1.9	14.5	14.5	4.1	2.8	18.2	24.0	0.7	4.2	0.4	20.3	11.5
Wealth Quintile														
Lowest	68.4	50.6	2.5	15.5	16.9	3.1	4.7	15.8	24.4	0.7	5.6	1.4	18.5	9.7
Second	74.0	56.9	1.9	16.1	11.9	3.2	3.8	19.6	25.8	1.1	5.1	1.4	18.0	9.0
Middle	78.3	62.6	4.8	15.9	10.7	2.8	3.6	20.7	22.2	0.8	4.8	0.4	15.3	6.9
Fourth	77.5	60.7	3.6	17.0	12.3	2.2	4.6	24.4	26.8	1.8	7.5	1.5	19.5	6.2
Highest	81.7	61.0	3.6	18.3	12.0	2.5	4.5	21.9	27.3	0.9	8.7	2.1	22.4	5.3
Stratum														
Rural/high transmission	70.2	56.1	2.0	16.7	13.6	2.4	3.6	19.2	23.7	1.0	4.5	0.9	22.9	9.4
Urban/low transmission	76.5	58.5	3.3	16.5	12.7	2.8	4.3	20.6	25.6	1.1	6.6	1.4	18.3	7.2
Total	75.9	58.2	3.2	16.6	12.8	2.8	4.2	20.4	25.4	1.0	6.4	1.4	18.8	7.4

Table 6.5: Knowledge of malaria transmission

Percentage of respondents who report that malaria is transmitted by various routes. Note that multiple responses were allowed.

	Mosquitoes	Person-to-person	Poor personal hygiene	Contaminated water	Contaminated food	Stagnant water	Traditional disease	Other	Don't know
District									
Malabo	81.4	1.0	10.0	4.7	6.1	4.2	0.1	8.9	11.6
Baney	84.5	2.3	4.9	3.2	4.1	2.7	0.0	5.8	9.8
Luba	78.8	1.7	7.8	2.0	2.5	1.8	0.0	4.2	12.7
Riaba	72.7	0.8	7.3	5.3	4.1	2.8	0.0	9.7	21.2
Respondent Gender									
Male	79.9	1.1	8.3	4.7	6.5	3.8	0.1	8.9	12.4
Female	82.9	1.3	9.8	4.2	5.1	4.0	0.0	8.0	10.8
Respondent Age									
15-24	78.7	2.0	9.6	4.0	3.9	2.8	0.1	9.2	12.8
25-34	82.6	1.0	9.1	4.2	5.8	4.1	0.0	9.1	10.8
35-44	83.7	1.1	9.1	4.3	6.3	4.6	0.1	8.1	11.1
45-54	83.0	0.8	9.3	4.9	5.6	3.2	0.0	6.5	10.5
55+	77.5	1.4	8.8	5.4	6.8	4.1	0.2	7.4	13.2
Respondent Education									
At most primary	71.5	0.7	14.3	3.9	7.2	5.1	0.0	7.4	17.1
Secondary	81.9	1.4	9.9	4.7	5.9	4.2	0.1	7.7	11.5
Post-secondary	88.0	1.3	8.2	4.8	5.3	4.2	0.1	7.8	7.1
Unknown	74.5	0.8	6.5	3.2	4.9	1.8	0.0	11.8	16.7
Wealth Quintile									
Lowest	75.1	0.8	8.7	4.1	5.4	4.3	0.1	10.5	14.0
Second	77.9	0.9	10.2	4.7	5.6	4.1	0.1	7.7	14.6
Middle	82.0	0.9	8.7	3.3	6.1	4.4	0.0	7.8	13.0
Fourth	85.8	1.4	9.8	5.0	5.9	3.0	0.0	8.0	8.3
Highest	87.9	2.1	8.2	4.8	5.4	3.8	0.1	7.6	7.2
Stratum									
Rural/high transmission	80.5	0.9	6.7	3.8	4.1	2.8	0.0	10.9	14.0
Urban/low transmission	81.8	1.2	9.4	4.5	5.9	4.0	0.1	8.0	11.2
Total	81.7	1.2	9.2	4.4	5.7	3.9	0.1	8.3	11.5

Table 6.6: Knowledge of malaria prevention

Percentage of respondents who were aware of various malaria prevention methods. Note that multiple responses were allowed.

