Missing Women: Age and Disease

Siwan Anderson and Debraj Ray

Preliminary
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Striking contrast with sub-Saharan Africa (ratio is only 0.985)

Sen suggests a way to quantify “missing women”.
“... [Calculate] the number of extra women who would have been in China or India if these countries had the same ratio of women to men as obtain in areas of the world in which they receive similar care ... 

In China alone this amounts to 50 million ‘missing women’ ...

When that number is added to those in South Asia, West Asia, and North Africa, a great many more than 100 million women are ‘missing’. These numbers tell us, quietly, a terrible story of inequality and neglect leading to the excess mortality of women.” Sen (1990).
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- Coale (1991) estimates 60 million
- See also Klasen (1994) and Klasen and Fink (2003).
“Missing Women” has spawned a large literature.
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Particular attention paid to:

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Particular attention paid to:

- Sex ratio at birth (selective abortion, infanticide, Hepatitis B)

- Discrimination in early childhood

- Later ages studied but not with the same vigor:
  - “the evidence indicates that parental preferences overwhelmingly shape the female deficit in South and East Asia” (Das Gupta (2005)).
Our Objectives
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- Move away from the use of overall sex ratios.
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- How are missing women “allocated” by age?
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- How are missing women “allocated” by age?
  (Are most of them to be found at birth?)

- How are missing women “allocated” by disease?
  (Compositional versus disease-by-disease effects)
Our Findings
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- Close to 37 - 45% of missing women in China are pre-natal.
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- Large numbers of women are missing at adult ages.

- At least 66% of missing in India and 55% in China are older than age 15.

- The experiences of India and China are distinct.

- Close to 37 - 45% of missing women in China are pre-natal.

- In India, this number is less than 11%.
Findings, *contd.*

- *Sub-Saharan Africa has many missing women; comparable to India or China.*
Findings, contd.

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- In %, sub-Saharan Africa is by far the worst of the three.
Findings, *contd.*

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- In %, sub-Saharan Africa is by far the worst of the three.

- Compare Sen (1990):

  “Sub-Saharan Africa, ravaged as it is by extreme poverty, hunger, and famine, has a substantial excess rather than deficit of women.”
Findings, *contd.*
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- Do disease patterns account for the missing women?
Do disease patterns account for the missing women?

We estimate missing women by age and by disease.
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- We can identify the diseases that are responsible.
Findings, contd.

By exactly the same yardstick used to identify missing women in developing countries, there are missing women in the historical data for now-developed countries.
Findings, contd.

- By exactly the same yardstick used to identify missing women in developing countries, there are missing women in the historical data for now-developed countries.

- 1900 United States a good example of missing women at all ages (except at birth).

- In %, the numbers are comparable to those for India or sub-Saharan Africa today.
One Important Implication

- Female deficit in S. and E. Asia attributed to “cultural norms”; ”discriminatory parental preferences in particular.
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  - Majority of excess female deaths occur when parental preferences have no direct role.
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- But our estimates suggest two things:

  - Excess female mortality is a more widespread phenomenon (sub-Saharan Africa, historical US). Varying cultural norms.

  - Majority of excess female deaths occur when parental preferences have no direct role.

  - If we want missing women from discriminatory parental preferences, original estimates need to be seriously revised downwards.

  - (though extent of revision unclear: e.g., ages 0–14).
Preliminaries: Sex Ratios By Age
Begin with Sex Ratios By Age

![Graph showing sex ratios by age](image-url)
Begin with Sex Ratios By Age
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[Graph showing sex ratios by age for China, Dev, and India, with curves indicating the ratio across different age groups.]
Begin with Sex Ratios By Age

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**China**

**India**

**sub-S Africa**
Can see this even more strongly studying relative death rates.
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- Unbiased death rate for women of age $a$ in country of interest:

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u^w(a) = \frac{d^m(a)}{\hat{d}^m(a)/\hat{d}^w(a)}.
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- Missing women at age $a$ then given by
  \[
  mw(a) = [d^w(a) - u^w(a)] \pi^w(a).
  \]
  where $\pi^w(a)$ is the starting population of women of age $a$. 
Need to add in missing women at birth.
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Wasn’t an issue for Sen because he used overall ratios.
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Necessitates an “unbiased” reference sex ratio at birth; an extremely difficult question
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- More important: sex ratio at birth significantly lower for African populations, both in Africa and in developed countries: 1.03
- (also an average as there is variation across sub-Saharan Africa).
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(also an average as there is variation across sub-Saharan Africa).

