Trends of Active Life Expectancy for the Elderly in Taiwan 1989-1999

- An Application of the IMaCh Approach

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Contents of the Study

- Background Information
- Study Assumptions
  - Method
  - Results
  - Summary
  - Limitation of the Study
- Conclusions & Future Plans
In the past 50 years, demographic changes in Taiwan have been significant. Decreasing fertility by 75% and mortality by 42.5% are notable. In 1952, fertility was 46.6, and by 2001, it had decreased to 11.7. Mortality similarly decreased, from 9.9 in 1952 to 5.7 in 2001. Leading causes of death have shifted from infectious to chronic diseases. Life expectancy has increased, and the aged population is growing.
Study Question and Assumption - 1

General Question -

*Do the elderly live longer and healthier in Taiwan?*

Study Questions 1 -

1. Health Transition (HT)
   - What are patterns and trends of HT among the elderly? by gender?

Assumptions

**HT:** The older groups have lower rates of improving HT and higher rates of deteriorating HT

**HT by Gender**
The female elderly have higher rates of deteriorating HT and retention HT in unhealthy state.
Study Questions and Assumptions - I

2. Active Life Expectancy (ALE)

- What are patterns and trends of ALE for the elderly in Taiwan? By gender? By the initial health states?

**Assumptions**

**ALE** and inactive LE of the elderly increased as the LE did.

**ALE by Gender:** The female elderly have longer LE and ALE, but lower percentages of ALE.

**ALE by the initial health states**

The one who started with an active state will have a longer ALE compared to the one who started with an inactive state.
Method - Data and Survey Design

- **Source of data**
  - Surveys of Health and Living Status of the Elderly in Taiwan (SHLSE) Conducted jointly by the Bureau of Health Promotion (Taiwan) and the Population Studies Center and Institute of Gerontology at University of Michigan (U.S.)

- **Survey design**
  - Multiple stage sampling method
  - Population: Age 60 and over in 1989 in Taiwan
## Sampling and Response Rates

<table>
<thead>
<tr>
<th>Content</th>
<th>1st wave</th>
<th>2nd wave</th>
<th>3rd wave</th>
<th>4th wave</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interview mon.</td>
<td>4-11</td>
<td>4-12</td>
<td>4-12</td>
<td>4-12</td>
</tr>
<tr>
<td>No. and Age of respondents</td>
<td>4049 (60+)</td>
<td>3154 (64+)</td>
<td>2669 (67+)</td>
<td>2310 (70+)</td>
</tr>
<tr>
<td>Deceased c. (Cumulate c.)</td>
<td>-</td>
<td>590</td>
<td>470 (1069)</td>
<td>426 (1488)</td>
</tr>
<tr>
<td>Mortality rates</td>
<td>-</td>
<td>18.4%</td>
<td>17.4%</td>
<td>19.0%</td>
</tr>
<tr>
<td>Response rates</td>
<td>91.8%</td>
<td>91.2%</td>
<td>89.3%</td>
<td>90.8%</td>
</tr>
<tr>
<td>Proxy cases (%)</td>
<td>126 (3.1%)</td>
<td>203 (6.4%)</td>
<td>251 (9.4%)</td>
<td>241 (10.4%)</td>
</tr>
</tbody>
</table>
**Survey Question**
- Do you have any difficulty performing any of the following activities by yourself because of a health or physical problem?
  - Bathing, managing money, using the telephone, and shopping

**Definition of an Active / Inactive states**
- Active state (Healthy state)
  - Without any problem performing any of the activities
- Inactive state (Unhealthy state)
  - Having at least one problem performing any of the activities
Research Design

- Multi-state life table concept

  Healthy (Active) ↔ Un-healthy (Inactive) → Death

- IMaCh program
  - The Interpolation Markov Chain (developed by Brouard & Lièvre)
Results of Frequencies and LE

- Frequencies
- Life Expectancy
Result 1 - Frequencies of Basic Variables

<table>
<thead>
<tr>
<th>Survey year (SA) Variables (%)</th>
<th>1989 (60+)</th>
<th>1993 (64+)</th>
<th>1996 (67+)</th>
<th>1999 (70+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-64 (%)</td>
<td>68.11</td>
<td>71.34</td>
<td>73.77</td>
<td>76.27</td>
</tr>
<tr>
<td>65-69</td>
<td>36.60</td>
<td>6.12</td>
<td>25.78</td>
<td>----</td>
</tr>
<tr>
<td>70-74</td>
<td>28.45</td>
<td>40.74</td>
<td>37.32</td>
<td>45.45</td>
</tr>
<tr>
<td>75-79</td>
<td>17.91</td>
<td>27.14</td>
<td>20.79</td>
<td>31.60</td>
</tr>
<tr>
<td>80-84</td>
<td>10.82</td>
<td>15.00</td>
<td>11.24</td>
<td>14.59</td>
</tr>
<tr>
<td>85+</td>
<td>4.22</td>
<td>8.02</td>
<td>4.87</td>
<td>8.35</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>57.08</td>
<td>56.44</td>
<td>55.90</td>
<td>55.02</td>
</tr>
<tr>
<td>Female</td>
<td>42.92</td>
<td>43.56</td>
<td>44.10</td>
<td>44.98</td>
</tr>
<tr>
<td>Total N %</td>
<td>4049</td>
<td>3154</td>
<td>2669</td>
<td>2310</td>
</tr>
</tbody>
</table>

