Republic of Kenya

2010 Kenya MALARIA Indicator Survey

Division of Malaria Control, Ministry of Public Health and Sanitation

Kenya National Bureau of Statistics

ICF Macro

Komesha Malaria
Okoa Maisha

Republic of Kenya

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July 2011

WORLD HEALTH ORGANIZATION

THIS REPORT SUMMARIZES the findings of the 2010 Kenya Malaria Indicator Survey (KMIS) carried out by the Division of Malaria Control (DOMC) in the Ministry of Public Health and Sanitation in partnership with the Kenya National Bureau of Statistics (KNBS). The Department for International Development provided financial assistance for the survey through the World Health Organization (WHO). Additional funding as well as support for technical assistance was provided by the U.S. President's Malaria Initiative (PMI). Technical assistance in implementing the survey was provided by the Centers for Disease Control and Prevention (CDC)/Atlanta and the MEASURE Demographic and Health Surveys (DHS) programme at ICF Macro. The opinions expressed in this report are those of the authors and do not necessarily reflect the views of the donor organizations.

Information about the survey may be obtained from the Division of Malaria Control in the Ministry of Public Health and Sanitation, P.O. Box 19982, Kenyatta National Hospital, Nairobi 00202, Kenya; Telephone: +254 20 271 6934/5; Fax: +254 20 271 6935; email: head.domc@domckenya.or.ke.

Additional information about the KMIS may be obtained from the Kenya National Bureau of Statistics (KNBS), P.O. Box 30266, Nairobi 00100, Kenya; Telephone: +254 20 340 929 / 317 583; Fax: +254 20 317 559; email: director@knbs.go.ke.

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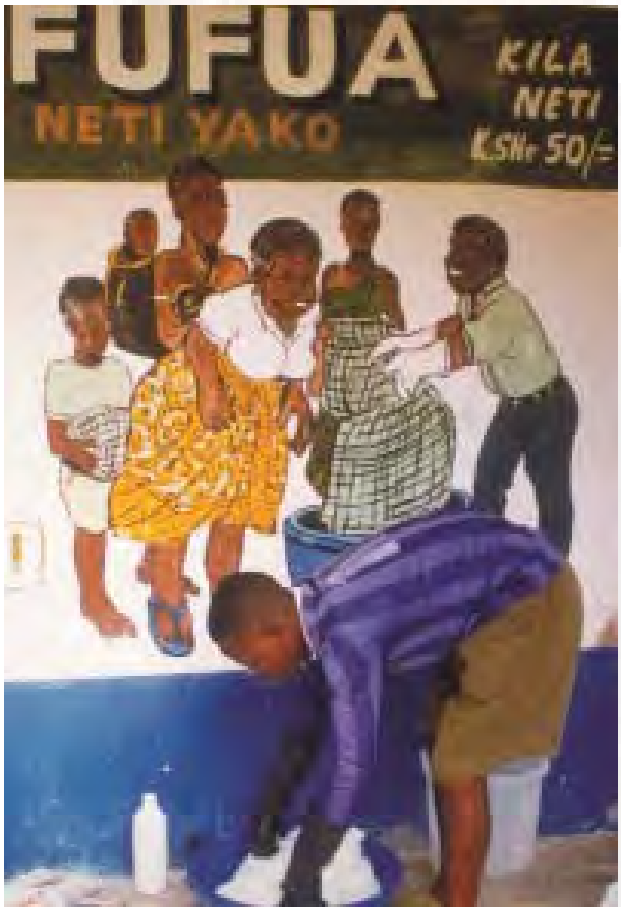

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Acronyms and Abbreviations

ACT	Artemisinin-based combination therapy
AMFm	Affordable Medicines Facility for malaria
AL	Artemether-lumefantrine
ANC	Antenatal care
CDC	Centers for Disease Control and Prevention
CDF	Constituencies Development Fund
CHS	Community Health Strategy
De facto	Stayed in the sampled household the night before the survey
De jure	Usual member of household, regardless of presence at the time of the survey
DFID	(United Kingdom) Department for International Development
DHSF	District Health Stakeholders Forum
DOMC	Division of Malaria Control
EA	Enumeration area
ENSO	*El Niño* southern oscillation
ERS	Economic Recovery Strategy
g/dl	Grams per decilitre
GDP	Gross domestic product
GFATM	Global Fund to Fight AIDS, TB and Malaria
GPS	Global positioning system
Hb	Haemoglobin
HH	Household
IPTp	Intermittent preventive treatment in pregnancy
IRS	Indoor residual spraying
ITN	Insecticide-treated net
IVM	Integrated vector management
KDHS	Kenya Demographic and Health Survey
KEMRI	Kenya Medical Research Institute
KEPH	Kenya Essential Package for Health
KMIS	Kenya Malaria Indicator Survey
KNBS	Kenya National Bureau of Statistics
LLIN	Long-lasting insecticidal net
MDGs	Millennium Development Goals
MOPHS	Ministry of Public Health and Sanitation
MTG	Malaria treatment guidelines
MTP	Medium Term Plan
NASSEP	National Sample Survey and Evaluation Programme
NCAPD	National Coordinating Agency for Population and Development
NHSSP II	Second National Health Sector Strategic Plan 2005–2010 (extended to 2012)
NMS	National Malaria Strategy
PDA	Personal digital assistant
PMI	US President's Malaria Initiative
PSI	Population Services International
RDT	Rapid diagnostic tests
SP	Sulphadoxine or sulphalene-pyrimethamine
UNICEF	United Nations Children's Fund
WHO	World Health Organization

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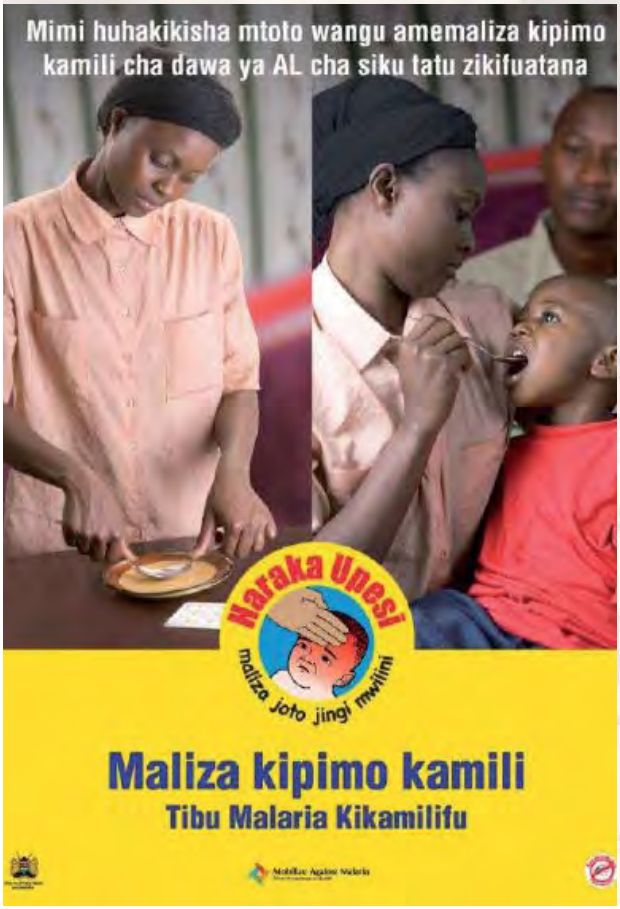
Foreword



Nearly 28 million Kenyans live in areas of malaria risk, a majority of them children under the age of 15 years. Investments in malaria control over the last five years have had a positive impact on the overall morbidity and mortality that is due to malaria. This is evidenced by the reduction in infant and child mortality experienced in Kenya between 2003 and 2009 and the significant reduction in malaria prevalence in Coast Province. The reduction in malaria transmission has also shifted the burden of disease to older children (5–10 years), who now have the highest prevalence of malaria.

This 2010 Malaria Indicator Survey (MIS) report contains the latest information on malaria in Kenya except for malaria-specific mortality. The results of this second malaria indicator survey confirm the gains that were made in malaria control as shown by the 2007 MIS and the 2008-09 Kenya Demographic and Health Survey.

Although malaria prevalence has remained low in most parts of the country, there has been little or no change in the household ownership and use of insecticide-treated nets and perhaps this may account for the small increase in the overall prevalence of malaria in children less than five years of age, particularly in Western Kenya. The failure to replace insecticide-treated nets in this age group as planned in 2009 was occasioned by lack of funding and is a clear indication that gains made in malaria control can be lost in a very short time if the level of investment in interventions is not maintained.

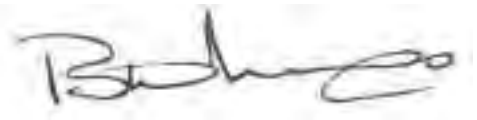
The Ministry of Public Health and Sanitation considers malaria a national priority and remains firmly committed to malaria control efforts in Kenya in line with the Ministry's vision of *A nation free*

of preventable diseases and ill health, the national development agenda as outlined in Kenya Vision 2030, and the aims of the Millennium Development Goals. This report therefore is an important reference document for all partners involved in malaria control in Kenya as it measures our progress towards the achievement of these goals.

The Ministry of Public Health and Sanitation would like to sincerely thank various partners in malaria control for their contributions to the successful completion of the 2010 Malaria Indicator Survey and this report: the United Kingdom Department for International Development (DFID), the United States President's Malaria Initiative (PMI) and the United Nations Children's Fund (UNICEF) for funding the survey process, as well as the World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) for the technical assistance provided. The survey was conducted in close collaboration with the Kenya National Bureau of Statistics (KNBS) and ICF Macro, Kenya Medical Research Institute (KEMRI), Walter Reed Project (KEMRI-WRP), Population Services International (PSI), and the National Coordinating Agency for Population and Development (NCAPD).

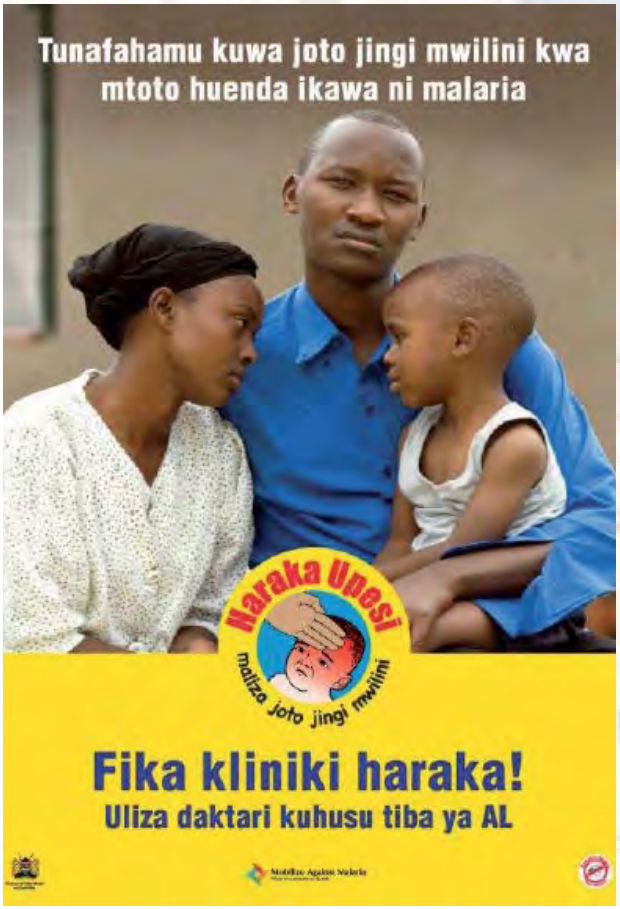
Special thanks go to field data collection teams, all the survey respondents and caregivers of the children who gave blood samples, staff of the Division of Malaria Control and to all members of the Malaria Monitoring and Evaluation Technical Working Group for coordination of the survey.

Findings of the survey will help all partners in malaria control to review implementation strategies going forward in order to achieve comparable reduction in malaria morbidity in Western Kenya as seen at the Coast and to consolidate gains made in controlling this disease countrywide.



Hon. Beth Mugo, EGH, MP
Minister for Public Health and Sanitation

Preface



As a household level survey, a malaria indicator survey (MIS) is particularly useful in countries where malaria is a major public health problem. An MIS provides an opportunity to measure the coverage of interventions that primarily target the household level, such as insecticide-treated nets and behaviour change communication, and also helps to understand patterns of antimalarial use among target populations.

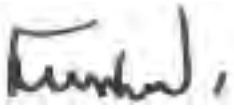
The MIS complements other household surveys such as the Demographic and Health Surveys and Multiple Indicator Cluster Surveys in evaluating progress against malaria control targets.

Unlike other surveys, MIS is conducted during the peak malaria transmission season, thus giving a true picture of malaria prevalence among target populations. This is the second MIS to be conducted in Kenya and there are some differences from the first one, conducted in 2007.

For one thing, the 2010 MIS sampled all districts in Kenya, weighting samples by malaria epidemiology, while in 2007, six districts in areas of low or no malaria risk were not included. Second, the 2007 MIS included only children less than five years of age, but this one covered children up through14 years.

The goal of the Kenya National Malaria Strategy (NMS) 2009–2017 launched in November of 2009 is to reduce malaria-related illness and death by two-thirds of the 2008 levels. The strategy for malaria control is to scale up access to malaria prevention and treatment to all persons living in malaria risk areas. The interventions, key strategic approaches and performance targets are in line with the global Roll Back Malaria targets for malaria control and elimination.

Documenting the progress made in the three years since the 2007 survey, this report of the second KMIS also assesses progress towards achieving the global Roll Back Malaria targets for 2010. The information provided will also be used as a baseline for evaluating the implementation of the current NMS as well as providing all partners in malaria control with a useful guide as we work towards achieving the goals articulated in the NMS 2009–2017.



Mark K. Bor, CBS
Permanent Secretary
Ministry of Public Health and Sanitation

Executive Summary

Malaria is recognized as a health and socio-economic burden by the Government of Kenya. Thus malaria control is a priority investment as articulated in the second National Health Sector Strategic Plan (NHSSP II, 2005–2010, extended to 2012) and the Ministry of Public Health and Sanitation Strategic Plan 2008–2012. The goal of the 2009–2017 National Malaria Strategy (NMS) is to reduce illness and death by two-thirds of the 2008 level. On its part, Kenya Vision 2030 includes among its health sector objectives the intention to reduce the proportion of inpatient malaria fatality to 3 per cent.

In 2010, clinically diagnosed malaria accounted for 34 per cent of outpatient hospital visits in Kenya. Impact of the investment in malaria control over the past ten years and the gains made in reducing morbidity and mortality are difficult to measure within the routine health system as nearly all fevers are diagnosed and treated as malaria. This situation makes it necessary to conduct periodic household surveys.

The Importance of the Survey

Household surveys and specifically malaria indicator surveys (MIS) provide the best periodic measurement of the progress of key malaria indicators against national and international targets. The first MIS in Kenya was conducted in 2007; its objectives were to collect up-to-date information on coverage of the core malaria indicators in the NMS 2001–2010; assess malaria parasite prevalence in children; assess the status of anaemia among children 6–59 months; and build capacity of the Division of Malaria Control (DOMC) and its partners in the implementation of MIS.

The results of the 2007 survey provided stakeholders with valuable information on the coverage of malaria interventions and parasite prevalence in the various epidemiological zones, as well as the prevalence of anaemia in the children. Among other key recommendations the MIS 2007 called for strategic re-direction towards universal coverage as opposed to targeting specific vulnerable groups. It also provided further justification for the need for confirmatory testing of fever cases before treatment and more broadly for continued emphasis on girls'

education as women's education level was shown to be directly related to increased use of nets and better antenatal clinic attendance.

The MIS 2010 was conducted during the peak malaria transmission season of June to August. The objectives of the survey were to determine the status of coverage of various key malaria intervention measures; to assess the prevalence of malaria among children 3 months through 14 years; and to assess the level of anaemia among children 6 months through 14 years. The MIS 2010 was a nationally representative survey that included low to no transmission areas that had not been sampled in the 2007 survey. In addition, the survey covered a larger age range for both malaria prevalence and the assessment of anaemia. In total, 6,538 households, 11,310 children aged 6 months to 14 years, and 5,749 women aged 15–49 were interviewed during the survey.

Prevalence of Malaria and Anaemia

Malaria parasitaemia and anaemia were measured in both 2007 and 2010 to assess the impact of malaria interventions. In the 2010 survey, the age ranges for malaria and anaemia testing were 3 months to 14 years and 6 months to 14 years, respectively, unlike in 2007 when the survey was limited to children under 5 years of age. The results of this survey show that children aged 5–14 years have the highest prevalence of malaria (13 per cent). The prevalence in children below five years increased from 4 per cent in 2007 to 8 per cent in 2010. Malaria prevalence is also nearly three times as high in rural areas (12 per cent) as in urban areas (5 per cent). The lake endemic zone has the highest prevalence of malaria overall (38 per cent), while the prevalence in the other zones is less than 5 per cent.

Plasmodium falciparum is the most prevalent parasite species at 96 per cent, of which 16 per cent comprises mixed infections with *P. ovale*, *P. malariae* or both. The prevalence of severe anaemia (Hb < 8g/dl) is low at 3 per cent, while that of moderate anaemia (Hb 8-11g/dl) is 24 per cent. The lake endemic zone, where malaria prevalence is highest, also has the highest prevalence of both severe and moderate anaemia (4 per cent and 30 per cent, respectively), while the seasonal risk zone with the lowest prevalence of malaria (0.5 per cent) has the second highest prevalence of severe anaemia (3 per cent). The survey results also show that the prevalence of anaemia decreases with age, while malaria prevalence increases with age.

MIS Objectives

- Determine the status of coverage of various key malaria intervention measures.
- Assess the prevalence of malaria among children 3 months through 14 years.
- Assess the level of anaemia among children 6 months through 14 years.

Vector Control

Results of this survey indicate that household ownership of at least one bed net has decreased from 63 per cent in 2007 to 57 per cent in 2010, with the overall decrease being in the ownership of untreated bed nets. The ownership of insecticide treated nets (ITNs) has remained constant since 2007 with eight ITNs for every ten households. It may be concluded that ITNs are being acquired by households through the distribution channels as untreated nets are being phased out. In 2009, the government adopted the global strategy of ensuring universal coverage with ITNs (one net for every two people) for all persons at risk of malaria. The results show that the ITN coverage in 2010 is one net for every five people at risk.

Net use is highest in vulnerable groups compared with the general population: 73 per cent of pregnant women and 71 per cent of children under five years in households with ITNs slept under a net the night before the survey, compared with 61 per cent of the general population in households with ITNs. Overall ITN use by pregnant women and children under five years of age has increased marginally between the two surveys: from 40 to 41 per cent and from 39 to 42 per cent, respectively. Net use in urban households was higher (38 per cent) than in rural households (31 per cent). This pattern was also reflected in net use among children under five years, with those in urban areas more likely to sleep under an ITN (46 per cent) than those in rural areas (41 per cent). Amongst pregnant women, however, net use in rural areas is higher (42 per cent) than in urban areas (38

per cent). Net use amongst school-aged children (5–14 years) is one of the lowest among sampled households and also in households that own ITNs; in houses owning at least one ITN, 52 per cent of these children slept under a net the night before the survey (compared with as many as 48 per cent among young children). Children under five in malaria endemic regions have the highest use of ITNs (48 per cent lake endemic and 55 per cent coast endemic).

Indoor residual spraying (IRS) is conducted for epidemic prevention in highland epidemic prone districts and for reduction of the disease burden in three districts in the lake endemic region. Net use is encouraged for all persons whether IRS has been conducted or not. This survey shows that in highland epidemic prone districts, 44 per cent of children under five slept under an ITN, while an additional 22 per cent slept in a house that had been sprayed in the preceding 12 months. In the lake endemic region, 48 per cent slept under an ITN and an additional 10 per cent slept in houses that had been sprayed in the preceding 12 months.

The social norm determinant that "everyone around here sleeps under a net" was highest in the lake endemic (63 per cent) and highland epidemic prone (62 per cent) regions, followed by coast endemic and seasonal risk zones (55 per cent each) and low risk zones (54 per cent).

Malaria Case Management and Prevention of Malaria in Pregnancy

Among children under five years, more than one child in four (27 per cent) had a fever during the fortnight preceding the survey. It was observed that fever prevalence was highest in one-year-olds (32 per cent) and lowest in three-year-olds (23 per cent). Prevalence of fever was highest in the lake endemic region (41 per cent) and lowest in areas of seasonal risk (21 per cent). The results further show that only 12 per cent of children with fever were tested and 35 per cent took an antimalaria medicine, with 21 per cent taking the malaria medicines the same or next day compared with 24 per cent and 15 per cent, respectively, in 2007. The results indicate that almost 60 per cent of children with fever sought treatment from a health facility/provider, compared with 70 per cent in 2007. As in 2007, lake endemic areas reported the lowest proportion (50 per cent) of children with a history of fever who sought treatment.

Children with fever in endemic zones had the highest use of ACT (27 per cent in coast and 24 per cent in lake endemic), while the lowest use (9 per cent) was in low risk zones.

Government policy recommends that all persons with fever, including children under five, be tested for malaria and if confirmed, treated with artemether-lumefantrine (AL), which is provided free of charge in all government and faith-based facilities. Eighteen per cent of children reporting recent fever took an ACT and 11 per cent got an ACT the same or next day. The results show that of the children who took an antimalarial, the proportion who took an ACT increased from 29 per cent in 2007 to 49 per cent in 2010, while the proportion who reported taking non-recommended treatments like SP, amodiaquine or chloroquine decreased from 52 per cent to 16 per cent. Moreover, 16 per cent of children under five with fever in urban areas took an ACT, compared with 18 per cent of children with fever in rural areas. Children with fever in endemic zones had the highest use of ACT (27 per cent in coast and 24 per cent in lake endemic), while the lowest use (9 per cent) was in low risk zones.

The results of the survey show that of children under five with fever who were taken for treatment, 65 per cent were taken to government facilities and 23 per cent to private facilities. Those living in rural areas (62 per cent) were less likely to seek treatment from government facilities than those in urban areas (79 per cent). There was a decline in the use of private health facilities, with only 20 per cent of urban and 24 per cent of rural children using them in 2010, compared with 28 per cent of urban and 43 per cent of rural children in 2007.

Pregnant women are vulnerable to the effects of malaria and are a specific target group for malaria interventions including ITNs given free of charge during antenatal care, intermittent preventive treatment in pregnancy (IPTp) with sulphadoxine/pyrimethamine (SP), and prompt and effective treatment of parasitaemia. IPTp has been the policy in Kenya since 1998. The current recommendation is to provide

Net use is highest in vulnerable groups compared with the general population: 73 per cent of pregnant women and 71 per cent of children under five years in households with ITNs slept under a net the night before the survey, compared with 61 per cent of the general population in households with ITNs.

full treatment dosages of SP beginning from quickening and repeat them at every antenatal clinic (ANC) visit until delivery as long as the visits are at least four weeks apart. This policy is meant only for endemic zones with moderate to high malaria transmission.

The vast majority (86 per cent) of mothers attended ANC during their last pregnancy leading to a live birth in the past two years. More mothers in urban areas (88 per cent) attended ANC than did those in rural areas (85 per cent). The survey further shows that women with more than primary education, living in low-risk malaria zones, or in the highest wealth quintiles had the highest ANC attendance. The results indicate that 66 per cent of mothers took an antimalaria medicine for prevention during pregnancy, compared with 45 per cent in 2007. Mothers in urban areas (70 per cent) are more likely to take an antimalarial for prevention in pregnancy than those in rural areas (66 per cent).

The proportion of women who took at least two doses of IPTp nearly doubled, increasing from 13 per cent in 2007 to 25 per cent in 2010. The data further show that 29 per cent of mothers living in low-risk areas completed two or more doses of IPTp, compared with 22 per cent of women living in endemic zones. Women with secondary education were more likely than those with no education to attend ANC (93 per cent versus 67 per cent, respectively) and also to take at least two doses of IPTp (34 per cent versus 17 per cent, respectively).

There was a limited campaign regarding prompt malaria treatment-seeking behaviour in some districts in Nyanza Province in the lake endemic region in 2009. In this survey, women aged 15–49 years were asked about their knowledge of the first line treatment for malaria. A third (35 per cent) of the women were able to cite ACTs as the antimalaria drug recommended by the Ministry of Health, 10 per cent said it was SP, while 52 per cent said they did not know. Of those who had heard about ACTs, the most common sources of information were health workers (39 per cent) and radio (36 per cent).

Summary of Major Recommendations

- Intensify malaria control interventions, particularly IRS and other integrated vector management methods like school-based interventions targeting net use and malaria prevention information especially in the lake endemic region, in order to increase the impact on disease prevalence.

- Scale up ITN coverage to the target of one net for two persons at risk and re-evaluate net use campaigns with a view of scaling up their intensity and addressing specific issues that impede net use.

- Because parasitological diagnosis of malaria is still low, carry out strong advocacy and information campaigns for communities and health workers to create awareness, increase demand and change behaviour towards malaria testing.

- Scale up community case management of malaria to address inequality in access to treatment of malaria, as well as communication campaigns to improve knowledge about the recommended malaria treatment in the community using effective channels.

- Maintain emphasis on girls' education, as survey results continue to show that better educated mothers are more likely to attend ANC, to take malaria prevention treatment, and to use nets for themselves and their children.

CHAPTER 1

Introduction

Malaria remains a leading cause of morbidity and mortality in sub-Saharan Africa. Kenya is no exception, and reducing malaria morbidity and mortality is one of the country's major public health objectives. The Kenya Malaria Indicator Survey (KMIS) 2010 was a national sample survey designed to measure progress achieved in key malaria indicators since the last survey in 2007 and to provide a baseline for the National Malaria Strategy 2009–2017. The results of the survey are presented in this report. The report first provides a brief profile of Kenya, then summarizes the objectives of the National Malaria Strategy and details the epidemiology of malaria in Kenya. Subsequent chapters of the report describe the survey methodology and implementation, present the results of the survey, and conclude with a discussion of the findings, conclusions and recommendations.

1.1 Kenya Country Profile

Bordered by Ethiopia to the north, Sudan to the northwest, Somalia to the east, Tanzania to the south and Uganda to the west, the Republic of Kenya covers a total area of 582,646 square kilometres with a 536-kilometre stretch along the Indian Ocean in the southeast. It straddles the Equator in eastern Africa, lying across latitudes 5°North to 5°South and longitudes 34°East to 42°East. The land rises from sea level at the Indian Ocean in the east to 5,199 metres at the highest peak of Mount Kenya. About 80 per cent of the land area, mostly in the north and northeast, is arid or semi-arid and only 20 per cent is arable. Much of the arable land is in the highlands and the Lake Victoria Basin in the southwest of the country. The Great Rift Valley bisects the Kenya highlands into east and west. The highlands are cool and agriculturally rich areas where both large and smallholder farming are carried out.

The variations in altitude and terrain create contrasts in the country's climate, which ranges from hot and humid tropical along the coast to temperate in the interior and very dry in the north and northeast. There are two rainy seasons – the long rains and the short rains. The long rainy season occurs from April to June and the short rainy season from October to December.

The temperature remains high throughout these months. The hottest period is from February to March and the coldest from July to August.

Administratively, Kenya is currently divided into eight provinces, which in turn are subdivided into districts, then divisions, locations and sub-locations. In August 2010, the country enacted a new Constitution in which the provinces will be replaced by 47 semi-autonomous counties once fully implemented.

1.1.1 The Economy

The performance of the Kenyan economy since the country became independent in 1963 has been mixed. Economic growth during the first decade of independence averaged 7 per cent per annum, with the growth attributed to expansion in the manufacturing sector and an increase in agricultural production. The 1980s and 1990s were a period of consistent decline in the economy, which reached its lowest GDP growth level of about 0.2 per cent in 2000. The weak performance was caused by external shocks and internal structural problems, including the drought of the 1980s, low commodity prices, world recession, bad weather, ineffective and inconsistent policies, and poor infrastructure. The consistently poor growth performance failed to keep pace with population growth. One result was an overall increase in poverty levels as the economy was unable to create enough jobs for the growing labour force.

In order to reverse the declining trend, the government that came to power in 2003 initiated the Economic Recovery Strategy (ERS) for Wealth and Employment Creation with the objectives of restoring economic growth, creating employment and enhancing social development (GOK, 2003). The ERS enabled the economy to grow steadily from 0.5 per cent in 2002 to a high of 7 per cent in 2007. Then, so as to consolidate the gains made under the ERS and mitigate against the effects of global economic challenges, the government in 2007 launched Kenya Vision 2030 and the following year articulated the First Medium Term Plan (MTP) for realizing the Vision (GOK, 2007, 2008). The overall aim of the Vision is to achieve "a globally competitive and prosperous country with a high quality of life by 2030" by transforming Kenya into a newly industrialized middle-income country.

1.1.2 The Population

According to the 2009 Population and Housing Census, Kenya's population stood at 38.6 million (KNBS, 2010). Previous census results indicated an annual population growth rate of 2.9 per cent per annum during the 1989–1999 period, a reduction from 3.4 per cent recorded for both the 1969–1979 and 1979–1989 intercensal periods. A decline in fertility rates and realization of the efforts contained in the National Population Policy for Sustainable Development (GOK, 2000) were the major drivers of this decline in population growth. For example, the crude birth rate has shown a steady decline from 54 births per 1,000 population in 1979 to 48 in 1989, then to 41 in 1999 and to 35 in 2009 (KNBS and ICF Macro, 2010).

In contrast, mortality rates increased during the 1990s as a result of increased HIV/AIDS-related deaths, a decline in health services and escalating poverty. For a long time the crude death rate was on the decline, but the period 1989–1999 reported an increase to 12 per 1,000 population from 11 per 1,000 for the 1979–1989 period. The infant mortality rate decreased from 119 deaths per 1,000 live births in 1969 to 88 in 1979, and to 68 in 1989, but then increased to 77 per 1,000 in 1999 (CBS, 1994, 2001). More recent data show some declines, however, with child mortality falling from 115 deaths per 1,000 in 2003 (CBS et al., 2004) to 74 deaths per 1,000 in 2008–2009 (KNBS and ICF Macro, 2010).

Kenya's population is characterized as "very young". The 2009 population census reports that 43 per cent of the population is under 15 years and only 4 per cent is aged 65 and older (KNBS, 2010). This is attributed to the high fertility and declining mortality in the past. The country's urban population, now constituting 32 per cent of the total population, grew from 3.8 million in 1989 to 12.4 million in 2009 (KNBS, 2010). This growth contributes to the proliferation of informal urban settlements, leading to environ-

Vision 2030 aims at restructuring the health care delivery system to shift the emphasis from curative to promotive and preventive health care, for example by giving priority to prevention at community and household level.

mental degradation and deteriorating public health standards (CBS, 1994, 2001).

1.2 Health Priorities and Programmes

The health sector is within Kenya Vision 2030's social pillar with the overall goal of providing equitable and affordable health care at the highest standard to all citizens. The Vision also aims at restructuring the health care delivery system to shift the emphasis from curative to promotive and preventive health care, for example by giving priority to prevention at community and household level. In addition, it prescribes efforts to be made to control environmental threats to health in order to lower the nation's disease burden (GOK, 2007).

Significantly, the Vision highlights pertinent flagship strategies that should be implemented to transform the health sector and more importantly reverse the trends in health indicators. These are defined in the first five-year plan for achieving the Vision – the 2008–2012 Medium Term Plan (MTP), which clearly illustrates the road map for achieving the health sector goals (GOK, 2008). These goals are drawn from the second National Health Strategic Plan (NHSSP II) covering the period 2005–2010, since extended to 2012 to conform with the MTP (MOH, 2005). The goal of NHSSP II, which reflected national concerns as well as international commitments such as the Millennium Development Goals (MDGs), was to reduce health inequalities and reverse the downward trend in health-related outcome and impact indicators. NHSSP II also introduced the Kenya Essential Package for Health (KEPH), which defined six levels of care and six life-cycle cohorts. The emphasis was on shifting the focus from a curative system to a preventive system, beginning at the community level.

Ministries, semi-autonomous government agencies and other government entities were charged with the responsibility of developing strategic plans to guide their operations that would conform to the aims of the MTP.

The MTP sets the following objectives for the health sector:

- Reducing under-five mortality from 120 to 33 per 1,000 births;
- Reducing maternal mortality from 410 to 147 per 100,000 live births;
- Increasing the proportion of births delivered by skilled personnel from 42 per cent to 95 per cent;
- Increasing the proportion of immunized children below one year from 71 per cent to 95 per cent;
- Reducing cases of TB from 888 to 444 per 100,000 persons;
- *Reducing the proportion of inpatient malaria fatality to 3 per cent;* and
- Reducing the HIV incidence rate to less than 2 per cent.

To respond to these medium-term imperatives the Ministry of Public Health and Sanitation (MOPHS), like other ministries, elaborated a strategic plan for the 2008–2012 period (MOPHS, 2008) with five broad strategic thrusts, each of which sets specific indicators to guide achievement. Because the MOPHS mandate focuses on the community and the health services closest to the community, the emphasis is on public service. For malaria specifically, the ministry's strategic plan aims to reduce malaria incidence to 15 per cent by utilizing cost effective control measures such as long-lasting insecticidal nets and indoor household spraying.

The ministry expects to achieve these objectives against a backdrop of daunting national and global challenges, in particular the knock-on effects of the global economic downturn and volatile international markets.

1.3 National Malaria Strategy 2009–2017

Kenya's National Malaria Strategy (NMS) covering the period 2009–2017 was developed in line with the Government's first Medium-Term Plan of Kenya Vision 2030 and the Millennium Development Goals, as well as Roll Back Malaria partnership goals and targets for malaria control. The NMS is based on and carries forward an inclusive partnership between the two ministries responsible for health, other line ministries of the Government of Kenya, and development and implementing partners in malaria control (DOMC, 2009).

The goal of the NMS is to reduce morbidity and mortality caused by malaria by two-thirds of the 2007–2008 baseline level by 2017. Six specific objectives will be used to achieve this:

1. By 2013, to have at least 80 per cent of people living in malaria-risk areas using appropriate malaria prevention interventions.
2. To have 80 per cent of all self-managed fever cases receive prompt and effective treatment and 100 per cent of all fever cases who present to health facilities receive parasitological diagnosis and effective treatment by 2013.
3. To ensure that all malaria epidemic-prone districts have the capacity to detect and the preparedness to respond to malaria epidemics by 2010.
4. To strengthen surveillance, monitoring and evaluation systems so that key malaria indicators are routinely monitored and evaluated in all malarious districts by 2011.
5. To strengthen advocacy, communication and social mobilization capacities for malaria control to ensure that at least 80 per cent of people in malarious areas have knowledge on prevention and treatment of malaria by 2014.
6. By 2013, to strengthen capacity in programme management in order to achieve malaria programme objectives at all levels of the health care system.

The NMS is implemented using four key strategic approaches:

- Guaranteeing all people access to quick and effective treatment, to significantly reduce illness and death from malaria.
- Providing malaria prevention measures and treatment to pregnant women.
- Ensuring use of insecticide-treated nets by at-risk communities to significantly reduce rates of disease.
- Improving epidemic preparedness and response.

