Exploration of efficient and effective sampling options for nonprofits

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Thanks and Disclaimer

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- The opinions and statements in this presentation are those of the authors and not the responsibility of RTI, GWU, or NAS. Neither Phil nor I claim to be experts on the non-profit sector.

Outline

Intent is to motivate discussion and bring up major themes that have to considered.

- Population and target population
- Frame and stratification
- Sampling ideas
- Auxiliary information/covariates
- Role of pilot study and adaptive sampling

Population

- A survey project begins with stating what you want to know and on which population you want to know it.
- Exclude: state-run higher education (government sector), non-profit private higher education (covered in other surveys)
- The question of what is R&D and how is it measured (one or more ways) will influence choices of the sampling design and data collection.

Target population

- Nonprofits (except those already excluded) that did research and development in a given time frame
- Time frame: 20?? or in NP's most recent fiscal year
- We don't have a frame or list specific to this population, so we have to do the best we can. We don't want to omit too many from our target population or include too may from non-target populations.
- One can use multiple frames: if frames overlap, then there is a need then for de-duplication/merging of files. An additional frame could be useful if it covers part of the target population better and/or with additional data than another frame.

Frame

- Others will cover frame data sources more completely and expertly
- Examples
  - EO BMF Extract (IRS)
  - EO Financial Extracts (IRS-SOI)
  - EO Sample Studies (SOI)
  - National Center for Charitable Statistics (Urban Inst)
- What is in the frame?
  - NTEE Codes from Form 990
  - Financial information covering various dimensions – if you are not sure which financial dimension will be correlated with outcomes, then preserve multiple measurements if possible
  - Other useful information?

Cut-off Sampling

- How can you tell if an organization is defunct? If you can with high probability tell this, then one could decide to remove it from the frame.
- Do some sectors do almost no R&D? Example: religious organizations that are not hospitals.
- Do some organizations that are small (as defined by revenue, expenditure, or FTE) do almost no R&D?
- Suggestion: look in detail at sectors and subsectors, look in detail at financial reporting – are other reductions in the frame possible without introducing much error?
- A pilot study might be used to confirm lack of R&D in some areas.

Stratification

- Segment by size
  - Sizes do not have to be the same by segment
  - You can use many strata and smaller samples per stratum
  - No one perfect definition of size – compare sample produced using alternative variables
- Use pilot sample to study and refine allocation: the sampling can be adaptive in the sense of adjusting allocation based on pilot; adjusted allocation can be zero (no more) for some strata
- Cut off sampling has been mentioned: it could introduce bias, but hopefully not much, and it could greatly improve efficiency, hopefully a lot
- Note: initial classification by segment does not have to be 100% correct – stratification can still be used – units remain in their assigned strata
- Simple strategy is stratified simple random sampling
  - One worries that only small units within a stratum respond (stratify by size, use many strata)
  - Use auxiliary variables from frame to check response propensities

Systematic and/or PPS sampling

- Some options are available that can increase efficiency *if* there is a variable available that is reasonably correlated with the outcome (R&D)
  - Systematic sampling: sort entities by size within strata, take a systematic sample (ensures small-medium-large all sampled)
  - PPS sampling: sample with probability proportional to size (with or without replacement) within strata (higher chance for larger)
  - Systematic PPS: sort entities by size within strata, take a systematic sample with size measure taken into account
- Notes
  - Need a correlated variable: pilot study?
  - You don't have to do the same thing in every stratum: perhaps one of these designs will be preferable among large units in a segment that typically includes R&D. In other strata, stratified SRS might be default.
  - Technical issues can be addressed, but some planning is needed

Auxiliary information

- Additional information from the frame that might be related to doing R&D and how much.
- Consider other variables to collect in the pilot – if they are not useful, drop them from continued data collection.

Survey weights

- Survey weights will adjust sample for over/under sampling in strata, differential nonresponse by strata
- It would be possible to calibrate or post-stratify to some control totals, but doing so requires variables on the population as well as in the sample.
- Planning:
  - Try to avoid extremely variable weights, anticipate problems
  - Plan to assemble potentially useful covariate information on all elements on frame (perhaps within a stratum) or on a bigger sample than the one used for analysis

Missing data

- Try to minimize the amount of missing data before the start of the survey
- Can you replace data collection by administrative data?
- Are any administrative data correlated with outcomes: check in pilot. Could you predict missing values within a stratum?
- Different approaches can be used by stratum: simple non-response weight adjustments might be used for smaller strata or strata with minimal R&D, but more sophisticated methods should be investigated for more "important" strata.
- Replacements? If a unit does not respond or data collection is insufficient, would you consider finding a replacement unit. A replacement could be within a stratum and similar in size.

Two-phase sampling option

- It was discussed in panel meetings that it might be difficult to use a screener to determine R&D status and then further sample from the results of the first phase sample – the process of asking about R&D might be so involved that you might as well do the whole survey.
- Instead, a screener might be used to assess whether the non profit is active during the target time period and segment (kind of non profit).
- A two-phase sample also can be done in two time periods (next slide)

Uses of pilot study

- Study stratification and refine stratification and allocation for larger sample
- Study quality of segment classifications
- Study response rates and missing data rates
- Analyze correlations amongst outcome and frame variables
  - Adjust further sampling plans
  - Potential models for missing data
  - Estimation, such as ratio estimation
- Suggestion: plan so that the pilot can be included in the final analysis in a rigorous way; this would be an example then of an adaptive sampling design

Conclusion

- Significant challenges exist in getting from what you want to know and on which population do you want to know it to an efficient sample design that is safe from surprises
- Flexibility is important in many dimensions of planning and design; e.g., not all the strata the same
- Simple has its merits, but selective enhancements should prove beneficial
- Don't make unrealistic assumptions about critical components – use the pilot study to maximum advantage
- Good luck!