SA: Age of sample
### Result 2 - Frequencies of ADL and IADLs

<table>
<thead>
<tr>
<th>Variables</th>
<th>Survey year (N)</th>
<th>1989 (age 60+)</th>
<th>1993 (64+)</th>
<th>1996 (67+)</th>
<th>1999 (70+)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ADL – Bathing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Problem</td>
<td>94.04</td>
<td>93.71</td>
<td>91.72</td>
<td>87.23</td>
<td></td>
</tr>
<tr>
<td>With problem</td>
<td>5.96</td>
<td>6.27</td>
<td>8.28</td>
<td>12.77</td>
<td></td>
</tr>
<tr>
<td>Missing (N)</td>
<td>7</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>IADL - shopping</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Problem</td>
<td>89.95</td>
<td>87.08</td>
<td>84.30</td>
<td>81.16</td>
<td></td>
</tr>
<tr>
<td>With Problem</td>
<td>10.05</td>
<td>12.92</td>
<td>15.70</td>
<td>18.84</td>
<td></td>
</tr>
<tr>
<td>Missing (N)</td>
<td>70</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>IADL - managing money</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Problem</td>
<td>91.94</td>
<td>90.44</td>
<td>86.73</td>
<td>84.89</td>
<td></td>
</tr>
<tr>
<td>With problem</td>
<td>8.06</td>
<td>9.56</td>
<td>13.27</td>
<td>15.11</td>
<td></td>
</tr>
<tr>
<td>Missing (N)</td>
<td>53</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>IADL - using telephone</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Problem</td>
<td>84.33</td>
<td>81.77</td>
<td>81.93</td>
<td>79.23</td>
<td></td>
</tr>
<tr>
<td>With Problem</td>
<td>15.67</td>
<td>18.23</td>
<td>18.07</td>
<td>20.27</td>
<td></td>
</tr>
<tr>
<td>Missing (N)</td>
<td>297</td>
<td>11</td>
<td>13</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td><strong>Sum of Activity limitation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No problem</td>
<td>80.8</td>
<td>76.4</td>
<td>75.3</td>
<td>71.2</td>
<td></td>
</tr>
<tr>
<td>With problem</td>
<td>19.2</td>
<td>23.6</td>
<td>24.7</td>
<td>28.8</td>
<td></td>
</tr>
<tr>
<td>Missing (N)</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Total N</strong></td>
<td>4049</td>
<td>3154</td>
<td>2669</td>
<td>2310</td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
## Comparisons of Life Expectancy at Age 60

### Official report*

<table>
<thead>
<tr>
<th>Year</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989 age 60</td>
<td>17.9</td>
<td>20.3</td>
</tr>
<tr>
<td>1993 age 64</td>
<td>15.2</td>
<td>18.0</td>
</tr>
<tr>
<td>1996 age 67</td>
<td>13.6</td>
<td>15.9</td>
</tr>
<tr>
<td>1999 age 70</td>
<td>11.9</td>
<td>13.8</td>
</tr>
</tbody>
</table>

### SHLSEs (survey data)

<table>
<thead>
<tr>
<th>Year</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989-93 age 64</td>
<td>15.0</td>
<td>16.4</td>
</tr>
<tr>
<td>1993-96 age 67</td>
<td>13.0</td>
<td>15.3</td>
</tr>
<tr>
<td>1996-99 age 70</td>
<td>13.6</td>
<td>14.3</td>
</tr>
<tr>
<td>1989-99 age 70</td>
<td>12.2</td>
<td>13.1</td>
</tr>
</tbody>
</table>

### Difference

- **0.2**  | 1.6  | /1993
- **0.6**  | 0.6  | /1996
- **-1.7** | -0.5 | /1999

Results for Assumption I

Health Transition

☞ General Patterns and Trends
☞ By Gender
Health Transition by Gender

- The female elderly compared to the male elderly
  - Retention health state
    - Higher rates of HT staying in an inactive state
    - Lower rates of HT staying in an active state
  - Deteriorating health state
    - Higher rates of HT entering to an inactive states
    - Lower mortality rates, especially from an inactive state
  - Improving health state
    - Lower rates of HT improving to an active state, esp. after age 75.
Results for Assumption II

