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The EVM site selection process and The EVM Site Selection Tool User Guide

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EVM—*setting a standard for the vaccine supply chain*

World Health Organization

Contents

Technical terms and acronyms

The following technical terms and acronyms are used in this document:

EVM	Effective Vaccine Management.
LD	Acronym used for lowest delivery level store.
Lowest delivery level store	A store which receives vaccine from a higher level store (primary or sub-national) and supplies one or more service delivery points. Example: a district store supplying one or more health facilities.
PR	EVM acronym used for primary store.
Primary store	A store which receives some or all of its vaccine directly from a national or international vaccine manufacturer. Example: a national vaccine store.
Service delivery point	A health facility or health post where vaccine is administered.
SN	EVM acronym used for sub-national store.
SP	EVM acronym used for service delivery point.
Sub-national store	A store which receives vaccine from a primary store or a higher level sub-national store and supplies one or more lower level sub-national store and/or one or more lowest delivery level stores. For example, a provincial store supplying one or more district stores.
Target population	Subset of the total population which is the target for receiving one or more of the vaccines in the immunization schedule.
Total population	The total population of a country or part of a country.

Acknowledgments

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Introduction

This document describes how to choose the sites for an EVM assessment. The first step is to collect basic data on the country's immunization supply chain. These data are then used to select sites in a systematic manner so that the sample is representative of the whole supply chain; the results of the EVM assessment should then provide a valid picture of its strengths and weaknesses. This selection process must be done in a standardized way to ensure that results within and across countries can be interpreted and compared in a consistent way.

The Excel-based EVM site selection tool described below is a component of the EVM assessment site selection package that assessors can download from the EVM website.

This document tells you how to select EVM sites using the spread sheet; it also describes how to do simple manual site selection calculations without the help of tool.

1. Principles

The sampling units for an Effective Vaccine Management (EVM) assessment are the stores which stock and distribute vaccines and other immunization supplies and the service delivery points where immunization is administered.

A one stage systematic sampling and one stage random sampling method is proposed as the easiest way to obtain a representative sample of immunization supply stores and service delivery points. Self-weighting is ensured in such a sample as follows:

- The sample size is determined based on the number of lowest delivery level stores using the sample size reference table in Annex 1. This table provides confidence levels of 80%, 85% and 90% with precision levels of ±5%, ±10% and ±15%. For countries where there is no lowest delivery level[1], the sample size is determined based on the service delivery points.
- Lowest delivery level (LD) stores are selected by using probability proportional to the target population served by the stores. If there is no lowest delivery level, service delivery points[2] are selected using probability proportional to the target population served by the service delivery points. If the intention of the assessment is to see the performance of district in relation to fixed versus outreach or far versus close, the selection should be based on such conditions and the precision and confidence levels should be determined and result analysed respectively.
- For each of the chosen lowest delivery level stores either random sampling or a population based method may be used to choose one or two service delivery point per LD taking in to consideration the confidence and precision levels intended to achieve. The number of service delivery points to be selected should be checked using the number of service delivery points in a country and the EVM sample size reference table in Annex 1 through referring to the number to select and comparing to the number of district selected. In case of the number of service delivery points being greater than the number LD to select,, LD with largest population will have two service delivery point to select to meet the service delivery points to be selected. For countries willing to assess more vaccination points, higher confidence levels and more precision levels can be selected but not a must. Inaccessible or hard-to-reach facilities may be omitted from the facility list before or after systematic or random sampling.
- Selection of the immunization supply storage levels above the lowest delivery level is automatically determined by following the immunization supply chain upwards from each of the selected lowest delivery level stores, back to the primary level[3].

2. Detailed steps for EVM site selection

To ease the process of the site selection, an Excel based EVM site selection tool has been developed. The following sub-sections describe the steps required.

2.1 Divide the country based on the immunization supply chain

Divide the country into supply chain levels, starting from the primary level and following the chain down to the service delivery level. Ensure that the supply chain structure is:

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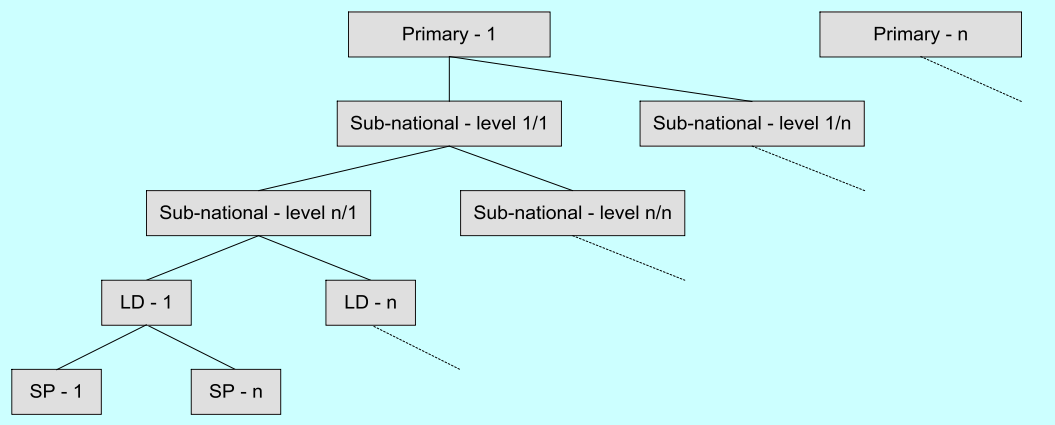
[1] This situation can arise where service delivery points are supplied direct from a primary store.

[2] For countries willing to assess a greater number of service delivery points a cluster of two service delivery points per lowest delivery level may be used but this is optional.

[3] In some countries there may be more than one primary store. For example, regional stores in larger countries may receive vaccine direct from vaccine manufacturers – these stores are, by definition, primary stores.

1. *Non-overlapping*: no lower level facility should receive vaccine from more than one higher level store.
2. *Complete*: include all elements of the supply chain down to the service delivery levels of the country.

Identify all fixed points in the supply chain, from the primary store(s) down to the service delivery levels. Figure 1 shows a generalized example of the tree structure that will emerge. **Figure 1 – Generalized supply chain structure**



Note that the following rules apply to this structure:

- There may be one or more primary stores, each receiving vaccine directly from the vaccine manufacturer(s). In this arrangement, each primary store will have its own non-overlapping supply chain down to service delivery level.
- In exceptional circumstances there may be two levels of primary store. This can occur if a 'high level' primary store receives vaccines from international sources and supplies these vaccines to 'lower level' primary stores, which in turn receive vaccines direct from in-country vaccine manufacturer(s).
- Frequently, there may be more than one level of sub-national store – for example regional stores and provincial stores.
- By definition, there can be only one level of lowest delivery level stores. These stores receive vaccine from a higher level store (primary or sub-national) and supply service delivery points only[4].
- By definition, there can be only one level of service delivery points.

