The decomposition of health expectancy change during 1987-2006 among Chinese elderly population

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Content

1 Background
2 Methods
3 Results & Discussion
4 Conclusion
1.1 China is undergoing health transition, but the mechanism is not so clear.

Figure 1. The life expectancy at birth in China during 1981-2010

Source: Tabulation on the 2010 population census of the People's Republic of China.
1.2 Disparity in the health pattern between urban and rural China

Figure 3. The life expectancy for urban and rural Chinese from 1982 to 2009

1.2 Disparity in the health pattern between urban and rural China

Figure 4. The 10 most highest disease-specific crude death rates for urban and rural China in 2011

Source: China Health Statistical Yearbook 2012
1.3 Study aim

- To calculate the change in disability-free life expectancy (DFLE) among elderly population (aged 60 and over) in China.
- To decompose the DFLE\textsubscript{60} changes into contribution of different disease groups.
- To explore the different health transition trajectory between urban and rural elderly population in China.
Content

1. Background
2. Methods
3. Results & Discussion
4. Conclusion
2.1 Data

DFLE = Quantity of life + Quality of life

Quantity of life
  └── Mortality
      ├── Cause of death
      │   └── Prevalence of disability
      └── Cause of disability

Quality of life
  └── Mortality
      └── Cause of death

DFLE = \text{Quantity of life} + \text{Quality of life}
2.1 Data---Mortality

1. Data sources (NBS)
   - 1987 1% Population Sample Survey in China
   - 2006 National Sample Survey on Population Changes (0.907‰)

2. Evaluation
   - Basically, both are nationally representative (NBS, 1988, 2007)
   - But, the mortality is under-reported, especially among elderly population (You & Zheng, 2005).

3. Adjustment
   - The life table was adjusted according to west model life table by Coale, Demeny, and Vaughan (1983)
2.1 Data---Death cause

1. Data sources (National CDC)
   1990 & 2006 National Death Cause monitoring System

2. Evaluation
   The disease-specific mortality is under-reported
   But, the structure of diseases, as cause of death, is generally reliable.
   (Ren et al., 2005)
2.1 Data---Disability level & cause

1. Data sources (mainly implemented by NBS)
   - 1987 National Sample Survey on Disability in China (1987 CSSD)
   - 2006 National Sample Survey on Disability in China (2006 CSSD)

2. Evaluation
   - The data quality is acceptable. (Zheng et al., 2011)
   - The two surveys are basically comparable (Liu et al., 2009)
2.2 Measures---Cause of Death

1. Coding rules
   1987-ICD 9 & 2006-ICD 10

2. Comparability
   - How to compare?
   - Finally, 18 disease or injury groups.
2.2 Measures---Disability

• **Definition**

A disabled person as someone who suffered from one or more abnormalities in anatomical structure or the loss of a certain organ or function (either psychological or physiological), and lost (totally or in part) the ability to perform an activity in the normal way.
2.2 Measures---Disability

- How to identify a disabled person and the causes?

**STEP 1**
Trained interviewers
Questionnaire
Find the suspected disabled persons

**STEP 2**
Physicians
Medical examination
Confirm the disability and causes

Disability – dummy variable
Causes-coded according to ICD rules
2.3 Statistical Analysis

1. Sullivan method (Sullivan, 1971)
   - to compute the change of $DFLE_{60}$ between 1987 and 2006

   - to decompose the $DFLE_{60}$ change into contributions of diseases and injury.
   - four steps are carried out

Step 1. $DFLE_{60}$ change = Mortality effect + Disability effect
Step 2. Mortality effect = $\sum$ Mortality effect (k)
Step 3. Disability effect = $\sum$ Disability effect (k)
Step 4. Contribution (k) = Mortality effect (k) + Disability effect (k)

Details
3.1 The change of DFLE_{60}

<table>
<thead>
<tr>
<th>Year</th>
<th>Urban male</th>
<th>Rural male</th>
<th>Urban female</th>
<th>Rural female</th>
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<tbody>
<tr>
<td>2006</td>
<td>14.15</td>
<td>12.60</td>
<td>15.53</td>
<td>13.03</td>
</tr>
<tr>
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<td>1987</td>
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<td></td>
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<td>3.93</td>
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<td></td>
<td>13.98</td>
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<td></td>
<td>5.46</td>
<td>4.91</td>
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<tr>
<td></td>
<td>71.91%</td>
<td>72.61%</td>
<td>75.47%</td>
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<tr>
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<td>72.77%</td>
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<td>77.61%</td>
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<tr>
<td></td>
<td>77.57%</td>
<td>77.57%</td>
<td>77.57%</td>
<td>77.57%</td>
</tr>
</tbody>
</table>

