

Survey Implementation

Document

Sample Design

[COUNTRY] [YEAR]

*Feed the Future Phase Three Zone of Influence Round 1 Indicator Assessment*

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# Instructions

This document is designed as a template that can be modified for each Phase 3 Zone of Influence Round 1 Indicator Assessment. The content and the text have been pre-approved by the United States Agency for International Development’s Bureau for Resilience, Environment, and Food Security (REFS) and should be modified where noted. The following conventions are used in this template to indicate where modifications should or may be made:

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# Abbreviations

EA enumeration area

FIES Food Insecurity Experience Scale

MDD-W women’s minimum dietary diversity

MOS measure of size

P3 phase three

PBS population-based survey

PPP purchasing power parity

PPS probability proportional to size

PSU primary sampling unit

SIO Survey Implementing Organization

USAID United States Agency for International Development

ZOI Zone of Influence

# Background

Feed the Future seeks to reduce poverty, hunger, and malnutrition among women and children; strengthen agriculture and food systems; increase income, resilience, women’s empowerment, dietary diversity, and appropriate feeding practices; and improve hygienic environments. Program efforts are designed to impact populations in the Zone of Influence (ZOI) in Feed the Future target countries, including [Country]. One of the main tools to track progress in achieving Feed the Future’s high-level objectives is a set of population-based indicators computed using data collected through household surveys every four years.

The purpose of the [Year(s)] Feed the Future [Country] Phase Three Zone of Influence (P3-ZOI) Round 1 Indicator Assessment, hereafter referred to as the Round 1 Indicator Assessment, is to quantify key indicators related to poverty, hunger, malnutrition, and related household characteristics in the selected P3-ZOI in [Country] and to provide a basis against which to measure progress toward a 2030 performance target for increasing the proportion of women in the Feed the Future ZOI who consume a nutritious diet. The primary audiences for this information are U.S. Government interagency partners, the United States Agency for International Development (USAID) Bureau for Resilience, Environment, and Food Security, USAID [Country], the [Country] government, and development partners.

Primary data for the Round 1 Indicator Assessment are derived from the [Year] [Country] P3-ZOI Round 1 Survey (hereafter, the Round 1 Survey), and secondary data are derived from the [Year] [Country] Demographic and Health Survey and the [Year] [Country] Annual Agricultural Survey/Living Standards Measurement Study. The Round 1 Survey is being conducted by [Contractor] and supported by the local Survey Implementing Organization, [SIO], based in [city/town and country where the SIO is based].

# Purpose of this document

The purpose of this document is to provide details on the sampling methodologies to be implemented for the Round 1 Survey in [Country], which serves as the primary data source for directly computed indicators in the Round 1 Indicator Assessment.[[1]](#footnote-2) This document details the activities undertaken by [Contractor] to develop the sampling frame and sample design, including the sample size, for the Round 1 Survey. The sample design is defined by the sample requirements provided in the Scope of Work and is implemented following the guidelines as outlined in the *Guidance for the Implementation of Zone of Influence Surveys for Feed the Future Target Countries Endline/Round 1* (hereafter referred to as the *ZOI Survey Guidance for Target Countries*) and the *Feed the Future Population-Based Survey (PBS) Sampling Guide*.[[2]](#footnote-3),[[3]](#footnote-4),[[4]](#footnote-5)

This document includes information on the sample size determination, development and preparation of the first-stage sampling frame, including implementation of stratification and sample allocation, as well as first-stage sample selection and its distribution across the sample design strata. In addition, it provides information on the sample design methodology that will be followed for subsequent stages of sampling and for producing appropriate sampling weights for analysis.

Currently, only the first-stage sample selection has been completed for the Round 1 Survey. Details on the implementation of the sample for subsequent stages of the sample design is dependent on the results from the household listing operation that is scheduled to begin [date when household listing operation commences]. The results of the household listing operation will be provided in the household listing report, and a detailed description of the final sample selection for the Round 1 Survey will be provided in the final indicator assessment report.

# Study population

The study population for the Round 1 Survey is all households and individuals residing within the P3-ZOI in [Country]. The P3-ZOI is composed of [XX] [regions/districts/communes/counties]. [Add any additional administrative and geographic information available that further describes the P3-ZOI.] A complete list of [regions/districts/communes/counties] that comprise the P3-ZOI is provided in the **Appendix**. A map of the P3-ZOI is shown in **Figure 1.**

Figure 1: Map of the P3-ZOI in [Country]

[Insert map showing the P3-ZOI in the country]

# Sample size determination

The Round 1 Survey will provide sample-weighted estimates for P3-ZOI indicators, including their standard errors and confidence intervals, at an acceptable level of statistical accuracy.[[5]](#footnote-6) This requires a survey with a sample size that is adequate to enable the calculation of reliable indicator estimates at a single point in time. Although the survey is not designed to detect statistically significant differences in indicator values over time, it will still be possible to detect statistically significant differences if the difference between values over a time period (e.g., between Round 1 and Round 2 surveys) is large enough.

The sample size was determined following the *ZOI Survey Guidance for Target Countries*. As per the guidance, the required sample sizes for the following directly collected and computed indicators were used in determining the sample size for the Round 1 Survey:

* Prevalence of poverty: Percentage of people living on less than $2.15/day 2017 purchasing power parity (PPP)
* Prevalence of moderate and severe food insecurity in the population, based on the Food Insecurity Experience Scale (FIES)
* Prevalence of stunted (height-for-age z-score< -2) children under 5 years of age
* Percent of women of reproductive age consuming a diet of minimum diversity (women’s minimum dietary diversity [MDD-W])

## Calculation of initial sample size per indicator

The initial required sample sizes were computed for the directly collected and computed indicators listed in the previous section. The initial sample size required for each indicator was determined based on an estimated base value, the degree of confidence ( = 0.05), the acceptable margin of error (5 percent), and the expected design effect of the survey.