2.2 Steps in selecting the sites

This section outlines the eight steps used to select sites for the EVM assessment.

2.2.1 Step 1: List facilities at each supply chain level & create a table

Using the information above, create a spreadsheet table laid out as shown in Table 1 below.

Start the table at the primary level. Then work down to the lowest delivery level by following the country's supply chain structure.

Example: Level 1 – National Vaccine Store (primary); Level 2 – Regional Vaccine Stores; Level 3 – Provincial Vaccine Stores; Level 4 – District Vaccine Stores (in this example, this is the lowest delivery level).

Add three further columns to the right of the table for 'LD population, 'cumulative population' and 'numbers to select'.

[4] It is not uncommon to find a health centre which provides immunization services and also supplies one or more additional service delivery points. The rule here is to treat the refrigerator(s) which are used to stock vaccine for the additional service delivery points as an LD store and to treat the refrigerator(s) that are used to stock vaccine for immunization services within the health centre as a service delivery point. If a single refrigerator is used for both purposes, a judgement has to be made on a case-by-case basis.

Working from the left hand side of the table, enter the primary store name in the first column, the first of the highest level sub-national store name(s) in the second column, the name of next level sub-national store(s) supplied by that store in the third column, and so on down to the lowest delivery level. Each lowest delivery level store will appear once only in the table. Fill in the table so that every row contains a complete and correct list of the higher level stores which supply the lowest delivery store in that row, from primary level downwards.

Arrange the table in a convenient order – for example in alphabetical order, or in ascending order of target population, or randomly without being biased.

Table 1: Layout of a typical supply chain table

Level 1 (National Level)	Level 2 (Regional Level)	Level 3 (Provincial level)	LD level (District Level)	LD population	Cumulative population	Numbers to select
1	2	3	4	5	6	7
National Store	Region 1	Province 1	District vaccine store 1	10,000		
National Store	Region 1	Province 1	District vaccine store 2	20,000		
National Store	Region 1	Province 1	District vaccine store 3	50,000		
National Store	Region 2	Province 2	District vaccine store 4	5,000		
National Store	Region 2	Province 2	District vaccine store 5	4,000		
National Store	Region 2	Province 2	District vaccine store 6	1,000		
National Store	Region 2	Province 2	District vaccine store 7	4,000		
National Store	Region 2	Province 2	District vaccine store 8	10,000		
National Store	Region 3	Province 3	District vaccine store 9	85,000		
National Store	Region 3	Province 3	District vaccine store 10	120,000		
National Store	Region 3	Province 3	District vaccine store 11	10,000		
National Store	Region 4	Province 4	District vaccine store 12	35,000		
National Store	Region 4	Province 4	District vaccine store 13	10,000		
National Store	Region 4	Province 4	District vaccine store 14	15,000		
Etc						

2.2.2 Step 2: Enter LD population & calculate cumulative population

Establish the population served by each lowest delivery store. This is the 'LD population'. Either the 'total population' or the 'target population' – expressed in terms of the annual birth cohort – can be used[5]. If target population data are not available, use the most recent census data or the best available information from other sources. Whichever option is selected, it must be used consistently throughout. These figures should be entered in the column headed 'LD population'. (e.g. 10,000 for district vaccine store 1 in Table 2).

Calculate the 'Cumulative Population' (CP) for each LD store. Enter this figure in the 'cumulative population' column. If the spreadsheet is used, this figure will be calculated automatically.

CP(1) = the target or total population of district vaccine store 1

CP(2) = CP(1) + the target or total population of district vaccine store 2

CP(3) = CP(2) + the target or total population of district vaccine store 3

CP(n) = CP(n-1) + the target or total population district vaccine store n

[5] The decision whether to use 'target population' or 'total population' as the basis for site selection depends upon the availability of data in the country.

Table 2 – Supply chain table with cumulative population

Level 1 (National Level)	Level 2 (Regional Level)	Level 3 (Provincial level)	LD level (District Level)	LD population	Cumulative population	Numbers to select
1	2	3	4	5	6	7
National Store	Region 1	Province 1	District vaccine store 1	10,000	10,000	
National Store	Region 1	Province 1	District vaccine store 2	20,000	30,000	
National Store	Region 1	Province 1	District vaccine store 3	50,000	80,000	
National Store	Region 2	Province 2	District vaccine store 4	5,000	85,000	
National Store	Region 2	Province 2	District vaccine store 5	4,000	89,000	
National Store	Region 2	Province 2	District vaccine store 6	1,000	90,000	
National Store	Region 2	Province 2	District vaccine store 7	4,000	94,000	
National Store	Region 2	Province 2	District vaccine store 8	10,000	104,000	
National Store	Region 3	Province 3	District vaccine store 9	85,000	189,000	
National Store	Region 3	Province 3	District vaccine store 10	120,000	309,000	
National Store	Region 3	Province 3	District vaccine store 11	10,000	319,000	
National Store	Region 4	Province 4	District vaccine store 12	35,000	354,000	
National Store	Region 4	Province 4	District vaccine store 13	10,000	364,000	
National Store	Region 4	Province 4	District vaccine store 14	15,000	379,000	
National Store	Region 4	Province 4	District vaccine store 15	50,500	429,500	
National Store	Region 5	Province 5	District vaccine store 16	24,500	454,000	
National Store	Region 5	Province 5	District vaccine store 17	6,000	460,000	
National Store	Region 5	Province 5	District vaccine store 18	35,000	495,000	
National Store	Region 5	Province 6	District vaccine store 19	29,000	524,000	
National Store	Region 5	Province 6	District vaccine store 20	14,000	538,000	
National Store	Region 5	Province 6	District vaccine store 21	1,000	539,000	
National Store					**539,000**	

2.2.3 Step 3: Calculate the sample size

The sample size (S) is established by using the EVM sample size reference table in Annex 1.

