# Re-analysis and interpretation of 2011 Liberia malaria indicator survey data to provide project-specific estimates for select malaria indicators


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## INTRODUCTION

Malaria is one of many components addressed in the Rebuilding Basic Health Services (RBHS) project; activities implemented in five out of Liberia's 15 counties. According to the 2011 Liberia Malaria Indicator Survey (MIS) report, 50% of pregnant women received the recommended two doses of intermittent preventive treatment (IPTp) for malaria during their last pregnancy (among women who had a live birth in the last two years and where at least one dose was received during an ANC visit). The RBHS project was reporting coverage of 73% using administrative reports. The discrepancy led USAID to question the project, which in turn led to a reanalysis of 2011 MIS data, comparing MIS collected in RBHS facility catchment areas to data collected in non-RBHS facility catchment areas to assess differences in IPT coverage.

The analysis was expanded to include two other project/non-project analyses: prevalence, diagnosis and prompt treatment of children with fever; and mosquito net usage by children under 5 years of age and by pregnant women.

## DATA and METHODS

The process involved mapping the project target areas over those captured in the 2011 MIS using Arc-GIS, identifying the appropriate comparison groups, and performing odd ratios and chi-square tests of independence using SAS. We compared the RBHS project areas to non-project areas for each of the following: (1) the probability of appropriately receiving two doses of IPT among women who had a live birth in the last 2 years, at least one dose provided during an ANC visit; (2) percent of children under 5 years of age and pregnant women who slept under an insecticide treated net the night before; and, (3) children under 5 with a fever receiving antimalarial drugs on the same or next day.

We employed a 0.05 significance level for all tests. In order to compare to results reported in the 2011 Liberia MIS report, the same weights used in the MIS were applied. However, since the 2011 Liberia MIS was designed using cluster sampling to generate robust estimates at the regional and national levels, there are limitations in generalizing the findings to the RBHS project level. SAS was used for all analyses using PROC FREQ.

*Determining RBHS Project Clusters*

To determine which MIS clusters were in RBHS facility catchment areas, we obtained the 2011 cluster listing from the National Malaria Control Program (NMCP), and mapped the clusters using Arc-GIS.

150 MIS clusters→ 41 clusters located in five RBHS supported counties (Bong, Nimba, Lofa, Grand Cape Mount and River Gee)→ 26 clusters located in RBHS facility catchment areas.

*Identifying the Appropriate Comparison Groups*

We compared RBHS clusters in the 5 counties (Bong, Lofa, Nimba, River Gee and Grand Cape Mount) (n=26 clusters) to all non-RBHS clusters (across the 15 counties) (n=124 clusters).

*Calculating the IPTp Denominator: Births less than 2 years*

To match the analysis in the 2011 MIS report, we calculated the denominator of women with a live birth in the last two years using the DHS Century Month Code (CMC) variables for child birth and date of interview.

## RESULTS

*Intermittent Preventive Treatment of Pregnant Women (IPTp)*

Eligible women in RBHS areas (61%) are significantly (p<.0001) more likely to have appropriately received IPT2 than in non-RBHS areas (46%). However, the RBHS project reported figure from project records for the comparable period (73%) was much higher than the *MIS e*stimate (61%). There are a number of potential explanations for the discrepancy including over-reporting by RBHS, limitations of self-reporting and recall bias in the MIS, and non-representativeness of the RBHS clusters in the MIS data (MIS was conducted in 80% of RBHS facility catchment areas) (Table 1).

**Table 2. Use of mosquito nets by children under 5 years of age and pregnant women, RBHS vs. non-RBHS clusters: % of the de facto household population who slept the night before the survey under a mosquito net (treated or untreated), under an insecticide-treated net (ITN), under a long-lasting insecticidal net (LLIN), and under an ITN or in a dwelling in which the interior walls have been sprayed against mosquitoes (IRS) in the past 12 months; and among the de facto household population in households with at least one ITN, the percentage who slept under an ITN the night before the survey, by RBHS and non RBHS areas, Liberia 2011**