These are supported by two vital cross-cutting strategies:

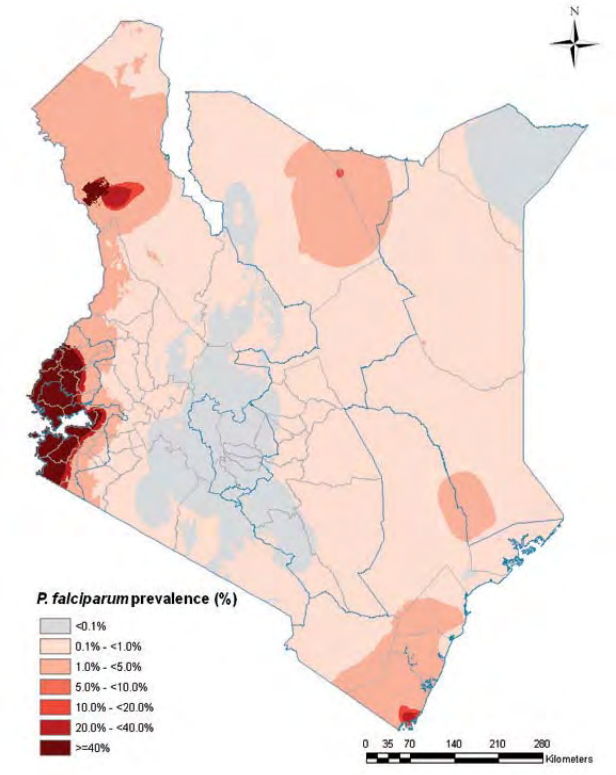
- Information, education, and communication.
- Monitoring and evaluation.

1.4 Epidemiology of Malaria in Kenya

Increasing evidence shows that the epidemiology and risk of malaria in Kenya declined between 1999 and 2009. A comparison of previous malaria maps and recently updated maps on malaria prevalence shows the shrinking of malaria endemic areas and expansion of low transmission zones. It is estimated that 60–70 per cent of the Kenyan land mass has a parasite prevalence of less than 5 per cent where 78 per cent of the population of Kenya lives. On the other hand, there is also a decline in the level of endemicity in endemic areas characterized by a reversal in the age group with the highest prevalence between children less than five years old and those 5–15 years of age.

A model-based map produced in 2009 shows the intensity of *P. falciparum* transmission in Kenya as defined by the proportion of infected children aged 2–10 years in the community (Figure 1.1).

Figure 1.1: 2009 Kenya malaria risk map



Source: Noor et al. (2009).

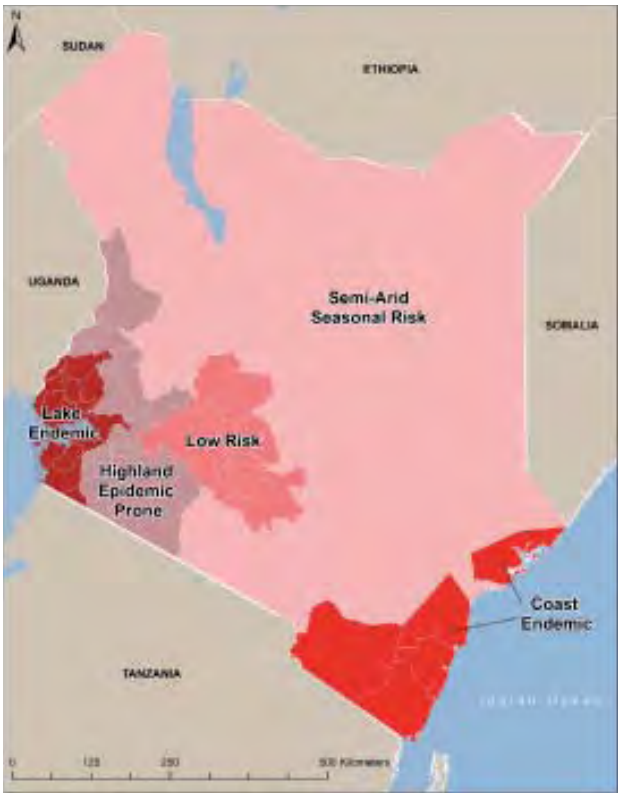
On the basis of the malaria risk map and the eco-epidemiology of malaria in Kenya, districts have been stratified into four groups: Endemic lake and coastal regions (risk class equal to or above 20 per cent); Epidemic-prone highland districts (risk class 5 to less than 20 per cent); Seasonal transmission risk districts (risk class less than 5 per cent); Low-risk districts (risk class less than 0.1 per cent).

The 2007 malaria indicator survey showed that there are variations in malaria parasite prevalence across the eco-epidemiological zones of the country among children under five years of age: 17 per cent in endemic areas, 1.4 per cent in areas of seasonal malaria transmission (arid and semi-arid lowlands), 1 per cent in epidemic prone areas and 0.4 per cent in low risk transmission areas.

Kenya has four malaria epidemiological zones (Figure 1.2):

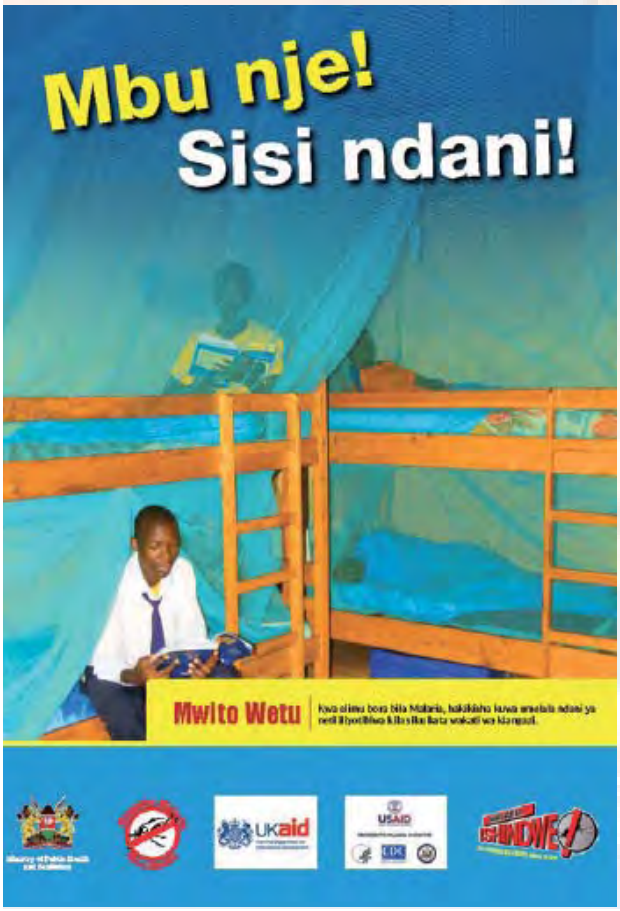
- *Highland epidemic prone areas:* Malaria transmission in the western highlands of Kenya is seasonal, with considerable year-to-year variation. The epidemic phenomenon is experienced when climatic conditions favour sustainability of minimum temperatures around 18°C. This increase in minimum temperatures during the long rains favours and sustains vector breeding, resulting in increased intensity of malaria transmission. The whole population is vulnerable and case fatality rates during an epidemic can be up to ten times greater than those experienced in regions where malaria occurs regularly.
- *Endemic areas:* Areas of stable malaria have altitudes ranging from 0 to 1,300 metres around Lake Victoria in western Kenya and in the coastal regions. Rainfall, temperature and humidity are the determinants of the perennial transmission of malaria. The vector life cycle is usually short with high survival rate because of the suitable climatic conditions. Transmission is intense throughout the year with high annual entomological inoculation rates. For the purposes of the 2010 MIS, the endemic areas have been divided into (a) Lake endemic, comprising lowland districts of Nyanza and Western provinces, and (b) Coast endemic, comprising areas along the coast.
- *Seasonal malaria transmission areas:* This epidemiological zone comprises arid and semi-arid areas of northern and southeastern parts of the country that experience short periods of intense malaria transmission during the rainy seasons. Temperatures are usually high and water pools created during the rainy season provide the malaria vector's breeding sites. Extreme climatic conditions like the *El Niño* southern oscillation lead to flooding in these areas, resulting in epidemic outbreaks with high morbidity rates because of the low immune status of the population.
- *Low risk malaria areas:* This zone covers the central highlands of Kenya including Nairobi. The temperatures are usually too low to allow completion of the sporogonic cycle of the malaria parasite in the vector. However, higher temperatures and changes in the hydrological cycle associated with climate change are likely to increase the areas suitable for malaria vector breeding with the introduction of malaria transmission in areas where it did not previously exist.

Figure 1.2: Malaria zone map



CHAPTER 2

Survey Organization and Methodology



The 2010 Kenya Malaria Indicator Survey (KMIS) was the second survey of its kind to be carried out in Kenya. As with the 2007 KMIS, the 2010 survey was designed to assess the global Roll Back Malaria targets, which were adopted in the National Malaria Strategy (NMS) 2009–2017 (DOMC, 2009).

2.1 Objectives of the Survey

The main objectives of the 2010 KMIS were to measure progress achieved in key malaria indicators since the 2007 KMIS and to provide a baseline for the NMS 2009–2017. The specific objectives were:

1. To determine the status of coverage of various key malaria intervention measures (e.g., bed net coverage and use, preventive measures during pregnancy, etc.).
2. To assess the prevalence of malaria among children 3 months to 14 years.[1]
3. To assess the level of anaemia among children 6 months to 14 years.

2.2 Survey Organization

A collaborative effort of the Division of Malaria Control (DOMC) of the Ministry of Public Health and Sanitation and the Kenya National Bureau of Statistics (KNBS), the 2010 KMIS was carried out with assistance from many other partners and institutions. The DOMC coordinated the overall exercise. The sample design, training of field staff, data collection, analysis and report writing were carried out by the DOMC and the KNBS in collaboration with other partners. The World Health Organization (WHO), UNICEF, the U.S. President's Malaria Initiative (PMI), ICF Macro and Population Services International (PSI) provided technical assistance during training, field work, data analysis and report writing.

The U.S. Centers for Disease Control and Prevention (CDC) provided technical assistance in programming of the personal data assistant

[1] Throughout this report the age ranges 3 months to 14 years and 6 months to 14 years include the 14-year-olds.

(PDA) units and training the research assistants in how to use them; in addition, they loaned the PDAs for the duration of the data collection.[2] The Kenya Medical Research Institute (KEMRI)/ Walter Reed Project (WRP) assisted in training and the collection and analysis of blood slides. The National Coordinating Agency for Population and Development (NCAPD) assisted in training, fieldwork and report writing. Funding was provided by the United Kingdom's Department for International Development (DFID), PMI and UNICEF.

2.3 Sample Design

A sample of 7,200 households for the 2010 KMIS was selected to be representative of the entire household population in Kenya. The design for the survey used a representative probability sample to produce estimates for the four malaria epidemiological zones with the endemic zones divided into lake endemic and coast endemic to make five zones (see Section 1.4):

1. Highland epidemic-prone
2. Lake endemic
3. Coast endemic
4. Seasonal risk/Semi-arid
5. Low risk

In addition, in each zone, clusters were categorized into urban and rural areas and provided two implicit domains for analysis at the national level.

The survey used the National Sample Survey and Evaluation Programme (NASSEP) IV sampling frame. The frame is nationally representative and was developed by the KNBS after the 1999 Census to support two-stage cluster sample surveys. The first stage sampling process involved selection of enumeration areas (EAs) and creation of 1,800 clusters with probability proportional to measure of size with the districts as the first level of stratification.

From the frame, a representative sample of 240 clusters was selected for the 2010 KMIS with a uniform sample of 30 households allocated to each cluster. The resulting sample of 7,200 households was designed so as to produce estimates of most of the key malaria indicators including the prevalence of anaemia in children aged 6 months through 14 years for the specified domains.

The sampling of the clusters was done by the KNBS prior to commencement of the fieldwork and the details loaded into the interviewers' PDAs, which were fitted with the capability to record the global positioning system (GPS) coordinates. All the selected clusters were mapped using PDAs in a process that involved collecting the basic descriptions of all the households and their geographic coordinates. A simple random sample of 30 households per cluster was selected with the aid of the PDAs. Further details on the sample design are provided in Appendix A.

2.4 Questionnaires

The questionnaires used in the 2010 KMIS were developed by the Roll Back Malaria Monitoring and Evaluation Reference Group (MERG) in collaboration with ICF Macro. The standard questionnaires were adapted to the Kenyan situation and programmed into PDAs by a team from CDC/Atlanta. The questionnaires were first reviewed by the KMIS Technical Working Group and were translated into Kiswahili. All KMIS interviews were done using the PDAs.

Two types of questionnaires were used: a Household Questionnaire and a Woman's Questionnaire. The Household Questionnaire captured information on the usual members and visitors, including age, sex and relationship to the head of the household. One purpose of the Household Questionnaire was to identify women aged 15–49 who were eligible for the individual interviews. The questionnaire also collected information on characteristics of the household's dwelling unit, such as the source of water, type of toilet facilities, materials used for the floor, walls and roof of the house, etc. Information on ownership and use of mosquito nets was also collected with the Household Questionnaire. In

The sample of 240 clusters with 30 households in each one was designed to produce estimates of most of the key malaria indicators, including anaemia in children aged 6 months to 14 years.

[2] The PDAs were used for mapping, selecting and interviewing households and eligible women.

addition, this questionnaire was used to capture some information on attitudes about malaria and to record the results of the request for doing anaemia and malaria testing on young children (see Section 2.5).

The Woman's Questionnaire was administered to consenting women aged 15–49 years to collect data on background characteristics, reproductive history, use of intermittent preventive treatment (IPT) during pregnancy for recent births, fever prevalence and treatment among children under five, and knowledge and attitudes regarding malaria and child survival.

The questionnaires used in the 2010 KMIS are provided in Appendix B.

2.5 Anaemia and Malaria Testing

Three "biomarkers" were used for testing: (1) taking finger-prick blood samples from children aged 6 months through 14 years to perform on-the-spot testing for anaemia and taking finger-prick blood samples from children aged 3 months through 14 years (2) to perform a rapid malaria test, and (3) to prepare thick and thin blood smears that were read in the laboratory to determine malaria parasitaemia.

Each data collection team included two health workers (a clinician and laboratory technician) who were responsible for implementing the malaria and anaemia testing and making the blood smears. They were also responsible for ensuring that medications for malaria were given in accordance with the treatment guidelines. Written informed consent for testing the children was requested from the child's parent or guardian at the end of the household interview before the tests were carried out. The protocol for the blood specimen collection and analysis was approved by the Kenyatta National Hospital/University of Nairobi Scientific and Ethics Review Committee and ICF Macro's Institutional Review Board (see below).

Parents/guardians whose children had low haemoglobin levels were given written results and a referral letter and advised to take the child to a health facility for follow-up care.

2.5.1 Anaemia Testing

Because of the correlation between malaria infection and anaemia, the KMIS included anaemia testing for children aged 6 months to 14 years. Blood samples were collected using a single-use, spring-loaded, sterile lancet to make a finger prick. Laboratory technicians then collected blood on a microcuvette from the finger prick.

Haemoglobin analysis was carried out on site using a battery-operated portable HemoCue® unit (HemoCue AB Angelholm, Sweden) and the results were given to the child's parent or guardian verbally and in written form. Parents/guardians whose children had a haemoglobin level of less than 8g/dl were given written results and a referral letter and advised to take the child to a health facility for follow-up care. Results of the anaemia test were recorded in the household questionnaire as well as in a brochure explaining the causes and prevention of anaemia that was left in the household.

2.5.2 Rapid Malaria Tests

Another major objective of the KMIS was to provide information about the extent of malaria infection among children aged 3 months–14 years. Blood samples were obtained (for most children, the same finger prick used for anaemia testing was also used for malaria testing) and tested immediately using rapid diagnostic tests (RDTs).[3] The test results were provided to the child's parent/guardian in oral and written form and were recorded on the household questionnaire.

Those who tested positive for malaria using the rapid diagnostic test were provided with a full course of artemether-lumefantrine (AL) according to national guidelines for the treatment of malaria in Kenya. AL was provided by the DOMC.

2.5.3 Malaria Smears

In addition to the rapid malaria test, both thick and thin blood smears were also taken for all children tested. Each blood smear slide was

[3] The CareStart® Malaria PF HRP2/ pLDH for *Plasmodium falciparum* was used in all areas except North Eastern Province, where CareStart® Malaria pLDH/HRP2 Combo (Pf/Pv) for both *P. falciparum* and *P. vivax* was used.

given a bar code label, which was also entered by the interviewer into the Household Questionnaire on the line showing consent for that child. A third copy of the same bar code label was affixed to a Blood Sample Transmittal Form in order to track the blood samples from the field to the laboratory. The blood smears were dried and packed carefully in the field. They were periodically sent by courier to the KEMRI/Walter Reed Project Malaria Diagnostics Centre laboratory in Kisumu for microscopic examination.

2.6 Training

Field staff training for KMIS 2010 was conducted from 7 to 17 July 2010 in Nakuru. A total of 148 participants took part, including 25 team supervisors, 59 research assistants, 56 health workers (28 clinicians and 28 laboratory technologists) and the 8 Provincial Malaria Control Coordinators.

Team supervisors and research assistants were trained on the rationale and methodology of KMIS data collection using PDAs and global positioning system technology. Key concepts in household listing, interviewing skills and filling the questionnaires using PDAs were emphasized.

Health workers were trained on how to conduct informed consent and specimen collection procedures like preparing blood smears and performing rapid diagnostic tests (RDT) for malaria and anaemia testing. Participants also received refresher training on the management of uncomplicated malaria and referral of complicated malaria cases.

As part of the training, the questionnaires were pre-tested in six urban areas in Nakuru that were purposively selected because of their proximity to the training centre. The questionnaires were then adapted and finalized for the actual field work.

2.7 Fieldwork

Among the 148 trained field staff, only 128 were selected for final data collection, while 12 were kept as reserves in case of attrition. The remaining eight were Provincial Malaria Control Coordinators who acted as national coordinators during the fieldwork. Twenty-five teams, each comprising one supervisor, two research assistants and two health workers (a clinician and a laboratory technician) constituted the field staff. Teams were each allocated clusters in the different districts in accordance to their local language competency. Each team was assigned a driver and supplied with logistics for the survey activity. The fieldwork was conducted for approximately 40 days with a one-week break at the beginning of August to allow for the national constitutional referendum activities. (Refer to Appendix C for a list of the personnel involved in the survey.)

> Children who tested positive for malaria using the rapid diagnostic test were provided with a full course of artemether-lumefantrine (AL) according to national guidelines for the treatment of malaria in Kenya.

Prior to the fieldwork, the communities residing in the sampled clusters received information about the KMIS through social mobilization and the mass media. This was necessary to alert the communities about the days of the survey and also that children would be tested for malaria. Taking of blood samples is often a sensitive issue requiring adequate information beforehand to avoid misinformation.

The fieldwork commenced on 18 July and after the one-week break (1–7 August) ended on 2 September. Teams spent an average of three days in a cluster with the first day dedicated to mapping the households while the next two days were used to conduct field interviews. Fieldwork was closely supervised by a team of national supervisors from the DOMC including the Provincial Malaria Control Coordinators and KNBS who visited the teams in the field to ensure that the survey was conducted according to the protocol and provide solutions to some of the challenges encountered. The teams were facilitated in the field by KNBS district staff; these included District Statistical Officers (DSO) and cluster guides who made sure that the enumeration areas were accurately identified. Village elders were also instrumental in guiding the teams and mobilizing the communities in their respective clusters.

2.8 Data Processing

KMIS data were captured using PDAs fitted with GPS. The questionnaires were programmed into the PDAs and tested before the actual field work. They were then periodically transferred to and saved on the supervisor's PDA in each team and at the end of the data collection were downloaded onto a personal computer for merging and analysis.

The data underwent various cleaning processes before analysis. First, the data were corrected for problems in geographic coding by using ArcGIS software to plot the coordinates and identify the misplaced information. The data were further split and merged into various data sets to ease analysis and were converted into SPSS (Statistical Package for Social Science) format. The data sets were then converted into CSPro format and further checks/corrections were made prior to the production of preliminary tabulations.

2.9 Weighting of the Data

Sample allocation among the domains was not proportional and, therefore, the resulting sample is not self-weighting. Final weighting adjustments were done to provide comparable estimates for the domains of study. Weighting was first done using the frame design selection probabilities and then adjusted to cater for household and individual non-response. Finally, the aggregate weights were normalized and applied to the data. Details on weighting procedures are presented in Appendix A.

All the results presented in this report, except those related to response rates, are based on weighted data.

2.10 Ethical Considerations

The protocol for the 2010 KMIS was submitted to the Kenyatta National Hospital/University of Nairobi Scientific and Ethics Review Committee. During data collection in the field, verbal informed consent was sought to administer the questionnaires. Written consent was also sought from the parents/guardians of children before obtaining blood samples for malaria and anaemia testing. Strict confidentiality was maintained and all personal identifiers were removed from the data during analysis.

The risks and benefits of participation in the survey were explained to each participant during the process of informed consent. The risk of participation for children under five was minimal, since it was limited mostly to the temporary discomfort associated with finger-prick blood collection. The benefits of participation in the survey included identification and immediate treatment of malaria and referral for anaemia treatment. There was minimal risk to women who participated in the interview, other than the possible temporary discomfort during the discussion of sensitive information around reproductive history and child survival. No incentives were offered to survey respondents.

2.11 Response Rates

Ninety-three per cent of the targeted households were interviewed. The survey yielded response rates of 93 per cent and 94 per cent for eligible children and women, respectively. Response rates for children under five reported by interviewed women were lower (74 per cent). Response rates are higher in rural areas than in urban areas. Table 2.1 summarizes the various response rates.

2.12 Challenges to the Implementation of the 2010 Survey

This survey included children aged 5–14 who are traditionally school going. Although the survey was carried out during the midyear school holiday, older children still had holiday schooling that required call-back visits during lunch breaks or in the evenings, presenting challenges with logistics and timing of visits to the various clusters.

Poor infrastructure and vast distances between clusters in the sparsely populated regions meant more time was spent in data collection in some areas than in others.

Table 2.1: Response rates for household and individual interviews

Number of households, number of children aged 6 months through 14 years, number of interviews with de facto women 15–49, number of children under 5 and response rates, according to residence (unweighted)

Population	Sample	Eligible	Completed	Response rate
National				
Households	7,223	7,025	6,538	93.1 [a]
De facto children 6 months–14 years	-	12,215	11,310	92.6 [b]
De facto women 15–49	-	6,120	5,749	93.9 [c]
De facto children under five	-	4,080	3,032	74.3 [d]
Rural				
Households	5,899	5,760	5,372	93.3 [a]
De facto children 6 months–14 years	-	10,850	10,101	93.1 [b]
De facto women 15–49	-	5,065	4,790	94.6 [c]
De facto children under five	-	3,582	2,717	75.9 [d]
Urban				
Households	1,324	1,265	1,166	92.2 [a]
De facto children 6 months–14 years	-	1,365	1,209	88.6 [b]
De facto women 15–49	-	1,055	959	90.9 [c]
De facto children under five	-	498	315	63.3 [d]

Note: De facto refers to those who stayed in the household the night before the interview.
a The household response rate is computed as the number of completed household interviews divided by the number eligible (i.e., sampled households minus households that were vacant, destroyed or where all members were absent for an extended period of time.
b The children 6 months through 14 years response rates are based on de facto children of those ages who consented to malaria or anaemia testing divided by all de facto children of those ages in the sampled households.
c The women's response rates are based on all de facto women 15–49 divided by the total number of de facto women in the households.
d Data on treatment of recent fever are based on children under five reported by interviewed women. Because many women reported having given birth, but had no children listed in their birth histories, during the data editing phase, household listings were searched for children reported as children of the household head. If the de facto mother was reported as the head of the household or the only spouse of the household head and the mother reported having had live births, but had no births reported in the birth history, the children under 7 years of age were imported into the woman's birth history. The total number of living children under 5 years of age includes the 835 (150 urban, 685 rural) children imported in this way. The response rate for children under 5 is based on all living children of de facto women, who are not coded as 'missing' for Q404 (fever) divided by the total number of living children under 5.

2.13 Limitations of the KMIS

It was not possible to determine from the survey whether children with a history of fever who also reported finger or heel prick were treated appropriately. Respondents had to recall from memory the name of the malaria medicine given (if any) for the last fever episode in young children. Since no monographs were used to assist in confirming that the medicine named was the actual medicine, it is possible that the use of non-recommended medicines may have been over- or understated.

As is common with cross-sectional surveys, it is not possible establish a cause and effect relationship between observed behaviours such as net use and use of antimalaria medicines, on one hand, and explanatory variables such as distance to service points, psycho-social beliefs about net use and treatment, on the other. This is because in a survey, behaviours and explanatory variables are observed at the same time (classical epidemiology requires that the cause precede the effect for meaningful inferences to be made). It is therefore recommended that a more in-depth analysis of existing data sets be undertaken. Such an analysis will take into account existing impact level indicators such as mortality from previous demographic and health surveys, anaemia and parasitaemia from the KMIS, and a time series analysis of HMIS data. It will, as well, link all these with a counterfactual argument on what else might explain the decline in under-five mortality or other impact level indicators with increasing intervention coverage.

CHAPTER 3

Household Population and Housing Characteristics

Basic demographic and socio-economic characteristics of the surveyed household population are summarized in this chapter. The household background characteristics include age, place of residence, sex, educational attainment, household socio-economic status and housing characteristics. The housing characteristics include sources of drinking water, type of toilet facility, type of cooking fuel, electricity, and main roof and wall material, as well as the number of rooms used for sleeping.

3.1 Household Population

Table 3.1 shows the percentage distribution of the de facto household population (defined as those who stayed in the household the night before the interview) by five-year age groups, according to sex and residence. The survey population consists of 47 per cent men and 53 per cent women. Results show that 18 per cent of the population comprises children who are under five years of age. These are the children who are most vulnerable to malaria infections. The data further show that children under 15 years of age constitute 46 per cent of the Kenyan population, which compares well with the 45 per cent found in the 2008–09 Kenya Demographic and Health Survey (KDHS). There is a sharp drop in population from age 10–14 to 15–19 for both men and women. Figure 3.1 presents the population pyramid of the surveyed population. The age-sex structure shows a wide base, indicating that the population is mostly youthful.

3.2 Household Composition

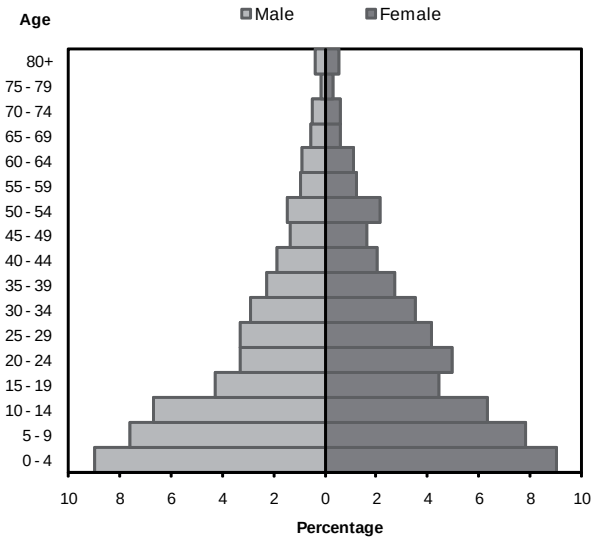
The number of members of a household determines to a large extent the demand for goods and services the household purchases. The larger the household, the more strain is put on the resources available for the household's disposal. This in turn affects the general welfare of household members in terms of nutrition, as well as access to health care, bed nets, malaria medication, etc.

Table 3.1: Household population by age, sex, and residence

Percentage distribution of the de facto household population by five-year age groups, according to sex and residence

Age	Urban			Rural			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
<5	16.3	15.8	16.0	19.5	17.4	18.4	18.9	17.1	18.0
5–9	11.9	12.6	12.3	16.9	15.3	16.0	16.0	14.7	15.3
10–14	10.8	7.9	9.2	14.8	12.9	13.8	14.1	12.0	13.0
15–19	5.8	6.8	6.3	9.8	8.6	9.2	9.1	8.3	8.6
20–24	7.9	13.1	10.7	6.7	8.4	7.6	6.9	9.3	8.2
25–29	11.0	12.1	11.6	6.0	6.8	6.4	6.9	7.8	7.4
30–34	10.0	9.5	9.7	5.1	5.9	5.6	6.0	6.6	6.3
35–39	7.2	6.8	7.0	4.2	4.7	4.5	4.8	5.1	4.9
40–44	5.7	4.2	4.9	3.5	3.8	3.7	3.9	3.9	3.9
45–49	3.7	2.5	3.1	2.8	3.2	3.0	3.0	3.1	3.0
50–54	4.2	4.4	4.3	2.8	3.9	3.4	3.1	4.0	3.5
55–59	2.4	1.4	1.8	2.1	2.4	2.3	2.1	2.2	2.2
60–64	0.9	1.3	1.1	2.0	2.2	2.1	1.8	2.0	1.9
65–69	1.0	0.6	0.8	1.3	1.3	1.3	1.3	1.2	1.2
70–74	0.7	0.5	0.6	1.1	1.3	1.2	1.0	1.2	1.1
75–79	0.1	0.2	0.2	0.5	0.7	0.6	0.4	0.6	0.5
80 +	0.3	0.2	0.3	0.8	1.2	1.0	0.7	1.0	0.9
Total	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***
Number	2,282	2,613	4,895	10,124	11,124	21,249	12,406	13,737	26,144

Figure 3.1: Population pyramid



Survey results on the percentage distribution of households by size and the mean household size by place of residence are given in Table 3.2. The mean size of a Kenyan household is 4.2 persons, compared with 4.4 in the 2007 KMIS and 4.2 in the 2008-09 KDHS. In general, households in urban areas tend to have fewer members than rural ones (4.4 persons in rural areas and 3.2 persons in urban areas).

Table 3.2: Household composition

Percentage distribution of households by household size and mean size of household, according to residence

Number of usual members	Residence		Total
	Urban	Rural	
1	23.4	11.8	14.6
2	17.5	11.0	12.6
3	16.9	15.5	15.9
4	20.4	17.6	18.3
5	10.8	14.2	13.4
6	5.0	11.3	9.8
7	2.9	7.7	6.5
8	2.0	4.7	4.0
9+	1.2	6.3	5.0
Total	100.0	100.0	100.0
Mean size of households	3.2	4.4	4.2
Number of households	***1,594***	***4,944***	***6,538***

Note: Table is based on de jure household members, i.e., usual residents.

Children under five years of age are the most vulnerable to malaria infections.

3.3 Sex and Age of Household Head

Results for the percentage distribution of households by sex and age group of the household head, according to place of residence are given in Table 3.3. Nearly two in three households are headed by men (64 per cent), with the remaining 36 per cent headed by women. Female-headed households are more common in rural areas (37 per cent) than in urban areas (31 per cent). The findings further show that the likelihood of being the head of a household increases with age up to 30–39 years in both rural (25 per cent) and urban (32 per cent) areas and thereafter declines.

Table 3.3: Sex and age of household head

Percentage distribution of households by sex and age of head of household, according to residence

Sex/Age of household head	Residence		Total
	Urban	Rural	
Household headship			
Male	68.9	62.8	64.3
Female	31.1	37.2	35.7
Total	100.0	100.0	100.0
Age of household head			
Less than 20	1.5	1.1	1.2
20–29	27.4	17.4	19.9
30–39	31.9	24.8	26.6
40–49	18.0	18.9	18.7
50–59	14.1	16.5	15.9
60–69	4.5	11.0	9.4
70 or over	2.4	10.2	8.3
Total	100.0	100.0	100.0
Number of households	***1,594***	***4,944***	***6,538***

Note: Table is based on de jure household members, i.e., usual residents.

3.4 Background Characteristics of Women Respondents

The percentage distribution of women aged 15–49 by background characteristics is summarized in Table 3.4. Slightly over one-fifth of the women interviewed (21 per cent) are youth aged 20–24 years. A majority of them (61 per cent) are either Protestants or other Christians, while Catholics and Muslims constitute 25 and 9 per cent, respectively. The findings further show that a majority of women reside in rural areas – 76 per cent compared with 24 per cent in urban areas. Almost three in ten women (29 per cent) reside in low-risk malaria areas, while 42 per cent are in either the highland epidemic or lake endemic areas. The survey shows that 15 per cent of women have no education; another 28 per cent have not completed primary school and one-third (34 per cent) have at least attended secondary school. Four women in five are able to read a simple sentence.

3.5 Housing Characteristics

According to the survey, only 19 per cent of Kenyan households overall have access to electricity and there are significant differences in the supply of electricity by place of residence. More than half of urban households (58 per cent) have access to electricity, compared with just 7 per cent of those in rural areas. Table 3.5 presents the percentage distribution of households by housing characteristics, according to residence.

Earth and sand at 42 per cent are the most common materials used by households for flooring, followed by cement (35 per cent) and dung (20 per cent). Rural households are more likely than urban ones to have earth and sand floors, at 49 per cent and only 18 per cent, respectively. Cement is used for floor construction in a majority of urban households (72 per cent), compared with only 24 per cent of rural households. The results indicate that three in four households in rural areas use either earth, sand or dung as floor materials.

Table 3.4: Background characteristics of women respondents

Percentage distribution of women aged 15–49 by selected background characteristics

Background characteristic	Weighted percentage	Number of women	
		Weighted	Unweighted
Age			
15–19	17.9	1,030	1,112
20–24	21.2	1,218	1,166
25–29	18.3	1,050	1,033
30–34	15.5	894	876
35–39	11.4	657	646
40–44	8.6	497	504
45–49	7.0	403	412
Religion			
Roman Catholic	24.8	1,425	1,241
Protestant/Other Christian	61.0	3,506	3,479
Muslim	8.9	513	694
No religion	1.8	104	146
Other	3.0	171	160
Don't know	0.5	30	29
Residence			
Urban	24.0	1,381	959
Rural	76.0	4,368	4,790
Malaria endemicity			
Highland epidemic	20.9	1,201	1,225
Lake endemic	21.0	1,205	1,247
Coast endemic	8.1	465	944
Semi-arid, seasonal	20.9	1,199	1,051
Low risk	29.2	1,679	1,282
Highest level of schooling			
No education	15.0	864	943
Primary incomplete	28.2	1,619	1,697
Primary complete	23.4	1,344	1,340
Secondary incomplete	13.3	764	716
Secondary complete	13.4	768	727
Higher	6.8	390	326
Literacy			
Literate	83.2	4,784	4,674
Illiterate	16.0	922	1,034
Missing/Not tested	0.7	43	41
Wealth quintile			
Lowest	17.1	984	1,151
Second	17.3	992	1,043
Middle	19.5	1,123	1,139
Fourth	20.9	1,204	1,200
Highest	25.1	1,446	1,216
Total 15–49	***100.0***	***5,749***	***5,749***

Note: Education categories refer to the highest level of education attended, whether or not that level was completed.

