IMPROVING THE INFORMATION ON THE MORTALITY SITUATION IN HONG KONG AND MEXICO

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Human Mortality Database
University of California, Berkeley
Overall goal

To improve the mortality information in Hong Kong and in Mexico building from the Human Mortality Database approach
Specific goals

1. Construct life table series for two countries used as case studies, namely Hong Kong and Mexico
2. Develop a set of standard data quality checks and adjustment methods
3. Assess the reliability of the resulting life table series for monitoring actuarial risks
Identification of In-country Experts

• Hong Kong Collaborators:
  ▪ Jennifer Wong, Census & Statistics Department (CSD), Hong Kong
  ▪ Paul S.F. Yip, University of Hong Kong
  ▪ Karen Cheung, University of Hong Kong

• Mexico Collaborators:
  ▪ Andreas Barajas Paz, Heriot Watt University, UK
  ▪ Piedad Urdinola, Universidad Nacional de Colombia-Bogotá
  ▪ Virgilio Partida, Facultad Latinoamericana de Ciencias Sociales (FLASCO)
  ▪ Víctor Manuel García Guerrero, Colegio de México
## Collection of Raw Data, Hong Kong

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Age Format</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Births</td>
<td>N/A</td>
<td>1948-2016</td>
</tr>
<tr>
<td>Deaths</td>
<td>5-year 1-year to 99+ 1-year to 100+</td>
<td>1986 1987-2000 2001-2016</td>
</tr>
<tr>
<td>Official population estimates</td>
<td>1-year to 85+ 1-year to 90+</td>
<td>1986-2000 2001-16</td>
</tr>
<tr>
<td>Census counts (used only for comparison)</td>
<td>0,1,2…85-89,90-94,95-99,100+ 1-year to 100+ 1-year to 75+ 1-year to 85+ 1-year to 100+ 1-year to 85+</td>
<td>1986 1991 1996 2001 2006 2011, 2016</td>
</tr>
</tbody>
</table>

* All data are given by sex and calendar year. Birth counts for 1973-2016 are also given by month.
Collection of Raw Data, Mexico

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Age Format</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Births</td>
<td>N/A</td>
<td>1985-2016</td>
</tr>
<tr>
<td>Deaths</td>
<td>1-year to 120</td>
<td>1990-2016</td>
</tr>
<tr>
<td>Official population estimates</td>
<td>1-year to 89+</td>
<td>1990</td>
</tr>
<tr>
<td></td>
<td>1-year to 90+</td>
<td>1991</td>
</tr>
<tr>
<td></td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td></td>
<td>1-year to 109+</td>
<td>2010-2017</td>
</tr>
<tr>
<td>Census counts (used only for comparison)</td>
<td>5-year to 95+</td>
<td>1950</td>
</tr>
<tr>
<td></td>
<td>1-year to 95+</td>
<td>1960</td>
</tr>
<tr>
<td></td>
<td>1-year to 85+</td>
<td>1970</td>
</tr>
</tbody>
</table>

* All data are given by sex and calendar year. Birth counts are also given by month.
Data Entry, Preparation, & Formatting

- All of the raw data for Hong Kong and Mexico have been formatted into standard HMD “Input Data” format.
- The Input Data have been checked for internal consistency.
Construction of Life Tables Using HMD Methods Protocol

• For both Hong Kong and Mexico, we constructed detailed estimates of deaths and population by Lexis triangle (i.e., by single year of age and birth cohort) from the Input Data.

• Then, we used these estimates to calculate sex- and age-specific death rates.

• Finally, we use the death rates to compute preliminary life tables.
Evaluation of Data Quality Using Fixed Set of Indicators

- We have analyzed the resulting preliminary life tables using standard diagnostics used for all HMD countries to evaluate:
  - Internal consistency
  - External consistency
  - Internal plausibility
  - External plausibility
HONG KONG
Comparison with other Asian life expectancy leaders
Comparison with other Asian life expectancy leaders
Comparison with other Asian life expectancy leaders
Comparison with other Asian life expectancy leaders

![Graph showing life expectancy at age 80 for Japan, Hong Kong, and South Korea. The graph indicates a steady increase in life expectancy over time, with Japan leading, followed by Hong Kong, and South Korea showing a later but still significant increase.](image)
Conclusions

• In general, data quality looks good for this recent period (1986-).

