



## Epidemiology and control profile of malaria in Sierra Leone | 2017 Supplement



## About this supplement

In 2015, the Sierra Leone National Malaria Control Programme released a comprehensive malaria control profile in partnership with the LINK programme, a collaboration between the London School of Hygiene & Tropical Medicine and the KEMRI-Wellcome Trust Research Programme based in Nairobi. The profile drew together data on parasite transmission risk from household surveys, the distribution of dominant vector species and the coverage of insecticide-treated mosquito nets (ITN), indoor residual spraying (IRS) and mass drug administration (MDA) and presented this data alongside programmatic and historic descriptive information. The profile supported the NMCP and partners in national strategic planning and funding applications to the larger aim of accelerating progress towards the targets specified in the National Malaria Strategic Plan.

Using newly available prevalence data from the 2016 MIS and administrative long-lasting insecticidal net (LLIN) distribution data from Sierra Leone's District Health Information System 2 (DHIS 2), this supplement applies a new geospatial modelling strategy to present updated maps of malaria prevalence and LLINs distribution.

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## Acknowledgements

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The report was prepared by the LINK programme team at the London School of Hygiene & Tropical Medicine in London (Jo Lines, Lauren Hashiguchi, Ruth Lorimer, Ngozi Erondy), the KEMRI-Wellcome Trust in Nairobi (Bob Snow, Emelda Okiro, Peter Macharia, Paul Ouma, Joseph Maina and Damaris Kinyoki), which assembled the data and performed the analyses and modelling, and the Sierra Leone NMCP.

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## Overview

Since the release of the 2015 epidemiological profile, Sierra Leone has withstood the Ebola Virus Disease early recovery phase, distributed 4.2 million LLINs, and completed the 2016 Malaria Indicator Survey (MIS) as part of its Demographic Health Survey (DHS). In addition, the country released National Malaria Strategic Plan (2016-2020) which established goals and objectives to guide the next half decade of malaria control activities.

The Malaria Control Strategic Plan, which envisions universal access to malaria control interventions, set forth an overarching goal to reduce 2015 levels of malaria morbidity and mortality by at least 40% by 2020. To this end, the NMCP identified the following objectives:

- 1a. All suspected malaria cases should have access to confirmatory diagnosis;
- 1b. All malaria cases to receive effective treatment;
- 2a. Provide access to 100% of the population at risk with preventive measures by 2017;
- 2b. To protect at least 80% of pregnant women and children under one year with IPT3 by 2020;
3. To provide knowledge to the population such that at least 80% of the population practices malaria prevention and treatment measures by 2018;
4. By 2020, at least 95% of health facilities report routinely on malaria programme performance; and
5. By 2020, maintain and strengthen capacity for program management, coordination and partnership to achieve malaria programme performance at all levels.

Using newly available data from the 2016 MIS and DHIS 2, the supplement presents the following materials to support the NMCP in its efforts to achieve the objectives of the national strategic plan for malaria control:<sup>1</sup>

1. Overview of methods and distribution of age-corrected parasite prevalence data used in prevalence models
2. Updated district-level maps of malaria burden (*Plasmodium falciparum* prevalence in children aged 2-10 [PfPR<sub>2-10</sub>]) for 2013 and 2016
3. Updated district-level maps of LLIN distribution (through mass and routine distribution) for 2014, 2016 and 2017
4. Per capita distribution of LLINs between 2014 and June 2017
5. Updated district-level maps of LLIN use 2014, 2016 and 2017

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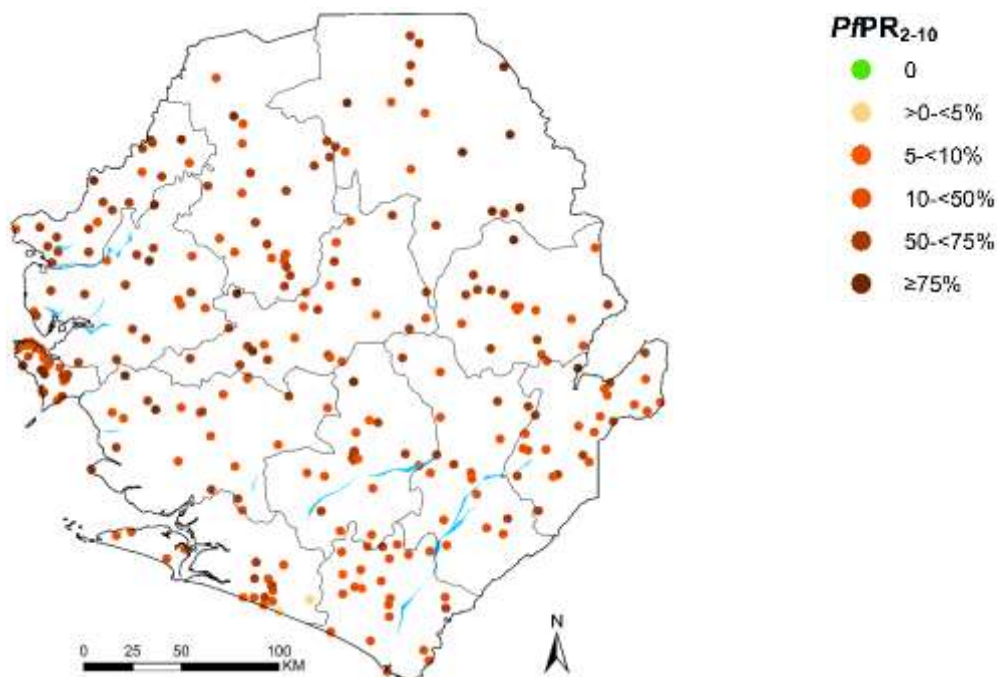
<sup>1</sup> The most current maps for Indoor Residual Spraying, distribution of reported vectors by district, insecticide treated net (ITN) distribution, and Mass Drug Administration can be found in the *Epidemiology and control profile of malaria in Sierra Leone* (NMCP, LSHTM and KEMRI-Wellcome Trust, 2015).

