



**Designing
and Implementing
Gridded Population
Surveys**

WAPOR

WORLD ASSOCIATION FOR
PUBLIC OPINION RESEARCH

Gridded Population Sampling

Dana R Thomson & Dale Rhoda
www.gridpopsurvey.com



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Overview

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What is gridded population sampling?

4

Who uses it? For what?

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When is gridded population sampling (not) appropriate? Why?

6

What tools can I use?

7

State of the field?

8

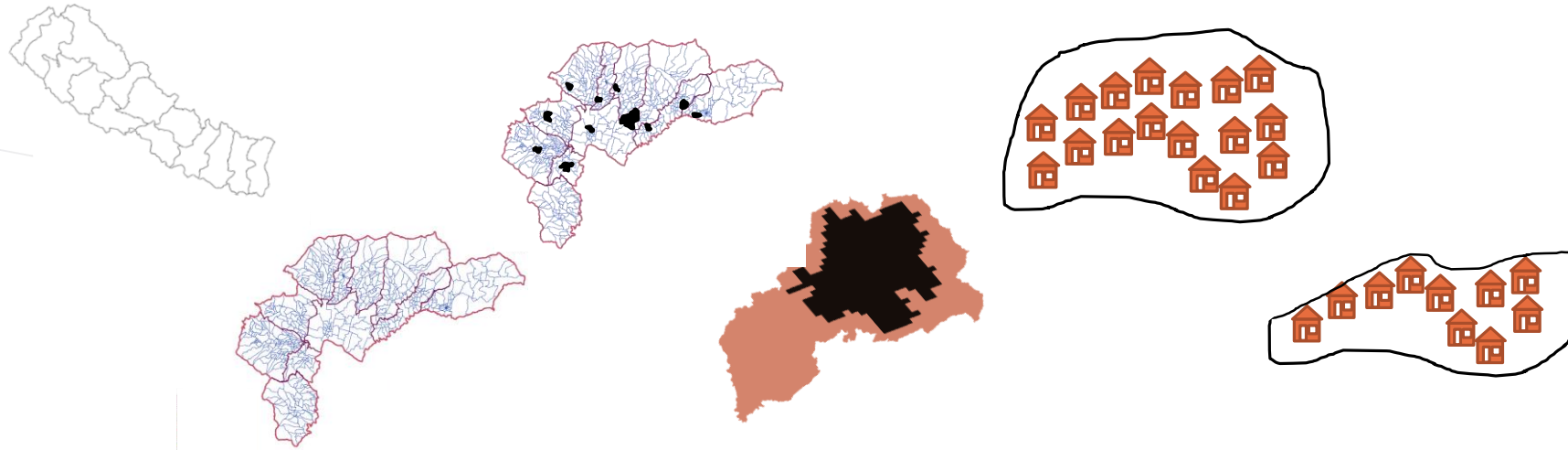
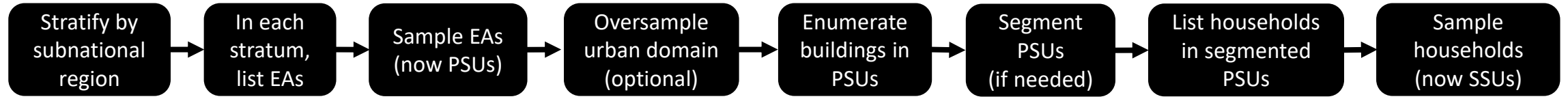
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Typical household survey in LMIC

