Frailty in Late Life: attempted working definition and dynamics between Independence and ADL Dependence

- Results from Swilsoo -

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Objectives

1. To propose a multi-dimensional definition of frailty \textit{(adapted from the literature)} and estimate its predictive validity
2. To study individual health transitions \textit{(reversibility of frailty, decline towards ADL dependence)}
Participants to Swilsoo
(Swiss Interdisciplinary Longitudinal Study on the Oldest-Old)

- Primary Investigator: Prof. Christian Lalive d’Epinay
- Supported by the Swiss National Science Foundation and the Cantons of Geneva and Valais
- 1994: 340 individuals between 80 and 84 years of age (born between 1910 and 1914)
- 1999: 376 individuals between 80 and 84 years of age (born between 1915 and 1919)
- Residing at home at study inception
- Sample stratified by gender (~50% F) and region (~50% urban and ~50% semi-rural)
## Participants to Swilsoo

<table>
<thead>
<tr>
<th>Wave/year</th>
<th>1st cohort (N)</th>
<th>2nd cohort (N)</th>
<th>Interval in months</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>340</td>
<td>-</td>
<td>18</td>
</tr>
<tr>
<td>1995</td>
<td>267</td>
<td>-</td>
<td>12</td>
</tr>
<tr>
<td>1996</td>
<td>237</td>
<td>-</td>
<td>12</td>
</tr>
<tr>
<td>1997</td>
<td>209</td>
<td>-</td>
<td>18</td>
</tr>
<tr>
<td>1999</td>
<td>172</td>
<td>376</td>
<td>18</td>
</tr>
<tr>
<td>2000</td>
<td>128</td>
<td>289</td>
<td>18</td>
</tr>
<tr>
<td>2001</td>
<td>100</td>
<td>247</td>
<td>12</td>
</tr>
<tr>
<td>2002</td>
<td>80</td>
<td>212</td>
<td>12</td>
</tr>
<tr>
<td>2004</td>
<td>59</td>
<td>173</td>
<td>18</td>
</tr>
</tbody>
</table>
Attempted working definition of frailty and its predictive validity
Frailty dimensions in the literature

**Frailty:** not restricted to a single domain

- manifests itself in different ways according to the person
- presents itself as a constellation of many conditions
  
  (Hamerman 1999; Rockwood et al. 2000)

**Dimensions of frailty**

- physical
- nutritional
- cognitive
- sensory
  
  (Lundin-Olsson et al. 1998; Strawbridge et al. 1998; Chin A Paw et al. 1999; Lebel et al. 1999; Fried et al. 2001; Mitnintski et al. 2002)

- **specific illnesses** (diabetes, hypertension, depression, dementia)
  
  (Lundin-Olsson et al. 1998; Mitnintski et al. 2002)
Frailty markers: self reports of problems
adapted from Strawbridge et al. (1998), J of Gerontol: Soc. Sc., 53B, 9-16

**Mobility**
« Can you ... alone »
1/ go up and down stairs
2/ move around outside
3/ walk 200 meters

**Sensory**
« Can you ... »
1/ read a newspaper
2/ hear a conversation with two peoples
3/ hear a conversation with many peoples

**Physical ailment**
« Which part of body may cause suffering»
1/ lower limbs
2/ upper limbs
3/ head, face
4/ back
5/ heart
6/ respiratory organs
7/ stomach, abdomen
8/ genital, urinary organs
9/ chest
10/ fever

**Energy**
1/ I’m tired
2/ I’m not hungry

**Memory**
Have you some problems with your memory?
2/ yes, but with difficulty
3/ no

**Energy**
2/ often or always

**Sensory**
2/ yes, but with difficulty
3/ no

3/ yes, a lot

3/ often
4/ always

Frail: at least two deficiencies across the five dimensions
ADL dependence

Activities of Daily Living (Katz et al. 1963)
« Can you … alone »
1/ wash
2/ dress
3/ eat
4/ rise and go to bed
5/ move around indoors

Beckett et al., 1996; Boult et al., 1994; Mendes de Leon et al., 1999;
Seeman, Bruce, & McAvay, 1996

• ADL dependence is more and more considered as a possible consequence of frailty

Are frailty and ADL dependence distinct conditions?
Frailty and ADL dependence are distinct conditions.

