Changes in morbidity by proximity to death over time: Evidence from Europe

Ingo Kolodziej, Dörte Heger

Rheinisch-Westfälisches Institut für Wirtschaftsforschung (RWI)

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Motivation

- Increase of life expectancy
  - By 2.6% (2 years at age 60, 1 year at age 80) from 2002 to 2012
- Rise of health care costs
  - By 21% from 2000 to 2013
- Change in morbidity
  - By 4% from 2000 to 2013

- Health care use of the elderly is important to predict the additional health care expenditures arising from population ageing.

- Ultimately, morbidity instead of age per se determines an individuals need for health services.
Introduction

Research Question

Explore the effects of demographic ageing and societal trends on morbidity: Are the additional life-years gained lived in bad health or does morbidity decline over time?

- **Compression of morbidity:** Morbidity is declining with increasing life expectancy. Time between first occurrence of disease and later death is declining (preventative measures; Fries 1980).

- **Expansion of morbidity:** Total morbidity is increasing, time spent in bad health is expanding (curative measures or medicalisation; Gruenberg 1977).

**Underlying causes of changes in morbidity:**

Influence of socio-economic, clinical and behavioural factors.
Empirical work

Empirical Studies draw mixed results:


- Evidence for compression of morbidity based on disability
  - recent, younger cohorts of the elderly
  - increase in active life expectancy past age 65 and decrease in disabled life expectancy.

Chatterji et al. 2015, Crimmins et al. 2010

- no consistent evidence for compression of morbidity in all countries
  - difficulties with iADL become more apparent in elderly across all countries
  - increased disease and loss of function.
Contribution

- Exploit the longitudinal aspect of a large European dataset
- Use additional information provided by exit interviews
- Combination of commonly used measures for morbidity: ADL, iADL as a meaningful measure of disability

ADL limitations include having problems concerning dressing, walking across a room, bathing or showering, eating, getting out of bed, and using the toilet, while IADL limitations include having problems concerning orientation using a map, preparing a hot meal, shopping for groceries, making telephone calls, taking medications, doing work around the house or garden, managing money.
Survey of Health and Retirement in Europe (SHARE)

- Micro data on health, socio-economic status
- Ten European countries that have respondents alive in 2004 and 2011
- Exit interviews:
  - Proxy answered questions about a former SHARE respondent’s last year of life.
  - Include individuals that died between 2004 and 2013: last two years of live are the most expensive.

Countries included: Austria, Germany, Sweden, the Netherlands, Spain, Italy, France, Denmark, Switzerland, Belgium.

Main causes of death include cancer, heart attack, stroke, other cardiovascular related disease, disease of the digestive system, severe infections disease and other, excluding death by accidents.
Main variables

- Disability defined as *Activity Limitations*: composite measure of limitations in (instrumental) activities of daily living; used to assess LTC needs.

- Predictors:
  - **Demography**
    - (age groups by gender, marital status, education, Living Area, Net Worth)
  - **Medical events**
    - (Cancer, Chronic Lung Disease, Parkinson’s Disease, Heart Attack, Stroke, Hip or Femoral Fracture, High Blood Pressure, High Blood Cholesterol, Diabetes, Asthma, Arthritis, Osteoporosis, Ulcer, Cataracts)
  - **Behavioural factors**
    - (smokes, physical inactivity, drinking habits, weight)
### Descriptive statistics

<table>
<thead>
<tr>
<th></th>
<th>TTD:2 2004-2005</th>
<th></th>
<th>TTD:2 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean</td>
<td>sd</td>
<td>mean</td>
</tr>
<tr>
<td>Numb. of activity lim.</td>
<td>3.09</td>
<td>4.03</td>
<td>3.94</td>
</tr>
<tr>
<td>ADL Limitations</td>
<td>1.20</td>
<td>1.86</td>
<td>1.69</td>
</tr>
<tr>
<td>IADL Limitations</td>
<td>1.89</td>
<td>2.42</td>
<td>2.25</td>
</tr>
</tbody>
</table>

#### Demographics

<table>
<thead>
<tr>
<th>Age</th>
<th>TTD:2 2004-2005</th>
<th></th>
<th>TTD:2 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean</td>
<td>sd</td>
<td>mean</td>
</tr>
<tr>
<td>Age 50-59</td>
<td>0.10</td>
<td>0.30</td>
<td>0.06</td>
</tr>
<tr>
<td>Age 60-69</td>
<td>0.18</td>
<td>0.38</td>
<td>0.15</td>
</tr>
<tr>
<td>Age 70-79</td>
<td>0.31</td>
<td>0.46</td>
<td>0.26</td>
</tr>
<tr>
<td>Age 80+</td>
<td>0.42</td>
<td>0.49</td>
<td>0.53</td>
</tr>
</tbody>
</table>