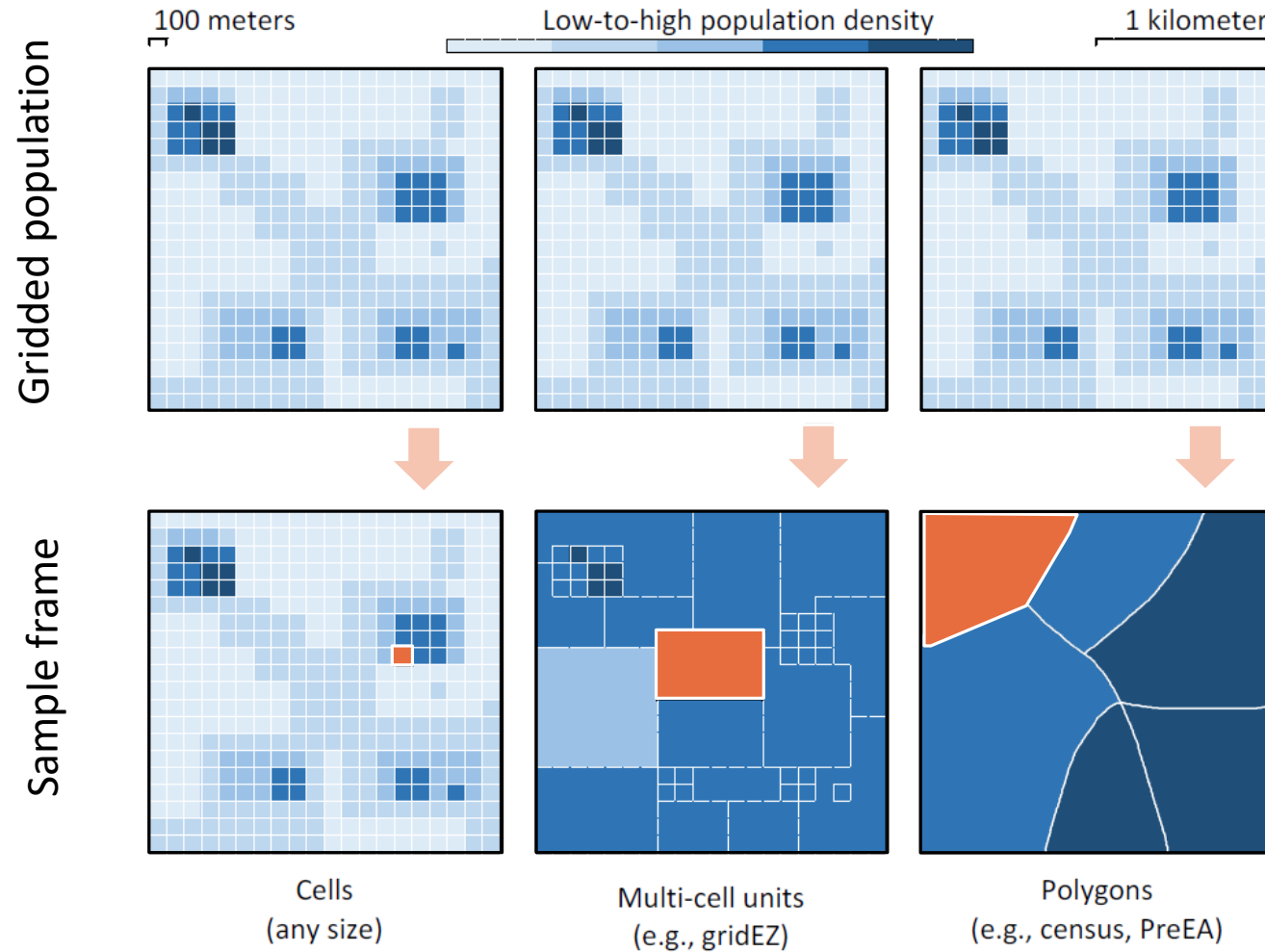
Example



Building	Dwelling	Household
1	1	1
1	1	2
1	2	1
1	3	1
2	1	1
2	1	2
3	1	1
4	1	1
4	2	1
.....



What is gridded population sampling?