Well-established racial differences in sex ratio at birth between blacks and whites.

Difference in the U.S. has persisted for over a century
Asian Indians and Chinese are another matter altogether.
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Asians in developed countries have higher sex ratios at birth (1.07).
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There is evidence of pre-natal sex-selection.


Unclear if phenomenon is pervasive enough to alter overall estimates.
<table>
<thead>
<tr>
<th>Nationality/Ethnicity</th>
<th>Sex Ratio at Birth</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>1.054</td>
</tr>
<tr>
<td>Black</td>
<td>1.030</td>
</tr>
<tr>
<td>sub-Saharan African</td>
<td>1.035</td>
</tr>
<tr>
<td>American Indian</td>
<td>1.031</td>
</tr>
<tr>
<td>Japanese</td>
<td>1.055</td>
</tr>
<tr>
<td>Hawaiian</td>
<td>1.054</td>
</tr>
<tr>
<td>Chinese</td>
<td>1.074</td>
</tr>
<tr>
<td>Filipino</td>
<td>1.072</td>
</tr>
<tr>
<td>Asian Indian</td>
<td>1.066</td>
</tr>
<tr>
<td>Puerto Rican</td>
<td>1.045</td>
</tr>
<tr>
<td>Cuban</td>
<td>1.054</td>
</tr>
<tr>
<td>Central and South American</td>
<td>1.044</td>
</tr>
<tr>
<td>Mexican</td>
<td>1.041</td>
</tr>
</tbody>
</table>

Summary of Actual and Reference Sex Ratios at Birth
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- India: *actual* 1.070–1.078; *reference* 1.059–1.066
- (actual from Demographic Health Surveys).
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- Sub-Saharan Africa: *actual* 1.033, *reference* 1.030–1.035
  (actual from Demographic Health Surveys and Garenne (2002)).
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  (actual from Demographic Health Surveys).

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- China: *actual* 1.139–1.169, *reference* 1.059–1.074
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- China:  
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- Use these to get missing girls at age 0: 
  \[ mw(0) = \left[ \frac{\sigma(0)}{\hat{\sigma}(0)} - 1 \right] \pi^w(0), \]

- \( \sigma(0) \) is SRB at home
- \( \hat{\sigma}(0) \) is reference SRB
- \( \pi^w(0) \) is total number of female births in given period.
Summary for Missing Women By Age

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- Missing women at age \( a \):
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- Add to get all missing women:
  \[ mw_A = \sum_{a=0}^{n} mw(a). \]
Data
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- WHO combines all available survey and census material together with demographic techniques to compute their estimates.

- Where possible we compare our estimates to alternative data sources and find no significant disparities.
Missing women \[ mw_A = \sum_{a=0}^{n} mw(a). \]
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<table>
<thead>
<tr>
<th>Excess Female Deaths, 000s</th>
<th>India</th>
<th>China</th>
<th>ssAfrica</th>
</tr>
</thead>
<tbody>
<tr>
<td>At Birth</td>
<td>184</td>
<td>644</td>
<td>0</td>
</tr>
<tr>
<td>0–4</td>
<td>310</td>
<td>132</td>
<td>192</td>
</tr>
<tr>
<td>5–14</td>
<td>93</td>
<td>2</td>
<td>70</td>
</tr>
<tr>
<td>15–29</td>
<td>258</td>
<td>24</td>
<td>578</td>
</tr>
<tr>
<td>30–44</td>
<td>94</td>
<td>73</td>
<td>345</td>
</tr>
<tr>
<td>45–59</td>
<td>121</td>
<td>89</td>
<td>84</td>
</tr>
<tr>
<td>60–69</td>
<td>241</td>
<td>154</td>
<td>101</td>
</tr>
<tr>
<td>70–79</td>
<td>300</td>
<td>336</td>
<td>112</td>
</tr>
<tr>
<td>80+</td>
<td>114</td>
<td>272</td>
<td>44</td>
</tr>
<tr>
<td>Total (mw (A))</td>
<td>1712</td>
<td>1727</td>
<td>1526</td>
</tr>
<tr>
<td>% Female Population</td>
<td>0.34</td>
<td>0.31</td>
<td>0.44</td>
</tr>
</tbody>
</table>

*Sources: WHO, UN Population Division, SRB*
Distribution of missing women by age:
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Patterns of Disease
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What do age-based comparisons of relative death rates imply?