## Updated prevalence maps

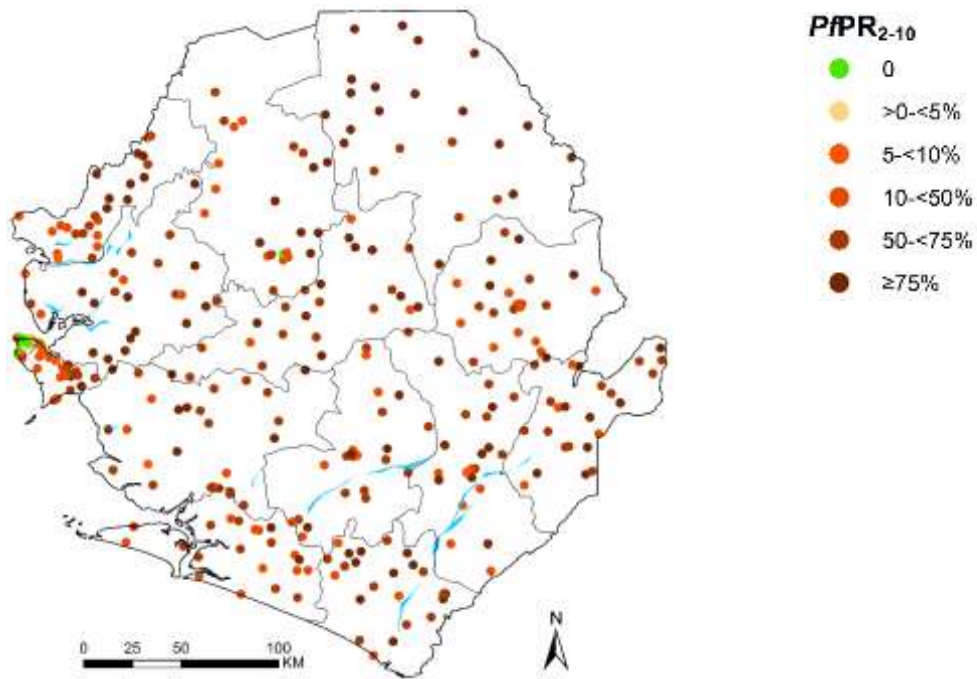
To generate geospatial models of parasite prevalence over time, *P. falciparum* parasite prevalence data from all available national household surveys were analysed to provide small area estimations at district levels of the mean prevalence in children aged 2-10 years ( $PfPR_{2-10}$ ). These models include the following covariates: temperature suitability index, enhanced vegetation index, precipitation and Worldpop's definition of urban.

**The updated maps are different from the 2015 maps in that they:**

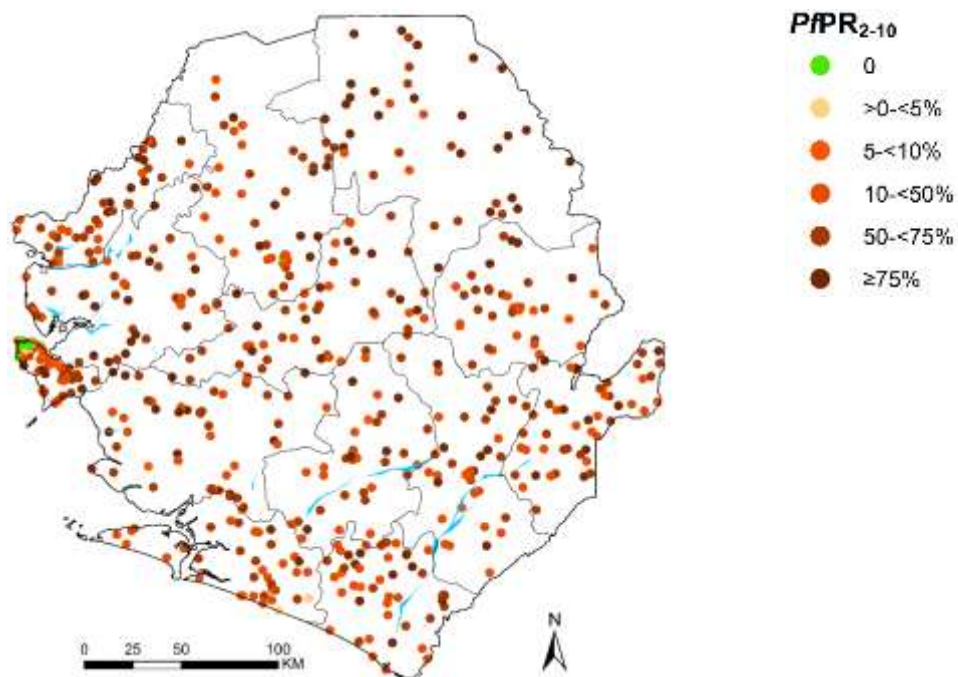
- 1. Employ a new modelling strategy.** These models use small area estimation rather than the point process model used in 2015. This method provides estimates by district, rather than a continuous measure of risk in space, as was done in 2015.
- 2. Include more data points.** The updated model includes data from the 2016 Malaria Indicator Survey (MIS). The 2013 MIS data, which was included in the 2015 profile included 276 ( $PfPR_{2-10}$ ) survey data points (Figure 1), while the 2016 MIS included 336 survey data points (Figure 2). In total, the updated model include 612 total unique locations between the two MIS surveys (Figure 3).