	Can't be prevented	Use bed nets	IRS	Preventative medication	Eliminate solid waste	Keep doors/windows closed	Install screens on doors/windows	Other	Don't know
District									
Malabo	0.5	67.6	21.3	8.2	32.2	8.7	2.2	24.1	9.3
Baney	0.4	69.2	17.7	9.2	35.0	6.5	1.9	20.6	9.4
Luba	0.9	73.2	21.3	5.7	22.8	3.1	0.2	13.7	13.3
Riaba	0.4	68.4	20.7	10.5	27.8	1.6	1.2	22.8	12.0
Respondent Gender									
Male	0.2	61.7	20.7	8.4	33.7	8.8	2.1	26.0	10.6
Female	0.6	72.7	20.9	8.2	31.2	7.7	2.0	21.3	8.7
Respondent Age									
15-24	0.5	66.3	19.5	8.5	29.6	7.9	1.5	24.4	10.5
25-34	0.5	67.5	22.5	7.2	33.3	9.4	1.9	25.5	8.8
35-44	0.3	71.3	22.7	8.5	36.3	7.5	2.4	21.0	8.5
45-54	0.7	68.1	19.3	8.7	32.6	9.0	1.9	22.8	8.5
55+	0.5	64.6	15.6	10.2	23.5	5.8	2.7	21.2	13.1
Respondent Education									
At most primary	0.3	64.0	13.1	8.4	22.5	8.6	2.1	17.9	14.9
Secondary	0.6	72.3	21.6	9.0	31.1	7.2	2.1	20.5	8.5
Post-secondary	0.3	63.5	24.7	7.4	38.7	10.6	2.5	28.8	7.8
Unknown	0.6	69.2	16.7	8.6	28.2	5.8	1.1	21.6	12.2
Wealth Quintile									
Lowest	0.1	64.1	16.2	10.1	25.0	5.2	1.0	20.1	13.6
Second	0.5	68.5	19.3	6.5	29.8	7.6	1.7	22.5	11.9
Middle	0.6	72.3	22.0	7.4	32.0	7.8	1.8	21.9	7.5
Fourth	0.9	69.7	24.1	8.6	35.9	8.7	2.5	24.3	7.4
Highest	0.4	66.0	22.8	9.0	38.8	11.5	3.4	27.7	6.6
Stratum									
Rural/high transmission	0.5	65.1	20.1	11.6	28.6	6.8	2.9	26.8	11.6
Urban/low transmission	0.5	68.4	20.9	7.9	32.7	8.3	1.9	22.9	9.3
Total	0.5	68.0	20.8	8.3	32.2	8.2	2.0	23.3	9.5

6.4 Awareness and acceptance of available interventions

The BIMEP collaborates with the NMCP to provide a range of malaria prevention and treatment interventions free of charge on Bioko Island, including IRS, ITN distributions, and both preventative (for pregnant women) and curative treatments. Awareness of the availability of these resources, and their acceptance among the population, is key to reducing the malaria burden.

6.4.1 Awareness of free resources at health facilities

Knowledge of free resources at health facilities:

Percentage of respondents who were aware that ACT (treatment), IPTp (preventative treatment in pregnancy) and ITNs for pregnant women are available free of charge in public health facilities

Denominator: Number of survey respondents

Currently, three resources are provided free of charge in public health facilities: diagnosis and treatment of malaria for the entire population, and IPTp-SP and ITNs for pregnant women. To assess awareness of these resources, respondents were asked if they knew whether public facilities provide treatment, or IPTp-SP and ITNs for pregnant women, free or at a cost to the patient. Awareness of resources for pregnant women were highest (80% aware of ITN availability and 72.3% of IPTp), while awareness of the availability of ACTs for the general population free of charge in public health facilities was somewhat lower (61%). The relatively high awareness of IPTp observed here is a change compared to previous BIMIS (e.g. 42.9% in 2024), and a possible indication that changes to the communication strategy and targeted outreach to pregnant women may have been effective. Awareness of all resources was lower among respondents with at most a primary level of education, or those from households with a lower income level. Overall, women had a higher level of awareness than men, and this difference was especially pronounced for knowledge of free IPTp-SP (55% in men versus 75.8% in women).

Table 6.7: Awareness of interventions available free of charge at public health facilities

Percentage of respondents who report treatment for malaria (ACTs), IPT for pregnant women, and ITNs for pregnant women are provided free of charge in public health facilities.

	ACTs	IPT for pregnant women	ITN for pregnant women
District			
Malabo	59.9	72.6	79.6
Baney	65.0	68.7	80.4
Luba	70.7	74.9	88.7
Riaba	70.0	82.8	79.6
Respondent Gender			
Male	52.5	55.0	70.3
Female	67.2	75.8	87.0
Respondent Age			
15-24	54.3	78.6	79.7
25-34	62.7	75.9	82.0
35-44	63.1	72.9	81.0
45-54	60.9	64.7	76.3
55+	62.4	61.0	76.4
Respondent Education			
At most primary	56.0	67.7	68.5
Secondary	62.4	75.1	81.1
Post-secondary	63.5	68.5	81.7
Unknown	56.5	73.7	81.0
Wealth Quintile			
Lowest	55.0	71.4	72.8
Second	57.8	73.4	79.1
Middle	61.4	71.3	83.7
Fourth	66.2	76.5	81.9
Highest	65.3	68.5	83.0
Stratum			
Rural/high transmission	63.3	75.8	77.1
Urban/low transmission	60.8	71.9	80.3
Total	61.0	72.3	80.0

6.4.2 Knowledge of IPTp timing and duration

Knowledge of IPTp timing and duration:

Percentage of respondents who were aware that IPTp should be started in the second trimester (i.e., fourth month) of pregnancy, and that at least three doses of IPTp should be taken

Denominator: Number of female survey respondents in reproductive age (15-49)

In order to be most effective, IPTp-SP should be taken at least three times during the pregnancy, beginning in the second trimester.²⁹ Accordingly, the survey included questions to assess knowledge of the population of the correct timing and duration of IPTp. As Table 6.8 shows, awareness of the timing of IPTp remains very low among women in reproductive age. A plurality (44%) were not sure of when IPTp should be initiated, and only 12% correctly identified the 4th month of pregnancy as the ideal starting time.

Table 6.8: Awareness of when pregnant women should start IPTp

Percentage women age 15-49 who report that pregnant women should begin taking IPTp by month of first dose.

