Applying SLEAC: Sierra Leone national coverage survey

The community-based management of acute malnutrition (CMAM) approach to treating cases of severe acute malnutrition (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 fourteen 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 the wide-area survey method to classify coverage at the district level. The district was selected as the unit of classification because service delivery was managed and implemented at the district level.

The primary sampling units (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). The structure of the district-level samples are shown in Figure NCS.01.

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

The number of PSUs to sample (\( n_{PSU} \)) 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:

\[
 n_{PSU} = \left\lceil \frac{\text{target sample size} \times \text{percentage of population 6-59 months} \times \text{SAM prevalence}}{\text{average EA population at ages} \times 100} \right\rceil
\]

Average EA population was estimated as:

\[
 \text{Average EA population} = \frac{\text{District population}}{\text{Total number of EAs}}
\]

using data from the Sierra Leone 2004 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 is used by Sierra Leone government departments, UNOs, 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 enumeration areas for the Western Area districts and large-scale maps of the EAs that were selected for sampling.
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:

$$\text{Sampling interval} = \frac{\text{Number of EAs in district}}{n_{PSU}}$$

**Step 3:** A random starting PSU from the top of the list was selected using a random number within the sampling interval. The random number was generated by coin-tossing.

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 who 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 traditional birth attendants, 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).

- 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 provided by the Sierra Leone Central Statistics Bureau (see Figure NCS.MAP).

After all PSUs in a district have 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. 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 formulae:

$$d_1 = \left\lfloor n \times p_1 \right\rfloor = \left\lfloor n \times \frac{20}{100} \right\rfloor = \left\lfloor \frac{n}{5} \right\rfloor$$

and

$$d_2 = \left\lfloor n \times p_2 \right\rfloor = \left\lfloor n \times \frac{50}{100} \right\rfloor = \left\lfloor \frac{n}{2} \right\rfloor$$

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 SL04.
Table NCS.01 presents the results of the surveys. Figure NCS.02 presents the same results as a map of per-district coverage.

A short questionnaire, similar to that shown in Box 2, asking about barriers to coverage was administered to carers of non-coverage cases found. This data was tabulated from the questionnaires using a tally-sheet and presented as a Pareto chart (Figure NCS.03).

SLEAC implementation process

The process as described above was completed in eight weeks staffed by fifteen mid-level health management staff and a principal surveyor provided 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 segment and provided with:

- A list of PSUs (sorted by chiefdom) to sample.
- A list or the locations of CMAM program sites.
- A list of the names and home villages of chiefs and chief’s assistants for each PSU.

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 restart case-finding on the following day. This continued until all the PSUs had been sampled. The surveys teams 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 NCS.01)
- Map coverage by district for the whole country (Figure NCS.02)
- List barriers to coverage ranked by their relative importance (Figure NCS.03)
Figure NCS.01: Structure of samples in rural and urban districts

A: Rural districts

B: Urban and peri-urban districts
Figure NCS.MAP: Example of a large-scale map used when sampling in an urban district

Map courtesy of the Sierra Leone Central Statistics Bureau
<table>
<thead>
<tr>
<th>Province</th>
<th>District</th>
<th>SAM cases found ((n))</th>
<th>Covered SAM cases ((c))</th>
<th>Lower decision threshold ((d_1))</th>
<th>Is (c &gt; d_1)?</th>
<th>Upper decision threshold ((d_2))</th>
<th>Is (c &gt; d_2)?</th>
<th>Coverage classification</th>
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<tr>
<td>Northern</td>
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<td>30</td>
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<td>15</td>
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<td></td>
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<td>No</td>
<td>16</td>
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</tr>
<tr>
<td></td>
<td>Kambia</td>
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<td>5</td>
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</tr>
<tr>
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<tr>
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<td>428</td>
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<td>85</td>
<td>No</td>
<td>214</td>
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<td>LOW</td>
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</tbody>
</table>
Figure NCS.02: Map of per-district coverage

Legend
- Low (< 20%)
- Moderate (20% to 50%)
- High (> 50%)

Map showing districts covered with varying levels of intervention.
Figure NCS.03: Barriers to service uptake and access

- Previously rejected
- Other reasons
- Discharged then relapsed
- No time/ too busy
- Distance
- No RUTF
- Lack of knowledge about SAM
- Lack of knowledge about the program