MALARIA: A BURDEN EXPLORED

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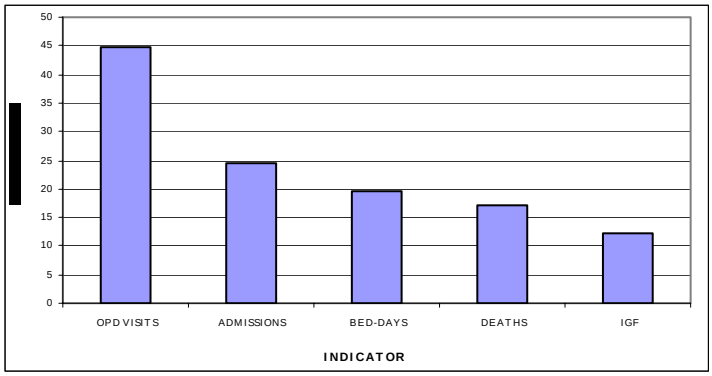
The burden of malaria: patterns and trends

Outpatient attendance over the last 19 years illustrates the increasing burden of malaria in Ghana. Communicable diseases accounted for about two third of outpatient visits, but their relative share has changed over time. While there is an overall consistent decrease of other infectious and parasitic diseases (from 31.8% in 1985 to 19.5% in 2003), there has been an increase in malaria cases (from 37.1% in 1985 to 44.7% in 2003). The decreasing trend in other communicable diseases is related to the downward trend in the percentage of outpatient visits for diarrhoeal diseases (from 8.3% in 1985 to 4.2% in 2003) and vaccine preventable diseases, such as measles (from 3.4% in 1985 to 0.1% in 2003).

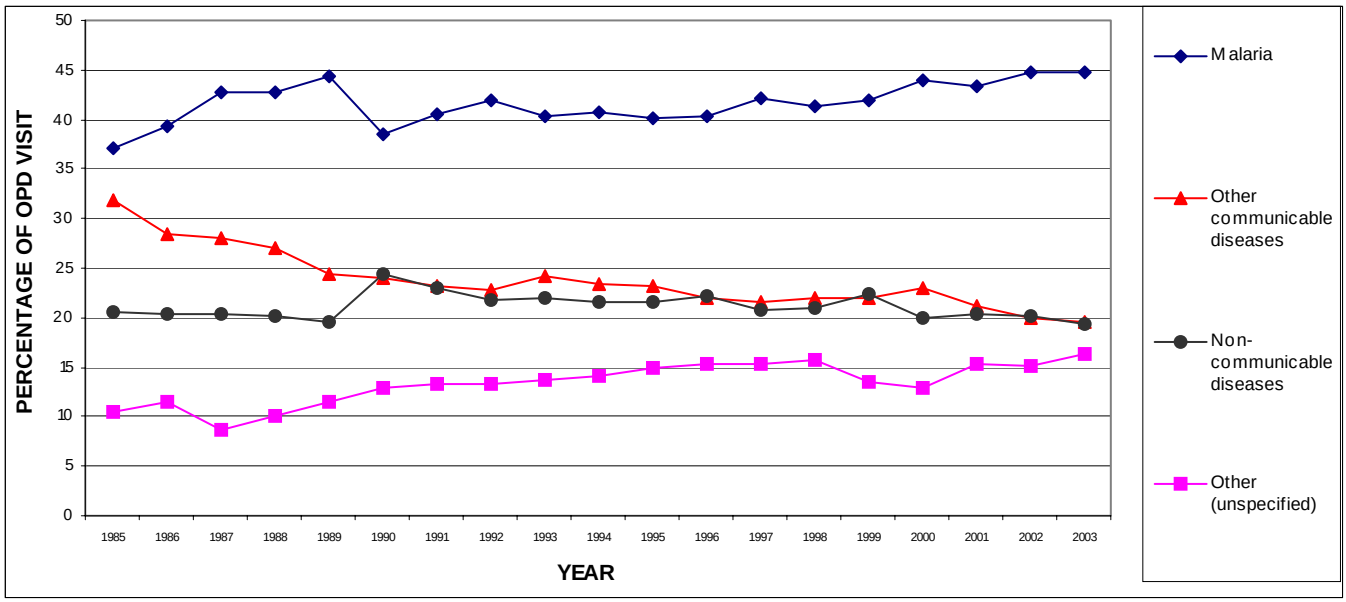
Fluctuations over time were observed for non-communicable diseases, whereas there was an increase in other (unspecified) diseases that were not individually reported in the list of diseases in the monthly outpatient form. Some important non-communicable diseases (such as diabetes) were not individually reported in this list and were included in the category of other (unspecified) diseases. This may have led to the underestimation of non-communicable diseases as well as to the inflation of cases of other (unspecified) diseases. The figure below shows the trend over time.

