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All-cause and Malaria-specific Mortality in Two Endemic West African Countries with Different Malaria Transmission Patterns

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The fourth millennium development goal (MDG) seeks to reduce under five child mortality by two-thirds for the period between 1990 and 2015. However, recent estimates show that only a handful of countries are on track to achieve this goal. One important challenge is to provide estimates that rely on efficient and effective methods that can properly assess the progress of the MDGs. All-cause mortality and malaria-specific mortality are key indicators for the fourth MDG and the Roll Back malaria initiative (RBM), yet these indicators are difficult to measure judiciously in many of the priority countries because vital registration systems do not provide complete coverage. Most of the available estimates are based on information collected retrospectively from surveys and censuses conducted among women by asking them questions about their birth histories and surviving children. Because such information is collected from living mothers, it is likely that biases are introduced by failing to capture information from orphans, especially where female adult mortality is high. Other available mortality data sources include the demographic surveillance system (DSS) which collects data prospectively and provides timely indicators but mostly on a very tiny proportion of the national population, thereby raising questions on representativeness. Therefore, the main aim of this study was to describe and improve the estimates of all-cause and malaria mortality and morbidity by combining and analyzing a series of studies that come from two West African countries namely Burkina Faso and The Gambia. The specific objectives of the study were:
  1) To supplement the continent-wide estimates of the burden of malaria by local estimates based on three data sources from these countries namely:
  2) To compare the effects of malaria-specific mortality rates to all-cause mortality by assessing and comparing trends of mortality from the two countries.
  3) To investigate linkages between malaria morbidity and mortality patterns using clinical-epidemiological data from selected studies from one DSS site in Burkina Faso.

To address the above objectives, three analysis methods were used. The first method used a review of all available data from the literature and expertly summarized and presented mortality trends for all-cause and malaria-specific mortality rates. This was supplemented by jointly analysing DSS data and data from within-site studies rich in time series for recent periods from a selected site in north-western Burkina Faso. The advantage of DSS data was observed in providing a better evaluation of the trends of mortality with a clearly defined denominator and cause of death ascertainment obtained from results of the verbal autopsy method. In the third section, an attempt was made to relate the observed mortality and morbidity from one study region in Burkina Faso by examining current monthly correlation coefficients as well as lagged monthly correlations between observed morbidity and mortality.

The results from the analysis approaches were consistent in showing evidence of an overall decline in under-five all-cause mortality over time but without a corresponding decline in malaria-specific mortality rates. In addition, urban-rural differences in mortality rates were observed with mortality being higher in the rural areas that are often under-resourced. However,

irrespective of the urban-rural differences, the contribution of malaria related mortality to under-five all-cause mortality was observed to have steadily increased over time and further declines in all-cause mortality rates might largely be achieved by expanding the efforts towards reducing the malaria burden through effective programs such as the use of Insecticide Treated bednets (ITNs) and recommended first-line combination therapies.

Additionally, the results showed that trends in malaria morbidity and mortality are highly influenced by the seasonal patterns and therefore targeted seasonal interventions may form an appropriate strategy in reducing child mortality from malaria. The use of annual seasonal intermittent preventive therapy may form a viable strategy especially if combined with ITN use.

Furthermore, the study demonstrated that by combining various sources of available data, mortality patterns can be compared across countries in the developing world. Indeed, it was also evident that no single data source today is adequate enough in monitoring the required health indicators for the MDGs, but rather a combination of various data sources is needed. In fact, caution is needed in extrapolating the results obtained from demographic surveillance systems to give national rates.

However, with DSS data, it was possible to take advantage of available morbidity data and investigate the linkage between malaria transmission parameters and child mortality. The results from this analysis showed significant correlation coefficients between current monthly all-cause mortality rates and current age-adjusted malaria prevalence rates, although, this correlation was not strong enough for one to conclude that morbidity information can contribute much to an improved estimate of mortality. Similar findings were observed for malaria specific mortality. Highly significant correlations were also observed between current all-cause mortality and current malaria-specific mortality. Similar findings were observed for corresponding rates of the following month, thereby pointing to the fact that malaria is a major contributor to all-cause mortality in this population.

Nevertheless, the current analysis needs to be extended to several countries in endemic malaria regions where DSS data exists so that verifications of the current findings in the observed trends can be confirmed.

Overall, this study adds to a more understanding of the longitudinal all-cause and malaria-specific mortality patterns in sub-Saharan Africa by reviewing historically available data from various sources and comparing trends of malaria and all-cause mortality from two countries that are representative of the developing world. The two most commonly used and available data sources in resource poor countries are Demographic and Health surveys (DHS) and DSS. A few comparative analyses for these two data sources have shown that both DHS and DSS estimates are practically comparable and coherent. The aim of this study was not to demonstrate supremacy in data sources in settings where complete registration of vital events is unavailable, but rather to complement and supplement on the various data sources and methods in order to improve child mortality estimates especially the much desired malaria-specific mortality trends. Results show that many available data sources can provide a good estimate of all-cause mortality and given that majority of the malaria related mortality cases are among children less than five years, then, the idea of monitoring trends of all-cause mortality among children less than five years may be a good proxy estimate for monitoring trends in malaria mortality if and only if changes in all-cause mortality are sensitive to trends in malaria mortality. This study has attempted to provide fundamental answers to this argument by providing trends in all-cause mortality and malaria-specific mortality rates as well as providing correlations between observed mortality and morbidity parameters.

Finally, one cannot emphasize further the need to strengthen malaria surveillance and monitoring tools in parallel to scaling-up implementation of malaria control measures that have been tested and proven to be effective in reducing the burden of the disease. This seems to be the best way forward in monitoring and achieving the set goals of the RBM initiative as well as the fourth MDG.