Any survey in which the sample frame is derived from modelled gridded population estimates

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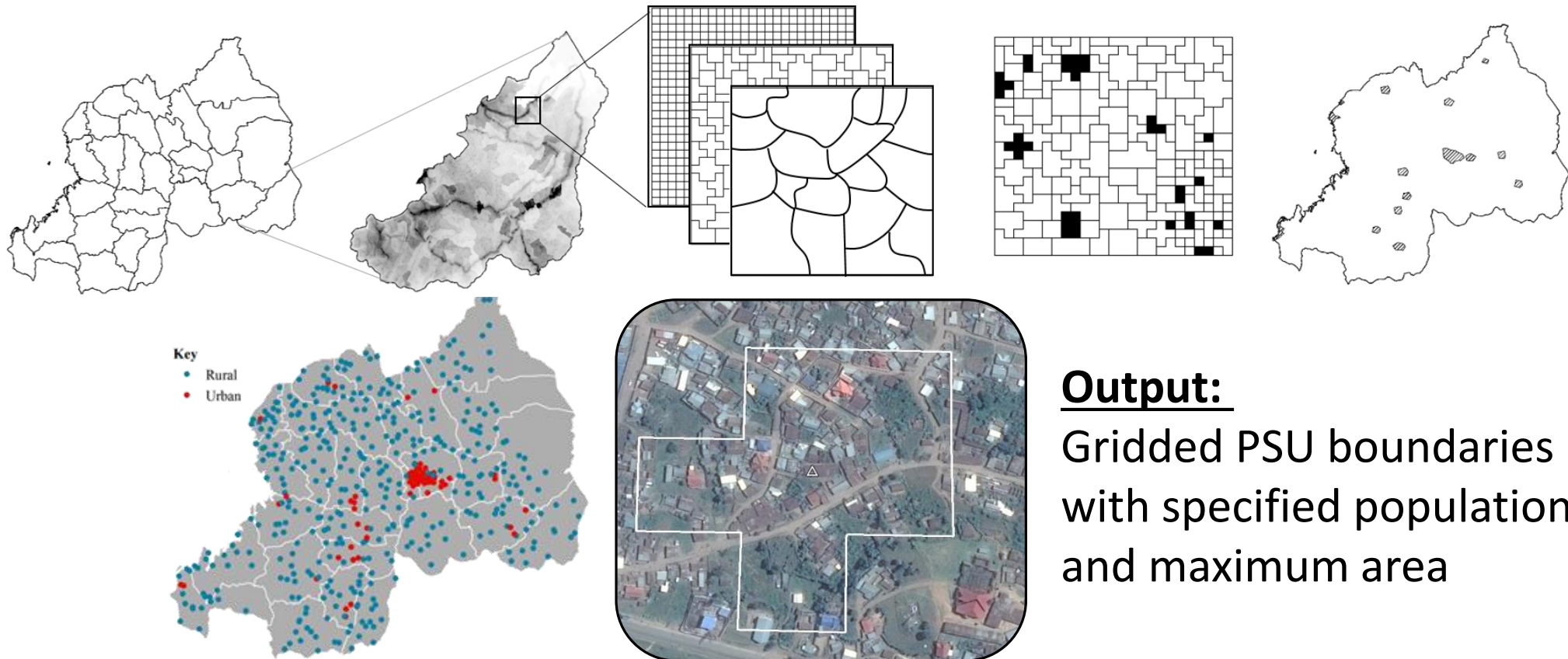
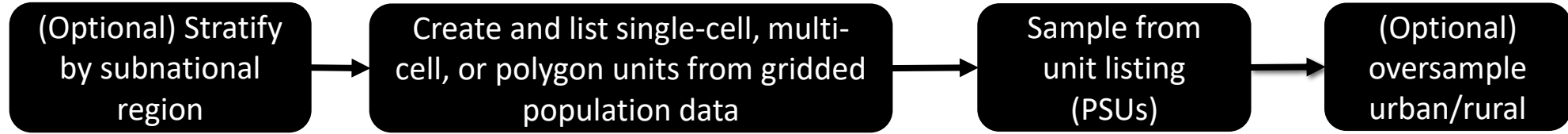
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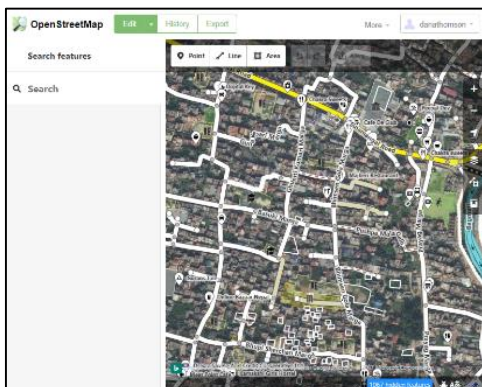
Gridded population survey in LMIC (Draw PSUs)