	1st month	2nd month	3rd month	4th month	5th month	6th month	7th month	8th month	9th month	Don't know
District										
Malabo	7.6	2.2	24.2	12.0	4.2	3.4	1.2	0.2	0.0	44.8
Baney	3.8	2.9	31.7	11.8	5.0	6.7	0.7	0.0	0.0	37.4
Luba	3.6	1.9	24.4	12.6	0.0	3.8	0.0	0.0	0.0	53.7
Riaba	4.9	0.0	21.9	14.6	4.9	4.8	0.0	0.0	0.0	48.8
Respondent Age										
15-24	6.0	3.3	28.8	9.9	7.1	4.3	1.6	0.0	0.0	39.0
25-34	7.4	2.1	26.6	11.6	6.7	3.9	2.0	0.2	0.0	39.6
35-44	7.3	2.6	24.8	12.9	1.4	4.1	0.3	0.3	0.0	46.4
45-54	4.8	0.2	16.1	13.4	1.1	2.5	0.0	0.0	0.0	61.7
Respondent Education										
At most primary	1.4	2.3	19.2	10.4	9.1	4.5	0.0	0.0	0.0	53.1
Secondary	7.1	2.7	28.4	13.0	3.3	4.2	1.0	0.0	0.0	40.3
Post-secondary	5.8	1.2	23.5	10.8	4.4	3.7	0.8	0.3	0.0	49.5
Unknown	10.9	3.0	23.6	11.5	3.9	3.7	2.4	0.6	0.0	40.4
Wealth Quintile										
Lowest	4.0	2.7	29.6	10.4	3.9	3.3	0.8	0.0	0.0	45.3
Second	8.7	3.9	23.1	9.6	4.9	2.2	1.0	0.0	0.0	46.6
Middle	7.0	2.0	22.4	9.1	3.8	8.1	1.2	0.6	0.0	45.9
Fourth	6.6	2.1	29.3	14.8	4.3	2.9	2.1	0.0	0.0	38.0
Highest	7.3	1.1	23.1	14.2	4.2	3.6	0.4	0.4	0.0	45.9
Stratum										
Rural/high transmission	4.5	1.7	26.3	13.0	2.6	6.0	0.0	0.0	0.0	45.9
Urban/low transmission	7.2	2.3	25.2	11.9	4.4	3.7	1.2	0.2	0.0	43.9
Total	7.0	2.3	25.3	12.0	4.2	3.9	1.1	0.2	0.0	44.0

Similarly, knowledge of the number of doses of IPTp-SP required was quite low (Table 6.9). Overall, 32.2% of women in reproductive age knew that at least three doses were required, but again a higher proportion (44.3%) reported not knowing the correct number of doses.

These results show that awareness of timing and dosage of IPTp-SP required for effective protection during pregnancy is very low among the target population. While knowledge among providers may be substantially higher, resulting in higher coverage of IPTp-SP with three or more doses (see Chapter 3), awareness among the population is still important because it may influence how likely a pregnant women is to return for the required number of ANC visits to complete a full round of IPTp-SP, and at the correct time.

Table 6.9: Awareness of number of doses of IPTp pregnant women should take

Percentage of women age 15-49 who report that pregnant women should take different numbers of doses of IPTp

	One	Two	Three or more	Don't know
District				
Malabo	12.3	11.2	31.5	44.4
Baney	14.4	6.0	37.5	42.1
Luba	4.7	16.7	30.2	48.4
Riaba	12.2	7.4	19.4	60.9
Respondent Age				
15-24	12.7	10.5	36.0	40.6
25-34	12.3	9.2	37.4	40.8
35-44	13.9	12.3	26.5	46.7
45-54	6.4	9.7	28.0	54.8
Respondent Education				
At most primary	13.9	4.9	32.4	48.4
Secondary	13.6	12.6	32.3	40.5
Post-secondary	10.6	9.7	31.1	48.7
Unknown	12.9	9.6	34.4	43.2
Wealth Quintile				
Lowest	15.3	11.4	28.0	45.4
Second	11.0	11.9	30.0	46.6
Middle	9.3	14.5	32.4	42.4
Fourth	15.7	7.9	34.1	42.2
Highest	11.4	8.8	34.3	45.1
Stratum				
Rural/high transmission	10.6	9.3	34.6	44.5
Urban/low transmission	12.6	10.7	32.0	44.2
Total	12.4	10.6	32.2	44.3

6.4.3 Acceptance of IRS

Acceptance of IRS:

Percentage of respondents who reported that they would like their house sprayed in the next year

Denominator: Number of survey respondents

Reasons for rejecting IRS:

Among those who did not want IRS in the next year, the percentage that cited particular reasons for not wanting IRS (note that multiple responses were allowed)

Denominator: Survey respondents who reported not wanting their house sprayed in the next year

Since 2004, IRS has been the principal vector control intervention on Bioko Island. As such, acceptance and reasons for refusal are of key importance for malaria control efforts. As part of the BIMIS, respondents were asked if they would want their house sprayed next year. The results are presented in Table 6.10. Overall, acceptance remains high (79.5%), and was especially high in Riaba and Luba districts. While these acceptances are high, it is important to remember that some respondents may agree in theory to having their house sprayed but refuse when the IRS team comes to spray, or make themselves unavailable to facilitate the spraying. Unsurprisingly, reported refusal was substantially higher in the urban stratum, and in wealthier and more highly educated households.

