Service Availability and Readiness Assessment (SARA)

An annual monitoring system for service delivery

Implementation Guide
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Project Management Group
The SARA methodology and tool were developed under the direction and management of Kathy O’Neill and Ashley Sheffel with valuable inputs from Ties Boerma and Marina Takane.

Project Advisory Group
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2. Sampling
2.1 Sampling strategies

Determining the sample size and selecting the sample for a facility survey is a complex subject, which will vary considerably from case to case depending on the desired precision and type of estimates, the number of facilities in the country as well as the specific objectives of the assessment. For example, a SARA conducted to produce national estimates will require a much smaller sample size than if district-level estimates are desired. Before concluding on a sampling strategy it should be decided if breakdowns by categories such as region, facility type, managing authority, urban/rural are desired. In order to ensure that the sample is representative, it is best to consult with a sampling expert or a statistician to select an appropriate sampling methodology. For the SARA, the most common sampling strategy is Option 1 in the table below—a nationally representative sample obtained by taking a simple random sample of facilities within each stratum (facility type and managing authority) at the national level. The table below presents different sampling options that could be used to conduct a SARA based on the desired level of estimates and available resources:

<table>
<thead>
<tr>
<th>Domains of estimation</th>
<th>Sampling method</th>
<th>Sample size (estimate)</th>
<th>Approximate cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Option 1: National estimates only</strong></td>
<td>Small country</td>
<td>National estimates with disaggregation by facility type (3 levels) and managing authority (public/private)</td>
<td>150 – 250 facilities</td>
</tr>
<tr>
<td>Medium country</td>
<td>Blend of list and area sampling: list sampling for large health facilities, and area sampling for small facilities (census of facilities in sampled area PSUs(^2)) (design effect = 1.2)</td>
<td>250 – 500 facilities</td>
<td>$100K-200K</td>
</tr>
<tr>
<td><strong>Option 2: Subnational estimates</strong></td>
<td>Small country</td>
<td>Regional and national estimates with disaggregation by facility type (3 levels) and managing authority (public/private)</td>
<td>5 regions: 250 – 500 facilities</td>
</tr>
<tr>
<td>Medium/large country</td>
<td>Blend of list and area sampling: list sampling for large health facilities, and area sampling for small facilities (census of facilities in sampled area PSUs(^2)) (design effect = 1.2)</td>
<td>10 regions: 500 – 800 facilities</td>
<td>$130K-180K</td>
</tr>
<tr>
<td>Large country</td>
<td>Purposive sample of regions; within regions, stratification by facility type and managing authority, simple/systematic random sampling within each stratum with oversampling of hospitals for each region (design effect = 1)</td>
<td>Medium country</td>
<td>4 regions: 300 – 500 facilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Large country</td>
<td>4 regions: 400 – 800 facilities</td>
</tr>
<tr>
<td><strong>Option 3: Subnational estimates</strong></td>
<td>Large country</td>
<td>Regional estimates for a subset of regions, with disaggregation by facility type (3 levels) and managing authority (public/private) for selected regions; no national estimates</td>
<td>4 regions (150 facilities per region): 600 facilities</td>
</tr>
</tbody>
</table>

1 Sample size estimates assume a margin of error of 0.1 and 95% level of confidence
2 Administrative units that form the PSUs (Primary Sampling Units) for the area sample should contain approximately 1-5 health facilities each (communes, sub-counties, villages)
2. Sampling

<table>
<thead>
<tr>
<th>Domains of estimation</th>
<th>Sampling method</th>
<th>Sample size (estimate)</th>
<th>Approximate cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Option 4: District sample</strong>&lt;br&gt;District estimates for sampled districts; national estimates if sufficiently many facilities are sampled</td>
<td>Small, medium and large countries&lt;br&gt;List sampling for regional and national hospitals plus sampling of districts (two-level cluster sample: selection of districts as first level, selection of facilities within these districts as the second level) (design effect = 2)</td>
<td>Small country&lt;br&gt;300-500 facilities (10-30 districts)</td>
<td>$100K-200K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium country&lt;br&gt;400-800 facilities (20+ districts)</td>
<td>$160K-320K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Large country&lt;br&gt;600-1000 facilities (30+ districts)</td>
<td>$270K-470K</td>
</tr>
<tr>
<td><strong>Option 5: Facility census</strong>&lt;br&gt;All possible domains of estimation</td>
<td>Small, medium and large countries&lt;br&gt;Census of all facilities</td>
<td>Very expensive</td>
<td></td>
</tr>
</tbody>
</table>