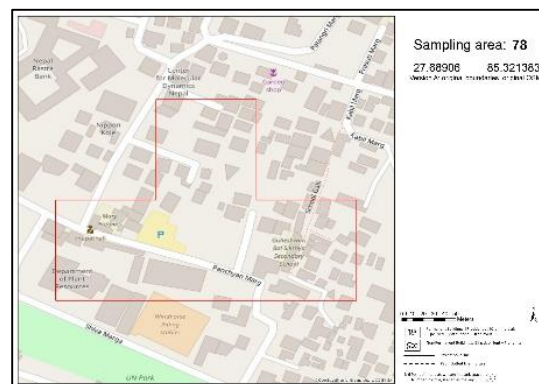
Gridded population survey in LMIC (Draw SSUs)



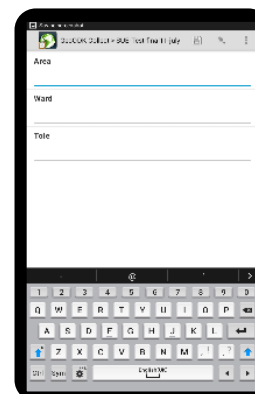
Pre-field enumeration in OpenStreetMap



Field enumeration (paper or digital)



List households (paper or digital)



Interview selected households

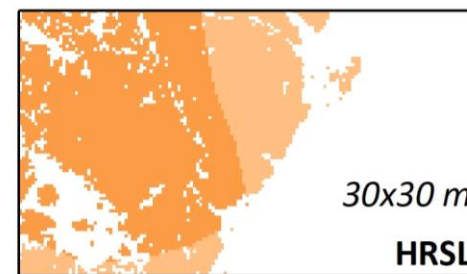
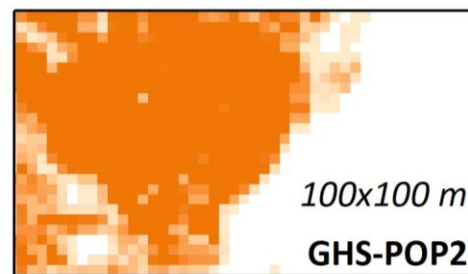
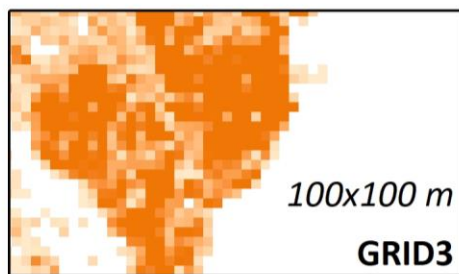
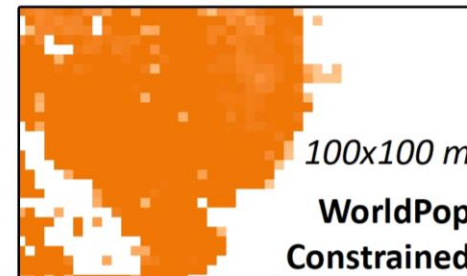
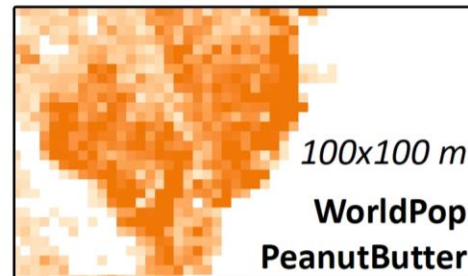
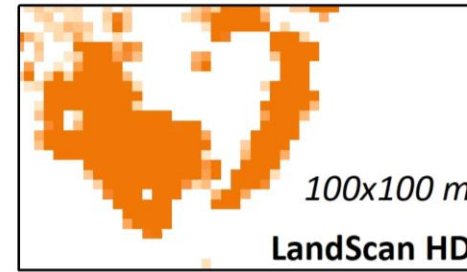
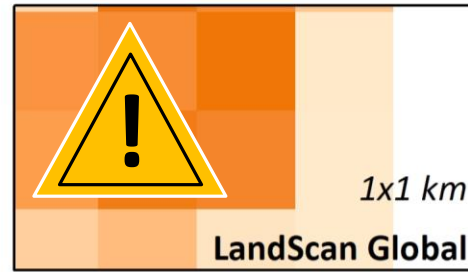


