Case Study: Applying SLEAC: Sierra Leone National Coverage Survey

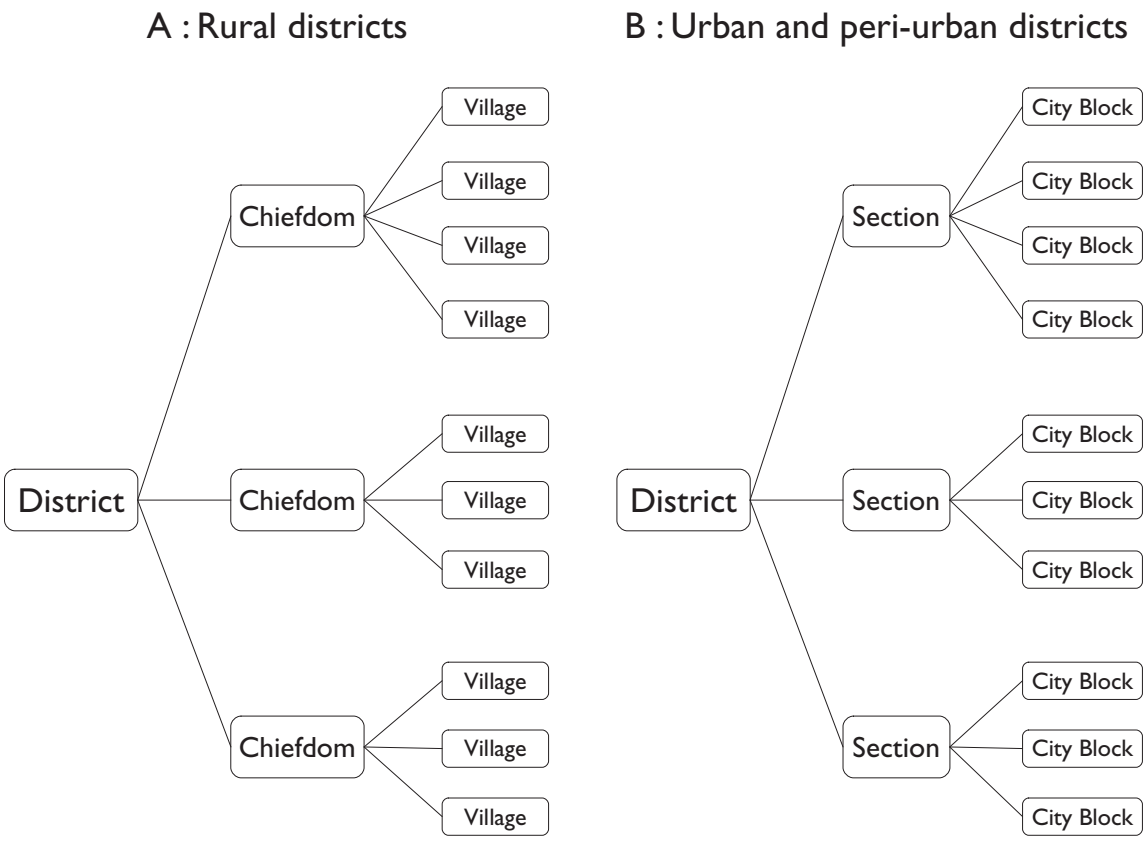
The CMAM approach to treating cases of SAM in government health facilities was piloted in four districts of Sierra Leone in 2008. The program was expanded to provide CMAM services in selected health centres in all 14 districts of the country in 2010. This case study describes the application of SLEAC to the assessment of the coverage of this national CMAM program.

SLEAC Sampling Design

SLEAC was used as a wide-area survey method to classify coverage at the district level. The district was selected as the unit of classification because service delivery of the national program was managed and implemented at the district level.

The PSUs used in the SLEAC surveys were census enumeration areas (EAs). In rural districts, EAs were individual villages and hamlets. In urban and peri-urban districts, EAs were city blocks. In rural districts, lists of potential PSUs were sorted by chiefdom. In urban and peri-urban districts, lists of potential PSUs were sorted by electoral ward (*sections*). This approach ensured a near-even spatial spread of the selected villages across rural districts and a near-even spatial spread of selected EAs across urban and per-urban districts. The structure of the district-level samples are shown in **Figure 103**.

Figure 103. Structure of samples in rural and peri-urban/urban districts



A target sample size of $n = 40$ current SAM cases was used in both rural and urban districts. This is the standard SLEAC sample size for large populations. A lower target sample size ($n = 33$) was used in the single peri-urban district because this district had a much lower population than the other districts.