• We suspect that it may be possible to add Hong Kong to the HMD.

• If so, Hong Kong will probably set the record for life expectancy among HMD countries.
  • Not a fair comparison?
  • Hong Kong is not a country, but a city.
  • It might be more appropriate to compare Hong Kong with Tokyo, London, or New York City.
MEXICO
Age Heaping

- Obvious patterns of age heaping in mortality rates prior to 2000.
- Some age heaping persists post-2000 among men aged 30-49.
- If there is age heaping, there may also be more serious forms of age misreporting (i.e., age exaggeration), which is more difficult to diagnose.
Death Rates by Age, 1990
Death Rates by Age, 2000
Death Rates by Age, 2010
Map of Mortality Deviations

Men

Women

Age

Year

R

<= - 0.1
- 0.1 to - 0.05
- 0.05 to + 0.05
+ 0.05 to + 0.1
>= 0.1

<0.001
X

>= 0.001
Comparison of $q_0$ with external estimates

![Graph comparing $q_0$ with external estimates for Men and Women over the years 1990 to 2015. The graph shows the comparison between MortX unadjusted and external estimates from LAMBdA, CONAPO, and UNPD.]
Unadjusted estimates of $q_0$ too low?

- Our unadjusted estimates of $q_0$ are much lower than the official estimates (CONAPO).
  - Official estimates have been adjusted.
- Our estimates are also lower than those produced by the UNPD and LAMBdA.
- **Conclusion:** Unadjusted estimates probably under-estimate infant mortality.
Unadjusted estimates of $e_0$ too high?
Unadjusted estimates of $e_{80}$ also too high?
Compared with Sweden, Men
Compared with Sweden, Women
Suspicious Patterns

• Both sexes: $e_0$ for Mexico well below Sweden during 1990-2016.

• Men: $e_{80}$ was higher in Mexico than in Sweden?

• Women: $e_{80}$ was higher in Mexico than in Sweden in 1990-2009 (but lower after 2010)?

• These implausible patterns suggest age exaggeration/mis-reporting.
An implausible mortality pattern
Relationship between mortality risks between ages 60 and 80 and child mortality (<5), Men
Even more implausible at higher ages
Death count ratio: 105+ years to 100+ years
Mexico (1990-2016), Chile (1992-2008) and Sweden (1950-2016)
Preliminary Conclusions

• We find numerous data quality issues.
  • Obvious age heaping which are typically an indication of low quality of age reporting in general
  • Our unadjusted estimates of \( e_0 \) are much higher than the official estimates (which have been adjusted)
  • Suspicious trends in \( e_{80} \) that lead us to suspect age exaggeration/mis-reporting
  • Implausibly low mortality at older ages relatively to younger ages
• We doubt that Mexico can be added to the HMD.
• Accurate estimates of life expectancy for Mexico will require adjustments to the raw data (or to the rates).
NEXT STEPS
Investigation into other possible sources of mortality information

• Post-censal surveys to verify census coverage.
• Statistical office own assessment of vital registration system.
• Representative surveys with mortality information (surveys with mortality follow-up; maternity histories, etc...).
Preliminary Conclusions

• We find numerous data quality issues.
  • Obvious age heaping
  • Unadjusted estimates of $e_0$ much higher than the official estimates (which have been adjusted)
  • Suspicious trends in $e_{80}$ relative to $e_0$ suggesting age exaggeration/mis-reporting

• Accurate estimates of life expectancy for Mexico will require adjustment to the raw data.

• Mexico cannot be added to the HMD.
Determination of necessary adjustments

• We will explore the possible tools that might be used to adjust the data.
• Others (i.e., CONAPO, LAMBDa, GBD, UNPD) have produced adjusted estimates.
• The adjustment methods rely on various underlying assumptions.