Output:

Geographically accurate digital map of each PSU, and a digital listing of households



Available gridded population datasets

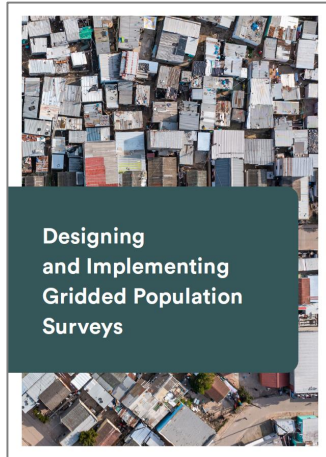


0 0.5 1 Km

0 0.5 1 Km

0 0.5 1 Km

Check out the manual



- ✓ Plain language descriptions of model methods
- ✓ Pros/cons for gridded population surveys

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Who uses gridded population sampling? For what?



Number of gridded pop. surveys in LMICs is likely 2X or 3X greater today

Thomson, Rhoda, et al. (2020) **Gridded population survey sampling: A systematic scoping review of the field and strategic research agenda**. Int J Health Geogr. <https://doi.org/10.1186/s12942-020-00230-4>

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When is gridded population sampling NOT appropriate?

- Recent widely-trusted census
- Very small coverage area (e.g., neighborhood)
- Survey planning team does not have:
 - Internet
 - Knowledge of basic mapping tools (e.g., Google Earth, Google Maps)

HERD
International
Kathmandu
2017



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When is gridded population sampling appropriate?

- Census is grossly outdated or inaccurate
- Dangerous area
- Highly dynamic and complex
- Stratify by geographic characteristics
- *Distribution* of gridded populations are often more accurate than underlying outdated/inaccurate census
- Small grid cells enable area-microcensus designs with 1 field visit
- Unlike listers, interviewers can build rapport & identify “hidden” HHs
- Gridded population sample frames are explicitly spatial