Table 3.5: Housing characteristics

Percentage distribution of households by housing characteristics, according to residence

Housing characteristic	Residence		Total
	Urban	Rural	
Electricity			
Yes	58.2	6.7	19.2
No	41.4	93.1	80.5
Missing	0.4	0.3	0.3
Total	100.0	100.0	100.0
Flooring material			
Earth, sand	18.1	49.2	41.6
Dung	2.9	26.0	20.3
Wood planks	0.6	0.3	0.4
Ceramic tiles	4.9	0.3	1.4
Cement	72.0	23.6	35.4
Other	1.0	0.3	0.6
Missing	0.4	0.3	0.3
Total	100.0	100.0	100.0
Main roof material			
Thatch / palm leaf	3.1	21.9	17.3
Plastic sheet	4.7	0.1	1.2
Corrugated iron	81.9	75.9	77.4
Cement/ concrete	6.3	0.1	1.6
Roofing shingles	0.2	0.0	0.1
Other	3.3	1.6	2.0
Missing	0.4	0.3	0.3
Total	100.0	100.0	100.0
Main wall material			
Cane / palm / trunks	0.3	5.5	4.3
Bamboo with mud	11.8	43.2	35.5
Stone with mud	5.0	10.5	9.2
Cement	24.5	4.7	9.5
Stone with lime / cement	27.3	6.3	11.4
Bricks	3.9	5.8	5.3
Cement blocks	10.4	1.1	3.4
Covered adobe	0.6	1.0	0.9
Wood planks / shingles	11.8	13.4	13.0
Other	4.0	8.2	7.3
Missing	0.4	0.3	0.3
Total	100.0	100.0	100.0
Rooms used for sleeping			
One	64.7	45.9	50.5
Two	22.2	33.6	30.8
Three or more	12.6	20.1	18.3
Missing	0.5	0.4	0.4
Total	100.0	100.0	100.0
Number of households	***1,594***	***4,944***	***6,538***

Possession of a radio or mobile telephone is more than a wealth indicator - it suggests access to information and new ideas.

A majority of households use corrugated iron sheets (77 per cent) as their main roofing material, followed by thatch or palm (17 per cent). Most households in both urban (82 per cent) and rural (76 per cent) areas use corrugated iron sheets. Households having thatched or palm roofs are mainly found in rural areas (22 per cent).

Over one-third of households (36 per cent) use bamboo with mud as their main wall material, followed by wood planks or shingles (13 per cent). Wall material varies by place of residence; more than four in ten rural households use bamboo with mud as their main wall material, compared with only about one in ten urban households.

The survey results show that half of Kenyan households use only one room for sleeping, but there are significant differences by place of residence. Almost two-thirds of urban households (65 per cent) use one room for sleeping, compared with 46 per cent of rural households.

3.6 Drinking Water, Sanitation and Cooking Fuel

Table 3.6 presents the distribution of households by main source of drinking water, sanitation facilities and cooking fuel, according to place of residence. The table shows that a majority of households get drinking water from improved sources (60 per cent), compared with 39 per cent from non-improved sources. As expected, a larger proportion of urban households (89 per cent) obtain drinking water from improved sources compared with rural households (51 per cent). In contrast, a higher proportion of rural households (49 per cent) draw water mainly from non-improved sources as compared with only 9 per cent of urban households.

One-quarter of households (24 per cent) use an improved type of toilet facility, while three in four households (76 per cent) use a non-improved facility. Urban households are more

likely to use improved sanitation facilities (56 per cent) than rural households (13 per cent). They are also more likely than rural households to use flush toilets (29 per cent and 2 per cent, respectively). The results further indicate that most Kenyan households (63 per cent) use pit latrines: Seven in ten households in rural areas use pit latrines, compared with only four in ten urban households. A larger proportion of rural households lacks toilet facilities (16 per cent), compared with only 5 per cent in the urban areas.

Survey results show that most households in rural areas (96 per cent) and urban areas (51 per cent) use biomass fuel for cooking, which has repercussions on the environment. Whereas the majority of households in rural areas depend heavily on wood, straw, shrubs and grass (86 per cent) for cooking, their counterparts in urban areas mainly use charcoal (38 per cent), followed by kerosene (25 per cent). In addition, about one in ten households in rural areas depends on charcoal for their cooking.

3.7 Household Possessions

A useful indicator of household socio-economic level is the availability of durable consumer goods. Moreover, particular goods have specific benefits. Having access to a radio or a television, for example, exposes household members to innovative ideas. A refrigerator prolongs the wholesomeness of foods, and a means of transport allows greater access to many services away from the local area.

Table 3.7 presents the percentage of households possessing various household effects and means of transportation, by place of residence. The table shows that radios are the most common item owned by households (70 per cent),

Half of Kenyan households use only one room for sleeping, 60 per cent get drinking water from improved sources, three in four (76 per cent) use a non-improved toilet facility, only 19 per cent of Kenyan households overall have access to electricity, and three in four households in rural areas use either earth, sand or dung as floor materials.

Table 3.6: Source of household drinking water, toilet facility and cooking fuel

Percentage distribution of households by source of drinking water, type of toilet and cooking fuel, according to residence

Characteristic	Residence		Total
	Urban	Rural	
Source of drinking water			
Improved source	88.9	50.5	59.9
Piped water into dwelling	16.4	1.5	5.2
Piped water into plot	31.2	11.2	16.1
Public tap/standpipe	26.4	9.9	13.9
Tube well or borehole	10.0	18.4	16.3
Covered well in compound	1.3	3.2	2.7
Covered public well	0.8	2.5	2.1
Rainwater	1.8	3.8	3.3
Bottled water	0.9	0.0	0.2
Non-improved source	9.1	48.6	39.0
Open well in compound	0.8	1.4	1.3
Open public well	0.6	5.0	3.9
Spring	1.1	8.4	6.6
River/stream/pond/lake/dam	6.6	33.9	27.2
Other	1.6	0.6	0.9
Missing	0.4	0.3	0.3
Total	100.0	100.0	100.0
Type of toilet facility			
Improved facility	55.6	13.1	23.5
Flush toilet	29.4	1.8	8.5
Ventilated improved pit latrine	26.2	11.4	15.0
Non-improved facility	44.0	86.1	75.8
Pit latrine	39.2	70.1	62.6
No facility/bush/field	4.8	16.0	13.2
Other	0.1	0.5	0.4
Missing	0.4	0.3	0.3
Total	100.0	100.0	100.0
Cooking fuel			
Electricity	1.7	0.1	0.5
LPG/Natural gas	18.8	0.8	5.2
Biogas	0.7	0.1	0.3
Kerosene	24.8	1.3	7.0
Charcoal	38.3	10.2	17.0
Wood/straw/shrubs/grass	12.9	85.7	68.0
Animal dung	0.0	0.5	0.3
No food cooked in household	2.2	0.8	1.1
Other	0.2	0.2	0.2
Missing	0.4	0.3	0.3
Total	100.0	100.0	100.0
Percentage using solid fuel for cooking [1]	51.2	96.4	85.4
Number of households	***1,594***	***4,944***	***6,538***

LPG = Liquid petroleum gas
[1]Includes charcoal, wood/straw/shrubs/grass and animal dung

followed by mobile phones (65 per cent), bicycles (26 per cent) and clocks (20 per cent). Radios, mobile phones and clocks are more commonly found in urban households, while bicycles are more commonly owned by rural households.

Table 3.7: Household durable goods

Percentage of households possessing various household goods, by residence

Possession	Residence		Total
	Urban	Rural	
Radio	79.0	67.4	70.3
Television	52.5	13.2	22.7
Mobile telephone	83.4	58.4	64.5
Non-mobile telephone	0.9	0.2	0.4
Refrigerator	13.4	0.7	3.8
Solar panel	1.3	3.5	3.0
Clock	25.6	18.5	20.2
Fan	3.9	0.1	1.0
Sewing machine	3.9	2.7	3.0
Cassette player	9.2	4.6	5.7
Plough	0.3	6.9	5.3
Grain grinder	0.2	0.7	0.6
VCR/DVD	20.4	3.7	7.8
Tractor	0.1	0.1	0.1
Bicycle	16.6	29.4	26.3
Motorcycle/scooter	3.1	2.7	2.8
Animal drawn cart	0.2	2.0	1.5
Car/truck or boat	11.3	2.4	4.6
Both car/truck and boat	2.2	0.3	0.8
Number of households	***1,594***	***4,944***	***6,538***

3.8 Wealth Quintiles

The wealth index is a background characteristic used throughout the report as a proxy for the long-term standard of living of the household. It is based on the data from the household's ownership of consumer goods, dwelling characteristics, source of drinking water, type of toilet facilities and other characteristics that relate to a household's socioeconomic status. To construct the index, each of these assets was assigned a weight (factor score) generated through principal component analysis, and the resulting asset scores were standardized in relation to a standard normal distribution, with a mean of zero and a standard deviation of one. Each household was then assigned a score for each asset, and the scores were summed for each household. Individuals were ranked according to the total score of the household in which they resided. The sample was then divided into quintiles from one (lowest) to five (highest). A single asset index was developed on the basis of data from the entire country sample, and this index is used in all the tabulations presented.

Table 3.8 presents the percentage distribution of the de jure household population by wealth quintiles and the Gini coefficient (see table note), according to residence and malaria region. The distributions indicate the degree to which wealth is evenly (or unevenly) distributed. According to the findings, wealth is concentrated in the urban areas, with about 65 per cent of the urban population falling in the highest wealth quintile. On the other hand, rural residents are relatively poorer, with about one in four in the lowest wealth quintile and only one in ten in the highest quintile. Among the residents in the low malaria risk areas, 39 per cent are in the highest quintile, compared with 8 per cent of those living in the highland epidemic areas.

One in four rural residents is in the lowest wealth quintile and only one in ten is in the highest quintile. For urbanites, about 65 per cent are in the highest wealth quintile. Among the residents in the low malaria risk areas, 39 per cent are in the highest quintile, compared with 8 per cent of those living in the highland epidemic areas.

Table 3.8: Wealth quintiles

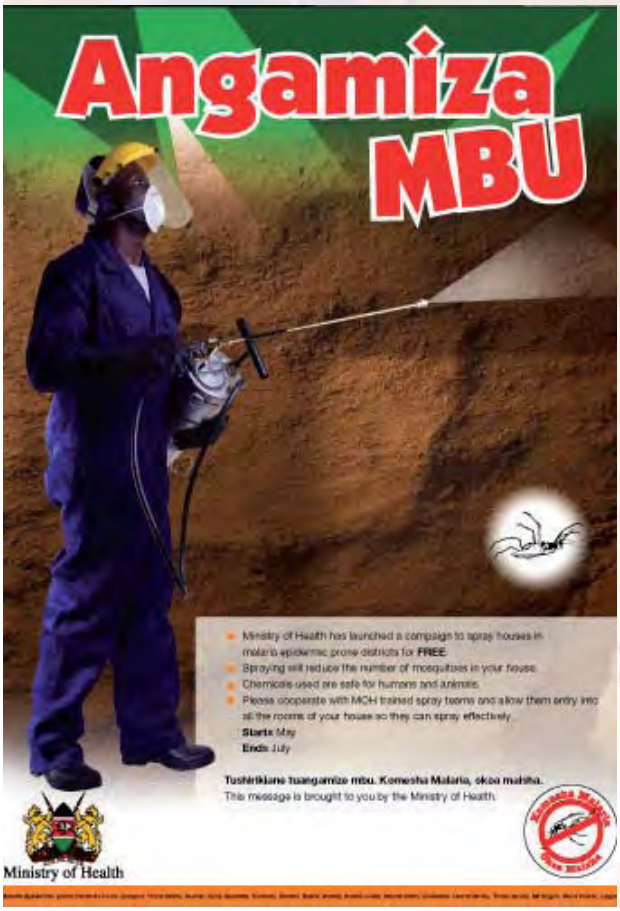
Percentage distribution of the de jure population by wealth quintiles, and the Gini coefficient according to residence and malaria region

Residence/malaria region	Wealth quintile					Total	No. of population	Gini coefficient
	Lowest	Second	Middle	Fourth	Highest			
Residence								
Urban	0.2	4.7	11.6	18.7	64.9	100.0	5,149	0.24
Rural	24.6	23.6	22.0	20.3	9.5	100.0	21,985	0.37
Malaria endemicity								
Highland epidemic	22.6	30.2	21.4	18.2	7.6	100.0	5,815	0.35
Lake endemic	22.9	28.4	20.9	18.6	9.2	100.0	6,048	0.37
Coast endemic	29.2	10.5	11.3	17.3	31.8	100.0	2,098	0.46
Semi-arid, seasonal	32.5	16.2	16.0	18.2	17.1	100.0	6,202	0.46
Low risk	1.4	10.4	24.4	25.1	38.7	100.0	6,969	0.34
Total	***20.0***	***20.0***	***20.0***	***20.0***	***20.0***	***100.0***	***27,134***	***0.44***

Note: There are 19 households for which there were no data except the listing of household members. These households were considered "completed" because there were either individual women interviewed or children under 15 years of age who were tested for malaria and/or anaemia. The Gini coefficient is a measure of inequality. It is expressed as a percentage of the distribution of income (or wealth, etc.) that is unequal. If there is equality of wealth, then as the proportion of the population rises so does wealth in the same proportion and the Gini coefficient is zero. If only one person holds all the wealth, then there is complete inequality and the Gini coefficient has the value of 1.

CHAPTER 4

Vector Control



Vector control is one of the key interventions in malaria control. The main objective is to have at least 80 per cent of people living in malaria risk areas using appropriate malaria prevention interventions.

4.1 Control Mechanisms and Policies

The primary malaria vector control methods used in Kenya are long-lasting insecticidal nets (LLINs) and indoor residual spraying (IRS) against mosquitoes. Because of the variations in malaria risk across the country, these methods are used in different epidemiological zones as depicted in Table 4.1.

Larviciding and environmental management are also used in targeted areas as per the Integrated Vector Management (IVM) Policy Guidelines (DOMC, 2010).

4.1.1 Net Distribution Mechanisms

LLINs are distributed by the following means:

- Routine distribution takes place through antenatal and child welfare clinics to pregnant women and children under one year of age and through comprehensive care clinics for people living with HIV. Routine distribution occurs in all epidemiological zones except low-risk areas. Between July 2008 and July 2010, some 5.4 million nets were distributed through this system.
- Social marketing through designated rural shops is carried out in all epidemiological zones except the low-risk areas. Socially marketed nets are both LLINs and untreated nets bundled with a long-lasting treatment kit (up to 2010) that are sold at a subsidized price. From July 2008 to July 2010, about 1.2 million social marketing nets were distributed.
- Mass distribution is carried out in epidemic and lake and coastal endemic zones only. Mass distribution is scheduled to take place every three years; however, the last one

Table 4.1: Malaria vector control methods used in Kenya, by epidemiological zone	
Epidemiological zone	**Vector control method**
Lake endemic	LLINs for the whole population and IRS in districts nearest to the epidemic highlands
Highland epidemic	LLINs for the whole population and IRS for prevention and response to epidemic threats
Coast endemic	LLINs for the whole population
Semi-arid, seasonal	LLINs for pregnant women and children under one year
Low risk	Environmental management

targeting children less than five years took place in 2006.

- Retail sales at full cost in supermarkets and other retail outlets occurs mainly in the urban areas of all epidemiological zones. The nets are both LLINs and conventional nets bundled with long-lasting treatment kits sold at retail price. About 500,000 long-lasting treatment kits and nets are distributed per year through this channel.

These distribution mechanisms work in such a way that populations in various wealth categories and areas of the country can access nets. The objective of the routine distribution mechanism is to maintain coverage of insecticide treated nets (ITNs)[4] achieved through the mass distribution campaigns.

In the past, net distribution focused only on vulnerable groups – pregnant women and children under five years. In 2009, the government adopted the global strategy of universal coverage (one net for every two persons) through mass campaigns for populations in endemic and epidemic prone areas irrespective of age or vulnerability. The 2010 KMIS provides a baseline for household ownership of ITNs in all malaria epidemiological zones.

4.1.2 Indoor Residual Spraying Policies

Currently, IRS is used in the highland epidemic prone areas in response to a threat of an epidemic as detected by surveillance data. In the lake endemic zone, IRS is used to reduce the disease burden in areas closest to the highland epidemic areas. At the time of the survey, 9 of the 41 districts in the lake endemic zone had been sprayed, while focalized IRS was conducted in all 38 highland epidemic prone districts. The use of IRS for vector control in endemic zones will require at least two annual cycles of spraying over a period of time in addition to universal coverage with LLINs in order to reduce the disease burden. The Integrated Vector Management Policy Guidelines (DOMC, 2010) emphasize the synergetic use of various vector control methods to achieve maximum effect in containing the vector while conserving resources as well.

A study in the lake endemic zone in 2008 showed that the combination of IRS and universal coverage with LLINs as a vector control strategy yielded a protective efficacy of 61 per cent compared with LLINs alone (Hamel, 2010). The 2010 KMIS surveyed the coverage of LLINs in households that had IRS done in the various epidemiological zones.

4.2 Results for Indoor Residual Spraying

IRS has been undertaken as part of the malaria programme in Kenya to prevent epidemics in the highland malaria epidemic prone areas since 2005. It was used for vector control to reduce the burden of malaria in the lake endemic zone in two districts in 2008 and 2009. In 2010, IRS was implemented in seven additional districts along the southern shores of Lake Victoria bordering a highland epidemic prone zone.

Although IRS is reported to have taken place in all epidemiological zones, as expected, the largest proportion of households that reported having IRS done in the 12 months before the

[4] In this survey, an ITN is defined as 1) a factory-treated net that does not require any further treatment (LLIN), 2) a net that has been soaked in K-O tab 1-2-3 binding agent within the past two years (to capture nets that were treated during the mass net retreatment campaign in 2008 and some batches of nets distributed through social marketing and retail outlets from 2007–2010), or 3) a net that has been soaked with any insecticide within the past six months. This differs slightly from the international definition, which includes nets soaked with insecticide within the past 12 months.

survey was in the highland epidemic areas (38 per cent), followed by the lake endemic areas (15 per cent). Almost half of the households that were sprayed also had at least one ITN. Comparison of urban and rural households shows that a considerably higher proportion of rural households were sprayed (14 per cent) than urban ones (2 per cent). See Table 4.2 for a summary of responses regarding IRS.

4.3 Results for Net Ownership and Use

Household responses on net ownership are summarized in Table 4.3. Overall, 57 per cent of households own at least one net of any type and 31 per cent own more than one. Almost half (48 per cent) of households have at least one ITN and 24 per cent have more than one. Ownership of ITNs has remained unchanged since 2007, but ownership of any net decreased by 9 per cent.

Rural households are less likely than urban households to own any mosquito net (56 and 60 per cent, respectively). Since 2007, household net ownership has decreased by 5 and 9 percentage points in the rural and urban populations, respectively. The reduction in household net ownership may be due to the absence of a major net distribution campaign since the mass distribution in 2006.

The average number of nets of any kind per household declined from 1.2 nets in 2007 to 1.1 in 2010; however, the average number of ITNs per household remained unchanged at 0.8. In the 2010 survey, 9 per cent of households sampled owned untreated nets, compared with 15 per cent in 2007.

Overall, the average number of ITNs per person is approximately 0.2, which is below the universal coverage target of 0.5 nets per person (or one net per two people). This underlines the validity of the current national policy on net distribution through mass campaigns. The next campaign will be implemented in 2011/12, in which one net will be given to every two people in endemic and highland epidemic prone zones.

Table 4.2: Indoor residual spraying against mosquitoes

Percentage of households in which someone has come into the dwelling to spray the interior walls against mosquitoes (IRS) in the past 12 months and the percentage of households with IRS in the past 12 months and at least one insecticide-treated net (ITN), by background characteristics

Background characteristic	Percentage of households with interior walls sprayed in the past 12 months (IRS)	Percentage of households with IRS in the past 12 months and at least one ITN[1]	Number of households
Residence			
Urban	2.2	1.3	1,594
Rural	13.5	6.3	4,944
Malaria endemicity			
Highland epidemic	38.0	18.3	1,269
Lake endemic	15.3	6.6	1,339
Coast endemic	1.4	1.2	495
Semi-arid, seasonal	0.2	0.1	1,439
Low risk	0.4	0.2	1,996
Wealth quintile			
Lowest	14.7	6.2	1,157
Second	17.9	7.9	1,179
Middle	11.9	6.4	1,230
Fourth	9.1	3.8	1,391
Highest	3.2	2.2	1,581
Total	***10.8***	***5.1***	***6,538***

[1] An insecticide-treated net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked in a K-O tab 1-2-3 binding agent in past 2 years or (3) a net that has been soaked with any insecticide within the past 6 months.

Table 4.3: Household possession of mosquito nets

Percentage of households with at least one and more than one mosquito net (treated or untreated), long-lasting insecticidal nets (LLIN) and insecticide-treated nets and the average number of nets per household, by background characteristics

Background characteristic	Any type of mosquito net			Long-lasting insecticidal nets (LLIN)			Insecticide-treated mosquito nets (ITN)[1]			Number of households
	Percentage with at least one	Percentage with more than one	Average number of nets per household	Percentage with at least one	Percentage with more than one	Average number of LLINs per household	Percentage with at least one	Percentage with more than one	Average number of ITNs per household	
Residence										
Urban	59.5	32.9	1.2	42.4	21.2	0.7	49.6	24.4	0.9	1,594
Rural	55.8	30.0	1.0	44.3	21.6	0.8	47.4	23.7	0.8	4,944
Malaria endemicity										
Highland epidemic	59.5	30.7	1.1	48.7	22.8	0.8	50.6	24.2	0.9	1,269
Lake endemic	70.7	37.4	1.3	54.4	25.8	0.9	60.2	29.7	1.0	1,339
Coast endemic	69.6	41.9	1.5	56.5	31.9	1.1	62.2	35.4	1.2	495
Semi-arid, seasonal	55.3	28.9	1.0	43.2	19.8	0.7	46.9	21.8	0.8	1,439
Low risk	43.2	24.7	0.8	31.1	16.5	0.6	35.2	18.3	0.6	1,996
Wealth quintile										
Lowest	47.4	20.1	0.8	39.6	15.7	0.6	41.0	16.6	0.6	1,157
Second	54.7	26.6	0.9	43.2	19.3	0.7	46.7	21.0	0.8	1,179
Middle	54.7	31.3	1.0	44.7	22.9	0.8	46.8	24.6	0.8	1,230
Fourth	55.9	31.3	1.1	42.3	21.4	0.7	46.5	24.6	0.8	1,391
Highest	67.1	40.5	1.4	48.2	26.5	0.9	56.0	30.1	1.1	1,581
Total	***56.7***	***30.7***	***1.1***	***43.9***	***21.5***	***0.8***	***47.9***	***23.9***	***0.8***	***6,538***

[1] An insecticide-treated net is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked in a K-O tab 1-2-3 binding agent in the past 2 years or (3) a net that has been soaked with any insecticide within the past 6 months.

Households in malaria endemic zones continue to own more nets than households in other transmission zones. Net ownership in the lake endemic and coast endemic zones is 71 and 70 per cent of households, respectively, and ITN ownership is 60 and 62 per cent, respectively.

Epidemic-prone areas are not far behind endemic areas in net ownership. In the highland epidemic zone, 60 per cent of households own at least one net and 51 per cent own at least one ITN; the average number of ITNs per household is 0.9. Households in low-risk areas are the least likely to own any net (43 per cent) or an ITN (35 per cent). Similarly, the average number of ITNs per household was highest in the endemic zones (1.0 and 1.2 ITNs per household in the lake endemic and coast endemic areas, respectively) and lowest in the low risk areas (0.6 ITNs per household).

The pattern of net ownership across wealth quintiles is consistently lowest for the lowest quintile and highest for the highest quintile. This pattern supports the free mass distribution of ITNs in 2011/12.

4.3.1 Use of Nets by Populations of All Ages

Almost 40 per cent of survey respondents slept under a net the night before the survey (Table 4.4). Thirty-two per cent of them had slept under an ITN, as had 61 per cent of respondents in households with an ITN. Most ITNs used are LLINs. The use of any type of net is slightly higher in the coast endemic zone (54 per cent) than in the lake endemic zone (46 per cent).

As shown in Table 4.4, ITN use was highest for the under-fives and lowest for the age groups

5–14 and 50+ years (42, 28 and 26 per cent, respectively). The same is true for households that owned ITNs: the lowest reported use of ITNs was in the 5–14-year age groups and the highest for those under 5 (52 and 71 per cent, respectively).

The results also show the additive effect that IRS provides with net use by households in which either intervention is used as a means of vector control. The proportion of the general population who slept under an ITN the night before the survey was 32 per cent, while those who had IRS done in their household or slept under an ITN the night before the survey was 41 per cent. In the epidemic and lake endemic areas, the proportions who used ITNs the night before the survey were 32 and 38 per cent, respectively. The proportions increase to 61 and 50 per cent, respectively, when IRS is taken into account.

4.3.2 Use of Nets by Children under Five

Because children under five are at particular risk of malaria, they were a focus of the survey. Results

Table 4.4: Use of mosquito nets by household members

Percentage of de facto household population who, the night before the survey slept under a mosquito net (treated or untreated), under a long-lasting insecticidal net (LLIN), under an insecticide-treated net (ITN), and under an ITN or in a dwelling in which the interior walls were sprayed against mosquitoes in the previous 12 months; and among the population in households with at least one ITN, the percentage who slept the night before the survey under an ITN, by background characteristics

Background characteristic	Household population in all households					Population in households with an ITN[1]	
	Percentage who slept under any net last night	Percentage who slept under an LLIN last night	Percentage who slept under an ITN last night[1]	Percentage who slept under an ITN last night or in a dwelling sprayed with IRS in the past 12 months[1]	Number	Percentage who slept under an ITN last night[1]	Number
Age (in years)							
< 5	49.5	38.8	42.2	50.1	4,694	70.8	2,798
5–14	34.2	25.1	27.8	38.8	7,397	52.2	3,946
15–34	38.0	27.9	31.0	39.9	7,989	58.3	4,248
35–49	44.5	32.1	36.3	44.4	3,097	68.7	1,638
50+	34.6	23.0	26.1	34.7	2,968	66.7	1,163
Sex							
Male	37.8	27.8	30.8	40.4	12,406	58.2	6,569
Female	40.8	30.1	33.4	42.2	13,737	63.6	7,224
Residence							
Urban	48.3	32.1	37.7	39.0	4,895	71.0	2,600
Rural	37.3	28.3	30.9	41.9	21,249	58.7	11,193
Malaria endemicity							
Highland epidemic	38.6	30.6	32.3	61.0	5,664	59.1	3,095
Lake endemic	45.6	33.1	38.1	50.2	5,927	58.7	3,845
Coast endemic	54.3	41.1	45.7	46.5	2,041	68.9	1,354
Semi-arid, seasonal	39.1	28.8	31.4	31.5	5,858	62.3	2,947
Low risk	30.1	20.6	23.5	23.7	6,655	61.2	2,554
Wealth quintile							
Lowest	30.7	24.9	25.9	37.6	5,197	56.7	2,375
Second	35.0	26.9	29.4	44.2	5,269	56.7	2,736
Middle	36.3	27.8	30.1	39.0	5,278	55.5	2,859
Fourth	41.9	30.5	34.5	41.9	5,253	65.9	2,749
Highest	53.2	35.1	41.2	44.1	5,147	69.0	3,074
Total	***39.4***	***29.0***	***32.2***	***41.3***	***26,144***	***61.0***	***13,794***

Note: Table is based on persons who stayed in the household the night before the interview.
IRS = Indoor residual spraying

[1] An insecticide-treated net (ITN) is defined as (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked in a K-O tab 1-2-3 binding agent in past 2 years or (3) a net that has been soaked with any insecticide within the past 6 months.

show that children this age are more likely than the general population to sleep under mosquito nets (Table 4.5). For example, half of children below the age of five years slept under a net the night before the survey, compared with only 39 per cent of the total population (Table 4.4). The former figure is about the same as in 2007 (51 per cent). Forty-two per cent of children under five sleep under an ITN, slightly more than in 2007 (39 per cent). In 2010, moreover, 71 per cent of children under five in households with an ITN slept under an ITN the night before the survey.

Use of any type of mosquito net is highest in the coast endemic zone (65 per cent), followed by the lake endemic zone (56 per cent) and the highland epidemic zone (51 per cent). Use of ITNs has increased since 2007 in all epidemiological zones (Figure 4.1).

The likelihood of a child under five years of age sleeping under a net is positively related to

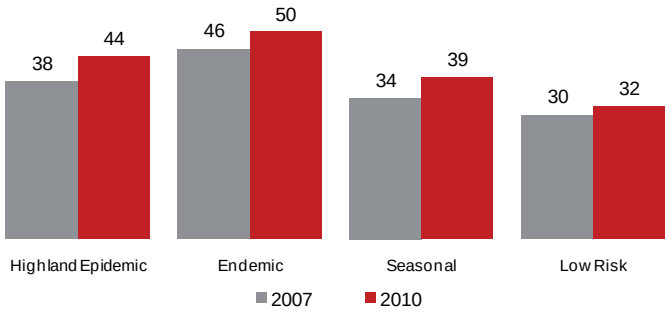
Table 4.5: Use of mosquito nets by children under five

Percentage of de facto children under five years of age, who, the night before the survey slept under a mosquito net (treated or untreated), under a long-lasting insecticidal net (LLIN), under an insecticide-treated net (ITN), and under and under an ITN or in a dwelling in which the interior walls were sprayed against mosquitoes in the previous 12 months; and among children under five years of age in households with at least one ITN, the percentage who slept the night before the survey under an ITN, by background characteristics

Background characteristic	Children under age 5 in all households					Children under five in households with an ITN[1]	
	Percentage who slept under any net last night	Percentage who slept under an LLIN last night	Percentage who slept under an ITN last night[1]	Percentage who slept under an ITN last night or in a dwelling sprayed with IRS in the past 12 months[1]	Number of children	Percentage who slept under an ITN last night[1]	Number of children
Age (in years)							
< 1	56.5	47.5	50.3	56.3	954	76.5	627
1	56.2	44.0	48.6	56.0	887	76.0	567
2	49.1	37.1	40.1	48.6	988	71.6	553
3	44.5	33.7	37.2	45.5	956	66.6	535
4	41.6	31.7	35.0	44.0	909	61.6	517
Sex							
Male	50.6	39.8	42.8	51.2	2,348	71.0	1,415
Female	48.5	37.7	41.6	48.9	2,347	70.6	1,383
Residence							
Urban	56.5	40.0	46.3	47.9	784	79.4	457
Rural	48.2	38.5	41.4	50.5	3,910	69.1	2,341
Malaria endemicity							
Highland epidemic	50.5	42.6	43.7	65.8	1,100	70.2	685
Lake endemic	55.8	42.3	47.9	58.2	1,187	67.8	838
Coast endemic	65.2	50.2	55.0	55.6	342	76.6	246
Semi-arid, seasonal	46.7	36.5	39.2	39.2	1,103	71.3	608
Low risk	38.5	28.5	32.3	32.5	961	73.6	421
Wealth quintile							
Lowest	41.7	34.5	35.3	45.9	1,159	65.5	625
Second	47.3	37.4	41.0	52.5	992	68.0	598
Middle	48.3	40.7	43.3	50.5	912	69.2	570
Fourth	55.1	41.7	46.3	51.0	879	76.9	530
Highest	59.7	41.4	48.2	51.6	752	76.4	475
Total	***49.5***	***38.8***	***42.2***	***50.1***	***4,694***	***70.8***	***2,798***

Note: Table is based on children who stayed in the household the night before the interview.
IRS = Indoor residual spraying
[1] An insecticide-treated net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked in a K-O tab 1-2-3 binding agent in past 2 years or (3) a net that has been soaked with any insecticide within the past 6 months.

Figure 4.1: Trends in use of ITNs by children under five



Note: Percentage of children who slept under an ITN the night before the survey. Data for 2007 excluded Nairobi, Kiambu, Nyandarua, Nyeri, Meru Central and Laikipia districts. ITN in 2010 included nets treated with K-O Tab 1-2-3 , which was not available in 2007.

wealth quintiles. Use of nets declines with age of children, especially among those age two through four years.

Household protection with a vector control intervention increased when ITN use on the night preceding the survey was considered along with protection from IRS conducted in the previous 12 months. The proportion of children under five years sleeping under an ITN was 42 per cent, while 50 per cent slept under an ITN or in a house that had been sprayed in the previous 12 months.

Table 4.6: Use of mosquito nets by pregnant women

Percentage of de facto pregnant women aged 15-49, who, the night before the survey slept under a mosquito net (treated or untreated), under a long-lasting insecticidal net (LLIN), under an insecticide-treated net (ITN), and under and under an ITN or in a dwelling in which the interior walls were sprayed against mosquitoes in the previous 12 months; and among pregnant women in households with at least one ITN, the percentage who slept the night before the survey under an ITN, by background characteristics

Background characteristic	Pregnant women in all households					Pregnant women in households with an ITN[1]	
	Percentage who slept under any net last night	Percentage who slept under an LLIN last night	Percentage who slept under an ITN last night[1]	Percentage who slept under an ITN last night or in a dwelling sprayed with IRS in the past 12 months[1]	Number of pregnant women	Percentage who slept under an ITN last night[1]	Number of pregnant women
Residence							
Urban	51.8	27.7	37.5	39.2	94	(70.0)	50
Rural	49.1	38.7	42.2	51.3	304	73.2	175
Malaria endemicity							
Highland epidemic	48.9	34.9	37.6	62.3	82	(69.4)	45
Lake endemic	63.3	50.9	58.3	68.0	89	76.1	68
Coast endemic	63.3	47.5	49.1	50.2	27	63.7	21
Semi-arid, seasonal	47.1	37.5	40.2	40.2	81	(81.9)	40
Low risk	39.0	22.4	29.5	29.5	119	(66.9)	52
Education							
No education	43.3	36.6	38.3	44.4	69	(91.3)	29
Primary incomplete	59.7	48.8	53.8	66.8	106	77.3	74
Primary complete	47.3	35.7	38.7	45.2	76	63.2	46
Secondary and higher	47.0	26.9	34.5	38.9	147	66.4	76
Wealth quintile							
Lowest	49.8	44.3	45.3	56.0	77	80.9	43
Second	49.1	34.7	40.8	55.4	72	(70.5)	42
Middle	45.5	38.1	40.5	46.6	73	(68.2)	43
Fourth	46.4	35.0	37.6	41.4	82	(79.8)	39
Highest	56.6	29.7	41.4	44.5	93	(66.2)	58
Total	***49.8***	***36.1***	***41.1***	***48.5***	***398***	***72.5***	***225***

Note: Table is based on interviewed pregnant women who stayed in the household the night before the interview. Pregnancy status is taken from the individual questionnaire. Numbers in parentheses are based on 25-49 unweighted cases.
IRS = Indoor residual spraying
[1] An insecticide-treated net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked in a K-O tab 1-2-3 binding agent in past 2 years or (3) a net that has been soaked with any insecticide within the past 6 months.

