Evaluation of Child Mortality Data from Population Censuses

United Nations Statistics Division

United Nations Workshop on Census Data Evaluation for English Speaking African Countries
Kampala, Uganda
12 – 16 November 2012
Outline

1. **Life tables**
   a) Constructing life tables
   b) Model life tables

2. **Survival of children ever born**
   a) Information required
   b) Checking data quality
   c) Brass type estimates of child mortality and checking with external sources
   d) A simplified version of Brass for evaluation
Life tables
Life tables

- Contain several functions that represent the effects of mortality on a population
  - Life expectancy, age-specific mortality rates, probability of dying by age $x$
- Cohort life tables trace the experience of a single birth cohort (e.g. all those born in 1950)
  - Have to wait for entire cohort to die to have full data
- Period life tables use a synthetic cohort to represent prevailing mortality conditions at present time
  - As if a cohort lived whole life under current mortality conditions
Constructing a cohort life table
Constructing a cohort life table (2)

<table>
<thead>
<tr>
<th>Age</th>
<th>Number left alive at age x</th>
<th>Number dying between x and x+n</th>
<th>Probability of dying between ages x and x+n</th>
<th>Person-years lived between ages x and x+n</th>
<th>Persons lived above age x</th>
<th>Expectation of life at age x</th>
<th>Death rate between age x and</th>
<th>nmx</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
<td>1</td>
<td>1/10</td>
<td>9 * 0.07 = 0.90</td>
<td>436.79 * 9.07 = 445.86</td>
<td>44.586</td>
<td>1/9.07</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>9</td>
<td>1</td>
<td>1/9</td>
<td>8 * 4 + 0.22 = 32.22</td>
<td>404.57 + 32.22 = 436.79</td>
<td>48.532</td>
<td>1/32.22</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>8 * 5 = 40</td>
<td>364.57 + 40 = 404.57</td>
<td>50.571</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>8</td>
<td>1</td>
<td>1/8</td>
<td>7 * 10 + 6.41 = 76.41</td>
<td>288.16 + 76.41 = 364.57</td>
<td>45.571</td>
<td>1/76.41</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>7</td>
<td>1</td>
<td>1/7</td>
<td>6 * 10 + 2.12 = 62.12</td>
<td>226.04 + 62.12 = 288.16</td>
<td>41.166</td>
<td>1/62.12</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>6 * 10</td>
<td>166.04 + 60 = 226.04</td>
<td>37.673</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>6 * 10</td>
<td>106.04 + 60 = 166.04</td>
<td>27.673</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>6</td>
<td>1</td>
<td>1/6</td>
<td>5 * 10 + 9.6 = 59.6</td>
<td>46.44 + 59.6 = 106.04</td>
<td>17.673</td>
<td>1/59.6</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>5</td>
<td>2</td>
<td>2/5</td>
<td>3 * 10 + 2.91 + 4.05 = 36.96</td>
<td>9.48 + 36.96 = 46.44</td>
<td>9.288</td>
<td>2/36.96</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

![Graph showing life expectancy and death rates](image)
The period life table - example