Communicable diseases are, in general, more amenable to broad-based primary prevention efforts than are non-communicable diseases, and the relative share of these diseases in part reflects the effectiveness of the primary health care system (and, specifically, immunization and communicable disease control programmes), in addition to the underlying demographic and epidemiological characteristics of the population.



Percentage of outpatient visits, hospital admissions, bed days, deaths, and user fees attributable to malaria in selected hospitals (Ghana, 2003).

Service utilization patterns and mortality burden in the selected districts show that malaria was the leading cause of hospital admissions, accounting for 24.6% of the total admissions made in 2003. Malaria also accounted for 19.5% of the total bed days and 17.1% of the total deaths in the facilities. In terms of revenue malaria ranked second (after delivery) accounting for 12.4% of the total user fees collected in the selected facilities.



Trend in percentage of outpatient visits by disease group (Ghana, 1985-2003).

Analysis of patterns and trends of hospital resource use by cause and severity shows that to a large extent primary curative care is currently provided in hospital settings, with simple malaria cases accounting for a large share of outpatient and inpatient services even in referral facilities. In particular, malaria accounted for 20.8% of the admissions in regional hospitals and for a higher percentage in mission hospitals (24.9%) and in district government hospitals (28.9%). If patients requiring basic care could be shifted to medically appropriate lower level facilities, health systems costs would be reduced and economic efficiency improved. Furthermore, the burden of malaria is increasing over time, and this may be the result of several factors, including poor living conditions, the increase in drug resistance, association between malaria and HIV/AIDS, climate and environmental change, and inadequate interventions and control strategies.

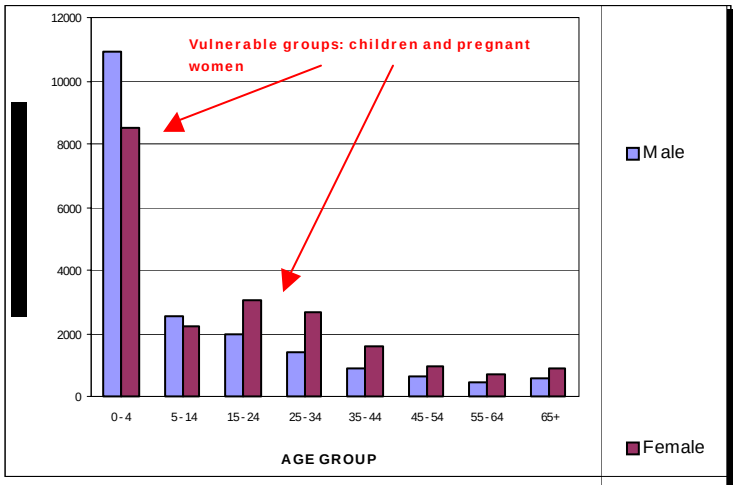
Patterns of malaria vulnerability

The distribution of malaria admissions by age and sex reflects the patterns of vulnerability in different demographic groups, showing a peak in childhood age in both sexes (higher in males), and an increase in young-adult ages (starting in the 15-24 age group) among females only. This latter increase may be mainly related to malaria in pregnancy, reflecting the extent of avoidable morbidity burden in this vulnerable group. The age- and sex-distribution of malaria admissions seems consistent with the general patterns of morbidity and mortality observed in Ghana, with women living longer, but experiencing greater morbidity than men.