**Figure 1.** Location of 276 age-corrected parasite prevalence data ( $PfPR_{2-10}$ ) for Sierra Leone MIS 2013



**Figure 2.** Location of 336 age-corrected parasite prevalence data ( $PfPR_{2-10}$ ) for Sierra Leone MIS 2016



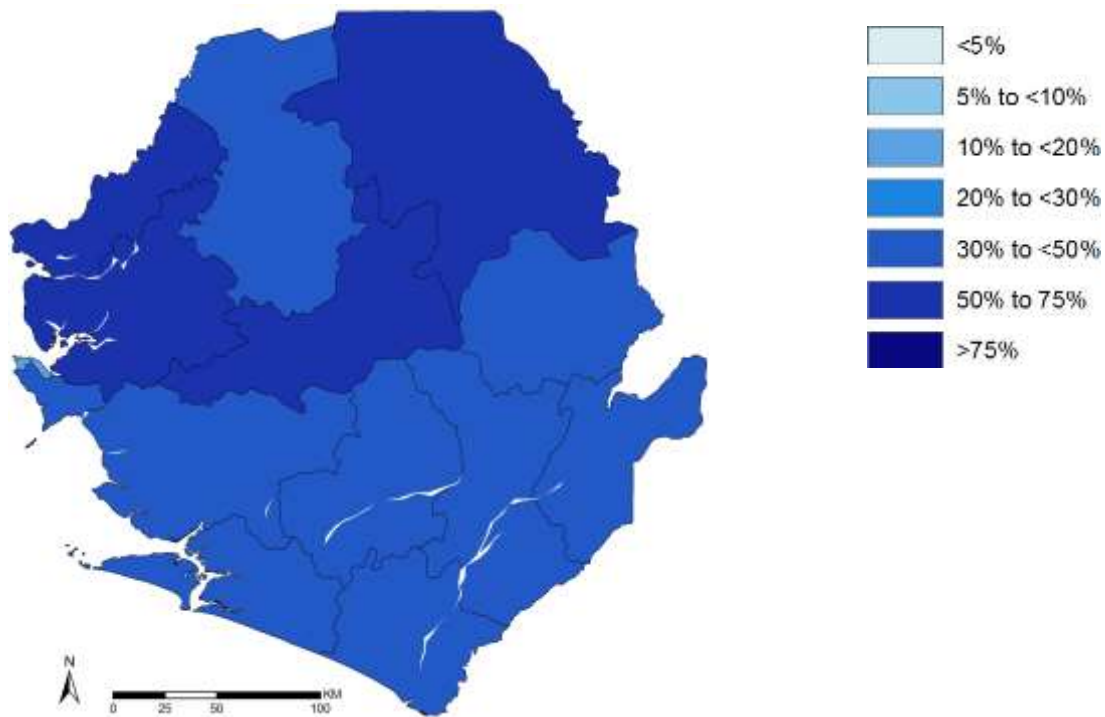
**Figure 3.** Location of 612 age-corrected parasite prevalence data ( $PfPR_{2-10}$ ) for Sierra Leone for MIS 2013 and MIS 2016 combined

The updated small area estimation models of malaria burden in Sierra Leone show that between 47% and 76% of 2-10 years olds in all districts are infected with *P. falciparum*, but that Freetown has a much lower prevalence (Table 1).

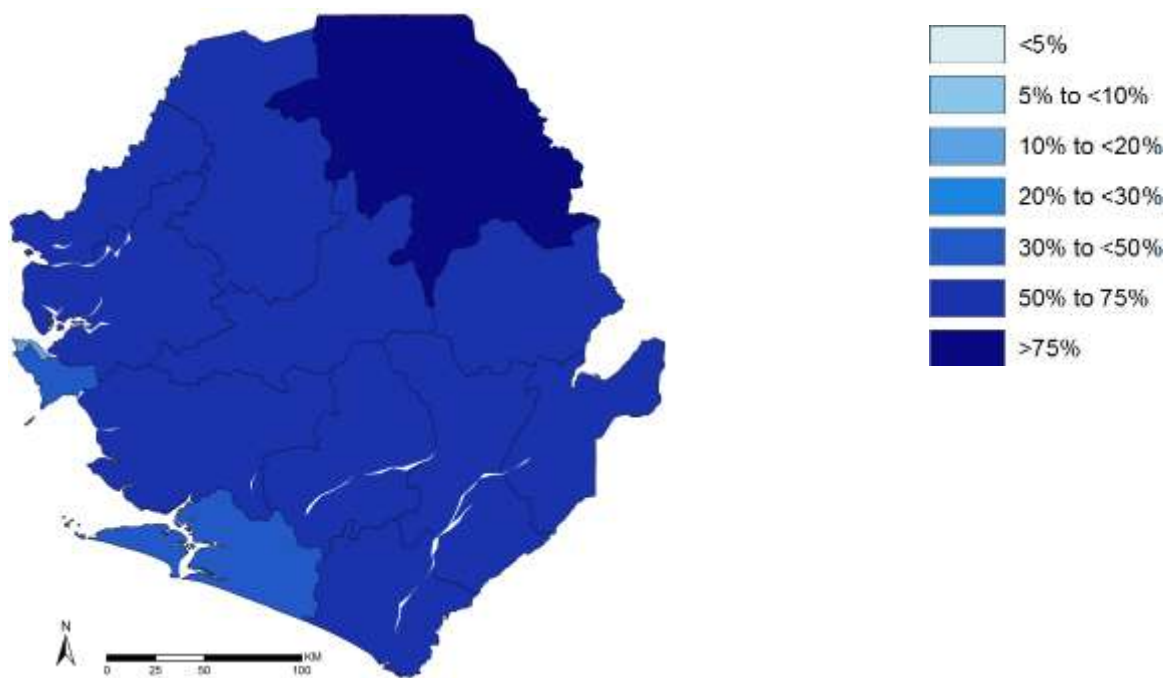
**Table 1.** District-level estimates of PfPR<sub>2-10</sub> in 2013 and 2016 using small area estimation (% of 2-10 year olds infected with *P. falciparum*)