<table>
<thead>
<tr>
<th>Age x</th>
<th>n N_x</th>
<th>n D_x</th>
<th>n m_x</th>
<th>n a_x</th>
<th>n q_x</th>
<th>n p_x</th>
<th>l_x</th>
<th>n d_x</th>
<th>n L_x</th>
<th>T_x</th>
<th>e^x</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>47,925</td>
<td>419</td>
<td>0.008743</td>
<td>0.068</td>
<td>0.008672</td>
<td>0.991328</td>
<td>100,000</td>
<td>867</td>
<td>99,192</td>
<td>7,288,901</td>
<td>72.889</td>
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<tr>
<td>1</td>
<td>189,127</td>
<td>70</td>
<td>0.000370</td>
<td>1.626</td>
<td>0.001479</td>
<td>0.998521</td>
<td>99,133</td>
<td>147</td>
<td>396,183</td>
<td>7,189,709</td>
<td>72.526</td>
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<tr>
<td>5</td>
<td>234,793</td>
<td>36</td>
<td>0.000153</td>
<td>2.500</td>
<td>0.000766</td>
<td>0.999234</td>
<td>98,986</td>
<td>76</td>
<td>494,741</td>
<td>6,793,526</td>
<td>68.631</td>
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<tr>
<td>10</td>
<td>238,790</td>
<td>46</td>
<td>0.000193</td>
<td>3.143</td>
<td>0.000963</td>
<td>0.999037</td>
<td>98,910</td>
<td>95</td>
<td>494,375</td>
<td>6,298,785</td>
<td>63.682</td>
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<td>254,996</td>
<td>249</td>
<td>0.000976</td>
<td>2.724</td>
<td>0.004872</td>
<td>0.995128</td>
<td>98,815</td>
<td>481</td>
<td>492,980</td>
<td>5,804,410</td>
<td>58.740</td>
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<td>326,831</td>
<td>420</td>
<td>0.001285</td>
<td>2.520</td>
<td>0.006405</td>
<td>0.993595</td>
<td>98,334</td>
<td>630</td>
<td>490,106</td>
<td>5,311,431</td>
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<td>2.481</td>
<td>0.005659</td>
<td>0.994341</td>
<td>97,704</td>
<td>553</td>
<td>487,127</td>
<td>4,821,324</td>
<td>49.346</td>
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<td>324,222</td>
<td>441</td>
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<td>0.006779</td>
<td>0.993221</td>
<td>97,151</td>
<td>659</td>
<td>484,175</td>
<td>4,334,198</td>
<td>44.613</td>
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<td>269,963</td>
<td>508</td>
<td>0.001882</td>
<td>2.701</td>
<td>0.009368</td>
<td>0.990632</td>
<td>96,492</td>
<td>904</td>
<td>480,384</td>
<td>3,850,023</td>
<td>39.900</td>
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<td>261,971</td>
<td>769</td>
<td>0.002935</td>
<td>2.663</td>
<td>0.014577</td>
<td>0.985423</td>
<td>95,588</td>
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<td>474,686</td>
<td>3,369,639</td>
<td>35.252</td>
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<td>238,011</td>
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<td>0.004849</td>
<td>2.698</td>
<td>0.023975</td>
<td>0.976025</td>
<td>94,195</td>
<td>2,258</td>
<td>465,777</td>
<td>2,894,953</td>
<td>30.734</td>
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<td>50</td>
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<td>1,866</td>
<td>0.007133</td>
<td>2.676</td>
<td>0.035082</td>
<td>0.964918</td>
<td>91,937</td>
<td>3,225</td>
<td>452,188</td>
<td>2,429,176</td>
<td>26.422</td>
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<tr>
<td>55</td>
<td>181,385</td>
<td>2,043</td>
<td>0.011263</td>
<td>2.645</td>
<td>0.054861</td>
<td>0.945139</td>
<td>88,711</td>
<td>4,867</td>
<td>432,096</td>
<td>1,976,988</td>
<td>22.286</td>
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<td>60</td>
<td>187,962</td>
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<td>0.018600</td>
<td>2.624</td>
<td>0.089062</td>
<td>0.910398</td>
<td>83,845</td>
<td>7,467</td>
<td>401,480</td>
<td>1,544,893</td>
<td>18.426</td>
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<td>65</td>
<td>153,832</td>
<td>4,366</td>
<td>0.028382</td>
<td>2.619</td>
<td>0.132925</td>
<td>0.867075</td>
<td>76,377</td>
<td>10,152</td>
<td>357,713</td>
<td>1,143,412</td>
<td>14.971</td>
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<tr>
<td>70</td>
<td>105,169</td>
<td>4,337</td>
<td>0.041238</td>
<td>2.593</td>
<td>0.187573</td>
<td>0.812427</td>
<td>66,225</td>
<td>12,422</td>
<td>301,224</td>
<td>785,699</td>
<td>11.864</td>
</tr>
<tr>
<td>75</td>
<td>73,694</td>
<td>5,279</td>
<td>0.071634</td>
<td>2.518</td>
<td>0.304102</td>
<td>0.695898</td>
<td>53,803</td>
<td>16,362</td>
<td>228,404</td>
<td>484,475</td>
<td>9.005</td>
</tr>
<tr>
<td>80</td>
<td>57,512</td>
<td>6,460</td>
<td>0.112324</td>
<td>2.423</td>
<td>0.435548</td>
<td>0.564452</td>
<td>37,441</td>
<td>16,307</td>
<td>145,182</td>
<td>256,070</td>
<td>6.839</td>
</tr>
<tr>
<td>85</td>
<td>32,248</td>
<td>6,146</td>
<td>0.190585</td>
<td>5,247</td>
<td>1.000000</td>
<td>0.000000</td>
<td>21,134</td>
<td>21,134</td>
<td>110,889</td>
<td>110,889</td>
<td>5.247</td>
</tr>
</tbody>
</table>