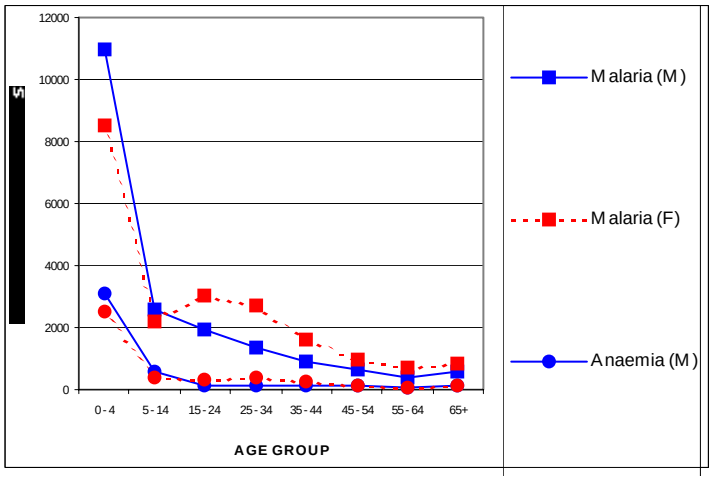
In general, very young children and pregnant women are the population groups at highest risk with respect to malaria morbidity and mortality. Most children experience their first malaria infections during the first year or two of life, when they have not yet acquired adequate clinical immunity, which makes these early years particularly dangerous.

Adult women have a high level of immunity, but this is impaired especially in the first pregnancy, with the result that risk of infection increases. Pregnant women and infants may experience a variety of adverse consequences from malaria infection including maternal anaemia, placental accumulation of malaria parasites, low birth weight from prematurity and intrauterine growth retardation, foetal parasite exposure and congenital infection, leading to increased risk of maternal and infant mortality.

The estimation of morbidity and mortality attributable to a single cause may be difficult, especially when different diseases are interrelated, such as in the case of malaria and anaemia. However, anaemia may also be related to other causes, including iron deficiency, malnutrition or hookworm. Age and gender related analysis may be useful to assess the possible associations between diseases, showing, for example, overlapping morbidity patterns. The figure below shows that both malaria and anaemia have a peak in childhood, then decreasing in adult and old age groups, supporting the hypothesis that anaemia cases may be mainly related to malaria in Ghana.

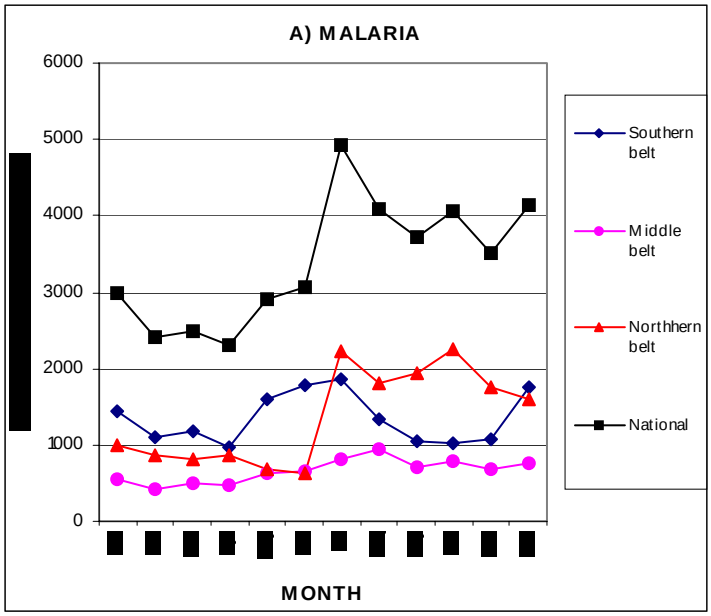


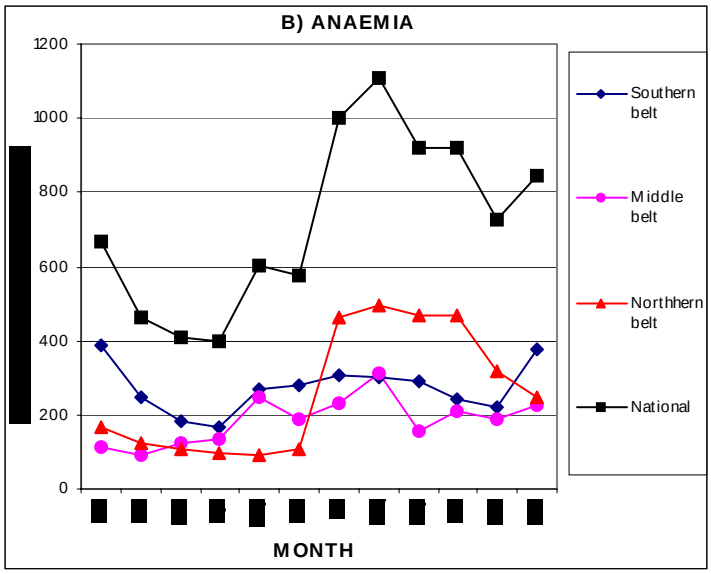
Distribution of malaria admissions by age group and sex in selected hospitals (Ghana, 2003).



