Increasing social inequality in life expectancy in Denmark

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Background: The purpose of the study was to determine trends in social inequality in mortality and life expectancy in Denmark. Methods: The study was based on register data on educational level and mortality during the period 1981–2005 and comprised all deaths among Danes aged 30–60. Sex- and age-specific death rates for each of three levels of education were calculated and age-standardized to allow comparisons over time and between groups. As data obtained since 1996 included ages up to 74, partial life expectancy (i.e. expected lifetime of 30-year-olds before the age of 75) was calculated for the period 1996–2005. Results: Between 1981 and 2005, the difference in death rates between people aged 30–60 with low and high educational level increased by two-thirds for men and was doubled for women. During the period 1996–2005, the gap in partial life expectancy from age 30 to 75 between people with low and high educational level increased by 0.3 years. Conclusion: During the past 25 years, the social gap in mortality has widened in Denmark. In particular, women with a low educational level have been left behind.

Keywords: denmark, education, life expectancy, social inequality, trends.

Mackenbach et al.¹ reported increasing relative social inequality in a study on mortality during 1981–85 and 1991–95 in six European countries, including Nordic countries. The decline in mortality from cardiovascular disease contributed in particular to the growing social inequality. In Denmark, life expectancy began to increase in the mid-1990s, after many years of stagnation,² but the decline in mortality rates during the period 1995–99 was unequally distributed socially. The smallest decrease was seen among Danes with a low educational level, in particular among women.³ Statistics Denmark has systematically monitored socioeconomic differences in mortality among Danes since 1970 on the basis of nationwide registration of occupation and mortality, and marked social inequality in mortality has been demonstrated.⁴ Social differences in the burden of diseases have also been reported.⁵ For instance, in spite of a shorter life expectancy, cardiovascular disease accounted for an average of 0.7 years shorter lifetime between ages 30 and 75 without long-standing, limiting illness, for men with a low rather than a high educational level. The difference was 0.4 years for women. Because national registers in Denmark can be linked at the individual level with a unique personal identification code assigned to all Danish citizens, mortality rates and life-tables can be calculated directly. Since the previous study of social differences in mortality during the period 1981–2005 and comprised all deaths among Danes aged 30–60. Sex- and age-specific death rates for each of three levels of education were calculated and age-standardized to allow comparisons over time and between groups. As data obtained since 1996 included ages up to 74, partial life expectancy (i.e. expected lifetime of 30-year-olds before the age of 75) was calculated for the period 1996–2005. Results: Between 1981 and 2005, the difference in death rates between people aged 30–60 with low and high educational level increased by two-thirds for men and was doubled for women. During the period 1996–2005, the gap in partial life expectancy from age 30 to 75 between people with low and high educational level increased by 0.3 years. Conclusion: During the past 25 years, the social gap in mortality has widened in Denmark. In particular, women with a low educational level have been left behind.

Material and methods

The core of the national registers on education and occupation of Statistics Denmark is the 1970 census. Since 1980, educational data have been reported from the Ministry of Education and are updated annually. We calculated sex- and age-specific death rates for various educational groups in Denmark by linking Statistics Denmark registers on vital status and education for all Danish inhabitants. Age-standardized death rates were calculated, and life-tables were constructed by educational level. As the 1970 census did not include educational data for persons over 50, calculation of mortality rates for the period 1981–2005 was restricted to persons under 60. Special attention was paid to the period 1996–2005, because life expectancy began to increase in the mid-1990s after many years of stagnation. Information on education was available for people under 75 during this period, and we calculated partial life expectancy for every year in this period.

Data on schooling, vocational training and further education were combined, and three levels of education were defined: low for persons with a maximum of 10 years of schooling and only semi-skilled training, basic vocational training or business school (first year); medium for persons with either a maximum of 10 years of schooling and further vocational or other training or with post-secondary schooling, but no higher education; and high for persons with any type of higher education. Life expectancy was estimated for 30-year-olds by assuming that most people had finished their education by that age. Individuals for whom data on education were unclassifiable or missing (about 2.3% of the 30–74-year-olds in the period 1996–2005) were excluded from the analysis.

Results

Overall, death rates have declined since 1981. In particular, the age-standardized death rates for the age group 30–60 declined for men and women with a high or medium educational level (results not presented here). The difference in age-standardized death rates of men with low and high educational levels grew from 230 per 100 000 in 1981 to 388 in 2005. For women, the difference in the age-standardized death rates increased from 97 in 1981 to 195 in 2005.
Trends during the period 1996–2005 were investigated further by using information on education for people up to the age of 75 and estimating partial life expectancy, i.e. the expected lifetime of 30-year-olds before the age of 75. Figure 1 shows increasing life expectancy in all groups. On average, partial life expectancy at age 30 increased by 1.24 years (from 39.72 to 40.96) for men and by 0.77 years (from 41.54 to 42.31) for women. The increase was 0.73 years for men and 0.42 years for women with a low educational level. For people with a medium educational level, the increase was 1.20 years for men and 0.59 years for women. For 30-year-old men and women with a high educational level, partial life expectancy increased by 1.06 years and 0.75 years, respectively.

**Discussion**

We found that the social inequality in life expectancy has widened since 1981. Information on causes of death was not available for recent years; however, until 2000, trends in mortality from cancer showed a decline among men and women with a medium educational level and among women with a high level, but not among men with a high level of education or men or women with a low educational level. Mortality from cardiovascular disease declined in all groups, with a high level than a low educational level, and among persons with little education and among persons with lesser education represent a diminishing group increasingly composed of people marginalized to unemployment and less attractive employments. Overall, the prevalence of tobacco smoking declines faster among persons with a high than a low educational level, and among Danish women with a low educational level, a marked increase in the prevalence of heavy smoking has been observed since 1987. The effect of different smoking histories is reflected in diverse trends in mortality. Changes in smoking prevalence over time and the effects on mortality are related to birth cohorts with different smoking experiences. Although some data on past smoking prevalence by educational level or occupation exist, they are insufficient to study the impact of smoking on the increasing social inequality in mortality.

Changes in exposure to risk factors other than smoking (physical inactivity, high alcohol consumption, malnutrition, obesity, etc.) differ between educational groups and healthier lifestyle often starts earlier and more rapidly among people with a high educational level than among people with a lower level. Thus, social differences in risk factor exposure have not generally decreased (Kjøller M, personal communications, and data from The Danish Health Interview Survey 2005). Differences in lifestyle are part of the explanation for the social inequality in mortality, and unequal changes in health-related behaviour are reflected in various changes in mortality rates. Social inequality in health could be reduced by health promotion targeting high-risk subpopulations, including people with a low educational level.

**Conflict of interest:** None declared.

**Key points**

- Social inequality in mortality has been observed for many years in Denmark and other European countries.
- Linkage at the individual level between national registers in Denmark made it possible to study time trends in social inequality in life expectancy including all Danish inhabitants
- The social gap in mortality has widened in Denmark for the last 25 years.

**References**


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