**Small country:** 50 – 100 hospitals, 1000 – 2000 health facilities total, 10 – 80 districts (e.g. Sierra Leone, Togo, Burkina Faso)<br>**Medium country:** 100-500 hospitals, 2000 – 5000 health facilities total, 80 – 500 districts (e.g. Uganda, Tanzania)<br>**Large country:** 500 – 1000 hospitals, 5000 – 10000 health facilities total, 500 – 1000 districts (e.g. DRC, Nigeria)

### 2.2 National estimates

The recommended sampling method for SARA is a nationally representative sample stratified by health facility type and managing authority.

The advantages of using this sampling approach are:

1. the relative simplicity of sample selection if a list of all facilities is available
2. there are no cluster effects, and
3. the sample size per facility type and managing authority can be controlled precisely.

The particular sample design for the facility survey will differ in each country; however, selection of a nationally representative sample stratified by facility type and managing authority will generally involve the following five steps:

1. determination of eligible facilities
2. construction of the list frame
3. determination of domains and/or strata
4. sample size determination, and
5. selection of the sample from the list.

The steps will be elaborated in the reminder of this section.

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3 Number of districts in sample depends on the number of facilities per district
Step 1. Determination of eligible facilities

The first step is to determine the characteristics of the facilities that form the study population. The sampling frame will be all health facilities that meet defined eligibility criteria in a country. Examples of eligibility criteria include:

1. the managing authority;
2. the type of facility (from primary health-care centres to tertiary-level hospitals); or
3. facilities within a certain geographical area.

Often, a combination of several such criteria is used. For SARA, it is recommended to include in the sampling frame health facilities of all types and all managing authorities (public, private-for-profit, NGO, FBO, etc.). Specialized health facilities such as eye hospitals, dental clinics, etc. may be excluded.

Step 2. Construction of the sampling frame

Whenever a list frame for any survey, including facility survey sampling, is constructed, three principles must be kept in mind. The frame must be, in so far as is practicable:

1. complete,
2. accurate, and
3. up to date.

A complete list consists of a list of all facilities in a country (both public and private) and contains a unique identifier along with information on region/district, facility type, managing authority, and urban/rural designation for each facility. If a Master Facility List (MFL) exists for a country, this can serve as the sampling frame.

Often a list frame that is complete, accurate and up-to-date, covering both public and private sectors does not exist. Then it will need to be constructed before a sample can be selected. Unless the country maintains a comprehensive master facility list, authorities do not always have up-to-date records of health facilities functioning in the country. Coverage of private facilities is often spotty and outdated; they may have closed or moved, and there is generally no standard definition for facility type in the private sector.

An initial list obtained from the MoH will usually need to be complemented with information from multiple other sources, such as private sector coordinating bodies, social ministries where NGOs register their activities, or directly from faith-based, private and parastatal organizations. In situations where it is not possible to obtain a reliable sampling frame list of facilities a dual-frame sampling methodology may be used. This method combines a simple random sample of hospitals and large facilities, with a sample of geographically-defined areas in the country.

Accuracy of the list can pose a problem on important details such as location, type and managing authority of a given facility. Finally, any list may suffer from outdated information such as inclusion of facilities that may not be operational at the time of the survey. Compilation of the facility list will likely involve coordinating and verifying information gathered from a number of sources. It is recommended that the government’s MoH be contacted first, to obtain a comprehensive list of government facilities. However, the MoH list itself may be

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2. Sampling

incomplete or out of date, in which case it will be necessary to supplement it with information from other sources such as private foundations, NGOs and religious organizations. These secondary sources should be used to correct and update information from the MoH. It is expected, for example, that private hospitals and other specialized clinics would more likely be identified through the secondary sources than through the MoH.