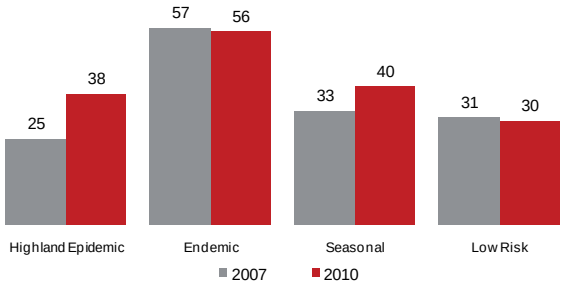
4.3.3 Use of Nets by Pregnant Women

The survey found that half of pregnant women sleep under a net and 41 per cent sleep under an ITN (Table 4.6). Seventy-three per cent of pregnant women living in households owning at least one ITN slept under an ITN the previous night. There are variations in the percentages of pregnant women who sleep under ITNs in the various epidemiological zones (Figure 4.2).

The survey results indicate that pregnant women in rural areas are slightly more likely to sleep under an ITN than those in urban areas. Specifically, as shown in Table 4.6, in lake endemic areas more pregnant women sleep under ITNs (58 per cent) as compared with coastal endemic (49 per cent), semi-arid, seasonal (40 per cent), highland epidemic (38 per cent) and low risk (30 per cent) zones. The proportion of pregnant women who slept under an ITN was 41 per cent, while 49 per cent slept under an ITN or in a house that had been sprayed in the previous 12 months.

Although pregnant women in the highest wealth quintile are the most likely to sleep under a net (57 per cent), generally wealth quintile was not directly related to the likelihood of sleeping under a net.

Figure 4.2: Trends in use of ITNs by pregnant women



Note: Percentage of pregnant women who slept under an ITN the night before the survey. Data for 2007 excluded Nairobi, Kiambu, Nyandarua, Nyeri, Meru Central and Laikipia districts. ITN in 2010 included nets treated with K-O Tab 1-2-3, which was not available in 2007.

4.4 Attitudes towards Mosquito Nets

The uptake of malaria control interventions by communities and households at risk of malaria depends on effective advocacy, social mobilization and behaviour change communication. Sustained behaviour change through effective educational communication is therefore vital in achieving malaria control targets. Government policy states: "The Government of Kenya shall ensure that everyone has access to appropriate, accurate and culturally acceptable information about malaria prevention, and management, so that effective behavioural change and practices are achieved through multiple channels of communication".

Mbu Nje Sisi Ndani was an integrated communications campaign launched in August 2009 that sought to address the lag between net ownership and net usage in Kenya. This campaign was driven by radio and complemented by other channels, specifically interpersonal sessions with the community through community-based organizations selected through the District Health Stakeholders Forum (DHSF), road shows and wall branding. Developed around the determinant of a social norm that "everyone around here sleeps inside a treated net", the campaign was run on national radio with heavy placement on regional and local stations targeting endemic and epidemic regions.

In order to assess attitudes and behaviour related to bed nets, a series of questions was included in the KMIS household questionnaire about issues such as the importance of sleeping under a net, whether people are at risk of malaria only in the rainy season, etc. Results are shown in Table 4.7.

More than 75 per cent of household respondents are confident about hanging nets, agree that it is important for young children to sleep under a treated net, agree that treated nets are safe, agree that you can hang a net anywhere and say they never use nets for things other than for sleeping. Only 58 per cent of respondents agree that most people in their communities sleep under ITNs every night. Just over one-third of respondents (35 per cent) disagree that it is only possible to get malaria during the rainy season.

There are differences in attitudes across epidemiological zones. For instance, over 20 per cent of respondents in lake endemic zones say they use bed nets for other things besides sleeping under compared with less than 5 per cent of respondents in coast endemic regions.

More than 75 per cent of household respondents are confident about hanging nets, agree that it is important for young children to sleep under a treated net, agree that treated nets are safe, agree that you can hang a net anywhere and say they never use nets for things other than for sleeping. Only 58 per cent of respondents agree that most people in their communities sleep under ITNs every night.

The survey results also indicate differences by epidemiologic zone with regard to the perception that "everyone around here sleeps under a net": Those in low-risk regions were less likely to report this perception (54 per cent) and those in lake endemic areas most likely to do so (63 per cent).

The figures in Table 4.7 suggest that messages on the importance of children sleeping under a net and the safety of nets have reached most respondents. The social norm that people in the community sleep under a net every night and knowledge that malaria is a risk all year have not spread as widely even in endemic zones where the risk is year-round.

4.5 Conclusions

1. Household ownership of at least one ITN has remained constant at about 48–50 per cent since 2007 (an average of 0.8 ITNs per household), while ownership of any type of net decreased from 63 per cent in 2007 to 57 per cent in 2010. It may be concluded that ITNs are being acquired by households through the distribution channels as untreated nets are being phased out.
2. Currently, the average ITN coverage is one net for five people, as opposed to the universal coverage target of one net for two people.
3. Pregnant women and children under five years in households that own at least one ITN are more likely to use ITNs (73 and 71

Table 4.7: Attitudes towards mosquito nets

Percentage of household respondents reporting specific attitudes and knowledge related to mosquito nets

Attitude/issue	Malaria endemicity					Total
	Highland epidemic	Lake endemic	Coast endemic	Semi-arid, seasonal	Low risk	
Extremely/very confident in hanging a net	90.3	80.8	93.2	88.7	79.0	84.8
Extremely/very important for young children to sleep under a treated net	95.4	90.9	97.4	92.2	89.0	92.0
Never use bed net other than for sleeping	92.2	76.2	95.6	82.0	82.1	83.9
Strongly/Somewhat agree that treated nets are safe	95.4	91.6	97.3	91.5	91.3	92.6
Strongly/Somewhat agree that most people in community sleep under an ITN every night	61.8	63.1	55.5	55.0	53.7	57.5
Strongly/Somewhat agree you can hang a net anywhere	90.0	90.9	89.6	77.1	60.5	78.4
Strongly/Somewhat disagree that people are at risk of getting malaria only during rainy season	38.1	38.6	42.2	28.2	32.3	34.6
Number of households	***1,269***	***1,339***	***495***	***1,439***	***1,996***	***6,538***

per cent, respectively) than the general population (61 per cent).

4. Net use amongst school-going children (aged 5–14 years) in households that own at least one ITN is one of the lowest among the general population.
5. The social norm determinant that "everyone around here sleeps under a net" was highest in the lake endemic zone (63 per cent) and the highland epidemic prone zone (62 per cent), followed by coast endemic and seasonal risk zones (55 per cent each) and low risk zones (54 per cent). In the first three epidemiological zones, all net distribution mechanisms are functional and therefore this social norm is important for net use.

4.6 Recommendations

1. Continue – and strengthen – current ITN distribution channels so as to phase out untreated nets.
2. Mount a mass net distribution campaign to attain universal coverage.
3. Tailor messages on ITN use to target the general population, in addition to the messaging to pregnant women and children under five in all epidemiological zones.
4. Target net use amongst school-going children both at home and at school in line with the malaria-free schools strategy described in the National Malaria Strategy.

CHAPTER 5

Case Management

Malaria case management is one of the strategic approaches of the 2009–2017 National Malaria Strategy (NMS). The broader objective of case management within the NMS is to have 80 per cent of all self-managed fever cases receive prompt and effective treatment and 100 per cent of all fever cases that present to health facilities receive parasitological diagnosis and effective treatment by 2013. The specific objectives for case management under the NMS are:

- Strengthening capacity for malaria diagnosis and treatment,
- Increasing access to affordable malaria medicines through the private sector, and
- Strengthening home management of malaria.

The main shift in malaria case management has been the focus on diagnostics. All positive cases will be managed according to the National Malaria Treatment Guidelines (MTG; GOK, 2010). Importantly, patients who test negative for malaria will not receive antimalaria medications. Resources will be mobilized to procure rapid diagnostic test (RDTs) and strengthen microscopy to ensure that all suspected cases of malaria first undergo a parasitology test.

In August 2010, Kenya launched the Affordable Medicines Facility for Malaria (AMFm). This is a global project aimed at increasing access to ACTs through a subsidy from the Global Fund to Fight AIDS, TB and Malaria (GFATM). It is anticipated that through this support, there will be increased access to ACTs in the private sector and also through community health workers in malaria endemic zones.

5.1 Management of Childhood Fevers

The government currently recommends that all suspected cases of malaria in Kenya be confirmed using microscopy or RDTs before being treated with antimalaria medication. The first line treatment for uncomplicated malaria is Artemether-lumefantrine (AL). In 2008, the Pharmacy and Poisons Board banned the importation, manufacture and trade of artemisinin monotherapies and other non-recommended monotherapies like amodiaquine and chloroquine.

5.1.1 Prevalence and Prompt Treatment of Fever

In the 2010 KMIS, 4,080 children under five were eligible for interview about fever in the two weeks preceding the survey. There was no information about fever for one-quarter of the children and these were dropped from subsequent analysis. Of children whose mothers were interviewed about fever, just over one-quarter (27 per cent) had fever in the two weeks preceding the survey (Table 5.1).

Table 5.1: Prevalence and prompt treatment of children with fever

Percentage of children under five with fever in the two weeks preceding the survey, and among children with fever, the percentage who sought treatment, the percentage who had blood taken from a finger or heel, the percentage who took antimalaria drugs or ACT and the percentage who took the drugs the same or next day following the onset of fever, by background characteristics

Background characteristic	Among all children under five with data on fever		Among children under age five with fever						
	Percentage with fever in the two weeks preceding the survey	Number of children with data	Percentage for whom advice or treatment was sought from a health facility or provider	Percentage who had blood taken from a finger or heel for testing	Percentage who took antimalarial	Percentage who took antimalarials same or next day	Percentage who took ACT	Percentage who took ACT same or next day	Number of children
Age in months									
Under 12	27.2	594	60.1	11.7	33.5	21.9	15.6	11.2	162
12–23	32.0	588	55.8	10.5	35.0	16.2	20.2	11.0	188
24–35	28.6	590	62.1	14.9	33.3	23.5	14.8	8.6	169
36–47	22.9	559	57.4	10.4	39.7	19.5	19.1	10.2	128
48–59	25.3	482	56.6	11.4	34.6	22.3	21.3	12.4	122
Child's sex									
Male	27.0	1,400	58.1	11.6	37.8	24.2	20.2	13.9	378
Female	27.6	1,414	58.9	12.1	32.4	17.0	15.9	7.5	391
Residence									
Urban	26.4	397	64.4	18.3	45.7	28.4	15.8	10.6	105
Rural	27.5	2,417	57.5	10.8	33.4	19.3	18.4	10.6	664
Malaria endemicity									
Highland epidemic	24.0	851	58.7	10.8	27.9	16.4	13.1	9.0	204
Lake endemic	40.9	596	49.6	10.9	40.3	25.0	23.9	15.5	244
Coast endemic	29.8	233	75.3	18.3	43.4	16.1	26.7	8.5	70
Semi-arid, seasonal	20.7	785	68.6	12.6	30.9	19.4	16.6	8.8	162
Low risk	25.7	349	50.9	10.2	38.1	23.2	8.9	5.9	90
Mother's education									
No education	18.7	510	64.8	4.6	26.9	9.5	17.4	4.7	96
Primary incomplete	28.6	988	53.9	10.7	30.0	18.5	18.4	11.3	283
Primary complete	30.4	696	62.8	15.4	45.7	30.4	20.3	13.2	212
Secondary and higher	28.8	620	57.2	13.3	34.9	18.0	15.0	9.6	179
Wealth quintile									
Lowest	25.5	812	52.6	4.2	20.3	11.3	14.8	7.3	207
Second	25.7	645	63.6	10.8	41.1	26.9	20.7	13.6	166
Middle	25.2	520	49.6	11.2	34.0	17.1	14.4	8.3	131
Fourth	31.1	471	62.4	15.7	46.8	28.5	27.4	17.0	146
Highest	32.4	367	66.5	22.4	39.0	21.5	12.2	7.0	119
Total	***27.3***	***2,814***	***58.5***	***11.8***	***35.1***	***20.5***	***18.0***	***10.6***	***769***

The lake endemic zone had the highest proportion of children with fever in the two weeks preceding the survey (41 per cent) and the coastal endemic zone had 30 per cent. In the low-risk region, 26 per cent had fever. This finding compares very closely with the KMIS 2007 results in which 40 per cent of children in the endemic regions presented with fever in the two weeks prior to the survey and 25 per cent in low-risk regions.

Among children with recent fever, nearly 60 per cent were taken to a health provider or facility for treatment (Figure 5.1). Treatment seeking is highest in the coast endemic zone (75 per cent) and lowest in the lake endemic zone (50 per cent – Figure 5.2). Diagnostic testing is not common, with only about one in eight (12 per cent) of these children receiving a finger or heel prick, which is a proxy for malaria testing.

A malaria case management quality of care study undertaken in Kenya in 2010 showed low testing rates without a substantial difference between children under five years of age (20 per cent) and older children and adults (29 per cent). Currently, at facilities with available diagnostics, only 43 per cent of all febrile patients are tested (Juma and Zurvac, 2011).

Figure 5.1: Management of childhood fever

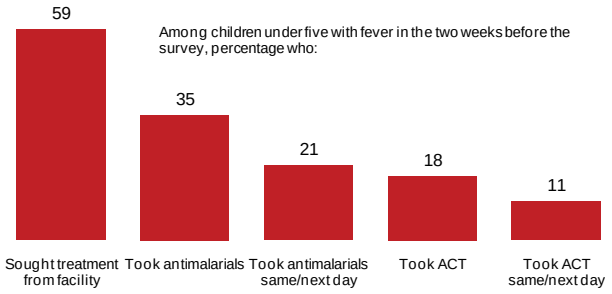
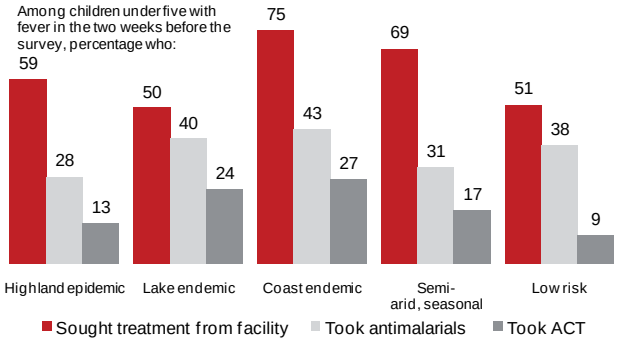


Figure 5.2: Zonal differences in management of childhood fever



Data on treatment of recent fever are based on children under five reported by interviewed women. Because many women reported having given birth but had no children listed in their birth histories, during the data editing phase, household listings were searched for children reported as children of the household head. If the de facto mother was reported as the head of the household or the only spouse of the household head and the mother reported having had live births, but had no births reported in the birth history, the children under the age of seven years were imported into the woman's birth history. This includes 835 children under five, none of whom had data on recent fever.

Table 5.1 shows that 18 per cent of children with fever receive ACT overall, while 11 per cent receive ACT the same or the next day after developing the fever. In comparison, in the 2008-09 KDHS, 8 per cent of children with fever received ACT and 4 per cent received it the same or the next day (KNBS and ICF Macro, 2010).

5.1.2 Sources of Treatment

Results for the types of places where children under five with fever were taken for advice or treatment are given in Table 5.2. The majority (65 per cent) sought treatment from the public sector and 23 per cent turned to the private sector. Another 9 per cent went to shops for treatment or advice, while 4 per cent went to faith-based facilities and 3 per cent to traditional healers. Only 2 per cent sought care from a community health worker.

Differences in the sources of treatment by background characteristics are not large. Nevertheless, among children with fever who were taken for treatment, those in rural areas are less likely to be taken to public facilities than those in urban areas. Those in the lowest wealth quintile (58 per cent) are less likely than their wealthier counterparts (65 per cent and over) to seek care from the public sector. The poor are more likely to seek treatment from the

Table 5.2: Source of treatment for children with fever

Among children under five with fever in the two weeks before the survey who were taken for treatment, percentage taken to specific sources of advice or treatment, by background characteristics

Background characteristic	Source of advice or treatment for fever							Number of children with fever who sought treatment/ advice
	Govern-ment	Private	Faith-based	Commu-nity health worker	Shop	Traditional healer	Other	
Age in months								
<12	65.5	22.2	4.2	3.4	5.1	2.7	6.8	97
12–23	66.9	19.6	2.7	2.2	8.5	1.2	4.3	105
24–35	68.6	21.5	3.2	0.0	16.6	2.2	1.3	105
36–47	59.8	31.6	4.9	2.8	5.8	2.7	8.3	74
48–59	60.4	24.8	3.1	2.7	7.7	5.4	1.9	69
Child's sex								
Male	63.2	23.3	4.1	2.0	10.3	2.1	4.4	220
Female	66.3	23.4	3.1	2.2	7.9	3.2	4.4	230
Residence								
Urban	78.9	19.6	2.0	0.0	11.0	3.1	1.3	68
Rural	62.3	24.0	3.8	2.5	8.8	2.6	5.0	382
Malaria endemicity								
Highland epidemic	54.1	33.1	0.0	3.5	6.6	3.5	6.9	120
Lake endemic	63.7	30.5	4.8	0.3	5.6	2.2	4.7	121
Coast endemic	71.4	20.9	0.9	0.6	10.6	0.0	2.4	52
Semi-arid, seasonal	66.1	10.4	6.0	3.6	12.5	3.9	2.7	111
Low risk	(85.2)	(13.2)	(6.7)	(1.5)	(14.7)	(1.4)	(3.6)	46
Mother's education								
No education	53.7	10.7	4.2	7.9	19.2	6.8	4.3	62
Primary incomplete	66.6	21.7	3.6	0.8	8.1	1.4	4.2	153
Primary complete	67.9	25.8	2.8	1.3	10.4	3.0	4.4	133
Secondary and higher	65.0	30.3	4.0	1.7	2.7	1.6	4.8	102
Wealth quintile								
Lowest	57.8	16.5	4.1	3.4	16.3	4.5	2.7	109
Second	68.1	19.0	1.9	1.8	11.4	4.3	6.1	106
Middle	65.4	22.7	4.4	2.8	9.9	1.7	7.7	65
Fourth	65.9	31.9	3.6	2.3	3.1	0.0	3.3	91
Highest	68.4	29.2	4.2	0.0	2.3	1.8	3.1	79
Total	***64.8***	***23.4***	***3.5***	***2.1***	***9.1***	***2.6***	***4.4***	***450***

Note: Private includes private hospitals/clinics, pharmacies, and other private medical sources; faith-based includes mission hospitals and clinics. Numbers in parentheses are based on 25–49 unweighted cases.

informal sector (shops and traditional healers) than those in higher income brackets.

5.1.3 Type and Timing of Antimalaria Drugs for Children

Table 5.3 presents information on types of antimalaria drugs given to children with fever and the proportion who took the first-line drug (ACT) and other drugs on the same or the next day after the onset of the fever. In interpreting the data, it is important to remember that the information is based on reports from the mothers of the febrile children. Many mothers may not have known the specific drug given to the child.

Overall, 18 per cent of children with fever took ACT, while 3 per cent each took amodiaquine and quinine, 2 per cent took SP/Fansidar, and only 1 per cent took chloroquine.

Although 18 per cent of children with fever took ACT, only 11 per cent received it the same or next day after the onset of the fever.

There has been an increase in the proportion of children with fever who are treated with ACT, from 8 per cent of children in 2008-09 to 18 per cent in 2010 (KDHS 2008-9 and KMIS 2010, respectively).

5.1.4 Perceptions of the Seriousness of Fever

Detailed determinants of behaviour were not included in previous national sample surveys of malaria prevention and treatment. Basic descriptive indicators such as knowledge of first line

Table 5.3: Type and timing of antimalaria drugs taken by children with fever

Among children under five with fever in the two weeks preceding the survey, the percentage who took specific antimalaria drugs and the percentage who took each type of drug the same or next day after developing the fever, by background characteristics

Background characteristic	Percentage of children who took drug						Percentage of children who took drug the same or next day						Number of children with fever
	ACT	SP/ Fansidar	Chloroquine	Amodiaquine	Quinine	Other antimalarial	ACT	SP/ Fansidar	Chloroquine	Amodiaquine	Quinine	Other antimalarial	
Age in months													
<12	15.6	2.6	1.2	3.0	3.2	10.0	11.2	2.0	0.0	1.6	0.4	6.6	162
12–23	20.2	1.0	0.6	0.5	3.1	11.1	11.0	0.5	0.0	0.0	1.4	4.0	188
24–35	14.8	1.0	0.2	2.9	3.9	11.3	8.6	1.0	0.0	1.6	2.7	10.0	169
36–47	19.1	2.9	1.1	7.7	2.2	7.5	10.2	1.8	0.0	2.0	1.2	4.4	128
48–59	21.3	0.6	2.3	3.7	0.8	8.7	12.4	0.0	1.5	3.7	0.0	5.8	122
Child's sex													
Male	20.2	1.9	0.6	2.9	2.9	10.4	13.9	1.2	0.0	1.5	1.4	6.3	378
Female	15.9	1.3	1.3	3.6	2.7	9.4	7.5	0.9	0.5	1.7	1.0	6.1	391
Residence													
Urban	15.8	0.0	0.0	5.8	0.7	23.5	10.6	0.0	0.0	1.9	0.0	15.9	105
Rural	18.4	1.9	1.1	2.9	3.1	7.8	10.6	1.2	0.3	1.6	1.4	4.7	664
Malaria endemicity													
Highland epidemic	13.1	1.3	1.3	1.5	0.4	11.0	9.0	0.2	0.4	1.0	0.0	5.8	204
Lake endemic	23.9	2.0	0.6	6.3	4.8	4.8	15.5	1.2	0.0	2.7	2.6	3.2	244
Coast endemic	26.7	0.0	3.7	3.7	2.1	9.5	8.5	0.0	0.5	0.6	0.4	6.3	70
Semi-arid, seasonal	16.6	2.6	0.5	1.8	4.6	5.5	8.8	2.6	0.5	1.1	1.7	5.5	12
Low risk	8.9	0.8	0.0	1.5	0.0	29.7	5.9	0.8	0.0	1.5	0.0	16.6	90
Mother's education													
No education	17.4	0.0	0.7	1.4	1.0	6.5	4.7	0.0	0.0	0.0	0.0	4.8	96
Primary incomplete	18.4	1.7	1.7	1.6	1.5	6.2	11.3	1.2	0.7	1.0	0.6	3.7	283
Primary complete	20.3	1.1	0.9	6.1	5.9	14.3	13.2	1.1	0.0	2.9	3.2	11.7	212
Secondary and higher	15.0	2.8	0.0	3.6	2.2	12.4	9.6	1.3	0.0	2.0	0.6	4.6	179
Wealth quintile													
Lowest	14.8	0.3	1.3	1.6	1.7	2.5	7.3	0.3	0.5	1.1	0.7	1.4	207
Second	20.7	3.3	1.0	4.3	3.8	9.5	13.6	1.7	0.5	1.6	2.2	7.8	166
Middle	14.4	1.1	1.4	1.4	7.2	10.0	8.3	0.0	0.0	1.4	2.4	6.1	131
Fourth	27.4	2.0	0.9	4.0	1.0	12.7	17.0	2.0	0.0	1.9	0.5	8.3	146
Highest	12.2	1.6	0.0	5.9	0.6	19.8	7.0	1.6	0.0	2.5	0.3	10.1	119
Total	***18.0***	***1.6***	***1.0***	***3.3***	***2.8***	***9.9***	***10.6***	***1.1***	***0.2***	***1.6***	***1.2***	***6.2***	***769***

ACT=Artemisinin based combination therapy

Table 5.4: Seriousness of child's fever

Percentage distribution of children with fever in the two weeks preceding the survey by seriousness of the fever, according to malaria endemicity zone

Seriousness of fever	Malaria endemicity					Total
	Highland epidemic	Lake endemic	Coast endemic	Semi-arid, seasonal	Low risk	
Extremely serious	12.4	10.2	6.7	8.3	3.0	9.2
Very serious	23.1	24.7	39.1	27.6	21.2	25.8
A little serious	53.1	59.7	48.8	54.9	61.0	56.1
Not at all serious	11.3	5.4	5.4	9.2	14.8	8.9
Total	100.0	100.0	100.0	100.0	100.0	100.0
Total number	***204***	***244***	***70***	***162***	***90***	***769***

treatment were included (e.g., percentage of women of reproductive age who know the first line treatment for malaria). In the KMIS 2010, baseline indicators to measure caregivers' ability, opportunity and motivation to seek prompt treatment for fever were investigated in a pilot study prior to the main survey. Specific questions were selected for inclusion in the main survey, including perception of severity of fever, importance of seeking care for fever, perceived affordability and availability of ACTs, and perceived efficacy of antimalarials in treating fever.

Results shown in Table 5.4 indicate that about two-thirds of the mothers (65 per cent) said the fever was a little serious or not serious at all, while one-third (35 per cent) said the fever was extremely or very serious. Mothers in the coast endemic zone are more likely to say that the fever was very serious, while those in the low-risk areas are more likely than mothers in other areas to say that the child's fever was only a little serious or not serious at all.

5.1.5 Attitudes and Perceptions about Management of Fever in Children

As shown in Table 5.5, over 90 per cent of mothers of children under five who had had a fever in the two weeks before the survey agreed that it is important to seek antimalaria treatment promptly when a child has fever and believe that antimalarials can cure fever. Over 80 per cent of these women disagreed that herbal remedies should be used first in the treatment of fever.

Nationally, three-quarters of mothers agreed that fever treatment was affordable and that malaria medicines were available. There were marked geographic differences, however. Two-thirds of mothers in the lake endemic zone reported that they agreed that fever treatment was affordable and that malaria medicines were available, compared with over eight in ten mothers in the coast endemic zone.

Table 5.5: Treatment seeking attitudes among mothers of young children

Percentage distribution of women with children under five who had a fever in the two weeks prior to the survey by treatment-seeking attitudes, according to malaria endemicity zone

Attitude/Issue	Malaria endemicity					Total
	Highland epidemic	Lake endemic	Coast endemic	Semi-arid, seasonal	Low risk	
Extremely/very important to seek antimalaria treatment immediately when child has fever	95.5	96.1	97.6	86.1	88.5	93.0
Strongly or somewhat disagree that child should be treated first with herbal remedies	85.8	87.4	81.6	66.0	88.2	82.0
Fever treatment was affordable or very affordable	81.2	66.5	84.6	68.8	80.0	74.2
When child had fever, antimalaria medicines were always or somewhat available	91.1	60.6	83.1	73.5	67.9	74.4
Believes strongly or somewhat that antimalaria medicines can cure child's fever	93.0	94.0	95.1	90.0	84.6	91.8
Total number	***180***	***209***	***59***	***142***	***88***	***679***

5.2 Malaria in Pregnancy

Malaria infection during pregnancy may lead to either clinical symptoms or be asymptomatic. Both conditions are associated with adverse effects on the outcome of the pregnancy (miscarriages, stillbirths or low birth weight) and maternal morbidity (anaemia or severe illness). Low birth weight (< 2,500 grams) is associated with neonatal and infant mortality.

The NMS aims at reducing the adverse effects of malaria during pregnancy through three strategic approaches:

- All pregnant women in endemic areas attending antenatal care to receive at least two doses of IPTp using SP.
- Provision of ITNs through the ANC source.

Table 5.6: Antenatal care

Percentage distribution of women 15-49 who had a birth in the five years before the survey, by antenatal care (ANC) provider during pregnancy for the most recent birth, and percentage receiving care from a skilled provider for the most recent birth, according to background characteristics

Background characteristic	Provider of ANC							Percentage who received care from a skilled provider[1]	Number of women
	Doctor	Nurse/ midwife	Traditional birth attendant	Community health worker	Missing	No one	Total		
Mother's age at birth									
< 20	26.3	56.0	0.5	1.7	4.7	10.8	100.0	82.3	384
20–34	31.0	56.4	0.8	0.6	2.2	9.1	100.0	87.5	1,975
35–49	33.4	47.9	0.4	1.2	2.8	14.4	100.0	81.2	416
Birth order									
1	32.9	54.2	0.8	1.5	2.7	7.7	100.0	87.2	549
2–3	32.5	55.9	0.4	0.6	2.0	8.5	100.0	88.5	1,092
4–5	27.1	57.6	1.1	0.6	2.9	10.8	100.0	84.7	642
6+	29.0	50.9	0.6	0.8	3.3	15.5	100.0	79.9	491
Residence									
Urban	29.8	58.5	0.7	1.0	2.4	7.8	100.0	88.2	528
Rural	30.9	54.3	0.7	0.8	2.6	10.7	100.0	85.2	2,246
Malaria endemicity									
Highland epidemic	32.2	54.7	0.8	1.3	1.3	9.7	100.0	86.9	690
Lake endemic	27.6	57.6	0.7	0.3	3.1	10.7	100.0	85.2	642
Coast endemic	23.0	56.8	0.4	0.0	8.2	11.6	100.0	79.8	212
Semi-arid, seasonal	28.6	53.5	0.5	0.8	2.8	13.7	100.0	82.2	638
Low risk	37.4	53.9	0.8	1.2	1.2	5.6	100.0	91.3	592
Education									
No education	21.2	45.9	0.7	1.4	4.8	26.1	100.0	67.0	463
Primary incomplete	27.7	58.5	1.1	0.5	2.5	9.6	100.0	86.3	902
Primary complete	34.7	55.8	0.1	0.5	2.2	6.8	100.0	90.4	713
Secondary and higher	36.9	56.0	0.7	1.2	1.7	3.6	100.0	92.9	697
Wealth quintile									
Lowest	23.1	53.5	0.9	1.3	2.0	19.2	100.0	76.6	639
Second	26.6	57.5	1.2	0.8	3.8	10.1	100.0	84.1	539
Middle	34.0	54.9	0.6	0.7	2.6	7.2	100.0	88.9	542
Fourth	34.3	56.1	0.1	0.2	1.7	7.5	100.0	90.5	554
Highest	37.4	53.6	0.5	1.0	2.8	4.7	100.0	91.0	500
Total	***30.7***	***55.1***	***0.7***	***0.8***	***2.5***	***10.1***	***100.0***	***85.8***	***2,774***

[1] Skilled provider includes doctor, nurse, or midwife.

- Diagnosis and effective treatment of all suspected malaria cases among pregnant women.

IPTp has been implemented in Kenya since 1998. The treatment was adopted as policy on the basis of various research findings showing beneficial effects on birth outcomes (Parise et al., 1998; Shulman, 1999; Schultz et al., 1994). Recent observational studies have shown that women get optimum benefit if they receive two or more doses of sulphadoxine-pyrimethamine (SP) (Filler et al., 2006). The current recommendation for malaria endemic areas in Kenya is to administer full treatment dosages of SP at every antenatal visit after quickening provided that those visits are at least four weeks apart.

Table 5.6 shows the distribution of women with a birth in the five years before the survey by the type of antenatal care (ANC) they received during the pregnancy for the most recent birth. It shows that ANC is widespread in Kenya: 86 per cent of women receive ANC from a skilled provider. Women pregnant with their sixth or higher birth, those in the moderate-to-low malaria endemic zones, those with no education, and those in the lowest wealth quintile are less likely to receive ANC than other mothers.

Table 5.7 presents the percentage of mothers who took any antimalaria drugs for prevention during pregnancy, and the percentage who received SP during an antenatal care visit for the last pregnancy leading to a live birth in the past two years. The results indicate that only one

Table 5.7: Use of antimalaria drugs and intermittent preventive treatment by women during pregnancy

Percentage of women aged 15-49 with a live birth in the two years preceding the survey, who during the pregnancy took any antimalaria drug for prevention, who took SP/Fansidar at all or during an antenatal care (ANC) visit, who took two or more doses of SP/Fansidar and who received intermittent preventive treatment (IPTp), by background characteristics

Background characteristic	Percentage who took any antimalaria drug	SP/Fansidar		IPTp[1]		Number of women with a live birth in the two years preceding the survey
		Percentage who took any SP/Fansidar	Percentage who received any SP/Fansidar during an ANC visit	Percentage who took 2+ doses of SP/Fansidar	Percentage who took 2+ doses of SP/Fansidar, at least one during an ANC visit	
Residence						
Urban	69.6	46.2	46.2	28.9	28.9	295
Rural	65.7	47.1	46.3	24.9	24.6	1,215
Malaria endemicity						
Highland epidemic	67.1	57.3	55.6	25.4	24.7	377
Lake endemic	63.9	38.7	38.6	22.0	22.0	365
Coast endemic	75.9	52.0	52.0	22.0	22.0	115
Semi-arid, seasonal	59.6	43.5	43.2	27.6	27.6	359
Low risk	73.7	46.1	45.2	29.9	29.2	292
Education						
No education	48.4	34.5	32.4	18.7	17.3	245
Primary incomplete	63.4	43.8	42.9	23.1	23.1	514
Primary complete	70.0	50.9	50.9	25.0	25.0	371
Secondary and higher	79.0	55.3	55.1	34.4	34.2	379
Wealth quintile						
Lowest	54.6	38.8	37.2	19.8	19.1	388
Second	62.1	45.4	44.9	20.1	19.8	290
Middle	69.0	52.8	52.5	31.7	31.7	283
Fourth	72.3	49.6	48.9	31.0	30.6	289
Highest	80.2	51.5	51.5	28.6	28.6	259
Total	***66.5***	***46.9***	***46.2***	***25.7***	***25.4***	***1,509***

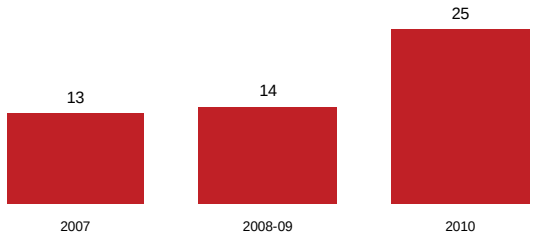
[1] IPTp: Intermittent preventive treatment during pregnancy, i.e., treatment with two or more doses of sulphadoxine-pyrimethamine (SP/Fansidar).

woman in four (25 per cent) in Kenya is getting appropriate antimalaria treatment during pregnancy, i.e., two or more doses of SP at least one of which was received during an ANC visit.

Women with secondary or higher education (34 per cent) are twice as likely as those with no education (17 per cent) to receive IPTp. Wealthier women are more likely to receive IPTp than those from the lower two wealth quintiles. There are only minor differences in IPTp uptake in urban and rural areas. Women in low-risk areas are most likely to receive IPTp.

As shown in Figure 5.3, the proportion of women who receive IPT during pregnancy increased from 13–14 per cent in 2007–2009 to 25 per cent in 2010. (KMIS 2007, KDHS 2008-9 and KMIS 2010, respectively.