Can the nature of the disease environment matter?

(changing pattern of disease with development)
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- The epidemiological transition (Omran (1971)):
  - Infectious and deficiency diseases replaced by chronic and degenerative diseases as development proceeds.
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The epidemiological transition (Omran (1971)):

Infectious and deficiency diseases replaced by chronic and degenerative diseases as development proceeds.

Might the transition account for "missing women"?

Conjecture. Infectious diseases affect males and females equally, chronic diseases affect males more.
We compute missing women by age and disease.
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- Data from the Global Burden of Disease Study (GBD)
- Collaborative effort between HSPH, WHO, and World Bank
- Estimation of comprehensive cause-of-death patterns worldwide
- 14 age-sex groups and over 130 important diseases.
- Estimates reflect all information currently available to WHO (also epidemiological models and estimation techniques)
- Data is less reliable for Sub-Saharan Africa
- Caution is required but it is the best data we have
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- **Group 2**: noncommunicable diseases (cardiovascular, cancer);
- **Group 3**: injuries (accidents, war, violence).
<table>
<thead>
<tr>
<th>Disease</th>
<th>sSAfrica</th>
<th>India</th>
<th>China</th>
<th>Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Communicable, Maternal, Perinatal, Nutritional</td>
<td>72</td>
<td>40</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>A. Infectious and parasitic</td>
<td>53</td>
<td>20</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>1. Tuberculosis</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>2. HIV/AIDS</td>
<td>20</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3. Diarrhoeal</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>4. Childhood Clusters</td>
<td>7</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5. Malaria</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>B. Respiratory Infections</td>
<td>10</td>
<td>10</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>C. Maternal</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>D. Perinatal</td>
<td>5</td>
<td>7</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>2. Noncommunicable</td>
<td>21</td>
<td>50</td>
<td>77</td>
<td>87</td>
</tr>
<tr>
<td>A. Malignant neoplasms</td>
<td>4</td>
<td>7</td>
<td>19</td>
<td>26</td>
</tr>
<tr>
<td>B. Cardiovascular</td>
<td>10</td>
<td>27</td>
<td>33</td>
<td>38</td>
</tr>
<tr>
<td>C. Respiratory</td>
<td>2</td>
<td>6</td>
<td>16</td>
<td>6</td>
</tr>
<tr>
<td>D. Digestive</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>3. Injuries</td>
<td>7</td>
<td>10</td>
<td>11</td>
<td>6</td>
</tr>
</tbody>
</table>
Disease Versus Disease Composition
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- Given: gender death rates by age $a$ and disease $k$: $d^m(a,k), d^w(a,k)$. 
Disease Versus Disease Composition

- Given: gender death rates by age \( a \) and disease \( k \): \( d^m(a, k) \), \( d^w(a, k) \).

- “Unbiased” death rate for women by age and disease:

\[
u^w(a, k) = \frac{d^m(a, k)}{\hat{d}^m(a, k) / \hat{d}^w(a, k)}.
\]
Disease Versus Disease Composition

- Given: gender death rates by age $a$ and disease $k$: $d^m(a, k)$, $d^w(a, k)$.

- “Unbiased” death rate for women by age and disease:

$$u^w(a, k) = \frac{d^m(a, k)}{\hat{d}^m(a, k)/\hat{d}^w(a, k)}.$$ 

- Excess female deaths by age and disease:

$$mw(a, k) = [d^w(a, k) - u^w(a, k)] \pi^w(a),$$

where $\pi^w(a)$ is population of age-$a$ women.
Disease Versus Disease Composition

- Given: gender death rates by age $a$ and disease $k$: $d^m(a,k)$, $d^w(a,k)$.