Depending upon time constraints and budgetary resources, additional sources may also be tapped to refine the frame. These would include local NGOs and the local offices of external donors who may be able to supplement and update the MoH list in regions of the country where each is active. Preliminary lists may also be verified with district or regional health officials. Finally, community informants may also be valuable resources in some instances, especially to verify whether facilities from central institutional lists are currently operational. See Creating a master facility list\(^5\) for a more comprehensive methodology for constructing a list of all facilities in a country.

**Step 3. Determination of domains and/or strata**

Once the sampling frame has been established, probability sampling principles are used to draw a selection of facilities for inclusion in the assessment. Usually, a multistage or stratified sampling plan is followed to ensure representation across various domains of the eligible facilities. In stratified random sampling, the sampling frame (or the population) is partitioned into strata (or subpopulations), which are then independently sampled (usually a simple or systematic random sample within each stratum). The results from the different strata are then combined to form estimates for the entire population.

There are a number of reasons why it is better to use a stratified sample for SARA rather than a simple random sample of all facilities. First, a stratified sample guarantees that a prescribed number of facilities from each strata (or subpopulation) will be assessed, whereas taking a simple random sample of all facilities might result in under-representation of certain types of facilities. Also, the number of hospitals in a country is generally small compared with the number of primary care facilities, and thus a simple random sample of all facilities in a country is likely to include only a very small number of hospitals or might miss them altogether. By stratifying the sample by facility type, the number of hospitals and primary care facilities can be controlled to ensure that a sufficient number of hospitals are included in the sample. Secondly, more precise estimates can be obtained in cases where facilities within each stratum are relatively homogeneous and the variation between strata is relatively large. The recommended sampling methodology for SARA is to select all tertiary-level facilities or hospitals in a country plus a simple random sample of the lower-level facilities stratified by a combination of region, facility type, managing authority and urban-rural distribution. If disproportionate allocation is used, sample weights need to be applied when analysing the data to calibrate for national representation. Please refer to SARA implementation guide chapter 8: Analysis and Outputs for more information on calculating weights.

Often, it is desirable to have separate estimates by region, facility type or other groupings of facilities called domains. Domains are the analytical groupings, whether geographical or categorical, for which separate estimates are wanted when analysing the results (for example, primary care facilities versus hospitals; urban areas versus rural areas; public sector facilities versus private sector facilities; different regions). Domains and strata are often synonymous, but this is not always the case, as the former is determined by analytical considerations, while the latter serves to improve sampling efficiency. For SARA, the domains of interest are usually the same as the strata, and are generally a subset of the following: region, facility type, managing authority and urban-rural location. The greater the number of domains, the larger the sample size is required to obtain good estimates.

**Step 4. Determination of sample size**

Determining sample size is a complex subject for any survey. The overall sample size for a facility survey will vary from country to country, depending upon conditions, precision requirements, and need for domain estimates. The larger the sample size, the greater the precision of the estimates; however, the total size of the sample will generally also depend on budget, time, and other constraints.

Given a desired level of precision (or margin of error) and confidence level, it is fairly easy to determine the necessary sample size using well-known mathematical formulas, assuming that some reasonable assumptions about the unknown parameters can be made. The SARA survey produces hundreds of estimates, each of which would require a different sample size according to the sample size formulas. It is customary in these cases to choose a small number of the most important estimates, then calculate the sample size requirements for each of these and to choose the largest. A formula commonly used for calculating the sample size for SARA is given in Annex 1.

**Adjusting sample size for the number of domains**

The survey design will most likely require that the estimates be disaggregated for important estimation domains—regions, facility types, urban-rural. If there is particular interest in obtaining very reliable data for a given domain, it may be necessary to increase the sample size in that domain. For example, if equally reliable data were desired for urban and rural areas separately it would be necessary to sample the two areas disproportionately to assure the same sample size. By way of illustration, use of a proportionate sampling scheme when the urban-rural distribution is 65 and 35 percent respectively would give a sample size for the urban part that is about twice as big as the rural part, in which case the reliability of the urban sample would be much better than the rural. The desire for equal reliability in this case would demand that the rural sample size be increased commensurately. The most efficient sample we will get when the two groups have equal size.

