

Educational Differences in the Compression of Disability Onset in the United States

Abstract

Studies regarding education as a “fundamental cause” of health disparities have shown that more-educated people enjoy longer life expectancy, mortality compression, later disability onset and disability compression compared with their less-educated counterparts, and this is especially true in the United States. However, it is still unclear whether educational differences in disability and mortality within a population are accompanied by compression of disability onset, that is, a smaller variation in ages of disability onset. This study proposes a hypothetical scenario of compression of disability onset, based on previous literature from the United States, showing that educational differences in disability and mortality within a population are very likely accompanied by compression of disability onset. The Health and Retirement Study will be used and microsimulation and bootstrap techniques will be performed. The compression of disability onset has very important policy implications and substantially influences how social welfare is arranged.

Introduction

Studies regarding education as a “fundamental cause” of health disparities (Link and Phelan 1995; Phelan and Link 2005) have shown that more-educated people enjoy longer life expectancy (Braveman et al. 2010; Crimmins and Saito 2001; Manton et al. 1997), compression of mortality (Brown et al. 2012), later disability onset (Jagger et al. 2007; Latham 2012; Melzer et al. 2001) and compression of disability (Crimmins and Saito 2001) compared with their less-educated counterparts, and this is especially true in the United States. However, it is still unclear

whether educational differences in disability and mortality within a population are accompanied by compression of disability onset, that is, a smaller variation in ages of disability onset.

The compression of morbidity concept was introduced in 1980 (Fries 1980), and the basic idea is that “the age at first appearance of symptoms of aging and chronic disease can increase more rapidly than life expectancy” (Fries et al. 2011). In terms of compression of disability, it is that while life expectancy is increased, the age of disability onset is also increased but at a faster speed than that of life expectancy, which results in decreased lifetime disability (Fries et al. 2011). Numerous studies have documented evidence of compression of disability in many countries. However, there is still no journal article documenting whether compression of disability onset even exists. This study aims to investigate the existence of compression of disability onset. Since education has been shown to have a crucial impact on life expectancy, mortality compression, age of disability onset, and disability compression, could it be possible that education also has an essential influence on the compression of disability onset? Or is compression of disability onset fulfilled or followed by longer life expectancy, compression of mortality, later disability onset, and compression of disability?

Compression of disability onset

What exactly does *compression of disability onset* mean? How is its related literature different from the compression of mortality literature? Or, to be precise, how does it differ from disability-free life expectancy?

Disability-free life expectancy refers to the average sum of disability-free years in the remaining life. Since people can recover from disabilities, the younger they are increases their chance of recovery. Therefore, people can have the same disability-free life expectancy but with

very different ages of disability onset by spending the same total amount of remaining years without disability. To investigate the age of disability onset at the population level is to look at the central tendency of the age of disability onset at the aggregate level, where people are most likely to suffer disability from active life. In this sense, regarding the central tendency measure, the mode is the best estimate for capturing the ages at which a person has the best chance to experience transitions into disability from an active health state. This has very important policy implications not only for the elderly but also for social welfare (such as long-term care). The variation of modal age of disability onset is also the key component that substantially influences how social welfare is arranged. The compression of disability onset measured by variation of modal age of disability onset therefore has crucial policy implications.

Hypotheses

- At higher levels of education within a population, disability onsets and deaths are redistributed from younger to older ages compared to less educated groups
- As education increases, disability onsets are redistributed faster than deaths such that disability becomes both delayed and compressed

Data

The data is from the Health and Retirement Study (HRS), a biennial survey beginning in 1992 and that is available up to 2010. The institutional population was not initially included in the HRS sample at the time of the first interview, but the longitudinal sample is followed into institutions so that the institutional respondents are also included in the current data. Overall, the HRS is representative of the U.S. non-institutional population ages 50 years and older and their spouses. This dissertation makes use of seven observation waves (1998, 2000, 2002, 2004, 2006,

2008, and 2010) to identify changes in disability across waves and mortality incidence for the U.S. population. The analytical sample will be age 50 and over in this study.