<b>District</b>	<b>2013</b>	<b>2016</b>
Bo	43.9	56.3
Bombali	47.8	60.4
Bonthe	34.6	47.0
Kailahun	48.7	61.5
Kambia	54.1	66.2
Kenema	46.3	58.9
Koinadugu	65.3	76.0
Kono	44.4	57.1
Moyamba	48.7	61.4
Port Loko	56.1	68.1
Pujehun	44.9	57.7
Tonkolili	55.5	67.7
Western Rural	37.5	50.0
Western Urban/Freetown	12.7	19.5

Applying these estimates to a geospatial model, results are presented within a map (Figures 4 and 5).



**Figure 4.** PfPR<sub>2-10</sub> prediction 2013 by health district in Sierra Leone using small area estimation



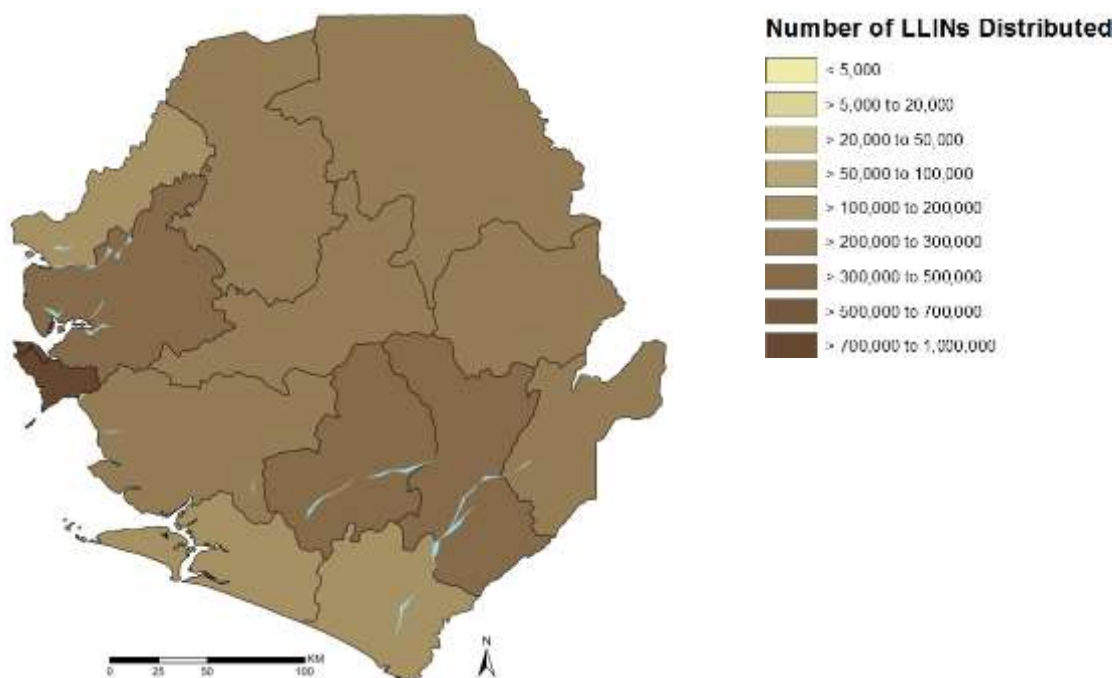
**Figure 5.** PfPR<sub>2-10</sub> prediction 2016 by health district in Sierra Leone using small area estimation



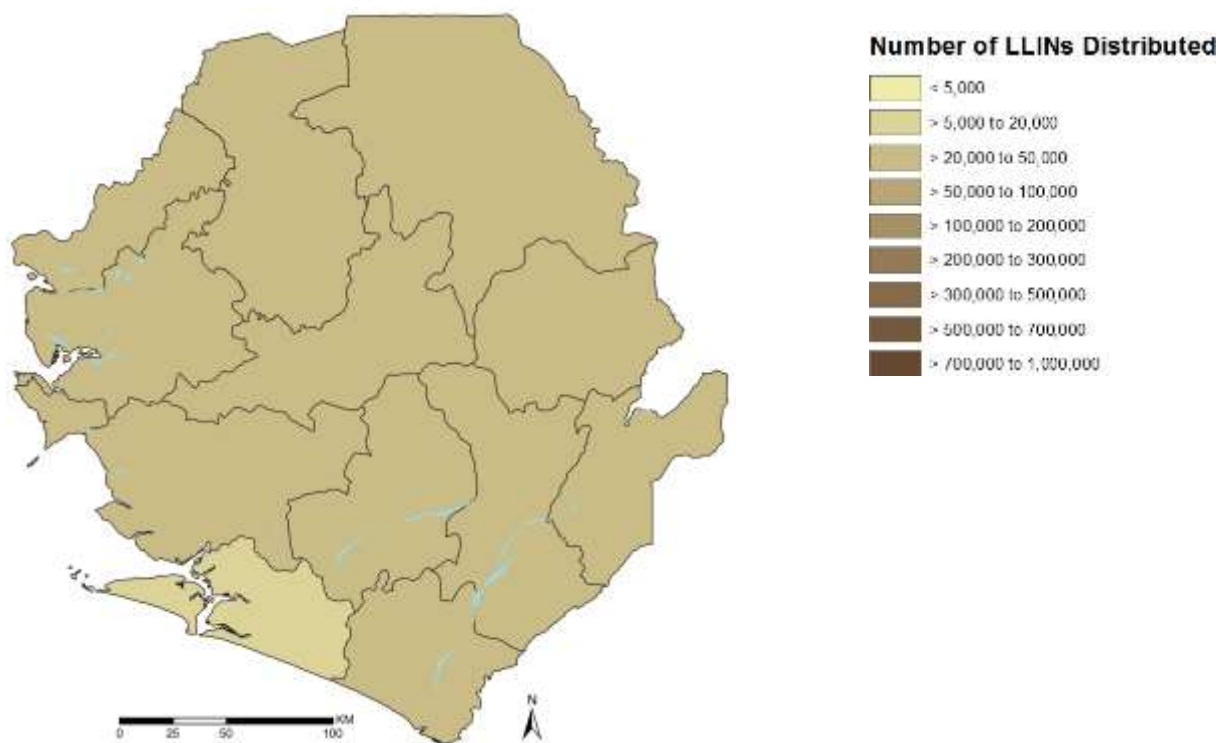
## Updated Long Lasting Insecticidal Nets (LLIN) distribution maps