Following the recommendations in the *ZOI Survey Guidance for Target Countries*, the estimated base values for the prevalence of poverty, food insecurity, stunting, and MDD-W indicators in the P3-ZOI were based on the following secondary data sources. [Describe the relevant data sources used for obtaining estimated base values for each of the indicators listed above].

Since no recent secondary data sources exist to reasonably estimate base values for the prevalence of poverty, food insecurity, stunting, and MDD-W indicators in the P3-ZOI, an estimated base value of 50 percent prevalence for all indicators was assumed. This approach provides a conservative base value estimate with the highest possible sample size requirement for each indicator, which guarantees sufficient sample size to meet reporting needs.

**Table 1** presents the calculation of the initial sample size required for these indicators based on the input parameters as provided using the formula that follows.

Table 1: Calculation of the Initial Sample Size Required for the Survey Indicators

| **Indicator** |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Prevalence of poverty ($2.15/day 2017 PPP) | [X] | 5% | 1.96 | 4.3 | [X] |
| Prevalence of moderate or severe food insecurity (FIES) | [X] | 5% | 1.96 | 3.6 | [X] |
| Prevalence of stunting (0-59 months) | [X] | 5% | 1.96 | 2.4 | [X] |
| Percent women 15-49 years consuming a diet of minimum diversity (MDD-W) | [X] | 5% | 1.96 | 2.4 | [X] |

(1)

Where,

= estimated initial sample size required for the survey for the given indicator.

= the estimated design effect for the given indicator. The estimate was based on the average design effect achieved across phase two ZOI Baseline Surveys for all indicators.

= the estimated P3-ZOI base value of the given indicator. This value is based on [specify the secondary data source used/a base value of 50 percent prevalence (for target countries with no recent secondary data sources)] for all indicators.

= the critical value for the normal probability distribution. The significance level is set at = 0.05, giving a value of = 1.96.

= is the margin of error. The margin of error used for the Round 1 Survey is 5 percent (i.e., M = 0.05).

## Calculation of the final sample size per indicator

To derive the final required household sample size for each indicator, the initial sample size values calculated were adjusted to account for the number of households that need to be contacted to obtain the required number of individuals for the given sub-population for individual level-indicators (i.e., children 0-59 months and women 15-49 years) and anticipated gross household non-response. Therefore, the final sample size, denoted by , is the product of the initial sample size and the adjustment for the number of households to contact for the given individual sub-population for individual-level indicators (i.e., ) and the adjustment for anticipated gross household non-response (i.e., ) for each indicator:

(2)

Where,

= estimated final sample size required for the survey based on the indicator

= adjustment for the number of households to contact to obtain the required number of individuals for the given sub-population for an individual-level indicator.[[6]](#footnote-7) The estimated proportion of the population in the age group underlying the indicator for this adjustment was based on the [data source] for all individual level indicators.

= adjustment for anticipated gross household non-response, which is equal to the inverse of the expected gross household response rate.[[7]](#footnote-8) The expected gross household response rate for this adjustment was based on the average gross household response rate of 94.5 percent achieved across phase two ZOI Surveys.

**Table 2** illustrates the computation of the final required sample size for the required indicators.[[8]](#footnote-9) An expected gross household non-response rate of 5.5 percent and an average household size of [X.X] was assumed for the indicators based on the [data source].

Table 2: Calculation of the Final Sample Size Required for the Survey Indicators

| **Indicator** |  | **Estimated average number of individuals in the sampling group per household** |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Prevalence of poverty ($2.15/day 2017 PPP) | [X] | n/a | n/a | n/a | 1.058 | [X] |
| Prevalence of moderate or severe food insecurity (FIES) | [X] | n/a | n/a | n/a | 1.058 | [X] |
| Prevalence of stunting (0-59 months) | [X] | [X] | [X] | [X] | 1.058 | [X] |
| Percent women 15-49 years consuming a diet of minimum diversity (MDD-W) | [X] | [X] | [X] | [X] | 1.058 | [X] |

### 4.2.1 Final survey sample size for the Round 1 Survey

Comparing the final required sample sizes across all indicators from **Table 2,** the [specify the indicator from Table 2 with the largest household sample size required] indicator has the largest required sample size of [X,XXX] households and therefore meets the sample size needs for all indicators in the Round 1 Survey.

However, given the large required sample size calculated and its impact on survey operations, USAID [Country] has determined that the sample size for the Round 1 Survey should be capped at 2,200 households in alignment with the *ZOI Survey Guidance for Target Countries*.

With a sample take of [XX] households per cluster, a total of [XXX] clusters will be sampled for the Round 1 Survey.[[9]](#footnote-10)

# Sampling frame

The *Feed the Future PBS Sampling Guide* recommends the use of a cross-sectional, stratified, multi-stage cluster sample design, with up to four stages of sampling, to obtain a representative random sample for the Round 1 Survey.[[10]](#footnote-11) The multiple stages of sampling include a sample of primary sampling units (PSUs) at the first stage, as well as segments (if applicable), and households and individuals at subsequent stages. To select a sample that is representative of the population, a valid frame of sampling units at each stage of sample selection is required.