In general, the sample size for domains when equal reliability is wanted for each necessitates multiplying the calculated sample size needed for a domain by the number of categories in the domain. Thus, if equally reliable estimates were wanted for, say, five regions, the sample size would be about five times the value calculated using the equation above. The survey budget would likely preclude such a large sample, so certain compromises would have to be made. One such compromise is to relax the confidence interval criterion for the domain estimates. Another possibility is to select the most important domains for the stricter reliability and allow the others to be measured with whatever reliability a proportionately allocated sample would yield.

An alternative approach for determining domain and overall sample sizes is to carry out the calculations from the formula in Annex 1 separately for each domain of interest. The total sample size would then be the sum of the domain samples.

**Sampling to estimate change**

Often facility surveys aim to monitor change over time. The need to estimate change has implications for survey operations and sample design of a facility survey. When making considerations for selecting the sample for a repeat SARA in a country, three methodologies may be considered:

- (a) use of the same sample of facilities on each occasion,
- (b) use of rotating or replacement panels of facilities, or
- (c) use of new, different samples each time.

Proceeding from (a) to (c), sampling error on estimates of change increases. Sampling error is least when the same sample facilities are used on each occasion, because the correlation between observations is highest.

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2. Sampling

Adjusting for non-response

The sample size calculation assumes that all facilities in the sample will be covered in the assessment. However, complete response is rarely attainable in the field, so the calculated sample size should be increased by a factor to reflect the anticipated non-response rate. Absent any other prior information, it is recommended that the sample size be increased by at least 10% to take into account non-response.

Adjusting the sample size for finite population size

When there are few facilities in the universe to be assessed, the sample size becomes a significant proportion (e.g. 5 percent or more) of that total. Then the calculated sample size \( n \) should be reduced by the factor, \( 1 - \frac{n}{N} \), where \( N \) is the total number of facilities in a country.

Summary of sample size calculation methodology

1. Ascertain main estimates of interest.
2. Identify those closest to zero or 100 percent: The ones with small or large value of \( p \).
3. Use formula in Annex 1 to calculate the sample size \( n \).
4. Choose the largest \( n \).
5. Adjust \( n \) upward to account for non-response.
6. Adjust \( n \) upwards to account for estimation domains.
7. Evaluate inclusion of previously sampled facilities for a repeat SARA
8. Evaluate \( n \) in relation to budget and field constraints; revise if necessary.

Step 5. Sample selection

Stratified sampling

Once the stratification and the sample size have been selected, the final step is to select the sample of facilities to be assessed from the list frame. The simplest sampling strategy is to use proportional allocation, in which the same sampling fraction is used for each stratum. For example, if there are 1000 health facilities in a country, and the sample size is 150, then \( \frac{150}{1000} = 15\% \) of facilities that need to be selected from each stratum.

Sometimes it is desirable to use a different sampling fraction for each stratum. For example, hospitals tend to make up a small percentage of the total number of facilities in a country, but it is often desirable to report results for this subgroup. If the same sampling fraction is used for hospitals as for other facility types, the number of hospitals included in the sample would be small, and any estimates based on such a small sample would be too unreliable to report. The problem can be solved by oversampling the hospitals in order to reduce the associated error. This is called disproportionate sampling, as different sampling fractions are used for different strata, and requires the application of sampling weights in the analysis of data to account for unbalanced sampling.

