Demography, Time and Space

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Professor WD (Mick) Borrie
Demography

**Definition:** The scientific study of population, with a central focus on the size, distribution and composition of population, and the processes of population change.

**Essence of a discipline:**
- Substantive focus
- Theoretical constructs
- Analytical methods
- Data sources
- Core problems
fissiparous
/ˈfɪsɪp(ə)rəs/

adjective

inclined to cause or undergo division into separate parts or groups. "the fissiparous tendencies innate in tribalism"

- BIOLOGY
  (of an organism) reproducing by fission.
  "small fissiparous worms"

https://www.google.com.au/#q=fissiparous
## End of the Demographic Transition?

### Table 1: The most important population issues facing the world in the next 20 years

<table>
<thead>
<tr>
<th>Issue</th>
<th>Asia/Oceania</th>
<th>Africa</th>
<th>South America</th>
<th>Europe</th>
<th>North America</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population aging</td>
<td>36</td>
<td>12</td>
<td>36</td>
<td>31</td>
<td>29</td>
<td>30</td>
</tr>
<tr>
<td>Large-scale migration flows</td>
<td>13</td>
<td>14</td>
<td>20</td>
<td>12</td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>9</td>
<td>32</td>
<td>4</td>
<td>13</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Above-replacement fertility</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>16</td>
<td>17</td>
<td>12</td>
</tr>
<tr>
<td>Urbanization</td>
<td>16</td>
<td>15</td>
<td>16</td>
<td>6</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Infant mortality</td>
<td>9</td>
<td>13</td>
<td>7</td>
<td>12</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Women’s reproductive rights</td>
<td>8</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Population decline</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
</tr>
<tr>
<td><strong>N =</strong></td>
<td><strong>199</strong></td>
<td><strong>104</strong></td>
<td><strong>70</strong></td>
<td><strong>188</strong></td>
<td><strong>157</strong></td>
<td><strong>718</strong></td>
</tr>
</tbody>
</table>

(a) Respondents were asked to rank at most three issues. A number of respondents filled in more than 3 population issues and to make a fair comparison we only include the respondents who ranked at most 3 issues and subsequently selected what they considered the most important issue.

Source: NIDI (2009)
• Demography and Time
Demographic Transition Theory

“…the central preoccupation of modern demography.”
Caldwell 1996
Lexis Diagrams

- Age-Time plan depicting the relationship between age, period and birth cohort.
- Age and time divided into equal intervals
- Lifelines show individual aging
- Events fall into age time intervals
- Links population stocks and flows
- Framework for the assembly and analysis of demographic data
Age at Migration & Life Course Events

• Demography and Space
John Snow and the Soho cholera epidemic

http://upload.wikimedia.org/wikipedia/commons/c/cc/John_Snow.jpg

http://upload.wikimedia.org/wikipedia/commons/c/cb/John_Snow_memorial_and_pub.jpg
The European Fertility Project

Fig. 6.9 Changing spatial distribution of marital fertility (Iₐ) for France, 1831–1901.
Data source: van de Walle (1974).

Fig. 6.8 Changing spatial distribution of marital fertility (Iₐ) for Italy, 1881–1961.

Problems with Spatial Aggregates

Ecological Fallacy:
• Making inferences about processes at the level of individuals from analysis of data about the groups to which they belong

MAUP – Modifiable Areal Unit Problem:
• Aggregated values vary according to (a) the number of units into which a region is divided (scale effect) and (b) the way the boundaries are drawn (pattern effect)
Four Domains of Spatial Demography

1. Spatial differentiation
   • GWR, Spatial clustering, Moran’s ‘I’

2. Modelling spatial diffusion
   • Event history, Multi-level regression

3. Location/allocation modelling
   • Thiessen polygons, SIMs

4. Areal estimation
   • Remote sensing, areal interpolation
Estimating Population

Population Distribution; Cyprus
Source: Landscan

Population Density India
Source: CIESEN/GRUMP
http://sedac.ciesin.columbia.edu/maps/gallery
Gridded Population Data 100m²

West Africa

Source: Worldpop.org.uk
http://www.worldpop.org.uk/ebola/
Example of aggregation: Germany

412 BSUs
200 ASRs
150 ASRs
100 ASRs
50 ASRs
10 ASRs
The MAUP and the MEI

Comparing Migration Effectiveness

• Space-time convergence
Global Migration Intensities

## Mobility in Space and Time

<table>
<thead>
<tr>
<th>Time</th>
<th>12 months</th>
<th>4 weeks</th>
<th>7 days</th>
<th>24 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years</td>
<td>Years</td>
<td>Months</td>
<td>Weeks</td>
<td>Days</td>
</tr>
<tr>
<td>Months</td>
<td>Months</td>
<td>Weeks</td>
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<td>Weeks</td>
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<td>Days</td>
<td>Days</td>
<td>Days</td>
<td>Days</td>
<td>Days</td>
</tr>
<tr>
<td>Hours</td>
<td>Hours</td>
<td>Hours</td>
<td>Hours</td>
<td>Hours</td>
</tr>
</tbody>
</table>

### Spatial Boundaries
- Local
- Regional
- National
- Inter-urban
- Inter-regional
- Inter-national
- Rural-urban
- Urban-rural
- Residential mobility

### Mobility Activities
- **Local**
  - Visit
  - Shopping
  - Commuting
- **Region**
  - Long distance commuting
  - Excursions
  - Business travel
  - Study
  - Vacations
- **National**
  - Extended recreational travel
  - Seasonal work
- **World**
  - Business travel
  - Study
  - Vacations
  - Extended recreational travel
  - Seasonal work
• Coupling Space and Time – Mobility and Migration
Tracking Mobility in West Africa

Mobile Phone Flowmaps
Source: http://www.worldpop.org.uk/ebola/
Tracking the St Lucia Campus Population

Space-Timelines: Daily Activity Patterns

Capturing Life-Spaces


Source: Lelievre & Robette 2010

Source: Hagerstrand Figure 11 in Carlstein, Parkes and Thrift (1978) : Timing Space and Spacing Time
• Conclusions