| | Household Population | | | | Household population in households with at least one ITN[1] |
|---|---|---|---|---|---|
| | % who slept under any net last night | % who slept under an ITN[1] last night | % who slept under an LLIN last night | % who slept under an ITN[1] last night or in dwelling sprayed with IRS[2] past 12 months | % who slept under an ITN[1] last night [3] |
| **Children Under 5** | | | | | |
| **Region** | | | | | |
| **RBHS** | 40.9 (282) | 40.0 (276) | 39.8 (274) | 43.8 (302) | 64.0 (276) |
| **non-RBHS** | 37.4 (990) | 36.3 (963) | 36.0 (953) | 42.6 (1129) | 67.2 (963) |
| **Chi-square** | 2.85 | 3.08 | 3.38 | 0.34 | 1.53 |
| **p-value** | p=0.0917 | p=0.0794 | p=0.0662 | p=0.5612 | p=0.2157 |
| **Odds Ratio** | 1.16 | 1.17 | 1.17 | 1.05 | 0.87 |
| **95% CI** | (0.98, 1.37) | (0.98, 1.38) | (0.99, 1.40) | (0.89, 1.24) | (0.69, 1.09) |
| **Total Percent** | 38.1 | 37.1 | 36.7 | 42.9 | 66.5 |
| **Total N** | 3340 | 3340 | 3340 | 3340 | 1864 |
| **2011 MIS Report** | 38.1 | 37.1 | 36.7 | 42.9 | 68.0 |
| **Total N** | 3352 | 3352 | 3352 | 3352 | 1827 |
| **Pregnant Women** | | | | | |
| **Region** | | | | | |
| **RBHS** | 47.9 (35) | 46.5 (34) | 46.5 (34) | 46.5 (34) | 80.6 (34) |
| **non-RBHS** | 38.3 (111) | 37.2 (108) | 37.2 (108) | 45.1 (131) | 74.2 (108) |
| **Chi-square** | 2.26 | 2.14 | 2.14 | 0.05 | 0.71 |
| **p-value** | p=0.1329 | p=0.1439 | p=0.1439 | p=0.8318 | p=0.4004 |
| **Odds Ratio** | 1.45 | 1.47 | 1.47 | 1.06 | 1.44 |
| **95% CI** | (0.86, 2.50) | (0.88, 2.47) | (0.88, 2.47) | (0.63, 1.77) | (0.61, 3.36) |
| **Total Percent** | 40.2 | 39.0 | 39.0 | 45.4 | 75.7 |
| **Total N** | 363 | 363 | 363 | 363 | 187 |
| **2011 MIS Report** | 40.2 | 39.0 | 39.0 | 45.4 | 77.4 |
| **Total N** | 363 | 363 | 363 | 363 | 183 |

*Prevalence, diagnosis, and prompt treatment of children with fever*

Eligible U5 children with a fever in RBHS project areas were more likely to receive timely treatment for fever than in non-RBHS areas, however, none of the differences were statistically significant.

The 2011 MIS survey found overall 40% coverage of ACT among children with a fever in the two weeks prior to the survey; RBHS project records showed 90%. One contributing factor may be the fact that those in RBHS areas were borderline significantly more likely to seek treatment than those in non-RBHS areas (64% vs. 58%, p=0.05). There are a number of potential other explanations, such as over-reporting by RBHS, limitations of self-reporting and recall bias by MIS, and non-representativeness of the RBHS clusters in the MIS data (Table 3).

**Table 1. Prophylactic use of antimalarial drugs and use of intermittent preventive treatment (IPTp) by women during pregnancy: % of women age 15-49 with a live birth in the two years preceding the survey who, during the pregnancy preceding the last birth, took any antimalarial drug for prevention, who took one dose of SP/Fansidar, and who received IPTp, by RBHS project area, Liberia 2011**

| | SP/Fansidar | | Intermittent preventive treatment | | Number of women with a live birth in the two years preceding survey |
|---|---|---|---|---|---|
| | Took any SP/Fansidar | Received any SP/Fansidar during ANC | Took 2+ doses of SP/Fansidar | Took 2+ doses of SP/Fansidar and received at least one during ANC | |
| **Region** | | | | | |
| **RBHS** | 72.7 (195) | 72.0 (193) | 62.6 (167) | 61.3 (164) | 268 |
| **non-RBHS** | 60.6 (614) | 59.4 (601) | 46.8 (473) | 46.2 (467) | 1031 |
| **Chi-square** | 13.41 | 14.35 | 21.00 | 19.36 | |
| **p-value** | p=0.0003 | p=0.0002 | p<.0001 | p<.0001 | |
| **Odds Ratio** | 1.73 | 1.76 | 1.90 | 1.84 | |
| **95% CI** | (1.29, 2.33) | (1.31, 2.36) | (1.44, 2.51) | (1.40, 2.43) | |
| **Total Percent** | 63.2 | 62.0 | 50.1 | 49.3 | |
| **Total N** | 1281 | 1281 | 1276 | 1281 | 1281 |
| **2011 LMIS Report** | 63.2 | 62.0 | 50.3 | 49.6 | 1230 |

*Use of mosquito nets by children under 5 years of age and pregnant women*

Though the RBHS project catchment areas generally show better coverage for both children under 5 years of age and for pregnant woman, none of the differences were statistically significant. This analysis suffered from an inadequately powered sample size, in particular among the analysis for pregnant woman (Table 2).