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$$u^w(a,k) = \frac{d^m(a,k)}{\hat{d}^m(a,k) / \hat{d}^w(a,k)}.$$ 

- Excess female deaths by age and disease:

$$mw(a,k) = [d^w(a,k) - u^w(a,k)] \pi^w(a),$$

where $\pi^w(a)$ is population of age-$a$ women.

- Add everything up:

$$mw_B = \sum_{a=1}^{n} \sum_k mw(a,k) + mw(0).$$
Exceptions to this Procedure
Exceptions to this Procedure

- Male death rate undefined for maternal mortality.
Exceptions to this Procedure

- Male death rate undefined for maternal mortality.

- Define unbiased death rate from maternal mortality by

\[
\hat{u}^w(a, \text{mm}) = \frac{\hat{d}^w(a, \text{mm})}{\hat{d}^w(a)} \hat{d}^w(a).
\]
Exceptions to this Procedure

- Male death rate undefined for maternal mortality.

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\[ u^w(a, \text{mm}) = \frac{\hat{d}^w(a, \text{mm})}{\hat{d}^w(a)} d^w(a). \]

- Developed-country death rates for some diseases unreliable for forming reference ratios.
Exceptions to this Procedure

- Male death rate undefined for maternal mortality.

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\[ u^w(a, \text{mm}) = \frac{\hat{d}^w(a, \text{mm})}{\hat{d}^w(a)}d^w(a). \]

- Developed-country death rates for some diseases unreliable for forming reference ratios.

- Malaria, childhood cluster (incl. measles), diarrhoeal diseases, TB:
  - Use overall death rates from all infectious diseases (excluding STDs) within each age in developed regions to compute reference death ratios.
Exceptions to this Procedure

- *Male death rate undefined for maternal mortality.*

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\[ u^w(a, \text{mm}) = \frac{\hat{d}^w(a, \text{mm})}{\hat{d}^w(a)} d^w(a). \]

- *Developed-country death rates for some diseases unreliable for forming reference ratios.*

- Malaria, childhood cluster (incl. measles), diarrhoeal diseases, TB:
  - Use overall death rates from all infectious diseases (excluding STDs) within each age in developed regions to compute reference death ratios.

- Nutritional disease and HIV/AIDS/other STDs (only for younger age categories):
  - Use 1:1 as a reference ratio.
  - (Medical ratios ideal, but where to get these from?)
Recall \( mw_B = \sum_{a=1}^{n} \sum_k mw(a, k) + mw(0) \).
Recall $mw_B = \sum_{a=1}^{n} \sum_{k} mw(a, k) + mw(0)$.

Makes no attempt to account for any change in the disease mix.

(Indeed, disease mix in reference country ignored.)
Recall \( mw_B = \sum_{a=1}^{n} \sum_{k} mw(a, k) + mw(0) \).

Makes no attempt to account for any change in the disease mix.

(Indeed, disease mix in reference country ignored.)

On the other hand, \( mw_A = \sum_{a=0}^{n} mw(a) \) includes the changing mix.
Recall \( mw_B = \sum_{a=1}^{n} \sum_{k} mw(a, k) + mw(0) \).

Makes no attempt to account for any change in the disease mix.

(Indeed, disease mix in reference country ignored.)

On the other hand, \( mw_A = \sum_{a=0}^{n} mw(a) \) includes the changing mix.

Observation. If the disease mix in country of interest is weighted in favor of diseases with relatively equal gender death rates,

\[ \Delta \equiv mw_A - mw_B > 0. \]
Recall $mw_B = \sum_{a=1}^{n} \sum_{k} mw(a, k) + mw(0)$.

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- Observation. If the disease mix in country of interest is weighted in favor of diseases with relatively equal gender death rates, 

$$ \Delta \equiv mw_A - mw_B > 0. $$

- $\Delta$: “missing women” due to the epidemiological transition.
Recall $mw_B = \sum_{a=1}^{n} \sum_{k} mw(a,k) + mw(0)$.

Makes no attempt to account for any change in the disease mix.

(Indeed, disease mix in reference country ignored.)