It is recommended that all hospitals in the list frame be included in the sample if possible. If it is not possible to cover all hospitals due to budget or other constraints, then all tertiary hospitals should be included in the sample, and a sample of the other hospitals should be taken. The proportion of hospitals to be included in the sample depends highly on the available resources, and should be oversampled relative to the other health facility types.
Cluster sampling

Cluster sampling means sampling in two stages. First a geographical area is sampled. Then facilities are sampled from within that area. The primary reason to use this kind of sampling is to reduce the distance between the sampled facilities, and hence reduce costs. The approach can be used in very large countries or countries were traveling for other reasons is time-consuming. In general, using a one-stage sample of facilities would be the recommended procedure in most countries.

If the approximate number of facilities in a primary sampling area (like province, district or local government area) is known, sampling areas proportional to the number of facilities in each area is recommended. This means that areas with many facilities will have a higher probability of being sampled. An equal number of facilities from each area should then be sampled. Information on which area a facility belongs to, will generally be available through a master facility list. To sample the areas, use the same approach as for sampling facilities, except the names of the sampled areas are selected, instead of the facility name. Then the sampling procedure will have to be repeated for selecting facilities within the selected geographical areas. How to do random sampling in excel is described in section 1.4.

Using the described approach for cluster sampling will not influence the chance of a given facility to be sampled. Hence, the weights used for the facilities will remain unchanged.

Using cluster sampling makes it necessary to increase the sample size. The design of a cluster sample makes it less representative because facilities located close to each other tend to be relatively equal, compared to other facilities. This is described as the design effect, and can be adjusted for by inflating the sample by the design effect factor. The design effect is described in more detail in Annex 1.

Blend of list and area sampling

More details on the blend of the list and area sampling methodology can be derived from the Sampling Manual for Facility Surveys for Population, Maternal Health, Child Health and STD Programs in Developing Countries.

Replacement facilities

Replacement facilities should be selected in the event that a facility in the sample cannot be surveyed (i.e. facility is closed, facility has relocated, etc.).

The replacement facilities should be selected in the Excel worksheet used to identify the sampled facilities. As a rule of thumb, identify the next 10 facilities listed after the facilities in the sample for each strata. These will serve as the replacement facilities in case of need.

---

Example 1: Determining sample size

The following example will describe the steps for calculating the sample size for a nationally representative sample stratified by facility type and managing authority. Note: this is a simple example for calculating sample size in order to demonstrate the basic steps.

1. Determine how many facilities are in the sampling frame categorized by facility type/managing authority.

<table>
<thead>
<tr>
<th>Facility type/ managing authority</th>
<th>Total number of facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital- public</td>
<td>27</td>
</tr>
<tr>
<td>Hospital- private</td>
<td>19</td>
</tr>
<tr>
<td>Health centre- public</td>
<td>51</td>
</tr>
<tr>
<td>Health centre- private</td>
<td>235</td>
</tr>
<tr>
<td>Health post- public</td>
<td>713</td>
</tr>
<tr>
<td>Health post- private</td>
<td>152</td>
</tr>
<tr>
<td>Total</td>
<td>1197</td>
</tr>
</tbody>
</table>

2. Determine the sample size for primary level facilities based on the total number of facilities in the sampling frame and the strata of interest. For the SARA, hospitals are typically oversampled to ensure there is a sufficient number of them in the sample for the hospital specific indicators. Hence, it is suggested to include all hospitals in the sample.

Using the following formula:

\[ n = \left[ \frac{(z^2 \cdot p \cdot q) + ME^2}{ME^2 + z^2 \cdot p \cdot q / N}\right] \ast d \]

where:
- \( n \) = sample size
- \( z \) = confidence level at 95% (1.96)
- \( ME \) = margin of error (15%)
- \( p \) = the anticipated proportion of facilities with the attribute of interest (.5)
- \( q \) = 1-\( p \)
- \( N \) = population size
- \( d \) = design effect