The number of PSUs (n_{PSU}) needed to reach the target sample size in each district was calculated using estimates of average EA population and SAM prevalence using the following formula:

$$n_{PSU} = \left\lceil \frac{target\ sample\ size\ (n)}{average\ \ EA\ \ population_{all\ ages} \times \frac{percentage\ \ of\ \ population_{6-59 months}}{100} \times \frac{SAM\ prevalence}{100}} \right\rceil$$

Average EA population was estimated as:

$$Average\ EA\ population = \frac{District\ population}{Total\ number\ of\ EAs\ in\ the\ district}$$

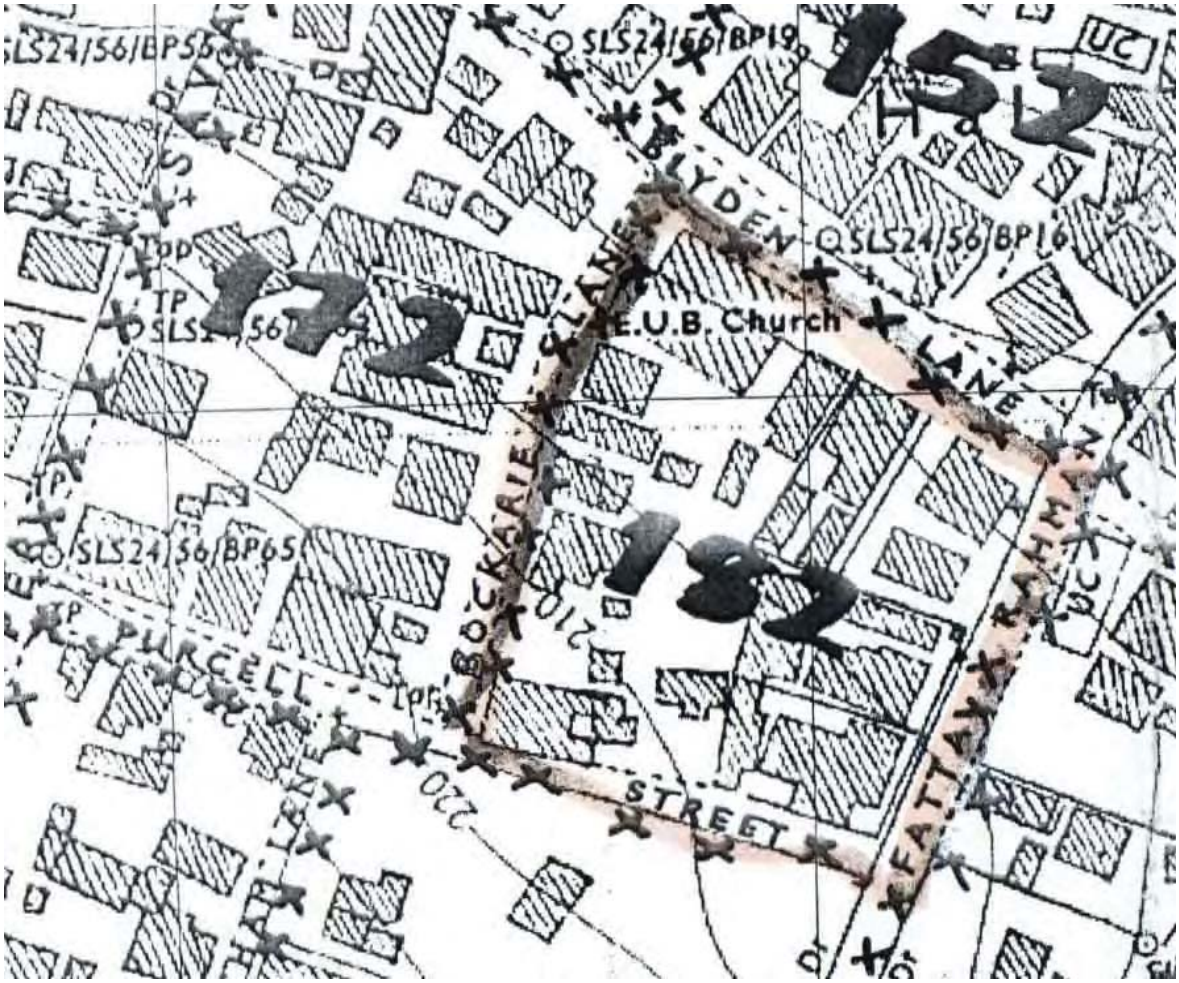
using data from the most recent (2004) Sierra Leone Population and Housing Census.