Follow the procedure set out below:

1. Count the number of districts listed in the supply chain table (21 districts are listed in the example shown in Table 2).
2. Select one of the three sub-tables in Annex 1, headed Option 1, Option 2 and Option 3, which gives the required confidence level for the assessment. The three sub-tables cover confidence levels of 80%, 85% and 90%. Each sub-table also shows the sample size required for different precision levels (±5%, ±10%, ±15%)[6]. All these combinations are acceptable for EVM and the range of options given allows countries to have more choice for selection depending on the

[6] The assessor should select a suitable sample size which takes account of country size, funding availability and the required precision level. For example a country with 150 districts wanting an 80% confidence level and ±10% precision would need a sample size of 33 (Annex 1, EVM Sample Size Determination).

objective of the assessment, budget and time available to carry out the assessment.

3. Using the chosen Annex 1 sub-table, select the cell in the column headed 'Number of LD stores for sample selection' in which the figure is just greater than the number of LD stores for the country you are assessing. Taking the example in Table 2, there are 21 LD stores registered. The two nearest entries in Annex 1 – Number of LD stores for sample selection – are 20 and 25. So, in this case, 25 should be selected as the appropriate entry. Mark this row (highlighted in the Annex).
4. Now, select the sub-table you want to use. For example, if the desired confidence level is 80%, choose the Option 1 sub-table.
5. Next, select the precision level. For example, let us assume the required precision level is ±15%. Follow the marked row containing the value 25 in the 'Number of LD stores' column until you reach the Option 1 sub-table cell for ±15% precision level. The value in this cell is 11[7]. This is your sample size.

2.2.4 Step 4: Calculate the sampling interval

Calculate the sampling interval (S) by dividing the cumulative population of the country by the number of LD stores in your calculated sample size.

$$S = \frac{\text{cumulative population}}{\text{sample size}}$$

Taking the example above, the sampling interval, S = 539,000/11 = 49,000

2.2.5 Step 5: Choose a random number

A number (r) should be selected at random between 1 and the sampling interval, S. Taking the previous example: where S = 49,000, r lies between 1 and 49,000.

This random selection from the sampling frame can be done by balloting, using a table of random numbers, or by using a computer spreadsheet[8]. For this example let us take 25,000[9] as a random number selected between 1 and the sampling interval of 49,000.

2.2.6 Step 6: Select the LD stores

First cluster: Use column 7 of Table 2 to identify the LD level district vaccine store in which the facility or cluster is located, together with the storage facilities that are supplying it. The first district vaccine store selected is that for which the cumulative population size (column 6) is greater than the random number r, and which is also greater than the cumulative target population size of the preceding district vaccine store. The random number r should then be entered in column 7 opposite the district vaccine store. Thus, for example, 25,000 is smaller than 30,000 (cumulative target population size for district vaccine store 2) but greater than 10,000 (cumulative target population size for district vaccine store 1); therefore district vaccine store 2 is selected for the first cluster (Table 3).

Second cluster: The second LD store selected is that in which the cumulative target population size (column 6) is greater than r + S, while r + S is greater than the cumulative target population size of the preceding district vaccine store. The number r + S should then be entered in column 7 corresponding to the district vaccine store. Thus, for example, 25,000 + 49,000 = 74,000 is smaller than 80,000 (cumulative target population size for district vaccine store 3) but greater than 30,000 (cumulative

[7] 11 is the sample size you will get if you use version 1.6 of the site selection tool. The new version of the tool (version 1.7) gives a sample size of 9.

[8] Refer to the EVM site selection excel tool

[9] In Excel use the function RAND (<sample size>). This returns a random number between 0 and the chosen sample size. A new random number is returned every time the worksheet is calculated, e.g. RAND(49000)=25000.

population size for district vaccine store 2); therefore district vaccine store 3 is selected as containing the second cluster (Table 4).

Subsequent clusters: The procedure described above is repeated n times, where n is the sample size. Select the district vaccine store by adding the sampling interval, S, each time to the number in column 7. Identify the LD store for which the cumulative population (column 6) is greater than the new number while the new number is greater than the cumulative target population size of the preceding district vaccine store.

In some cases the new number may fall in the same LD store. In this case, the district vaccine store is selected once and a cluster of two immunization delivery points are selected from this particular district.

Note: In order to avoid the selection of inaccessible or hard-to-reach areas, you can select the LD store that is one above or one below from the one selected mathematically. This approach can be used not only to make access easier, but also to increase geographic representation, should this be a concern; this might be necessary in countries with wide climate variations or complex topography.

Table 3 gives an example of selection of lowest delivery levels with a probability proportional to target population size.

Table 3 – Example of selection of lowest delivery levels

Level 1 (National Level)	**Level 2** (Regional Level)	**Level 3** (Provincial level)	**LD level** (District Level)	**LD population**	**Cumulative population**	**Numbers to select**
1	**2**	**3**	**4**	**5**	**6**	**7**
National Store	Region 1	Province 1	District vaccine store 1	10,000	10,000	
National Store	Region 1	Province 1	District vaccine store 2	20,000	30,000	25,000
National Store	Region 1	Province 1	District vaccine store 3	50,000	80,000	**74,000**
National Store	Region 2	Province 2	District vaccine store 4	5,000	85,000	
National Store	Region 2	Province 2	District vaccine store 5	4,000	89,000	
National Store	Region 2	Province 2	District vaccine store 6	1,000	90,000	
National Store	Region 2	Province 2	District vaccine store 7	4,000	94,000	
National Store	Region 2	Province 2	District vaccine store 8	10,000	104,000	
National Store	Region 3	Province 3	District vaccine store 9	85,000	189,000	**123,000; 172,000;**
National Store	Region 3	Province 3	District vaccine store 10	120,000	309,000	**221,000; 270,000**
National Store	Region 3	Province 3	District vaccine store 11	10,000	319,000	
National Store	Region 4	Province 4	District vaccine store 12	35,000	354,000	**319,000**
National Store	Region 4	Province 4	District vaccine store 13	10,000	364,000	
National Store	Region 4	Province 4	District vaccine store 14	15,000	379,000	**368,000**
National Store	Region 4	Province 4	District vaccine store 15	50,500	429,500	**417,000**
National Store	Region 5	Province 5	District vaccine store 16	24,500	454,000	
National Store	Region 5	Province 5	District vaccine store 17	6,000	460,000	
National Store	Region 5	Province 5	District vaccine store 18	35,000	495,000	**466,000**
National Store	Region 5	Province 6	District vaccine store 19	29,000	524,000	
National Store	Region 5	Province 6	District vaccine store 20	14,000	538,000	**515,000**
National Store	Region 5	Province 6	District vaccine store 21	1,000	539,000	
			Total:	**539,000**		
				Sampling interval:	**49,000**	
				Random number:	**25,000**	

2.2.7 Step 7 – Select the service delivery points

Get first the total number of service delivery points in a country. Use the same confidence and precision levels used for selecting the LD stores from table in Annex 1 and determine the sample size for the service delivery level using step 3. Then, compare the sample size determined for service delivery points with the sample size for LD stores in step 3. For each of the selected LD stores (district vaccine stores), obtain a list of all the service delivery facilities which are supplied by the store. Select either a single facility for each LD store, or a cluster of two facilities. for large LD stores based on population size if the sample size of service delivery points is higher than the sample size of LD stores till the number matches. A single facility will normally be adequate, but two may be chosen if additional data are required[10]. If the number to select falls in the same district twice, a cluster of two immunization delivery points are selected (see the example of district vaccine stores 9 and 10 in table 3 above).