This section discusses the sampling frame that will be used at each stage of sampling, followed by a detailed description of the first-stage sampling frame preparation for the Round 1 Survey. A high-quality sampling frame is critical for the successful implementation of any PBS.[[11]](#footnote-12) It comprises a complete list of all sampling units (i.e., clusters/enumeration areas [EAs]/wards, segments, households, or individuals) that covers the target population from which a representative sample can be randomly selected at each stage of the survey.

**First-stage Sampling Frame of Clusters**

The *Feed the Future PBS Sampling Guide* recommends the use of census EAs as the first-stage sampling units/clusters for the Round 1 Survey. The recommended sampling frame at the first stage is therefore a census EA frame that covers the target population. For the Round 1 Survey in [Country], the sampling frame is based on the [Year] [Country] census EA frame. The [XXXX] EAs that fall within the [XX] [regions/districts/communes/counties] of the P3-ZOI constitute the first-stage sampling frame for the survey (see Section 4.1). Section 6.3.1 provides additional details on how the first-stage sampling of EAs was completed using the first stage sampling frame.

**Second-stage Sampling Frame of Segments[[12]](#footnote-13)**

The second-stage sampling frame is dependent on the results and details of the household listing operation. At this stage, there is a possibility of sampling segments within some EAs, depending on the size of the EAs found during the household listing operation. EAs that are found to be too large to feasibly conduct listing and fieldwork operations will be subject to segmentation, following the guidelines in the *Feed the Future PBS Sampling Guide*.[[13]](#footnote-14) Therefore, for this survey, a sampled cluster can be an EA or a segment of an EA. Segmentation will only be implemented in EAs that are found to meet the requirements for segmentation, and the identification of these EAs will only be done during the initial stages of the household listing operation. Sections 6.3.2 and 6.3.3 provide further details on the procedures that will be followed, as needed, during segmentation and segment selection for this survey.

**Third-stage Sampling Frame of Households[[14]](#footnote-15)**

Within the selected EAs, a complete and comprehensive list of all households will be created through a household listing operation that occurs before the fieldwork for the survey. This list of households in each cluster will constitute the third-stage sampling frame that will be used for selecting a representative random sample of households for the Round 1 Survey. The household listing operation within sampled clusters is scheduled to begin [date when household listing operations commences]. Sections 6.3.2 and 6.3.4 provide further details on the procedures that will be followed during the household listing and household selection for this survey.

**Fourth-stage Sampling Frame of Individuals**

At the final stage of sampling, the frame consists of individuals found within the sampled households from the third stage. This frame is established through a household roster, which is a listing of all usual household members and visitors who stayed the night before the survey, along with associated information such as demographics and relationship to a designated primary adult decision-maker within the household. Interviewers generate the household roster during the main data collection, after sampled households have been located and contact has been established with a responsible adult (or emancipated minor, as applicable) within these households. Section 6.3.5 provides further details on the procedures that will be followed for sampling of individuals within households for this survey.

## Preparation of the first-stage sampling frame

Using the [Year] census EA frame data from the [national statistical organization]**, Table 3** shows the distribution of EAs and households by [appropriate administrative and/or geographic levels showing the distribution of the first-stage sampling units] within the P3-ZOI for the Round 1 Survey.

[Add narrative describing the distribution of the EAs and households in Table 3].

Table 3: Distribution of EAs and Households within the P3-ZOI for the Round 1 Survey

| **[Administrative levels defining the P3-ZOI area]** | **Number of EAs** | **Number of households** |
| --- | --- | --- |
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| **Total** |  |  |

The key characteristic of a high-quality sampling frame is that it provides a comprehensive, complete, and up-to-date set of sampling units that cover the entire target population. In general, for the first-stage frame to be considered “complete,” it should consist of an exclusive (i.e., with no duplicates) and exhaustive (i.e., with no missing units) set of all EAs covering the [XX] [regions/districts/communes/counties] that comprise the P3-ZOI in [Country]. For the first-stage sampling frame to be considered comprehensive, it should include, at a minimum, a unique identifier for each EA (such as a unique EA code), as well as information on the administrative hierarchy and geography in the country. In addition, any auxiliary information about each EA that can be used during the sample design will be useful (e.g., number of households, number of persons). As mentioned previously, the EAs from the [Year] [Country] census EA frame were used to derive a first-stage sampling frame for this survey. The frame file includes an EA code, information on the number of households per EA (based on the [Year] updated census counts), and the administrative hierarchy and geographic residence type defining each EA. The information on the frame file was checked to ensure that all necessary variables were complete and had valid values to enable the sample design for the survey.

Overall, [XXX] EAs fall within the [XX] [regions/districts/communes/counties] that comprise the P3-ZOI in [Country].

# Stratification, sample allocation, and sample selection

The Round 1 Survey uses a stratified, multi-stage cluster sample design, as recommended by the *Feed the Future PBS Sampling Guide*. This section describes the Round 1 Survey sample design with respect to the stratification, sample allocation, and sample selection.

## Stratification

Stratification is the process by which a target population is divided into subgroups (called strata) that have similar characteristics. It is an important step in designing the Round 1 Survey because it has the effect of reducing the overall variability across the sample, resulting in an increase in the precision of survey estimates. It also allows for greater flexibility, in the sense that different sample designs can be applied within each stratum, as well as providing a foundation for allocating the sample. For the Round 1 Survey, the stratification of the sampling frame was undertaken in two phases: explicit stratification and implicit stratification.

### 6.1.1 Explicit stratification

The sampling frame is explicitly stratified by [country-specific strata] to improve sample efficiency and enable the required analyses for the survey. [Provide a brief description of the stratification process undertaken for this survey]. This approach results in a total of [XX] design strata being created for this Round 1 Survey.

