

Extremity Injuries and Dementia increase the Risk for long-term Care at older Age. An Analysis of counter-factual projection scenarios based on German Health Insurance Routine Data.

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Background

- Increasing demand for long term care (LTC) due to increasing life expectancy is an important issue for ageing populations.
- Large baby boomer cohorts born between the mid-1950s to the mid-1960s will be reaching ages in which LTC becomes prevalent between 2030 and 2050. The size of these cohorts will most likely lead to a growing absolute need for LTC, regardless of compression or expansion of morbidity and care need.
- What impact can modifiable risk factors on individual level achieve?
- Interactions between risk factors?

Background: Dementia and lower extremity injuries

- Dementia and lower extremity injury two important and common LTC risk factors at older age
 - Dementia and lower extremity injury share risk factors and can cause each other
 - Dementia and lower extremity injury disproportionately increase LTC risk when present together (resulting risk larger than additive risks)
- application of counter-factual scenarios

Projection of long term care need for Germany

- Usually based on a single population scenario that is combined with the age-specific prevalence of LTC.
- Primary source of uncertainty is the assumption about the future development of life expectancy
- The different available projections span different time periods, start at different base years, and cover either all persons with LTC, or only a subset, e.g. from some specific age upwards. They employ different definitions of LTC, e.g. the objective definition used by the LTC insurance, or self-reported criteria. The focus is on the total number of LTC recipients, care at home and in institutions is not presented separately.

Projection of long term care need for Germany

- Available projections indicate rates of increase between 22% and 62% between 2005 and 2030, and between 45% and 123% between 2005 and 2050.
- Differences between the status quo-projections and the "health improvement" scenarios range between 400.000 – 600.000 individuals with LTC for 2030, and about a million for 2050.
- Main conclusion: the age structure dictates a marked increase in LTC that no realistic increase of good health and/or degree of compression of morbidity at older age will be able to compensate
- The number of LTC recipients will increase markedly, the question is, how big this increase will be.

Methods: Data used for rate estimation

- Longitudinal health claims data from Germany's largest public health insurance AOK. Random sample of 250.000 individuals who in the first quarter of 2004 were at least 50 years old
- Drawn from all insured persons, regardless of seeking medical treatment or not and followed until the end of 2010. Reduction to 65+, data cleaning, consistency checking, removal of interrupted observations and 2 year long validation period for incident dementia: 122.000 individuals aged 65+ at the first quarter of 2006
- Medical diagnoses (ICD-10), age, sex, LTC status (no LTC, LTC at home, LTC in institution), date of death, etc.
- Sample covers whole population; big advantage when studying health-related aspects at old age that are risk factors for LTC

Methods: Definition of long term care

- All individuals who received benefits from Germany's statutory LTC insurance are defined as being in need of LTC. Pay-as-you-go financed mandatory insurance founded in 1995. To receive benefits, applicants must pass an objective assessment primarily focused on ADL impairments.
- Three LTC levels depending on the amount of care required. Lowest level: at least one and a half hours of care, at least half of which concern basic tasks. The highest level: at least five hours of care (four of which concerning basic tasks).
- Our projections don't distinguish between LTC level. All individuals living in an institution receive LTC.

Methods: Definition of dementia

- Dementia is defined as one or more of the following diagnoses: Alzheimer's disease (ICD-10 codes F00/G30), vascular dementia (F01), Lewy body dementia (G31.82), circumscribed brain atrophy (G31.0), dementia as a side-effect of another disease, e.g. Parkinson's disease (F02, F05.1, G23.1), other/not specified dementia (F03).
- Only diagnoses flagged as "secure diagnosis" for outpatients or "discharge diagnosis" for inpatients used
- Concurrent diagnoses either by an inpatient and an outpatient physician or from different outpatient specialists were required.

Methods: Definition of lower extremity injury

- Lower extremity injuries are defined using diagnostic data of fractures and injuries. Lower extremities are defined from the hip and pelvis downwards, and relevant injuries are fractures, wounds, luxations, contusions, burns, frostbites and amputations (ICD codes S70–S99, relevant parts of T). Lower extremity injury was coded as present from the first occurrence onwards.