Table 6.10: Acceptance of IRS

Percentage of respondents who reported wanting their house sprayed in the following year

	Accept IRS	Don't accept IRS	Not sure
District			
Malabo	78.9	8.9	12.2
Baney	77.9	11.6	10.5
Luba	93.7	3.3	3.0
Riaba	96.7	1.7	1.6
Respondent Gender			
Male	82.7	6.5	10.8
Female	77.1	10.8	12.0
Respondent Age			
15-24	70.3	8.5	21.2
25-34	77.7	10.8	11.4
35-44	81.6	9.8	8.6
45-54	86.3	6.3	7.4
55+	86.6	5.7	7.7
Respondent Education			
At most primary	90.0	3.9	6.0
Secondary	82.2	8.9	8.9
Post-secondary	76.4	11.0	12.6
Unknown	74.0	8.7	17.3
Wealth Quintile			
Lowest	84.5	6.8	8.7
Second	80.0	8.2	11.8
Middle	79.7	9.5	10.8
Fourth	78.9	9.3	11.8
Highest	74.2	11.4	14.4
Stratum			
Rural/high transmission	85.5	6.2	8.3
Urban/low transmission	78.8	9.3	11.9
Total	79.5	9.0	11.5

Respondents who reported not wanting their house sprayed next year were asked a follow-up question to identify reasons for refusing IRS. Table 6.11 presents the results for this question. The number of respondents is low (422 in total), but by far the most common reason cited for refusing IRS was ill health effects (37.1%). This may indicate a need for tailoring communication strategies to address the health concerns of the population with respect to IRS. Responses were generally consistent across strata and district.

Table 6.11: Reasons for not accepting IRS

Among respondents who reported not wanting their house sprayed in the following year, the percentage which reported each of the following reasons. Note that multiple responses were allowed.

	Number of households that don't want IRS	Reason for not wanting IRS (%)										Other	Don't know
		Ill health effects	Dangerous for animals	Disruptive/ disagreeable	Attitude of sprayers	Damages to furniture/walls	Not effective	Not applicable to us	Use bed nets instead	Time is inconvenient			
District													
Malabo	340	37.8	0.0	10.4	4.0	9.0	10.3	5.1	1.2	3.0	27.7	6.7	
Baney	64	33.7	0.0	20.1	1.9	5.0	8.3	1.7	0.0	1.6	28.9	9.0	
Luba	14	34.4	0.0	16.5	0.0	5.5	39.1	0.0	0.0	0.0	16.6	5.5	
Riaba	4	75.1	0.0	0.0	24.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Respondent Gender													
Male	136	38.2	0.0	6.8	1.6	13.6	13.0	4.2	1.0	3.0	23.5	7.2	
Female	286	36.7	0.0	14.5	4.5	5.9	9.1	4.6	0.9	2.6	29.5	7.0	
Respondent Age													
15-24	67	26.4	0.0	18.2	0.0	3.9	10.9	1.8	1.8	1.8	33.2	11.4	
25-34	166	37.0	0.0	11.7	5.9	7.3	9.3	8.7	0.8	1.7	27.7	6.5	
35-44	121	44.3	0.0	10.1	3.5	8.0	14.1	1.7	1.0	4.1	23.7	5.3	
45-54	35	30.1	0.0	15.7	3.9	18.3	4.9	3.6	0.0	0.0	33.7	5.9	
55+	33	42.4	0.0	5.0	0.8	12.2	4.9	0.0	0.8	7.9	24.2	8.2	
Respondent Education													
At most primary	24	64.7	0.0	11.8	2.8	7.3	0.0	0.0	0.0	7.4	22.1	2.9	
Secondary	167	44.8	0.0	11.2	3.1	4.9	11.1	3.9	1.6	3.1	23.8	6.3	
Post-secondary	170	30.8	0.0	11.0	4.0	10.8	11.2	7.0	0.7	3.0	28.6	6.9	
Unknown	58	27.7	0.0	18.7	4.4	10.1	8.5	0.4	0.0	0.0	34.7	10.9	
Wealth Quintile													
Lowest	68	40.9	0.0	13.8	0.8	6.8	14.2	4.0	0.0	1.9	26.7	5.3	
Second	84	43.8	0.0	10.0	5.9	7.3	10.7	7.6	1.8	1.8	14.2	7.3	
Middle	79	32.8	0.0	9.6	3.4	4.2	14.0	0.0	0.0	1.6	40.8	3.8	
Fourth	85	37.1	0.0	17.9	2.9	9.1	7.0	1.4	0.0	4.4	28.8	10.4	
Highest	106	32.7	0.0	10.2	4.4	12.0	7.5	7.8	2.3	3.5	28.7	7.6	
Stratum													
Rural/high transmission	112	32.2	0.0	15.7	4.3	9.4	21.2	3.7	0.8	0.8	25.2	7.2	
Urban/low transmission	310	37.5	0.0	11.9	3.6	8.1	9.4	4.5	1.0	2.9	27.9	7.0	
Total	422	37.1	0.0	12.2	3.7	8.2	10.3	4.4	1.0	2.7	27.7	7.1	

6.4.4 Acceptability of new mass treatment interventions

Acceptability of mass treatment:

Percentage of respondents who reported that they would be willing to take malaria prophylaxis during travel to mainland EG, be tested for malaria on departure to or arrival from mainland EG and take treatment in case of positive result (test and treat), or to take an antimalarial treatment even when not presenting symptoms (i.e., as part of an MDA campaign)

Denominator: Number of survey respondents

In addition to assessing the awareness and acceptance of existing interventions, since 2022 the BIMIS has included questions to assess the acceptability of new treatment-based interventions on Bioko Island. Respondents were asked if they would be willing to take malaria prophylaxis during travel to mainland EG, to submit to a malaria test and take treatment if positive during travel to or from mainland EG, or participate in mass drug administration (MDA, that is, taking treatment for malaria whether currently experiencing symptoms or not).