The percentage of the population aged between 6 and 59 months was estimated as 17.7%. This is a national average taken from the Sierra Leone 2004 Population and Housing Census. This estimate was used by Sierra Leone government departments, United Nations organisations, and NGOs.

SAM prevalences were taken from reports of SMART surveys of prevalence in each district that had been undertaken in the lean period of the previous year. The prevalence of SAM using MUAC and oedema was used since this matched program admission criteria.

The Sierra Leone Central Statistics Bureau provided information on the total district populations and total number of EAs in each district. The Sierra Leone Central Statistics Bureau also provided lists of EAs for the Western Area (urban and peri-urban) districts and large-scale maps (see **Figure 104**) of the EAs that were selected for sampling.

Figure 104. Example of a large-scale map showing enumeration area boundaries used when sampling in an urban district



Map courtesy of the Sierra Leone Central Statistics Bureau

PSUs were selected using the following *systematic sampling* procedure:

Step 1. The lists of EAs were sorted by chiefdom for rural districts and by section for urban and peri-urban districts.

Step 2. A sampling interval was calculated using the following formula:

$$Sampling\ interval = \left\lfloor \frac{Number\ of\ EAs\ in\ district}{n_{PSU}} \right\rfloor$$

Step 3. A random starting PSU from the top of the list was selected using a random number between 1 and the the sampling interval. The random number was generated by the coin-tossing method described under 'A Note on Generating Random Numbers' in the SQUEAC section of this document.

The PSUs selected by this procedure were sampled using a case-finding method tailored to the particular district:

- In rural districts, a district-specific case-finding question was developed from the base case-finding question:

  > *Where can we find children that are sick, thin, have swollen legs or feet, or have recently been sick and have not recovered fully, or are attending a feeding program?*

  This question was adapted and improved using information collected from TBAs, female elders, traditional health practitioners, carers of children in the program, and other key informants to include local terms (in all local languages) and local aetiological beliefs regarding wasting and oedema. This question was used as part of an active and adaptive case finding method (see Box 3, page 65).

- In urban and peri-urban districts, house-to-house and door-to-door case-finding was used. This was done because it was felt that active and adaptive case-finding would not work well in these districts. Sampling was aided by the use of large-scale maps showing EA boundaries provided by the Sierra Leone Central Statistics Bureau (see Figure 104).

After all selected PSUs in a district had been sampled, the survey team met at the district headquarters for data collation and analysis. The simplified LQAS classification technique was applied to the collated data.

The coverage standards:

> **Low coverage:** Below 20%
>
> **Moderate coverage:** Between 20% and 50%
>
> **High coverage:** Above 50%

were decided centrally by MOH and UNICEF staff before the start of the surveys. These standards were used to create decision rules using the rule-of-thumb formulas:

$$d_1 = \lfloor n \times p_1 \rfloor = \left\lfloor n \times \frac{20}{100} \right\rfloor = \left\lfloor \frac{n}{5} \right\rfloor \quad \text{and} \quad d_2 = \lfloor n \times p_2 \rfloor = \left\lfloor n \times \frac{50}{100} \right\rfloor = \left\lfloor \frac{n}{2} \right\rfloor$$

where n is the sample size achieved by the survey, p_1 is the lower coverage threshold (i.e., 20%), and p_2 is the upper coverage threshold (i.e., 50%).

Coverage in each district was classified using the algorithm presented in Figure 70. **Table 11** presents the results of the surveys. **Figure 105** presents the same results as a map of per-district coverage.