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Observation. If the disease mix in country of interest is weighted in favor of diseases with relatively equal gender death rates,

$$\Delta \equiv mw_A - mw_B > 0.$$ 

$\Delta$: "missing women" due to the epidemiological transition.

$mw_B$: "missing women" due to lack of similar care".
<table>
<thead>
<tr>
<th>Excess Deaths, 000s</th>
<th>0-4</th>
<th>5-14</th>
<th>15-29</th>
<th>30-44</th>
<th>45-59</th>
<th>60-69</th>
<th>70-79</th>
<th>80+</th>
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<tr>
<td>1. Group 1</td>
<td>263</td>
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<td>61</td>
<td>47</td>
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- $mw_A$ and $mw_B$ include 184,000 missing women at birth.
- Epidemiological transition accounts for 4% of all missing women.
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<td>A. Infect./Parasit.</td>
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<td>23</td>
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<tr>
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<td>71</td>
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<td>4</td>
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<tr>
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<td>8</td>
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<td>10</td>
<td>16</td>
<td>7</td>
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<td>86</td>
<td>32</td>
<td>34</td>
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<td>16</td>
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<th>60-69</th>
<th>70-79</th>
<th>80+</th>
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<td>276</td>
<td>46</td>
<td>402</td>
<td>289</td>
<td>67</td>
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<td>108</td>
<td>112</td>
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<td>-12</td>
<td>-12</td>
<td>-4</td>
<td>-2</td>
<td>-1</td>
<td>-0</td>
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</tbody>
</table>

mw$_B$ = 1,385

| mw$_A$ = 1,526      | 275 | 50   | 406   | 278   | 134   | 97    | 120   | 25  |
|                    | 192 | 70   | 578   | 345   | 84    | 101   | 112   | 44  |

- No missing women at birth.
- Epidemiological transition accounts for 9% of all missing women.
<table>
<thead>
<tr>
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<th>5-14</th>
<th>15-29</th>
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<th>70-79</th>
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<tbody>
<tr>
<td><strong>Group 1</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Infect./Parasit.</td>
<td>270</td>
<td>31</td>
<td>296</td>
<td>221</td>
<td>54</td>
<td>−22</td>
<td>−1</td>
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<tr>
<td>Tuberculosis</td>
<td>0</td>
<td>0</td>
<td>−9</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>−1</td>
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<tr>
<td>HIV/AIDS</td>
<td>−3</td>
<td>−1</td>
<td>277</td>
<td>240</td>
<td>78</td>
<td>13</td>
<td>3</td>
<td>−</td>
</tr>
<tr>
<td>Other STDs</td>
<td>−5</td>
<td>−</td>
<td>11</td>
<td>−2</td>
<td>−13</td>
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<td>−</td>
<td>−</td>
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<td>1</td>
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<td>1</td>
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<td>−</td>
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<td>−</td>
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<tr>
<td>E. Nutritional</td>
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## Excess Deaths, 000s

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<tr>
<th>Group 2</th>
<th>0-4</th>
<th>5-14</th>
<th>15-29</th>
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<th>60-69</th>
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<tr>
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<td>77</td>
<td>79</td>
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\[ mw_B = 1,592 \]

\[ mw_A = 1,727 \]

- \( mw_A \) and \( mw_B \) include 644,000 missing women at birth.
- Epidemiological transition accounts for 8% of all missing women.
# Excess Deaths, 000s

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<td><strong>Group 1</strong></td>
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<th>30-44</th>
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<td>32</td>
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Historical Excursion: Missing Women in 1900 United States
The methodology developed so far can be applied to developed countries a century ago.
Historical Excursion: Missing Women in 1900 United States

- The methodology developed so far can be applied to developed countries a century ago.

- Data for 1900 US comes from the Historical Vital Statistics of the United States.
Historical Excursion: Missing Women in 1900 United States

- The methodology developed so far can be applied to developed countries a century ago.

- Data for 1900 US comes from the Historical Vital Statistics of the United States.