Use either random sampling or a population-based approach to select the health facilities. If random sampling is used, follow the steps below:

1. List all the health facilities providing immunization in each of the selected districts (see example Table 4, column 5).
2. Assign a sequential number to each service delivery level supplied by the selected LD store in the list (example Table 4, column 6).
3. Select one random number between 1 and N if a single facility is to be selected or two random numbers if two facilities are required. In the example shown in table, N=7 because there are seven health facilities supplied by District Vaccine Store 3. One facility is required and the random number generated is 3[11]. This is entered in column 7 against health facility HF3; this is the one selected for EVM assessment.
4. Repeat steps 1 to 4 for each of the selected LD stores.

If the population-based approach is chosen, the same methodology as that described above for LD store selection should be used.

Note: In order to avoid choosing inaccessible or hard-to-reach facilities[12], you can further draw a number to eliminate these facilities. Alternatively, these locations could be omitted from the facility list right from the beginning.

Table 4 – Example of single facility service delivery point selection

Level 1 (National Level)	**Level 2** (Regional Level)	**Level 3** (Provincial level)	**LD level** (District Level)	**Health facilities**	**Sequential number**	**Randomly selected number**
1	**2**	**3**	**4**	**5**	**6**	**7**
National Store	Region 1	Province 1	District vaccine store 3	HF 1	1	
				HF2	2	
				HF 3	3	3
				HF4	4	
				HF 5	5	
				HF6	6	
				HF 7	7	

[10] For example, some countries have a mix of health facilities with permanent refrigeration and others which rely on cold boxes for periodic immunization sessions (weekly, fortnightly or monthly).

[11] In Excel use the function RANDBETWEEN(bottom, top) if one number to be selected. For more than one number, an excel reference formula is provided in the Excel-based EVM site selection tool

[12] Some facilities may be inaccessible at certain times of the year; others may be hard to reach at all times.

2.2.8 Step 8 – Select the higher level stores

Once the LD level stores (district vaccine stores) have been selected, the choice of higher level stores in the sample is automatic. For each LD store, simply follow the supply chain back to the supplying primary store. Every store shown in the row in which the district store is listed is taken into the final sample. The highlighted rows in Table 5 below illustrate this selection process.

Table 5 – Selecting higher level stores in the immunization supply chain

Level 1 (National Level)	**Level 2** (Regional Level)	**Level 3** (Provincial level)	**LD level** (District Level)	**LD population**	**Cumulative population**	**Numbers to select**
1	**2**	**3**	**4**	**5**	**6**	**7**
National Store	Region 1	Province 1	District vaccine store 1	10,000	10,000	
National Store	Region 1	Province 1	District vaccine store 2	20,000	30,000	25,000
National Store	Region 1	Province 1	District vaccine store 3	50,000	80,000	**74,000**
National Store	Region 2	Province 2	District vaccine store 4	5,000	85,000	
National Store	Region 2	Province 2	District vaccine store 5	4,000	89,000	
National Store	Region 2	Province 2	District vaccine store 6	1,000	90,000	
National Store	Region 2	Province 2	District vaccine store 7	4,000	94,000	
National Store	Region 2	Province 2	District vaccine store 8	10,000	104,000	
National Store	Region 3	Province 3	District vaccine store 9	85,000	189,000	**123,000; 172,000;**
National Store	Region 3	Province 3	District vaccine store 10	120,000	309,000	**221,000; 270,000**
National Store	Region 3	Province 3	District vaccine store 11	10,000	319,000	
National Store	Region 4	Province 4	District vaccine store 12	35,000	354,000	**319,000**
National Store	Region 4	Province 4	District vaccine store 13	10,000	364,000	
National Store	Region 4	Province 4	District vaccine store 14	15,000	379,000	**368,000**
National Store	Region 4	Province 4	District vaccine store 15	50,500	429,500	**417,000**
National Store	Region 5	Province 5	District vaccine store 16	24,500	454,000	
National Store	Region 5	Province 5	District vaccine store 17	6,000	460,000	
National Store	Region 5	Province 5	District vaccine store 18	35,000	495,000	**466,000**
National Store	Region 5	Province 6	District vaccine store 19	29,000	524,000	
National Store	Region 5	Province 6	District vaccine store 20	14,000	538,000	**515,000**
National Store	Region 5	Province 6	District vaccine store 21	1,000	539,000	
			Total:	**539,000**		
				Sampling interval:	**49,000**	
				Random number:	**25,000**	

Table 6 shows an example of a final list of selected facilities as it would be used for the EVM assessment.