Table 6.12 summarizes the acceptability of these new (for Bioko Island) interventions. The travel related interventions (prophylaxis and test-and-treat during travel) had high acceptability (88.6% and 92.3%, respectively). Acceptance of these interventions varied little by demographic factors. However, acceptability of MDA was much lower (60.4%). This is likely at least partially influenced by the manner in which the question was asked (“Would you be willing to take an antimalarial, even if you do not have malaria symptoms”) and could potentially be increased with the right communication strategy emphasizing the importance of asymptomatic malaria.

Table 6.12: Acceptability of treatment-based interventions

Proportion of respondents who reported being willing (Yes) to take malaria prophylaxis during travel to mainland EG, be tested for malaria on departure to or arrival from mainland EG and take treatment if positive, or take antimalarials as part of a mass drug administration campaign.

	Prophylaxis during travel			Test and treat during travel			Mass drug administration		
	Yes	No	Don't know	Yes	No	Don't know	Yes	No	Don't know
District									
Malabo	87.9	8.8	3.3	91.8	5.3	2.9	60.0	35.8	4.2
Baney	91.4	6.1	2.5	94.1	4.4	1.5	59.1	38.8	2.1
Luba	92.5	5.4	2.1	95.3	3.3	1.4	73.0	22.2	4.7
Riaba	95.6	3.6	0.8	98.0	1.6	0.4	67.4	30.6	2.0
Respondent Gender									
Male	87.0	9.2	3.8	90.1	6.4	3.4	60.9	35.2	3.9
Female	89.8	7.6	2.7	93.9	4.0	2.1	60.0	36.1	3.9
Respondent Age									
15-24	86.3	10.0	3.7	91.0	5.9	3.2	54.1	42.3	3.6
25-34	89.3	7.8	2.9	93.1	4.5	2.4	58.5	37.7	3.8
35-44	89.6	7.6	2.8	92.6	5.1	2.3	60.5	35.2	4.3
45-54	88.7	8.6	2.7	93.1	4.0	2.9	64.7	31.9	3.4
55+	87.7	8.1	4.2	90.9	6.0	3.1	70.2	25.5	4.3
Respondent Education									
At most primary	84.5	10.1	5.4	87.3	6.6	6.1	63.8	30.5	5.7
Secondary	89.5	7.4	3.0	92.5	5.1	2.5	65.7	30.3	4.0
Post-secondary	90.2	7.8	2.0	93.1	5.1	1.7	56.3	40.7	3.0
Unknown	86.4	9.8	3.8	93.3	4.0	2.7	53.4	42.2	4.3
Wealth Quintile									
Lowest	86.8	9.2	4.0	91.2	5.2	3.6	62.5	32.7	4.8
Second	86.9	8.7	4.4	92.2	4.6	3.2	59.9	35.4	4.7
Middle	87.9	9.9	2.2	91.9	6.0	2.2	61.5	34.6	3.9
Fourth	90.4	7.7	2.0	93.1	4.6	2.2	59.3	37.6	3.1
Highest	91.1	6.0	2.8	93.1	5.0	1.9	58.9	38.3	2.8
Stratum									
Rural/high transmission	91.3	6.1	2.6	93.3	4.4	2.2	63.0	31.4	5.6
Urban/low transmission	88.3	8.5	3.2	92.2	5.1	2.7	60.1	36.2	3.7
Total	88.6	8.3	3.1	92.3	5.0	2.6	60.4	35.7	3.9

6.4.5 Acceptability of malaria vaccines

Acceptability of malaria vaccine:

Percentage of individuals who reported that they would be willing to be vaccinated against malaria

Denominator: Number of individuals registered present at time of survey

Percentage of individuals who reported that they would be willing to be vaccinated with a total of 4 doses (following R21 dosing schedule)

Denominator: Number of individuals reporting willingness to be vaccinated

In 2024 following the WHO approval of the R21 malaria vaccine,³⁶ the BIMIS incorporated questions to assess the acceptability of malaria vaccines, which were again included in 2025. All household residents present at the time of the survey were asked if they were willing to be vaccinated for malaria. For those indicating willingness, a follow-up question about willingness to take a total of four doses, one per month for three months and a booster after one year (i.e. following the R21 dosing schedule), was asked. These results provide important evidence about the likely acceptability of R21 vaccines on Bioko, and in Equatorial Guinea more broadly, both for the already approved age groups (children under 5) and for potential all-age vaccination campaign, should such a use case be found effective by trials and approved by the WHO.

The results show a high level of acceptability of malaria vaccines, generally, and also for the specific R21 dosing schedule (Table 6.). Overall, more than four in five individuals (83.4%) indicated willingness to be vaccinated for malaria, and nearly all of these (97%) indicated willingness to take four doses following the R21 dosing schedule. This acceptability was remarkably consistent across gender, age, and education, but did decrease with increasing household wealth. Acceptability was also lower in Baney and Malabo than Luba and Riaba. These results have important implications. First, it appears that acceptability is sufficiently high to warrant a possible implementation of R21 (or similar malaria vaccines) on Bioko. Secondly, if vaccines are to be piloted in some districts, Luba and Riaba may be good candidates considering their high level of acceptance (and generally high transmission levels). Finally, should use of vaccines for wider age ranges gain WHO approval, the consistent acceptability across ages on Bioko suggests that achieving high rates of vaccination may be possible.