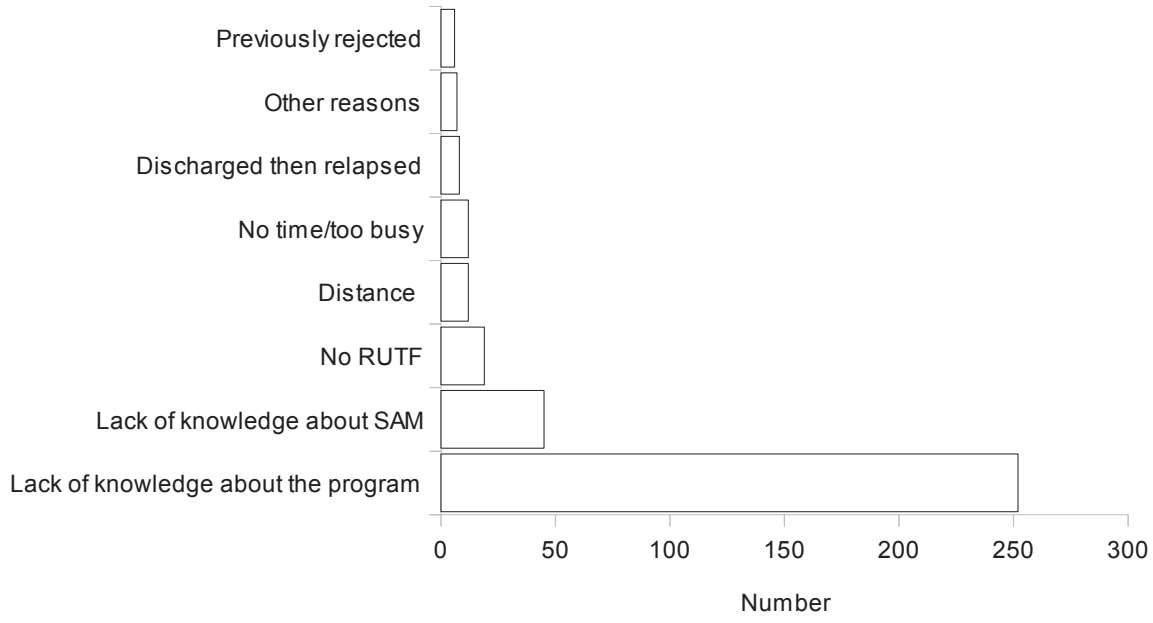
Table 11. Coverage classification by district

Province	District	SAM cases found (n)	Covered SAM cases (c)	Lower decision threshold $d_1 = \left\lfloor \frac{n}{5} \right\rfloor$	Is $c > d_1$?	Upper decision threshold $d_2 = \left\lfloor \frac{n}{2} \right\rfloor$	Is $c > d_2$?	Coverage classification
Northern	Bombali	30	4	6	No	15	No	LOW
	Koinadugu	32	0	6	No	16	No	LOW
	Kambia	28	0	5	No	14	No	LOW
	Port Loko	30	2	6	No	15	No	LOW
	Tonkolili	28	1	5	No	14	No	LOW
Eastern	Kono	16	2	3	No	8	No	LOW
	Kenema	34	8	6	Yes	17	No	MODERATE
	Kailahun	34	4	6	No	17	No	LOW
Southern	Bonthe	41	7	8	No	20	No	LOW
	Pujehun	27	6	5	Yes	13	No	MODERATE
	Bo	22	6	4	Yes	11	No	MODERATE
	Moyamba	40	6	8	No	20	No	LOW
Western	Rural	46	6	9	No	23	No	LOW
	Urban	20	2	4	No	10	No	LOW
National Total		**428**	**54**	**85**	**No**	**214**	**No**	**LOW**

Figure 105. Map of per-district coverage

A short questionnaire, similar to that shown in Box 2 (page 49) asking about barriers to coverage was administered to carers of non-covered cases found. Data were tabulated from the questionnaires using a tally sheet and presented as a Pareto chart (**Figure 106**).

Figure 106. Barriers to service uptake and access



SLEAC Implementation Process

The process as described above was completed in 8 weeks (44 working days) staffed by 15 mid-level health management staff and a principal surveyor provided by Valid International. Three survey teams with five members each were used. The teams were divided into two sub-teams. A survey team was headed by a 'captain' who was in charge of managing the sub-teams, organising travel and survey logistics, and co-ordinating survey activities with the principal surveyor.

Each district was divided into three segments. Segmentation was informed by logistics, with each segment being served by a road (when possible).

Each survey team was assigned to one of the three segments and provided with:

- A list of PSUs (sorted my chiefdom) to be sampled
- A list of the locations of CMAM program sites
- A list of the names and home villages of chiefs and chief's assistants for each PSU to be sampled