<table>
<thead>
<tr>
<th>Frailty</th>
<th>ADL dependence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>N=339</td>
</tr>
<tr>
<td>Yes</td>
<td>36</td>
</tr>
<tr>
<td>No</td>
<td>170</td>
</tr>
<tr>
<td>No</td>
<td>4</td>
</tr>
<tr>
<td>No</td>
<td>129</td>
</tr>
</tbody>
</table>

Frailty and ADL dependence are distinct conditions.
Health status in 3 categories

- Independent
  - Not frail, not ADL dependent

- Frail
  - Frail but not ADL dependent

- Dependent
  - ADL dependent and frail
Predictive validity of health status

Frailty = Loss of reserves and resilience by the old person

Risk situation

Frail people are at increased risk of falls and successive illnesses, which may lead to hospitalization, dependence and death

Health Status:
Should be able to predict these adverse outcomes
Frailty: a high-risk state predictive of a range of adverse health outcomes.
Frailty – not dependence – is a leading situation among octogenarians.
Relative risk of frailty and ADL dependence by socio-demographic variables (at baseline).

<table>
<thead>
<tr>
<th></th>
<th>Frail versus independent (n=299)</th>
<th>Dependent versus independent (n=169)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (female)</td>
<td>1.44</td>
<td>0.77</td>
</tr>
<tr>
<td>Area (urban)</td>
<td>1.26</td>
<td>0.34*</td>
</tr>
<tr>
<td>Socioeconomic status (medium/upper)</td>
<td>0.50**</td>
<td>0.38*</td>
</tr>
<tr>
<td>Marital status (married)</td>
<td>1.18</td>
<td>0.76</td>
</tr>
<tr>
<td>Age</td>
<td>1.14</td>
<td>1.26</td>
</tr>
</tbody>
</table>

The prevalence of frailty is lower among medium/upper socioeconomic status but does not depend on gender.
Individual health transitions between frailty and dependence
Three questions:

1. Does frailty lead to a rapid decline towards dependence?

2. Is frailty always a precursor of dependence?

3. Is it possible to recover from frailty?
Markov chain model

With the collaboration of A. BERCHTOLD, Institute of Applied Mathematics, Uni. Lausanne, Switzerland

- 1st order - any 2 successive waves
  - 3 states of origin
  - 4 destination states

- 2nd order - any 3 successive waves
  - Transition probabilities of health status between $V_n, V_{n+1}$
  - Complementary information but less precise estimation
Does frailty lead to a rapid decline towards dependence?

$n = 965$ trajectories

Stability is the predominant pattern

<table>
<thead>
<tr>
<th>$W_n$</th>
<th>I</th>
<th>F</th>
<th>D</th>
<th>$\dagger$</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.62</td>
<td>0.30</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>F</td>
<td>0.17</td>
<td>0.59</td>
<td>0.16</td>
<td>0.08</td>
</tr>
<tr>
<td>D</td>
<td>0.03</td>
<td>0.14</td>
<td>0.60</td>
<td>0.23</td>
</tr>
</tbody>
</table>
Does frailty lead to a rapid decline towards dependence?

Frailty is a lasting situation

<table>
<thead>
<tr>
<th>The 3 most frequent trajectories</th>
<th>3 successive waves (~3 years)</th>
<th>4 successive waves (~4 years)</th>
<th>5 successive waves (5 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F - F - F</td>
<td>N</td>
<td>I-I-I-I</td>
<td>I-I-I-I-I</td>
</tr>
<tr>
<td>D - D - D</td>
<td>127</td>
<td>F-F-F-F</td>
<td>F-F-F-F-F</td>
</tr>
<tr>
<td></td>
<td>84</td>
<td>I-F-F-F</td>
<td>I-F-F-F-F</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>61</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td></td>
<td>14</td>
</tr>
</tbody>
</table>
Is frailty a precursor of dependence?

