Heterogeneity in Multimorbidity and Dementia Trajectories in Old Age in Germany

A Study Based on Health Claims Data

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1 Introduction

- Ageing populations: occurrence of multiple diseases and progression of multimorbidity over time (Souza et al. 2021)
- Expected increase of the number of people with dementia (GBD 2022)
- Dementia coexists with comorbidities (Bunn et al. 2014, Clague et al. 2017)

- Aim: To identify and describe different groups of multimorbidity trajectories in Germany, with special emphasis on trajectories involving dementia diagnosis

- Research question 1: Do individuals with a dementia diagnosis follow different pathways of multimorbidity?
- Research question 2: Are there sex-specific differences between different groups of multimorbidity and dementia trajectories?

2 Data and Methods

Data

- Health claims data of the largest health insurer in Germany (AOK Allgemeine Ortskrankenkasse) 2005-2019
- Cohort of 70-74 year-olds at baseline (2007)

Methods

- Dementia diagnosis following ICD-10 (F00, F01, F02, F03, F05.1, G30, G31.0, G31.82, G23.1) and a validation strategy
- Categorization of the Weighted Charlson Comorbidity Index (dementia excluded): Low (0-1), Medium (2-5), High (6-9), Very high (>=10)
- Accumulation of diseases from 2005-2006

- Sequence analysis
  - Alphabet: Low, Medium, High, Very High, Dementia + Low, Dementia + Medium, Dementia + High, Dementia + Very high, Death
  - Sequence length: 1st quarter of 2007 – 4th quarter of 2019
  - Distance measure: Longest common subsequence (LCS)

- Cluster analysis
  - Ward's algorithm

- Regression analysis
  - Multinomial logistic regression model to describe identified clusters
  - Controlling for sex and age at baseline (1st quarter of 2007)
  - Marginal means (probability) of being in cluster x by sex and age at baseline

3 Results

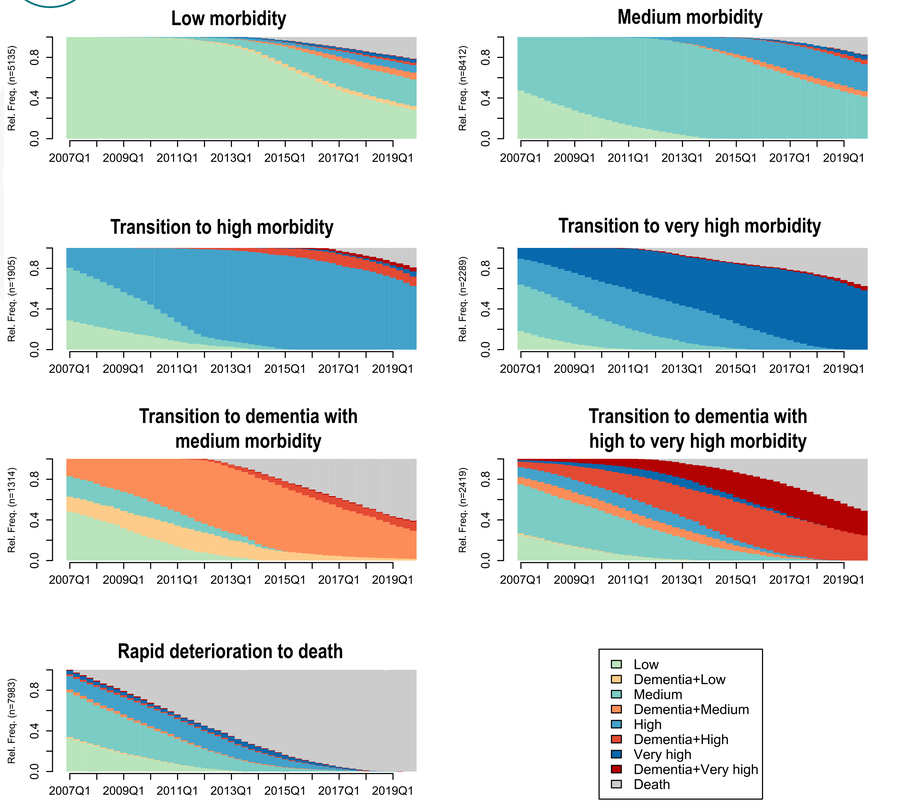

Figure 1: Clusters of multimorbidity and dementia trajectories. Distribution plot, n=29,457. Source: AOK 2005-2019

