Extended abstract

Slowing Disease Accumulation but Persistent Complexity: Multimorbidity Dynamics from Age 70 to 100 in the Swedish Population

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Background:

At the individual level, diseases tend to accumulate steadily with age. At the population level, however, selective survival may alter this trajectory, producing an apparent slowing of disease accumulation in advanced ages—analogous to the mortality plateau observed in demographic studies. Whether such dynamics extend to a broad range of diseases and multimorbidity remains unclear.

The aim of the study was to provide new insights into how population health changes with advancing age in the context of shifting population composition. Specifically, we investigated how disease accumulation and patterns of disease combinations evolve from ages 70 to 100, and how these patterns change as fewer individuals remain in the cohort. Understanding these dynamics has important implications for public health and healthcare planning in an era of increasing longevity. It also helps to address key questions: Does the burden of disease continue to accumulate as the population grows older? Can we expect disease patterns and combinations at the average lifespan to resemble those observed five or ten years later in older survivors?

The **aim** of the present study was to provide new insights into how population health changes with advancing age in the context of shifting population composition. Specifically, we investigated how disease accumulation and patterns of disease combinations evolve from ages 70 to 100, and how these patterns change as fewer individuals remain in the cohort. Understanding these dynamics has important implications for public health and healthcare planning in an era of increasing longevity. It also helps to address key questions: Does the burden of disease continue to accumulate as the population grows older? Can we expect disease patterns and combinations at the average lifespan to resemble those observed five or ten years later in older survivors?

Methods:

All individuals born in 1920, 1921 and 1922, surviving to age 70 and residing in Sweden were identified in the Total Population Register. Using historical administrative health care records, individuals could be followed prospectively from January 1st, 1990, until their death or December 31st, 2022 (age 70 to 100). However, for the sake of defining prevalent condition at age 70, an accumulation period of three years prior age 70 was used and thus individuals were followed from age 67.

Through the unique personal identification number assigned to all Swedish residents, information about all specialized care visits with a corresponding International Classification

of Diseases system (ICD) diagnosis code was linked to each individual from the National Patient Register. We used a disease list previously applied to analyze (multi)morbidity patterns among older people. The ten disease groups were: anemia, cardiovascular, digestive, endocrine, malignancy, neuropsychiatric, musculoskeletal, neurosensorial, respiratory, and urological diseases.

Results:

Disease accumulation accelerated with age but decelerated beyond age 90, largely due to slower transitions from having no or few diseases to developing additional conditions. In contrast, individuals with five or more diseases showed relatively stable accumulation rates from ages 85 to 100. Cardiovascular diseases dominated the morbidity burden at all ages. Although overall accumulation slowed in the oldest-old, multimorbidity complexity persisted: new disease combinations continued to emerge, particularly among cardiovascular conditions.

Conclusion:

This nationwide, population-based study shows how diseases manifest and evolve across late life, revealing the natural course of multimorbidity at the population level. The findings challenge the notion that late-life populations become healthier through selective survival. While the rate of disease accumulation flattens after age 90, disease complexity continues to increase. Understanding these dynamics is essential for anticipating future healthcare needs and developing prevention and management strategies that address not only the number but also the complexity of diseases at the oldest ages.

Figures:

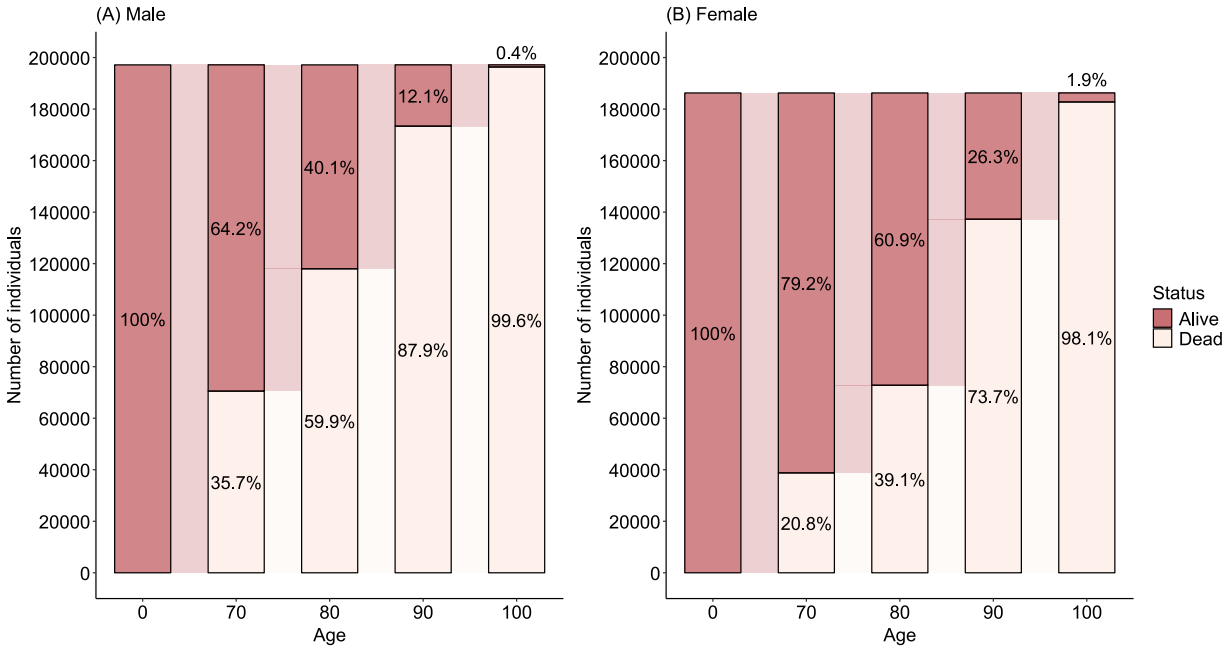

Figure 1 Mortality selection of the cohort 1920-1922, Sweden.