Table 6 – Example of a final list of selected facilities

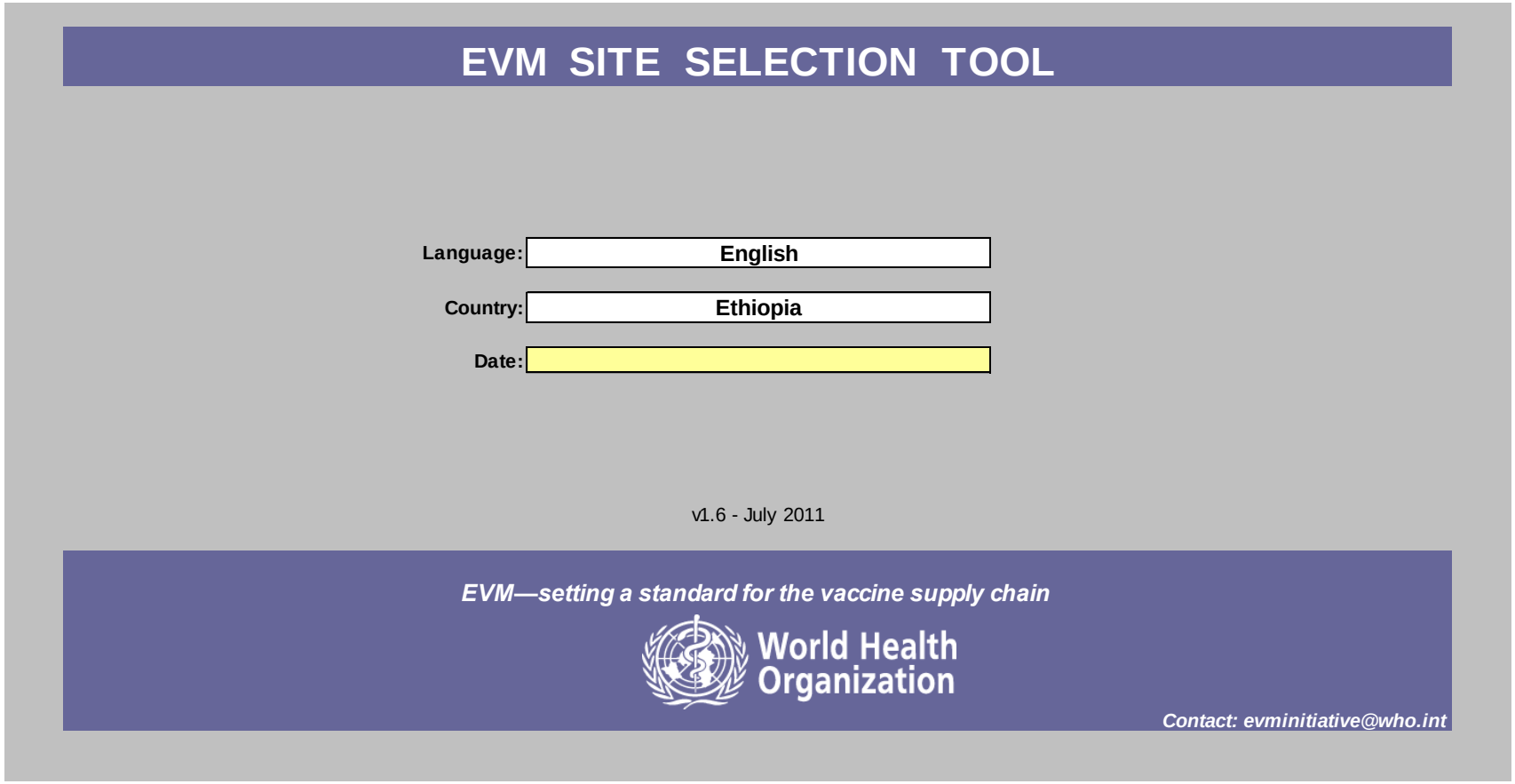
Level 1 (National Level)	**Level 2** (Regional level)	**Level 3** (Provincial level)	**LD level** (District Level)	**LD population**	**Selected health facilities**
1	**2**	**3**	**4**	**5**	**6**
National Store	Region 1	Province 1	District vaccine store 2	20,000	**H1**
			District vaccine store 3	50,000	**H2**
	Region 3	Province 3	District vaccine store 9	85,000	**H3,H4**
			District vaccine store 10	120,000	**H5, H6**
	Region 4	Province 4	District vaccine store 12	35,000	**H8**
			District vaccine store 14	15,000	**H9**
		Province 4	District vaccine store 15	50,500	**H10**
	Region 5	Province 5	District vaccine store 18	35,000	**H11**
		Province 6	District vaccine store 20	14,000	**H12**

3. The EVM site selection tool

The following pages show annotated screens shots of the Excel-based EVM site selection tool. This has been written for use with Excel 2003 or higher. The tool follows the methodology and terminology described above.

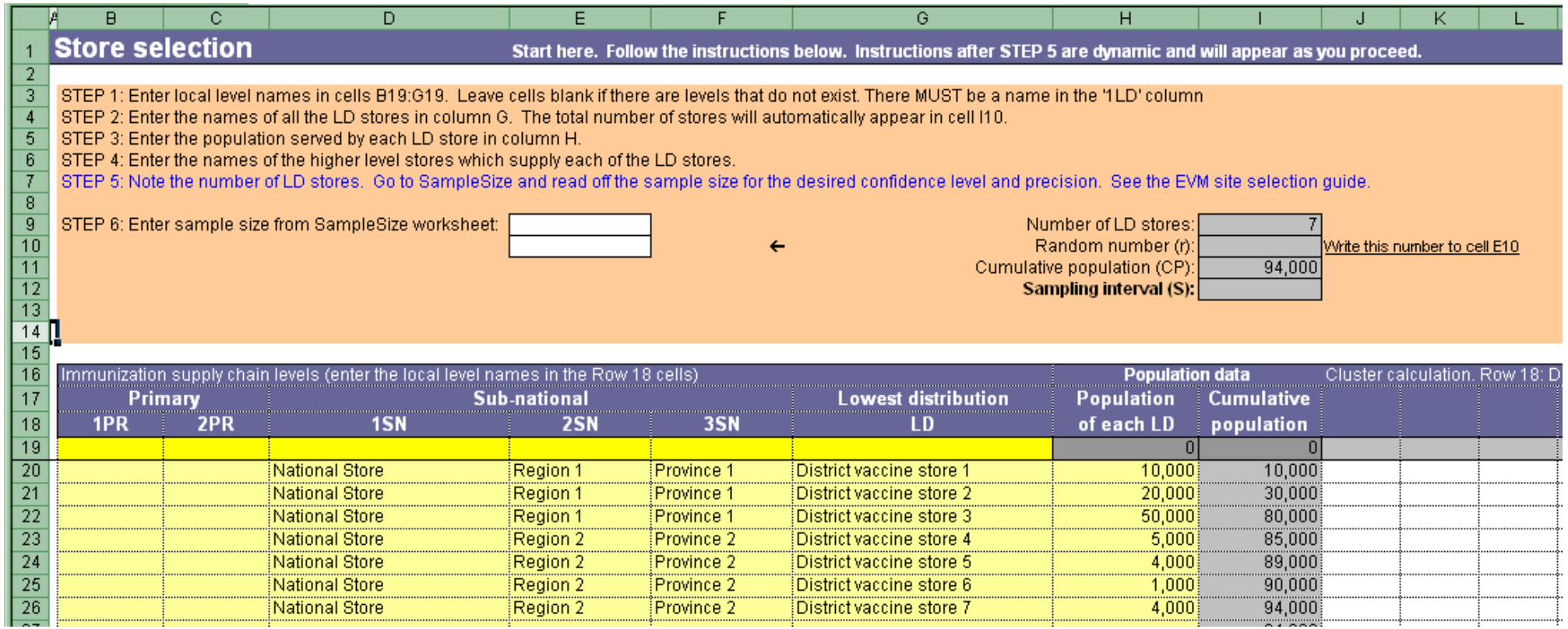
3.1 Cover page

Enter the country name and date on the cover page to start the site selection process.