JEI / SDI
Lagos 2020



Area-microcensus design example

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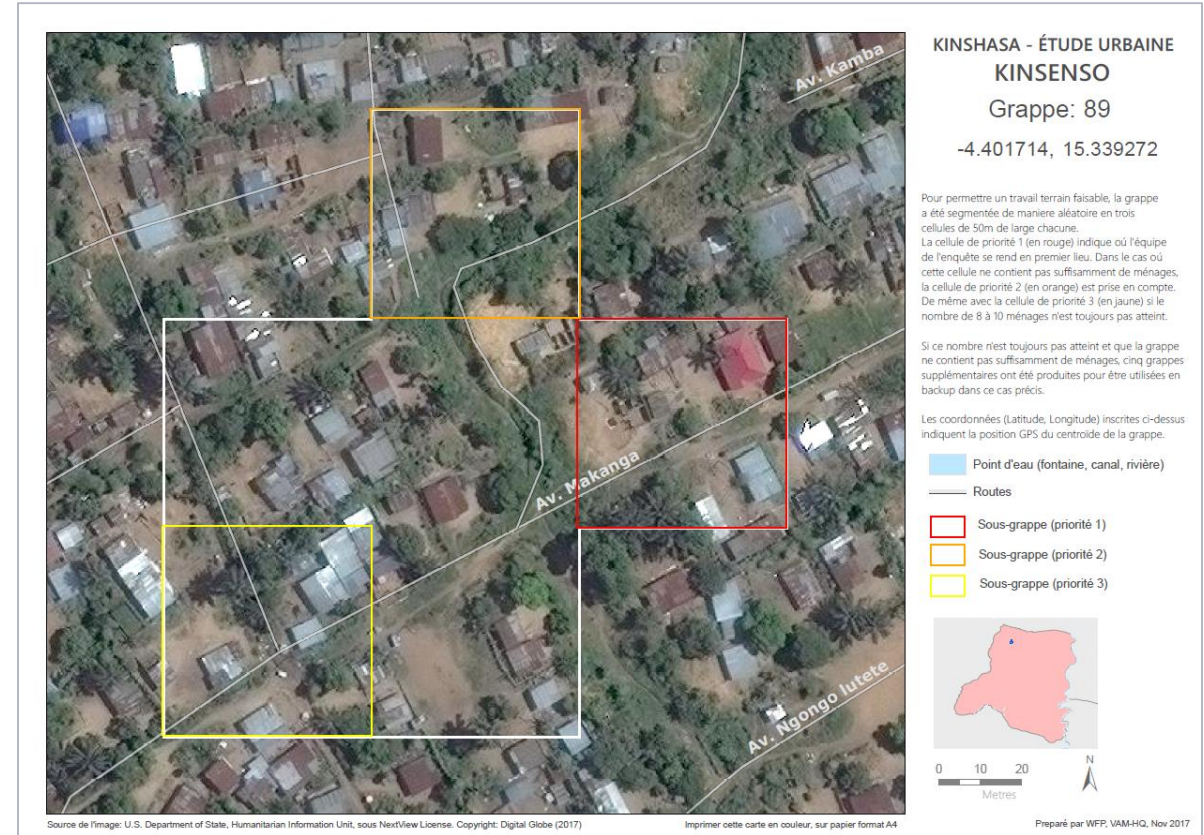
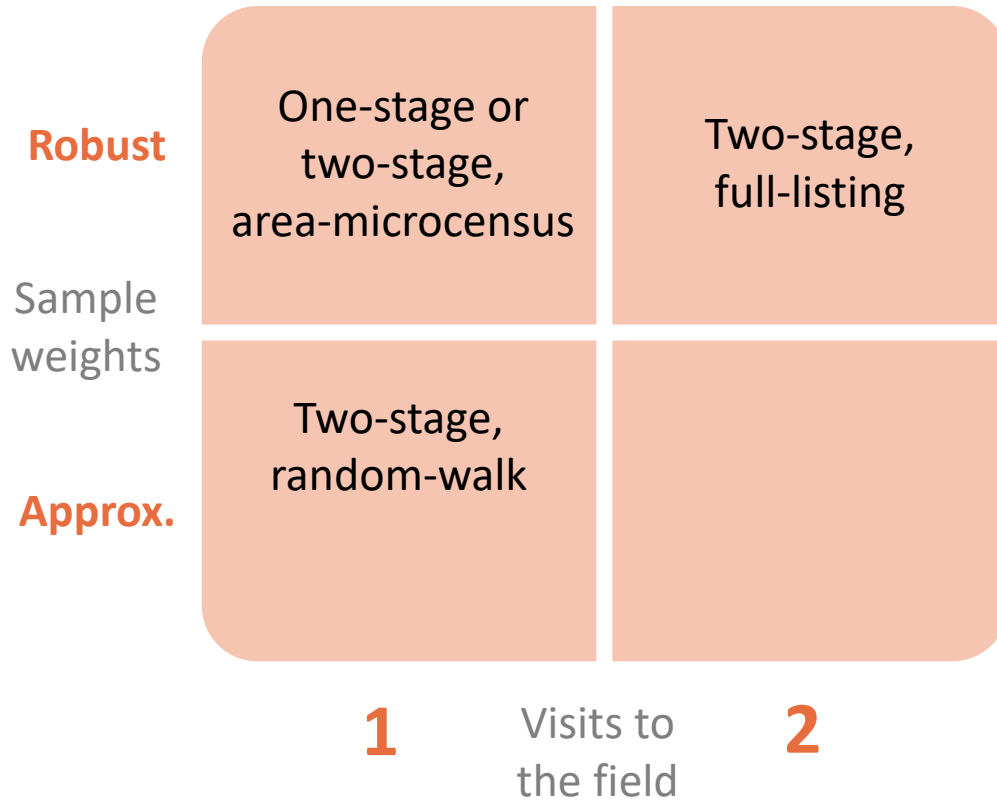
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World Food Programme
Kinshasa 2017