Table 6.13: Acceptability of malaria vaccine

Proportion of respondents who reported being willing (Yes) to be vaccinated against malaria (without specifying dosing schedule), and among those accepting, the percentage that reported being willing to be vaccinated with a total of 4 doses (following the R21 dosing schedule)

	Vaccine			R21 dosing schedule		
	Yes	No	Don't know	Yes	No	Don't know
District						
Malabo	83.0	9.3	7.8	96.6	2.4	1.0
Baney	83.5	10.4	6.0	98.6	1.2	0.1
Luba	96.5	2.3	1.3	99.4	0.4	0.1
Riaba	91.2	4.6	4.2	99.7	0.3	0.0
Gender						
Female	84.2	8.8	7.0	96.7	2.3	1.0
Male	82.5	9.8	7.7	97.5	1.9	0.6
Age						
<5	85.8	7.0	7.2	97.2	2.2	0.6
5-14	86.0	6.5	7.5	98.0	1.4	0.6
15-24	83.3	10.2	6.5	96.1	2.9	1.0
25-34	78.9	12.9	8.2	96.2	2.9	0.9
35-44	80.1	12.4	7.6	96.1	2.6	1.3
45-54	83.0	10.5	6.6	97.4	1.5	1.1
55+	84.2	8.5	7.3	98.5	1.1	0.4
Household Head Education						
At most primary	82.5	11.3	6.2	97.9	1.6	0.5
Secondary	85.4	8.8	5.8	97.6	1.5	0.9
Post-secondary	83.4	9.2	7.4	96.5	2.7	0.8
Unknown	80.3	9.2	10.5	96.6	2.5	0.9
Wealth Quintile						
Lowest	85.0	10.2	4.8	97.5	1.7	0.8
Second	83.4	9.6	7.0	96.9	2.2	0.9
Middle	85.6	8.3	6.1	97.4	1.9	0.7
Fourth	82.9	8.9	8.2	97.6	1.6	0.8
Highest	81.6	9.5	8.9	96.2	2.9	0.9
Stratum						
Rural/high transmission	87.7	6.6	5.7	98.8	0.7	0.5
Urban/low transmission	83.0	9.5	7.5	96.8	2.3	0.9
Total	83.4	9.3	7.3	97.0	2.1	0.8

6.5 Perception of malaria risk in Continental Region

Perception of malaria in Bioko compared to mainland EG:

Percentage of respondents who reported that Bioko Island has a higher risk of malaria than mainland EG (or vice versa)

Denominator: Number of survey respondents

Use of malaria prevention measures during travel to mainland EG:

Percentage of respondents with recent history of travel to mainland EG who reported that they used a bed net or any antimalarial during their travel in the next year

Denominator: *De jure* household members with travel history to mainland EG in the 8 weeks preceding the survey

Given the elevated risk for malaria among individuals with recent travel history outside Bioko Island (see Chapter 5), and in particular to mainland EG, in 2022 questions were added to the BIMIS to assess the perception of malaria risk in mainland EG, and use of preventative measures during travel. All respondents were asked if they considered Bioko Island or mainland EG to have a higher risk of malaria, and individuals who reported recent travel outside Bioko Island were asked if they used any antimalarial medications or ITNs during their travel.

As shown in Table 6.14, awareness of the elevated risk for malaria in mainland EG was relatively low. Only one in five (22.9%) respondents reported that mainland EG had a higher risk for malaria, and the plurality (38.7%) were not sure. Younger and more highly educated respondents were more likely to report that the Continental Region had higher risk than those older or less highly educated, who were more likely to report being unsure. However, the percentage of respondents reporting that risk was higher on Bioko did not vary substantially by demographic factors, and was indistinguishable across strata (28.7% and 29.9% in the rural/high transmission and urban/low transmission strata, respectively).

Table 6.14: Perception of malaria risk in regions of Equatorial Guinea

Percentage of respondents by which region of Equatorial Guinea (Bioko Island or Continental Region) they reported to have higher risk of malaria.				
	Bioko Island	Continental region	Same risk	Not sure
District				
Malabo	29.2	23.2	8.3	39.3
Baney	30.9	23.6	9.5	36.0
Luba	38.0	15.5	11.2	35.4
Riaba	38.6	9.8	9.8	41.9
Respondent Gender				
Male	29.6	25.3	6.4	38.7
Female	30.0	21.1	10.2	38.7
Respondent Age				
15-24	35.6	32.2	4.1	28.2
25-34	28.4	25.2	7.9	38.5
35-44	27.9	20.0	9.6	42.5
45-54	28.5	17.1	11.3	43.1
55+	30.5	14.8	12.1	42.5
Respondent Education				
At most primary	24.9	9.4	11.5	54.2
Secondary	31.2	20.6	9.2	39.0
Post-secondary	30.6	31.4	7.3	30.8
Unknown	28.5	19.0	8.4	44.1
Wealth Quintile				
Lowest	28.4	14.9	10.1	46.6
Second	26.6	21.0	8.8	43.7
Middle	30.9	22.7	8.1	38.4
Fourth	32.1	25.4	7.9	34.6
Highest	31.5	30.7	8.0	29.8
Stratum				
Rural/high transmission	28.7	18.8	9.1	43.4
Urban/low transmission	29.9	23.4	8.5	38.2
Total	29.8	22.9	8.6	38.7

Despite relatively low awareness of the increased risk, use of malaria prevention measures was somewhat common during travel (Table 6.15). More than one in four travelers (28.9%) reported using a bed net during travel. Bed net use varied by age, with older children and young adults having higher usage (45.6% for children age 5-14 and 39.1% for those age 15-24). The lower use of bed nets among children under 5 years is somewhat concerning, but the small number of children with recent history of travel limits the strength of these comparisons.