3.2 Stores selection - 1

Open the main StoreSelection worksheet. Follow the step-by-step instructions on the screen shot below to establish a dataset for the selection process[13]. First, enter the names of all the lowest delivery level (LD) stores in your sampling area (either an entire country or a region of the country). Next, enter the population served by each of these stores. Then, for each LD store, follow the supply chain up to primary store level and enter the complete chain for each store. You are unlikely to need to use all five of the higher levels (1PR, 2PR, 1SN, 2SN and 3SN) – just use those that apply. Enter the local names for each level in cells **B19** to **G19** – for example 'NVS', 'Province', 'Aimag', 'Rayon', etc.



Store selection — Start here. Follow the instructions below. Instructions after STEP 5 are dynamic and will appear as you proceed.

STEP 1: Enter local level names in cells B19:G19. Leave cells blank if there are levels that do not exist. There MUST be a name in the '1LD' column
STEP 2: Enter the names of all the LD stores in column G. The total number of stores will automatically appear in cell I10.
STEP 3: Enter the population served by each LD store in column H.
STEP 4: Enter the names of the higher level stores which supply each of the LD stores.
STEP 5: Note the number of LD stores. Go to SampleSize and read off the sample size for the desired confidence level and precision. See the EVM site selection guide.

STEP 6: Enter sample size from SampleSize worksheet:

Number of LD stores: 7
Random number (r):
Write this number to cell E10
Cumulative population (CP): 94,000
Sampling interval (S):

Immunization supply chain levels (enter the local level names in the Row 18 cells)						Population data		Cluster calculation. Row 18: D
Primary		Sub-national			Lowest distribution	Population	Cumulative	
1PR	2PR	1SN	2SN	3SN	LD	of each LD	population	
						0	0	
		National Store	Region 1	Province 1	District vaccine store 1	10,000	10,000	
		National Store	Region 1	Province 1	District vaccine store 2	20,000	30,000	
		National Store	Region 1	Province 1	District vaccine store 3	50,000	80,000	
		National Store	Region 2	Province 2	District vaccine store 4	5,000	85,000	
		National Store	Region 2	Province 2	District vaccine store 5	4,000	89,000	
		National Store	Region 2	Province 2	District vaccine store 6	1,000	90,000	
		National Store	Region 2	Province 2	District vaccine store 7	4,000	94,000	

[13] Steps in blue text are hyperlinked to the relevant subsidiary worksheets in the tool.

3.3 Sample size

Write down the total number of LD stores calculated in cell **I9.** Next, click on the STEP 5 hyperlink and go to the SampleSize worksheet. Refer to the procedure described earlier in this guide. Follow down Column B until you reach the cell with a number closest to the number of LD stores (250 for example). Now read off the sample size at your chosen confidence level and precision; in this example, the required sample size for a 90% confidence level ±15% precision is 18 LD stores.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	**Sample size**			Find row with nearest number of LD stores. Select desired Option. Read off the sample size										
2	Store selection													
3		Number of LD stores for sample selection		Option 1: 80% Confidence level and Precision options in %				Option 2: 85% Confidence level and Precision options in %				Option 3: 90% Confidence level and Precision options in %		
4				±5%	±10%	±15%		±5%	±10%	±15%		±5%	±10%	±15%
5		5		5	5	4		5	5	4		5	5	5
6		10		10	8	6		10	8	7		10	9	7
7		15		14	10	7		14	11	8		14	12	9
8		20		17	12	8		18	13	9		19	14	11
9		25		21	14	9		22	15	10		22	17	12
10		40		30	17	10		31	19	11		33	22	14
11		50		35	18	10		37	21	12		39	24	15
12		75		44	20	11		49	24	13		53	28	16
13		100		52	21	11		58	26	13		64	31	17
14		125		58	22	11		65	27	14		73	33	17
15		150		62	23	11		71	28	14		81	34	18
16		175		66	23	11		76	29	14		88	35	18
17		200		70	24	12		81	29	14		94	36	18
18		225		72	24	12		84	30	14		99	37	18
19		250		75	24	12		87	30	14		103	38	18
20		275		77	25	12		90	30	15		107	38	19
21		300		78	25	12		93	30	15		111	38	19
22		325		80	25	12		95	31	15		114	39	19
23		350		81	25	12		97	31	15		117	39	19

3.4 Stores selection - 2

Return to the StoreSelection worksheet using the hyperlink and enter the sample size (29) you have established in cell **E9.** The tool will now generate a random number in cell **I10.** Copy this number into cell **E10**. Cell **I10** will clear and be replaced with the message 'Number copied'[14].

Store selection — Start here. Follow the instructions below. Instructions after STEP 5 are dynamic and will appear as you proceed.

STEP 1: Enter local level names in cells B19:G19. Leave cells blank if there are levels that do not exist. There MUST be a name in the '1LD' column
STEP 2: Enter the names of all the LD stores in column G. The total number of stores will automatically appear in cell I10.
STEP 3: Enter the population served by each LD store in column H.
STEP 4: Enter the names of the higher level stores which supply each of the LD stores.
STEP 5: Note the number of LD stores. Go to SampleSize and read off the sample size for the desired confidence level and precision. See the EVM site selection guide.

STEP 6 OK: Sample size entered	11
STEP 7 OK: Random number copied from cell I10:	25,000

Number of LD stores:	21
Random number (r):	Number copied
Cumulative population (CP):	484,028
Sampling interval (S):	**44,003**

STEP 8: The highlighted LD stores in the table below are your sample.
STEP 9: Go to ServicePointRand to choose a service delivery point sample for each of the highlighted LD stores.
STEP 10: Follow the highlighting in the table below to select the higher level stores.