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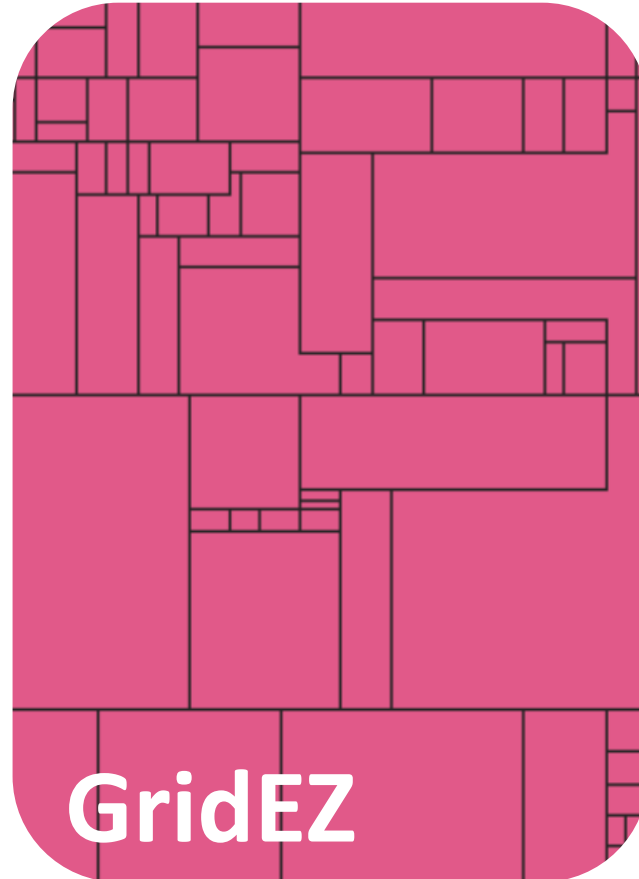
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Sample frame tools

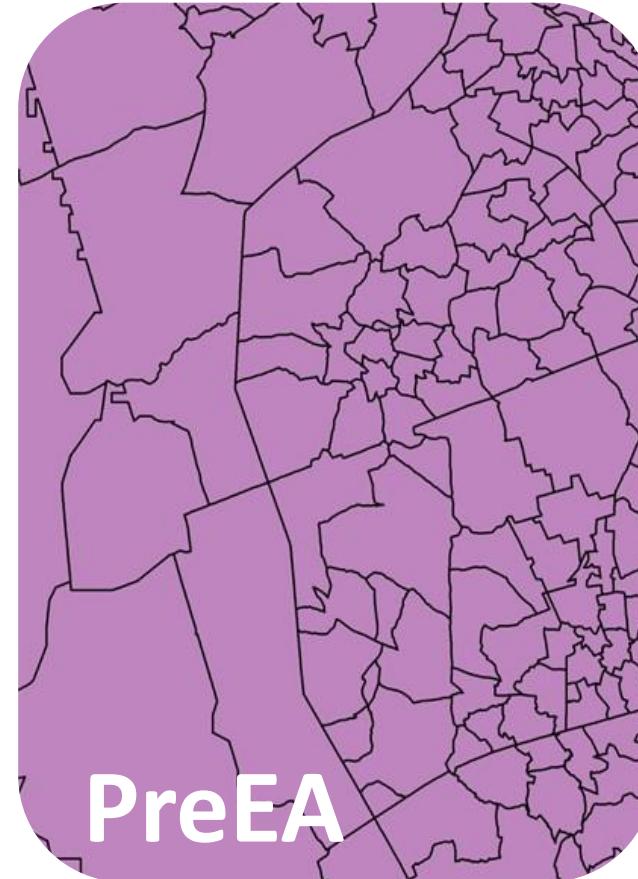
Non-GIS users

- Basic
- Intermediate
- Advanced

GridSample, R



RUPHIA
Uganda 2022



Census preparation
Burkina Faso 2019

GIS users

- Intermediate
- Advanced

QGIS



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State of the field

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Tools for designing and implementing gridded population surveys are piecemeal