Using 2016 distribution data from the NMCP, we updated the LLIN distribution maps to reflect activities since 2015. Distribution data from 2016 and 2017 reflect routine distribution through national Antenatal Care (ANC) and expanded programme on immunisation (EPI), as well as mass distributions; the data were collected using the DHIS 2 and were shared in July 2017 by the NMCP and DPPI. In 2010, the NMCP distributed 3.2 million free ITNs, in 2014 the country distributed 3.5 million free LLINs and in 2017 it distributed 4.2 million free LLINs. To note, distribution does not reflect use.

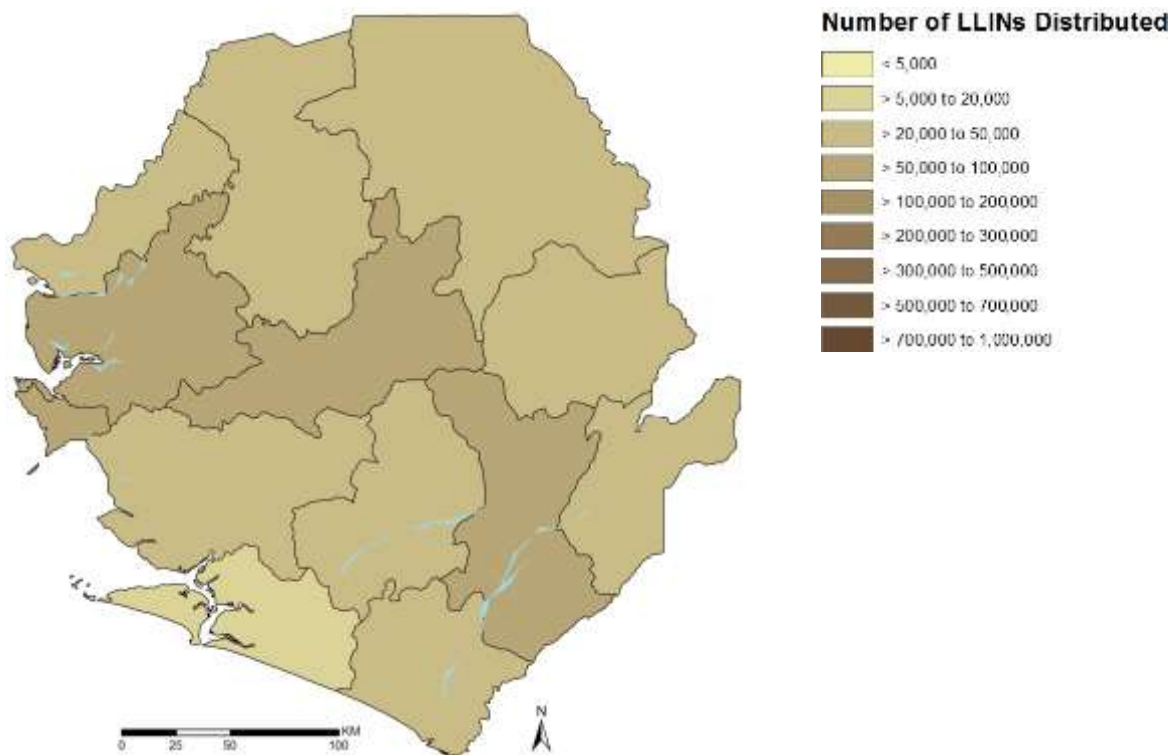
We present the number of LLINs distributed by district in 2014, 2015, 2016 and January to June 2017 (Figures 6-8), as well as per capita LLIN distribution between 2014 and June 2017 (Figure 10).