965 trajectories

Wn: I → F → D
12 or 18 months: 12 (15%) → 68 (85%) → 6 (17%) → 29 (83%)

672 trajectories

Wn+1: I → F → D

Wn+2: D

965 trajectories vs. 672 trajectories: Yes
Is it possible to recover from frailty?

$W_n$ $W_{n+1}$ $W_{n+2}$

$N=965$ trajectories

$N=672$ trajectories

$N=56\%$ $N=8\%$ $N=17\%$ $N=16\%$ $N=59\%$ $N=8\%$

Possible but of short duration
Summary

1. We proposed a multi-dimensional definition of frailty and estimated its predictive validity.

2. Frailty and ADL dependence are distinct conditions.

3. Frailty is a leading and a lasting situation among octogenarians, from which ameliorations are possible but most often of short duration.

The next presentation: identify the consequences of frailty with respect to social networks and activities.
Thank You

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christian.lalive@socio.unige.ch

For additional information:
Poster session: 11/22/04 3:15PM-4:45PM
Marriott Balcony A
“Individual Health Transitions between Frailty and Dependence in Late Life”
Series of affected dimensions

\[ W_n \xrightarrow{12-18\text{ months}} W_{n+1} \]

37% Sensory

- Sensory + Physical ailments
- Sensory + Memory

24% Memory

- Memory + Sensory
- Memory + Physical ailments

18% Energy

11% Physical ailments

9% Mobility
Predictive validity by number of affected dimensions

- Relative risk
  - Fall: 2
  - Illnesses: 2
  - Hospitalizations: 2
  - Death: 2

- Functional disability:
  - 0: 2
  - 1: 2
  - 2: 2
  - 3+: 2
## Dynamic of frailty

Wilcoxon test on number of self-reports of problems (from 0 to 19) according to health transitions on two successive waves.

<table>
<thead>
<tr>
<th>$W_n$</th>
<th>$W_{n+1}$</th>
<th>Frequency (%)</th>
<th>Z - test</th>
<th>Evolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>I</td>
<td>25</td>
<td>-0.23</td>
<td>$\Rightarrow$</td>
</tr>
<tr>
<td>I</td>
<td>F</td>
<td>12</td>
<td>-8.24***</td>
<td>$\Uparrow$</td>
</tr>
<tr>
<td>F</td>
<td>I</td>
<td>8</td>
<td>-6.73***</td>
<td>$\Uparrow$</td>
</tr>
<tr>
<td>F</td>
<td>F</td>
<td>30</td>
<td>-2.56*</td>
<td>$\Uparrow$</td>
</tr>
<tr>
<td>F</td>
<td>D</td>
<td>8</td>
<td>-6.16***</td>
<td>$\Uparrow$</td>
</tr>
<tr>
<td>D</td>
<td>D</td>
<td>12</td>
<td>-1.49</td>
<td>$\Rightarrow$</td>
</tr>
</tbody>
</table>

The arrows indicate stability ($\Rightarrow$), increase ($\Uparrow$) or decrease ($\Downarrow$) of number of self-reported deficiencies, respectively.

The other health transitions (ID, DI, DF) were experienced by a small number of persons and were not considered here.

* $p < .05$; *** $<.001$
Long-term dependence is not necessarily the last (health) stage of life

N = 62 deceased

A majority of the oldest old die without having to suffer from long-term functional dependence
Associations between 5 dimensions of frailty (Cramer's V)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Cramer's V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobility</td>
<td>0.22</td>
</tr>
<tr>
<td>Physical ailments</td>
<td>0.36</td>
</tr>
<tr>
<td>Sensory</td>
<td>0.32</td>
</tr>
<tr>
<td>Memory</td>
<td>0.37</td>
</tr>
<tr>
<td>Energy</td>
<td>0.12</td>
</tr>
</tbody>
</table>

Note: NS indicates non-significance.