The University of California, San Francisco

Malaria Elimination Initiative (MEI)

Module 5

Sampling design for operational purposes

The **Entomological Surveillance Planning Tool**

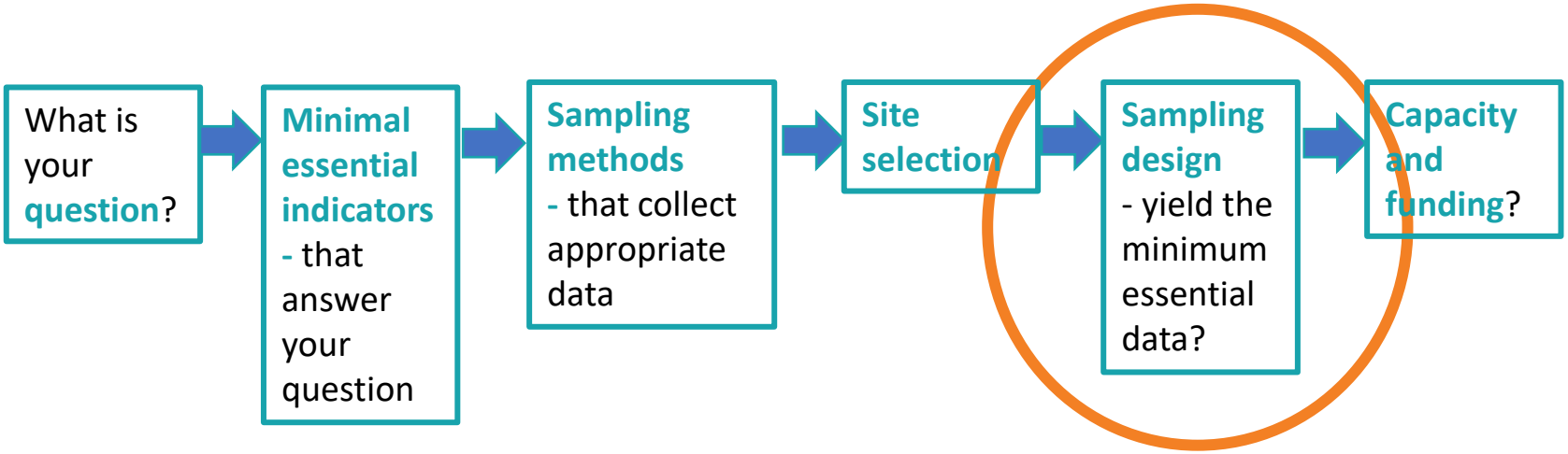
Learning objectives: Module 5

1. Understand how to use the ESPT to develop a sampling plan based on priority program questions and available capacity and resources.

2. Understand the importance of data standardization and data quality in the context of available capacity and resources.

Where are we in the ESPT?

Module 5 is a short step-by-step guide to help you work through key considerations for designing your **sampling plan**.



Key concepts

Sampling site: the collection locality from where mosquito samples are collected to obtain relevant data to measure the indicators selected.

Sampling unit: an individual unit for mosquito collection within sampling sites. E.g., a village, a house, a water body, etc.

Sample size: the number of sampling units allocated (i.e., ‘sampled’) within a sampling site.

Steps for sampling design

Step 1. Determine the sampling site

Step 2. Determine the sampling unit

Step 3. Allocate the sampling units

Step 4. Determine the sampling method

Step 5. Set the frequency of sampling

Step 1. Determine the sampling site

- After you have determined your site type in Module 4, you must decide where these sampling sites will be located on the map.
- Sampling sites are selected based on your question,
  - Limited capacity and resources may also limit the size and number of sampling sites.

►In Step 1, Table 11 proposes examples of sampling sites for 3 common program questions.

Table 11. Example questions posed with corresponding appropriate sampling site

Program question	Sampling site(s)
Where are the villagers of Village X exposed to *Anopheles* mosquitoes?	Village X + other areas where villagers are present during *Anopheles* biting times (e.g., village X + surrounding forest worksites)
Health Facility A and B are reporting abnormally high number of malaria cases. What are the entomological drivers of this outbreak?	Catchment areas of Health Facility A and B
Is there presence or absence of insecticide resistance to the active ingredient used for IRS and/or LLINs in Region Y?	All sentinel sites in Region Y where the intervention was deployed

Step 2. Determine the sampling unit

- Sampling unit can be a village, house, cattle shed, forest, farm worksite, water body, etc.,

- Your priority question and the indicators you selected will guide you in deciding on the appropriate sampling unit.
  - *Example*: if aiming to measure the Human Biting Rate inside and outside homes, then the sampling unit would be a single home.
- Sampling unit must be standardized across all selected sampling sites.
  - *Example*: if aiming to measure the larval density of *Anopheles stephensi* in artificial larval sites, then the sampling unit must be a single artificial larval site.

