Socioeconomic status and the expectation of disability in old age: estimates for England

The Medical Research Council Cognitive Function and Ageing Study (MRC CFAS) writing committee: David Melzer, Brenda McWilliams, Carol Brayne, Tony Johnson, John Bond

Abstract

Objectives—The longer life expectancy in old age of more privileged socioeconomic groups is well established, but less clear is whether the net effect of additional years of life is a lengthened, stable or reduced duration of disability. Estimates of healthy and disabled life expectancy (using definitions including dependency in activities of daily living and cognitive impairment) were made, contrasting occupational classes I and II (professional and managerial) with the rest.

Design—Disability prevalence was estimated from the Medical Research Council Cognitive Function and Ageing study. Sullivan’s method was used to calculate health expectancy.

Subjects—10 377 people aged 65 years or over in Cambridgeshire, Newcastle, Nottingham and Oxford. Subjects were classified as disabled if they had evidence of dementia (using the Automated Geriatric Examination Computer Assisted Taxonomy) or scored 11 or more on the modified Townsend Disability scale, at baseline screen.

Results—The prevalence of disability overall and need for “constant care” was lower in both men and women in social classes I and II compared with the rest. Men aged 65 to 69 in classes I and II can expect nearly 14 years of life free of disability compared with 11.5 years for those in classes III to V: for women the equivalent expectations are 15.5 and 13.8 years. Men aged 65 to 69 in classes I and II can also expect a shorter duration of disability: 1 year compared with 1.6 years for classes III to V. In women expectation of disability is higher overall, but shows little difference by occupational class.

Conclusions—Relatively privileged socioeconomic groups in England, especially men, can expect fewer years of disability despite longer overall life expectancy. These findings lend weight to optimistic scenarios for the future numbers of older people with disability.

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Socioeconomic differences are one of the key influences on health and their effect on mortality in old age is well established. It is also clear from several studies that the prevalence of disability in relatively privileged sections of the older population is lower. What is less clear, however, is whether the net effect of longer survival of privileged socioeconomic subgroups is lengthened, stable or diminished numbers of years lived with disability in old age.

Theories about the effect of rising life expectancy in populations over time vary from the pessimistic, which predict that additional years of life will be spent in a dependent state, through to the optimistic, which envisage a compression of morbidity into an increasingly brief period before death. Clearly, a similar range of possibilities might apply to longer lived subgroups within the current older population. As health, social and long term care service use is closely related to disability, establishing the expectation of disability in longer lived subgroups is of considerable policy importance in efforts to prepare health and welfare institutions for an aging society.

The best measure combining disability and mortality data is disability free life expectancy, which estimates the average number of years of life free of disability remaining at a given age to members of a particular population. This index is independent of the particular age structure of the study population and is therefore useful for comparing population health states and for monitoring and projecting future population health. Conventionally, only physical disabilities or limitations in activities of daily living are considered, although this may introduce biases by excluding cognitive impairments, which are a major element of disability especially at older ages.

Estimates of disability free life expectancy for different socioeconomic groups have been provided for the USA showing that subgroups who had more education have longer expectancy of life free of disability and a shorter proportion of their lives lived with disability, but a similar or longer actual duration of expected disability. Previous estimates of disability free life expectancy by socioeconomic group for the UK have suggested that life expectancy without disability made up a larger proportion of total life expectancy in relatively privileged subgroups. However, these data are from the mid-eighties, measures of disability were relatively crude, and data on occupation were missing in 27% of those with disabilities.

The study presented here aimed to estimate the disability free life expectancy, and the expectancy of life with physical disability or cognitive impairment by socioeconomic groups in England using the UK occupationally defined social class. The Medical Research
Council Cognitive Function and Ageing Study provides a large and recent source of data to explore this issue. This paper presents prevalence data for a range of measures of disability by social class and estimates of the expectation of health and disability in a range of age groups for men and women. The implications of the patterns of healthy and disabled life expectancy reported here are then explored by contrasting traditional projections with social class based short-term projections of future numbers of older people with disability in England.

