Using sampled social network data to estimate adult death rates

Dennis M. Feehan
UC Berkeley
The challenge: measuring mortality on a survey

Adult deaths are challenging to measure with a survey

- We can’t sample and interview dead people
- Death is a rare event
The challenge: measuring mortality on a survey

Adult deaths are challenging to measure with a survey

- We can’t sample and interview dead people
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Leading approach to overcoming these challenges: the sibling method
Sibling survival

Sibling survival method: ask respondents to list their siblings, when they were born, and whether or not they died.
Sibling survival

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Good because

- We learn about people we don’t interview
- We learn about more than one person from each respondent
Sibling survival

But there are also challenges with sibling survival

- We don’t learn about enough siblings per interview to produce precise death rate estimates
- Considerable disagreement about how data should be analyzed
- Not well suited to some situations -- disasters, short timeframes, specific geographical areas, etc
Sibling survival

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What about going beyond sibship and asking about other types of social relationships?
siblings
siblings
extended kin
friends
neighbors
etc…
network reporting

siblings
extended kin
friends
neighbors
etc…
error in estimate

stronger tie

weaker tie

sampling error
error in estimate

- stronger tie
- weaker tie

non-sampling error
A graph showing the relationship between error in estimate and tie strength. The X-axis represents the strength of the tie (from stronger to weaker), and the Y-axis represents the error in estimate. The graph includes three lines:

- **Total Error**: This line decreases as the tie strength increases, indicating that stronger ties lead to a reduction in total error.
- **Non-Sampling Error**: This line increases as the tie strength increases, suggesting that stronger ties lead to an increase in non-sampling error.
- **Sampling Error**: This line remains relatively constant across different tie strengths, indicating that sampling error does not significantly change with tie strength.

The graph illustrates the trade-off between total error and non-sampling error as the strength of the tie changes.
The diagram illustrates the relationship between error in the estimate and different types of error: total error, non-sampling error, and sampling error. The graph shows how these errors change as the strength of the tie between siblings varies. The total error curve decreases with increasing tie strength, indicating a reduction in error. Conversely, the non-sampling error curve increases with stronger ties, suggesting an increase in error. The sampling error curve shows a more complex relationship, with a peak at a certain tie strength, indicating that the error rate varies based on the tie strength.
Data: household survey in Rwanda
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- Intended to mimic a Demographic and Health Survey
- Stratified, two-stage cluster sample of approximately 5,000 Rwandans aged 15 and over (oversampled Kigali)
Survey experiment in Rwanda

**Acquaintance Network**

- People of all ages who live in Rwanda
- People the respondent knows by sight and by name, and who know the respondent by sight and by name
- People the respondent has had some contact with -- either in person, over the phone, or on the computer -- in the previous 12 months

**Meal Network**
Survey experiment in Rwanda

**Acquaintance Network**
- People of all ages who live in Rwanda
- People the respondent knows by sight and by name, and who know the respondent by sight and by name
- People the respondent has had some contact with -- either in person, over the phone, or on the computer -- in the previous 12 months

**Meal Network**
- People of all ages who live in Rwanda
- People the respondent knows by sight and by name, and who know the respondent by sight and by name
- People you have shared a meal or drink with in the past 12 months. These could be family members, friends, co-workers, or neighbors. You should include meals or drinks taken at any location, such as at home, at work, or in a restaurant.
Recap

**Sibling survival**
- respondents report about deaths among their siblings
- expect relatively little information per interview
- … but expect respondents to be reasonably well-informed about their siblings

**Network survival**
- respondents report about deaths among people in their network
- expect more information per interview - and more for acquaintances than for meals
- … but less clear how well-informed respondents will be about network members
Comparison estimates: Rwanda DHS sibling survival

Sibling method results from Rwanda 2010-11 DHS
- Based on interviews with 13,761 women who were asked to report on their siblings
- The sibling estimates of death rates are based on the 7-year period before the interviews
  (the network results are for 1 year before the interview)
Deaths per interview
Deaths per interview

Deaths reported per interview

- Acquaintance
- Meal
- Sibling (84 months)
- Sibling (12 months)
Estimated 45q15
Summary of Rwanda empirical results

- A network survival study is feasible on a Demographic and Health Survey
- We learned about more deaths from each interview using the network methods
- The estimated age-specific death rates are roughly similar for the sibling method and for the meal and acquaintance tie definitions (especially for males)
Other projects underway

- using network reports in combination with an online sample
  - (idea: we can quickly and easily reach people online, but still learn about people we can’t directly interview — deaths, outmigrants, people not online, people without a cell phone, etc)
- improve degree estimation
- large study in 27 Brazilian cities - compare network survival, sibling, and models
- better understand how to produce estimates from sibling histories
What I haven’t talked about and where this could go

- The study design in Rwanda also provides a template that can be used to embed experiments in data collection, with the goal of improving the method over time
  - Ideal situation: experiment to converge on tie definitions that make the most sense in a given setting. (This may not be the same everywhere!)
  - Papers also have a way to produce blended estimates using data from both arms of the experiment -- so these experiments need not mean that only half the sample gets used for the actual estimates
What I haven’t talked about and where this could go

- the papers develop a framework for sensitivity analysis
  - answers the question: how do reporting errors/other factors affect estimates?
  - reveals what we could potentially try to measure in order to adjust estimates produced by this method (see work by Helleringer and colleagues on measuring reporting errors for the sibling method)
  - these quantities could be measured in an HDSS site or other setting with rich, accurate data collection

\[ D_\alpha = \left( \frac{y_{F,D_\alpha}}{d_{F,\alpha,F}} \right) \times \frac{1}{d_{D_\alpha,F} / d_{F,\alpha,F}} \times \frac{1}{\bar{v}_{D_\alpha,F} / d_{D_\alpha,F}} \times \frac{y_{F,D_\alpha}}{y_{F,D_\alpha}, \text{ adjustment factors}} \]
Where this could go

Frequent surveys producing timely estimates (maybe through SMS/phone, maybe in person)

combined with

Less frequent, higher effort data collected in a setting like an HDSS site that can be used to gather information needed to adjust the rapid estimates via the sensitivity framework
Where this could go

All of this could be tuned, over time, to use the tie definition that produces the best information in a given setting

It could produce district-level estimates if the survey is designed with that goal in mind

Can estimate other quantities with network reports also; for example, out-migration

Perhaps it could also locate deaths that could be the target of a VA?
Thanks!

My website http://www.dennisfeehan.org has more information and links to papers and data.
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