Lecture 4
Assessing the Completeness of Death Registration
Basic Approaches

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Methods for evaluating completeness of death registration

Lecture	Type of method	Demographic balance methods	Extinct generation methods
4	Basic approaches	Tests of consistency using balancing equation of demographic change for real cohorts	Extinct generations for real cohorts
5	One census methods (stable assumption)	Brass Growth Balance method (BGB)	Synthetic extinct generations in a stable population (Preston-Coale)
6	Multiple census method	Generalized Growth Balance method (GGB)	Synthetic extinct generations (SEG)

Outline

- Plausibility checks
  - Examining patterns of raw (uncorrected) mortality data
  - Comparison with other sources of mortality data
  - Comparison with model life tables (using MORTPAK)
- Internal consistency of the data
  - Balancing equation of demographic change
  - Synthetic generations

Calculation of uncorrected mortality rates

- ${}_nD_x$ = deaths observed during a calendar year
- ${}_nN_x$ = mid-year population
- ${}_nM_x = {}_nD_x / {}_nN_x$

- More generally:
- ${}_nD_x[t_1, t_2]$ = deaths observed between t_1 and t_2
- ${}_nN_x[(t_1+t_2)/2]$ = mid-period population
- ${}_nM_x[t_1, t_2] = \frac{{}_nD_x[t_1,t_2]}{{}_nN_x\left[\frac{t_1+t_2}{2}\right]*(t_2-t_1)}$

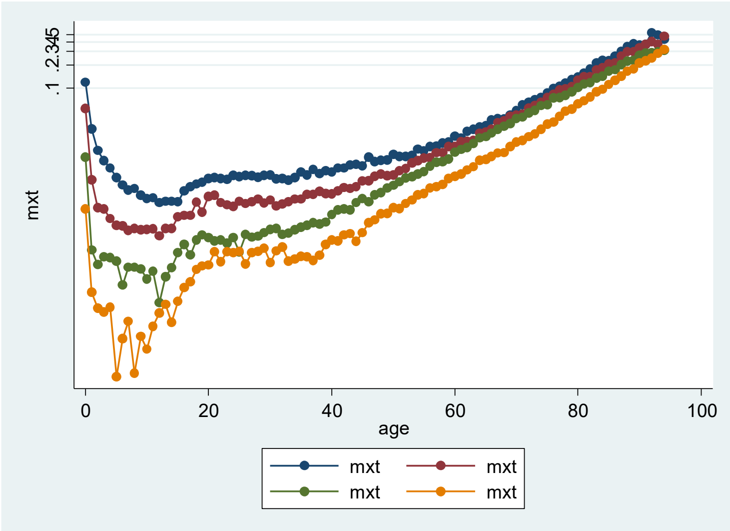
Other important mortality indicators

- IMR or ${}_1q_0$
- U5MR or ${}_5q_0$
- Life expectancy at birth (e_0)
- Life expectancy at age 5 (e_5)
  - From life table calculations

Patterns in raw mortality data

- Age patterns
- Differentials
  - Urban vs. rural
  - Sex
  - Province
  - Socio-economic status
- International comparisons
- Time trends

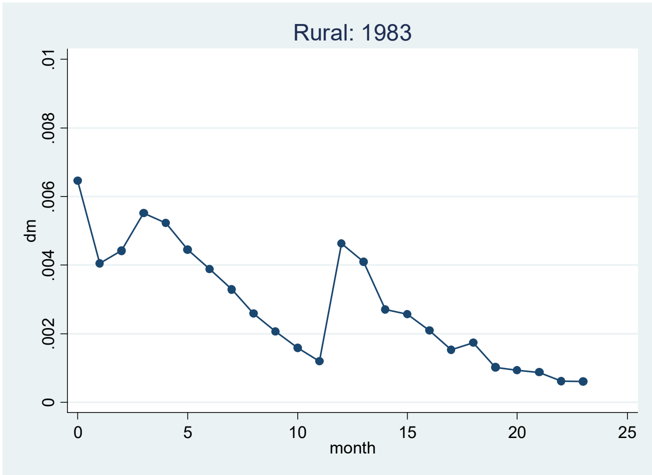
Age patterns – Sweden, Males, 1Mx
1900, 1935, 1970, 2010