Health measures

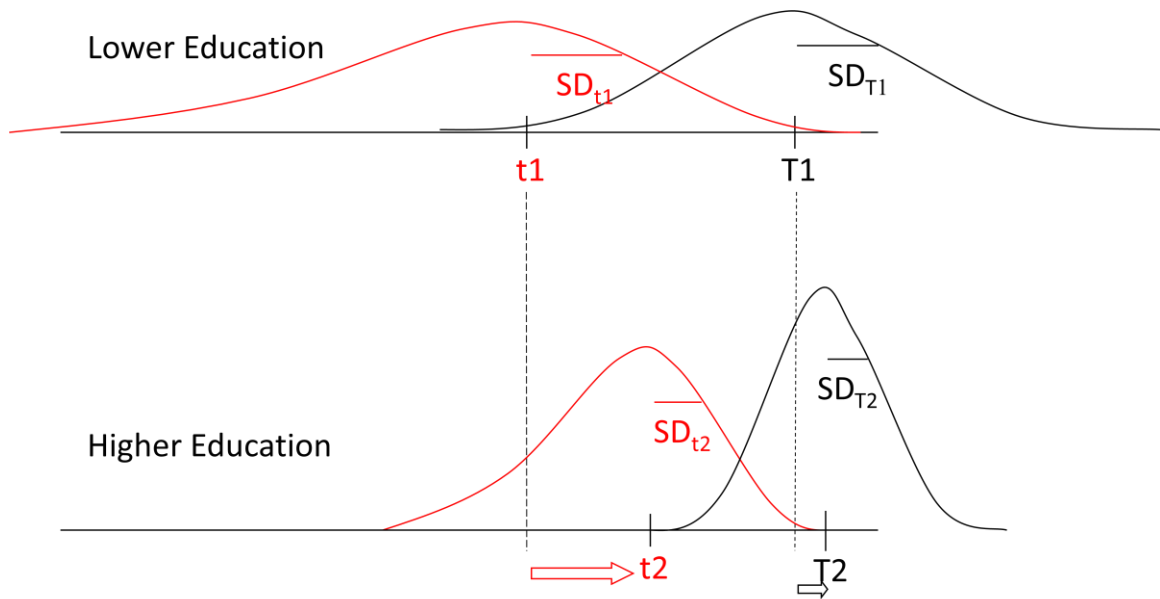
Death

HRS is linked to a National Death Index and also identifies deaths via follow-up interviews (from family members).

Disability

- 5 activities of daily living (ADLs: dressing, bathing, eating, bedding and walking)
- Inactive (Disabled): Have difficulty performing any one of the 5 ADLs
- Active: Have no difficulty performing all 5 ADLs

Hypothetical scenario of compression of disability onset



Note:

- T is age at death and t is age of disability onset.
- SD is standard deviation above mode.
- Red distribution indicates distribution of disability onset age
- Black distribution indicates distribution of death incidence age.

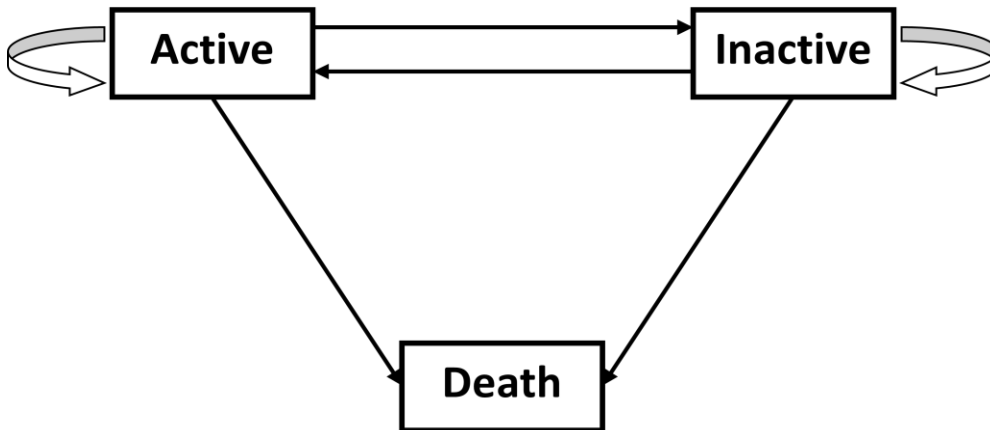
The educated have higher life expectancy or higher modal age of death ($T_2 > T_1$). The educated experience more mortality compression ($SD_{T_2} < SD_{T_1}$). Education also brings later disability onset ($t_1 > t_2$) with faster speed than that of life (expectancy) increases. Because a more rapid rise in the disability onset age than in the age of death squeezes the time within which disability incidence can happen (interval between disability onset and death) into a shorter span, the distribution of disability onset will become more narrow ($SD_{t_2} < SD_{t_1}$), which shows the compression of disability onset comes with increased education.

Method

Transition probability is estimated from multinomial logistic regression:

$$\ln(p_{ij}/p_{ii}) = \beta_{0ij} + \beta_{1ij} * \text{Age, by Sex and Education}$$

There are six transitions as shown below:



The microsimulation and bootstrap techniques will be performed based on the estimated transition probability obtained from multinomial logistic regression above.

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