The explicit stratification also ensures that an adequate reserve sample can be allocated within those strata in which replacement of PSUs may be needed (see Section 7 for more details on the reserve sample).

**Table 4** shows the distribution of the EAs per stratum.

Table 4: Distribution of the Round 1 Survey EAs per Stratum

| **Stratum** | | | **Number of EAs** |
| --- | --- | --- | --- |
| **[Stratification variable 1]** | **[Stratification variable 2]** | **[Stratification variable 3]** |
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| **Total** | | |  |

### 6.1.2 Implicit stratification

Implicit stratification is an added measure that can be implemented prior to sampling to improve the efficiency of the sample design without having to create explicit strata. By ordering the frame within each stratum in a logical way before sampling, gains in precision can be achieved because the ordering has a similar effect as stratification without explicitly creating separate strata.

For this Round 1 Survey, within each of the explicit strata (as listed in **Table 4**), the EAs were sorted by [country-specific frame variables used for implicit stratification] before selection of the EAs during the first stage of sampling, to increase the efficiency of the sample design.

## Sample allocation

The main objective of the Round 1 Survey is to collect data to compute P3-ZOI indicator estimates that are representative of the P3-ZOI population. As shown in Section 5**,** a sample of [X,XXX] households will be selected within the P3-ZOI. The recommended allocation method to produce optimal estimates at the overall level for the P3-ZOI is a proportional allocation within each of the design strata using a measure of size (MOS), such as the number of households in each stratum. As per the recommendations in the *ZOI Survey Guidance for Target Countries*, the Round 1 Survey uses a proportional allocation within each of the primary design strata to produce estimates.

For this survey, the MOS used was the census household count per stratum, as recommended in the *Feed the Future PBS Sampling Guide*. The formula for allocating the final sample size to the design strata using proportional allocation is given by:

(4)

Where:

= portion of the final sample size () to be allocated to stratum

= number of households in stratum (based on the census EA frame count)

= total number of households across all strata

**Table 5** presents the allocation of the final sample size (=[X,XXX] households) to each stratum.

Table 5: Allocation of Final Sample Size across Strata

| **Stratum** | | | **Number of households in stratum**  **()** | **Allocation of the sample**  **()\*** |
| --- | --- | --- | --- | --- |
| **[Stratification variable 1]** | **[Stratification variable 2]** | **[Stratification variable 3]** |
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|  |  |  |  |  |
| **Total** | | |  |  |

\* Allocated sample sizes per stratum, rounded to the nearest whole number

## Sample selection

The sampling process will involve multiple stages of selection to arrive at the final sample to be implemented during fieldwork. As described in this document, at the first stage, EAs should be selected using systematic probability proportional to size (PPS) sampling. If applicable, EA segments should be selected using PPS in the second stage. Households should be selected using fractional interval systematic sampling in the third stage, and eligible household members should be selected using “take all” sampling in the fourth stage.[[15]](#footnote-16) “Take all” sampling means that all household members who meet the eligibility criteria to respond to specific questions (e.g., women of reproductive age for the minimum dietary diversity indicator) or have measurements taken (e.g., children under five for anthropometry indicators) should be included in the sample, and no subsampling among eligible members should occur. **Table 6** summarizes the methods for each of the four sampling stages.

Table 6: Summary of Methods for Each Stage of Sampling

| **Stage 1: Selection of EAs** | **Stage 2: Selection of segments** | **Stage 3: Selection of households** | **Stage 4: Selection of individuals** |
| --- | --- | --- | --- |
| Systematic PPS | PPS | Fractional interval systematic | Take all |

This section describes each stage of sampling and how it will be implemented. Currently, the first-stage sample of EAs has been selected (as described in Section 6.3.1), and the listing operation within these sampled EAs will determine the basis for subsequent stages of selection (i.e., procedures described in Sections 6.3.2 and 6.3.3). After the listing operation is complete, the sampling of households will be undertaken (see Section 6.3.4), followed by the sampling of eligible individuals within the sampled households (see Section 6.3.5).

### 6.3.1 First-stage sampling of EAs

For this Round 1 Survey, the stratification of the sample frame and sample allocation has been completed with each stratum, denoted by , having its own sample size, . The next step in the survey design process was to randomly select the sample of EAs from the sampling frame, independently within each stratum.

During the first stage of sampling, systematic PPS sampling was used to randomly select a sample of EAs, called the PSUs. The advantage of PPS sampling in a multistage design is that it leads to an overall self-weighting scheme (when combined with subsequent stages), resulting in a more efficient sample design for increased precision in estimating population indicators. In general, PPS sampling selects the PSUs according to a MOS that is related to the key indicators of interest. In line with Feed the Future recommendations, the [Year] census EA frame household counts were used as the MOS for the Round 1 Survey. In addition, Feed the Future recommends using a fixed household sample size of between 20 to 30 households per PSU to maintain the approximate self-weighting design. For this survey, a fixed number of [XX] households per PSU will be selected.