<table>
<thead>
<tr>
<th>Facility type/ managing authority</th>
<th>All facilities</th>
<th>Hospitals</th>
<th>Primary</th>
<th>z</th>
<th>p</th>
<th>q</th>
<th>ME</th>
<th>Primary sample size</th>
<th>Hospitals</th>
<th>Total sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital- public</td>
<td>27</td>
<td>27</td>
<td>0</td>
<td>1.96</td>
<td>0.5</td>
<td>0.5</td>
<td>0.15</td>
<td>0</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>Hospital- private</td>
<td>19</td>
<td>19</td>
<td>0</td>
<td>1.96</td>
<td>0.5</td>
<td>0.5</td>
<td>0.15</td>
<td>0</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Health centre- public</td>
<td>51</td>
<td>0</td>
<td>51</td>
<td>1.96</td>
<td>0.5</td>
<td>0.5</td>
<td>0.15</td>
<td>24</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>Health centre- private</td>
<td>235</td>
<td>0</td>
<td>235</td>
<td>1.96</td>
<td>0.5</td>
<td>0.5</td>
<td>0.15</td>
<td>37</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>Health post- public</td>
<td>713</td>
<td>0</td>
<td>713</td>
<td>1.96</td>
<td>0.5</td>
<td>0.5</td>
<td>0.15</td>
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<tr>
<td>Health post- private</td>
<td>152</td>
<td>0</td>
<td>152</td>
<td>1.96</td>
<td>0.5</td>
<td>0.5</td>
<td>0.15</td>
<td>34</td>
<td>0</td>
<td>34</td>
</tr>
<tr>
<td>Total</td>
<td>1197</td>
<td>46</td>
<td>1151</td>
<td>1.96</td>
<td>0.5</td>
<td>0.5</td>
<td>0.15</td>
<td>136</td>
<td>46</td>
<td>182</td>
</tr>
</tbody>
</table>
3. Oversampling of strata where there is most likely to be variations (strata with less than 30 facilities) should be done. This will give the final sample size and sampling proportions for the sample.

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>All Facilities</th>
<th>Hospitals</th>
<th>Primary Facilities</th>
<th>Primary Sample Size</th>
<th>Hospitals</th>
<th>Total Sample Size</th>
<th>Oversampling of Strata</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital - public</td>
<td>27</td>
<td>27</td>
<td>0</td>
<td>1.96</td>
<td>0.5</td>
<td>0.15</td>
<td>0</td>
</tr>
<tr>
<td>Hospital - private</td>
<td>19</td>
<td>19</td>
<td>0</td>
<td>1.96</td>
<td>0.5</td>
<td>0.15</td>
<td>0</td>
</tr>
<tr>
<td>Health centre - public</td>
<td>51</td>
<td>0</td>
<td>51</td>
<td>1.96</td>
<td>0.5</td>
<td>0.15</td>
<td>24</td>
</tr>
<tr>
<td>Health centre - private</td>
<td>235</td>
<td>0</td>
<td>235</td>
<td>1.96</td>
<td>0.5</td>
<td>0.15</td>
<td>37</td>
</tr>
<tr>
<td>Health post - public</td>
<td>713</td>
<td>0</td>
<td>713</td>
<td>1.96</td>
<td>0.5</td>
<td>0.15</td>
<td>41</td>
</tr>
<tr>
<td>Health post - private</td>
<td>152</td>
<td>0</td>
<td>152</td>
<td>1.96</td>
<td>0.5</td>
<td>0.15</td>
<td>34</td>
</tr>
<tr>
<td>Total</td>
<td>1197</td>
<td>46</td>
<td>1151</td>
<td>1.96</td>
<td>0.5</td>
<td>0.15</td>
<td>46</td>
</tr>
</tbody>
</table>

### 2.3 Probability sampling in Excel

Once the sampling fractions for each stratum have been determined, the facilities from each stratum should be selected using a probability sampling method. The list frame should be partitioned according to the chosen stratification, and within each stratum (e.g. a list of hospitals in Region 1), the facilities to be included in the sample should be selected by simple random sampling or systematic sampling. Replacement facilities for those facilities that are closed or otherwise cannot be accessed can be selected using the same method. Alternatively, to facilitate logistics, the closest facility of the same type in the same geographical area can be selected.

First select the facilities to be included in the sample from the MFL. The MFL should be divided up according to the categories selected to determine the sample (e.g. the ones mentioned in step 5 in section 1.3). If the MFL is in a Microsoft excel workbook, copy and paste each strata of facilities into a new worksheet within the workbook.