Figure 5.3: Trends in intermittent preventive treatment of malaria in pregnancy



Note: IPT refers to the percentage of women who gave birth in the two years before the survey who received two or more doses of SP/Fansidar, at least one of which was during an antenatal care visit during the pregancy. Data for 2007 omit certain areas and do not reflect the entire country.

5.3 Information, Education and Communication Regarding ACTs

Through the Mobilize against Malaria programme, Pfizer supported the DOMC and partners to reduce malaria-related mortality and morbidity in pregnant women and children under the age of five years in Nyanza Province. DOMC and partners provided communication targeting caregivers of children under five around early symptom recognition, care-seeking behaviour, correct administration of and adherence to appropriate dosages of antimalaria medicines.

An integrated communications approach was adopted for the campaign dubbed *Haraka Upesi*, which translated means “Hurry! Fast!”. Communication was by regional radio stations skewed to Nyanza and Western and community health talks through trained community-based organizations. Reminder materials such as posters were also produced and strategically disseminated to reinforce the other communication channels.

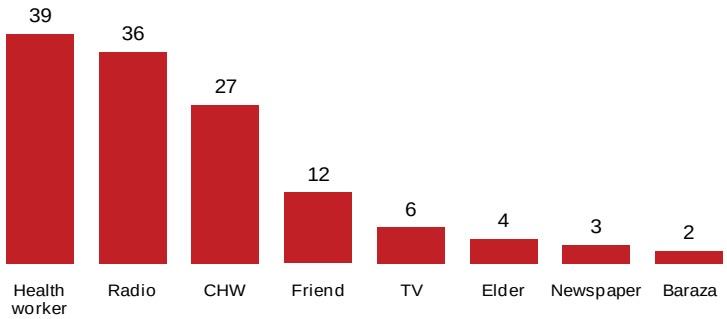
The proportion of women who receive IPT during pregnancy increased to 25 per cent in 2010 from 13–14 per cent in 2007–2009, and women with secondary or higher education (34 per cent) are twice as likely as those with no education (17 per cent) to receive IPTp.

Women aged 15–49 years were interviewed regarding their knowledge of the first line treatment for malaria. As shown in Table 5.8, just over one-third of women were able to cite ACTs as the antimalaria drug being promoted by the Ministry of Health, with 10 per cent saying it is SP; over half of women said they did not know the name of the new drug.

When asked if they had seen or heard any information about ACT or AL, however, more than half (56 per cent) said yes. Respondents in lake endemic areas have the greatest knowledge about ACTs, with 71 per cent having seen or heard information about ACT and almost half (46 per cent) being able to cite it by name as the new antimalaria drug. Women in coast endemic areas are least likely to have seen or heard information about ACT. Knowledge about ACT increases dramatically with the education and wealth of the woman.

As shown in Figure 5.4, the most common sources of information about ACT were health workers (cited by 39 per cent of women) and radio (36 per cent).

Figure 5.4: Sources of information about ACT



Based on women aged 15-49 who had seen or heard information about ACT. Numbers may not add to 100 per cent because women could cite more than one source.

Table 5.8: Knowledge of ACT

Percentage distribution of women aged 15–49 by specific medicine mentioned as the new malaria medicine being promoted by the Ministry of Health, and percentage of women who have seen or heard information about ACT, by background characteristics

Background characteristic	ACT/AL	SP/ Fansidar	Chloroquine	Amodiaquine	Other	Don't know/ missing	Total	Have seen or heard information about ACT	Number of women
Age									
15–19	23.3	7.7	1.8	0.6	1.8	64.8	100.0	42.1	1,030
20–24	35.1	10.4	1.5	0.9	1.2	50.9	100.0	57.3	1,218
25–29	38.3	8.9	1.4	1.1	1.5	48.9	100.0	61.1	1,050
30–34	38.4	11.5	0.9	0.3	1.3	47.7	100.0	61.2	894
35–39	40.5	11.3	1.7	0.7	1.7	44.2	100.0	61.4	657
40–44	38.8	9.4	0.7	1.5	0.3	49.3	100.0	60.8	497
45–49	31.9	9.9	3.2	0.6	0.1	54.1	100.0	52.2	403
Residence									
Urban	41.5	10.8	1.5	0.4	1.1	44.8	100.0	61.6	1,381
Rural	32.7	9.5	1.5	0.9	1.4	54.1	100.0	54.6	4,368
Malaria endemicity									
Highland epidemic	25.0	14.9	1.1	0.7	1.5	56.7	100.0	50.4	1,201
Lake endemic	46.2	4.3	2.1	1.1	1.4	44.8	100.0	71.0	1,205
Coast endemic	28.6	3.6	1.9	0.0	2.2	63.6	100.0	46.0	465
Semi-arid, seasonal	33.2	7.3	1.1	0.9	0.6	57.0	100.0	50.5	1,199
Low risk	36.5	13.4	1.6	0.7	1.3	46.5	100.0	56.9	1,679
Education									
No education	21.1	10.0	2.2	0.9	0.7	65.2	100.0	38.0	864
Primary incomplete	27.2	9.5	1.7	1.1	1.1	59.4	100.0	48.9	1,619
Primary complete	34.6	9.3	1.3	0.5	2.0	52.3	100.0	59.4	1,344
Secondary and higher	47.5	10.3	1.2	0.6	1.2	39.2	100.0	68.8	1,922
Wealth quintile									
Lowest	21.9	8.1	1.4	0.9	1.0	66.7	100.0	41.5	984
Second	32.0	11.9	1.7	1.3	1.4	51.7	100.0	54.0	992
Middle	32.0	9.1	2.4	0.9	1.0	54.5	100.0	53.8	1,123
Fourth	35.2	9.9	0.9	0.6	1.7	51.8	100.0	57.9	1,204
Highest	47.4	9.8	1.4	0.4	1.2	39.8	100.0	68.6	1,446
Total	***34.8***	***9.8***	***1.5***	***0.8***	***1.3***	***51.8***	***100.0***	***56.3***	***5,749***

ACT=artemisinin-based combination therapy; AL=artemether lumefantrine

Women in coast endemic areas are least likely to have seen or heard information about ACT and those in the lake endemic zone are most familiar with ACTs with almost half being able to cite it by name. Knowledge about ACT increases dramatically with the education and wealth of the woman.

5.4 Conclusions

1. Sixty per cent of children reporting recent fever sought treatment at a health facility.
2. Eighteen per cent of children reporting recent fever took an ACT and 11 per cent got an ACT within 24 hours.

3. Children presenting with fever in the lowest wealth quintile use public health facilities less than their counterparts in the higher wealth quintiles.
4. There has been improvement in IPTp2 uptake (13 per cent in 2007 and 25 per cent in 2010); IPTp 2 uptake is highest in low-risk areas relative to other transmission zones.
5. Professional health workers and community health workers (CHWs) are important sources of information about malaria. This has implications for both empowering people with correct messages and consistently updating them when messages are revised or changed.

5.5 Recommendations

1. Scale up community management of malaria to address inequality in access to treatment.
2. Roll out strong advocacy communication and social mobilization campaigns to create demand for malaria diagnosis and appropriate treatment with ACTs.
3. Create demand for IPTp at both community and facility level and improve documentation of IPTp uptake at the facility.
4. While evaluating the effectiveness of various channels of communication, consider those channels used in the period preceding the survey, for example if any specific messages were disseminated through the channel in the period preceding the survey.

CHAPTER 6

Malaria and Anaemia in Children

In areas of constant and high malaria transmission, partial immunity to malaria develops within the first two years of life. Many people, including children, may have malaria parasites in their blood without showing any outward signs of infection. Such asymptomatic infection not only contributes to further transmission of malaria but also takes a toll on the health of individuals by contributing to anaemia.

Anaemia – a low level of haemoglobin in the blood – decreases the amount of oxygen reaching the tissues and organs of the body and reduces their capacity to function. It is associated with impaired cognitive and motor development in children. Although there are many causes of anaemia, inadequate intake of iron, folate, vitamin B12 or other nutrients usually accounts for the majority of cases in many populations. For populations living in malaria endemic regions, malaria is one of the leading causes of anaemia. Other causes of anaemia include thalassemia, sickle cell disease and intestinal worms. Promotion of the use of insecticide-treated bed nets and de-worming medication every six months for children are some of the important measures to reduce the prevalence of anaemia.

Malaria parasitaemia and anaemia were measured in both the 2007 and the 2010 KMIS surveys to assess the impact of malaria interventions. In the KMIS 2007, malaria and anaemia testing was done among children 3–59 months for parasitaemia and those aged 6–59 months for anaemia. In the KMIS 2010, the age ranges for malaria and anaemia testing were 3 months to 14 years and 6 months to 14 years, respectively.

In 2010, rapid diagnostic tests (RDTs) were used for malaria[6] and HemoCue was used to measure the concentration of haemoglobin. As shown in Appendix D, Table D2, of the 12,436 children aged 3 months to 14 years eligible for testing, 92 per cent were tested with the rapid malaria test and the anaemia test, and 90 per cent were tested for malaria based on blood smears. Coverage levels were uniformly high across background characteristics.

[6] The CareStart® Malaria PF HRP2/pLDH for *Plasmodium falciparum* was used in all areas except North Eastern Province, where CareStart® Malaria pLDH/HRP2 Combo (Pf/Pv) for both *P. falciparum* and *P. vivax* was used.

6.1 Malaria in Children

Malaria parasitaemia was measured in two ways. In the field, health technicians used RDTs to determine whether children had malaria infection. In addition, health technicians made thick and thin blood smears that were sent to the KEMRI/WRP Malaria Diagnostics Centre in Kisumu for microscopy (see Chapter 1).

For the 2010 MIS, the overall prevalence of malaria among children aged 3 months–14 years is summarized in Table 6.1. The table shows that malaria was found in 15 per cent of the children by RDT and in 11 per cent by microscopy (slide). The higher prevalence of parasitaemia using

Table 6.1: Prevalence of malaria in children

Percentage of children aged 3 months–14 years classified as having malaria, by background characteristics

Background characteristic	Malaria prevalence					Number of children tested with RDT	Number of children with slide read at lab
	RDT positive	Slide positive	Positive for *Pf*	Positive for *Pm*	Positive for *Po*		
Age							
3-5 months	7.2	5.0	5.0	0.0	0.5	175	173
6-8 months	9.8	5.3	5.3	0.0	0.0	186	185
9-11 months	7.6	5.0	4.6	0.7	0.4	221	218
12-17 months	10.7	6.0	6.0	0.2	0.3	476	466
18-23 months	10.5	5.6	5.6	0.5	0.9	369	357
2 years	13.3	8.9	8.7	0.8	1.3	948	925
3 years	13.6	9.6	9.2	1.4	0.6	892	875
4 years	14.2	9.7	9.0	2.2	1.5	862	844
3-59 months	12.3	8.1	7.8	1.1	0.9	4,130	4,043
6-59 months	12.5	8.2	7.9	1.1	0.9	3,955	3,870
5-9 years	16.5	13.4	12.8	2.2	1.0	3,686	3,613
10-14 years	15.6	13.1	12.7	1.3	0.4	3,001	2,945
Child's sex							
Male	15.3	11.6	11.2	1.6	1.0	5,388	5,274
Female	14.0	10.9	10.5	1.4	0.6	5,429	5,326
Residence							
Urban	5.0	4.7	4.6	0.6	0.6	1,549	1,502
Rural	16.2	12.3	11.9	1.7	0.8	9,268	9,098
Malaria endemicity							
Highland epidemic	4.0	3.3	3.0	0.2	0.1	2,483	2,447
Lake endemic	50.4	38.1	36.8	5.5	2.8	2,789	2,742
Coast endemic	6.0	4.3	4.3	0.0	0.0	826	794
Semi-arid, seasonal	0.7	0.5	0.5	0.0	0.0	2,542	2,484
Low risk	0.6	1.1	1.0	0.1	0.2	2,176	2,133
Wealth quintile							
Lowest	19.6	14.6	14.2	2.2	0.7	2,478	2,416
Second	19.9	14.9	14.1	2.4	1.2	2,385	2,357
Middle	16.0	12.9	12.6	1.4	0.8	2,256	2,219
Fourth	10.1	7.9	7.4	0.8	0.8	2,069	2,027
Highest	3.3	2.8	2.7	0.2	0.3	1,629	1,581
Total 3 mos-14 years	*14.6*	*11.3*	*10.8*	*1.5*	*0.8*	*10,817*	*10,600*
Total 6 mos-14 years	*14.8*	*11.4*	*10.9*	*1.5*	*0.8*	*10,641*	*10,428*

RDT = rapid diagnostic test (CareStart, Access Bio, New Jersey, USA). *Pf = Plasmodium falciparum; Pm = Plasmodium malariae; Po = Plasmodium ovale*. There were no cases positive for *P. vivax.*
Note: Table is based on children who slept in the household the night before the interview.

RDTs compared with microscopy is attributed to the ability of RDTs to detect malaria antigens after parasites have been cleared from the blood. The table also shows that children aged 5–9 years have the highest prevalence of parasitaemia by either RDTs (17 per cent) or microscopy (14 per cent).

As shown in Figure 6.1, malaria is more than twice as prevalent in rural areas (12 per cent of children) as in urban areas (5 per cent). This is expected because malaria transmission is less in urban setting because of limited vector breeding sites. A similar pattern was observed in the KMIS 2007.

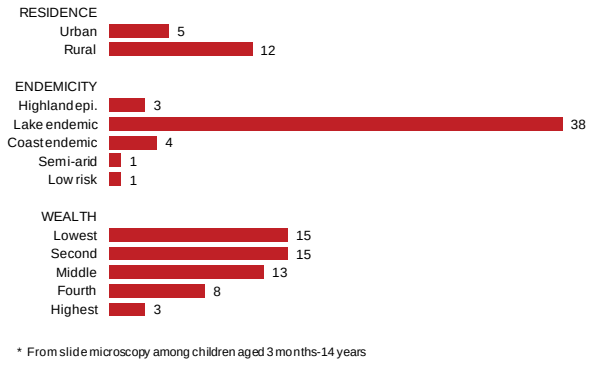
The survey found enormous variation in malaria prevalence across endemicity zones. Results from the blood smear slides indicate that 38 per cent of children in the lake endemic zone test positive for malaria. This compares with 4 per cent in the moderate-to-low zone, 3 per cent in the highland epidemic zone and 1 per cent or less in the low risk or semi-arid/seasonal zones.

Although there is little difference in malaria prevalence among children in the lowest three wealth quintiles, parasitaemia prevalence declines among those in the wealthiest groups.

Assessing trends in malaria prevalence between the 2007 and 2010 KMIS surveys is hampered by several differences between the surveys. First, the 2007 survey did not cover the entire country, but instead omitted most of the low-risk areas, i.e., Nairobi and what were then Kiambu, Nyandarua, Nyeri, Meru Central and Laikipia districts. Second, as mentioned earlier, the age range of children eligible for malaria testing changed between the two surveys. Results for malaria prevalence from the two surveys are illustrated in Figure 6.2. The results show an increase in the prevalence of malaria in children less than five years.

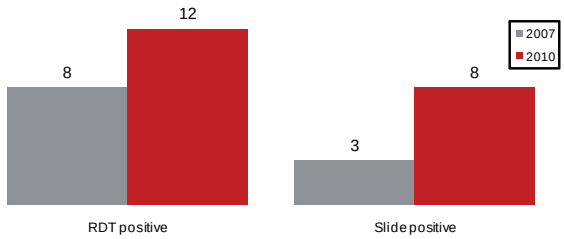
Malaria prevalence based on RDTs is usually higher than that based on microscopy, because the former measures malaria antigens even after parasites have been cleared from the blood. Table 6.2 shows a comparison of the results for the two tests. Of the 11,114 children tested with both methodologies, 94 per cent had the same result on both (1,276 positive and 9,207 negative). However, among children who tested positive according to the RDT, 29 per cent tested negative using microscopy (521/1,797). Conversely, among those who tested positive

Figure 6.1: Differentials in malaria prevalence, Kenya, 2010



* From slide microscopy among children aged 3 months-14 years

Figure 6.2: Trends in malaria prevalence among young children, 2007 and 2010



*Data refer to children aged 1-59 months in 2007 and aged 3-59 months in 2010. Data for 2007 exclude Nairobi Province; Kiambu, Nyandarua, and Nyeri districts in Central Province; Meru Central district in Eastern Province, and Laikipia district in Rift Valley Province.

Table 6.2: Comparison of RDT and slide prevalence of malaria

Unweighted number of children 3 months–14 years testing positive and negative according to the rapid diagnostic test and slide microscopy, Kenya 2010

Rapid diagnostic test results	Slide microscopy results				Number of children tested	
	Positive		Negative			
	Number	Percentage	Number	Percentage	Number	Percentage
Positive	1,276	92.1	521	5.4	1,797	16.2
Negative	110	7.9	9,207	94.6	9,317	83.8
Number of children tested	1,386	100.0	9,728	100.0	11,114	100.0

Note: Table is based on children who slept in the household the night before the interview. Percentages will differ from Table 6.1 because data in this table are unweighted.

according to microscopy, 8 per cent (110/9,317) tested negative using RDT.

Of the positive slides, 96 per cent had *P. falciparum*, 80 per cent of which were pure infections, while 16 per cent were mixed infections with *P. malariae* or *P. ovale* or both. Another 2 per cent were pure *P. malariae* infections and 1 per cent pure *P. ovale* infections (Table 6.3). No samples tested positive for *P. vivax* in this survey.

Table 6.3: Predominant malaria parasites

Unweighted number of children aged 3 months–14 years testing positive according to slide microscopy and percentage distribution by type of species

Species	Number of positive slides	Percentage
P. falciparum only	1,271	80.0
P. malariae only	28	1.8
P. ovale only	32	2.0
P. vivax only	0	0.0
P. faciparum and *P. ovale*	77	4.8
P. falciparum and *P. malariae*	170	10.8
P. falciparum, P. malariae and *P. ovale*	9	0.6
Total	***1,587***	***100.0***

6.2 Anaemia in Children

Results for the prevalence of anaemia among children aged 6 months–14 years are summarized in Table 6.4. Three per cent of children have severe anaemia (defined as haemoglobin levels below 8.0g/dl), while 24 per cent have moderate anaemia.

The proportion of children who are anaemic generally declines with age (Figure 6.3). For example, 63 per cent of children aged 6–8 months

Figure 6.3: Percentage of children with malaria and anaemia by age group, Kenya 2010

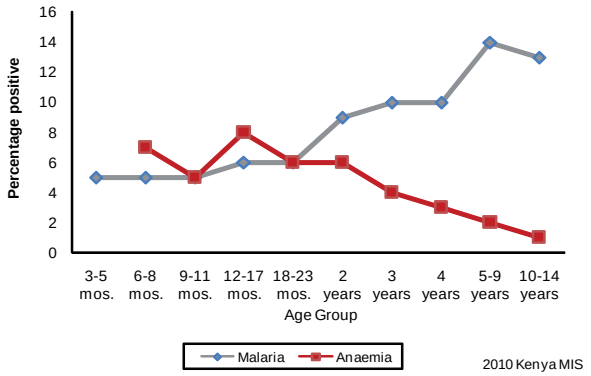


Table 6.4: Anaemia prevalence among children

Among children aged 6 months–14 years, percentage distribution of level of anaemia and mean haemoglobin level (g/dl), by background characteristics

Background characteristic	Severe anaemia (< 8 g/dl)	Moderate anaemia (8-10.9 g/dl)	No anaemia 11+ g/dl)	Total	Number of children	Mean Hb
Age						
6–8 months	7.2	55.5	37.2	100.0	174	10.2
9–11 months	5.1	56.2	38.7	100.0	220	10.5
12–17 months	7.5	57.9	34.6	100.0	473	10.2
18–23 months	6.3	52.0	41.7	100.0	370	10.5
2 years	6.0	41.9	52.1	100.0	948	10.8
3 years	4.1	33.9	61.9	100.0	893	11.2
4 years	3.0	26.6	70.4	100.0	862	11.5
6–59 months	5.1	41.0	53.8	100.0	3,940	10.9
5–9 years	1.6	16.9	81.5	100.0	3,701	12.1
10–14 years	0.5	8.6	90.9	100.0	3,012	12.8
Child's sex						
Male	2.9	24.0	73.0	100.0	5,294	11.8
Female	2.3	22.9	74.8	100.0	5,360	11.9
Residence						
Urban	1.4	22.2	76.4	100.0	1,515	12.0
Rural	2.8	23.7	73.5	100.0	9,139	11.8

Continued

Table 6.4, *continued*: Anaemia prevalence among children

Among children aged 6 months–14 years, percentage distribution of level of anaemia and mean haemoglobin level (g/dl), by background characteristics

Background characteristic	Severe anaemia (< 8 g/dl)	Moderate anaemia (8-10.9 g/dl)	No anaemia 11+ g/dl)	Total	Number of children	Mean Hb
Malaria endemicity						
Highland epidemic	2.1	23.3	74.5	100.0	2,439	11.9
Lake endemic	4.2	30.1	65.7	100.0	2,743	11.4
Coast endemic	1.9	25.8	72.3	100.0	816	11.7
Semi-arid, seasonal	3.1	22.5	74.5	100.0	2,514	11.9
Low risk	0.8	15.4	83.8	100.0	2,141	12.3
Wealth quintile						
Lowest	3.6	27.9	68.5	100.0	2,439	11.5
Second	2.8	25.5	71.7	100.0	2,359	11.8
Middle	2.5	21.5	76.0	100.0	2,225	11.9
Fourth	2.3	21.0	76.6	100.0	2,037	12.0
Highest	1.4	19.4	79.3	100.0	1,593	12.1
Total	***2.6***	***23.5***	***73.9***	***100.0***	***10,654***	***11.8***

Note: Table is based on children who slept in the household the night before the interview. Prevalence of anaemia is based on haemoglobin levels and is adjusted for altitude using CDC formulas (CDC, 1998). Haemoglobin is measured in grams per decilitre (g/dl).

are either severely or moderately anaemic, compared with only 9 per cent of those aged 10–14 years. Anaemia levels correlate with malaria endemicity; areas with the highest malaria burden – the lake endemic zone – also have the highest levels of childhood anaemia (34 per cent). The low malaria risk zone also has the lowest anaemia level (16 per cent).

Table 6.5 compares the prevalence of anaemia and malaria for the same children and shows that 44 per cent of children with malaria also have anaemia (602/1,375). This is higher than the level of 25 per cent for children who do not have malaria infection (2,362/7,202) and may imply that about 20 per cent of anaemia cases among children is due to malaria.

Table 6.5: Comparison of anaemia and slide prevalence of malaria

Unweighted number of children 6 months–14 years by anaemia and malaria prevalence according to slide microscopy

Anaemia test results	Slide microscopy results		Number of children tested
	Positive	Negative	
Any anaemia (< 11g/dl)	602	2,362	2,964
No anaemia (11+ g/dl)	773	7,202	7,975
Number of children tested	1,375	9,564	10,939

Note: Table is based on children who slept in the household the night before the interview.

6.3 Conclusions

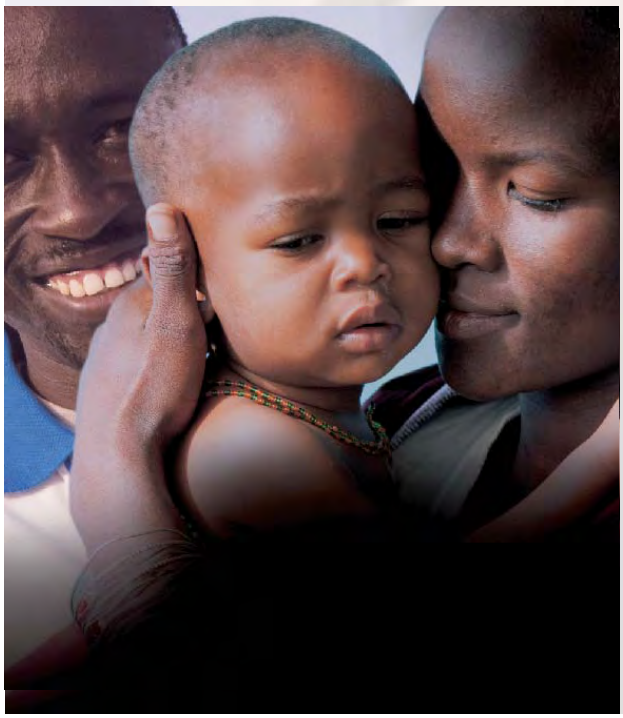
1. Children aged 5–14 years have the highest prevalence of malaria.
2. Malaria prevalence is twice as high in rural areas as in urban areas.
3. *Plasmodium falciparum* is the most prevalent species at 96 per cent.
4. Anaemia prevalence is highest in the lake endemic zone, which also has the highest malaria prevalence.

6.4 Recommendations

1. Intensify malaria control interventions, particularly IRS and other integrated vector management methods in the lake endemic region.
2. Intensify surveillance countrywide.
3. Strengthen school-based malaria control interventions in malaria endemic regions.

CHAPTER 7

Discussion, Conclusions and Recommendations



Since the last MIS was conducted in 2007, the malaria programme in Kenya has made efforts to scale up malaria control interventions to universal coverage in line with global targets for malaria control and elimination. Key among these have been the scaling up of affordable ACTs in the private sector through subsidies provided by the first phase of the Affordable Medicines Facility for Malaria (AMFm); universal coverage with LLINs for nearly 22 million Kenyans at risk of malaria; and a move from presumptive treatment of fever among children under five to parasitology diagnosis-based treatment of malaria among all age groups.

Other significant actions have been the training of health workers on malaria diagnosis and treatment in both the public and the private sectors with a focus on behaviour change to diagnosis-based treatment of malaria; and the strengthening of laboratory systems through the establishment of a malaria reference laboratory. The National Malaria Control Programme also undertook a comprehensive programme review in 2009 with the aim of evaluating the performance of the programme and reorienting strategies for malaria control. The programme review led to the development of the National Malaria Strategy and monitoring and evaluation plan for 2009–2017.

The 2010 KMIS was conducted from July to September 2010, the period of peak malaria transmission season in the country. The objective was to determine the status of various key malaria prevention interventions such as bed net coverage and use, coverage of IPTp, access to prompt treatment for children under five years with fever, and the impact of these interventions on the prevalence of malaria and anaemia in children up to 14 years of age.

7.1 Impact of Malaria Interventions

According to this MIS, the lake endemic zone has the highest prevalence of malaria overall (38 per cent), while the prevalence in the rest of the zones is less than 5 per cent. In general, malaria parasite prevalence has been declining in Kenya. In the lake endemic area,

parasite prevalence among children under five years of age declined from over 80 per cent in 2002 to 27 per cent in 2010. Parasite prevalence in the coast endemic region also declined during the period, from 10–30 per cent in 2002 to 2 per cent in 2010. Essentially, the investment in malaria prevention and control in Kenya is beginning to pay off. Malaria endemic zones, in particular the coastal region, are being transformed from stable high transmission to very low transmission with malaria prevalence similar to areas of unstable transmission like the epidemic prone, arid/seasonal risk and low risk zones. These zones are characterized by very low parasite prevalence in 2010 (2 per cent, 0.1 per cent and 2 per cent, respectively).

With efforts geared towards achieving universal ITN coverage in the endemic and highland epidemic prone areas in 2011, it is likely that with time the entire country will gradually be an area of very low transmission and the population will become susceptible to epidemics of malaria. It is therefore important to invest in surveillance to provide timely information for malaria epidemic prediction, detection and response. This can be achieved in the context of implementation of the electronic medical records component of the district health information system.

7.2 Vector Control with ITNs/LLINs

Kenya has been the focus of the international community as a learning centre in the use of routine distribution systems for the provision of LLINs as a complement to mass distribution and maintenance for coverage achieved through mass distribution. A total of 3.4 million LLINs was distributed during the mass campaign in 2006 aimed at universal coverage for all children under five years. The coverage was to be maintained through routine distribution of LLINs to infants integrated with standard immunization and other child welfare activities. Another mass campaign to replace the LLINs was scheduled for 2009, but funding constraints did not allow it to take place. One result was a fall in LLIN coverage because of aging, damage or loss of existing nets. The decline in coverage may partly explain the increase in parasite prevalence in young children seen in the 2010 survey. Rwanda had a similar experience in 2009, when the ITN coverage fell from more than 60 per cent to less than 16 per cent, resulting in malaria outbreaks in 28 of the 30 districts of Rwanda (Ministry of Health, Rwanda, 2011). Even with this example, the Kenya programme needs to re-evaluate possible causes of increased parasite prevalence in children under five.

> Net use is encouraged for all persons regardless of whether IRS has been conducted or not.

Distribution of ITNs has targeted vulnerable groups like pregnant women and children less than five years of age. Children and adolescents aged 5–14 years have had one of the lowest net use rates (28 per cent using ITNs) as confirmed in this survey and also the highest malaria prevalence (13 per cent). This age group also comprises 28 per cent of the general population, is mostly primary school-going, and while those living in endemic areas may have developed some immunity against clinical disease before their fifth birthday (Snow et al., 1997; Snow and Marsh, 2002), they have not developed the anti-parasite immunity that protects against parasitaemia and parasite density. The group thus forms a large reservoir of asymptomatic infection that perpetuates the malaria transmission cycle.

Making a lasting impact on the disease burden at community level requires targeting this age group for universal coverage with LLINs and through prevention and treatment activities integrated into the government's school health programme. Net use among those living in households with at least one ITN is 61 per cent, with the highest use in these households by children under five years (71 per cent). There is a significant correlation between the number of nets in a household and net use as evidenced by other studies (Eisele et al., 2009). There is still a significant gap between coverage and net use, however, indicating a need for sustained advocacy campaigns that address specific challenges to consistent net use.

7.3 Vector Control with IRS

Indoor residual spraying (IRS) is conducted for epidemic prevention in highland epidemic prone districts and also in nine districts in the lake endemic region. Net use is encouraged for all persons regardless of whether IRS has been conducted or not. This survey shows that in highland epidemic prone districts, 44 per cent of children under five slept under an ITN, while an additional 22 per cent slept under an ITN or in a house that had been sprayed in the preceding 12 months. In the lake endemic region, 48 per cent slept under an ITN while an additional 10 per cent slept in houses that had been sprayed in the preceding 12 months.

Additional measures are needed to heighten the impact on the disease burden in the lake endemic zone. A study undertaken in 2008 found that in this region, the addition of IRS to an area with high LLIN coverage yielded a combined protective efficacy of 61 per cent compared with LLINs alone (Hamel, 2010). The Government of Kenya has thus adopted both IRS and LLINs for the lake endemic region in an effort to reduce the disease burden.

7.4 Access to Malaria Treatment

Prompt access to malaria treatment is essential for the prevention of severe malaria-related illness and death. In 2006, an artemisinin-based combination therapy (ACT), artemether-lumefantrine (AL), was introduced as the first line treatment for malaria in Kenya. The medicine is available in government and faith-based facilities free of charge. The recommendation is that all patients with fever be tested for malaria and if positive treated with AL. Without testing, it is appropriate to treat patients with fever for malaria if no other cause for the fever can be established.

The proportion of children under five with fever treated with an ACT rose from 7 per cent in 2007 (DOMC et al., 2009) to 18 per cent in 2010, with those receiving prompt treatment with ACTs increasing from 4 per cent in 2007 to 11 per cent in 2010. Children with fever in the lowest wealth quintile (58 per cent) are less likely than their wealthier counterparts (65 per cent and over) to seek care from the public sector. The poor are more apt to turn to informal sector sources (shops and traditional healers) than those in higher income brackets. This may be because health facilities are more scattered in rural areas so that physical access hinders access to free AL (Noor et al., 2003). The Constituencies Development Fund (CDF) and the Economic Stimulus Package of 2010 have enhanced the availability of health facilities countrywide and efforts are under way to ensure they are all operational.

Six per cent of children with fever reported taking non-recommended malaria medicines such as SP, chloroquine, and amodiaquine. This compares with the 4 per cent result from a health facility survey conducted in 2010 and both are much lower than the 13 per cent reported in Juma and Zurovac, 2011) and DOMC et al. (2009). There is a need to strengthen pharmacovigilance and post-market surveillance activities.

7.5 Malaria Diagnosis

Traditionally, the number of children with a history of fever has been used as the denominator for evaluating prompt access to malaria treatment, presenting a challenge with setting targets for this indicator. The ideal denominator would be children with malaria confirmed by testing. Kenya has adopted universal testing of all suspected cases of malaria before treatment, to be implemented in phases over three years beginning with areas of low malaria risk and ending in the lake endemic zones.

Malaria testing is not easy to evaluate in a cross-sectional survey and in this MIS, a history of a heel or finger prick for collection of a blood sample was used as a proxy for malaria testing.

Malaria was found in 15 per cent of the children aged 3 months to 14 years by RDT and in 11 per cent by microscopy (slide). The higher prevalence of parasitaemia using RDTs compared with microscopy is attributed to the ability of RDTs to detect malaria antigens after parasites have been cleared from the blood.

Failure to sustain coverage with antimalaria interventions – particularly prevention using ITNs – can result in a rise in malaria prevalence and must be avoided at all costs.

Overall, only 12 per cent of children under five with fever reported having had a finger or heel prick. A health facility survey conducted in 2010 showed that health workers tested only 20 per cent of children under five years for malaria (Juma and Zurovac, 2011). This may be because until 2009, presumptive diagnosis and treatment were recommended in this age group (Juma and Zurovac, 2011).

Parasite prevalence in the lake endemic area was 38 per cent; it was less than 5 per cent in other epidemiological zones. The low prevalence is a reflection of low or declining transmission in the case of the coast endemic areas. With such low malaria prevalence, fever cases presenting in these epidemiological zones are not likely to be due to malaria. Thus in these zones, diagnosis-based treatment becomes critical so that other causes of febrile morbidity can be adequately addressed in order to reduce severe illness and death from these causes. In the lake endemic zone, given the investments in universal ITN coverage in this area in 2011 and the IRS initiative planned for 2012 , it is likely that the parasite prevalence will continue to decline.

The prevalence of severe anaemia (Hb <8g/dl) in children 6–59 months is 5 per cent and that of moderate anaemia (Hb 8–11g/dl) is 41 per cent. The lake endemic zone, which has the highest malaria prevalence, also has the highest prevalence of both severe and moderate anaemia (4 per cent and 30 per cent, respectively) among those aged 6 months–14 years. The seasonal risk zone with the lowest prevalence of malaria (0.5 per cent) has the second highest prevalence of severe anaemia (3 per cent). The survey also found that the prevalence of anaemia decreases with age and that malaria prevalence increases with age. Studies in Kenya have shown that malaria prevention treatment in school children reduces anaemia and significantly improves cognitive learning. Although there is a relationship between malaria prevalence and anaemia, especially in the lake endemic areas, the differences in anaemia prevalence are not as large as the differences in malaria prevalence, indicating that there are other underlying causes of anaemia besides malaria that need to be identified and addressed in this school-going age group.