►In Step 2, Table 12 provides examples of possible sampling unit based on common questions and their corresponding indicator.

Table 12.
Example questions with corresponding possible sampling unit selection criteria

Program question	Indicator	Sampling unit	Possible sampling unit selection criteria
How is IRS affecting the indoor resting density of *Anopheles* in Village X?	Indoor Resting Density	Houses*	• Sprayed houses. • Samples of all wall types present (mud, concrete, zinc, etc). • Inhabited houses—people sleeping inside every night
What is the human biting location of *Anopheles* in Village X?	Human Biting Rates	Houses* and other structures in village	• Inhabited houses (inside and outside) • Spaces where people are present during *Anopheles* biting periods such as outdoor cooking shelters

Are bed nets an appropriate intervention for the village community of Katosha?

- **Sampling site**: Katosha.
- Katosha has 50 permanent homes and 1 border post (where up to 10 border police members might sleep at any given time).
- Key indicator to measure: Human Biting Rate inside/outside.

Step 3. Allocate the sampling units

- Allocation of sampling units = the selection of sampling units that will be included in the entomological investigation.
- To support the allocation of sampling units:
  1. Consider **historical data**
  2. Assess **how many** sampling units (i.e., 'sample size') is appropriate.

➢ Three **Example Cases** illustrate the considerations elaborated in Step 2.

Are bed nets an appropriate intervention for the village community of Katosha?

- **Sampling site**: Katosha.
- **Sampling unit**: sleeping structures.
- Can select 6 sleeping structures.

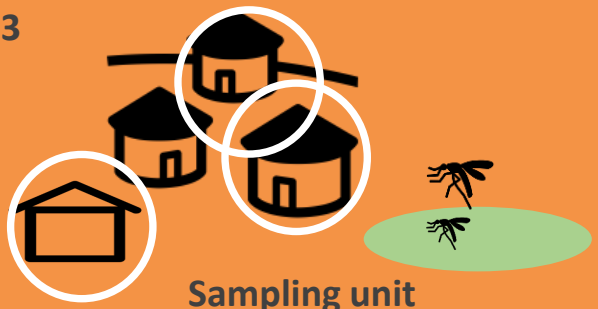
Step 1

Sampling site: Katosha village

Step 2

Sampling unit: sleeping structures (homes and border post)

Step 3



Sampling unit allocation: 2 houses in Katosha

Participant exercise 1

Determine the sampling site and sampling unit for your priority question:

1. Use ***Step 1*** and **Table 11** to determine your **sampling site** *(Remember that in Module 4 you saw how to select the appropriate site type!)*
2. Then, work through ***Step 2*** to decide on your **sampling unit** (refer to Table 12 for help).

Step 4. Determine the sampling method

- Sampling methods used have an important impact on the data and on whether the question was appropriately addressed.
  - In Module 3, you learned about how each sampling method comes with its biases, advantages and disadvantages.
  - For this step, use Module 3 to help you decide on what is the best sampling method for your question and given available resources.
- Standardization of sampling across all sampling units is critical.

Step 5. Set the frequency of sampling

- Step 5 - essential considerations for frequency of sampling.
- Frequency of sampling is dependent on question and on available human and financial resources.
  - More frequent sampling can often produce more representative data, but quality of data should always be prioritized over quantity.
- Frequency of sampling is determined at 2 levels:

  1) the number of **sampling periods** within a sampling site, and

  2) the number of **sampling days or nights** per sampling period.
  - ***Example***: sampling 3x per year and for a duration of 5 days during each of the 3 sampling periods.
- **Frequency of sampling periods** is determined based on your priority program question, and available capacity.
  - ***Example***: In Katosha, you might consider 2 sampling periods: 1x during the high transmission season, and 1x during the low transmission period (transmission dynamics might differ) between both seasons. But if you can only afford 1 sampling period, then you should prioritize sampling during the high transmission season.

Step 5. Set the frequency of sampling

Timing of sampling periods must also be determined and are largely based on the question and the available resources.

Example Case 4. Timing and frequency of sampling

Question: What is the residual efficacy of a new insecticide being used for IRS?

Timing and frequency of sampling:

- If resources permit, Option 1: sampling begins immediately following spraying, and subsequently occurs once per month until *Anopheles* mortality is below 80%.
- If resources are limited, then Option 2: sampling begins immediately following spraying, and subsequently occurs once every 2 months following spraying until (or beyond?) 6 months following spraying, or until *Anopheles* mortality is below 80%.

Review of Modules 1 – 5

At this stage, you have learned how to:

1. Identify and formulate a priority program question
2. Select appropriate entomological and other indicators to answer the program question
3. Select vector sampling and lab methods, as well as human behavior/HRP survey methods.
4. Select your site type by survey type based on your question.
5. Consider 5 key steps when designing your sampling plan.