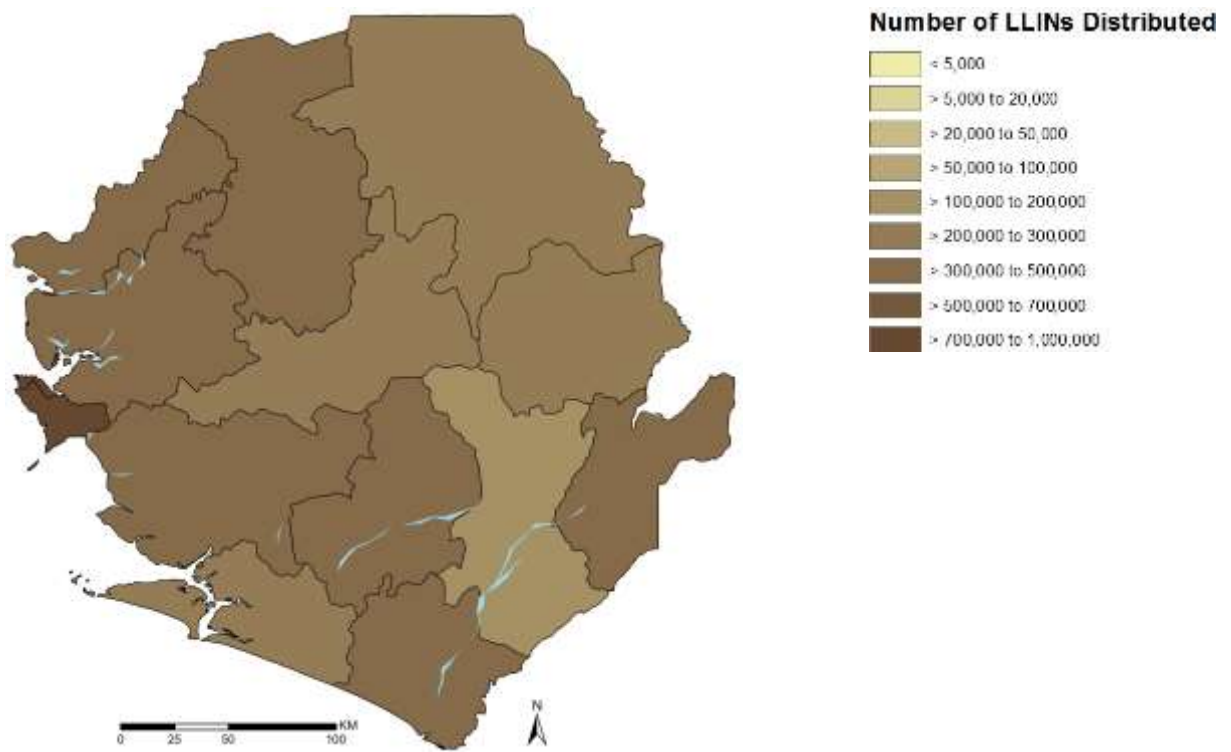
**Figure 6.** Number of LLINs distributed to households through mass distribution and routine programmes in 2014



**Figure 7.** Number of LLINs distributed to households through mass distribution and routine programmes in 2015

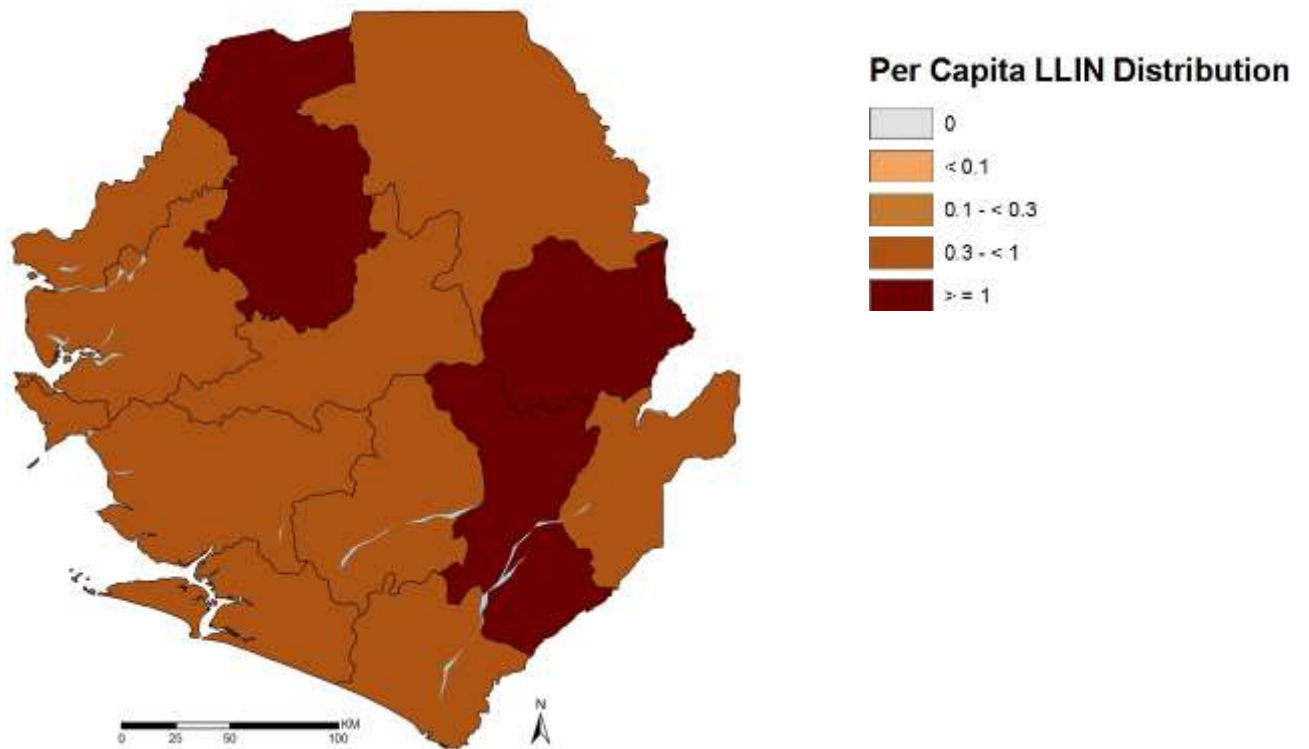


**Figure 8.** Number of LLINs distributed to households through mass distribution and routine programmes in 2016



**Figure 9.** Number of LLINs distributed to households through mass distribution and routine programmes in 2017 (January to June)