Following the recommendations in the *Feed the Future PBS Sampling Guide*, a systematic PPS sample of EAs was selected within each stratum based on the allocated stratum sample sizes, (see **Table 5**) and the sample take per EA, with the MOS being the [Year] census EA frame counts of the number of households within each EA.[[16]](#footnote-17)

**Reserve Sample of EAs**

During discussions with [SIO], it was flagged that some [regions/districts/communes/counties] within the P3-ZOI were anticipated to have accessibility issues during the survey due to [specify the reasons for areas being flagged as being potentially inaccessible for the survey]. Therefore, these areas may require replacement of sampled EAs. The *Feed the Future PBS Sampling Guide* makes provision for the allocation of a reserve sample of EAs using a two-phase sampling approach during the first stage of selection that can be used if some of the EAs from the main sample are found to be inaccessible.[[17]](#footnote-18) During the first phase of the first stage of sampling, a total number of EAs, which constitutes both the reserve number of EAs expected to be required as well as the actual number of EAs required for the survey sample, was selected from each stratum. During the second phase of the first stage of sampling, the subset of EAs for the reserve sample was then selected from the first phase sample using fractional interval systematic sampling. The reserve EAs will be released during fieldwork when required. For more details on the reserve sample EAs, see Section 7.

The *Feed the Future PBS Sampling Guide* makes provision for the allocation of a reserve sample of EAs using a two-phase sampling approach during this first stage of selection that could be used if some of the EAs from the main sample are found to be inaccessible.[[18]](#footnote-19) Based on discussions with [SIO], it is not anticipated that there would be any accessibility issues experienced while conducting the survey in any of the areas covered by the P3-ZOI. Therefore, no reserve sample of EAs was selected for this survey.

**Table 7** provides the distribution of the EAs for the overall main sample.

Table 7: Distribution of the Main Sample EAs per Stratum

| **Stratum** | | | **Number of sampled EAs per stratum**  **()** |
| --- | --- | --- | --- |
| **[Stratification variable 1]** | **[Stratification variable 2]** | **[Stratification variable 3]** |
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| **Total** | | |  |

Overall, the Round 1 Survey sample is made up of [XXX] sampled EAs, across the [XX] strata for this survey.

### 6.3.2 Preparation of the second- and third-stage sampling frames

Before conducting the second and subsequent stages of sampling, a household listing operation must take place within each sampled EA. The listing operation is critical because it provides an update on the current situation in these areas in terms of the sampling units and target population. This information is needed to create an up-to-date and accurate sampling frame for subsequent stages of sampling.

The [XXX] EAs selected for the Round 1 Survey during the first stage of sampling will undergo the listing process. During this process, some of the EAs might be identified to undergo segmentation (which involves an additional stage of selection) based on the given criteria (see Section 6.3.3). For EAs that do not require segmentation, a listing of all households will be undertaken following the listing methodology in the *CAPI Household Listing Manual*.[[19]](#footnote-20)

### 6.3.3 Second-stage sampling of segmented EAs (as needed)

There could be substantial changes (i.e., growth or reduction) in the size of EA populations as provided in the sampling frame compared to when the Round 1 Survey will be conducted. If a sampled EA has grown too large by the time of the listing operation, field teams will need to divide the EA and subsample one part of it through a process called segmentation.

For this Round 1 Survey, the first-stage sampling frame is based on the [Year] census EA frame within the P3-ZOI. Given the time that has passed since the [Year] census, there may be some changes to the size of some of the EAs. Based on the average EA size from the [Year] census EA frame in the P3-ZOI (i.e., [XXX] households), the criterion used to identify EAs that require segmentation is when their size exceeds [XXX] households, as recommended in the *Feed the Future PBS Sampling Guide*.

If an EA is identified for segmentation during the listing operation, it will be divided into an appropriate number of segments such that each segment is roughly equal to the average EA size with clearly identifiable boundaries.[[20]](#footnote-21) One segment will be randomly selected from the EA using PPS sampling (with the MOS being the number of dwelling units identified per segment based on a rough count). The selected segment is then listed to create a list frame of households within the segment (see Section 6.3.4).

After the listing operation is complete, an up-to-date list frame of the households within each sampled cluster will be available to be used to select the households for the next stage of sampling.

### 6.3.4 Third-stage sampling of households within sampled EAs or segments

The third stage of sampling consists of randomly selecting the households with which to conduct interviews in each sampled cluster. The listing operation will provide an ordered list of households for each sampled cluster to serve as a household sampling frame.

The process of randomly selecting households will be undertaken using an equal probability variant of systematic sampling called fractional interval systematic sampling. Systematic sampling is the preferred method of selection because it spreads the sample of selected households throughout the cluster and, in so doing, captures more within-cluster variation than, for example, using a simple random sampling method. The implementation of the fractional interval systematic sampling of households at this stage will follow the recommendations provided in the *Feed the Future PBS Sampling Guide*. As noted in Section 6.3.1, the sample take will be [XX] households per cluster for the survey.

### 6.3.5 Fourth-stage sampling of individuals within sampled households

During the fieldwork, as part of the household interview, a roster of household members will be established for each sampled household by obtaining information from a responsible adult member (or emancipated minor, as applicable) of the household; this serves as a fourth-stage sampling frame of individuals for all sampled households. Demographic information, including the name, relationship to the primary adult male decision-maker (or primary adult female decision-maker if the household has no primary adult male decision-maker), age, sex, and any other information needed to establish eligibility to respond to one or more subsequent questionnaire modules, will be collected on all individuals included in the roster.

Following the recommendations in the *ZOI Survey Guidance for Target Countries*, a “take-all” approach will be used for selecting individuals for interview. All eligible individuals for each sampling group found within sampled households will be interviewed (i.e., eligible individuals are sampled with certainty).