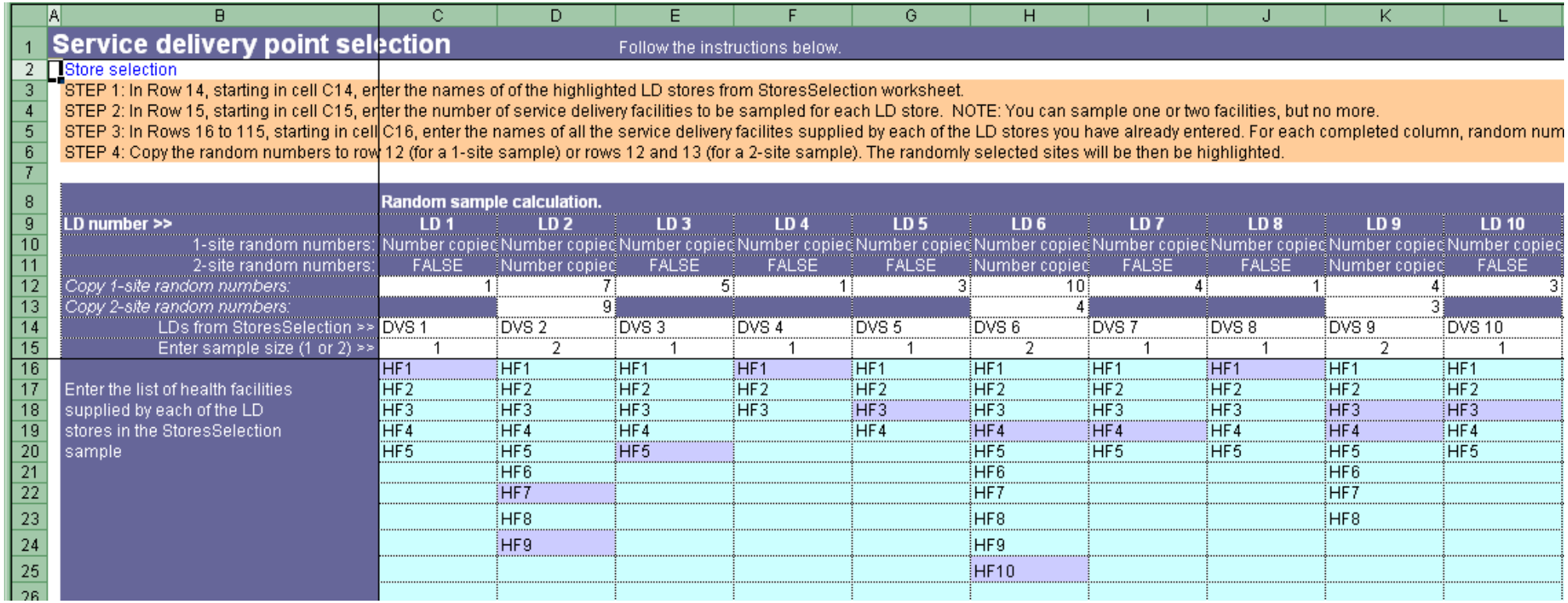
Immunization supply chain levels (enter the local level names in the Row 18 cells)						Population data		Cluster calculation	
Primary		Sub-national			Lowest distribution	Population	Cumulative		
1PR	2PR	1SN	2SN	3SN	LD	of each LD	population	1	2
						0	0	25,000	69,003
		National Store	Region 1	Province 1	District vaccine store 1	10,000	10,000		
		National Store	Region 1	Province 1	District vaccine store 2	20,000	30,000	25,000	
		National Store	Region 1	Province 1	District vaccine store 3	50,000	80,000		69,003
		National Store	Region 2	Province 2	District vaccine store 4	5,000	85,000		
		National Store	Region 2	Province 2	District vaccine store 5	4,000	89,000		
		National Store	Region 2	Province 2	District vaccine store 6	1,000	90,000		
		National Store	Region 2	Province 2	District vaccine store 7	4,000	94,000		
		National Store	Region 2	Province 2	District vaccine store 8	10,000	104,000		
		National Store	Region 3	Province 3	District vaccine store 9	85,000	189,000		
		National Store	Region 3	Province 3	District vaccine store 10	120,000	309,000		
		National Store	Region 3	Province 3	District vaccine store 11	10,000	319,000		

[14] If, by mistake, you delete the sample size in cell E9 *after* you have entered the random number in cell E10, you will create a temporary error condition in the cluster calculation table.

You have now completed all the steps needed to generate a sample of LD stores. The sample selection will be highlighted in blue-grey. Record these names.

Service delivery point selection

Click on the STEP 9 hyperlink and go to the ServicePointRand worksheet. Follow the step-by-step instructions on the screen shot below to establish a dataset for the service point selection process. Once you have done these steps, the tool will now randomly select from your list and the selection will be highlighted in blue-grey. Record these names. If the highlighted sample contains facilities that are hard to access and you want to change the sample, follow the procedure described in section 2.2.7 above.



	A	B	C	D	E	F	G	H	I	J	K	L
1		**Service delivery point selection**			Follow the instructions below.							
2		Store selection										
3		STEP 1: In Row 14, starting in cell C14, enter the names of of the highlighted LD stores from StoresSelection worksheet.										
4		STEP 2: In Row 15, starting in cell C15, enter the number of service delivery facilities to be sampled for each LD store. NOTE: You can sample one or two facilities, but no more.										
5		STEP 3: In Rows 16 to 115, starting in cell C16, enter the names of all the service delivery facilites supplied by each of the LD stores you have already entered. For each completed column, random num										
6		STEP 4: Copy the random numbers to row 12 (for a 1-site sample) or rows 12 and 13 (for a 2-site sample). The randomly selected sites will be then be highlighted.										
7												
8			**Random sample calculation.**									
9		**LD number >>**	**LD 1**	**LD 2**	**LD 3**	**LD 4**	**LD 5**	**LD 6**	**LD 7**	**LD 8**	**LD 9**	**LD 10**
10		1-site random numbers:	Number copiec	Number copiec	Number copiec	Number copiec	Number copiec	Number copiec	Number copiec	Number copiec	Number copiec	Number copiec
11		2-site random numbers:	FALSE	Number copiec	FALSE	FALSE	FALSE	Number copiec	FALSE	FALSE	Number copiec	FALSE
12		*Copy 1-site random numbers:*	1	7	5	1	3	10	4	1	4	3
13		*Copy 2-site random numbers:*		9				4			3	
14		LDs from StoresSelection >>	DVS 1	DVS 2	DVS 3	DVS 4	DVS 5	DVS 6	DVS 7	DVS 8	DVS 9	DVS 10
15		Enter sample size (1 or 2) >>	1	2	1	1	1	2	1	1	2	1
16		Enter the list of health facilities supplied by each of the LD stores in the StoresSelection sample	HF1	HF1	HF1	HF1	HF1	HF1	HF1	HF1	HF1	HF1
17			HF2	HF2	HF2	HF2	HF2	HF2	HF2	HF2	HF2	HF2
18			HF3	HF3	HF3	HF3	HF3	HF3	HF3	HF3	HF3	HF3
19			HF4	HF4	HF4		HF4	HF4	HF4	HF4	HF4	HF4
20			HF5	HF5	HF5			HF5	HF5	HF5	HF5	HF5
21				HF6				HF6			HF6	
22				HF7				HF7			HF7	
23				HF8				HF8			HF8	
24				HF9				HF9				
25								HF10				
26												

Return to the StoresSelection worksheet.