We use calibrated weights to make results representative for the population 50 and older in the respective countries at the time of the interview.
Disability by age groups at two different points in time

Ingo Kolodziej, Dörte Heger (RWI)

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Disability by Time (in Months) until Death by Wave

Wave 1
- ≤ 12: High
- 13-24: Moderate
- >24: Low

Wave 4
- ≤ 12: Very High
- 13-24: High
- >24: Moderate

Mean of AL

Graphs by time until death
Morbidity levels

- by age: healthy life span is extended in absolute terms.
- by proximity of death: sickness is compressed into a shorter time span before death in absolute terms.
- Could be an extension of morbidity, i.e. people live longer with disability.

To control for possible confounding factors, such as changes in the age and sex composition, a multivariate analysis is necessary.
Methodology

- First, we consider a linear model of health, where health is explained by demographic, clinical and behavioural factors and control for the country of origin:

\[ AL = \beta_0 + \beta_{dem} \times DEM + \beta_{clin} \times CLIN + \beta_{beh} \times BEH + \beta_{cou} \times COU. \]

- Old age (age 80+) is positively related to the number of activity limitations.
- The effect is more pronounced for women.
- Low socioeconomic status and being single are associated with more activity limitations.
Methodology

We use an Oaxaca-Blinder decomposition to decompose drivers of the change in morbidity into the change in demographic, clinical and behavioural factors and the change of their impact on morbidity status (Cutler 2013, Oaxaca 1973; Blinder 1973; Jann 2008):

\[
\Delta AL = (\Delta DEM \times \beta_{dem}^{t_0} + \Delta CLI \times \beta_{cli}^{t_0} + \Delta BEH \times \beta_{beh}^{t_0} + \Delta COU \times \beta_{cou}^{t_0}) \\
+ (DEM_{t_0} \times \Delta \beta_{dem} + CLI_{t_0} \times \Delta \beta_{cli} + BEH_{t_0} \times \Delta \beta_{beh} + COU_{t_0} \times \Delta \beta_{cou})
\]

"explained part":
differences in the endowments, i.e. observable characteristics

"unexplained part":
differences in coefficients and unobservable factors
## Methodology and Results

### Decomposition Results

#### Changes over Time, 2004/5 vs. 2011

<table>
<thead>
<tr>
<th></th>
<th>overall</th>
<th>explained</th>
<th>unexplained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave 1</td>
<td>0.622*** (0.021)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wave 4</td>
<td>0.615*** (0.024)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>difference</td>
<td>0.007 (0.032)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>explained</td>
<td>-0.063* (0.036)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>unexplained</td>
<td>0.070 (0.043)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demographics</td>
<td>-0.019 (0.017)</td>
<td>-0.358** (0.172)</td>
<td></td>
</tr>
<tr>
<td>Conditions</td>
<td>0.018 (0.012)</td>
<td>-0.057 (0.036)</td>
<td></td>
</tr>
<tr>
<td>Behaviour</td>
<td>-0.055** (0.026)</td>
<td>-0.189** (0.094)</td>
<td></td>
</tr>
<tr>
<td>Countries</td>
<td>-0.006** (0.003)</td>
<td>-0.009 (0.015)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.683*** (0.195)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>44,473</td>
<td>44,473</td>
<td>44,473</td>
</tr>
</tbody>
</table>

Note: * p < 0.10, ** p < 0.05, *** p < 0.01
Results

- The difference in average disability levels is insignificant and negligible in size.
- Had the population composition remained unchanged, the difference in the number of activity limitations between wave 1 and wave 4 would be greater by 0.063 limitations.
- Influence of demographic factors: age group 50 to 59 and being male have negative impact.
- The impact of most of the other socioeconomic variables remained unchanged while the coefficient effect of income is positive.
- Except for chronic lung disease, the unexplained changes for the health conditions are statistically insignificant.
- Behavioural factors influence morbidity differently (weight).
While average disability did not change over time, this finding is the result of two opposing trends:

- changes in the population composition by itself would have led to an increase in the average disability level,
- unobserved changes counteracted this effect.
Thank you for your attention.