**Table 3. Prevalence, diagnosis, and prompt treatment of children with fever**
**Percentage of children under age five with fever in the two weeks preceding the survey; and among children under age five with fever, the percentage for whom advice or treatment was sought from a health facility, provider, or pharmacy, the percentage who had blood taken from a finger or heel, the percentage who took artemisinin-based combination therapy (ACT), the percentage who took ACT the same or next day following the onset of fever, the percentage who took antimalarial drugs, and the percentage who took the drugs the same or next day following the onset of fever, by RBHS and non RBHS areas, Liberia 2011**

| | Among children U5 | Among children U5 with fever | | | | | |
|---|---|---|---|---|---|---|---|
| | % with fever in the two weeks preceding the survey | % sought treatment or advice from health facility, provider or pharmacy | % who had blood taken from a finger or heel for testing | % who took ACT | % who took ACT same or next day | % who took antimalarial drugs | % who took antimalarial drugs same or next day |
| **Region** | | | | | | | |
| **RBHS** | 48.9 (309) | 64.2 (181) | 34.5 (97) | 44.4 (125) | 27.2 (76) | 60.8 (171) | 37.2 (104) |
| **Non-RBHS** | 46.1 (1107) | 57.6 (566) | 33.1 (326) | 40.1 (395) | 25.3 (249) | 58.1 (571) | 35.9 (353) |
| **Chi-square** | 1.60 | 3.97 | 0.19 | 1.62 | 0.41 | 0.65 | 0.16 |
| **p-value** | p=0.2064 | p=0.0464 | p=0.6599 | p=0.2031 | p=0.5213 | p=0.4199 | p=0.6895 |
| **Odds Ratio** | 1.12 | 1.32 | 1.06 | 1.19 | 1.10 | 1.12 | 1.06 |
| **95% CI** | (0.94, 1.33) | (1.00, 1.74) | (0.81, 1.41) | (0.91, 1.55) | (0.82, 1.49) | (0.85, 1.47) | (0.81, 1.39) |
| **Total Percent** | 46.7 | 59.7 | 33.5 | 41.1 | 25.7 | 58.7 | 36.2 |
| **Total N** | 3034 [2] | 1264 | 1264 | 1264 | 1264 | 1264 | 1264 |
| **2011 LMIS Report** | 49.2 | 59.7 | 33.3 | 39.7 | 24.5 | 57.1 | 35.0 |
| **Total N** | 2876 | 1416 | 1416 | 1416 | 1416 | 1416 | 1416 |

## CHALLENGES and CONCLUSIONS

We faced challenges in recreating the exact 2011 MIS report denominators. For example, in Table 1, the 2011 MIS reported a total of 1,230 births in the last 2 years; 51 fewer than our 1,281. Similar discrepancies can be seen in Tables 2 and 3. We were unable to determine the reason for these discrepancies despite correspondence with MEASURE DHS analysts, but concluded that for our primary purpose of comparing project to non-project areas, it was inconsequential.

The DHS reanalysis allowed us to compare project indicators collected in the survey to those also collected through project records, thus helping validate the accuracy of the project tools, as well as provide a rough assessment of the impact of project activities at the household level. In this sense, it was a beneficial exercise.

On the other hand, challenges in conducting the analysis in terms of being able to specifically recreate the MIS variable/indicator definitions, inadequate sample sizes for some of the sub population analysis, and the larger issue of generalizability to the project area led us to question whether it would equally be a good use of project staff time on future projects.

The standardized and rigorous implementation of the Demographic and Health Surveys provides a wealth of largely unharnessed data for project management and evaluation purposes. However, to maximize cost effectiveness, it is suggested that health projects—and in particular those that are specifically aligned with national priorities—partner with DHS to oversample the clusters from project areas to provide a more robust assessment of the effectiveness of project activities at the household level. Overall, despite limitations in generalizing the findings to the RBHS project level, the MIS reanalysis proved to be a beneficial and cost-effective tool contributing to other project evaluation activities.

## NOTES


The Rebuilding Basic Health Services (RBHS) project, funded by the United States Agency for International Development (USAID), is the United States government's major initiative in support of Liberia's Ministry of Health and Social Welfare (MOHSW).

RBHS is a partnership led by JSI Research and Training (JSI), with partners Jhpiego, the Johns Hopkins University Center for Communication Programs (JHU-CCP), and Management Sciences for Health (MSH).

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