Age patterns

- Signs of data quality issues
    - Mortality not uniformly declining with age during the first few months and years of life
    - Mortality decreasing with age at older ages

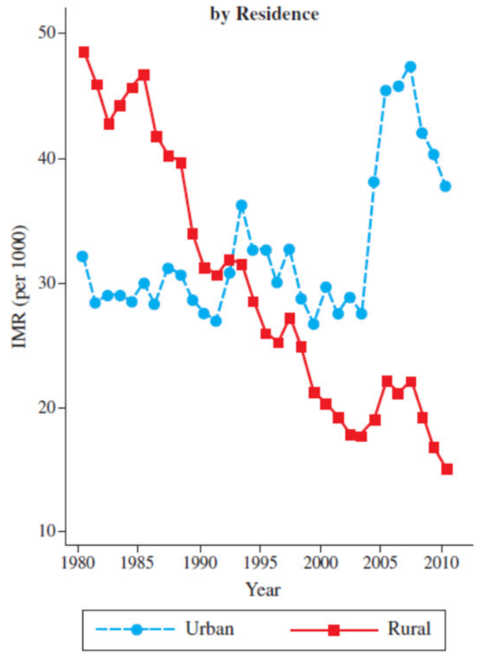
Example: Kyrgyzstan
Monthly probabilities of death



Urban/rural differentials

- Today, in virtually all countries, mortality is lower in urban areas (because of higher education, higher income, better health services, etc.)
- Reported higher mortality in urban areas is usually due to poor data quality (low coverage in rural areas)

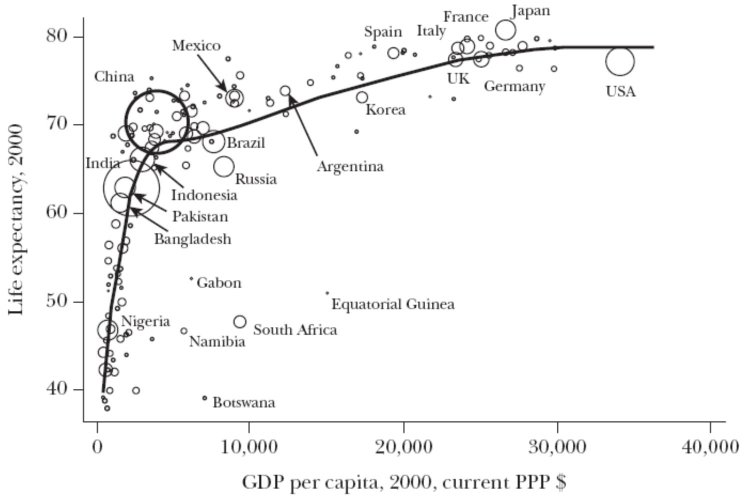
Example: IMR in Kyrgyzstan



Mortality regularities

- Mortality typically higher
    - among males
    - in poorer, less developed provinces
    - among population groups that are less educated, poorer
    - among countries that are less developed
- Observed mortality patterns that do not follow these patterns indicate potential data quality issues

Figure 1
The Preston Curve: Life Expectancy versus GDP Per Capita



Source: Reproduced from Deaton (2003, Figure 1).
Note: Circles are proportional to population.

Time trends

- Real increases in mortality reflect severe deterioration of socio-economic situation and health care system
- Observed increases during times of improvements in socio-economic situation are often signs of data quality issues (for example, improvement in registration)