Method

The Cognitive Function and Ageing Study (CFAS) was set up in 1991 as a two stage population prevalence survey with longitudinal follow up. Full details of the study can be found elsewhere. Stratified random population samples of people in their 65th year and above were selected from Family Health Service Authority lists to provide equal numbers in the two age groups 65 to 74 years and 75 years and over, and included people living in institutions. Initially each person in the sample was interviewed in their home by a trained fieldworker using a computerised interview. At this prevalence screening interview, data were collected covering basic demographic details (including years of full time education and social class), activities of daily living, help provided with certain activities, social networks, health, cognitive functioning and the presence of organic psychiatric disorder (assessed by diagnostic interview). Data from the initial prevalence screen (Version 4.0) for Cambridgeshire, Newcastle, Nottingham and Oxford were used in this analysis, plus death notifications from the National Health Service Central Register. Prevalence screening information was available on 10,377 people from these sites and data were pooled as there were no important differences between the sites in demographic structure or cognitive impairment.

Social class was coded according to OPCS standard occupational codes using CASOC, coding each person’s main occupation for most of their working life and the occupation of their most recent husband for married, widowed, divorced or separated women. Class I and II includes all those who had professional and managerial occupations; class III to V includes class IIIN (skilled non-manual, for example, clerical and secretarial), class IIIIM (skilled manual, for example, craft and related occupations and foremen), class IV (partly skilled occupations, for example, street traders and scaffolders) and class V (unskilled occupations, for example, cleaners and farm labourers).

Definitions of Disability and Need for Care

People in the sample were identified as disabled if they were mentally impaired, physically disabled or both. Mental impairment (possible dementia) was measured at screen by the Automated Geriatric Examination Computer Assisted Taxonomy (AGECAT). If the AGE-CAT syndrome level was 3 or more (identifying possible dementia), people were classified as mentally impaired. They were identified as physically disabled if they scored 11 or more on the modified Townsend Disability Scale. This scale covers nine activities of daily living (washing all over, cutting toenails, getting on a bus, going up and down stairs, doing heavy housework, going shopping and carrying heavy bags, preparing and cooking hot meals, reaching an overhead shelf and tying a good knot in a piece of string). Each activity scores 0 (no difficulty), 1 (can do but with difficulty) or 2 (not able) and the scores are summed to give a total, which is subdivided into five groups: 0 (no incapacity), 1–2 (slight incapacity), 3–6 (some incapacity), 7–10 (appreciable incapacity) and 11 or more (severe incapacity). A person who is classified as physically disabled (scoring 11 or more) would need help with at least two of the specified activities and have some difficulty with some or all of the rest.

People were also classified as needing constant care or supervision, based on the “critical interval of need for care”. The two dimensions in this classification are functional incapacity (self care, house care and mobility) and mental state. People were first allocated to a category on the basis of their daily living functioning (from the Townsend disability scale plus a further three activities) and their degree of mobility (from a specific question asked at screening), and then on their degree of mental impairment, as measured by the Mini Mental State Examination. All those with severe mental impairment (MMSE score less than 10) are classified here as needing constant care regardless of their physical state. Typically, a person with critical interval or constant care needs would be bedfast or chairfast, or unable to get to or use the toilet, or be severely mentally impaired.

Healthy Life Expectancy

Healthy life expectancy is the number of years a person, at a particular age, can expect to live in a healthy state (however health is defined). Healthy and disabled life expectancies together with confidence intervals were calculated using Sullivan’s method. Sullivan’s method involves dividing expected years lived from the life table for the study population into active and inactive years, based on age specific prevalence estimates of the proportion of the population that is active or inactive (disabled). Age specific mortality rates for different social class

Table 1 Number of people in the study sample by age, sex and social class

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>(years)</td>
<td>I+II</td>
<td>III–V</td>
</tr>
<tr>
<td>65–74</td>
<td>620</td>
<td>1638</td>
</tr>
<tr>
<td>75–84</td>
<td>428</td>
<td>1075</td>
</tr>
<tr>
<td>85+</td>
<td>75</td>
<td>228</td>
</tr>
<tr>
<td>Total</td>
<td>1 123</td>
<td>2 941</td>
</tr>
</tbody>
</table>

Those who were unclassified by social class (2.7%) have been randomly allocated in age/sex specific proportions to the two social class groups and those in the armed forces (1.3%) have been excluded.
Melzer, McWilliams, Brayne, et al

Table 2  Prevalence of disability, need for constant care, poor self assessed health and mortality during the two years after screening interview, by gender and age group