Table 6.15: Use of interventions during travel to mainland EG

Percentage of travelers that reported using a bed net or antimalarials during their travel to the continental region

	Used bed net	Used antimalarials	Number of travelers
District			
Malabo	29.1	7.1	544
Baney	24.7	8.4	110
Luba	44.2	10.7	27
Riaba	73.7	9.2	23
Gender			
Female	35.4	9.1	348
Male	21.9	5.7	356
Age			
<5	20.4	12.2	36
5-14	45.6	9.4	92
15-24	39.1	10.9	96
25-34	23.7	6.0	159
35-44	24.2	4.8	182
45-54	29.3	6.8	73
55+	19.9	7.7	66
Wealth Quintile			
Lowest	23.7	3.6	63
Second	32.7	5.3	87
Middle	22.1	8.8	106
Fourth	33.9	8.1	137
Highest	28.2	7.9	311
Stratum			
Rural/high transmission	23.7	6.0	255
Urban/low transmission	29.5	7.6	449
Total	28.9	7.4	704

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APPENDIX A: INFORMED CONSENT DOCUMENTS

BIOKO ISLAND MALARIA INDICATOR SURVEY

INFORMATION NOTICE

Introduction

Dear Sir/Madame, my name is _____, I work for the National Malaria Control Program (NMCP). Every year the NMCP organizes a survey in some households on the island of Bioko. I am here because your household has been randomly selected this year.

Survey objectives

The objectives of this survey are: (1) To know your level of knowledge about malaria, (2) To know if you have mosquito bed nets in your home and if you use them, (3) If there is a woman age between 15 and 49 in this household, to know if she took preventive medicine for malaria during her last pregnancy, (4) To know how you and your family treat yourselves when you are sick, (5) To know how many people in your household have malaria and low hemoglobin level (anemia).

Procedures

We will prick the finger with a small needle, and we will collect a drop of blood to test for malaria, a second drop of blood to test for anemia, and three other drops of blood that we will take to the laboratory for confirmation. Results will be available in less than 20 minutes; while waiting, we will ask you some general questions about your home and your family; we will also ask some specific questions to each woman age between 15 and 49 who is available and willing to take part.

Benefits

Your family will receive free malaria and anemia tests. We will treat people with positive malaria tests for free. We ensure that this treatment is the same that is used in government hospitals and health centers. However, we will not treat anemia because we do not know its cause, so you should consult a doctor on your own.

Potential risks

You will feel a slight pain in the finger during the prick that will last less than 20 seconds. You may not feel comfortable with some of the questions, but we want to assure you that they are simple questions not directed towards your privacy.

Confidentiality

Everything we will discuss here, including the answers to the questions, are confidential. Test results will be blinded and coded.

Voluntarism

Your participation is not mandatory and you can withdraw your consent at any time without suffering any pressure from us. Refusing to participate will not affect you in any way in your community and when you visit the hospital. In case of any questions or more information about the survey, please feel free to call the following numbers:

Crisantos Nsue Abeso Tel: 222 505 592

Teresa Ayingono Mifumu Tel: 222 079 697

CONSENT

I read and understood the information related to the survey. The objectives, procedures, potential risks and benefits were clearly explained to me. I understand that my participation is voluntary and I am free to stop at any time without suffering any form of pressure.

A. Consent of the informant

Name of informant: _____

Signature: _____

- ☐ I accept to be interviewed, tested and sampled
☐ I accept to be interviewed and tested, **but not sampled**
☐ I accept to be interviewed, **but not tested or sampled**

Surveyor name: _____

Surveyor

signature: _____

Date: _____

B. Consent for children age less than 18 years

- ☐ I authorize my children to be tested and sampled
☐ I authorize my children to be tested **but not sampled**
☐ I do not authorize my children to be tested

Name of the person authorizing: _____ Tel: _____

Relation to the children: _____ Signature / Thumbprint: _____

C. For adults who are not able to sign

The information was explained to the people and they understood

Name of witness: _____ date: _____

Signature of witness: _____

D. Other adults (+18 years) who are able to sign

1. Name of the person: _____ date: _____

- ☐ I agree to be tested and sampled
☐ I agree to be tested **but not sampled**

2. Name of the person: _____ date: _____

- ☐ I agree to be tested and sampled
☐ I agree to be tested **but not sampled**

3. Name of the person: _____ date: _____

- ☐ I agree to be tested and sampled
☐ I agree to be tested **but not sampled**

4. Name of the person: _____ date: _____

☐
☐

I agree to be tested and sampled
I agree to be tested **but not sampled**

5. Name of the person: _____ date: _____

☐
☐

I agree to be tested and sampled
I agree to be tested **but not sampled**

6. Name of the person: _____ date: _____

☐
☐

I agree to be tested and sampled
I agree to be tested **but not sampled**

7. Name of the person: _____ date: _____

☐
☐

I agree to be tested and sampled
I agree to be tested **but not sampled**

8. Name of the person: _____ date: _____

☐
☐

I agree to be tested and sampled
I agree to be tested **but not sampled**

9. Name of the person: _____ date: _____

☐
☐

I agree to be tested and sampled
I agree to be tested **but not sampled**

10. Name of the person: _____ date: _____

☐
☐

I agree to be tested and sampled
I agree to be tested **but not sampled**

11. Name of the person: _____ date: _____

☐
☐

I agree to be tested and sampled
I agree to be tested **but not sampled**

12. Name of the person: _____ date: _____

☐
☐

I agree to be tested and sampled
I agree to be tested **but not sampled**

13. Name of the person: _____ date: _____

☐
☐

I agree to be tested and sampled
I agree to be tested **but not sampled**

14. Name of the person: _____ date: _____

☐
☐

I agree to be tested and sampled
I agree to be tested **but not sampled**

APPENDIX B: SURVEY PERSONNEL

SURVEY ORGANIZERS

David Galick
Guillermo Garcia
Wonder Phiri

GIS SUPPORT

Jeremias Nzamio Mba
Restituto Mba

DATA VISUALIZATION

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David Galick
Jordan Smith

REPORT AUTHOR

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Crisantos Nsue Abeso
David Galick
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Juan Jose Edu Abeso
Teresa Ayingono Ondo