Methods: Projections

- LTC for ages 75+
- We projected a set of six different scenarios of LTC in Germany from 2014 to 2044, gained from closed, deterministic multi-state population projections
- States: healthy (i.e. no LTC), LTC at home, LTC in an institution, death
- Transitions from healthy to care at home (1) and to institutional care (2), and additionally from home care to institutional care (3), from every functional state to death (4-6)
- All transitions are irreversible
- For each transition in every projection scenario, age- and sex-specific transition and mortality rates were estimated

Methods: Projections

- Estimation for counter-factual scenarios uses only data spells without the respective condition
- Transition rates were applied unchanged for the entire time span of the projection, while the mortality rates were reduced by 1.5% each year to account for increasing life expectancy
- Fertility and migration are not considered, because fertility does not impact projections of individuals aged 75+ within the timeframe of our projections, while migration would only have a marginal effect in the considered age groups
- Starting population (2014) based on census data (general population structure at the end of 2014) and statistics on LTC status by age and sex based on LTC insurance data

Methods: Projection scenarios

| | A | B | C |
|-------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|
| 1. Status Quo | Mortality rates -1.5% each year Includes dementia & EI cases | Mortality rates -1% each year Includes dementia & EI cases | Mortality rates -2% each year Includes dementia & EI cases |
| 2. No Dementia | Mortality rates -1.5% each year Excludes dementia cases | | |
| 3. No Extremity Injuries | Mortality rates -1.5% each year Excludes EI cases | | |
| 4. No Dementia & Extremity Injuries | Mortality rates -1.5% each year Excludes dementia & EI cases | | *all scenarios: starting at age 75 |

Results: Overview

| Scenario | Long term care recipients aged 75+ in 2044 | | |
|---------------------------------------|--------------------------------------------|-------------|-----------|
| | Home | Institution | Total |
| Status Quo (1A) | 1.997.012 | 1.281.420 | 3.278.432 |
| <i>% change from 2014</i> | 67% | 105% | 80% |
| No Dementia (2A) | 2.182.140 | 971.606 | 3.153.746 |
| <i>% change from 2014</i> | 82% | 55% | 73% |
| No Extremity Injuries (3A) | 1.985.348 | 1.273.943 | 3.259.291 |
| <i>% change from 2014</i> | 66% | 104% | 79% |
| No Dementia & Extremity Injuries (4A) | 2.107.444 | 791.725 | 2.899.169 |
| <i>% change from 2014</i> | 76% | 27% | 59% |

Results: Status quo scenario

| | Male | | | | | | Female | | | | | | Total | | | | | |
|------|-----------|------|-----------|------|-----------|------|-----------|-----|-----------|-----|-----------|-----|-----------|-----|-----------|------|-----------|-----|
| | Home Care | % | Institut. | % | All Care | % | Home Care | % | Institut. | % | All Care | % | Home Care | % | Institut. | % | All Care | % |
| 2014 | 379.057 | | 135.681 | | 514.738 | | 818.280 | | 489.399 | | 1.307.679 | | 1.197.337 | | 625.080 | | 1.822.417 | |
| 2044 | 776.917 | 105% | 340.081 | 151% | 1.116.998 | 117% | 1.220.095 | 49% | 941.339 | 92% | 2.161.434 | 65% | 1.997.012 | 67% | 1.281.420 | 105% | 3.278.432 | 80% |

- 3.3 million in LTC (80% increase)
- Institutional care more than doubles, with an increase of 105% to 1.28 million people; home care demand increases by 67% to nearly 2 million people.
- The marked increase in the demand for institutional LTC is caused mainly by males: increase of 151% to 340.000 males; the increase for females is at 92%, from 490.000 to 941.000
- This pattern is also visible for home care with a larger increase for men