- Begin with sex ratios, just as we did for the developing countries.
Recall old diagram.
Recall old diagram.
India, sub-Saharan Africa...
India, sub-Saharan Africa... and the historical United States
Same phenomenon if we study age-specific death rates.
Same phenomenon if we study age-specific death rates.
Same phenomenon if we study age-specific death rates.
<table>
<thead>
<tr>
<th>Excess Female Deaths, 000s</th>
<th>India</th>
<th>China</th>
<th>ssAfrica</th>
<th>19US</th>
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<td>644</td>
<td>0</td>
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</tr>
<tr>
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<td>132</td>
<td>192</td>
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<tr>
<td>5–14</td>
<td>93</td>
<td>2</td>
<td>70</td>
<td>8</td>
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<td>258</td>
<td>24</td>
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<td>45</td>
</tr>
<tr>
<td>30–44</td>
<td>94</td>
<td>73</td>
<td>345</td>
<td>30</td>
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<tr>
<td>45–59</td>
<td>121</td>
<td>89</td>
<td>84</td>
<td>22</td>
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<tr>
<td>60–69</td>
<td>241</td>
<td>154</td>
<td>101</td>
<td>23</td>
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<tr>
<td>70–79</td>
<td>300</td>
<td>336</td>
<td>112</td>
<td>16</td>
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<tr>
<td>80+</td>
<td>114</td>
<td>272</td>
<td>44</td>
<td>4</td>
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<tr>
<td><strong>Total (mw_A)</strong></td>
<td>1712</td>
<td>1727</td>
<td>1526</td>
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<tr>
<td>% Female Population</td>
<td>0.34</td>
<td>0.31</td>
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- WHO, UN, SRB data, US Historical Vital Statistics
- 1900 US female population approx. 37m.
Missing women by disease in 1900 U.S.
<table>
<thead>
<tr>
<th>Disease</th>
<th>sSA</th>
<th>19US</th>
<th>India</th>
<th>China</th>
<th>Dev</th>
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<td><strong>Group 1</strong></td>
<td></td>
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<tr>
<td>A. Infectious and parasitic</td>
<td>53</td>
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<td>20</td>
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<td>11</td>
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<tr>
<td>4. Childhood Clusters</td>
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<td>0</td>
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<tr>
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<td>10</td>
<td>15</td>
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<td>3</td>
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<td>0</td>
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<td><strong>Group 2</strong></td>
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<td>11</td>
<td>27</td>
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<td>38</td>
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<td>1</td>
<td>6</td>
<td>16</td>
<td>6</td>
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### Excess Deaths, 00s

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<th>0-4</th>
<th>5-14</th>
<th>15-29</th>
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<th>80+</th>
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<td>85</td>
<td>26</td>
<td>168</td>
<td>201</td>
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<td>68</td>
<td>64</td>
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<td>71</td>
<td>98</td>
<td>116</td>
<td>100</td>
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<td>−8</td>
<td>−9</td>
<td>−2</td>
<td>1</td>
<td>3</td>
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</tbody>
</table>

\[ mw_B = 1,115 \]

\[ mw_A = 1,548 \]

- Excess Female Deaths by Disease Group: 1900 US.
- No missing women at birth.
- Epidemiological transition explains 28%.
- All figures in *hundreds*. 
<table>
<thead>
<tr>
<th>Excess Deaths, 00s</th>
<th>0-4</th>
<th>5-14</th>
<th>15-29</th>
<th>30-44</th>
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<th>60-69</th>
<th>70-79</th>
<th>80+</th>
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<tr>
<td>Group 1</td>
<td>85</td>
<td>26</td>
<td>168</td>
<td>201</td>
<td>80</td>
<td>68</td>
<td>64</td>
<td>21</td>
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<td>A. Infect./Parasit.</td>
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<td>149</td>
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<td>45</td>
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* A look inside Group 1: United States, 1900.
<table>
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<tr>
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<th>15-29</th>
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<td>116</td>
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<td>A. Cancer</td>
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<td>-</td>
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<td>19</td>
<td>39</td>
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<td>14</td>
<td>4</td>
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<tr>
<td>B. Cardiovascular</td>
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<td>51</td>
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<tr>
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<td>-1</td>
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<td>22</td>
<td>15</td>
<td>10</td>
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<td>-1</td>
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</table>

A look inside Group 2: United States, 1900.
Patterns in historical data are similar to developing countries today.
Patterns in historical data are similar to developing countries today.

