Mortality selection among adults in Brazil: the survival advantage of Air Force Officers

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The interest on disentangling pathways to lower mortality have found mortality advantages related to several dimensions:

- (Not surprising) factors: income, educational attainment, occupational status, gender, race groups, marital status and health measures
- (Surprising) factors: ethnicity/nativity
- Selected population subgroups living in special contexts: learned societies, religious groups and the MILITARY
Background

- **Military Mortality:**
  - Officers experience lower mortality than many groups in society, even in the context of war
    - Buzzel & Preston 2007: Young black males in Philly have mortality rates 9% higher than troops in Iraq.
    - MacIntyre 1978: Pilots (WWII and Korean war) had lower all-cause and cause-èspecific mortality (cardiovascular, cancer) than the US Civilian population
  - The association of early life infections, and stressful situations with mortality later in life *(Costa & Kahn 2010; Costa 2003)*
  - Association of body build, nutrition, and mortality *(Costa and Fogel 2004)*
Background

- Brazil:
  - Lack of high quality data and longitudinal mortality studies
  - Lack of historical high quality data (insufficient to study demographic and epidemiological transitions)
  - Little information on SES gradients in mortality
  - **Cohort of Air Force officers represent selected adult subgroup:**
    - Individuals from above average income, born during the first stages of the demographic transition (average 1935)
    - Selection at enlistment and training
    - Share similar social experiences and standardized careers (“reenginering a social context”)
Research Questions

- How large is the survival advantage of Brazilian Officers?

- Are early life conditions (place of birth) associated with survival later in life? Do health selection and health conditions over the life course offset potential differences at birth?
Data

- Retrospective longitudinal mortality data from 1947 to 2013 (n=706, 66 years follow-up), for Air Force male officers (BAF)
  
- Career (Pilot/administrative), place of birth (Northern and Southern regions), causes of death (on duty, other causes). All retrieved from the pension fund system
  
- Human Mortality Database (for selected low mortality countries)
  
- 1950-2015 UN life tables and 2000 official mortality data for Brazil (IBGE)
Methods

- **Research Question 1 (Mortality levels):**
  
  • Predict age-specific death rates from the coefficients of Poisson modeling that controls only for age;
  
  • Estimate truncated life expectancy at age 80 for BAF, Brazil (period and cohort), Chile, Sweden, France and Japan
Results

Figure 1. Male age-specific mortality rates, BAF and selected countries, 2000
Results

Figure 2. Male mortality ratios, BAF and selected countries (Sweden standard)
## Results

### Truncated male life expectancies at age 80

<table>
<thead>
<tr>
<th>Age</th>
<th>95% Confidence Level Lower</th>
<th>Average</th>
<th>Upper</th>
<th>95% Confidence Level Upper</th>
<th>Brazil 2000</th>
<th>Brazil 1935 cohort</th>
<th>Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>25.28</td>
<td>30.25</td>
<td>32.92</td>
<td>25.91</td>
<td>25.68</td>
<td>25.91</td>
<td>30.43</td>
</tr>
<tr>
<td>55</td>
<td>17.35</td>
<td>21.16</td>
<td>23.29</td>
<td>18.58</td>
<td>17.85</td>
<td>18.58</td>
<td>21.22</td>
</tr>
<tr>
<td>65</td>
<td>10.43</td>
<td>12.67</td>
<td>13.95</td>
<td>11.60</td>
<td>10.73</td>
<td>11.60</td>
<td>12.57</td>
</tr>
<tr>
<td>75</td>
<td>3.81</td>
<td>4.33</td>
<td>4.70</td>
<td>4.38</td>
<td>4.04</td>
<td>4.38</td>
<td>4.46</td>
</tr>
</tbody>
</table>
Methods

- **Research Question 2 (early life conditions):**

  - Cause-specific cumulative incidence function (CIF), a non-parametric curve that provides cause-specific mortality hazards in presence of other causes;

  - Fine and Gray (FG) regression to model the underlying hazard: partial likelihood + weighting principles = competing risks need not be proportional and independent

  - Compare mortality from casualties and other causes by place of birth, controlling for career
Results

Cumulative Incidence Functions by regions of birth and causes of death

**CIF’s by Region**

Other Causes of Death

<table>
<thead>
<tr>
<th>Region</th>
<th>Cumulative Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td></td>
</tr>
<tr>
<td>Southern</td>
<td></td>
</tr>
</tbody>
</table>

**CIF’s by Region**

Casualties

<table>
<thead>
<tr>
<th>Region</th>
<th>Cumulative Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td></td>
</tr>
<tr>
<td>Southern</td>
<td></td>
</tr>
</tbody>
</table>

*p-value* = 0.407 (Other Causes of Death)

*p-value* = 0.000 (Casualties)
# Results

FG regression coefficients for region of birth, career and causes of death

<table>
<thead>
<tr>
<th>Deaths by Other Causes</th>
<th>Deaths by Casualties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
</tr>
<tr>
<td><strong>Region of birth</strong></td>
<td></td>
</tr>
<tr>
<td>Southern</td>
<td>-</td>
</tr>
<tr>
<td>Northern</td>
<td>0.1272</td>
</tr>
<tr>
<td><strong>Career</strong></td>
<td></td>
</tr>
<tr>
<td>Administrative</td>
<td>-</td>
</tr>
<tr>
<td>Pilot</td>
<td>(-0.6390)***</td>
</tr>
</tbody>
</table>

*p<.05; **p<.01; ***p<.001
Discussion

• Lower bounds of mortality rates among BAF males in Brazil comparable to rates for the leading low mortality countries

• There is no threshold for life expectancy?

• No advantage for officers born in the most developed regions: selection, equalized life conditions (is it never too late to catch up?) or both? – offsetting scarring effects?

• Disadvantage for Northern pilots: self-selection of institutional-based selection?
Discussion

• Future research: include data for more recent cohorts to examine whether the patterns remain true in a context of rapid transitions (including transitions in the Military!) and include health data!

• What factors are associated to selection in a developing country scenario?
THANK YOU!

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