On each sheet add a column called Random. Type “Random” into the first cell. In the column to the right of the column called Random, type the word “TRUE” in the first cell, as illustrated by the yellow fields in the figure below.
2. Sampling

Use the following formula to assign a random unique number to each facility.

\[ \text{=IF($B$1, TRUNC(RAND())*(1000000-1)+1), A2} \]

Copy and paste the formula into the first cell of the column called Random. Place the cursor at the lower right corner of the cell with the formula and pull it downwards. If the columns named “Random” and “TRUE” is not in the first two columns (A and B), please change A to the letter of the “Random” column and B to the letter of the “TRUE” column in the formula. A random number will be assigned to each of the facilities.

Then change the word TRUE to FALSE. This will freeze the random numbers so that they don’t regenerate new random numbers.

A warning box may appear similar to the following:

Click on OK. Then filter the data so that the column Random is in descending order, from the largest to the smallest.
See the final sampling table in section 1.2 step 5 and determine how many facilities in the strata should be selected. Highlight starting from the first facility in the list through the total number of facilities needed for the sample in that strata. These facilities will be included in the survey sample. Repeat for each of the strata identified above. Then select the next ten facilities in each worksheet as replacement facilities.
Annex 1 | Calculating the sample size for SARA

The following formula is commonly used to calculate the sample size for SARA:\(^8\):

\[
n = \left( \frac{z^2 \times p \times q + ME^2}{ME^2 + z^2 \times p \times q / N} \right)^*d
\]

where

- \(n\) is the sample to be calculated,
- \(z^2\) is the square of the normal deviate at the required confidence level,
- \(ME\) is the margin of error,
- \(p\) is the anticipated proportion of facilities with the attribute of interest,
- \(q\) is \(1 - p\), and
- \(d\) is the design effect

Each parameter is explained in detail in the table below:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Z^2)</td>
<td>It is customary to use a 95% level of confidence, for which the corresponding value of (Z) is 1.96. Thus (Z^2 = 3.84).</td>
</tr>
<tr>
<td>(ME)</td>
<td>The margin of error is the amount of random sampling error in a survey’s results. For SARA, a margin of error of 15% is generally used.</td>
</tr>
<tr>
<td>(p)</td>
<td>Most SARA estimates are of the form “percent (p) of facilities with attribute X.” It is necessary to have some idea of the value of (p) in order to use the formula to calculate sample size. It is not necessary for the value of (p) used for the sample size calculation to be very accurate (otherwise there would be no need to conduct the survey), and it can be obtained from previous surveys conducted in the country, or from similar countries that conducted similar surveys.</td>
</tr>
<tr>
<td>(d)</td>
<td>The design effect is a value that reflects the ratio of sampling variances, where the numerator is the variance of the sample design being used for the particular facility survey in question, and the denominator is the variance that would result if a simple random sample of facilities with the identical sample size had been used. The design effect reflects the effects of stratification, stages of selection and degree of clustering used in the facility survey. Generally, the clustering component, which is a measure of the degree to which two facilities in the same cluster have the same characteristic compared to two selected at random in the population of facilities, contributes the biggest effect. The interpretation of the design effect is that it shows how much more unreliable the sample is compared to a simple random sample of the same size. If the design effect were 1.2, for example, the facility sample would have sampling variance 20 percent greater than an alternative design using simple random sampling. For a stratified sample drawn from a list frame without clustering, the recommended sampling strategy for SARA, the design effect should be approximately 1.0. Therefore it is recommended to use a value of (d = 1.0) for a stratified list sample. If a different sampling strategy is used, then the design effect could be higher. For example, a cluster sample is expected to have a higher value of (d). If a country has information from a previous survey that suggests the value of the design effect, this value should also be used to calculate the sample sizes. For the blend of list and area sampling mentioned earlier, it is recommended to use a value of (d = 1.2).</td>
</tr>
</tbody>
</table>

\(^8\) Several equivalent formulas exist.