Source: *Demography*, Preston et. al., 2001

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Calculating the period life table

\[ nM_x = \text{age-specific period- mortality rate} \]

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Box 3.1 Period Life Table Construction.

A. Observed data:
   \[ uN_x = \text{mid-year population in age interval } x \text{ to } x + n \]
   \[ uD_x = \text{deaths between ages } x \text{ and } x + n \text{ during the year} \]

B. Steps for period life table construction:
1. \[ ua_x \approx uM_x = \frac{uD_x}{uN_x} \]
2. \[ ua_x : \]
   calculated from Coale and Demeny equations shown in table 3.3 under age 5, borrowed from Keyfitz and Flieger above age 5
3. \[ uq_x = \frac{n \cdot uM_x}{1 + (n - ua_x) \cdot uM_x} \]
   \[ \infty q_{85} = 1.00 \]
4. \[ up_x = 1 - uq_x \]
5. \[ l_0 = 100,000 \]
   \[ l_{x+n} = l_x \cdot u p_x \]
6. \[ u d_x = l_x - l_{x+n} \]
7. \[ u L_x = n \cdot l_{x+n} + ua_x \cdot u d_x \]
   (open-ended interval; \( \infty L_x = \frac{l_x}{\infty q_{85}} \))
8. \[ T_x = \sum_{u=0}^{\infty} u L_u \]
9. \[ e_x = \frac{T_x}{l_x} \]

Example: Austria, males, 1992

Source: *Demography*, Preston et al, 2001, P49
Data checks: does the life table make sense?

Example - using MortPak LIFTB

Data Source: Botswana Demographic Survey 2006, available at Human Lifetable Database
http://www.lifetable.de
Does it make sense?
Botswana 2006 Demographic Survey

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Model life tables

- Represent expected age patterns of mortality – fewer parameters
- Created to estimate demographic parameters for countries with limited data
- Built on empirical studies of age-specific mortality patterns in the past
- Two groups of model life tables:
  - Coale-Demeny (1983): based on European populations, from >600 mortality patterns
    - North, South, East and West European models
    - West only model based on some non-European life tables
  - United Nations (1982): based on developing countries
    - Latin American, Chilean, South Asian, Far Eastern, General
1. Age-specific shape of mortality – relative probabilities of dying at different ages

2. Level of mortality – each model has several different levels that correspond with a different life expectancies at birth (e0)

Source: Model Life tables for Developing Countries, 1982, United Nations
Survival of children ever born

Indirect estimation of child mortality
Quick review
- children ever born/surviving data

- Have been used for the past 50 years to collect data on infant and child mortality

- For every woman the following information is collected:
  - the total number of female children she has borne in her lifetime.
  - the total number of male children she has borne in her lifetime.
  - the number of female children who are surviving
  - the number of male children who are surviving
Survival of children ever born

- Ever born – Surviving = Children deceased
- Children deceased / Ever born = Proportion deceased
- Life table measures of infant, child and young adult mortality may be derived from the proportion of deceased
  - In combination with data on age of mother
CEB/CS data