Exception. 0–4 age category, less missing girls in historical case.
Patterns in historical data are similar to developing countries today.

Exception. 0–4 age category, less missing girls in historical case

Female deficit from respiratory deaths (not counting TB) similar to s-S Africa.
Patterns in historical data are similar to developing countries today.

Exception. 0–4 age category, less missing girls in historical case

Female deficit from respiratory deaths (not counting TB) similar to s-S Africa.

Female deficit from TB is high. TB a major killer in 1900 US.

Reference rates for TB unreliable. Using those for older age groups more than doubles the estimates of missing women from this disease in 1900 U.S.
Patterns in historical data are similar to developing countries today.

Exception. 0–4 age category, less missing girls in historical case

Female deficit from respiratory deaths (not counting TB) similar to s-S Africa.

Female deficit from TB is high. TB a major killer in 1900 US.

Reference rates for TB unreliable. Using those for older age groups more than doubles the estimates of missing women from this disease in 1900 U.S.

Classification problems: "convulsions" and "debility and atrophy".
Epidemiological transition may play a larger role in historical US.
Epidemiological transition may play a larger role in historical US.
Epidemiological transition may play a larger role in historical US.
Summary
Summary

- Missing women defined by aggregate sex ratios can be misleading.
Summary

- Missing women defined by aggregate sex ratios can be misleading.
- Reference country has different age distributions and disease patterns
Summary

- Missing women defined by aggregate sex ratios can be misleading.
- Reference country has different age distributions and disease patterns
- Important to understand at what age women are missing and what diseases are responsible
So we unpack missing women by age and disease
So we unpack missing women by age and disease

$mw_A$ is missing women by age.

(No control for epidemiological transition.)
So we unpack missing women by age and disease

$mw_A$ is missing women by age.

(No control for epidemiological transition.)

$mw_B$ is missing women by disease and age.

(Disease by disease; no compositional effects.)
So we unpack missing women by age and disease

$mw_A$ is missing women by age.

(No control for epidemiological transition.)

$mw_B$ is missing women by disease and age.

(Disease by disease; no compositional effects.)

The difference $mw_B - mw_A$ proxies the epidemiological transition.
So we unpack missing women by age and disease

$mw_A$ is missing women by age.

(No control for epidemiological transition.)

$mw_B$ is missing women by disease and age.

(Disease by disease; no compositional effects.)

The difference $mw_B - mw_A$ proxies the epidemiological transition.

Epidemiological transition explains 7% missing women.
Percentage of Missing Women by Disease
## Percentage of Missing Women by Disease

<table>
<thead>
<tr>
<th>Disease</th>
<th>India</th>
<th>China</th>
<th>SSA</th>
<th>1900US</th>
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</thead>
<tbody>
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<td>Group 1</td>
<td>33</td>
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<td>A. Infectious and parasitic</td>
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<td>61</td>
<td>44</td>
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<td>HIV/AIDS</td>
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<td>44</td>
<td>0</td>
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<td>Malaria</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>2</td>
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<tr>
<td>B. Respiratory Infections</td>
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<td>6</td>
<td>3</td>
<td>14</td>
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<tr>
<td>C. Maternal</td>
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<td>17</td>
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<tr>
<td>Group 2</td>
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<tr>
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Concept of Missing Women
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- We have identified the question of age and disease composition
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- Some categories represent clear indicators of violence or discrimination against women.
- In India fire-related death is a leading cause of missing women due to injuries (over 100,000 each year).
- Could be dowry related violence
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- Only area of the world where women are more likely to commit suicide than men

- Overall 25% more likely, rural areas 66% more likely.
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Maternal mortality perhaps more straightforward.

Maternal deaths practically eradicated over the 20th century in developed countries

But maternal mortality in 1900 U.S was the same as in India today.
A more complex example:

600,000 missing women each year from HIV/AIDS in Sub-Saharan Africa.
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- Is this lack of “similar care”? The result of sexual practices? Imbalances in social power? Violence?
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Highlights relativistic nature of computation of missing women.
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Not clear from looking at the numbers

Male and female death rates from cardiovascular disease in India are 26.2 and 22.2

Male and female death rates from cardiovascular disease in developed countries are 15.4 and 9.3