Age-sex distribution of hospital admissions for malaria and anaemia in selected hospitals (Ghana, 2003).

Similar monthly patterns of admissions for malaria and anaemia were also observed, further supporting the hypothesis of the association between the two diseases as illustrated in the figure below.



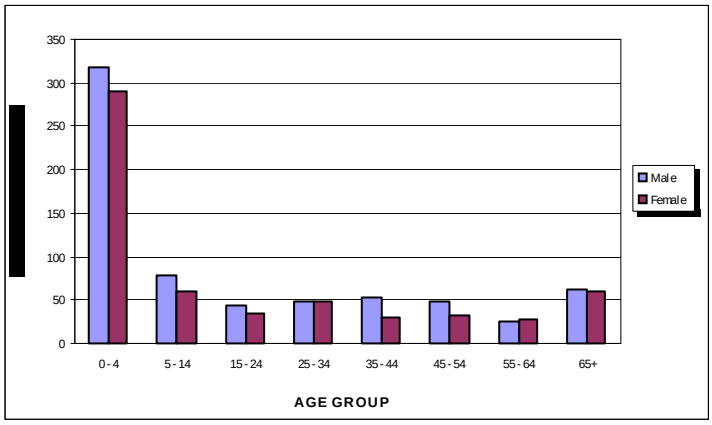


Monthly distribution of hospital admissions for malaria (A) and anaemia (B) in selected hospitals by geographical belt (Ghana, 2003).

Although such clinical and epidemiologic complexity makes the estimation of the burden from specific diseases uncertain, there are clear implications for health interventions. For example, health programs primarily designed to control the spread of a single disease entity in a vulnerable group (such as malaria in childhood) can exert a disproportionate impact on child health by simultaneously reducing morbidity and mortality from associated causes (such as anaemia).

Malaria mortality in Ghana

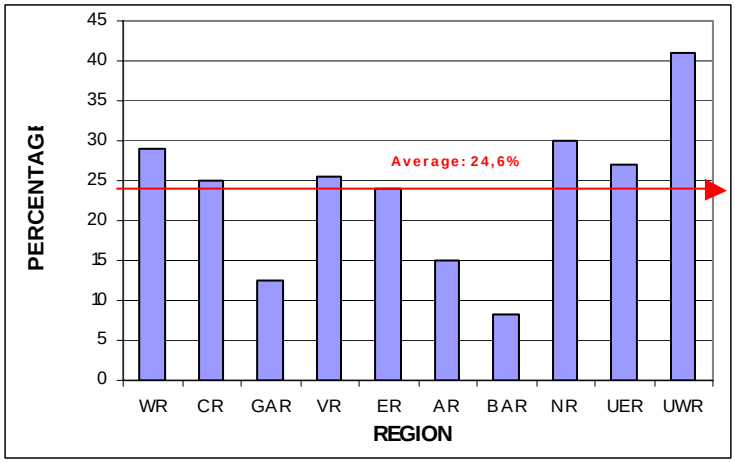
There are three principal ways in which malaria can contribute to death in young children. First, an overwhelming acute infection, which frequently presents as seizures or coma (cerebral malaria), may kill a child directly and quickly. Second, repeated malaria infections contribute to the development of severe anaemia, which substantially increases the risk of death. Third, low birth weight which is frequently the consequence of malaria infection in pregnant women constitutes the major risk factor for death in the first month of life. In addition, repeated malaria infections make young children more susceptible to other common childhood illnesses, such as diarrhoea and respiratory infections, and thus contribute indirectly to mortality. It is estimated that the total (direct and indirect) malaria mortality is at least twice as high as the direct malaria mortality. As a result, children under 5 are the most vulnerable group for malaria mortality. The distribution of deaths due to malaria by age and sex shows a high peak among children under 5 years, who accounted for almost half (48.2%) of the total malaria deaths.