- Possible to get high quality responses in censuses
  - If both CEB and CS understated → some cancellation of errors
  - In practice, reporting of CS is more complete than reporting of CEB → child mortality underestimated

- More powerful with multiple data sources
CEB/CS data evaluation check list:

- Population by age-sex distribution!
- Any missing data and/or editing?
- Are data on CEB/CS/deceased consistent?
  - By age and over time
- Sex ratio at birth from CEB data for different mother age groups
  - Is it plausible?
  - Under-reporting of female births?
- Is proportion of children surviving/deceased plausible?
  - Comparing with other sources on child mortality
- Is child mortality estimate plausible?
  - Comparing with external sources
CEB/CS – missing data and editing?

Example: missing or implausible values of CEB and CS data

Table 5.1 Percentage of cases where no editing of children ever born and children surviving data was required, by population group and age group

<table>
<thead>
<tr>
<th>Age</th>
<th>African CEB</th>
<th>African CS</th>
<th>Coloured CEB</th>
<th>Coloured CS</th>
<th>Indian/Asian CEB</th>
<th>Indian/Asian CS</th>
<th>White CEB</th>
<th>White CS</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-14</td>
<td>65.2</td>
<td>34.5</td>
<td>53.5</td>
<td>27.2</td>
<td>61.4</td>
<td>19.7</td>
<td>46.2</td>
<td>22.6</td>
</tr>
<tr>
<td>15-19</td>
<td>73.5</td>
<td>44.0</td>
<td>63.7</td>
<td>37.2</td>
<td>68.8</td>
<td>24.6</td>
<td>55.9</td>
<td>28.9</td>
</tr>
<tr>
<td>20-24</td>
<td>82.5</td>
<td>62.5</td>
<td>78.5</td>
<td>59.5</td>
<td>79.1</td>
<td>40.9</td>
<td>73.9</td>
<td>44.5</td>
</tr>
<tr>
<td>25-29</td>
<td>88.2</td>
<td>75.6</td>
<td>87.6</td>
<td>75.4</td>
<td>88.0</td>
<td>64.3</td>
<td>85.4</td>
<td>63.6</td>
</tr>
<tr>
<td>30-34</td>
<td>90.9</td>
<td>81.2</td>
<td>91.2</td>
<td>82.0</td>
<td>92.2</td>
<td>78.3</td>
<td>90.2</td>
<td>76.6</td>
</tr>
<tr>
<td>35-39</td>
<td>91.9</td>
<td>83.2</td>
<td>92.6</td>
<td>84.5</td>
<td>93.5</td>
<td>82.9</td>
<td>91.3</td>
<td>81.3</td>
</tr>
<tr>
<td>40-44</td>
<td>91.4</td>
<td>83.3</td>
<td>92.5</td>
<td>84.7</td>
<td>93.3</td>
<td>83.6</td>
<td>91.5</td>
<td>82.7</td>
</tr>
<tr>
<td>45-49</td>
<td>89.9</td>
<td>82.3</td>
<td>91.3</td>
<td>83.7</td>
<td>91.9</td>
<td>82.6</td>
<td>90.4</td>
<td>82.2</td>
</tr>
</tbody>
</table>

Source: *Estimation of mortality using the South African Census 2001 data*, Dorrington, Moultrie and Timæus, Centre of Actuarial Research, University of Cape Town, 2001
Table 1: CEB/CS data plausible (by age)?

