**Title: The increase in lifespan inequality in inter-war female cohorts in Denmark?**

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**Classification:** Social Sciences, Public Health – Demography

**Keywords:** Demography, life expectancy, lifespan variability, aging, mortality.

**Abstract [250 words]**

**Background**

**Methods**

**Results**

**Conclusions**

**Introduction [aimed to IJE] [3000 words]**

Female life expectancy in Denmark has followed atypical patterns since the second half of the 20th century. Periods of improvements followed by large periods of stagnation have been documented (1-3). The stagnation of life expectancy and its low level, compared to Denmark’s Scandinavian counterparts, is a result of the increased female mortality of those born between the two World Wars (3). Such increase in mortality has been linked to health behaviors. In particular, evidence suggests that smoking prevalence was higher in these particular cohorts (1), and it has been shown that the absolute effect of smoking on mortality caused the stagnation in adult life expectancy (2).

Although life expectancy is commonly used as a measure of the health status in a population, it is equivalently significant to analyze inequality in lifespans. Lifespan inequality is a dimension of health that refers to the ultimate difference between individuals in a population: the age at death (4). It expresses the uncertainty surrounding lifetimes and has been negatively associated with life expectancy in several developed countries and regions (5, 6).

Since lifespan inequality addresses the growing interest in health inequalities and its linkage with health and social behaviors (7), it is imperative to analyze if the stagnation of Danish female life expectancy in the second half of the 20th century, and the most recent improvements in mortality, were accompanied by presumed higher levels of lifespan inequality during the period of stagnation, and improvements thereafter. In this article, we analyze trends in lifespan inequality above age (15,30,50)? since the 1960’s. We disentangle the effect of specific causes of death on the unpredictability of life, before, during and after the stagnation of female life expectancy in Denmark using decomposition and demographic techniques. We hypothesize that although life expectancy stagnated between the mid-1970’s and the mid-1990’s, lifespan inequality could have increased throughout this period. We pose such hypothesis because higher prevalence of smoking is associated with increased overall adult mortality, which would cause higher lifespan inequality.

**Data and Methods**

We use publicly available period lifetables from the Human Mortality Database (8) for Denmark since 1960. These data contain high quality information on lifetable’s measures, such as the death distribution, survival function and life expectancy, by single age and sex. Cause-of-death data come from the World Health Organization Mortality Database (9). [a short description of these data and ICD codes] .

***Cause-of-death classification***

Originally, data on deaths were classified according to the International Classification of Diseases (ICD), revision 9 for years x and revision 10 for y. We classify deaths as…

***Dispersion measure***

Several dispersion measures have been proposed to analyze lifespan inequality (10). Here, we use the coefficient of variation defined as the standard deviation weighted by the average, in lifetable notation it is:

Where and denote the age at death density function, life expectancy at age x (to be defined), and the open-aged interval (110+ in our case), respectively. [some advantages of this indicator and its interpretation]. The strong correlation between lifespan inequality indicators suggests that main conclusions and results would not differ regardless of the which one is used (10-12).

***Decomposition techniques***

Lifespan inequality may increase or decrease while life expectancy is stagnating, this depends on the balance between reducing mortality at early ages, which compresses lifespan inequality, and saving lives at older ages, which increases inequality in lifespans (13, 14). To get a better interpretations of the reasons behind changes in lifespan inequality over time, we decompose lifespan inequality differences before, during, and after the stagnation of life expectancy by age and causes of death using standard decomposition techniques (15).

**Results**

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