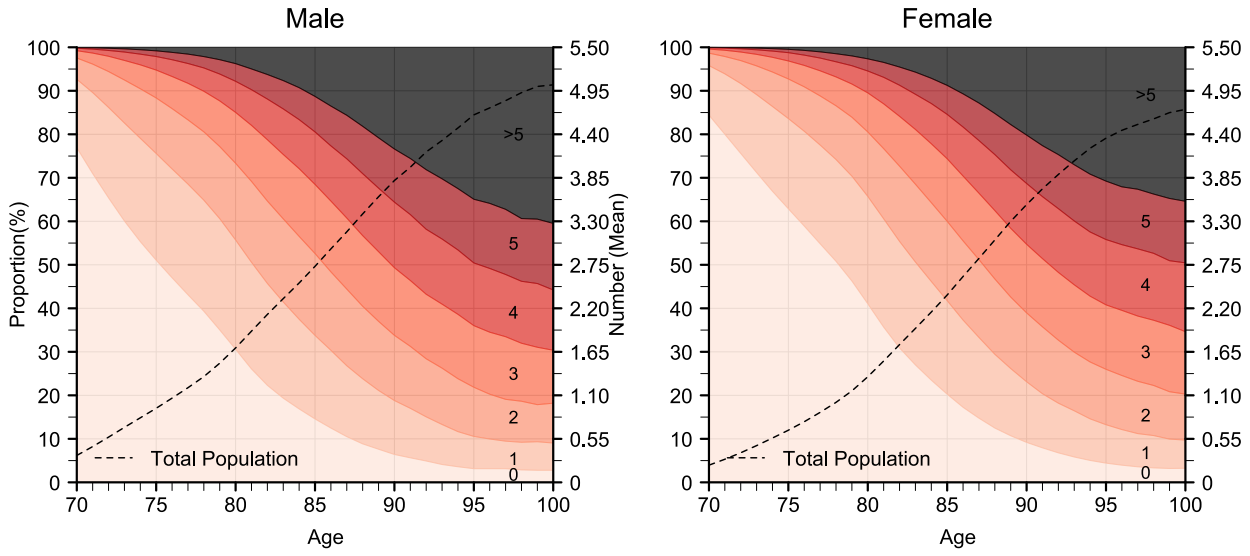

Figure 2. Proportion (left Y-axis) and number (right Y-axis) of individual diseases at different ages between 70 and 100 for male and female, birth cohorts 1920-1922, Sweden

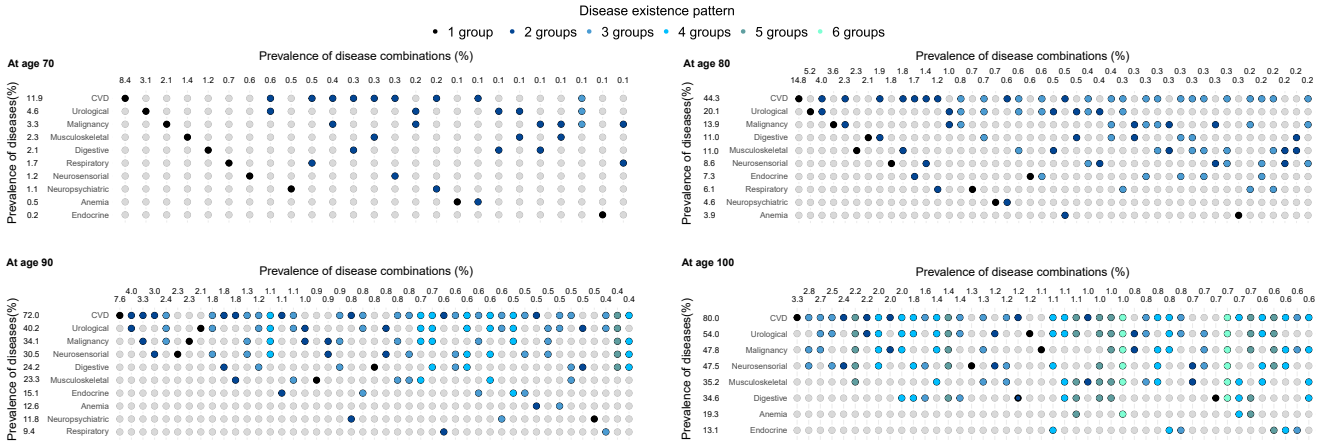

Figure 3. Disease coexistence pattern in male at age 70, 80, 90 and 100, birth cohorts 1920 to 1922, Sweden

Notes: The x-axis represents the prevalence of the 45 most common disease existence patterns, ranked in descending order. Disease patterns are displayed using dots in different colors (single disease group in black, combinations of 2 in dark blue, 3 in grey blue, 4 in sky blue, 5 in green blue, 6 in bright green). Only disease combination with a prevalence of 0.1% and higher are included in the figure. The prevalence of neuropsychiatric diseases at age 100 is 8.2% and the prevalence of respiratory diseases is 8.7%. They are not shown in the plot because they are not involved in the most common 45 disease combinations.