FIELD COORDINATORS

Crisantos Nsue Abeso
Faustino Etoho Ebang
Juan Jose Edu Abeso Ada

FIELD SUPERVISORS

Ana Delicias Caba Sepa
Antonio Abaga Nvo
Federico Comsil
Jose Maria Nkogo Mbono Eyang
Samuel Vicente Evale
Santiago Mba Micha

PRE-PACKAGING TEAM

Almudena Nchama
Cefora Anastasia Eni Mba
Inmaculada Esono Micha
Maria Dolores Suakin Loka
Raul Memba Borico

DRIVERS

Alberto Abaga
José Mabale Nguema
José Roca
Mariano Ntutumu
Rosendo Akue
Santiago Chicampo
Sergio Osa Ovono Nchama

SURVEYORS

Adrian Mosibe Botala
Angel Roman Mba Bang
Nchama
Angela Eburi Kinson
Antonia Pasialo Dick
Baltazar Obiang Nguema Nsuga
Benito Ela Nguema Mangué
Celestina Nsang Ndong Beyeng
Clara Nzang Obama Abegue
Clemente Motobe Vaz
Diosdado Engaga Engaga Osie
Jesus Nguema Abeso Nsegue
Joaquina Cachina Esapa
Josefina Nchama Esono Ensem
Juan Carlos Huesca Nena
Juan Carlos Sima Mokuy
Maria del Pilar Mangué Mitogo
Nsee
Maria Teresa Nzo Mbasogo
Marta Nchama Abeso Ayingono
Ayingono
Matutina Mangué Engonga
Oyana
Melodia Roca Compañía
Montserrat Onguene Beka
Onguene
Neri Priscila Mba Ntutumu
Prisca Bolopo Riosa
Romualdo Macías Evuna Nfono
Rosa Ngung Mbela
Santiago Ntonga Bikie
Sebastian Sale Kuku
Sidney Odetty Sipua Raso
Tecla Nzang Ntutumu Mikue
Thelma Bokuma Rivas

APPENDIX C: SURVEYORS EVALUATION CHECKLIST

MAPPING	
Correctly identifies sector?	YES / NEEDS IMPROVEMENT / NO
Is able to efficiently move between sectors?	YES / NEEDS IMPROVEMENT / NO
Is able to correctly identify selected houses?	YES / NEEDS IMPROVEMENT / NO
PRESENTATION	
Presented correctly in the house?	YES / NEEDS IMPROVEMENT / NO
Gave a clear explanation of the reason of visit	YES / NEEDS IMPROVEMENT / NO
Informed the household on survey procedures	YES / NEEDS IMPROVEMENT / NO
Informed the households on risks and benefits	YES / NEEDS IMPROVEMENT / NO
Informed the household of the confidentiality of the survey	YES / NEEDS IMPROVEMENT / NO
Informed the household that participation is voluntary	YES / NEEDS IMPROVEMENT / NO
MALARIA AND ANEMIA TESTING	
Correctly prepared lists of household members and visitors	YES / NEEDS IMPROVEMENT / NO
Obtained signed informed consent before taking samples for testing	YES / NO
Organized working space appropriately	YES / NEEDS IMPROVEMENT / NO
Labeled RDTs and filter papers with barcodes	YES / NEEDS IMPROVEMENT / NO
Tested household members according to the order established in lists	YES / NO
Took temperature as per protocol	YES / NEEDS IMPROVEMENT / NO
Cleaned finger before pricking	YES / NEEDS IMPROVEMENT / NO
Waited for finger to dry before pricking	YES / NEEDS IMPROVEMENT / NO
Cleaned the first drop of blood	YES / NEEDS IMPROVEMENT / NO
Took a drop of blood for anemia testing as per protocol	YES / NEEDS IMPROVEMENT / NO / NA
Wiped hemo-cuvette before inserting in hemocue	YES / NEEDS IMPROVEMENT / NO / NA
Took drop of blood for malaria RDT as per protocol	YES / NEEDS IMPROVEMENT / NO
Introduced blood in appropriate well on RDT	YES / NEEDS IMPROVEMENT / NO
Introduced correct quantity of buffer in the appropriate well on RDT	YES / NEEDS IMPROVEMENT / NO
Prepared good blood spots on filter paper	YES / NEEDS IMPROVEMENT / NO / NA
Read malaria RDTs correctly and at proper time, as per protocol	YES / NEEDS IMPROVEMENT / NO
Registered results on the lists of household members/visitors	YES / NEEDS IMPROVEMENT / NO
Explained test results to the household	YES / NEEDS IMPROVEMENT / NO
INTERVIEW	
Asked the questions without changing the meaning	YES / NEEDS IMPROVEMENT / NO
Asked the questions without prompting answers	ALWAYS / SOMETIMES / NEVER
Asked to observe bed nets	YES / NEEDS IMPROVEMENT / NO / NA
Listed and identified the occupants of each bed net	YES / NEEDS IMPROVEMENT / NO / NA
Correctly prepared referral/prescription for malaria-positive and anemic individuals	YES / NO / NA
Registered the date and time of visit in the household list?	YES / NO
After finishing the interview, sensitized the respondent and responded to their questions?	YES / NEEDS IMPROVEMENT / NO