<table>
<thead>
<tr>
<th>Age group of women</th>
<th>Total women</th>
<th>Total CEB</th>
<th>Average CEB</th>
<th>Total CS</th>
<th>deceased (CD=CEB-CS)</th>
<th>Proportion deceased CD/CEB</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 - 19</td>
<td>3518257</td>
<td>294628</td>
<td>0.08</td>
<td>281296</td>
<td>0.003789</td>
<td>0.045</td>
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<tr>
<td>20 - 24</td>
<td>3263432</td>
<td>2078364</td>
<td>0.64</td>
<td>1991445</td>
<td>0.026634</td>
<td>0.042</td>
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<tr>
<td>25 - 29</td>
<td>2918825</td>
<td>4522719</td>
<td>1.55</td>
<td>4312404</td>
<td>0.072055</td>
<td>0.047</td>
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<td>30 - 34</td>
<td>2457285</td>
<td>5700038</td>
<td>2.32</td>
<td>5395143</td>
<td>0.124078</td>
<td>0.053</td>
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<tr>
<td>35 - 39</td>
<td>2400808</td>
<td>7036619</td>
<td>2.93</td>
<td>6563946</td>
<td>0.196881</td>
<td>0.067</td>
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<td>40 - 44</td>
<td>1985225</td>
<td>6707033</td>
<td>3.38</td>
<td>6131544</td>
<td>0.289886</td>
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<td>45 - 49</td>
<td>1658012</td>
<td>6394157</td>
<td>3.86</td>
<td>5722904</td>
<td>0.404854</td>
<td>0.105</td>
</tr>
</tbody>
</table>

Unless fertility has been rising, average CEB should increase with age group.

Unless fertility or child mortality are increasing, average CD should increase with age group.

Average CEB should be realistic given country TFR and typical ages at childbearing.
Proportion deceased with external sources

Proportion of children deceased, Morocco censuses and DHS

Proportion deceased

Age group of mother

Data source: United Nations Demographic Yearbook and DHS STATcompiler

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Obtaining children mortality estimates – Brass method

- Proportion dead → Life table type mortality measure
  - Brass (1975)
  - Use of model life tables
  - Referring to estimates up to 20 years ago

- Data required:
  - Number of women by
    - 5 year age group OR Duration of marriage (5 year groups)
  - Total number of children born alive and living to women in corresponding 5-year groups
Brass type estimates – tabulation

- Women in the age group should include all women, not only those who respond to CEB/CS questions

- Important to check in contexts where inappropriate to ask unmarried women about childbearing

**Source:** Step by step guide to the estimation of child mortality, 1990, United Nations

<table>
<thead>
<tr>
<th>AGE GROUP OF WOMEN</th>
<th>TOTAL WOMEN</th>
<th>TOTAL BIRTHS</th>
<th>CHILDREN AT HOME</th>
<th>CHILDREN AWAY</th>
<th>CHILDREN DEAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-14</td>
<td>259 104</td>
<td>6 677</td>
<td>921 227</td>
<td>24 327</td>
<td>0</td>
</tr>
<tr>
<td>15-19</td>
<td>2 019 436</td>
<td>4 901 382</td>
<td>6 927 908</td>
<td>219 989</td>
<td>1 937 955</td>
</tr>
<tr>
<td>20-24</td>
<td>2 573 496</td>
<td>10 910 256</td>
<td>7 126 473</td>
<td>2 261 196</td>
<td>2 621</td>
</tr>
<tr>
<td>25-29</td>
<td>2 003 082</td>
<td>19 085 552</td>
<td>7 126 473</td>
<td>4 901 382</td>
<td>1 937 955</td>
</tr>
<tr>
<td>30-34</td>
<td>1 766 100</td>
<td>9 085 552</td>
<td>20 434 469</td>
<td>1 217 846</td>
<td>1 959 544</td>
</tr>
<tr>
<td>35-39</td>
<td>1 473 382</td>
<td>10 910 256</td>
<td>7 126 473</td>
<td>2 261 196</td>
<td>2 621</td>
</tr>
<tr>
<td>40-44</td>
<td>1 328 262</td>
<td>9 085 552</td>
<td>12 648 400</td>
<td>2 800 615</td>
<td>3 233 015</td>
</tr>
<tr>
<td>45-49</td>
<td>1 128 791</td>
<td>10 910 256</td>
<td>7 126 473</td>
<td>2 261 196</td>
<td>2 621</td>
</tr>
<tr>
<td>50-54</td>
<td>1 040 877</td>
<td>9 085 552</td>
<td>12 648 400</td>
<td>2 800 615</td>
<td>3 233 015</td>
</tr>
<tr>
<td>55-59</td>
<td>601 625</td>
<td>5 963 087</td>
<td>2 601 163</td>
<td>1 217 846</td>
<td>1 959 544</td>
</tr>
<tr>
<td>60+</td>
<td>1 631 217</td>
<td>8 136 608</td>
<td>2 102 978</td>
<td>2 800 615</td>
<td>3 233 015</td>
</tr>
<tr>
<td>NS</td>
<td>204</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>17 018 632</td>
<td>68 876 212</td>
<td>40 822 467</td>
<td>9 483 700</td>
<td>18 570 045</td>
</tr>
</tbody>
</table>