Figure 5. The change of DFLE_{60}, LWD_{60} and LE_{60} during 1987~2006
3.2 The contribution of mortality and disability effect

![Figure 6. The decomposition of change of DFLE₆₀ changes during 1987~2006 into disability and mortality effect](image-url)
### 3.3 Table 1. The mortality effect, disability effect and total effect of diseases on DFLE\textsubscript{60} changes during 1987~2006

<table>
<thead>
<tr>
<th>Disease Type</th>
<th>Urban Male ME</th>
<th>Urban Male DE</th>
<th>Urban Male Total</th>
<th>Urban Female ME</th>
<th>Urban Female DE</th>
<th>Urban Female Total</th>
<th>Rural Male ME</th>
<th>Rural Male DE</th>
<th>Rural Male Total</th>
<th>Rural Female ME</th>
<th>Rural Female DE</th>
<th>Rural Female Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infectious</td>
<td>0.08</td>
<td>0.05</td>
<td>0.13</td>
<td>0.04</td>
<td>0.11</td>
<td>0.14</td>
<td>0.17</td>
<td>0.10</td>
<td>0.27</td>
<td>0.15</td>
<td>0.21</td>
<td>0.36</td>
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<td>Neoplasm</td>
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<td>0.00</td>
<td>-0.10</td>
<td>-0.22</td>
<td>-0.01</td>
<td>-0.22</td>
<td>-0.49</td>
<td>0.00</td>
<td>-0.49</td>
<td>-0.32</td>
<td>0.00</td>
<td>-0.32</td>
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<td>Endocrine</td>
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<td>0.00</td>
<td>-0.04</td>
<td>-0.08</td>
<td>0.00</td>
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<td>-0.03</td>
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<td>-0.04</td>
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<td>Mental</td>
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<td>0.00</td>
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<td>Nervous</td>
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<td>Eye</td>
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<td>0.21</td>
<td>0.00</td>
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<td>0.35</td>
<td>0.01</td>
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<td>Circulatory</td>
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<td>-0.08</td>
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<td>-0.18</td>
<td>-0.10</td>
<td>-0.32</td>
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<td>-0.54</td>
<td>-0.36</td>
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<td>-0.55</td>
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<tr>
<td>Respiratory</td>
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<td>0.75</td>
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<td>0.05</td>
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<td>Genitourinary</td>
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<td>0.00</td>
<td>-0.01</td>
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<td>0.02</td>
<td>0.02</td>
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<tr>
<td>Maternal</td>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
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<td>0.01</td>
<td>0.00</td>
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</tr>
<tr>
<td>Skin</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
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<td>0.00</td>
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<tr>
<td>Musculoskeletal</td>
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<td>0.02</td>
<td>0.02</td>
<td>0.00</td>
<td>0.01</td>
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<td>0.01</td>
<td>0.00</td>
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<tr>
<td>Congenital</td>
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<td>-0.01</td>
<td>-0.01</td>
<td>0.00</td>
<td>-0.02</td>
<td>-0.02</td>
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<td>-0.03</td>
<td>0.01</td>
<td>-0.03</td>
<td>-0.02</td>
</tr>
<tr>
<td>Perinatal</td>
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<td>-0.10</td>
<td>0.00</td>
<td>-0.11</td>
<td>-0.11</td>
<td>0.00</td>
<td>-0.08</td>
<td>-0.07</td>
<td>0.00</td>
<td>-0.09</td>
<td>-0.08</td>
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<tr>
<td>Injury</td>
<td>0.57</td>
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<td>0.39</td>
<td>0.64</td>
<td>-0.11</td>
<td>0.52</td>
<td>0.51</td>
<td>-0.23</td>
<td>0.28</td>
<td>0.51</td>
<td>-0.17</td>
<td>0.34</td>
</tr>
<tr>
<td>Other</td>
<td>0.08</td>
<td>-0.09</td>
<td>-0.01</td>
<td>0.21</td>
<td>-0.37</td>
<td>-0.16</td>
<td>0.09</td>
<td>-0.41</td>
<td>-0.31</td>
<td>0.07</td>
<td>-0.53</td>
<td>-0.45</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1.15</strong></td>
<td><strong>0.19</strong></td>
<td><strong>1.34</strong></td>
<td><strong>1.16</strong></td>
<td><strong>0.27</strong></td>
<td><strong>1.44</strong></td>
<td><strong>0.80</strong></td>
<td><strong>-0.30</strong></td>
<td><strong>0.51</strong></td>
<td><strong>0.89</strong></td>
<td><strong>0.07</strong></td>
<td><strong>0.95</strong></td>
</tr>
</tbody>
</table>
The negative impact of disease related to public health and living standard went down

- Public health projects (such as vaccine and sanitary water) improve living environment (Sinton et al., 2004; MOH, 2009);

- Social and economic development provide better living conditions (NBS, 2009)

- Progress in medical technology to better cure diseases (Zheng et al., 2011; Wang & Li, 2009);
Table 3. During 1987~2006, whose changes decreased DFLE_{60}?