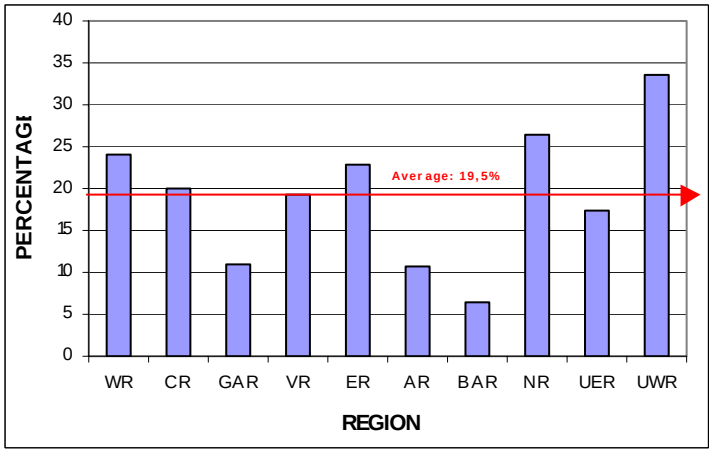
Distribution of in-hospital deaths due to malaria by age group and sex in selected hospitals (Ghana, 2003).

Malaria: a disease of poverty

Wide variations in percentage of malaria admissions out of the total admissions were observed across belts, with the northern belt showing the highest percentage (32.9%), followed by the southern belt (24.0%) and the middle belt (16.7%). In particular, the highest percentages of malaria admissions were observed in selected facilities located in Upper West Region (40.9%) and in Northern Region (30.0%)



Distribution of the percentage of malaria admissions in selected hospitals by region (Ghana, 2003).



Distribution of the percentage of bed days attributable to malaria in selected hospitals by region (Ghana, 2003).

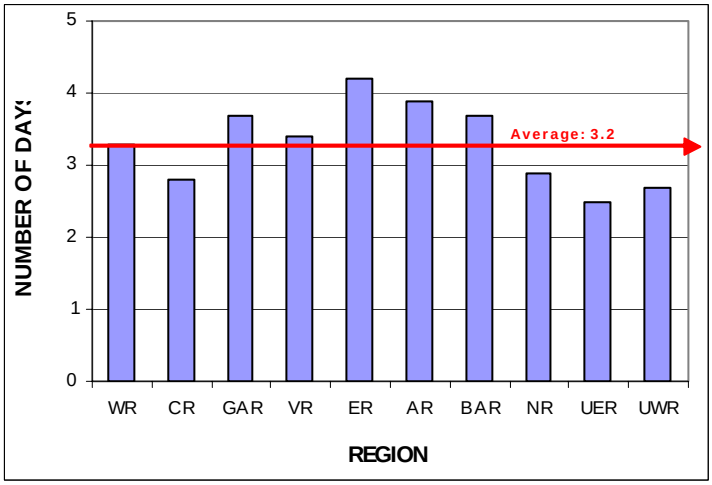
Similar, although less pronounced, patterns of malaria deaths were observed across belts, with the northern belt accounting for the highest Proportional Mortality Rate (PMR=19.6%), while lower PMRs were found in the southern belt (17.1%) and in the middle belt (15.1%). As expected, PMR was higher in the "most deprived districts" (24.5%) than in the other districts (16.2%).

The burden on hospital services

The use of hospital inpatient services for a disease varies according to three major features. These are the frequency of admissions, the duration of the service provided (expressed in length of stay in hospital) and the intensity of the service (expressed as the proportion of total charges represented by laboratory, radiology and ancillary services). The number (and percentage) of hospital bed days, related to both frequency of admissions and duration of hospital stay, are used to estimate the burden of malaria on hospital services.

Wide variations in percentage of bed days to malaria were observed across regions, with facilities located in Upper West Region and Northern Region showing the highest percentages (33.6% and 26.5%, respectively). As for admissions, the highest percentages of bed days attributable to malaria were observed in the northern belt (26.4% of the total bed days) and in the "most deprived districts" (34.7%).

Variations in service utilization patterns for malaria across regions may be related to differences in frequency of admissions or in duration of hospital stay. In particular, wide variations in length of stay for malaria were observed across regions, ranging between 2.5 days in Upper East Region and 4.2 days in Eastern Region. Facilities located in the three northern regions had among the highest percentages of malaria admissions, while showing the lowest length of stay, therefore accounting for the patterns of bed days.