Note small number of women in 0-14 age group – unmarried were not included
## Brass type estimates - basic idea

<table>
<thead>
<tr>
<th>Age group of mother in years</th>
<th>Age group index</th>
<th>Proportion of children dead approximates</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-19</td>
<td>1</td>
<td>q(1)</td>
</tr>
<tr>
<td>20-24</td>
<td>2</td>
<td>q(2)</td>
</tr>
<tr>
<td>25-29</td>
<td>3</td>
<td>q(3)</td>
</tr>
<tr>
<td>30-34</td>
<td>4</td>
<td>q(5)</td>
</tr>
<tr>
<td>35-39</td>
<td>5</td>
<td>q(10)</td>
</tr>
<tr>
<td>40-44</td>
<td>6</td>
<td>q(15)</td>
</tr>
<tr>
<td>45-49</td>
<td>7</td>
<td>q(20)</td>
</tr>
<tr>
<td>50-54</td>
<td>8</td>
<td>q(25)</td>
</tr>
<tr>
<td>55-59</td>
<td>9</td>
<td>q(30)</td>
</tr>
</tbody>
</table>
Brass type method – basic idea (2)

- Proportion dead → corresponds to one life table element
  - e.g., proportion dead for 25-29 women → q(3)
- Look for appropriate model life table – from external sources/existing experiences
- Obtain child mortality estimates, q(1), q(5), 4q1 etc
- Find the date associated with the estimates
Brass type estimates – typical results

Bangladesh, 1974 Retrospective Survey of Fertility and Mortality

Figure 7. Under-five mortality, q(5), for both sexes in Bangladesh, estimated using model South and the Trussell version of the Brass method.


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How to identify the right model life table (1)

Most of the model life tables represent a different relationship between mortality risk during the first year of life and between ages 1 - 4.
How to identify the right model life table (2)

Figure 5. Comparison of country-specific estimates of infant and child mortality with the Coale-Demeny mortality models

Source: Step by step guide to the estimation of child mortality, 1990, United Nations

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How to identify the right model life table (3)

Example: Direct estimates of 4q1 and 1q0 from Malawi DHS, and the relationships to Coale-Demeny and UN model life tables

Source: IUSSP Tools for Demographic Estimation
http://demographicestimation.iussp.org/

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Brass type estimates - MortPak QFIVE (1)

- Calculate the sex ratio at birth
  - If not available, can use standard 1.05
- Calculate the mean age of childbearing (only for UN model life tables)
  - \[ M = \frac{17.5 \times B(15-20) + 22.5 \times B(20-25) + \ldots + 47.5 \times B(45-50))}{B(15-20) + B(20-25) + \ldots + B(45-50))} \]
  - Where \( B(X-X+N) \) = Births in past year to women age \( X \) to \( X+N \)
  - Multiply by mid-point of respective age group and divide by sum of births to all women
Brass type estimates – QFIVE (2)

Select type of input based on data available
Brass type estimates – QFIVE (3) output using Coale-Demeny life tables

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### Brass types estimates - QFIVE: (4)

#### output using UN model life tables

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Figure 2: Estimated under five and under one mortality over time, Malawi 2008 census

Note most recent estimates should be disregarded because estimates of child mortality based on reports from young mothers tend to be exaggerated.