**Table 8** lists the sampling groups at the individual level that will be required for the survey.

Table 8: Individual-level Sampling Groups

| **Sampling group** | **Sampling approach** | **Questionnaire module** | **Eligibility determined** |
| --- | --- | --- | --- |
| Women 15-49 years of age | Take all | Module 4: Women’s nutrition | Roster + Module 4 |
| Children under 5 years of age | Take all | Module 5: Children’s anthropometry | Roster + Module 5 |
| Primary adult female decision-maker in the household (age 18 or older) | Take all | Module 6: Women’s empowerment in agriculture | Roster + Module 6 |

# Reserve sample

As mentioned previously, provision is made for the selection of a reserve sample of EAs to be used if some of the EAs from the sample cannot be enumerated during fieldwork. However, it should be noted that the reserve sample should only be used as a last resort. The field teams should make every effort to enumerate the [XXX] EAs that are part of the main Round 1 Survey sample before considering replacing any EA in the sample.

For the Round 1 Survey, [SIO] anticipates that some sampled EAs may require replacement using a reserve sample due to [specify the reasons for some areas being flagged as being potentially inaccessible and requiring replacement during the survey] in some areas of the P3-ZOI. Specifically, [SIO] has identified [regions/districts/communes/counties] as having potential accessibility issues during fieldwork and therefore requiring a reserve sample for possible replacement during the survey. The assessment and identification of [regions/districts/communes/counties] was used as a basis for allocating the reserve sample across the strata for the survey.

The reserve sample per stratum was based on the proportion of EAs in each design stratum that falls within areas identified to have a risk of inaccessibility. **Table 9** presents the distribution of the main sample and reserve sample EAs across the design strata for the Round 1 Survey, as well as the percentage of high-risk EAs per stratum. A total of [XX] reserve EAs were sampled across the P3-ZOI.

Table 9: Distribution of the Main and Reserve Sample EAs per Stratum

| **Stratum** | | | **EAs** | | **Percentage of high-risk EAs per stratum** |
| --- | --- | --- | --- | --- | --- |
| **[Stratification variable 1]** | **[Stratification variable 2]** | **[Stratification variable 3]** | **Main**  **sample** | **Reserve sample** |
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| **Total** | | |  |  |  |

[Provide a brief narrative describing the distribution of the reserve sample across the design strata].

The selection of the reserve sample was based on a two-phased sampling approach applied during the first-stage sampling of EAs (as described in Section 6.3.1). During implementation of the survey, reserve sample EAs will be released based on the order of sampling.

Based on discussions with [SIO], it is not anticipated that there will be any accessibility issues experienced while conducting the survey in the sampled EAs. Therefore, no reserve sample of EAs was selected for this survey.

# Sample weighting

After data collection, processing, and editing, the final edited data from the Round 1 Survey need to be weighted to account for the sample design and any adjustments due to non-response that may have occurred during data collection before data analysis can take place. Sampling weights will be constructed based on the analysis requirements to compute P3-ZOI indicator estimates. Household-level sampling weights (i.e., the household weight and the household member weight) will be constructed, taking into account the sample design for the survey. The survey will also require individual-level sampling weights to be constructed for the required sub-populations. Individual weights for the following sub-populations will be constructed:

* Women 15-49 years of age
* Children under 5 years of age
* Women 18 years of age or older who are the primary adult female decision-maker in the household

This section provides an overview of the proposed methodology to construct the sampling weights following the guidelines and recommendations in the *Feed the Future PBS Sampling Guide*.

## Calculating probabilities of selection and design weights

The overall selection probability is calculated as the product of the probabilities of selection across all four stages of sampling, with the overall design weight taken as the inverse of the overall selection probability.

The Round 1 Survey sample is based on a stratified, multi-stage cluster sample design. At the first stage of selection, EAs were sampled as PSUs from the [Year] [Country] census EA frame that fell within the P3-ZOI [regions/districts/communes/counties] using systematic PPS sampling. The MOS used was the number of households based on the census count within these EAs. A selection probability is calculated at the first stage using this information. If any EAs from the reserve sample are used as a replacement in the main sample, then the selection probabilities and sampling weights for the first stage will be adjusted accordingly to account for the total number of EAs released for the survey, including the additional reserve sample EAs used.

Some sampled EAs may need to undergo segmentation, with one segment being randomly selected for the survey using PPS sampling. Therefore, the sampled clusters in the survey can be an EA or a segment of a sampled EA. For sampled clusters that are segments, the selection probabilities will account for this additional stage of selection.

Within the selected clusters, a listing of households will be undertaken, and a sample of households will be selected from the listing using fractional interval systematic sampling. Within each sampled cluster, a fixed number of [XX] households will be selected for the Round 1 Survey. A selection probability is calculated at the third stage using this information.

Finally, within selected households, eligible individuals for each sampling group are considered for the survey. For this ZOI Survey, all eligible individuals for a particular sampling group per household will be included in the survey (i.e., a take-all sampling approach). Therefore, the probability of selection as well as the design weight for this stage of sampling will be one.

## Adjustments to the design weights

During execution of survey operations, issues may arise that affect the implementation of the proposed sample. All efforts will be made to address or at least account for these issues or changes as part of the sampling methodology because they may introduce bias or a decrease in the expected precision of the sample. One way these issues or changes can be addressed and accounted for is through adjustments to the design weights. The following design weight adjustments are anticipated for this Round 1 Survey:

* **Weight adjustments for household non-response:** It is expected that some proportion of households will be unreachable, unavailable, or unwilling to participate in the survey despite the best efforts of field staff to enumerate these households. The *Feed the Future PBS Sampling Guide* recommends the use of a weighted household response rate (i.e., weighted by the sample design weight as described in Section 8.1) in computing the non-response adjustment. This adjustment will be computed at the stratum level to preserve the self-weighting design.
* **Weight adjustments for individual non-response:** Individual non-response occurs when an eligible individual within a sampled household is not available for the survey, refuses, or does not respond to a request for an interview. For individual non-response, a separate adjustment must be made for each sampling group to which the individual belongs. In this Round 1 Survey, weight adjustments for individual non-response for each of the sampling groups in question will be calculated using the weighted individual response rate (i.e., weighted by the sample design weight as described in Section 8.1), as recommended in the *Feed the Future PBS Sampling Guide*. This adjustment will be computed at the stratum level to preserve the self-weighting design.