Distribution of average length of stay for malaria in selected hospitals by region

Severity of cases (e.g., percentage of cases of cerebral malaria) should be taken into account in interpreting variation in length of stay. However, case mix cannot fully explain such large differences in duration of hospital stay. This may, at least in part, be attributable to other factors related to local management and efficiency in hospital resource use. A number of factors subject to management intervention may contribute to long duration of stay. Poor scheduling of diagnostic

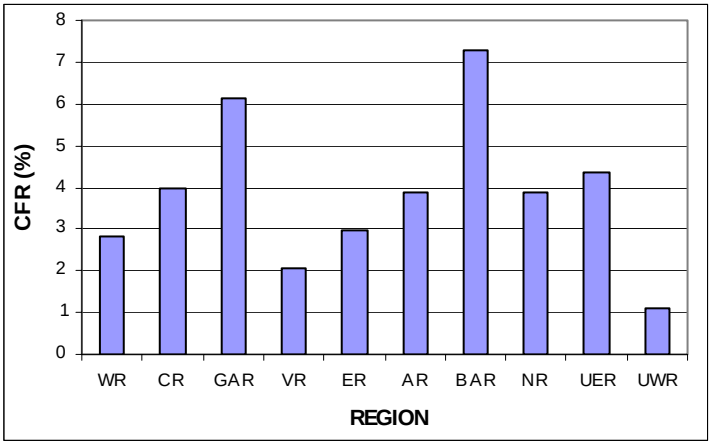
and therapeutic care and inadequate case management may be contributory factors. Reduction in duration of stay may be achieved, among others, by changing the standard practice for specific causes of admission (i.e., with use of cost-effective clinical protocols), integration of inpatient and outpatient services and early discharge policies.

Malaria Case Fatality Rate

Case Fatality Rate (CFR) represents a measure of the outcome of hospital care. It may also reflect quality of care and good clinical practices. However, the complexity of the causal pathways, variations in severity of case-mix, the integrative properties of the outcome, and the multifaceted nature of quality, make it often difficult to use CFR as a direct indicator of quality of care. The analysis of malaria-specific CFR across regions is thus developed for comparative purposes.

Malaria CFR in children under five years is especially relevant because it reflects the outcome of hospital care in the most vulnerable group. This is included in the list of sector-wide indicators and used for monitoring the performance of the health sector. In the selected hospitals, there were 610 malaria deaths out of the total 18,752 malaria admissions in children under 5 years resulting in a U5 malaria CFR of 3.3%: this estimate was lower than the international standard (CFR=4%), which is considered as acceptable for sub-Saharan Africa. It was also slightly lower than in 2002 (3.9%).

Large variations in CFR were observed across regions, ranging between 1.1% in Upper West Region and 7.3 in Brong Ahafo Region. Almost one quarter (21.0%) of total malaria deaths in childhood was observed in the Northern Region alone.



Case Fatality Rate for malaria in children under 5 years in selected hospitals by region (Ghana 2003).

High case-fatality rates observed in some facilities may be due to late presentation, more complex case-mix, inadequate management, and unavailability or stock-outs of effective drugs, and should be investigated in order to identify the underlying reasons. In particular, large variations in percentage of cerebral malaria cases were observed across regions (national average=1.8%), with hospitals in Brong Ahafo Region showing the highest percentages of cerebral malaria (8.3%). Since a much higher CFR was observed for cerebral malaria (20.3%) with respect to the non-complicated malaria cases (3.0%), these different patterns in severity of case mix may account, at least partly, for the observed CFR patterns.

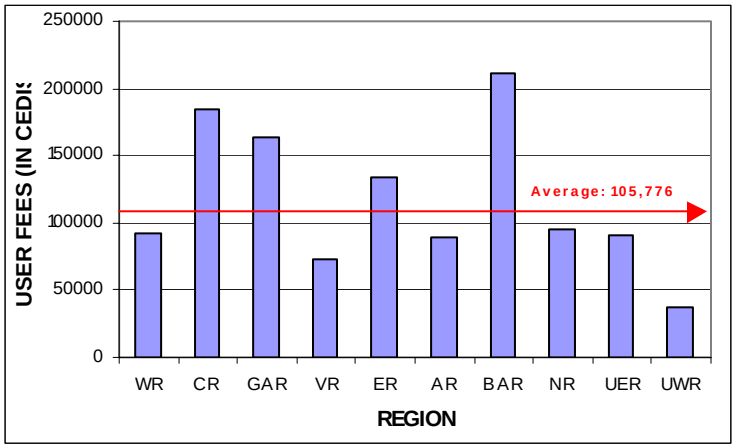
Malaria and financial accessibility to hospital care