7.6 Conclusion and Recommendations

According to the 2010 MIS, the prevalence of malaria in children less than five years increased from 4 per cent in 2007 to 8 per cent in 2010. Among all children under 15, the lake endemic zone has the highest prevalence of malaria overall (38 per cent), while the prevalence in the rest of the epidemiologic zones is less than 5 per cent. The household ownership of ITNs remained relatively unchanged at 50 per cent, compared with 48 per cent in 2007. There is urgent need to scale up ITN coverage to the target of one net for two persons at risk and to re-evaluate net use campaigns with a view of scaling up their intensity to address specific issues that impede the use of the nets. This survey has shown that failure to sustain coverage with interventions – particularly prevention using ITNs – can result in a rise in malaria prevalence and must be avoided at all costs.

Overall, parasitological diagnosis of malaria is still low. Strong advocacy and information campaigns for both communities and health workers are needed to create demand and change behaviour towards malaria testing for all age groups, especially in areas where malaria prevalence is very low. There is need to scale up community case management of malaria to address inequality in prompt access to treatment of malaria. Improving and sustaining malaria communications campaigns are also essential, using effective channels to improve knowledge about the recommended malaria treatment in the community.

Finally, as these and other survey results continue to show, girls' education cannot be overemphasized. Better educated mothers are more likely to attend ANC, to take malaria prevention treatment, and to use nets for themselves and their children.

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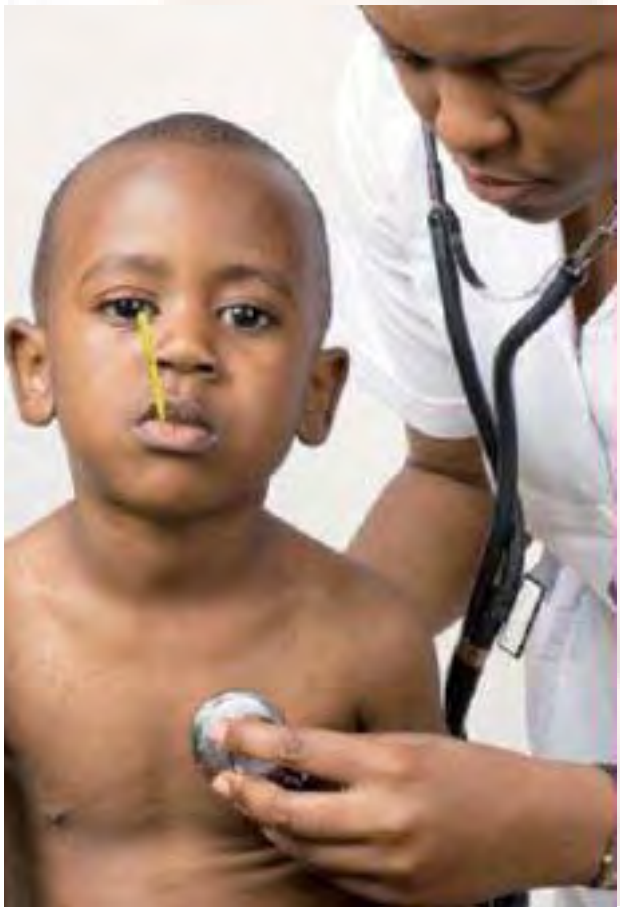

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APPENDIX A

Sample Design for 2010 Kenya Malaria Indicator Survey

A.1 Study Domains

The 2010 KMIS was a representative probability sample designed to produce estimates for the specified domains from household populations in Kenya. The level of malaria endemicity in Kenya varies from one area to another and can be classified into five malaria endemicity regions. These regions, listed below, served as the domains for the survey.

1. Highland epidemic prone
2. Lake endemic
3. Coast endemic
4. Semi-arid, seasonal risk
5. Low risk

In addition, the five regions are categorized into either urban or rural areas and implicitly provide two domains for analysis, at the national level.

A.2 Sampling Frame

The sampling frame for 2010 KMIS was the National Sample Survey and Evaluation Programme (NASSEP) IV. The frame is a two-stage stratified cluster sample format. The first stage involved selection of primary sampling units (PSUs), which were census enumeration areas (EAs), using the probability proportional to measure of size method, with the districts as the first level of stratification. The second stage involved the selection of households for various surveys. EAs were selected with a basis of one measure of size (MOS) defined as the ultimate cluster with an average of 100 households and constituting one (or more) EAs. The MOS was defined with a lower limit of 50 households and an upper limit of 149 households. Prior to selection, those EAs with fewer than 50 households were merged with the neighbouring ones to form the minimum requirements for the MOS.

During listing of selected EAs for the frame, those with more than 149 households were segmented and only one segment randomly picked to constitute a cluster. NASSEP IV has a total of 1,800 clusters with 1,260 being rural areas while the remaining 540 are urban. The frame has undergone regular updates.

A.3 Sample Size and Allocation

The sample size of 7,200 households that was used in the 2007 KMIS was maintained for the 2010 KMIS. The precision for key malaria indicators for populations at greater risk of malaria (pregnant women and children aged five years and below) are important for KMIS. The number of pregnant women, at a given time, is smaller than the number of children aged five and below and, therefore, indicators based on pregnant women are the determinants for the sample size.

The allocation of the sample to the domains was done using the power allocation method. This method was appropriate, instead of proportional allocation, to ensure that the domain with the lowest proportion of households was oversampled for valid estimates. The allocation of the sample is shown in Table A.1.

A.4 Household and Cluster Sampling

A first-stage selection involved selection of the clusters by KNBS for the specified domains. The clusters were selected from the NASSEP IV frame with equal probability within each frame stratum. The selection of the clusters was expected to retain the probability proportional to measure of size design used in creation of the frame.

A second-stage sampling was conducted at the time of field work using personal digital assistants (PDAs). All households within a cluster were to be listed using PDAs fitted with global positioning units and a simple random sample of 30 households per cluster selected for interviewing.

Every attempt was to be made to conduct interviews in the 30 selected households, and up to three visits were expected be made to ascertain compliance in case of absence of all household members (or any household members in the case of malaria parasite testing) to minimize potential bias. Non-responding households were strictly not to be replaced.

A.5 Calculation of Sampling Weights

Since the 2010 KMIS sample is unbalanced by zone, it required a final weighting adjustment procedure to provide estimates at every other domain of study. Given that the sample is a two-stage stratified cluster sample, sampling probabilities were calculated separately for each sampling stage and for each EA. Formulas use the following notations:

P_{1hi}: first stage sampling probability of the i^{th} EA in stratum h

P_{2hi}: second-stage sampling probability within the i^{th} EA (households)

P_{hi}: overall sampling probability of any households of the i^{th} EA in stratum h

Let a_h be the number of EAs selected in stratum h, M_{hi} the number of households according to the sampling frame in the i^{th} EA, and $\sum M_{hi}$ the total number of households in the stratum h. The probability of selecting the i^{th} EA in stratum h is calculated as follows:

$$P_{1hi} = \frac{a_h M_{hi}}{\sum M_{hi}}$$

Let a_h be the proportion of households in the selected segment compared with the total number of households in EA i in stratum h if the EA is segmented, otherwise $b_{hi} = 1$. Let L_{hi} be the number of households listed in the household listing operation in EA i in stratum h, let g_{hi} be the number of households selected in the EA. The second stage selection probability for each household in the EA is calculated as follows:

$$P_{2hi} = \frac{g_{hi}}{L_{hi}} \times b_{hi}$$

The overall selection probability of each household in EA i of stratum h is the product of the selection probabilities:

$$P_{hi} = P_{1hi} \times P_{2hi}$$

The sampling weight for each household in EA i of stratum h is the inverse of its selection probability:

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

This weight was adjusted for household non-response. The adjusted weight was further normalized for the whole sample so that the total number of weighted cases was equal to the number of unweighted cases. This normalized household weight is the gross sample weight for individuals (eligible women) living in the households in the same EA. This weight was further adjusted for individual non-response and then normalized to get the final individual sample weight.

Table A.1: Allocation of the sample by epidemiological zone and residence

Malaria zone	1999 households		Proportional allocation	Power allocation	Sample size		Sample clusters			Sampled households		
	Number	Percentage rural			Households	Clusters	Rural	Urban	Total	Rural	Urban	Total
Highland epidemic	1,143,937	0.89	0.18	0.20	1,410	47	42	5	47	1,260	150	1,410
Lake endemic	1,299,315	0.87	0.21	0.21	1,500	50	44	6	50	1,320	180	1,500
Coast endemic	485,070	0.49	0.08	0.14	1,020	34	24	10	34	720	300	1,020
Semi-arid, seasonal	1,265,263	0.89	0.20	0.20	1,470	49	44	5	49	1,320	150	1,470
Low risk	2,105,525	0.57	0.33	0.25	1,800	60	42	18	60	1,260	540	1,800
Total	***6,299,110***	***0.75***	***1.00***		***7,200***	***240***	***196***	***44***	***240***	***5,880***	***1,320***	***7,200***

Table A.2: Allocation of sample clusters and households by malaria zone, province, district and residence

Malaria zone	Province	District	Sampled clusters			Sampled households		
			Rural	Urban	Total	Rural	Urban	Total
Highland epidemic prone	Nyanza	Gucha	3		3	90		90
	Nyanza	Kisii Central	3		3	90		90
	Nyanza	Kisii North	3	1	4	90	30	120
	Rift Valley	Bomet	3		3	90		90
	Rift Valley	Kericho	4		4	120		120
	Rift Valley	Koibatek	2	1	3	60	30	90
	Rift Valley	Nandi	3		3	90		90
	Rift Valley	Narok	3		3	90		90
	Rift Valley	Trans Mara	2	1	3	60	30	90
	Rift Valley	Trans Nzoia	4		4	120		120
	Rift Valley	Uasin Gishu	3	1	4	90	30	120
	Rift Valley	West Pokot	2		2	60		60
	Rift Valley	Buret	3		3	90		90
	Western	Mt. Elgon	2		2	60		60
	Western	Lugari	2	1	3	60	30	90
	Total		*42*	*5*	*47*	*1,260*	*150*	*1,410*
Lake endemic	Nyanza	Homa Bay	4	1	5	120	30	150
	Nyanza	Kisumu	2	1	3	60	30	90
	Nyanza	Kuria	3		3	90		90
	Nyanza	Migori	3	1	4	90	30	120
	Nyanza	Rachuonyo	3		3	90		90
	Nyanza	Siaya	4		4	120		120
	Nyanza	Suba	2		2	60		60
	Nyanza	Bondo	3	1	4	90	30	120
	Nyanza	Nyando	3		3	90		90
	Western	Bungoma	4	1	5	120	30	150
	Western	Busia	2		2	60		60
	Western	Kakamega	3		3	90		90
	Western	Teso	3	1	4	90	30	120
	Western	Vihiga	3		3	90		90
	Western	Butere/Mumias	2		2	60		60
	Total		*44*	*6*	*50*	*1,320*	*180*	*1,500*

Continued

Table A.2, *continued:* Allocation of sample clusters and households by malaria zone, province, district and residence

Malaria zone	Province	District	Sampled clusters			Sampled households		
			Rural	Urban	Total	Rural	Urban	Total
Moderate to low risk	Coast	Kilifi	5	1	6	150	30	180
	Coast	Kwale	6	1	7	180	30	210
	Coast	Lamu	3	1	4	90	30	120
	Coast	Mombasa		5	5		150	150
	Coast	Taita Taveta	5	1	6	150	30	180
	Coast	Malindi	5	1	6	150	30	180
	Total		*24*	*10*	*34*	*720*	*300*	*1,020*
Semi-arid /Seasonal risk	Coast	Tana River	2		2	60		60
	Eastern	Embu	2		2	60		60
	Eastern	Isiolo	2		2	60		60
	Eastern	Kitui	2	1	3	60	30	90
	Eastern	Makueni	2		2	60		60
	Eastern	Marsabit	2		2	60		60
	Eastern	Mbeere	2		2	60		60
	Eastern	Meru Central	3	1	4	90	30	120
	Eastern	Moyale	2		2	60		60
	Eastern	Mwingi	2		2	60		60
	Eastern	Meru North	3		3	90		90
	Eastern	Tharaka	1		1	30		30
	Eastern	Nithi	3		3	90		90
	North Eastern	Garissa	1	1	2	30	30	60
	North Eastern	Mandera	2		2	60		60
	North Eastern	Wajir	2		2	60		60
	Rift Valley	Baringo	2	1	3	60	30	90
	Rift Valley	Keiyo	2		2	60		60
	Rift Valley	Kajiado	2		2	60		60
	Rift Valley	Marakwet	2		2	60		60
	Rift Valley	Samburu	1	1	2	30	30	60
	Rift Valley	Turkana	2		2	60		60
	Total		*44*	*5*	*49*	*1,320*	*150*	*1,470*
Low risk	Nairobi	Nairobi		10	10		300	300
	Central	Kiambu	4	1	5	120	30	150
	Central	Kirinyaga	4	1	5	120	30	150
	Central	Murang'a	4		4	120		120
	Central	Nyandarua	4		4	120		120
	Central	Nyeri	5	1	6	150	30	180
	Central	Thika	4	1	5	120	30	150
	Central	Maragua	5	1	6	150	30	180
	Central	Machakos	4	1	5	120	30	150
	Rift Valley	Laikipia	3		3	90		90
	Rift Valley	Nakuru	5	2	7	150	60	210
	Total	*42*	*18*	*60*	*1,260*	*540*	*1,800*	
Total			***196***	***44***	***240***	***5,880***	***1,320***	***7,200***

Table A.3: Sample implementation

Percentage distribution of households and eligible women by results of the household and individual interviews, and household, eligible women and overall response rates, according to urban-rural residence and malaria endemicity (unweighted)

Result	Residence		Malaria endemicity					
	Urban	Rural	Highland epidemic	Lake endemic	Coast endemic	Semi-arid, seasonal	Low risk	Total
Selected households								
Completed (C)	88.1	91.1	92.0	93.4	94.5	81.3	92.1	90.5
Household present but no competent respondent at home (HP)	4.1	5.7	3.7	2.9	2.2	15.0	2.8	5.4
Postponed (P)	0.5	0.1	0.1	0.0	0.3	0.3	0.3	0.2
Refused (R)	2.8	0.8	0.8	1.1	1.2	0.9	1.6	1.1
Dwelling not found (DNF)	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Household absent (HA)	3.9	2.0	2.8	2.6	1.5	2.2	2.4	2.4
Dwelling vacant/address not a dwelling (DV)	0.1	0.1	0.2	0.0	0.0	0.0	0.1	0.1
Other (O)	0.5	0.3	0.4	0.1	0.4	0.1	0.6	0.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of sampled households	1,324	5,899	1,418	1,502	1,023	1,474	1,806	7,223
Household response rate (HRR)[1]	92.2	93.3	95.3	96.0	96.3	83.3	95.1	93.1
Eligible women								
Completed (EWC)	90.9	94.6	93.7	93.5	96.9	97.2	90.0	93.9
Partly completed (EWPC)	3.0	3.5	4.2	4.9	1.5	1.2	4.3	3.4
Other (EWO)	6.1	1.9	2.1	1.6	1.5	1.6	5.7	2.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of women	1,055	5,065	1,307	1,334	974	1,081	1,424	6,120
Eligible women response rate (EWRR)[2]	90.9	94.6	93.7	93.5	96.9	97.2	90.0	93.9
Overall response rate (OWRR)[3]	83.8	88.2	89.3	89.7	93.3	81.0	85.6	87.4

[1]Using the number of households falling into specific response categories, the household response rate (HRR) is calculated as:

$$\frac{100 \times C}{C+HP+P+R+DNF}$$

[2] The eligible woman response rate (EWRR) is equivalent to the percentage of interviews completed (EWC)
[3] The overall woman response rate (OWRR) is calculated as: OWRR = HRR * EWRR/100

Table A.4: List of selected variables for sampling errors

Variable	Type of estimate	Base population
Ownership of at least 1 insecticide-treated net (ITN)*	Proportion	Households
Had indoor residual spraying in last 12 months	Proportion	Households
Slept under an ITN last night *	Proportion	All de facto household members
Child slept under an ITN last night *	Proportion	Children under 5 in household
Pregnant woman slept under an ITN last night*	Proportion	Pregnant women 15–49 in household
Received 2+ doses of SP at least 1 during ANC visit (IPTp)	Proportion	Last birth of women 15–49 in last 2 years
Child has fever in last 2 weeks	Proportion	Children under 5 in woman's birth history
Child took ACT	Proportion	Children under 5 with fever in last 2 weeks
Child under 15 has malaria (based on slides)	Proportion	Children 3 months–14 years tested for malaria
Child under 5 has malaria (based on slides)	Proportion	Children 3 months–4 years tested for malaria
Child under 15 has anaemia (any)	Proportion	Children 6 months–14 years tested for anaemia
Child under 5 has anaemia (any)	Proportion	Children 6 months–4 years tested for anaemia

* An insecticide-treated net is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked in a K-O tab 1-2-3 binding agent in past 2 years or (3) a net that has been soaked with any insecticide within the past 6 months.

Table A.5: Sampling errors for all Kenya

Variable	Value (R)	Standard error (SE)	Number of cases		Design effect (DEFT)	Relative error (SE/R)	Confidence limits	
			Unweighted (N)	Weighted (WN)			R–2SE	R+2SE
Ownership of at least 1 ITN	0.479	0.018	6538	6538	2.964	0.038	0.443	0.516
Had IRS in last 12 months	0.108	0.014	6538	6538	3.689	0.131	0.079	0.136
Slept under an ITN last night	0.322	0.013	26946	26144	4.619	0.041	0.296	0.348
Child slept under an ITN last night	0.422	0.016	4873	4694	2.256	0.038	0.390	0.454
Pregnant woman slept under an ITN last night	0.412	0.034	396	389	1.373	0.082	0.344	0.480
Received 2+ doses of SP at ANC (IPTp)	0.254	0.016	1547	1509	1.486	0.065	0.221	0.287
Child has fever in last 2 weeks	0.273	0.015	3032	2814	1.854	0.055	0.243	0.303
Child took ACT	0.180	0.017	858	769	1.310	0.095	0.146	0.215
Child under 15 has malaria (based on slides)	0.113	0.008	11140	10600	2.828	0.075	0.096	0.130
Child under 5 has malaria (based on slides)	0.081	0.008	4207	4043	1.930	0.101	0.064	0.097
Child under 15 has anaemia (any)	0.261	0.009	11226	10654	2.105	0.033	0.243	0.278
Child under 5 has anaemia (any)	0.462	0.013	4113	3940	1.646	0.028	0.436	0.487

Table A.6: Sampling errors for urban areas

Variable	Value (R)	Standard error (SE)	Number of cases		Design effect (DEFT)	Relative error (SE/R)	Confidence limits	
			Unweighted (N)	Weighted (WN)			R-2SE	R+2SE
Ownership of at least 1 ITN	0.496	0.049	1166	1594	3.368	0.100	0.397	0.594
Had IRS in last 12 months	0.022	0.010	1166	1594	2.439	0.480	0.001	0.043
Slept under an ITN last night	0.377	0.036	3676	4895	4.523	0.096	0.305	0.450
Child slept under an ITN last night	0.463	0.044	602	784	2.156	0.095	0.375	0.551
Pregnant woman slept under an ITN last night	0.376	0.096	55	86	1.464	0.257	0.183	0.568
Received 2+ doses of SP at ANC (IPTp)	0.289	0.052	204	295	1.634	0.180	0.185	0.393
Child has fever in last 2 weeks	0.264	0.049	315	397	1.986	0.187	0.165	0.363
Child took ACT	0.158	0.054	81	105	1.323	0.342	0.050	0.265
Child under 15 has malaria (based on slides)	0.047	0.020	1194	1502	3.191	0.415	0.008	0.086
Child under 5 has malaria (based on slides)	0.043	0.020	494	635	2.240	0.477	0.002	0.084
Child under 15 has anaemia (any)	0.236	0.023	1206	1515	1.865	0.097	0.190	0.281
Child under 5 has anaemia (any)	0.432	0.030	486	620	1.325	0.069	0.372	0.491

Table A.7: Sampling errors for rural areas

Variable	Value (R)	Standard error (SE)	Number of cases		Design effect (DEFT)	Relative error (SE/R)	Confidence limits	
			Unweighted (N)	Weighted (WN)			R–2SE	R+2SE
Ownership of at least 1 ITN	0.474	0.018	5372	4944	2.672	0.038	0.437	0.510
Had IRS in last 12 months	0.135	0.018	5372	4944	3.881	0.134	0.099	0.172
Slept under an ITN last night	0.309	0.014	23270	21249	4.532	0.044	0.282	0.337
Child slept under an ITN last night	0.414	0.017	4271	3910	2.255	0.041	0.380	0.448
Pregnant woman slept under an ITN last night	0.422	0.034	341	303	1.259	0.080	0.355	0.490
Received 2+ doses of SP at ANC (IPTp)	0.246	0.016	1343	1215	1.385	0.066	0.213	0.278
Child has fever in last 2 weeks	0.275	0.016	2717	2417	1.810	0.056	0.244	0.306
Child took ACT	0.184	0.018	777	664	1.268	0.096	0.148	0.219
Child under 15 has malaria (based on slides)	0.123	0.009	9946	9098	2.843	0.076	0.105	0.142
Child under 5 has malaria (based on slides)	0.088	0.009	3713	3408	1.911	0.101	0.070	0.105
Child under 15 has anaemia (any)	0.265	0.009	10020	9139	2.134	0.036	0.246	0.284
Child under 5 has anaemia (any)	0.467	0.014	3627	3320	1.702	0.030	0.439	0.495

Table A.8: Sampling errors for highland epidemic zone

Variable	Value (R)	Standard error (SE)	Number of cases		Design effect (DEFT)	Relative error (SE/R)	Confidence limits	
			Unweighted (N)	Weighted (WN)			R–2SE	R+2SE
Ownership of at least 1 ITN	0.506	0.032	1305	1269	2.328	0.064	0.441	0.570
Had IRS in last 12 months	0.380	0.051	1305	1269	3.797	0.134	0.277	0.482
Slept under an ITN last night	0.323	0.023	5893	5664	3.930	0.074	0.275	0.371
Child slept under an ITN last night	0.437	0.028	1145	1100	1.926	0.065	0.381	0.494
Pregnant woman slept under an ITN last night	0.376	0.067	86	82	1.167	0.163	0.253	0.499
Received 2+ doses of SP at ANC (IPTp)	0.247	0.028	393	377	1.334	0.118	0.189	0.305
Child has fever in last 2 weeks	0.240	0.028	889	851	1.971	0.118	0.183	0.296
Child took ACT	0.131	0.028	211	204	1.203	0.214	0.075	0.187
Child under 15 has malaria (based on slides)	0.033	0.010	2556	2447	2.803	0.300	0.013	0.053
Child under 5 has malaria (based on slides)	0.021	0.006	1001	965	1.399	0.305	0.008	0.033
Child under 15 has anaemia (any)	0.255	0.021	2551	2439	2.416	0.082	0.213	0.296
Child under 5 has anaemia (any)	0.447	0.029	965	928	1.818	0.065	0.389	0.505

Table A.9: Sampling errors for lake endemic zone

Variable	Value (R)	Standard error (SE)	Number of cases		Design effect (DEFT)	Relative error (SE/R)	Confidence limits	
			Unweighted (N)	Weighted (WN)			R–2SE	R+2SE
Ownership of at least 1 ITN	0.602	0.034	1403	1339	2.577	0.056	0.535	0.669
Had IRS in last 12 months	0.153	0.042	1403	1339	4.419	0.278	0.068	0.238
Slept under an ITN last night	0.381	0.023	6214	5927	3.686	0.060	0.335	0.426
Child slept under an ITN last night	0.479	0.030	1250	1187	2.108	0.062	0.419	0.539
Pregnant woman slept under an ITN last night	0.583	0.064	89	88	1.225	0.111	0.454	0.711
Received 2+ doses of SP at ANC (IPTp)	0.220	0.028	372	365	1.320	0.129	0.163	0.277
Child has fever in last 2 weeks	0.409	0.026	652	596	1.367	0.064	0.356	0.461
Child took ACT	0.239	0.030	265	244	1.148	0.126	0.179	0.299
Child under 15 has malaria (based on slides)	0.381	0.030	2901	2742	3.297	0.078	0.322	0.441
Child under 5 has malaria (based on slides)	0.268	0.029	1122	1057	2.229	0.110	0.209	0.327
Child under 15 has anaemia (any)	0.343	0.018	2899	2743	1.988	0.051	0.308	0.378
Child under 5 has anaemia (any)	0.527	0.027	1084	1025	1.777	0.051	0.473	0.581

Table A.10: Sampling errors for coastal endemic zone

Variable	Value (R)	Standard error (SE)	Number of cases		Design effect (DEFT)	Relative error (SE/R)	Confidence limits	
			Unweighted (N)	Weighted (WN)			R–2SE	R+2SE
Ownership of at least 1 ITN	0.622	0.036	967	495	2.308	0.058	0.550	0.694
Had IRS in last 12 months	0.014	0.004	967	495	1.170	0.314	0.005	0.023
Slept under an ITN last night	0.457	0.034	4225	2041	4.425	0.074	0.389	0.525
Child slept under an ITN last night	0.550	0.038	730	342	2.084	0.070	0.473	0.627
Pregnant woman slept under an ITN last night	0.491	0.096	68	27	1.578	0.196	0.298	0.684
Received 2+ doses of SP at ANC (IPTp)	0.220	0.049	251	115	1.886	0.224	0.121	0.319
Child has fever in last 2 weeks	0.298	0.037	529	233	1.848	0.123	0.224	0.371
Child took ACT	0.267	0.054	159	70	1.542	0.203	0.159	0.376
Child under 15 has malaria (based on slides)	0.043	0.012	1703	794	2.524	0.287	0.018	0.068
Child under 5 has malaria (based on slides)	0.020	0.008	614	287	1.483	0.416	0.003	0.037
Child under 15 has anaemia (any)	0.277	0.023	1765	816	2.157	0.083	0.231	0.323
Child under 5 has anaemia (any)	0.505	0.031	621	289	1.552	0.062	0.443	0.567

Table A.11: Sampling errors for semi-arid, seasonal risk zone

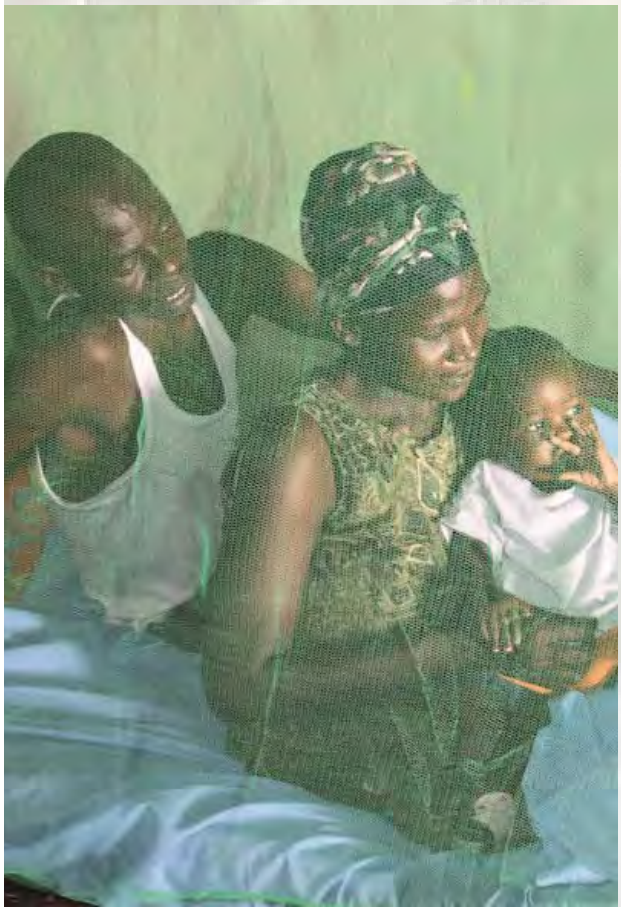
Variable	Value (R)	Standard error (SE)	Number of cases		Design effect (DEFT)	Relative error (SE/R)	Confidence limits	
			Unweighted (N)	Weighted (WN)			R–2SE	R+2SE
Ownership of at least 1 ITN	0.469	0.041	1199	1439	2.825	0.087	0.387	0.550
Had IRS in last 12 months	0.002	0.001	1199	439	0.893	0.519	0.000	0.005
Slept under an ITN last night	0.314	0.034	4965	5858	5.210	0.109	0.245	0.382
Child slept under an ITN last night	0.392	0.039	922	1103	2.399	0.098	0.315	0.470
Pregnant woman slept under an ITN last night	0.402	0.061	70	83	1.037	0.152	0.279	0.524
Received 2+ doses of SP at ANC (IPTp)	0.276	0.036	306	359	1.393	0.129	0.205	0.347
Child has fever in last 2 weeks	0.207	0.027	663	785	1.689	0.129	0.154	0.260
Child took ACT	0.166	0.033	159	162	1.100	0.196	0.101	0.232
Child under 15 has malaria (based on slides)	0.005	0.003	2098	2484	1.829	0.589	0.000	0.010
Child under 5 has malaria (based on slides)	0.001	0.001	778	931	0.926	0.978	0.000	0.003
Child under 15 has anaemia (any)	0.255	0.019	2123	2514	2.046	0.076	0.217	0.294
Child under 5 has anaemia (any)	0.482	0.029	767	917	1.582	0.059	0.425	0.539

Table A.12: Sampling errors for low risk zone

Variable	Value (R)	Standard error (SE)	Number of cases		Design effect (DEFT)	Relative error (SE/R)	Confidence limits	
			Unweighted (N)	Weighted (WN)			R–2SE	R+2SE
Ownership of at least 1 ITN	0.352	0.042	1664	1996	3.576	0.119	0.268	0.435
Had IRS in last 12 months	0.004	0.002	1664	1996	1.051	0.414	0.001	0.007
Slept under an ITN last night	0.235	0.029	5649	6655	5.145	0.124	0.177	0.293
Child slept under an ITN last night	0.323	0.037	826	961	2.295	0.116	0.248	0.397
Pregnant woman slept under an ITN last night	0.289	0.078	83	109	1.563	0.270	0.133	0.446
Received 2+ doses of SP at ANC (IPTp)	0.292	0.048	225	292	1.595	0.166	0.195	0.389
Child has fever in last 2 weeks	0.257	0.051	299	349	2.035	0.201	0.154	0.360
Child took ACT	0.089	0.039	64	90	1.099	0.444	0.010	0.167
Child under 15 has malaria (based on slides)	0.011	0.009	1882	2133	3.850	0.854	0.000	0.029
Child under 5 has malaria (based on slides)	0.019	0.015	692	804	2.897	0.787	0.000	0.050
Child under 15 has anaemia (any)	0.162	0.012	1888	2141	1.415	0.074	0.138	0.186
Child under 5 has anaemia (any)	0.353	0.021	676	782	1.118	0.058	0.312	0.394

APPENDIX B

Survey Questionnaires



Household Questionnaire

- Usual members and visitors: Age, sex, relationship to the head of the household
- Characteristics of the household's dwelling unit: Source of water, type of toilet facilities, materials used for the floor, walls and roof of the house, cooking fuel, availability of electricity, etc.
- Ownership of certain possessions such as clocks, radios, telephones, fans, sewing machines, ploughs, bicycles, etc.
- Indoor residual spraying
- Ownership and use of mosquito nets, whether simple or treated with insecticide, how to hang, how to use
- Attitudes about malaria
- Results of the request for doing anaemia and malaria testing on young children

Woman's Questionnaire

- Consenting women aged 15–49 years
- Background characteristics: Age, education, religion, ethnicity, ability to read a simple sentence
- Reproductive history: Number of children, antenatal care,
- Use of intermittent preventive treatment (IPT) during pregnancy for recent births
- Fever prevalence and treatment among children under five, including iron supplements
- Knowledge and attitudes regarding malaria and child survival, awareness of the latest antimalaria medication

CONFIDENTIAL

DIVISION OF MALARIA CONTROL

KENYA MALARIA INDICATOR SURVEY 2010

HOUSEHOLD QUESTIONNAIRE

IDENTIFICATION

PROVINCE _____

DISTRICT _____

KMIS CLUSTER NUMBER . . . . . | | | |

HOUSEHOLD NUMBER . . . . . | | | |

INTERVIEWER VISITS

	1	2	3	FINAL VISIT
DATE				DAY / MONTH / YEAR (2010)
INTERVIEWER'S NAME				INTER. CODE
RESULT**				FINAL RESULT
NEXT VISIT: DATE				TOTAL NUMBER OF VISITS
TIME				

**RESULT CODES:

1 COMPLETED
2 NO HOUSEHOLD MEMBER HOME/NO COMPETENT RESPONDENT HOME AT TIME OF VISIT
3 ENTIRE HOUSEHOLD ABSENT FOR EXTENDED PERIOD OF TIME
4 POSTPONED
5 REFUSED
6 DWELLING VACANT OR ADDRESS NOT A DWELLING
7 DWELLING DESTROYED
8 DWELLING NOT FOUND
9 OTHER _____ (SPECIFY)

TOTAL PERSONS IN HOUSEHOLD | |

TOTAL WOMEN 15-49 | |

INTRODUCTION AND CONSENT

Hello, my name is __ and I'm from the Ministry of Health. We are talking to people all over Kenya about malaria. The information we collect will help the government to plan health services. Your household was selected for the survey. I would like to ask you some questions about your household. The questions usually take about 15 to 20 minutes. All of the answers you give will be kept confidential and will not be shared with anyone other than members of our survey team.

You do not have to be in the survey. If I ask any question you don't want to answer, just let me know and I will go on to the next question; or you can stop the interview at any time. However, we hope you will agree to answer the questions since your views are important.

Do you have any questions? May I begin the interview now?