## Final sampling weights

The final sampling weights to be used during data analysis will be calculated differently, depending on whether the underlying sampling groups being analyzed are individuals or households (i.e., there will be separate weights that will be derived for household-level analysis and individual-level analysis). The final household sampling weights will be included within the household-level data file, and the final individual sampling weights will be included within the person-level data files for the Round 1 Survey.

For household-level indicators, the final household sampling weight will be calculated by taking the product of design weights (which account for the selection probabilities across the stages of sampling) and the non-response weight adjustments (excluding individual-level weight adjustments). The final household member weight is derived by taking the product of the final household sampling weight and the mean number of de jure household members for each household. For the individual-level indicators, the final sampling weights will be the product of the final household sampling weights, together with the relevant non-response weight adjustments that have been calculated at the individual level.

**Table 10** lists those indicators that will be computed from the Round 1 Survey with the type of sampling weight to be used during analysis.

Table 10: List of Directly Collected Indicators and Their Sampling Weights

| **Indicator #** | **Indicator Name** | **Module** | **Sampling weight** |
| --- | --- | --- | --- |
| EG-j | Prevalence of poverty: Percent of people living on less than $2.15/day 2017 PPP | Module 8: Household consumption expenditure | Household member weight\* |
| EG-k | Depth of poverty of the poor: Mean percent shortfall of the poor relative to the $2.15/day 2017 PPP poverty line | Module 8: Household consumption expenditure | Household member weight\* |
| EG-i | Prevalence of near-poor: Percent of people who are “Near-Poor”, living on 100 percent to less than 125 percent of the $2.15/day 2017 PPP poverty line | Module 8: Household consumption expenditure | Household member weight\* |
| EG-e | Prevalence of moderate and severe food insecurity in the population, based on the Food Insecurity Experience Scale (FIES) | Module 3: Food security and resilience | Household weight |
| EG-g | Percentage of households below the comparative threshold for the poorest quintile of the Asset-Based Comparative Wealth Index | Module 2: Dwelling characteristics and household assets | Household weight |
| RESIL-a | Ability to recover from shocks and stresses index | Module 3: Food security and resilience | Household weight |
| HL.9.1-d | Percent of women of reproductive age consuming a diet of minimum diversity (MDD-W) | Module 4: Women’s nutrition | Women 15-49 years of age weight |
| EG.3-i | Five Domains of Empowerment (5DE) score for women | Module 6: Women’s empowerment in agriculture | Primary adult female decision-maker weight |
| HL.8.2-a | Percentage of households with access to a basic sanitation service | Module 2: Dwelling characteristics and household assets | Household weight |
| - | Prevalence of water insecurity, based on the Brief Water Insecurity Experiences Scale (HWISE-4)[[21]](#footnote-22) | Module 2: Dwelling characteristics and household assets | Household weight |
| HL.9-a | Prevalence of stunted (HAZ < -2) children under five (0-59 months) | Module 5: Children’s anthropometry | Children 0-59 months of age weight |
| HL.9-b | Prevalence of wasted (WHZ < -2) children under five (0-59 months) | Module 5: Children’s anthropometry | Children 0-59 months of age weight |
| HL.9-i | Prevalence of healthy weight (WHZ ≤ 2 and ≥-2) among children under five (0-59 months) | Module 5: Children’s anthropometry | Children 0-59 months of age weight |

HAZ = height-for-age z-score; WHZ = weight-for-height z-score

\* The household member weight is derived from the household survey weight and the mean number of de jure household members.

# References

Bureau for Resilience, Environment and Food Security. (2024). *Guidance for the implementation of Zone of Influence Surveys for Feed the Future target countries Endline/Round 1.* Feed the Future Monitoring and Evaluation Guidance Series. Washington, DC: Bureau for Resilience, Environment and Food Security.

*Feed the Future Scope of Work [Country] [Year] Phase Three Zone of Influence Round 1 Indicator Assessment.* Survey Implementation Document. [Month] [Year].

*Feed the Future Survey Protocol [Country] [Year] Phase Three Zone of Influence Round 1 Indicator Assessment.* Survey Implementation Document. [Month] [Year].

ICF. (2025 [forthcoming]). *Guide to Feed the Future statistics for Phase Two Zone of Influence Endline Surveys and Phase Three Zone of Influence Round 1 Surveys*. Reston, VA: ICF.

Stukel, D.M. (2018). *Feed the Future population-based survey sampling guide.* Washington, DC: Food and Nutrition Technical Assistance Project, FHI 360.