Results: Counter-factual scenario – no dementia

| | Male | | | | | | Female | | | | | | Total | | | | | |
|------|-----------|------|-----------|-----|-----------|------|-----------|-----|-----------|-----|-----------|-----|-----------|-----|-----------|-----|-----------|-----|
| | Home Care | % | Institut. | % | All Care | % | Home Care | % | Institut. | % | All Care | % | Home Care | % | Institut. | % | All Care | % |
| 2014 | 379.057 | | 135.681 | | 514.738 | | 818.280 | | 489.399 | | 1.307.679 | | 1.197.337 | | 625.080 | | 1.822.417 | |
| 2044 | 825.351 | 118% | 266.356 | 96% | 1.091.707 | 112% | 1.356.789 | 66% | 705.250 | 44% | 2.062.039 | 58% | 2.182.140 | 82% | 971.606 | 55% | 3.153.746 | 73% |

- 125.000 less people with care need than in the status quo projection (73% increase).
- 310.000 less people in institutional LTC
- More people remain in care at home (+82%). This pattern holds true for females and males alike, because for both sexes, dementia is a strong risk factor for institutional LTC. Overall, this scenario would considerably relieve institutional care providers, because it only indicates a total increase of institutional care demand of 55% rather than 105%.

Results: Counter-factual scenario – no lower extremity injuries

| | Male | | | | | | Female | | | | | | Total | | | | | |
|------|-----------|------|-----------|------|-----------|------|-----------|-----|-----------|-----|-----------|-----|-----------|-----|-----------|------|-----------|-----|
| | Home Care | % | Institut. | % | All Care | % | Home Care | % | Institut. | % | All Care | % | Home Care | % | Institut. | % | All Care | % |
| 2014 | 379.057 | | 135.681 | | 514.738 | | 818.280 | | 489.399 | | 1.307.679 | | 1.197.337 | | 625.080 | | 1.822.417 | |
| 2044 | 768.630 | 103% | 334.925 | 147% | 1.103.555 | 114% | 1.216.718 | 49% | 939.018 | 92% | 2.155.736 | 65% | 1.985.348 | 66% | 1.273.943 | 104% | 3.259.291 | 79% |

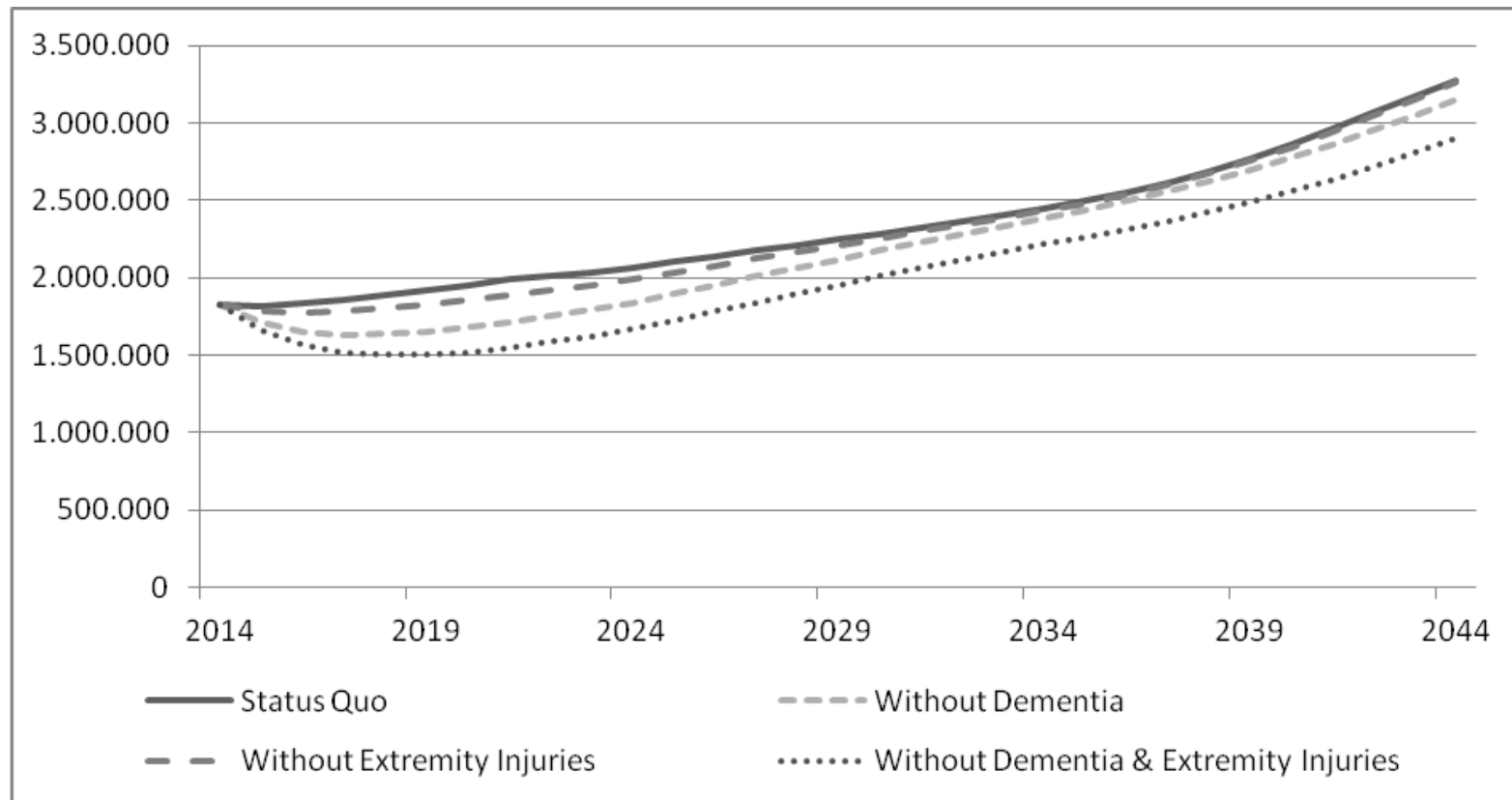
- Differs only slightly from the status quo-projection, LTC only 20.000 individuals lower than the status quo-projection.
- In terms of care at home or in an institution, and in terms of differences between sexes, this scenario is also practically identical with the status-quo projection. On its' own, the absence of lower extremity injuries does not affect the sum total of LTC recipients or the ratio between home and institutional care.

