National and Subnational experience estimating completeness of registration of deaths in Brazil

Bernardo L. Queiroz
Universidade Federal de Minas Gerais

Everton C. Lima
Universidade Estadual de Campinas

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Main objectives

- analyze the evolution of the completeness of death counts coverage in Brazil and its regions since 1980;
- compare different approaches, using Death Distribution Methods, and data sources
- discuss the importance of evaluating data quality
- discuss how demographic methods can be combined to statistical methods to produce small area estimates
- presentation builds on collaborative work with Everton Lima, Flavio Freire (UFRN) and Marcos Gonzaga (UFRN)
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Completeness of Death Counts Coverage

- very small percentage of countries have complete vital registration systems
  - mortality estimates are very limited and demand, in general, application of demographic and statistical methods
- but, mortality estimates are important because they are necessary to keep track of development goals
- defective data affects public health planning and population forecasts at national and subnational levels
- significative improvement happened in the last few years, but there is wide variation in quality and progress
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Why Brazil is an important case study?

- availability of data: vital registration system, Ministry of Health Database, census data (all public available)
- large population distributed in large territory
  ⇒ large socioeconomic inequality, different trends in the demographic and epidemiological transition
  ⇒ possibility to study small-area problems
  ⇒ much interest in understanding levels and trends in data quality and mortality
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Data sources

- From three different sources
  - IBGE Vital Registration System
  - Ministry of Health Database (www.datasus.gov.br)
  - IBGE Population Census (both population and death counts)
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Death Distribution Methods

- apply all variants of Death Distribution Methods to country, states and smaller areas and for each pair of intercensal period
- they compare the distribution of deaths by age with the age distribution of the population and provide age patterns of mortality in a defined period
- for more details see Hill (1987), Hill, You and Choi (2009) or IUSSP/UNFPA manual
- used R package developed by Tim Riffee (MPIDR), Everton Lima (Nepo) and Bernardo Queiroz (UFMG)
- package runs all variations of DDM with different age ranges and produce a 'best estimate'
- compare to estimates produce under the Global Burden Diseases Project and present alternatives to small area estimation
Estimates of death counts coverage - vital records completeness - Brazil, 1980 to 2010

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<tr>
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<tbody>
<tr>
<td>Males</td>
<td>84%</td>
<td>90%</td>
<td>94.6%</td>
<td>98%</td>
</tr>
<tr>
<td>Females</td>
<td>79%</td>
<td>81%</td>
<td>90%</td>
<td>96%</td>
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</tbody>
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Household Deaths in the 2010 Census

- 2010 census included a question on household deaths and information on age and sex of the deceased
- Queiroz and Sawyer (2012) evaluate the quality of information for the country
- Freire and Queiroz (2016) evaluate quality for all 27 states
- Recent studies used question to investigate mortality differentials by educational level, income level and young adult mortality differences
Comparison between census and datasus, Brazil, Males, 2010

![Graph showing age-specific mortality rates for census and SIM](image-url)
national level improved consistently over the last few decades
- investments from Ministry of Health and other agencies
- however, improvements are not homogeneous over space
Completeness of Death Counts in Brazil

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Estimates of death counts coverage, Males Brazilian States, 2000

Completeness of Death Counts Coverage, Males, Brazil, 2000

scale approx 1:31,000,000

0 1000 2000 km

[45,60]  [60,70]  [70,80]  [80,90]  [90,95]  [95,100]
Estimates of death counts coverage, Males, Brazilian States, 2010

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scale approx 1:31,000,000

[60,70]
[70,80]
[80,90]
[90,95]
[95,100]
Evolution of Data Quality - Brazilian Mesoregions, Females 1980 to 2010

Female Mortality Coverage for the Period of 1980-1991

Female Mortality Coverage for the Period of 1991-2000

Female Mortality Coverage for the Period of 2000-2010
Do small area estimates match state level estimates?

- since methods assumptions might be violated in small areas, one should check results
- we perform a very simple analysis, adding up estimated death counts at the small area and comparing to states
- estimates are quite reasonable, especially for states with better data
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Concluding remarks

- remarkable regional differences on the completeness of deaths counts and adult mortality across three last decades
- Quality of death counts registration in Brazil is improving over time and across the country;
- Methods and combination of methods work well for sub-national levels. Results from 1980 to 2010 for meso-regions are very promising even using traditional demographic methods
- limitations for small areas: migration flows (violate assumption) random fluctuations and zero cases
Concluding remarks

- improvements seem to be very close associated to investments in the public health care system and administrative procedures to collect vital statistics.

- that efforts from the central and local governments to improve data quality in Brazil are being successful, and they will allow a better understanding of the dynamics of health and mortality transition in Brazil.

- investments in the Brazilian Family Health Program could have important impacts on the improvement of mortality data quality in Brazil.

- case of Brazil some efforts of Ministry of Health and Public Pension System to control deaths at older ages (data is not public available).
Concluding remarks

- Data should be public available to researchers and others.
- Census questions was useful to some additional studies.
- Recent efforts to develop methods combining demographic methods to statistical methods and smoothing procedures.
- Lima et. al (2016) used several statistical methods to estimate mortality for city level.
- Gonzaga and Schmertmann (2016) using Topals method to estimate mortality curves at local levels.
- Same authors developing alternatives to estimate completeness by age groups using bayesian statistics.
Thank You

Bernardo - lanza@cedeplar.ufmg.br
Everton - everton@nepo.unicamp.br
Contact Information

Thank You
Bernardo - lanza@cedeplar.ufmg.br
Everton - everton@nepo.unicamp.br