Malaria is understood to be both a disease of poverty and a cause of poverty. Not only poor people are at increased risk of malaria infection and death, but also they are less likely to be able to pay either for effective malaria treatment or for transportation to a health facility capable of treating the disease. Both direct and indirect costs associated with a malaria episode represent a substantial burden on the poorer households. A study in the Kassena-Nankana District (Upper East Region) found that, while the cost of malaria care was just 1% of the income of the rich, it was 34% of the income of poor households. Furthermore, given fixed household incomes, high fees imply that consumption of other goods or services, possibly food and education, could be reduced. This is an example of the so-called "inverse care law", in which those persons with the greatest overall need for healthcare (i.e., socially and economically deprived persons) are the least able to obtain it

Since fees can have adverse effects on equity by impeding the access of the poor to needed services, it is important to analyse the fees patterns according to geographical and socio-economic criteria. The average user fees for malaria admission were 105,776 Cedis, ranging between 73,846 Cedis in the Northern belt, 124,237 Cedis in the southern belt, and 141,443 Cedis in the middle belt. The average user fees paid for malaria admissions in the most deprived districts (55,458 Cedis) were less than half of those paid in the

other districts (125,468). It is important to note that the average user fees for malaria may hide wide differences according to its severity and the subsequent variations in costs of diagnostic and therapeutic procedures. These differences ranged between 103,443 Cedis for non-complicated malaria and 183,367 Cedi for cerebral malaria.

The minimal user fees paid in some regions, such as Upper West Region, may be related to the implementation of the exemptions policy while those paid in Brong Ahafo and Central Regions may be the result of institutional arrangements and procedures. Most facilities in the Brong Ahafo Region are mission facilities and operate to a large extent on the revenue generated. This may provide incentives for increased fees to patients.



Distribution of user fees for malaria in selected hospitals by region (Ghana, 2003).

The burden of malaria: some reflections

Malaria has been estimated to constitute 10% of the overall disease burden in sub-Saharan Africa, being the leading cause of mortality in children aged under five years and accounting for about 40% of public health expenditure. It is also estimated to account for 20-50% of inpatient admissions, and up to 50% of outpatient visits in areas with high malaria transmission. The goal of Roll Back Malaria (RBM) Programme is to reduce malaria morbidity and mortality by 50% by 2010 through improved prevention (i.e., use of insecticide-treated nets), better access to care (i.e., early detection and rapid treatment of cases), higher quality and efficiency in service delivery, and increased partnership in the context of overall sector-wide development.

Baseline data and reliable monitoring of key malaria indicators are needed to measure whether the goals for morbidity and mortality reduction are achieved. Data from health facilities are potentially useful for monitoring malaria patterns and trends, but have several limitations. In Ghana, most cases of malaria in outpatient settings are diagnosed on the basis of clinical symptoms and treatment is presumptive, rather than based on laboratory confirmation. Moreover, malaria parasitaemia is common among people taking up health services in many endemic areas, so that a positive laboratory result does not necessarily mean that the patient is ill with malaria. The main clinical symptoms of malaria, fever and general weakness, are non-specific and may well be due to other common infections.

The crucial factor affecting the representativeness of hospital data is the extent to which the hospital statistics reflect the burden of disease in the population. Severe malaria cases only are included in the hospital statistics that are affected also by the accessibility of hospital services and by the health care seeking behaviour of the population. Demographic and health surveys (DHS) and other sources indicate that less than 50% of malaria morbidity and mortality is seen in formal health facilities indicating that only a fraction of the total burden can be accounted for by health statistics. Despite these limitations, hospital statistics may be acceptable for monitoring trends if their low sensitivity remains consistent over time.

Patterns of malaria morbidity and mortality in Ghana seem consistent with those observed in areas with high transmission in sub-Saharan countries, highlighting that the challenge of reducing malaria burden is still unmet. This has wide policy implications especially since malaria control has been recognized as an essential prerequisite as well as an outcome of development policies in Ghana. Investment in malaria control can reduce childhood and maternal death and disability, contribute to the well-being of families and the community, and ultimately improve human capital development and opportunities for economic growth.

However, malaria burden reflects intrinsic (human, parasite, mosquito) and extrinsic (environmental, social, behavioural, political, and economic conditions as well as disease-control efforts) determinants. Many of these determi-

nants, “upstream” from the point of health care delivery, lying outside the direct control of the health sector. The objectives of better health and greater equity may be achieved only through intersectoral collaboration, depending on how effectively the health sector engages other sectors and civil society. Therefore, because the burden of disease is multi-determined, policies need to exert leverage at multiple points, including education, environment and economics.