3.5 Higher level store selection

Identify the complete list of higher level stores supplying your selected LD sample, highlighted in blue-grey.

Store selection — Start here. Follow the instructions below. Instructions after STEP 5 are dynamic and will appear as you proceed.

STEP 1: Enter local level names in cells B19:G19. Leave cells blank if there are levels that do not exist. There MUST be a name in the '1LD' column
STEP 2: Enter the names of all the LD stores in column G. The total number of stores will automatically appear in cell I10.
STEP 3: Enter the population served by each LD store in column H.
STEP 4: Enter the names of the higher level stores which supply each of the LD stores.
STEP 5: Note the number of LD stores. Go to SampleSize and read off the sample size for the desired confidence level and precision. See the EVM site selection guide.

STEP 6 OK: Sample size entered: 11
STEP 7 OK: Random number copied from cell I10: 25,000

Number of LD stores: 21
Random number (r): Number copied
Cumulative population (CP): 484,028
Sampling interval (S): 44,003

STEP 8: The highlighted LD stores in the table below are your sample.
STEP 9: Go to ServicePointRand to choose a service delivery point sample for each of the highlighted LD stores.
STEP 10: Follow the highlighting in the table below to select the higher level stores.

Immunization supply chain levels (enter the local level names in the Row 18 cells)						Population data		Cluster calculation	
Primary		Sub-national			Lowest distribution	Population	Cumulative		
1PR	2PR	1SN	2SN	3SN	LD	of each LD	population	1	2
						0	0	25,000	69,003
		National Store	Region 1	Province 1	District vaccine store 1	10,000	10,000		
		National Store	Region 1	Province 1	District vaccine store 2	20,000	30,000	25,000	
		National Store	Region 1	Province 1	District vaccine store 3	50,000	80,000		69,003
		National Store	Region 2	Province 2	District vaccine store 4	5,000	85,000		
		National Store	Region 2	Province 2	District vaccine store 5	00	89,000		
		National Store	Region 2	Province 2	District vaccine store 6	00	90,000		
		National Store	Region 2	Province 2	District vaccine store 7	00	94,000		
		National Store	Region 2	Province 2	District vaccine store 8	10,000	104,000		
		National Store	Region 3	Province 3	District vaccine store 9	85,000	189,000		
		National Store	Region 3	Province 3	District vaccine store 10	120,000	309,000		
		National Store	Region 3	Province 3	District vaccine store 11	10,000	319,000		

Supply chain: Region 1-Province 1

Supply chain: Region 3-Province 3

Annex 1 – Complete sample size reference table

The recommended combination of confidence level and precision is 80% and ±10% respectively.

Sample size Find row with nearest number of LD stores. Select desired Option. Read off the sample size

Store selection

Number of LD stores for sample selection	Option 1: 80% Confidence level and Precision options in %			Option 2: 85% Confidence level and Precision options in %			Option 3: 90% Confidence level and Precision options in %		
	±5%	±10%	±15%	±5%	±10%	±15%	±5%	±10%	±15%
5	5	5	4	5	5	4	5	5	5
10	10	8	6	10	8	7	10	9	7
15	14	10	7	14	11	8	14	12	9
20	17	12	8	18	13	9	19	14	11
25	21	14	9	22	15	10	22	17	12
40	30	17	10	31	19	11	33	22	14
50	35	18	10	37	21	12	39	24	15
75	44	20	11	49	24	13	53	28	16
100	52	21	11	58	26	13	64	31	17
125	58	22	11	65	27	14	73	33	17
150	62	23	11	71	28	14	81	34	18
175	66	23	11	76	29	14	88	35	18
200	70	24	12	81	29	14	94	36	18
225	72	24	12	84	30	14	99	37	18
250	75	24	12	87	30	14	103	38	18
275	77	25	12	90	30	15	107	38	19
300	78	25	12	93	30	15	111	38	19
325	80	25	12	95	31	15	114	39	19
350	81	25	12	97	31	15	117	39	19
375	83	25	12	99	31	15	119	39	19
400	84	25	12	100	31	15	122	40	19
425	85	25	12	102	31	15	124	40	19
450	86	25	12	103	31	15	126	40	19
475	87	25	12	104	32	15	128	40	19
500	87	25	12	106	32	15	129	40	19
525	88	26	12	107	32	15	131	41	19
550	89	26	12	108	32	15	132	41	19
575	89	26	12	108	32	15	134	41	19
600	90	26	12	109	32	15	135	41	19
625	90	26	12	110	32	15	136	41	19
650	91	26	12	111	32	15	137	41	19
675	91	26	12	112	32	15	138	41	19
700	92	26	12	112	32	15	139	41	19
725	92	26	12	113	32	15	140	41	19
750	93	26	12	113	32	15	141	41	19
775	93	26	12	114	32	15	142	42	19
800	93	26	12	114	32	15	143	42	19
825	94	26	12	115	32	15	144	42	19
850	94	26	12	115	32	15	145	42	19
875	94	26	12	116	33	15	145	42	19
900	95	26	12	116	33	15	146	42	19
925	95	26	12	117	33	15	147	42	19
950	95	26	12	117	33	15	147	42	19
975	95	26	12	117	33	15	148	42	19
1000	95	26	12	118	33	15	148	42	19
>2000	95	26	12	118	33	15	148	42	19

Revision history

Date	Change summary	Reason for change	Approved
10.05.2010	Original document		Hailu Makonnen Kenea
28.05.2010	Updated to include user guide for selection tool v1.1-beta		Andrew Garnett, Hailu Makonnen kenea
19.09.2010	Reference table updated		Hailu Makonnen Kenea
19.09.2011	Update to include the changes made in the Site Selection tool v.106 and feedback received from EURO regional workshops and assessments	To align with the changes occurred in the v1.06 version and to incorporate some changes and meet user requirement.	Hailu Makonnen Kenea, Souleymane kone
19.03.2014	SampleSize sheet updated. New sample sizes are significantly smaller than previously for any chosen combination of confidence level and precision. WHO now recommends a confidence level of 80% and a precision of ±10%.	Sample sizes are now determined by hypergeometric statistics alone.	Paul Colrain