Signature of interviewer: _____ Date: _____

RESPONDENT AGREES TO BE INTERVIEWED . . . 1 ↓

RESPONDENT DOES NOT AGREE TO BE INTERVIEWED . . . 2 → END

HOUSEHOLD SCHEDULE

LINE NO.	USUAL RESIDENTS AND VISITORS	RELA-TION-SHIP	SEX	RESIDENCE		AGE	WOMEN AGE 15-49		CHILD-REN < 15
	Please give me the names of the persons who usually live in your household and guests of the household who stayed here last night, starting with the head of the household. AFTER LISTING THE NAMES, RELATIONSHIP AND SEX FOR EACH PERSON, ASK QUESTIONS 2A-2C TO BE SURE THE LISTING IS COMPLETE. THEN ASK APPROPRIATE QUESTIONS IN COLUMNS 5-14 FOR EACH PERSON.	What is the relation-ship of (NAME) to the head of the house-hold? SEE CODES BELOW.	Is (NAME) male or female?	Does (NAME) usually live here?	Did (NAME) stay here last night?	How old is (NAME)? IF 95 OR MORE, WRITE '95'.	CIRCLE LINE NUM-BER OF ALL WOMEN AGE 15-49	Is (NAME) currently pregnant?	CIRCLE LINE NUM-BER OF ALL CHILD-REN AGE 0-14
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
			M F	YES NO	YES NO			Y N DK	
01			1 2	1 2	1 2		01	1 2 8	01
02			1 2	1 2	1 2		02	1 2 8	02
03			1 2	1 2	1 2		03	1 2 8	03
04			1 2	1 2	1 2		04	1 2 8	04
05			1 2	1 2	1 2		05	1 2 8	05
06			1 2	1 2	1 2		06	1 2 8	06
07			1 2	1 2	1 2		07	1 2 8	07
08			1 2	1 2	1 2		08	1 2 8	08

CODES FOR Q. 3: RELATIONSHIP TO HEAD OF HOUSEHOLD

01 = HEAD
02 = WIFE OR HUSBAND
03 = SON OR DAUGHTER
04 = SON-IN-LAW OR DAUGHTER-IN-LAW
05 = GRANDCHILD
06 = PARENT
07 = PARENT-IN-LAW
08 = BROTHER OR SISTER
09 = OTHER RELATIVE
10 = ADOPTED/FOSTER/STEP CHILD
11 = NOT RELATED
98 = DON'T KNOW

HOUSEHOLD SCHEDULE

LINE NO.	USUAL RESIDENTS AND VISITORS	RELA-TION-SHIP	SEX	RESIDENCE		AGE	WOMEN AGE 15-49		CHILD-REN < 15
	Please give me the names of the persons who usually live in your household and guests of the household who stayed here last night, starting with the head of the household. AFTER LISTING THE NAMES, RELATIONSHIP AND SEX FOR EACH PERSON, ASK QUESTIONS 2A-2C TO BE SURE THE LISTING IS COMPLETE. THEN ASK APPROPRIATE QUESTIONS IN COLUMNS 5-14 FOR EACH PERSON.	What is the relation-ship of (NAME) to the head of the house-hold? SEE CODES BELOW.	Is (NAME) male or female?	Does (NAME) usually live here?	Did (NAME) stay here last night?	How old is (NAME)? IF 95 OR MORE, WRITE '95'.	CIRCLE LINE NUM-BER OF ALL WOMEN AGE 15-49	Is (NAME) currently pregnant?	CIRCLE LINE NUM-BER OF ALL CHILD-REN AGE 0-14
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
			M F	Y N	Y N	IN YEARS		Y N DK	
09			1 2	1 2	1 2		09	1 2 8	09
10			1 2	1 2	1 2		10	1 2 8	10
11			1 2	1 2	1 2		11	1 2 8	11
12			1 2	1 2	1 2		12	1 2 8	12
13			1 2	1 2	1 2		13	1 2 8	13
14			1 2	1 2	1 2		14	1 2 8	14
15			1 2	1 2	1 2		15	1 2 8	15

TICK HERE IF CONTINUATION SHEET USED ☐

2A) Just to make sure that I have a complete listing, are there any other persons such as small children or infants that we have not listed? YES ☐→ ADD ☐

2B) Are there any other people who may not be members of your family, like domestic servants, lodgers, or friends who usually live here? YES ☐→ ADD ☐

2C) Are there any guests or temporary visitors staying here, or anyone else who stayed here last night, who have not been listed? YES ☐→ ADD ☐

HOUSEHOLD CHARACTERISTICS

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES			SKIP
101	What is the main source of drinking water for members of your household?	PIPED WATER PIPED INTO DWELLING . . . . . 11 PIPED TO COMPOUND/PLOT . . . . . 12 PUBLIC TAP/STANDPIPE . . . . . 13 BOREHOLE . . . . . 14 OPEN WELL IN COMPOUND/PLOT . . . . . 21 OPEN PUBLIC WELL . . . . . 31 COVERED WELL IN COMPOUND/PLOT 32 RAINWATER . . . . . 41 BOTTLED WATER . . . . . 42 COVERED PUBLIC WELL . . . . . 51 SPRING . . . . . 61 RIVER/STREAM . . . . . 71 POND/LAKE . . . . . 81 DAM . . . . . 96 OTHER _____ 91 (SPECIFY)			
102	What kind of toilet facility do members of your household usually use?	FLUSH TOILET . . . . . 11 TRADITIONAL PIT TOILET . . . . . 12 VENTILATED IMPROVED PIT TOILET . . . 13 NO FACILITY/BUSH/FIELD . . . . . 61 OTHER 96			
103	Does your household have:		YES	NO	
	A clock or watch?	CLOCK/WATCH	1	2	
	Electricity?	ELECTRICITY	1	2	
	A radio?	RADIO	1	2	
	A television?	TELEVISION	1	2	
	A mobile telephone?	MOBILE TELEPHONE	1	2	
	A non-mobile telephone?	NON-MOBILE TELEPHONE .	1	2	
	A refrigerator?	REFRIGERATOR	1	2	
	A solar panel?	SOLAR PANEL	1	2	
	Fan?	FAN	1	2	
	Sewing machine?	SEWING MACHINE	1	2	
	Cassette player?	CASSETTE PLAYER	1	2	
	Plough?	PLOW	1	2	
	Grain grinder?	GRAIN GRINDER	1	2	
	VCR/DVD?	VCR/DVD	1	2	
	Tractor?	TRACTOR	1	2	
	Hammer mill?	HAMMER MILL	1	2	
	NONE OF THE ABOVE	NONE	1	2	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
104	What type of fuel does your household mainly use for cooking?	ELECTRICITY . . . . . 01 LPG/ NATURAL GAS . . . . . 02 BIOGAS . . . . . 03 KEROSENE . . . . . 04 COAL, LIGNITE . . . . . 05 CHARCOAL . . . . . 06 FIREWOOD/STRAW . . . . . 07 DUNG . . . . . 08 NO FOOD COOKED IN HOUSE . . . . . 09 OTHER 96	
105	MAIN MATERIAL OF THE FLOOR.	EARTH/SAND . . . . . 11 DUNG . . . . . 12 WOOD PLANKS . . . . . 21 VINYL OR ASPHALT STRIPS . . . . . 32 CERAMIC TILES . . . . . 33 CEMENT . . . . . 34 OTHER 96	
106	MAIN MATERIAL OF THE ROOF.	THATCH / LEAF . . . . . 11 STICKS AND MUD . . . . . 12 RUSTIC MAT / PLASTIC SHEET . . . . . 21 REED / BAMBOO . . . . . 22 WOOD PLANKS . . . . . 23 CORRUGATED IRON . . . . . 31 WOOD . . . . . 32 CALAMINE / CEMENT FIBER . . . . . 33 CEMENT / CONCRETE . . . . . 34 ROOFING SHINGLES . . . . . 35 OTHER 96	
107	MAIN MATERIAL OF THE WALLS. RECORD OBSERVATION.	NO WALLS . . . . . 11 CANE/STICKS/BAMBOO/REED . . . . . 12 BAMBOO/WOOD WITH MUD . . . . . 21 STONE WITH MUD . . . . . 22 UNCOVERED ADOBE . . . . . 23 PLYWOOD . . . . . 24 CARTON . . . . . 25 CEMENT . . . . . 31 STONE WITH LIME/CEMENT . . . . . 32 BRICKS . . . . . 33 CEMENT BLOCKS . . . . . 34 COVERED ADOBE . . . . . 35 WOOD PLANKS/SHINGLES . . . . . 36 OTHER _____ 96 (SPECIFY)	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
108	How many rooms in this household are used for sleeping?	ROOMS . . . . . [ ][ ]	
109	Does any member of this household own:	**YES** NO	
	A bicycle?	BICYCLE 1 2	
	A motorcycle or motor scooter?	MOTORCYCLE/SCOOTER . . . 1 2	
	An animal-drawn cart?	ANIMAL-DRAWN CART 1 2	
	A car, truck, or boat with a motor?	CAR/TRUCK/BOAT 1 2	
110	At any time in the past 12 months, has anyone come into your dwelling to spray the inside walls against mosquitoes to control malaria?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	→ 113
111	How many months ago was the house sprayed? IF LESS THAN ONE MONTH, WRITE '00'	MONTHS AGO . . . . . [ ][ ]	
112	Who sprayed the house?	GOVERNMENT WORKER/PROGRAM . . . . . A PRIVATE COMPANY . . . . . B HOUSEHOLD MEMBER . . . . . C OTHER _____ X (SPECIFY) DON'T KNOW . . . . . Y	
113	Does your household have any mosquito nets that can be used while sleeping?	YES . . . . . 1 NO 2	→ 127
114	How many mosquito nets does your household have? IF 7 OR MORE NETS, RECORD '7'.	NUMBER OF NETS . . . . . [ ]	

		NET #1	NET #2	NET #3
115	ASK THE RESPONDENT TO SHOW YOU THE NETS IN THE HOUSEHOLD. IF MORE THAN 3 NETS, USE ADDITIONAL QUESTIONNAIRE(S).	OBSERVED . . . . . 1 NOT OBSERVED . 2	OBSERVED . . . . . 1 NOT OBSERVED . 2	OBSERVED . . . . . 1 NOT OBSERVED . 2
116	How many months ago did your household obtain the mosquito net? IF LESS THAN ONE MONTH, RECORD '00'.	MONTHS AGO . . . . . [ ][ ] MORE THAN 37 MONTHS AGO . . . 95 YEARS AGC 98	MONTHS AGO . . . . . [ ][ ] MORE THAN 37 MONTHS AGO . . . 95 NOT SURE 98	MONTHS AGO . . . . . [ ][ ] MORE THAN 37 MONTHS AGO . . . 95 NOT SURE 98
117	Where did your household get this net?	GOVT.CAMPAIGN . 11 GOVT.CLINIC/HOSP 12 OTHER CLINIC/HOSP 13 NEIGHBOURHOOD . 14 HEALTH COMMITTEE 15 COMM.HEALTH WOR 16 AGENT/NGO . . . . . 17 RETAIL SHOP . . . . . 18 PHARMACY . . . . . 19 WORKPLACE . . . . 20 OTHER . . . . 96 NOT SURE 98	GOVT.CAMPAIGN . 11 GOVT.CLINIC/HOSP 12 OTHER CLINIC/HOSP 13 NEIGHBOURHOOD . 14 HEALTH COMMITTEE 15 COMM.HEALTH WOR 16 AGENT/NGO . . . . . 17 RETAIL SHOP . . . . . 18 PHARMACY . . . . . 19 WORKPLACE . . . . 20 OTHER . . . . 96 NOT SURE 98	GOVT.CAMPAIGN . 11 GOVT.CLINIC/HOSP 12 OTHER CLINIC/HOSP 13 NEIGHBOURHOOD . 14 HEALTH COMMITTEE 15 COMM.HEALTH WOR 16 AGENT/NGO . . . . . 17 RETAIL SHOP . . . . . 18 PHARMACY . . . . . 19 WORKPLACE . . . . 20 OTHER . . . . 96 NOT SURE 98
118	OBSERVE OR ASK THE BRAND/ TYPE OF MOSQUITO NET.	'LONG LASTING' NET OLYSET . . . . 11 PERMANET . . . . . 12 SUPANET EXTRA 13 OTHER/ DK BRAND . . . . . 16 (SKIP TO 124) 'CONVENTIONAL' NET KINGA NET . . . . . 21 SUPANET . . . . . 22 UNBRANDED RURAL NET . . . 23 OTHER/ DK BRAND . . . . . 26 (SKIP TO 120) OTHER . . . . 31 UNBRANDED . . . . . 32 DK BRAND 98	'LONG LASTING' NET OLYSET . . . . 11 PERMANET . . . . . 12 SUPANET EXTRA 13 OTHER/ DK BRAND . . . . . 16 (SKIP TO 124) 'CONVENTIONAL' NET KINGA NET . . . . . 21 SUPANET . . . . . 22 UNBRANDED RURAL NET . . . 23 OTHER/ DK BRAND . . . . . 26 (SKIP TO 120) OTHER . . . . 31 UNBRANDED . . . . . 32 DK BRAND 98	'LONG LASTING' NET OLYSET . . . . 11 PERMANET . . . . . 12 SUPANET EXTRA 13 OTHER/ DK BRAND . . . . . 16 (SKIP TO 124) 'CONVENTIONAL' NET KINGA NET . . . . . 21 SUPANET . . . . . 22 UNBRANDED RURAL NET . . . 23 OTHER/ DK BRAND . . . . . 26 (SKIP TO 120) OTHER . . . . 31 UNBRANDED . . . . . 32 DK BRAND 98
119	When you got the net, was it already treated with an insecticide?	YES . . . . 1 NO . . . . 2 NOT SURE 8	YES . . . . 1 NO . . . . 2 NOT SURE 8	YES . . . . 1 NO . . . . 2 NOT SURE 8
120	Since you got the mosquito net, was it ever soaked or dipped in a liquid?	YES . . . . 1 NO . . . . 2 (SKIP TO 124) NOT SURE 8	YES . . . . 1 NO . . . . 2 (SKIP TO 124) NOT SURE 8	YES . . . . 1 NO . . . . 2 (SKIP TO 124) NOT SURE 8
121	How many months ago was the net last soaked or dipped? IF LESS THAN ONE MONTH, WRITE '00'.	MONTHS AGO . . . . . [ ][ ] MORE THAN 25 MONTHS AGO . . . 95 NOT SURE 98	MONTHS AGO . . . . . [ ][ ] MORE THAN 25 MONTHS AGO . . . 95 NOT SURE 98	MONTHS AGO . . . . . [ ][ ] MORE THAN 25 MONTHS AGO . . . 95 NOT SURE 98

		NET #1	NET #2	NET #3
122	The last time the net was treated, was a liquid from a packet like this added to the treatment solution? SHOW PICTURE OF SACHET FOR K-O TAB 1-2-3 BINDING AGENT.	YES . . . . . 1 NO . . . . . 2 NOT SURE 8	YES . . . . . 1 NO . . . . . 2 NOT SURE 8	YES . . . . . 1 NO . . . . . 2 NOT SURE 8
123	The last time the net was treated, was it treated as part of a net retreatment campaign?	YES . . . . . 1 NO . . . . . 2 NOT SURE 8	YES . . . . . 1 NO . . . . . 2 NOT SURE 8	YES . . . . . 1 NO . . . . . 2 NOT SURE 8
124	Did anyone sleep under this mosquito net last night?	YES . . . . . 1 NO . . . . . 2 (SKIP TO 126) ← NOT SURE 8	YES . . . . . 1 NO . . . . . 2 (SKIP TO 126) ← NOT SURE 8	YES . . . . . 1 NO . . . . . 2 (SKIP TO 126) ← NOT SURE 8
125	Who slept under this mosquito net last night? RECORD THE PERSON'S LINE NUMBER FROM THE HOUSEHOLD SCHEDULE.	NAME_____ LINE NO.	NAME_____ LINE NO.	NAME_____ LINE NO. . . . .
		NAME_____ LINE NO.	NAME_____ LINE NO.	NAME_____ LINE NO. . . . .
		NAME_____ LINE NO.	NAME_____ LINE NO.	NAME_____ LINE NO. . . . .
		NAME_____ LINE NO.	NAME_____ LINE NO.	NAME_____ LINE NO. . . . .
126		GO BACK TO 115 FOR NEXT NET; OR, IF NO MORE NETS, GO TO 127.	GO BACK TO 115 FOR NEXT NET; OR, IF NO MORE NETS, GO TO 127.	GO TO 115 IN FIRST COLUMN OF A NEW QUESTIONNAIRE; OR, IF NO MORE NETS, GO TO 127.

ATTITUDES ABOUT MALARIA

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
127	Which color of net would you prefer: blue or white or green?	GREEN . . . . . 10 BLUE . . . . . 20 WHITE . . . . . 40 DOES NOT CARE 96	
128	Which shape of net would you prefer: conical or rectangular?	CONICAL . . . . . 10 RECTANGULAR . . . . . 20 DOES NOT CARE 96	
129	How confident are you that you can hang a mosquito net in your household: are you extremely confident, very confident, a little confident, or not at all confident?	EXTREMELY CONFIDEN . . . . . 1 VERY CONFIDENT . . . . . 2 A LITTLE CONFIDENT . . . . . 3 NOT AT ALL CONFIDENT 4	
130	How important do you think it is for young children to sleep under a treated net: is it extremely important, very important, a little important, or not at all important?	EXTREMELY IMPORTANT . . . . . 1 VERY IMPORTANT . . . . . 2 A LITTLE IMPORTANT . . . . . 3 NOT AT ALL IMPORTANT 4	
131	How frequently do you use mosquito nets for other things besides sleeping under: all the time, sometimes, rarely, or never?	ALL THE TIME . . . . . 1 SOMETIMES . . . . . 2 RARELY . . . . . 3 NEVER 4	
	Now I would like to ask your opinion about some issues. I'm going to read some statements and I would like you to tell me if you agree strongly, agree somewhat, disagree somewhat or disagree strongly.		
132	Treated nets are safe to sleep under. Do you strongly agree, somewhat agree, somewhat disagree, or strongly disagree?	STRONGLY AGREE . . . . . 1 SOMEWHAT AGREE . . . . . 2 SOMEWHAT DISAGREE . . . . . 3 STRONGLY DISAGREE 4	
133	Most people in this community sleep under an insecticide-treated net every night. Do you strongly agree, somewhat agree, somewhat disagree, or strongly disagree?	STRONGLY AGREE . . . . . 1 SOMEWHAT AGREE . . . . . 2 SOMEWHAT DISAGREE . . . . . 3 STRONGLY DISAGREE 4	
134	You can hang a net any place people sleep in your house. Do you strongly agree, somewhat agree, somewhat disagree, or strongly disagree?	STRONGLY AGREE . . . . . 1 SOMEWHAT AGREE . . . . . 2 SOMEWHAT DISAGREE . . . . . 3 STRONGLY DISAGREE 4	
135	People are at risk of getting malaria only during the rainy season. Do you strongly agree, somewhat agree, somewhat disagree, or strongly disagree?	STRONGLY AGREE . . . . . 1 SOMEWHAT AGREE . . . . . 2 SOMEWHAT DISAGREE . . . . . 3 STRONGLY DISAGREE 4	

211	RECORD RESPONSE CODE OF **ANAEMIA** TEST.	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 213)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 213)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 213)
212	RECORD HEMOGLOBIN LEVEL HERE AND IN THE ANEMIA PAMPHLET.	G/DL ☐☐.☐	G/DL ☐☐.☐	G/DL ☐☐.☐
213	RECORD RESPONSE CODE OF **MALARIA** TEST	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 217)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 217)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 217)
214	BAR CODE LABEL PASTE BAR CODE HERE AND ON SLIDES AND ON TRANSMITTAL FORM.			
215	RESULT OF **MALARIA** TEST	POSITIVE . . . . . 1 NEGATIVE . . . . . 2 (SKIP TO 217) OTHER 6	POSITIVE . . . . . 1 NEGATIVE . . . . . 2 (SKIP TO 217) OTHER 6	POSITIVE . . . . . 1 NEGATIVE . . . . . 2 (SKIP TO 217) OTHER 6
216	READ INFORMATION FOR MALARIA TREATMENT AND CONSENT STATEMENT TO PARENT OR OTHER ADULT RESPONSIBLE FOR THE CHILD. ASK ABOUT ANY TREATMENT THE CHILD HAS ALREADY RECEIVED.	ACCEPTED MEDICINE 1 _____ (SIGN) REFUSED . . . . . 2 ALREADY HAS ACT . 3 NOT ELIGIBLE . . . . . 4 OTHER 6	ACCEPTED MEDICINE 1 _____ (SIGN) REFUSED . . . . . 2 ALREADY HAS ACT . 3 NOT ELIGIBLE . . . . . 4 OTHER 6	ACCEPTED MEDICINE 1 _____ (SIGN) REFUSED . . . . . 2 ALREADY HAS ACT . 3 NOT ELIGIBLE . . . . . 4 OTHER 6
217		GO BACK TO 203 IN NEXT COLUMN IN THIS QUESTIONNAIRE OR IN THE FIRST COLUMN OF THE ADDITIONAL QUESTIONNAIRE(S); IF NO MORE CHILDREN, END INTERVIEW.		

211	RECORD RESPONSE CODE OF **ANAEMIA** TEST.	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 213)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 213)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 213)
212	RECORD HEMOGLOBIN LEVEL HERE AND IN THE ANEMIA PAMPHLET.	G/DL ☐☐.☐	G/DL ☐☐.☐	G/DL ☐☐.☐
213	RECORD RESPONSE CODE OF **MALARIA** TEST	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 217)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 217)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 217)
214	BAR CODE LABEL PASTE BAR CODE HERE AND ON SLIDES AND ON TRANSMITTAL FORM.			
215	RESULT OF **MALARIA** TEST	POSITIVE . . . . . 1 NEGATIVE . . . . . 2 (SKIP TO 217) OTHER 6	POSITIVE . . . . . 1 NEGATIVE . . . . . 2 (SKIP TO 217) OTHER 6	POSITIVE . . . . . 1 NEGATIVE . . . . . 2 (SKIP TO 217) OTHER 6
216	READ INFORMATION FOR MALARIA TREATMENT AND CONSENT STATEMENT TO PARENT OR OTHER ADULT RESPONSIBLE FOR THE CHILD. ASK ABOUT ANY TREATMENT THE CHILD HAS ALREADY RECEIVED.	ACCEPTED MEDICINE 1 _____ (SIGN) REFUSED . . . . . 2 ALREADY HAS ACT . 3 NOT ELIGIBLE . . . . . 4 OTHER 6	ACCEPTED MEDICINE 1 _____ (SIGN) REFUSED . . . . . 2 ALREADY HAS ACT . 3 NOT ELIGIBLE . . . . . 4 OTHER 6	ACCEPTED MEDICINE 1 _____ (SIGN) REFUSED . . . . . 2 ALREADY HAS ACT . 3 NOT ELIGIBLE . . . . . 4 OTHER 6
217		GO BACK TO 203 IN NEXT COLUMN IN THIS QUESTIONNAIRE OR IN THE FIRST COLUMN OF THE ADDITIONAL QUESTIONNAIRE(S); IF NO MORE CHILDREN, END INTERVIEW.		

		CHILD 4	CHILD 5	CHILD 6
202	LINE NUMBER FROM COLUMN 10 NAME FROM COLUMN 2	LINE NUMBER . . . ☐☐ NAME _____	LINE NUMBER . . . ☐☐ NAME _____	LINE NUMBER . . . ☐☐ NAME _____
203	IF MOTHER INTERVIEWED, COPY CHILD'S MONTH AND YEAR FROM BIRTH HISTORY AND ASK DAY; IF MOTHER NOT INTERVIEWED, ASK: What is (NAME'S) birth date?	DAY . . . . . ☐☐ MONTH . . . . . ☐☐ YEAR ☐☐☐☐	DAY . . . . . ☐☐ MONTH . . . . . ☐☐ YEAR ☐☐☐☐	DAY . . . . . ☐☐ MONTH . . . . . ☐☐ YEAR ☐☐☐☐
204	CHECK 203: CHILD BORN IN JANUARY 1995 OR LATER?	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 217)	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 217)	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 217)
205	CHECK 203: IS CHILD AGE 0-2 MONTHS, I.E., WAS CHILD BORN IN MONTH OF INTERVIEW OR TWO PREVIOUS MONTHS?	0-2 MONTHS . . . . . 1 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 217) OLDER 2	0-2 MONTHS . . . . . 1 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 217) OLDER 2	0-2 MONTHS . . . . . 1 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE, GO TO 217) OLDER 2
206	LINE NUMBER OF PARENT OR ADULT RESPONSIBLE FOR CHILD. RECORD '00' IF NOT LISTED.	LINE NUMBER . . . ☐☐	LINE NUMBER . . . ☐☐	LINE NUMBER . . . ☐☐
207	ASK CONSENT FOR **ANAEMIA** TEST FROM PARENT/OTHER ADULT IDENTIFIED IN 206 AS RESPONSIBLE FOR CHILD.	As part of this survey, we are asking that children all over the country take an anaemia test. Anaemia is a serious health problem that is usually caused by poor nutrition, infection, or disease. This survey will assist the government to develop programs to prevent and treat anaemia. We ask that all children 3 months to 15 years take part in anaemia testing in this survey and give a few drops of blood from a finger. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. The blood will be tested for anaemia immediately, and the result will be told to you right away. The result will be kept confidential and will not be shared with anyone other than members of our survey team. Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you allow (NAME OF CHILD/NAMES OF CHILDREN) to participate in the anemia test?		
208	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED 1 (SIGN) REFUSED 2	GRANTED 1 (SIGN) REFUSED 2	GRANTED 1 (SIGN) REFUSED 2
209	ASK CONSENT FOR **MALARIA** TEST FROM PARENT/OTHER ADULT IDENTIFIED IN 206 AS RESPONSIBLE FOR CHILD.	As part of this survey, we are asking people all over the country to take a malaria test. Malaria is a serious illness caused by a parasite transmitted by mosquito bites. This survey will assist the government to develop programs to prevent malaria. We ask that all children 3 months to 15 years take part in malaria testing in this survey and give a few drops of blood from a finger. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. We will use blood from the same finger prick made for the anemia test. The blood will be tested for malaria immediately, and the result will be told to you right away. The result will be kept confidential and will not be shared with anyone other than members of our survey team. Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you allow (NAME OF CHILD/NAMES OF CHILDREN) to participate in the malaria test?		
210	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED 1 (SIGN) REFUSED 2	GRANTED 1 (SIGN) REFUSED 2	GRANTED 1 (SIGN) REFUSED 2

CONDUCT TESTS FOR WHICH CONSENT IS GRANTED AND CONTINUE TO 211

211	RECORD RESULT CODE OF **ANAEMIA** TEST.	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 213)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 213)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 213)
212	RECORD HEMOGLOBIN LEVEL HERE AND IN THE ANEMIA PAMPHLET.	G/DL ☐☐.☐	G/DL ☐☐.☐	G/DL ☐☐.☐
213	RECORD RESULT CODE OF **MALARIA** TEST	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 217)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 217)	TESTED . . . . . 1 NOT PRESENT . . . . . 2 REFUSED . . . . . 3 OTHER . . . . . 6 (SKIP TO 217)
214	BAR CODE LABEL PASTE BAR CODE HERE AND ON SLIDES AND ON TRANSMITTAL FORM.			
215	RESULT OF **MALARIA** TEST	POSITIVE . . . . . 1 NEGATIVE . . . . . 2 (SKIP TO 217) OTHER 6	POSITIVE . . . . . 1 NEGATIVE . . . . . 2 (SKIP TO 217) OTHER 6	POSITIVE . . . . . 1 NEGATIVE . . . . . 2 (SKIP TO 217) OTHER 6
216	READ INFORMATION FOR MALARIA TREATMENT AND CONSENT STATEMENT TO PARENT OR OTHER ADULT RESPONSIBLE FOR THE CHILD. ASK ABOUT ANY TREATMENT THE CHILD HAS ALREADY RECEIVED.	ACCEPTED MEDICINE 1 _____ (SIGN) REFUSED . . . . . 2 ALREADY HAS ACT . 3 NOT ELIGIBLE . . . . . 4 OTHER 6	ACCEPTED MEDICINE 1 _____ (SIGN) REFUSED . . . . . 2 ALREADY HAS ACT . 3 NOT ELIGIBLE . . . . . 4 OTHER 6	ACCEPTED MEDICINE 1 _____ (SIGN) REFUSED . . . . . 2 ALREADY HAS ACT . 3 NOT ELIGIBLE . . . . . 4 OTHER 6
217		GO BACK TO 203 IN NEXT COLUMN IN THIS QUESTIONNAIRE OR IN THE FIRST COLUMN OF THE ADDITIONAL QUESTIONNAIRE(S); IF NO MORE CHILDREN, END INTERVIEW.		

TREATMENT FOR CHILDREN WITH POSITIVE MALARIA TESTS

IF MALARIA TEST IS POSITIVE: The malaria test shows that your child has malaria. We can give you free medicine. The medicine is called AL. AL is very effective and in a few days it should get rid of the fever and other symptoms.

BEFORE PROVIDING AL, FIRST ASK IF THE CHILD IS ALREADY TAKING OTHER DRUGS AND IF SO, ASK TO SEE THEM. IF CHILD IS ALREADY TAKING AL, CHECK ON THE DOSE ALREADY AVAILABLE. BE CAREFUL NOT TO OVERTREAT.

You do not have to give the child the medicine. This is up to you. Please tell me whether you accept the medicine or not.

DOSING SCHEDULE WITH ARTEMETHER-LUMEFANTRINE (AL)

Weight (Kg)	Approx. age	No. of tablets (each with 20 mg. A and 120 mg. Lu.) recommended at approx. hrs					
		0 hours	8 hours	24 hours	36 hours	48 hours	60 hours
< 5 kgs.	< 5 months	Nothing	Nothing	Nothing	Nothing	Nothing	Nothing
5-14.9 kgs.	5 mos.- < 3 years	1	1	1	1	1	1
15-24.9 kgs.	4-8 years	2	2	2	2	2	2
25-34.9 kgs.	9-14 years	3	3	3	3	3	3
35 + kgs.	15+ years	4	4	4	4	4	4

The second dose on the first day should be taken 8 hours after the first dose. Dosage on the 2nd and 3rd days is twice a day (12 hours apart).
IF CHILD WEIGHS LESS THAN 5 KGS., DO NOT LEAVE DRUGS. TELL PARENT TO TAKE CHILD TO HEALTH FACILITY.

First day starts by taking first dose followed by the second one 8 hours later; on subsequent days, the recommendation is simply "morning" and "evening" (around 12 hours apart). Take the medicine (crushed for smaller children) with high fat food or drinks like milk.

Make sure that the FULL 3 days treatment is taken at the recommended times, otherwise the infection may return.
If your child vomits within an hour of taking the medicine, you will need to get additional tablets and repeat the dose.

ALSO TELL THE PARENT/CARETAKER:

If [NAME] has any of the following symptoms, you should take him/her to a health professional for treatment immediately:

-- High fever
-- Fast or difficult breathing
-- Not able to drink or breastfeed
-- Gets sicker or does not get better in 2 days

CONFIDENTIAL

DIVISION OF MALARIA CONTROL

KENYA MALARIA INDICATOR SURVEY 2010

WOMAN'S QUESTIONNAIRE

IDENTIFICATION

PROVINCE _____

DISTRICT _____

KMIS CLUSTER NUMBER . . . . . .

HOUSEHOLD NUMBER . . . . . .

LINE NUMBER OF WOMAN _____

INTERVIEWER VISITS

	1	2	3	FINAL VISIT
DATE				DAY / MONTH / YEAR (2010)
INTERVIEWER'S NAME				INTER. CODE
RESULT**				FINAL RESULT
NEXT VISIT: DATE				TOTAL NUMBER OF VISITS
TIME				

*RESULT CODES:

1 COMPLETED
2 NOT AT HOME
3 POSTPONED
4 REFUSED
5 PARTLY COMPLETED
6 INCAPACITATED
7 OTHER _____ (SPECIFY)

INTRODUCTION AND CONSENT

Hello. My name is __. I am working with the Ministry of Health. We are talking to people all over the country about malaria and we would very much appreciate your participation in this survey. The information you give will help the government to plan health services. The questions usually take about 15 minutes to complete. Whatever information you give will be kept confidential and will not be shared with anyone other than members of our survey team.

You do not have to be in the survey. If I ask any question you don't want to answer, just let me know and I will go on to the next question; or you can stop the interview at any time. However, we hope you will agree to answer the questions since your views are important.

Do you have any questions? May I begin the interview now?

Signature of interviewer: _____ Date: _____

RESPONDENT AGREES TO BE INTERVIEWED . . . 1 ↓

RESPONDENT DOES NOT AGREE TO BE INTERVIEWED . . . 2 → END

SECTION 1 - RESPONDENT'S BACKGROUND

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
102	In what month and year were you born?	MONTH . . . . . ☐☐ DON'T KNOW MONTH . . . . . 98 YEAR . . . . . ☐☐☐☐ DON'T KNOW YEAR 9998	
103	How old are you?	AGE IN COMPLETED YEARS ☐☐	
104	Have you ever attended school?	YES . . . . . 1 NO 2	→108
105	What is the highest level of school you attended: primary, vocational, secondary, or higher?	NURSERY, KINDERGARTEN . . . . . 1 PRIMARY . . . . . 2 POST-PRIMARY/VOCATIONAL . . . . . 3 SECONDARY/'A' LEVEL . . . . . 4 COLLEGE (MIDDLE LEVEL) . . . . . 5 UNIVERSITY 6	
106	What is the highest (standard/class/year) you completed at that level? IF COMPLETED <1 YEAR AT THAT LEVEL, WRITE '00'.	CLASS/YEAR . . . . . ☐☐	
107	CHECK 105: PRIMARY, ☐ POST-PRIMARY/VOCATIONAL, ↓ SECONDARY OR HIGHER ☐		→109
108	Now I would like you to read this sentence to me. SHOW SENTENCES BELOW TO RESPONDENT. IF RESPONDENT CANNOT READ WHOLE SENTENCE, PROBE: Can you read any part of the sentence to me?	CANNOT READ AT ALL . . . . . 1 ABLE TO READ ONLY PARTS OF SENTENCE . . . . . 2 ABLE TO READ WHOLE SENTENCE. . 3 NO CARD WITH REQUIRED LANGUAGE _____ 4 (SPECIFY LANGUAGE) BLIND/VISUALLY IMPAIRED 5	
109	What is your religion?	ROMAN CATHOLIC . . . . . 11 PROTESTANT/OTHER CHRISTIAN . . . 21 MUSLIM . . . . . 31 NO RELIGION . . . . . 41 OTHER 99	
110	What is your ethnic group/tribe?	EMBU . . . . . 1 KALENJIN . . . . . 2 KAMBA . . . . . 3 KIKUYU . . . . . 4 KISII . . . . . 5 LUHYA . . . . . 6 LUO . . . . . 7 MASAI . . . . . 8 MERU . . . . . 9 MIJIKENDA/SWAHILI . . . . . 10 SOMALI . . . . . 11 TAITA/TAVETA . . . . . 12 OTHER _____ 96 (SPECIFY)	

SENTENCES FOR READING (Q.108):

1. The child is reading a book.
2. Farming is hard work.
3. Parents should care for their children.
4. The rains were heavy this year.

SECTION 2. REPRODUCTION

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
201	Now I would like to ask about all the births you have had during your life. Have you ever given birth?	YES . . . . . 1 NO 2	→ 206
202	Do you have any sons or daughters to whom you have given birth who are now living with you?	YES . . . . . 1 NO 2	→ 204
203	How many sons live with you? And how many daughters live with you? IF NONE, RECORD '00'.	SONS AT HOME . . . . . [ ][ ] DAUGHTERS AT HOME . . . . . [ ][ ]	
204	Do you have any sons or daughters to whom you have given birth who are alive but do not live with you?	YES . . . . . 1 NO 2	→ 206
205	How many sons are alive but do not live with you? And how many daughters are alive but do not live with you? IF NONE, RECORD '00'.	SONS ELSEWHERE . . . . . [ ][ ] DAUGHTERS ELSEWHERE . [ ][ ]	
206	Have you ever given birth to a boy or girl who was born alive but later died? IF NO, PROBE: Any baby who cried or showed signs of life but did not survive?	YES . . . . . 1 NO 2	→ 208
207	How many boys have died? And how many girls have died? IF NONE, RECORD '00'.	BOYS DEAD . . . . . [ ][ ] GIRLS DEAD . . . . . [ ][ ]	
208	SUM ANSWERS TO 203, 205, AND 207, AND ENTER TOTAL. IF NONE, RECORD '00'.	TOTAL . . . . . [ ][ ]	
209	CHECK 208: Just to make sure I have this right: you have had in TOTAL ____births during your life. Is that correct? YES ↓ NO → PROBE AND CORRECT 201-208 AS NECESSARY.		
210	CHECK 208: ONE OR MORE BIRTHS ↓ NO BIRTHS Q.208 IS '00' →		→ 225

211 Now I would like to record the names of all your births, whether still alive or not, starting with the first one you had.
RECORD NAMES OF ALL THE BIRTHS IN 213. RECORD TWINS AND TRIPLETS ON SEPARATE LINES.
(IF THERE ARE MORE THAN 12 BIRTHS, USE AN ADDITIONAL QUESTIONNAIRE, STARTING WITH THE SECOND ROW).