%	Low morbidity	Medium morbidity	Transition to high morbidity	Transition to very high morbidity	Transition to dementia with medium morbidity	Transition to dementia with high to very high morbidity	Rapid deterioration to death
Total	17.4	28.6	6.5	7.8	4.5	8.2	27.1
Female	66.1	63.6	58.6	50.7	64.1	58.1	44.1
Male	33.9	36.4	41.4	49.3	35.9	41.9	55.9

Table 1: Proportion of the identified clusters. n=29,457. Source: AOK 2005-2019

- Identification of seven distinct clusters (Figure 1) after evaluation of cluster quality measures
- Majority in morbidity clusters (60.2%, Table 1)
- 12.7% in dementia clusters with most individuals in the 'Transition to dementia with high to very high morbidity' cluster (64.8%)
- 27.1% in 'Rapid deterioration to death' cluster (55.9% men and 44.1% women)

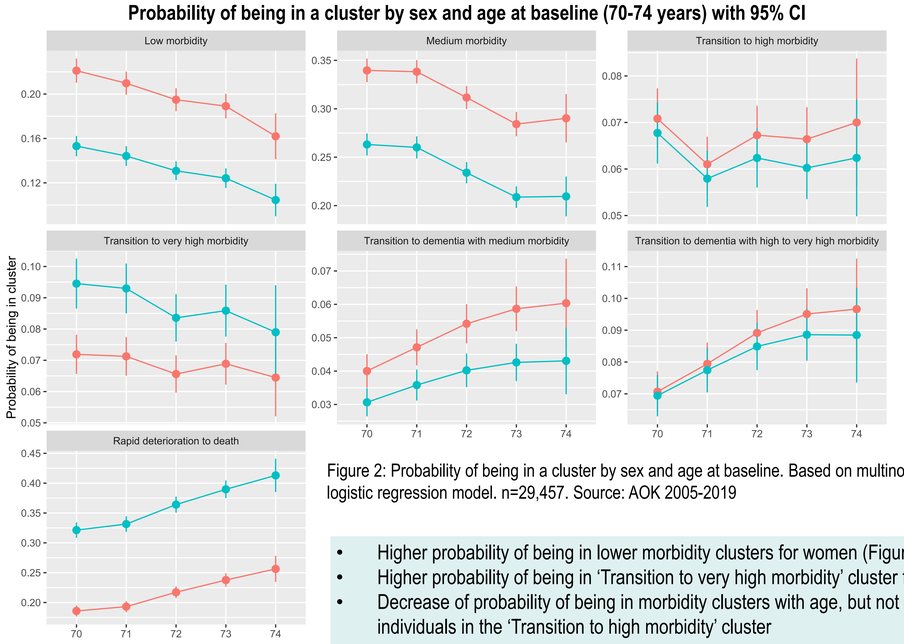

Figure 2: Probability of being in a cluster by sex and age at baseline. Based on multinomial logistic regression model. n=29,457. Source: AOK 2005-2019

- Higher probability of being in lower morbidity clusters for women (Figure 2)
- Higher probability of being in 'Transition to very high morbidity' cluster for men
- Decrease of probability of being in morbidity clusters with age, but not for individuals in the 'Transition to high morbidity' cluster

- Higher probability of being in 'Transition to dementia with medium morbidity' for women
- No significant sex difference in probability of being in 'Transition to dementia with high to very high morbidity'
- Significant higher probability of having a rapid deterioration to death for men
- Increase with age in dementia and rapid deterioration to death clusters

4 Conclusion and next steps

- Despite large heterogeneity in individual multimorbidity and dementia trajectories in a cohort of 70-74 year-olds, a limited number of clusters was identified
- More individuals died in the dementia clusters compared to the morbidity clusters
- Two distinct dementia clusters, with almost twice as many 70-74 year-olds progressing to dementia with high to very high morbidity than to dementia with medium morbidity
- Faster progression to very high multimorbidity for men vs. slow progression to lower multimorbidity for women

Next steps:

- Multichannel sequence analysis with dementia and multimorbidity representing single dimensions
- Comparison with other populations (clusters of multimorbidity trajectories and their demographic characteristics)

5 References

- Souza, D. et al. (2021): BMC Public Health. 21(1), 76.
- Global Burden of Disease (2022): The Lancet. Public health 7(2).
- Bunn, F. et al. (2014): BMC Medicine 12, 192.
- Clague, F. et al. (2017): Age and Ageing, 46(1), 33–39.