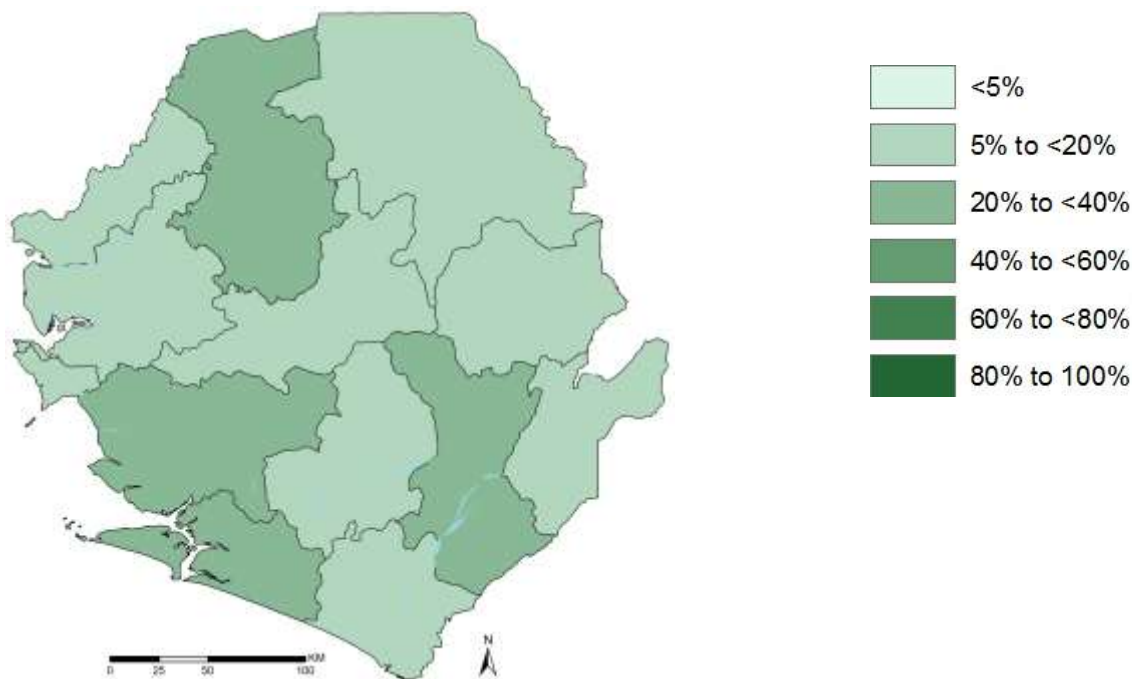
## Updated map of per capita LLIN distribution



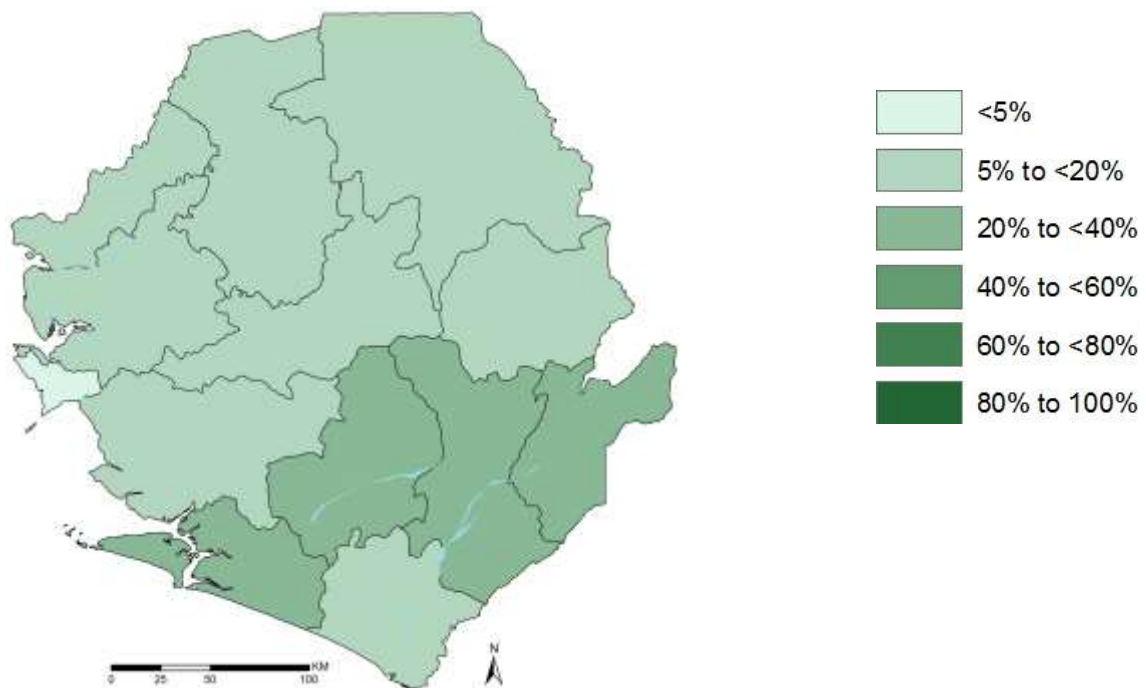
**Figure 10.** Per capita distribution of LLINs between 2014 and June 2017