Source: IUSSP Tools for Demographic Estimation
http://demographicestimation.iussp.org/

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Brass: $q(5)$ more robust to model life table choice than $q(1)$

Figure 12. Infant and under-five mortality for both sexes in Bangladesh, estimated using the four Coale-Demeny mortality models.

Figure 13. Infant and under-five mortality for both sexes in Bangladesh, estimated using the five United Nations mortality models.

Figure 14. Range of variation of the possible estimates of infant and under-five mortality for both sexes in Bangladesh.

Brass: take-home messages

1. Date the estimates!
2. Do not use estimates from 15-19 age group
   - First birth associated with higher mortality level
   - Selection by socioeconomic status
   - Can’t represent the population
3. Select the appropriate model life table
4. q(5) more robust than q(1)
5. Consider the assumptions:
   - Fertility decline: over-estimate mortality level
   - Selection bias
     - Mother died and can’t report child mortality
     - Mortality level differs between alive and dead mother? If yes, there is a selection bias
     - Typically small unless there is a high HIV prevalence

Quality of estimates: Checking multiple sources

q(5), Morocco censuses and DHS

Year

2004 Census Brass
2003/04 DHS
1994 Census Brass
1992 DHS

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Morocco, under 5 mortality rate from other sources (UNICEF)

Source: www.childmortality.org

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Quality assessment: Comparison with existing external sources

- UN Population Division (World Population Prospects)
- UNICEF child mortality website (www.childmortality.org)
A rapid assessment of CEB/CS data:
Ethiopia, 2007 census (1)

<table>
<thead>
<tr>
<th>Age group</th>
<th>Total women</th>
<th>CEB</th>
<th>CS</th>
<th>CS/CEB</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 - 19</td>
<td>4293380</td>
<td>922350</td>
<td>864962</td>
<td>0.938</td>
</tr>
<tr>
<td>20 - 24</td>
<td>3303702</td>
<td>4446644</td>
<td>4141375</td>
<td>0.931</td>
</tr>
<tr>
<td>25 - 29</td>
<td>3039655</td>
<td>8577951</td>
<td>7819158</td>
<td>0.912</td>
</tr>
<tr>
<td>30 - 34</td>
<td>2131905</td>
<td>8728591</td>
<td>7747622</td>
<td>0.888</td>
</tr>
<tr>
<td>35 - 39</td>
<td>1949929</td>
<td>9709603</td>
<td>8391978</td>
<td>0.864</td>
</tr>
<tr>
<td>40 - 44</td>
<td>1409245</td>
<td>7775789</td>
<td>6474546</td>
<td>0.833</td>
</tr>
<tr>
<td>45 - 49</td>
<td>1097840</td>
<td>6329979</td>
<td>5147848</td>
<td>0.813</td>
</tr>
</tbody>
</table>

Source: Table produced based on data from the United Nations *Demographic Yearbook*
A rapid assessment of CEB/CS data: Ethiopia 2007 census (2)

- Proportion deceased for the 30-34 age group = (1-0.888)=0.112
  - Proportion of children deceased born to mothers of 30-34 years of age approximates q(5), the proportion of children born who die before their 5th birthday, about 7 years before data collection

- Compare with other estimates, e.g., UN Population Division estimates of under-5 mortality
  - 2007 census estimates of under-5 child mortality = 112 per 1000 for 2000
  - UN Pop Division estimates for the period 2000-2005: 139 per 1000
  - Fairly significant underestimate in census data

A rapid assessment of CEB/CS data: Ethiopia 2007 census (3)

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Source: World Population Prospects: The 2010 Revision
References

- IUSSP Tools for Demographic Estimation (in progress)
  http://demographicestimation.iussp.org/


- Model Life Tables for Developing Countries, 1982, United Nations
  http://www.un.org/esa/population/publications/Model_Life_Tables/Model_Life_Tables.htm

- Updated UN model life tables: http://esa.un.org/unpd/wpp/Model-Life-Tables/download-page.html