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Social class I+II</th>
<th>Social class III–V</th>
<th>Social class I+II</th>
<th>Social class III–V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% (95% CI)</td>
<td>% (95% CI)</td>
<td>% (95% CI)</td>
<td>% (95% CI)</td>
</tr>
<tr>
<td>All disability*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65–74</td>
<td>3.1 (1.7,4.5)</td>
<td>6.5 (5.3,7.7)</td>
<td>3.9 (2.5,5.3)</td>
<td>7.9 (6.7,9.1)</td>
</tr>
<tr>
<td>75–84</td>
<td>6.8 (4.9,9.2)</td>
<td>17.5 (15.2,19.8)</td>
<td>16.8 (14.0,20.0)</td>
<td>24.3 (22.3,26.3)</td>
</tr>
<tr>
<td>85+</td>
<td>26.7 (16.7,36.7)</td>
<td>38.8 (32.3,45.1)</td>
<td>53.8 (47.6,60.0)</td>
<td>55.9 (52.0,59.8)</td>
</tr>
<tr>
<td>Severe disability (needing constant care)†</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65–74</td>
<td>1.9 (0.8,2.9)</td>
<td>2.4 (1.7,3.1)</td>
<td>0.8 (0.2,1.4)</td>
<td>2.2 (1.6,2.8)</td>
</tr>
<tr>
<td>75–84</td>
<td>2.1 (0.7,3.4)</td>
<td>4.1 (2.9,5.3)</td>
<td>4.4 (2.9,5.9)</td>
<td>5.8 (4.7,6.9)</td>
</tr>
<tr>
<td>85+</td>
<td>6.8 (1.1,12.5)</td>
<td>9.4 (5.6,13.2)</td>
<td>14.7 (10.3,19.1)</td>
<td>15.1 (12.2,17.9)</td>
</tr>
<tr>
<td>Poor self assessed health‡</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65–74</td>
<td>3.6 (2.1,5.1)</td>
<td>7.3 (6.0,8.6)</td>
<td>3.2 (1.9,4.5)</td>
<td>7.0 (5.8,9.1)</td>
</tr>
<tr>
<td>75–84</td>
<td>3.3 (1.6,5.0)</td>
<td>7.9 (6.3,9.5)</td>
<td>3.5 (2.1,4.9)</td>
<td>7.7 (6.5,8.9)</td>
</tr>
<tr>
<td>85+</td>
<td>4.3 (0.0,9.1)</td>
<td>6.3 (3.0,9.6)</td>
<td>5.5 (2.5,8.5)</td>
<td>6.6 (4.5,8.7)</td>
</tr>
<tr>
<td>Mortality§</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65–74</td>
<td>6.1 (4.2,8.0)</td>
<td>7.8 (5.6,9.1)</td>
<td>2.5 (1.4,3.6)</td>
<td>4.0 (3.1,4.9)</td>
</tr>
<tr>
<td>75–84</td>
<td>12.1 (9.0,15.2)</td>
<td>17.2 (14.9,19.5)</td>
<td>9.1 (6.9,11.3)</td>
<td>11.8 (10.3,13.3)</td>
</tr>
<tr>
<td>85+</td>
<td>24.0 (14.3,33.7)</td>
<td>31.1 (25.1,37.1)</td>
<td>24.3 (19.0,29.6)</td>
<td>27.1 (23.6,30.6)</td>
</tr>
</tbody>
</table>

% Unclassified and excluded from table: *0.2%, †0.8%, ‡2.8%. †Needing constant care (that is, bedfast or chairfast or unable to get to or use the toilet or severely mentally impaired). §Died within two years from prevalence screen. Those unclassified by social class but these have been randomly allocated to the two social class groups. One hundred and thirty four people (1.3%) were in the armed forces and these have not been included in the table also shows the proportion in each group who died during the two years from the baseline interview. The data illustrate the well established pattern of rising rates of disability with age and higher rates of disability in women. More importantly for this analysis, an overall pattern of significantly higher morbidity and mortality in less privileged social classes is evident.

The most meaningful index of both disability and mortality data is healthy and disabled life expectancy. In figure 1 (A and B), the disability rates presented above are combined with national data on life expectancy by social class to estimate healthy and disabled life expectancy across several age groups. Figure 1 (A and B)
shows that the upper quartile of social class men can expect a shorter duration of disability combined with a longer healthy life expectancy, although the differences are less statistically significant in the oldest groups. Thus, a man in social class III to V and age group 65 to 69 could expect to live 13.1 years, 11.6 without disability (table 3) and 1.6 years with disability, during 1987–91. On the other hand, a similar man in social class I and II can expect to live 1.9 years longer in total, 14 without disability but only 1 with disability.