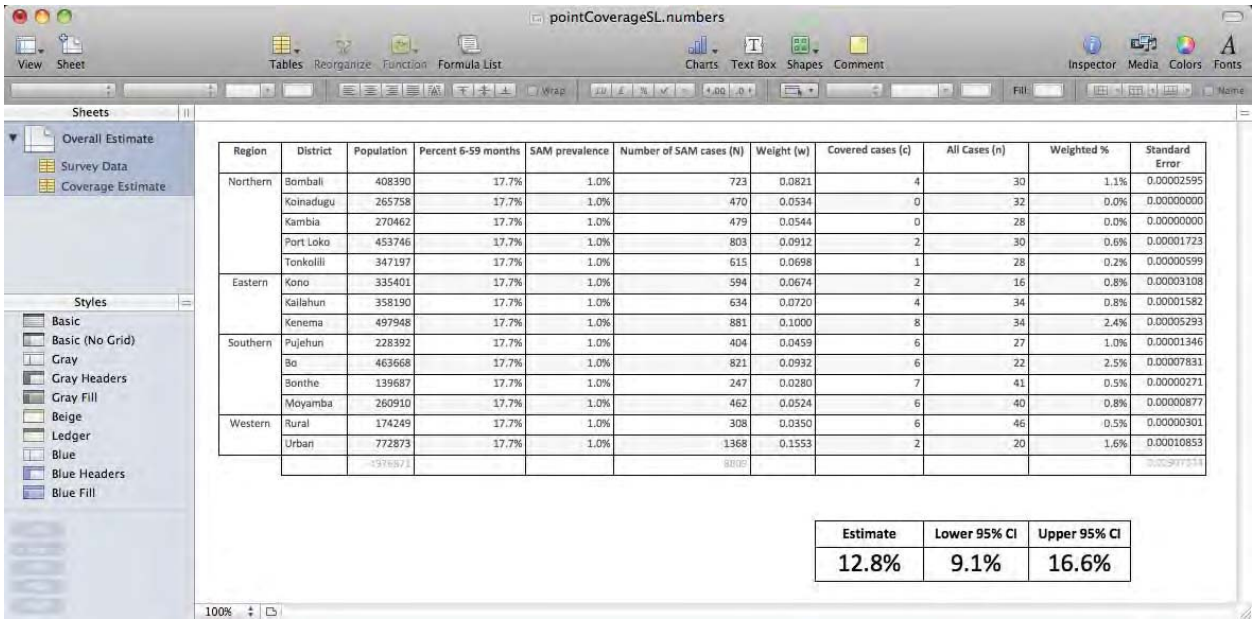
Each survey team started case-finding in the farthest PSU and then moved to the next-farthest PSU for case-finding and so-on. At the end of each day, the survey teams lodged in health centres, local guesthouses, or in villagers' homes. They restarted case-finding on the following day. This continued until all the PSUs had been sampled. The survey teams then came together at the district headquarters for data collation and analysis and results shared with district-level health management staff.

Upon completion, the survey team was able to:

- Classify coverage in each district (Table 11, page 185)
- Map coverage by district for the whole country (Figure 105)
- List barriers to coverage ranked by their relative importance (Figure 106)

An overall coverage estimate was calculated but not reported. **Figure 107** shows the calculation of a weighted point coverage estimator using spreadsheet software.

Figure 107. Calculation of a wide-area coverage estimate



Region	District	Population	Percent 6-59 months	SAM prevalence	Number of SAM cases (N)	Weight (w)	Covered cases (c)	All Cases (n)	Weighted %	Standard Error
Northern	Bombali	408390	17.7%	1.0%	723	0.0821	4	30	1.1%	0.00002595
	Koinadugu	265758	17.7%	1.0%	470	0.0534	0	32	0.0%	0.00000000
	Kambia	270462	17.7%	1.0%	479	0.0544	0	28	0.0%	0.00000000
	Port Loko	453746	17.7%	1.0%	803	0.0912	2	30	0.6%	0.00001723
	Tonkolili	347197	17.7%	1.0%	615	0.0698	1	28	0.2%	0.00000599
Eastern	Kono	335401	17.7%	1.0%	594	0.0674	2	16	0.8%	0.00003108
	Kailahun	358190	17.7%	1.0%	634	0.0720	4	34	0.8%	0.00001582
	Kenema	497948	17.7%	1.0%	881	0.1000	8	34	2.4%	0.00005293
Southern	Pujehun	228392	17.7%	1.0%	404	0.0459	6	27	1.0%	0.00001346
	Bo	463668	17.7%	1.0%	821	0.0932	6	22	2.5%	0.00007831
	Bonthe	139687	17.7%	1.0%	247	0.0280	7	41	0.5%	0.00000271
	Moyamba	260910	17.7%	1.0%	462	0.0524	6	40	0.8%	0.00000877
Western	Rural	174249	17.7%	1.0%	308	0.0350	6	46	0.5%	0.00000301
	Urbari	772873	17.7%	1.0%	1368	0.1553	2	20	1.6%	0.00010853

Estimate	Lower 95% CI	Upper 95% CI
12.8%	9.1%	16.6%