212 What name was given to your (first/next) baby? (NAME)	213 Is (NAME) a boy or a girl?	214 Were any of these births twins?	215 In what month and year was (NAME) born? PROBE: When is his/her birthday?	216 Is (NAME) still alive?	217 IF ALIVE: How old was (NAME) at his/her last birthday? RECORD AGE IN COMPLETED YEARS.	218 IF ALIVE: Is (NAME) living with you?	219 IF ALIVE: RECORD HOUSE-HOLD LINE NUMBER OF CHILD (RECORD '00' IF CHILD NOT LISTED IN HOUSEHOLD).	220 IF DEAD: How old was (NAME) when he/she died? IF '1 YR', PROBE: How many months old was (NAME)? RECORD DAYS IF LESS THAN 1 MONTH; MONTHS IF LESS THAN TWO YEARS; OR YEARS.	221 Were there any other live births between (NAME OF PREVIOUS BIRTH) and (NAME), including any children who died after birth?
01	BOY 1 GIRL 2	SING 1 MULT 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (NEXT BIRTH)	DAYS . . . 1 MONTHS 2 YEARS . . 3	
02	BOY 1 GIRL 2	SING 1 MULT 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (GO TO 221)	DAYS . . . 1 MONTHS 2 YEARS . . 3	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
03	BOY 1 GIRL 2	SING 1 MULT 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (GO TO 221)	DAYS . . . 1 MONTHS 2 YEARS . . 3	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
04	BOY 1 GIRL 2	SING 1 MULT 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (GO TO 221)	DAYS . . . 1 MONTHS 2 YEARS . . 3	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
05	BOY 1 GIRL 2	SING 1 MULT 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (GO TO 221)	DAYS . . . 1 MONTHS 2 YEARS . . 3	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
06	BOY 1 GIRL 2	SING 1 MULT 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (GO TO 221)	DAYS . . . 1 MONTHS 2 YEARS . . 3	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH
07	BOY 1 GIRL 2	SING 1 MULT 2	MONTH YEAR	YES . . 1 NO . . . 2 → 220	AGE IN YEARS	YES . . . 1 NO 2	LINE NUMBER (GO TO 221)	DAYS . . . 1 MONTHS 2 YEARS . . 3	YES . . . . 1 ADD BIRTH NO . . . . . 2 NEXT BIRTH

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
225	Are you pregnant now?	YES . . . . . 1 NO . . . . . 2 UNSURE 8	→ 227
226	How many months pregnant are you? RECORD NUMBER OF COMPLETED MONTHS.	MONTHS . . . . . ☐☐	
227	CHECK 224: ONE OR MORE BIRTHS IN 2005 OR LATER NO BIRTHS IN 2005 OR LATER		→ 501

SECTION 3. ANTENATAL CARE AND INTERMITTENT PREVENTIVE TREATMENT

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
301	CHECK 212 AND 215: ENTER IN 302 THE NAME AND LINE NUMBER OF THE MOST RECENT BIRTH SINCE 2005 EVEN IF THE CHILD IS NO LONGER ALIVE. Now I like to ask you some questions about your last pregnancy that ended in a live birth.		
302	NAME AND BIRTH NUMBER FROM 212	NAME OF LAST BIRTH _____ BIRTH NUMBER	
303	Did you see anyone for antenatal care for this pregnancy?	YES . . . . . 1 NO 2	→ 305
304	Whom did you see? Anyone else? PROBE TO IDENTIFY EACH TYPE OF PERSON AND CIRCLE ALL MENTIONED	**HEALTH PERSONNEL** DOCTOR . . . . . A NURSE/MIDWIFE . . . . . B **OTHER PERSON** TRADITIONAL BIRTH ATTENDANT. . . C COMMUNITY HEALTH WORKER. . . D OTHER _____ X (SPECIFY)	
305	During this pregnancy, did you take any drugs to keep you from getting malaria?	YES . . . . . 1 NO 2	→ 401
306	What drugs did you take? Any other? RECORD ALL MENTIONED. IF TYPE OF DRUG IS NOT DETERMINED, SHOW HER THE TYPICAL ANTIMALARIAL DRUGS. TREATMENT WITH SP/FANSIDAR USUALLY CONSISTS OF TAKING 3 BIG WHITE TABLETS AT THE HEALTH FACILITY.	SP/FANSIDAR . . . . . A CHLOROQUINE . . . . . B OTHER _____ X (SPECIFY) DON'T KNOW . . . . . Z	
307	CHECK 306. SP/FANSIDAR TAKEN FOR MALARIA PREVENTION? CODE 'A' CIRCLED ☐ ↓ CODE 'A' NOT CIRCLED ☐ → 401		
308	How many times did you take SP/FANSIDAR during this pregnancy?	NUMBER OF TIMES	
309	CHECK 304. ANTENATAL CARE FROM HEALTH PERSONNEL DURING PREGNANCY. CODE 'A' OR 'B' CIRCLED ☐ ↓ OTHER ☐ → 401		
310	Did you get the SP/FANSIDAR during any antenatal care visit, during another visit to a health facility or from another source?	ANTENATAL CARE VISIT. . . . . 1 ANOTHER FACILITY VISIT. . . . . 2 OTHER SOURCE. 6	

SECTION 4. FEVER IN CHILDREN

401 ENTER IN THE TABLE THE LINE NUMBER, NAME, AND SURVIVAL STATUS OF EACH BIRTH IN 2005 OR LATER. ASK THE QUESTIONS ABOUT ALL OF THESE BIRTHS. BEGIN WITH THE LAST BIRTH.

Now I would like to ask you some questions about the health of your children. (We will talk about each one separately.)

		LAST BIRTH	NEXT-TO-LAST BIRTH	SECOND-FROM-LAST BIRTH
402	BIRTH NUMBER FROM 212	BIRTH NUMBER . . .	BIRTH NUMBER . . .	BIRTH NUMBER . . .
403	FROM 212 AND 216	NAME ____ LIVING DEAD (GO TO 403 IN NEXT COLUMN OR, IF NO MORE BIRTHS, GO TO 501)	NAME ____ LIVING DEAD (GO TO 403 IN NEXT COLUMN OR, IF NO MORE BIRTHS, GO TO 501)	NAME ____ LIVING DEAD (GO TO 403 IN FIRST COLUMN OF NEW QUESTIONNAIRE, OR IF NO MORE BIRTHS, GO TO 501)
403A	In the last seven days, did (NAME) take iron pills, sprinkles with iron, or iron syrup (like this/any of these)? SHOW COMMON TYPES OF PILLS/SPRINKLES/SYRUPS	YES . . . . 1 NO . . . . 2 DON'T KNOW 8	YES . . . . 1 NO . . . . 2 DON'T KNOW 8	YES . . . . 1 NO . . . . 2 DON'T KNOW 8
404	Has (NAME) been ill with a fever at any time in the last 2 weeks?	YES . . . . 1 NO . . . . 2 (GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 427) DON'T KNOW 8	YES . . . . 1 NO . . . . 2 (GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 427) DON'T KNOW 8	YES . . . . 1 NO . . . . 2 (GO TO 403 IN FIRST COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE BIRTHS, GO TO 427) DON'T KNOW 8
405	Did you seek advice or treatment for the fever from any source?	YES . . . . 1 NO . . . . 2 (SKIP TO 408)	YES . . . . 1 NO . . . . 2 (SKIP TO 408)	YES . . . . 1 NO . . . . 2 (SKIP TO 408)
406	Where did you seek advice or treatment? Anywhere else? PROBE TO IDENTIFY EACH TYPE OF SOURCE AND CIRCLE ALL APPLICABLE CODE(S). IF UNABLE TO DETERMINE IF A HOSPITAL, HEALTH CENTER, OR CLINIC IS PUBLIC OR PRIVATE MEDICAL, WRITE THE THE NAME OF THE PLACE. ____ (NAME OF PLACE(S))	**PUBLIC SECTOR** GOVT HOSPITAL A GOVT HEALTH CENTER . . . . . B GOVT DISPENS-ARY . . . . C OTHER PUBLIC ____ D (SPECIFY) **PRIVATE MEDICAL SECTOR** MISSION HOSP./ CLINIC . . . . E PVT. HOSPITAL/ CLINIC . . . . F PHARMACY . . . G OTHER PRIVATE MED. ____ H (SPECIFY) MOBILE CLINIC . . . I COMMUNITY HEALTH WORKER . . . . J **OTHER SOURCE** SHOP . . . . K TRADITIONAL PRACTITIONER L RELATIVE/FRIEND M OTHER ____ X (SPECIFY)	**PUBLIC SECTOR** GOVT HOSPITAL A GOVT HEALTH CENTER . . . . . B GOVT DISPENS-ARY . . . . C OTHER PUBLIC ____ D (SPECIFY) **PRIVATE MEDICAL SECTOR** MISSION HOSP./ CLINIC . . . . E PVT. HOSPITAL/ CLINIC . . . . F PHARMACY . . . G OTHER PRIVATE MED. ____ H (SPECIFY) MOBILE CLINIC . . . I COMMUNITY HEALTH WORKER . . . . J **OTHER SOURCE** SHOP . . . . K TRADITIONAL PRACTITIONER L RELATIVE/FRIEND M OTHER ____ X (SPECIFY)	**PUBLIC SECTOR** GOVT HOSPITAL A GOVT HEALTH CENTER . . . . . B GOVT DISPENS-ARY . . . . C OTHER PUBLIC ____ D (SPECIFY) **PRIVATE MEDICAL SECTOR** MISSION HOSP./ CLINIC . . . . E PVT. HOSPITAL/ CLINIC . . . . F PHARMACY . . . G OTHER PRIVATE MED. ____ H (SPECIFY) MOBILE CLINIC . . . I COMMUNITY HEALTH WORKER . . . . J **OTHER SOURCE** SHOP . . . . K TRADITIONAL PRACTITIONER L RELATIVE/FRIEND M OTHER ____ X (SPECIFY)

NO.	QUESTIONS AND FILTERS	LAST BIRTH NAME ________	NEXT-TO-LAST BIRTH NAME ________	SECOND-FROM-LAST BIRTH NAME ________
407	How many days after the fever began did you first seek advice or treatment for (NAME)? IF THE SAME DAY, RECORD '00'.	DAYS ..... [ ][ ]	DAYS ..... [ ][ ]	DAYS ..... [ ][ ]
408	At any time during the illness, did (NAME) have blood taken from his/her finger or heel for testing?	YES .... 1 NO .... 2 DON'T KNOW 8	YES .... 1 NO .... 2 DON'T KNOW 8	YES .... 1 NO .... 2 DON'T KNOW 8
409	At any time during the illness, did (NAME) take any drugs for the illness?	YES .... 1 NO .... 2 (GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 425) DON'T KNOW 8	YES .... 1 NO .... 2 (GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 425) DON'T KNOW 8	YES .... 1 NO .... 2 (GO TO 403 IN FIRST COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE BIRTHS, GO TO 425) DON'T KNOW 8
410	What drugs did (NAME) take? Any other drugs? RECORD ALL MENTIONED. IF SHE DOES NOT KNOW THE TYPE OF DRUG, SHOW HER THE TYPICAL ANTIMALARIAL DRUGS. IF SHE STILL IS NOT SURE, ASK TO SEE THE DRUGS.	**ANTIMALARIAL DRUGS** ACT, AL .... A SP/FANSIDAR ... B CHLOROQUINE ... C AMODIAQUINE ... D QUININE .... E OTHER ANTI-MALARIAL ________ F (SPECIFY) **OTHER DRUGS** ASPIRIN .... G ACETAMINOPHEN/PARACETEMOL H IBUPROFEN ... I OTHER ________ X (SPECIFY) DON'T KNOW ..... Z	**ANTIMALARIAL DRUGS** ACT, AL .... A SP/FANSIDAR ... B CHLOROQUINE ... C AMODIAQUINE ... D QUININE .... E OTHER ANTI-MALARIAL ________ F (SPECIFY) **OTHER DRUGS** ASPIRIN .... G ACETAMINOPHEN/PARACETEMOL H IBUPROFEN ... I OTHER ________ X (SPECIFY) DON'T KNOW ..... Z	**ANTIMALARIAL DRUGS** ACT, AL .... A SP/FANSIDAR ... B CHLOROQUINE ... C AMODIAQUINE ... D QUININE .... E OTHER ANTI-MALARIAL ________ F (SPECIFY) **OTHER DRUGS** ASPIRIN .... G ACETAMINOPHEN/PARACETEMOL H IBUPROFEN ... I OTHER ________ X (SPECIFY) DON'T KNOW ..... Z
411	CHECK 410: ANY CODE A-F CIRCLED?	YES [ ] NO [ ] (GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 425)	YES [ ] NO [ ] (GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 425)	YES [ ] NO [ ] (GO TO 403 IN FIRST COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE BIRTHS, GO TO 425)
412	Did you already have (NAME OF DRUG FROM 410) at home when the child became ill? ASK SEPARATELY FOR EACH OF THE DRUGS 'A' THROUGH 'F' THAT THE CHILD IS RECORDED AS HAVING TAKEN IN 410. IF YES FOR ANY DRUG, CIRCLE CODE FOR THAT DRUG. IF NO FOR ALL DRUGS, CIRCLE 'Y'.	ACT, AL .... A SP/FANSIDAR ..... B CHLOROQUINE ... C AMODIAQUINE ... D QUININE .... E OTHER ANTI-MALARIAL ..... F NO DRUG AT HOME . Y	ACT, AL .... A SP/FANSIDAR ..... B CHLOROQUINE ... C AMODIAQUINE ... D QUININE .... E OTHER ANTI-MALARIAL ..... F NO DRUG AT HOME . Y	ACT, AL .... A SP/FANSIDAR ..... B CHLOROQUINE ... C AMODIAQUINE ... D QUININE .... E OTHER ANTI-MALARIAL ..... F NO DRUG AT HOME . Y

NO.	QUESTIONS AND FILTERS	LAST BIRTH NAME ______	NEXT-TO-LAST BIRTH NAME ______	SECOND-FROM-LAST BIRTH NAME ______
413	CHECK 410: ACT/AL ('A') GIVEN	CODE 'A' CIRCLED ↓ CODE 'A' NOT CIRCLED (SKIP TO 415)	CODE 'A' CIRCLED ↓ CODE 'A' NOT CIRCLED (SKIP TO 415)	CODE 'A' CIRCLED ↓ CODE 'A' NOT CIRCLED (SKIP TO 415)
414	How long after the fever started did (NAME) first take ACT?	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8
415	CHECK 410: SP/FANSIDAR ('B') GIVEN	CODE 'B' CIRCLED ↓ CODE 'B' NOT CIRCLED (SKIP TO 417)	CODE 'B' CIRCLED ↓ CODE 'B' NOT CIRCLED (SKIP TO 417)	CODE 'B' CIRCLED ↓ CODE 'B' NOT CIRCLED (SKIP TO 417)
416	How long after the fever started did (NAME) first take SP/FANSIDAR?	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8
417	CHECK 410: CHLOROQUINE ('C') GIVEN	CODE 'C' CIRCLED ↓ CODE 'C' NOT CIRCLED (SKIP TO 419)	CODE 'C' CIRCLED ↓ CODE 'C' NOT CIRCLED (SKIP TO 419)	CODE 'C' CIRCLED ↓ CODE 'C' NOT CIRCLED (SKIP TO 419)
418	How long after the fever started did (NAME) first take chloroquine?	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8
419	CHECK 410: AMODIAQUINE ('D') GIVEN	CODE 'D' CIRCLED ↓ CODE 'D' NOT CIRCLED (SKIP TO 421)	CODE 'D' CIRCLED ↓ CODE 'D' NOT CIRCLED (SKIP TO 421)	CODE 'D' CIRCLED ↓ CODE 'D' NOT CIRCLED (SKIP TO 421)
420	How long after the fever started did (NAME) first take amodiaquine?	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8

NO.	QUESTIONS AND FILTERS	LAST BIRTH NAME ________	NEXT-TO-LAST BIRTH NAME ________	SECOND-FROM-LAST BIRTH NAME ________
421	CHECK 410: QUININE ('E') GIVEN	CODE 'E' CIRCLED ↓ / CODE 'E' NOT CIRCLED (SKIP TO 423)	CODE 'E' CIRCLED ↓ / CODE 'E' NOT CIRCLED (SKIP TO 423)	CODE 'E' CIRCLED ↓ / CODE 'E' NOT CIRCLED (SKIP TO 423)
422	How long after the fever started did (NAME) first take quinine?	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8
423	CHECK 410: OTHER ANTIMALARIAL ('F') GIVEN	CODE 'F' CIRCLED ↓ / CODE 'F' NOT CIRCLED (SKIP TO 425)	CODE 'F' CIRCLED ↓ / CODE 'F' NOT CIRCLED (SKIP TO 425)	CODE 'F' CIRCLED ↓ / CODE 'F' NOT CIRCLED (SKIP TO 425)
424	How long after the fever started did (NAME) first take the (OTHER ANTIMALARIAL)?	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8	SAME DAY . . . . 0 NEXT DAY . . . . 1 TWO DAYS AFTER FEVER . . . . 2 THREE OR MORE DAYS AFTER FEVER . . . . 3 DON'T KNOW . . . 8
425	How serious was (NAME's) fever? Was it extremely serious, very serious, a little serious, or not at all serious?	EXTREMELY SERIOUS 1 VERY SERIOUS . . . 2 A LITTLE SERIOUS . 3 NOT AT ALL SERIOUS 4	EXTREMELY SERIOUS 1 VERY SERIOUS . . . 2 A LITTLE SERIOUS . 3 NOT AT ALL SERIOUS 4	EXTREMELY SERIOUS 1 VERY SERIOUS . . . 2 A LITTLE SERIOUS . 3 NOT AT ALL SERIOUS 4
426		GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 427.	GO BACK TO 403 IN NEXT COLUMN; OR, IF NO MORE BIRTHS, GO TO 427.	GO TO 403 IN 1st COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE BIRTHS, GO TO 427.
427	CHECK 404--ALL COLUMNS. ANY CHILD HAD FEVER? ONE OR MORE CHILDREN HAD FEVER ↓	NO CHILD HAD FEVER → 501		

NO.	QUESTIONS AND FILTERS	LAST BIRTH NAME _____	NEXT-TO-LAST BIRTH NAME _____	SECOND-FROM-LAST BIRTH NAME _____
428	When your child/children had the fever, how important or unimportant was it to seek antimalarial treatment immediately? Was it extremely important, very important, a little important, or not at all important?		EXTREMELY IMPORTANT . . . . . 1 VERY IMPORTANT . . . . . 2 A LITTLE IMPORTANT . . . . . 3 NOT AT ALL IMPORTANT 4	
429	When your child/children had the fever, how much do you agree or disagree that your child should be treated first with herbal remedies? Did you strongly agree, somewhat agree, somewhat disagree, or strongly disagree?		STRONGLY AGREE . . . . . 1 SOMEWHAT AGREE . . . . . 2 SOMEWHAT DISAGREE . . . . . 3 STRONGLY DISAGREE 4	
430	When your child/children had the fever, how affordable was treatment. Was it very affordable, affordable, unaffordable, or very unaffordable?		VERY AFFORDABLE . . . . . 1 AFFORDABLE . . . . . 2 UNAFFORDABLE . . . . . 3 VERY UNAFFORDABLE 4	
431	When your child/children had the fever, how available were antimalarial medicines. Were they always available, somewhat available, rarely available, or never available?		ALWAYS AVAILABLE . . . . . 1 SOMEWHAT AVAILABLE . . . . . 2 RARELY AVAILABLE . . . . . 3 NEVER AVAILABLE 4	
432	How much do you believe or disbelieve that antimalarial medicines can cure your child's fever. Do you strongly believe they can cure it or somewhat believe, or somewhat disbelieve, or strongly disbelieve?		STRONGLY BELIEVE . . . . . 1 SOMEWHAT BELIEVE . . . . . 2 SOMEWHAT DISBELIEVE . . . . . 3 STRONGLY DISBELIEVE 4	

SECTION 5. KNOWLEDGE OF ACT

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
501	What is the new anti-malarial drug that Is being promoted by the Ministry of Health?	ACT/AL . . . . . 11 SP/FANSIDAR . . . . . 12 CHLOROQUINE . . . . . 21 AMODIAQUINE . . . . . 31 OTHER . . . . . 96 DOES NOT KNOW 98	
502	Have you seen or heard any information about ACT or AL?	YES . . . . . 1 NO 2	
503	Where did you see or hear about ACT or AL? Any other place or person? CIRCLE ALL MENTIONED.	TELEVISION . . . . . A RADIO . . . . . B NEWSPAPER . . . . . C BARAZA . . . . . D RELATIVE/FRIEND . . . . . E HEALTH WORKER . . . . . F COMMUNITY LEADER/ELDER . . . . . G COMMUNITY HEALTH WORKER . . . . . H ROAD SHOW . . . . . I OTHER X	
512	RECORD THE TIME.	HOUR . . . . . [ ][ ] MINUTES . . . . . [ ][ ]	

APPENDIX C

Persons Involved in the Survey

National Coordinators

Anthony Kilele, KNBS
S.K. Sharif, MOPHS
Willis Akhwale, MOPHS
Collins Opiyo, KNBS
Elizabeth Juma, DOMC
Peter Akhonya, KNBS
Abdulkadir Amin, KNBS
Robert Buluma, KNBS
Nancy Etiang', PMCC Rift Valley
Mohamed Hanif, PMCC Coast
Samwel Kadivane, PMCC Nairobi
Rodgers Kazungu, KNBS
Peter Kibui, KNBS
Rebecca Kiptui, DOMC
Rosemary Kong'ani, KNBS
Alfred Maina, PMCC Eastern
Raphael Maritim, KNBS
Agneta Mbithi, DOMC
John Moro, DOMC
Hussein Muhamed, PMCC North Eastern
Alex Mulewa, KNBS
Stephen Ngaruiya, KNBS
John Ngugi, PMCC Central
Stephen Ngugi, KNBS
John Nyamuni, DOMC
Andrew Nyandigisi, DOMC
Macdonald Obudho, KNBS
Jacob Odhiambo, PMCC Western
Christopher Omolo, KNBS
Beatrice Onyando, PMCC Nyanza
Thomas Onyango, KNBS
Jacinta Opondo, DOMC
Donatus Othieno, KNBS
Godfrey Otieno, KNBS
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Data Analysis

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APPENDIX D

Supplementary Tables of Survey Results

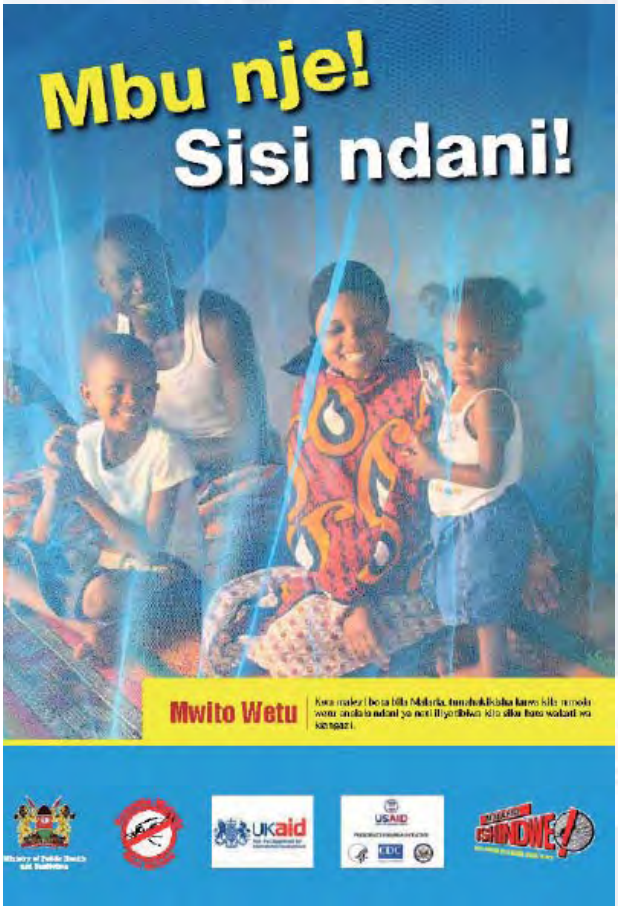

Table D.1: Household age distribution

Single-year age distribution of the de facto household population by sex (weighted)

Age	Women		Men	
	Number	Percentage	Number	Percentage
0	464	3.4	490	4.0
1	445	3.2	442	3.6
2	475	3.5	512	4.1
3	508	3.7	448	3.6
4	455	3.3	454	3.7
5	440	3.2	456	3.7
6	434	3.2	423	3.4
7	408	3.0	376	3.0
8	421	3.1	405	3.3
9	323	2.4	320	2.6
10	385	2.8	474	3.8
11	301	2.2	330	2.7
12	337	2.5	342	2.8
13	329	2.4	322	2.6
14	291	2.1	279	2.3
15	263	1.9	265	2.1
16	206	1.5	259	2.1
17	223	1.6	227	1.8
18	241	1.8	213	1.7
19	206	1.5	159	1.3
20	280	2.0	189	1.5
21	236	1.7	155	1.2
22	236	1.7	166	1.3
23	272	2.0	169	1.4
24	257	1.9	180	1.4
25	286	2.1	175	1.4
26	246	1.8	188	1.5
27	187	1.4	178	1.4
28	215	1.6	189	1.5
29	139	1.0	126	1.0
30	252	1.8	230	1.9
31	181	1.3	135	1.1
32	213	1.5	163	1.3
33	142	1.0	102	0.8
34	123	0.9	117	0.9
35	196	1.4	179	1.4
36	147	1.1	115	0.9
37	118	0.9	99	0.8
38	148	1.1	122	1.0
39	86	0.6	79	0.6
40	175	1.3	179	1.4
41	110	0.8	101	0.8
42	130	0.9	85	0.7
43	57	0.4	52	0.4
44	62	0.4	66	0.5

Continued

Table D.1, *continued:* Household age distribution

Age	Women		Men		Age	Women		Men	
	Number	Percentage	Number	Percentage		Number	Percentage	Number	Percentage
45	114	0.8	109	0.9	57	46	0.3	50	0.4
46	72	0.5	59	0.5	61	37	0.3	30	0.2
47	96	0.7	81	0.7	62	55	0.4	45	0.4
48	97	0.7	64	0.5	63	31	0.2	26	0.2
49	43	0.3	56	0.5	64	37	0.3	36	0.3
50	208	1.5	100	0.8	65	62	0.4	64	0.5
51	76	0.6	67	0.5	66	22	0.2	18	0.1
52	103	0.8	80	0.6	67	31	0.2	31	0.3
53	69	0.5	61	0.5	68	34	0.2	34	0.3
54	88	0.6	72	0.6	69	12	0.1	11	0.1
55	73	0.5	68	0.5	70+	381	2.8	271	2.2
56	78	0.6	54	0.4	***Total***	***13,737***	***100.0***	***12,406***	***100.0***

Table D.2: Coverage of testing for malaria and anaemia testing in children

Percentage of eligible children aged 3 months–14 years who were tested for malaria and anaemia, by background characteristics (unweighted)

Background characteristic	Percentage tested for:		Number of children eligible for malaria testing (unweighted)	Percentage tested for anaemia	Number of children eligible for anaemia testing (unweighted)
	Malaria with RDT	Malaria slide			
Age					
3–5 months	81.9	80.1	221	na	na
6–8 months	90.8	89.9	217	83.9	217
9–11 months	92.0	89.9	238	91.6	238
12–17 months	95.1	92.8	528	94.5	528
18–23 months	95.0	92.0	400	95.3	400
2 years	94.8	92.3	1,024	94.8	1,024
3 years	93.3	91.4	1,000	93.3	1,000
4 years	94.3	91.8	985	94.3	985
3–59 months	93.5	91.2	4,613	na	na
6–59 months	94.1	91.8	4,392	93.6	4,392
5–9 years	92.7	90.6	4,221	93.0	4,221
10–14 years	88.2	86.3	3,602	88.5	3,602
Child's sex					
Male	90.9	88.7	6,267	91.1	6,141
Female	92.5	90.5	6,169	92.7	6,074
Residence					
Urban	88.4	85.8	1,392	88.4	1,365
Rural	92.1	90.1	11,044	92.4	10,850
Malaria endemicity					
Highland epidemic	89.5	88.1	2,900	89.7	2,845
Lake endemic	95.0	93.4	3,107	94.9	3,055
Coast endemic	93.6	88.9	1,915	93.7	1,883
Semi-arid, seasonal	90.7	88.6	2,367	91.2	2,327
Low risk	89.2	87.7	2,147	89.7	2,105

Continued

Table D.2, *continued*: Coverage of testing for malaria and anaemia testing in children

Percentage of eligible children aged 3 months–14 years who were tested for malaria and anaemia, by background characteristics (unweighted)

Background characteristic	Percentage tested for:		Number of children eligible for malaria testing (unweighted)	Percentage tested for anaemia	Number of children eligible for anaemia testing (unweighted)
	Malaria with RDT	Malaria slide			
Wealth quintile					
Lowest	91.5	89.0	3,180	91.7	3,124
Second	92.0	90.5	2,742	92.5	2,694
Middle	92.9	90.7	2,511	92.9	2,473
Fourth	92.4	90.7	2,264	92.7	2,220
Highest	88.8	86.2	1,739	89.0	1,704
Total	***91.7***	***89.6***	***12,436***	***91.9***	***12,215***

na = Not applicable. Children under 6 months were not tested for anaemia.
Note: Table is based on children who slept in the household the night before the interview (de facto).

Table D.3: Prevalence of malaria in children aged 3–59 months

Percentage of children aged 3–59 months classified as having malaria, by background characteristics

Background characteristic	Malaria prevalence					Number of children tested with RDT	Number of children with slide read at lab
	RDT positive	Slide positive	Positive for *Pf*	Positive for *Pm*	Positive for *Po*		
Age							
3–5 months	7.2	5.0	5.0	0.0	0.5	175	173
6–8 months	9.8	5.3	5.3	0.0	0.0	186	185
9–11 months	7.6	5.0	4.6	0.7	0.4	221	218
12–17 months	10.7	6.0	6.0	0.2	0.3	476	466
18–23 months	10.5	5.6	5.6	0.5	0.9	369	357
2 years	13.3	8.9	8.7	0.8	1.3	948	925
3 years	13.6	9.6	9.2	1.4	0.6	892	875
4 years	14.2	9.7	9.0	2.2	1.5	862	844
Child's sex							
Male	12.8	7.9	7.7	0.9	1.1	2,064	2,006
Female	11.8	8.2	7.8	1.3	0.7	2,067	2,037
Residence							
Urban	4.6	4.3	4.3	0.0	0.5	654	635
Rural	13.7	8.8	8.4	1.3	1.0	3,477	3,408
Malaria endemicity							
Highland epidemic	3.5	2.1	2.0	0.1	0.0	976	965
Lake endemic	42.0	26.8	25.8	4.0	3.4	1,071	1,057
Coast endemic	2.9	2.0	2.0	0.0	0.0	300	287
Semi-arid, seasonal	0.4	0.1	0.1	0.0	0.0	960	931
Low risk	1.3	1.9	1.9	0.0	0.0	824	804
Wealth quintile							
Lowest	17.1	11.2	10.8	1.8	1.1	1,025	1,002
Second	15.8	9.3	8.6	2.2	1.2	879	866
Middle	12.3	7.8	7.6	0.2	1.1	811	795
Fourth	10.4	7.1	7.0	0.5	0.6	774	759
Highest	2.2	2.8	2.8	0.0	0.1	642	621
Total	***12.3***	***8.1***	***7.8***	***1.1***	***0.9***	***4,130***	***4,043***

RDT = rapid diagnostic test (CareStart). Pf = *P. falciparum*; Pm = *P. malariae*; Po = *P. ovale*. There were no cases positive for *P. vivax*.
Note: Table is based on children who slept in the household the night before the interview.

Table D.4: Anaemia prevalence among children aged 6–59 months

Among children aged 6–59 months, percent distribution of level of anaemia and mean haemoglobin level (g/dl), by background characteristics

Background characteristic	Severe anaemia (< 8 g/dl)	Moderate anaemia (8-10.9 g/dl)	No anaemia 11+ g/dl)	Total	Number of children	Mean Hb
Age						
6–8 months	7.2	55.5	37.2	100.0	174	10.2
9–11 months	5.1	56.2	38.7	100.0	220	10.5
12–17 months	7.5	57.9	34.6	100.0	473	10.2
18–23 months	6.3	52.0	41.7	100.0	370	10.5
2 years	6.0	41.9	52.1	100.0	948	10.8
3 years	4.1	33.9	61.9	100.0	893	11.2
4 years	3.0	26.6	70.4	100.0	862	11.5
Child's sex						
Male	6.3	41.8	51.9	100.0	1,954	10.8
Female	4.0	40.3	55.8	100.0	1,987	11.0
Residence						
Urban	2.2	40.9	56.8	100.0	620	11.0
Rural	5.7	41.0	53.3	100.0	3,320	10.9
Malaria endemicity						
Highland epidemic	4.4	40.3	55.3	100.0	928	10.9
Lake endemic	7.9	44.8	47.3	100.0	1,025	10.6
Coast endemic	3.4	47.1	49.5	100.0	289	10.8
Semi-arid, seasonal	6.4	41.8	51.8	100.0	917	10.9
Low risk	1.6	33.7	64.7	100.0	782	11.3
Wealth quintile						
Lowest	6.9	44.3	48.8	100.0	984	10.7
Second	5.9	43.6	50.6	100.0	840	10.8
Middle	4.3	38.9	56.8	100.0	773	11.1
Fourth	5.0	38.1	57.0	100.0	736	11.0
Highest	2.5	38.5	59.1	100.0	607	11.1
Total	***5.1***	***41.0***	***53.8***	***100.0***	***3,940***	***10.9***

Note: Table is based on children who slept in the household the night before the interview. Prevalence of anaemia is based on haemoglobin levels and is adjusted for altitude using CDC formulas (CDC, 1998). Haemoglobin is measured in grams per decilitre (g/dl).

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