By contrast with the pattern in men, the greater healthy life expectancy of upper social class women is associated with virtually unchanged expectancy of disability (fig 2 (A and B)). Thus, women in social class III to V and age group 65 to 69 could expect to live 17.18 years in all (table 3), 13.76 without disability and 3.42 years with disability. By contrast, a similar group of women in social class I and II could expect to live 1.5 years longer overall (18.72 years in total) with a statistically insignificant 0.2 of a year less of living with disability.

CONFIRMATORY ANALYSES

The pattern of shorter expectation of disability in upper class men, with stable expectation in women is evident in a range of confirmatory analyses. Calculating the Sullivan table using single years (rather than abridging to five year groups), with mortality measured from the CFAS study, produces little difference in the pattern of results: an expectation of disability at age 65 for men in social class I and II of 1.63 years versus 2.00 years in classes III to V and for women 3.42 years with disability. By contrast, a similar group of women in social class I and II could expect to live 1.5 years longer overall (18.72 years in total) with a statistically insignificant 0.2 of a year less of living with disability.

Expectation of severe disability assessed as constant care needs (that is, bedfast or chairfast or unable to get to or use the toilet or severely mentally impaired).
Discussion

The results presented above are consistent with a large body of research on disability in old age. Levels of disability in women are substantially higher than those in men and lower socioeconomic groups are again shown to experience higher mortality and a higher prevalence of disability, both in men and women.1 2 10 19–22

The results are also consistent with recent work on healthier sub-populations of older people, previously defined by years of education23 24 or healthy behaviour.25 This analysis goes further however, in showing that the net effect of differences in mortality and disability on healthy and disabled life expectancy in older people in the UK is complex, with evidence of a significantly shorter expectation of disability in relatively privileged older men.

However, a number of methodological issues need to be considered in evaluating these results. The study is not based on national data, but rather samples from four sites in England, although basic socioeconomic characteristics across these populations are similar to the national pattern.11 The study method has involved some re-allocation of missing data on a random basis within age/sex groupings, although this process will have had the effect of reducing the reported differences. In any event, these effects will be small, because for example, the highest percentage of data missing was 2.8% of the total in the measure of needing constant care and supervision.

The definition of disability is crucial in evaluating the results of any study of healthy life expectancy.26 Work on trends in disability have found diverging patterns with different measures of disability27 and thus we have reported several measures including disability in activity of daily living or cognitive impairment, the same definition ignoring cognitive impairment, severe disability sufficient to imply a need for constant care and attention and finally, self assessed health. It is clear from table 3 that the overall pattern of substantially lower rates, especially in men in privileged socioeconomic groups is present across these variables, although these do not always reach statistical significance, mostly because the prevalence and study numbers are small. The social class classification can also be criticised as not reflecting the circumstances of people who may have retired long ago, especially for older women.22 However, when the analyses were repeated with the population divided on the basis of more than 10 years in education (which included the upper 22%), a similar pattern was seen.

The Sullivan method for assessing healthy and disabled life expectancy, used here, is based on current rates of disability measured on a cross sectional basis in the population. In theory this measure may be biased if rates of becoming disabled and remission have undergone sudden and irregular changes over the longer term. As there is no evidence of abrupt changes in patterns of onset and recovery from the broad categories of disability presented here, Sullivan’s method should provide a good measure of healthy and disabled life expectancy.28 Using the alternative multi-state models (based on computed risks of transition to disability, recovery from disability or death over a set time period) also raises difficulties as estimates can be unstable29 and sensitive to the details of study method. These methodological differences may explain the differences in findings between this study and the US studies by Guralnik5 (who reported some excess of expected duration of disability in more educated subgroups) and Crimmins6 (who found

![Figure 3](http://journals.bmj.com/jech/2002/01/01/images/358f01.jpg)
similar expectations of disability across educational groups). Further work to explore these diverging patterns is justified.
14 Bond J, Carstairs V. Services for the elderly: a survey of the characteristics and needs of a population of 5,000,000 old people. Scottish Home and Health Studies No 42. Edinburgh: Scottish Home and Health Department, 1982.
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