# Appendix: List of [regions/districts/communes/counties], comprising the phase three Zone of Influence

| **No.** | **[Administrative level 1]** | **[Administrative level 2]** | **[Administrative level 3]** | **[Administrative level 4]** |
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1. This document is not intended to cover the sampling methodologies and analysis approaches when using secondary data sources such as the Demographic and Health Survey, Living Standards Measurement Study, or Annual Agricultural Survey in producing some of the ZOI indicator estimates for the Round 1 Indicator Assessment. Details of how indicator estimates are produced when using secondary data sources can be found in the *Guide to Feed the Future Statistics for Phase Two Zone of Influence Endline and Phase Tree Zone of Influence Round 1 Surveys,* available as part of the *Feed the Future ZOI Survey Methods Toolkit—Endline/Round 1 (2024-2026),* available at <https://agrilinks.org/post/feed-future-zoi-survey-methods-toolkit-endlineround-1-2024>. [↑](#footnote-ref-2)
2. Bureau for Resilience, Environment and Food Security. (2024). Guidance for the *i*mplementation of Zone of Influence Surveys for Feed the Future *target c*ountries Endline/Round 1. Feed the Future Monitoring and Evaluation Guidance Series. Washington, DC: Bureau for Resilience, Environment and Food Security. [↑](#footnote-ref-3)
3. Stukel, DM. (2018). Feed the Future *population-based survey sampling guide.* Washington, DC: Food and Nutrition Technical Assistance Project, FHI 360. Available at: https://agrilinks.org/post/feed-future-zoi-survey-methods. [↑](#footnote-ref-4)
4. [Year] Feed the Future [Country] Phase Three Zone of Influence Round 1 Indicator Assessment Scope of Work. Survey Implementation Document. [Month] [Year]. [↑](#footnote-ref-5)
5. The ZOI Survey Guidance for Target Countries sets a margin of error of 5 percent as an acceptable level of statistical accuracy for survey estimates of key P3-ZOI indicators. [↑](#footnote-ref-6)
6. This adjustment is determined based on the Stukel-Deitchler Inflator using the estimated average household size and proportion of the population made up of the given sub-population for each indicator. Please refer to Appendix A of the Feed the Future PBS Sampling Guide for a more detailed discussion of this adjustment factor. [↑](#footnote-ref-7)
7. The gross household response rate is the number of households interviewed divided by the number of households selected for the survey. Note that this is in contrast to the net household response rate, which is typically reported in ZOI Survey and Indicator Assessment reports and is defined as the number of households interviewed divided by the number of valid households found during the survey (i.e., households occupied). [↑](#footnote-ref-8)
8. For individual-level indicators, the final required sample size computation includes an additional adjustment to determine the number of households to contact for the given individual sub-population. [↑](#footnote-ref-9)
9. To maintain a fixed sample take per cluster as recommended in the *Feed the Future PBS Sampling Guide*, the final survey sample size for the Round 1 Survey is slightly larger than the required sample size as determined in Table 2. [↑](#footnote-ref-10)
10. Refer to Section 6.3. for more detail on the stages of sampling being implemented for the survey. [↑](#footnote-ref-11)
11. The key characteristics of a high-quality sampling frame are that it is comprehensive, complete, and up to date. Please refer to the *Feed the Future PBS Sampling Guide* for a detailed discussion of the importance of a high-quality sampling frame. [↑](#footnote-ref-12)
12. Segments are smaller geographic areas created by splitting an EA based on set criteria through a process called segmentation. When segmentation is implemented, an additional stage of sampling is required for sampling of these segments. [↑](#footnote-ref-13)
13. When the average EA size is small (i.e., less than 150 households per EA), the *Feed the Future PBS Sampling Guide* recommends segmenting any EA that is at least twice the size of the average EA in the survey area. In cases in which the average EA size is large (i.e., at least 150 households per EA), then the *Feed the Future PBS Sampling Guide* recommends segmenting EAs that exceed 300 households in size. [↑](#footnote-ref-14)
14. If no EAs or first-stage sampling units require segmentation for the survey, then this stage of selecting a household sample will become the second stage of sampling for the survey. [↑](#footnote-ref-15)
15. Fractional interval systematic sampling involves selecting households from the EA sample frame systematically at a set sampling interval after determining a random start somewhere between 1 and the sampling interval. [↑](#footnote-ref-16)
16. A minimum of two EAs were selected in each stratum to maintain a minimum level of statistical representativeness and to be able to estimate measures of precision accounting for all strata in the sample. For more detail on the steps undertaken in implementing the systematic PPS sampling method, please refer to the *Feed the Future PBS Sampling Guide.* [↑](#footnote-ref-17)
17. The “main sample” (of EAs) refers to the original set of EAs sampled to be used during the survey if there are no accessibility issues encountered during the survey, and the “reserve sample” (of EAs) refers to the additional set of EAs that are sampled and only to be released as and when EAs from the main sample are found to be inaccessible and need to be replaced during the survey. [↑](#footnote-ref-18)
18. The “main sample” (of EAs) refers to the original set of EAs sampled to be used during the survey if there are no accessibility issues encountered during the survey, and the “reserve sample” (of EAs) refers to the additional set of EAs that are sampled and only to be released as and when EAs from the main sample are found to be inaccessible and need to be replaced during the survey. [↑](#footnote-ref-19)
19. This document is part of the *Feed the Future ZOI Survey Methods Toolkit—Endline/Round 1 (2024-2026)*, available at: <https://agrilinks.org/post/feed-future-zoi-survey-methods-toolkit-endlineround-1-2024>. [↑](#footnote-ref-20)
20. When demarcating segments, it is important to be able to have clearly identifiable boundaries for each segment, such as a road or footpath, so that the field teams can easily identify the area covered by a segment during the listing operation and data collection. [↑](#footnote-ref-21)
21. This indicator is not an official Feed the Future indicator as part of the Global Food Security Strategy results framework and therefore does not have an indicator number assigned to it. [↑](#footnote-ref-22)