Title of template

**Skill level needed:**Intermediate/Advanced with GIS skills

**Sample designs supported:**

1, 2, 3, 4, 5, 6

Designing and Implementing Gridded Population Surveys

**gridpopsurvey.com**

**B1. PSU sample – ArcGIS aggregation**

Last updated: Aug 2022

**Sample frame unit aggregation in ArcGIS**

## Example: Namibia

**Motivation:** After an initial PSU sample frame is constructed, use this tutorial to manually review PSUs and aggregate very small PSUs with a neighboring PSU before sample selection. This tutorial is most relevant for Designs 1, 2, and 5 because fieldworkers will visit all households in each PSU, and you want to ensure that time and resources are well spent, though it can be used with any design.

**Example:** In the hypothetical example of a survey in Namibia, we generated the first stage sample frame from old census boundaries and a recent gridded population estimate (see Tutorial A2), and now we will visually inspect PSUs with very small population estimates and decide whether to aggregate them with neighboring sample frame units.

**Steps:**

* + 1. Sort the first-stage sample frame ascending (smallest-to-largest) by total population so that you can investigate each low-population estimate one-by-one.

Graphical user interface, application, table

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* + 1. Add additional layers to ArcMap that help to investigate low-population issues, for example, the original gridded population dataset (nam\_ppp\_2020\_UNadj\_constrained), and ESRI’s imagery basemap.

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* + 1. One-by-one, zoom to sample frame units with low-population estimates. Here are some common issues that you might encounter, and how they might be addressed.
       1. **Issue**: First-stage unit is shaped in such a way that it does not contain the centroid of any one grid cell, and thus has a zero population estimate.

**Solution**: Combine with a contiguous neighboring unit which appears to have a similar settlement pattern in satellite imagery, preferably the neighboring unit with the smallest population and which does not pose geographic access barriers.

**Implementation**: In this example, we join EA 40501027 which has 0 estimated population with its southern neighbor EA 40501029 by creating a new attribute for EA ID, and manually assign the same ID to both units.

Map

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Graphical user interface, application, table

Description automatically generated

* + - 1. **Issue**: The first-stage unit appears unpopulated in satellite imagery, thus the zero population is likely “true.”

**Solution**: Do not change these units; they will be omitted from the sample frame. If you are concerned that the satellite imagery does not reflect recent population changes (for example, displacement in the last few weeks), then combine zero population units with a neighboring PSU following the guidance above (Step c.1).

Graphical user interface

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* + - 1. **Issue**: The population estimate is very small because it represents a small amount of urban sprawl from a neighboring area. In the below example, EA 908 has 1 estimated person, and EA 622 has 43 estimated people. Satellite imagery shows a few buildings along the edge of the EA to east, and no buildings elsewhere.

**Solutions**: Option 1: Combine these EAs with the unit that is the source of the urban sprawl. This will substantially increase the area of the PSU, which could complicate stage-two sample selection (e.g., Design 4) or production of field maps. Option 2: Manually update the unit boundaries so that large unsettled regions have zero probability of selection, and the urban sprawl is contained in settled units.

**Implementation**: To implement Option 2, activate the Editor toolbar, and move the vertices of EA 409, 602, and 908 (old boundaries in red) so that urban sprawl is consolidated in EA 409 (modified boundaries in black).

Graphical user interface, application, Word

Description automatically generatedMap

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Graphical user interface, text

Description automatically generated with medium confidence

* + - 1. Revise first-stage sample frame population estimates by repeating Tutorial A2.

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