Results: Counter-factual scenario – no dementia, no l. extremity injuries

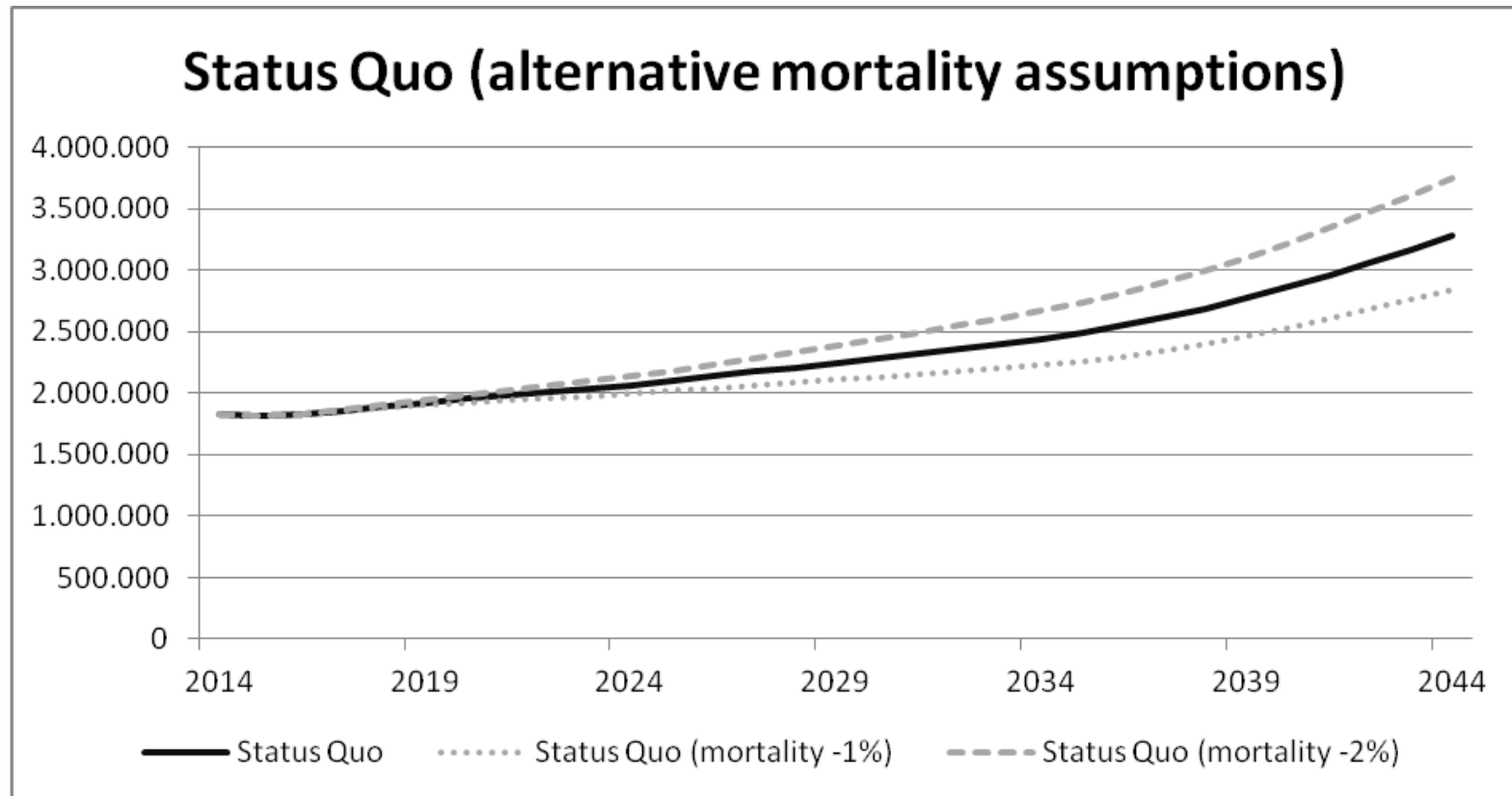
| | Male | | | | | | Female | | | | | | Total | | | | | |
|------|-----------|------|-----------|-----|-----------|------|-----------|-----|-----------|----|-----------|-----|-----------|-----|-----------|-----|-----------|-----|
| | Home Care | % | Institut. | % | All Care | % | Home Care | % | Institut. | % | All Care | % | Home Care | % | Institut. | % | All Care | % |
| 2014 | 379.057 | | 135.681 | | 514.738 | | 818.280 | | 489.399 | | 1.307.679 | | 1.197.337 | | 625.080 | | 1.822.417 | |
| 2044 | 788.969 | 108% | 257.323 | 90% | 1.046.292 | 103% | 1.318.475 | 61% | 534.402 | 9% | 1.852.877 | 42% | 2.107.444 | 76% | 791.725 | 27% | 2.899.169 | 59% |

- Marked differences from the status-quo projection and the two previous counter-factual scenarios.
- 380.000 LTC recipients less than the status quo-projection and 255.000 less people than in dementia-free scenario in LTC
- Much lower demand for institutional care (+27%) compared to the status quo-projection, (+105%)
- 110.000 people more in LTC at home than in the status quo-projection

Results: Total number of long term care recipients 75+ over time



Results: Sensitivity analysis



Discussion

- Total number of LTC recipients will grow in the coming decades
- Mainly driven by the ageing of large baby boomer cohorts
- Future increase of life expectancy is the most important factor
- Effect of (modifiable) risk factors varies and is much lower, as our two examples of extremity injury and dementia show
- On its' own, the removal of lower extremity injuries shows only a very small effect, but combined with the absence of dementia, the resulting reduction in total care need is disproportionately large
- We thus showed that interactions between risk factors should be taken into account

Discussion

- Counter-factual scenario without dementia yielded a marked reduction of long term need, especially institutional care, but smaller impact than the alternative scenario with slightly higher mortality
- Strength: projections of future LTC demand based on empirical data (transitions and mortality) gained from a very large, representative dataset, by sex, age and home or institutional care
- Examples for contra-factual scenarios which allow us to assess the effect of the hypothetical removal of a single care risk, or also more risks at the same time
- Weaknesses: Definition of LTC will definitely change. Assumptions of future developments of mortality are central to the results.

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