<table>
<thead>
<tr>
<th></th>
<th>Urban male</th>
<th>Urban female</th>
<th>Rural male</th>
<th>Rural female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neoplasm</td>
<td>-0.10</td>
<td>-0.22</td>
<td>-0.49</td>
<td>-0.32</td>
</tr>
<tr>
<td>Circulatory</td>
<td>-0.08</td>
<td>-0.10</td>
<td>-0.54</td>
<td>-0.55</td>
</tr>
<tr>
<td>Endocrine and blood</td>
<td>-0.04</td>
<td>-0.08</td>
<td>-0.03</td>
<td>-0.04</td>
</tr>
<tr>
<td>Mental</td>
<td>-0.02</td>
<td>-0.04</td>
<td>-0.05</td>
<td>-0.10</td>
</tr>
</tbody>
</table>

The negative impact of diseases related to life style and health behaviour increased.
- During 1992~2002, the prevalence of **overweight** increased by 38.6%;
- During 1991~2002, the prevalence of **hypertension** increased from 13.58% to 17.65% (aged 15 and over)
  (Wang, 2005)
3.4 The urban-rural disparity

Compared with urban area, the negative impact of infectious and respiratory diseases on $\text{DFLE}_{60}$ decreased faster in rural area.

Figure 7. The contribution of infectious and respiratory diseases to the change of $\text{DFLE}_{60}$
3.4 The urban-rural disparity

Compared with urban area, the negative impact of infectious and respiratory diseases on DFLE$_{60}$ decreased faster in rural area.

- In 1987, their influences were higher in rural China
  - more space to improve in rural China

- Chinese government implemented projects to improve the living environment in rural area. (MOH, 2009)
  
  e.g. during 1993~2008, the prevalence of tap water increased by 20%, and the prevalence of unsanitary toilets decreased by 38%.
3.4 The urban-rural disparity

Compared with urban China, the negative impact of circulatory and neoplasm increased at a faster speed in rural China.

Figure 8. The contribution of neoplasm and circulatory diseases to the change of DFLE_{60}
3.4 The urban-rural disparity

Compared with urban area, the negative impact of circulatory and neoplasms increased at a faster speed in rural area.

- The rural residents also went through changes in lifestyle.
- The health resource in rural China is relatively poor.

(Eggleston et al., 2008)
Compared with urban area, the negative impact of circulatory and neoplasm increased at a faster speed in rural area.

- The rural residents also went through changes in life style.

- The health resource in rural China is relatively poor. (Eggleston et al., 2008)

3.4 The urban-rural disparity

The prevalence of hypertension increased by 3.4 times during 1993~2008, which is higher than that in urban area (1.6 times) (MOH, 2009)
3.4 The urban-rural disparity

Compared with urban area, the negative impact of circulatory and neoplasm increased at a faster speed in rural area.

- The rural residents also went through changes in lifestyle.
- The health resource in rural China is relatively poor. (Eggleston et al., 2008)
Limitations

1. The measurement of disability
   - Not measured with ADL/IADL, but primarily as impairments that caused difficulty in functioning (Jagger and Robine, 2011; Zheng et al., 2011)
   - Consistent with the standard of Chinese disability certificate, one of the qualifying criteria for disability allowances (CDPF, 2008)
   - Medical confirmation by physicians is more accurate than self-reported data.

   - Not only the way to group diseases, but also the rule to judge the cause of death (Anderson&Rosenberg, 2003; Janssen&Kunst, 2004)
   - Analyses were carried out at the level of disease group---help to reduce the impact (Wang&Li, 2009)

3. The selection bias
   - Some disabled persons may have died before the surveys.
   - Old persons at 1987 - birth before 1927; at 2006 - birth before 1946
   - Before 1949, wars, famines, and poor health conditions
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Conclusion

1. The $\text{DFLE}_{60}$ change is a combined influence of different diseases.

   Push forward: the influence of diseases related to poor public health and living standard decreased
   Pull back: the influence of diseases related to life style increased.

2. Health system needs to be adjusted to health transition in China.
   e.g. health intervention to promote healthy life style

3. Health policy needs to be designed considering the different health pattern in urban and rural China.
Thanks!