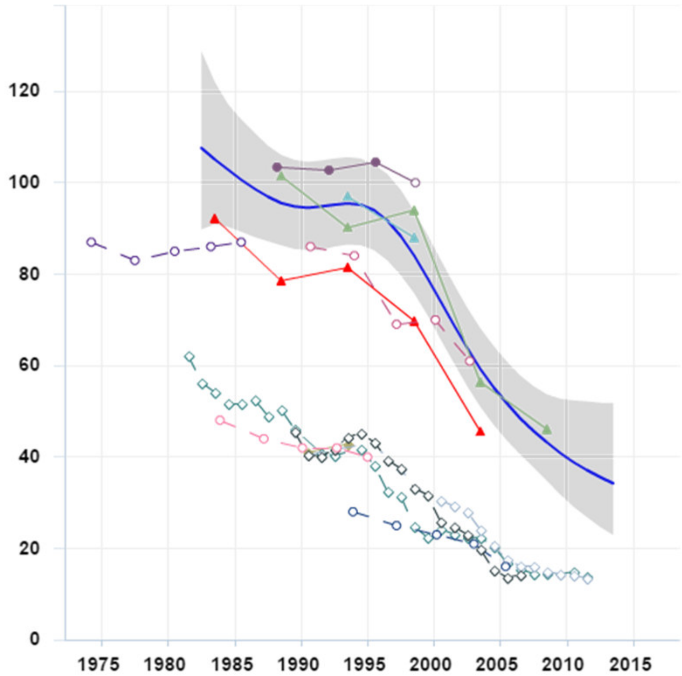
Caution

- Implausible patterns are not always false!
- Not definite evidence of data quality problem
- Useful for detecting potential problems
- Provides guidance for additional analyses

Comparison with other sources of mortality information

- Particularly useful for IMR and U5MR for which survey-based information is available
- Calculate IMR and U5MR from vital statistics
- Compare with IMR and U5MR estimates from DHS/PAPFAM
- www.childmortality.org
- No similar comparison is possible for mortality above age 5

U5MR, Azerbaijan



Comparisons with Model Life Tables (MLT) using MORTPAK

- Model life table shows how age-specific mortality can be expected to be distributed by age given a level of life expectancy
- Conversely, it shows the level of life expectancy that can be expected given mortality in a given age-range
- Based on correlations observed for countries (historical and contemporary) with high quality data
- 9 available models representing variations in age patterns across regions
  - 4 Coale & Demeny models and 5 UN models
- Always useful to check observed patterns of $_nM_x$ against patterns in MLT

Using MORTPAK

1. Choose the “MATCH” procedure by selecting “Application” and then “MATCH” from the drop down menu
2. Select Sex (males or females)
3. Select Model life table pattern
4. Type in your input life table value in the cell “has value of”
5. Choose the column of the life table to which your input value pertains (${}_nm_x$, ${}_nq_x$, e_x or l_x)
6. Type in the age (beginning of interval) to which your input value pertains
7. Click on “Run”

Internal consistency of the data

- N2 = N1 + B – D + I – O
- True for entire population
- For cohort alive at first census:

  N2 = N1 – D + I – O
- For cohorts born between two censuses

  N2 = B – D + I - O

Consistency of data

- If estimates of N1, B, D, I, O and N2 agree with one another, the data are consistent
- If estimates do not agree, “error of enclosure” -- one or more data sources are biased
- Without further information on relative quality of sources, difficult to conclude about the source of error
- By privileging some sources over other sources, it is possible to estimate the amount of error

Example

- Age 65+ at first census
- Intercensal period of 10 years
- N2(75+) = N1(65+) – D + I – O
- Assumptions:
  - Census data are reliable
  - I and O well recorded or negligible at these ages
- (-D + I – O) / (N2 – N1) = coverage of death registration for cohorts aged 65+ at first census

Coverage of deaths at ages 65+ Kyrgyzstan

Intercensal period	Males			Females		
	Urban areas	Rural areas	Total	Urban areas	Rural areas	Total
1959-70	95.7%	48.7%	58.1%	89.5%	40.1%	50.1%
1970-79	96.7%	83.6%	87.2%	86.3%	68.8%	74.2%
1979-89	94.7%	87.1%	89.7%	87.6%	79.8%	82.7%
1989-99	92.8%	98.0%	95.7%	88.6%	94.5%	91.7%

Problems

- Changes in census coverage
- Issues with registration of migration
- Age-misreporting

Extinct generations

- Estimates the size of a cohort age x by counting all deaths that occurred in that cohort subsequent to age x until the cohort has become extinct
- N^(80,t) = D(80,t) + D(81,t+1) + D(82,t+2) + D(83,t+3) …
- Compare N^(x,t) with N(x,t) observed in a census
- N^(x,t)/N(x,t) gives an estimate of average coverage of death registration above age x

Limitations

- Works for cohorts now extinct
- Assumes no migration above age x
- Age-misreporting