Build better integrated tools

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Gridded population datasets are evolving (and improving) rapidly

Use of field data to evaluate accuracy

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Area-microcensus designs are promising, but need study (e.g. design effects)

Develop an evidence base

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Tutorials: Mix-and-Match

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Design 1. Two-stage, detailed-listing
 Design 2. Two-stage, quick-listing

Step	Image	Tutorial	Difficulty
			Intermediate
		A1. PSU San selection	Advanced
		A3. PSU San select PSUs	Advanced-GIS
		B2. PSU review – Google Earth segment	Basic
		B5. PSU review – Excel to drop & replace	Intermediate
		C1. SSU sample – GeoSampler	Intermediate-GIS

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Skill level needed:
 Basic/Intermediate/Advanced
 Sample designs supported: 4

C1. SSU sample – GeoSampler

Last updated: Aug 2022

Select a simple random sample of buildings from satellite imagery in GeoSampler

Example: Namibia

Motivation: GeoSampler is a simple tool developed by Epicentre to create random points (with an optional buffer) over satellite imagery, and results in a simple random sample of buildings by guiding the user to keep only those points that land directly on top of a building. Use this tutorial to select a simple random sample of buildings within PSU boundaries for sample Design 4. Field interview teams will require training for the following situations:

- There are multiple households in the building: Fieldworker should list all households in the building and randomly select one household (for example, using a Kish table).
- The selected building is not residential, but is owned by a household (e.g. latrine, separate kitchen, barn): Fieldworker should identify the residential building(s) used by the household, and approach residents.
- The selected building is not associated with a household (e.g., shop, religious facility, office): Fieldworker should confirm that no one sleeps in the building, then move to the next SSU. Optionally, fieldworkers can follow a protocol to select a replacement building in the field, for example:
 - Randomly select a building from a back-up list of SSUs (buildings).
 - Sample the nearest residential building (in a particular direction).

Example: In this example, the team has selected 500 PSUs across Namibia using the boundaries of old census enumeration areas (see Tutorial A3).

Steps:

- Navigate to the Epicentre GeoSampler app. <https://apps.msf.fr/epiGeoSampler/>
 - By default, Google satellite imagery is displayed as the base layer, but other public base maps can be displayed, if desired, via the dropdown menu in the upper-right.
 - The "Overview" tab contains three buttons that you will need to (1) define your PSU boundaries, (2) generate random points over public satellite imagery, and (3) save all generated points that are located over a building.
 - The "Data" tab summarizes all building points that you generate and save during the session, and enables the point data to be exported as a CSV, KML, or GPX file.
 - The "Options" tab includes customizable parameters to visualize building points.

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b) On the Overview tab, define your PSU boundaries by uploading a shapefile or KML file, or selecting 1+ preloaded administrative unit boundaries. In this example, we upload a KML file of the sampled PSU boundaries.



c) (OPTIONAL) We recommend updating two default parameters on the Options tab before generating points.

- Reduce the "circle radius" around each random point from 50 m to 5 m or 10 m. This arbitrary circle radius increases the chances that a given point will be located on a building in satellite imagery. However, the larger the radius, the greater the chance of sampling a building located in a rural or sparsely settled area. To avoid inadvertently biasing the sample, ensure that the circle radius is not larger than a typical residential building in the survey setting.
- Uncheck "simplify polygons" (unless absolutely necessary for performance) to avoid inadvertently selecting buildings outside of the PSU, or excluding buildings inside the PSU. Note that polygons that follow grid cell boundaries are already simplified.



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Filter relevant tutorials

Download & modify in Word

Assemble your custom manual!



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Thank you

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By skill level:

- ✓ Decision-trees
- ✓ Step-by-step tutorials

For each design:

- ✓ Real-world survey profile
- ✓ Sample weights calculations



Dana R. Thomson
dana.r.thomson@gmail.com
X @GridPopSurvey

