## ORIGINAL ARTICLE

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## Trends in active life expectancy in Germany between 1984 and 2003—a cohort analysis with different health indicators

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Abstract Aim: This article examines trends in active life expectancy and their dependency on indicators of health using data from the German Socio-Economic Panel (GSOEP). Subjects and methods: A multistate life-table modelling approach is used to estimate active life years. First, mortality risks and the rates of entering and leaving the health statuses are estimated by applying multivariate hazard models. In a second step, increment-decrement life tables are constructed by applying age-specific transition rates for three different cohorts. Two measures of limitations in the activities of daily life (ADL) and two measures of health satisfaction are used. The study uses a cohort approach instead of the more commonly used method of cross-sectional investigation. Results: Results show that trends in active life expectancy depend markedly on the indicator chosen. Substantial improvements can be observed for younger cohorts with regard to severe health states. These improvements are a result of the decline in the transition from the independent to the dependent state, whereas no advances in recovery from the dependent state could be found. In contrast, if moderate health limitations in ADLs are investigated, the improvements are less substantial, and moderate health dissatisfaction is not accompanied by any change for younger cohorts. Conclusions: These findings suggest that, rather than examining trends in the prevalence of each health status, further research should focus on the changing path in and out of differing health status.

**Keywords** Active life expectancy · Multistate life tables · Compression of morbidity · Longitudinal research

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## Introduction

As in most developed countries, life expectancy in Germany has increased over the last several decades. Whether these increases in life expectancy have been accompanied by an expansion or contraction of the number of healthy years has been a fundamental question in the literature of aging (Fries 1980; Gruenberg 1977; Manton 1982). Three general theories have been proposed concerning changes over time in the relationship between active life expectancy and life expectancy per se. The first view, "compression of morbidity", is that the recent declines in mortality have been associated with similar improvements in morbidity. Increasingly, the onset of chronic disease becomes postponed to later ages, with morbidity therefore being compressed into the last few years of life (Fries 1980). An opposing view, proposed by Gruenberg (1977), raised the possibility of an expansion of morbidity. This theory suggests that improvements in mortality in recent years have occurred by increasing the duration of time that a person survives with a disease or disability. A third theory, "dynamic equilibrium" (Manton 1982), falls between the two views, suggesting that recent improvements in mortality have occurred because of the improved ability to manage the progression and severity of disease through delayed onset and effective medical care.

Studies on active life expectancy examine whether or not changes in overall life expectancy across the population are accompanied by changes in active life expectancy. Most studies use cross-sectional data and calculate active life expectancy using the method introduced by Sullivan (1971). Research has shown that increases in total expected years of life do not necessarily lead to increases in expected years of healthy life. For example, a recent study by Brønnum-Hansen (1998) found an increase in the proportion of active life expectancy for Danish men, while Crimmins et al. (1989) found a decrease for the population in the United States between 1970 and 1980. Numerous studies have also shown a discontinuous trend over longer periods (Bebbington 1988; Crimmins et al. 1997; Doblehammer and Kytir 2001). In general, the question