Active Life Expectancy

❖ General Patterns and Trends
❖ By Gender
❖ By Initial Health Status
Comparison of ALE by Initial Health Status at Age 70 (Female 1989-99)
Comparison of ALE by the Initial Health Status at Age 70 (Male 1989-99)
Summary - Health Transition

- General trends
  - Decrease rates of retention and improving HT for staying or entering an active state by age
  - Increase rates of deteriorating HT for entering an inactive state or death by age

- The female elderly
  - Higher rates of retention HT for staying in an inactive state
  - Higher rates of deteriorating HT for entering an inactive state
  - Lower mortality rates either from an active or an inactive state

- The male elderly
  - Much higher mortality rates, especially for those who started with an inactive state
Summary - Active Life Expectancy

- General patterns (age 70)
  - LE increased during 1989-1999
  - ALE increased during 1989-96, but kept stable during 1996-99
  - Inactive LE increase during the first-two and third-forth waves

- The female elderly – the results are similar to previous literatures
  - At age 70 --
    - 0.5-1.9 years longer of LE
    - 2.5-3.3 years longer of inactive LE
    - 16.0%-25.8% lower ALE%

- Different pattern
  - 1.0-2.8 years shorter of ALE
ALE by Initial Health State

- General patterns - at age 70
  - The *healthy elderly* are expected to live around *5 years longer* in an active life
  - The *unhealthy elderly* are expected to live *2.2-2.5 years longer* in an inactive life, and are likely to live 2.6 years shorter in general
## Differences of LE/ALE by Initial Health Status & Gender

<table>
<thead>
<tr>
<th>Age 70</th>
<th>All waves</th>
<th>W1-W2</th>
<th>W2-W3</th>
<th>W3-W4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LE</td>
<td>2.6</td>
<td>2.7</td>
<td>2.6</td>
<td>2.6</td>
</tr>
<tr>
<td>ALE</td>
<td>5.1</td>
<td>5.1</td>
<td>4.9</td>
<td>5.0</td>
</tr>
<tr>
<td>In-ALE</td>
<td>-2.5</td>
<td>-2.5</td>
<td>-2.2</td>
<td>-2.5</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LE</td>
<td>2.3</td>
<td>1.9</td>
<td>2.6</td>
<td>2.3</td>
</tr>
<tr>
<td>ALE</td>
<td>4.6</td>
<td>4.2</td>
<td>4.7</td>
<td>4.8</td>
</tr>
<tr>
<td>In-ALE</td>
<td>-2.3</td>
<td>-2.3</td>
<td>-2.1</td>
<td>-2.5</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LE</td>
<td>3.6</td>
<td>3.8</td>
<td>3.2</td>
<td>4.0</td>
</tr>
<tr>
<td>ALE</td>
<td>5.5</td>
<td>4.8</td>
<td>5.1</td>
<td>5.2</td>
</tr>
<tr>
<td>In-ALE</td>
<td>-1.9</td>
<td>-2.1</td>
<td>-1.8</td>
<td>-1.2</td>
</tr>
</tbody>
</table>

Difference = Who started with an active state – Who started with an inactive state
Limitation

- Changing patterns of questions and categories of answers
  - Increase missing values
- Simplifying disablement process
  - Only consider age and gender in the study
    - Other risk factors should be considered in future study such as education, life style, etc.
Limitation and Problem

1989
1. No problem performing
2. Have some difficulty performing
3. Have difficulty performing
4. Can not perform
5. Do not know
6. Never perform the task

1993, 1996, 1999
1. No problem performing
2. Have some difficulty performing
3. Have difficulty performing
4. Can not perform

Recoded as missing value
Conclusion and Policy Implication I

*High risk groups*
- Higher deteriorating HT
- Higher retention HT in an inactive state
- Longer inactive LE
- Higher mortality rates

*Policy implication*
- Those are target groups who need more long-term care
- Projection of the needs of LTC in the future

- Older age group, esp. 75+
- Female elderly
- Unhealthy male elderly
Conclusion and Policy Implication II

**ALE**

- The female elderly have a longer life, but with a longer inactive LE
- The healthy elderly are expected to live 5 years longer in an active life
- The unhealthy elderly are expected to live 2.6 (male 3.6, female 2.3) years shorter and spend 2.5 (male 1.9, female 2.3) more years in an inactive life

**Policy Implication**

- Health promotion to keep the elderly as active as possible, esp. for middle and old age of the female
- Research on risk factors of unhealthy status for the elderly
Future Research Plans

- Include other covariates
- Age-cohort differences in disability prevalence
  - Need to add new sample in 1996 (age 50-66) into analysis
- Risk factors of health status for the elderly
Acknowledgements

We would like to thank the following institutions and people to make this presentation possible.

- The Bureau of Health Promotion, Executive Yuan, R.O.C.
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- Agnes Lièvre
- Committee members of my Ph.D. Dissertation
Thank You

Comments are Welcome