## Updated Insecticide-Treated Net (ITN) use maps

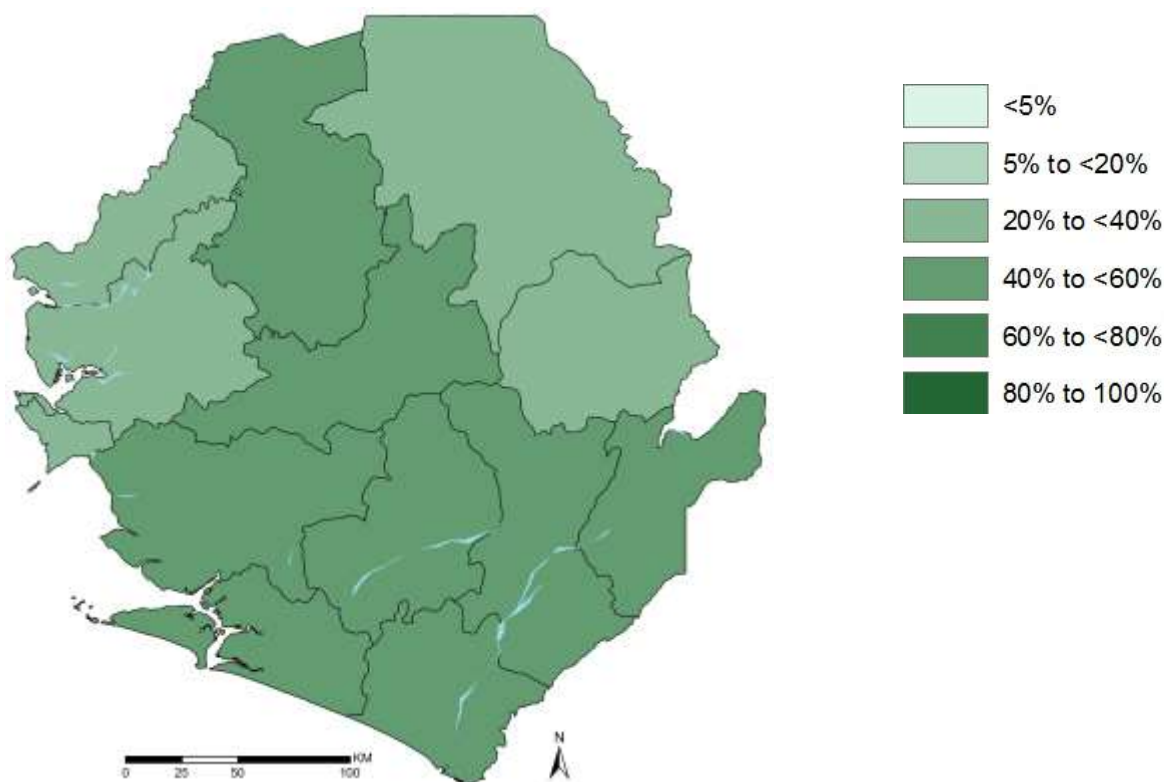
Using data from the 2013 and 2016 MIS surveys, we update the LLIN use maps to reflect activities since 2015. We present percent of households with at least one ITN for every two persons (Figures 11 and 12) and percent of population sleeping under an ITN the previous night (Figures 13 and 14).



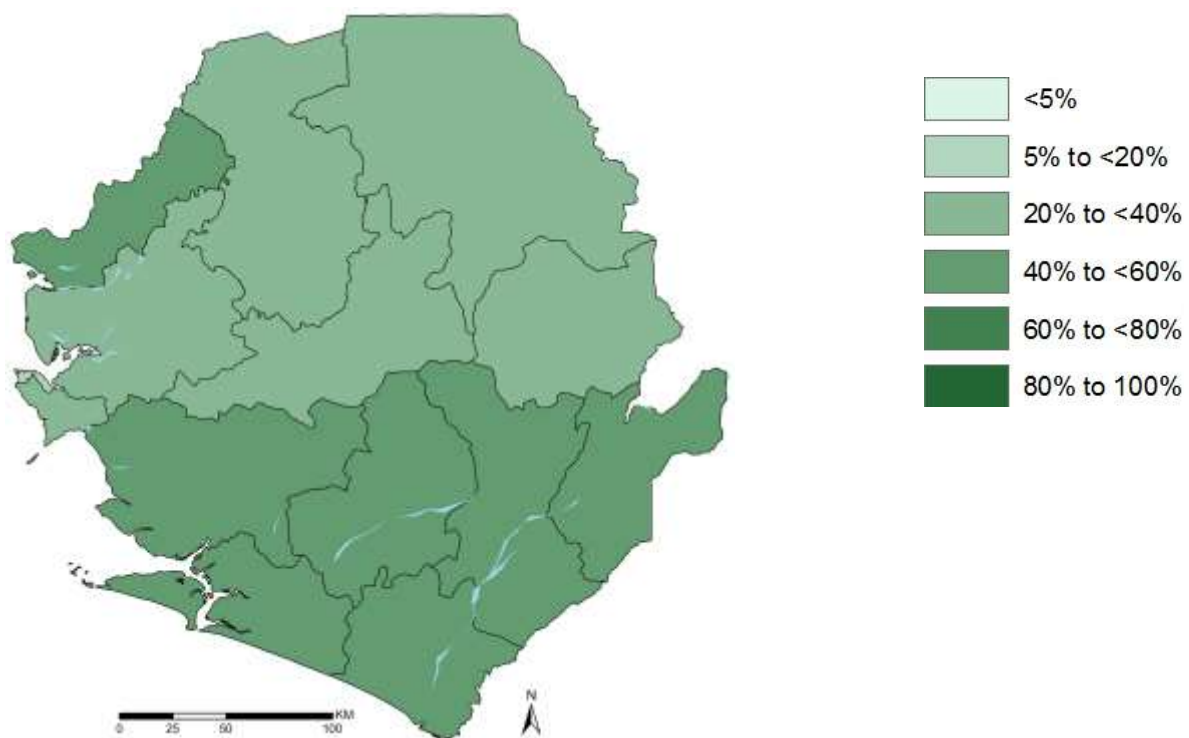
**Figure 11.** Percent of households with at least one ITN for every two persons in 2013



**Figure 12.** Percent of households with at least one ITN for every two persons in 2016



**Figure 13.** Percent of the population sleeping under an ITN in 2013



**Figure 14.** Percent of the population sleeping under an ITN in 2016



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