Healthy life expectancy in England and Wales: recent evidence

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Synopsis

This report has two main purposes. The first is to updates the evidence about trends in healthy life expectancy using the 1994 GHS, which included both the limiting longstanding illness question and a section of the health of elderly people comparable to that asked in 1981 and 1985.

There are various problems with using these household surveys for measuring states of health, and Appendix A discusses what might be done to establish a more suitable basis for measuring the need for long-term care.

The report finds that there has been an improvement in healthy life expectancy for the elderly in relation to climbing stairs, little change in mobility outdoors, and a continuing decline for everyone in relation to limiting longstanding illness. A possible explanation of this pattern is that while people are continuing to encounter disability creating conditions at a similar rate, the most severe levels of disability are being successfully contained. If these trends continue, then in future as the number of elderly people increases, there will be more with minor problems, though the demand for services for severe disablement may not necessarily increase.

The second purpose is to compare estimates of healthy life expectancy from limiting longstanding illness with quality adjusted life years using the EuroQol battery, based on the 1995 Omnibus Survey. The expected quality-adjusted life years at 15 from this survey are 51.9 for a man, 54.5 for a woman: compared with a healthy life expectancy using limiting longstanding illness of 46.3 years for men and 48.0 years for women.

In other respects, despite their conceptual differences the two measures are highly correlated and in a range of epidemiological applications describing and comparing the health of broad groups of the population, defined by age, gender or region, lead to similar types of conclusion, especially after allowing for the fact that EuroQol based QALYs measure health at a rather more severe level on average than limiting longstanding illness.

A regional analysis based on the Omnibus Survey finds that the North/West versus South/East divide in healthy life expectancy continues, with the difference in healthy life expectancy (measured with by QALYs or using LLI rates) consistently greater than differences in life expectancy. Appendix B discusses the effect of migration on local or regional estimates, using the Longitudinal Survey, and finds some remarkable differences between counties in the health of their immigrants and emigrants, but concludes that the net effect on estimates of healthy life expectancy are probably not great.

1. Introduction

The purpose of this report is to describe recent evidence based on the 1994 General Household Survey (GHS) and the 1995 (First Quarter) Omnibus Survey, concerning healthy life expectancy in England and Wales. These findings extend some of the analysis described in *Healthy Life Expectancy and Its Uses* (Bone et al., 1995), and provide further evidence of trends in disability.

The remainder of this section describes the background to this research. Section 2 outlines the method of measuring health expectancies.

Section 3 analyses 1994 GHS in a manner comparable with estimates using past rounds of the GHS, in order to project forward trends in healthy life expectancy. This uses firstly the limiting longstanding illness question and secondly, for elderly people, activities of daily living. (It had been hoped to include estimates by social class, but mortality rates by social class are not yet available from OPCS.)

Section 4 uses 1995 Omnibus Survey data to demonstrate the comparison of healthy life expectancy using the limiting longstanding illness question, and quality adjusted life years using the Euroqual scale. A regional analysis is included.

There are three appendices. Appendix A comments on the relevance of the questions being used in the General Household Survey, to issues concerning resource use and financing of community care. Appendix B examines evidence from the Longitudinal Survey about the health of migrants, and comments on the effect of migration on estimates of the healthiness of local populations in England & Wales. Appendix C describes the methods used to approximate disability in communal establishments in order to obtain estimates of healthy life expectancy from the GHS and Omnibus Surveys.

1.1 Background

There is an international effort to establish trends in healthy life expectancy. A core question is whether the recent lowering of mortality rates, which have lead to an aging of the population in most developed nations, are being accompanied by a corresponding improvement in morbidity rates, particularly among older people.

What makes health expectancy, the number of years a person can expect to live at a given state of health, of particular interest to this question is that it provides a summary measure of health that is independent of the age structure of populations. It provides a measure of a nation's continued success in improving the health of its population. Moreover it presents information about health in the population in a form that has immediate implications for an individual planning for his or her own future health needs.

The trend in health expectancy offers an answer to the question of whether over the coming decades we can expect an expansion or compression of morbidity:

- Expansion of morbidity occurs when the decline in the incidence of morbidity is less than the incidence of mortality (Olshansky et al., 1991), which produces an increase in the expectation of the proportion of life lived in chronic ill-health, and is associated with a high growth in the prevalence of morbidity. The usual most pessimistic assumption is that age-specific morbidity rates will be unchanged, which is indeed the implicit position of the simplest forecasts of future health expenditure need. However, it is not impossible that age-specific morbidity might get worse in some circumstances.

- Compression of morbidity (Fries, 1980), conversely, means a reduction in the proportion of life lived in chronic ill-health, and is associated with low growth or even a decline in the prevalence of morbidity. Probably the most optimistic assumption is that the expectation of years in ill-health will remain unchanged as life-span increases, (though Fries has argued that the expectation of ill-health may actually fall). This is equivalent, under certain conditions, to an assumption that the prevalence of ill-health remains unchanged.

The converse of health expectancy, ill-health expectancy, follows directly. The trend in this will be crucial to the future costs of long-term care particularly for elderly people.

Comparison of health expectancy between population groups is an important source of evidence about equity and the need to target health care resources. It can also be of value in the search for common risk factors, by identifying relevant variables which appear to be associated with differences in health.

Other policy applications of health expectancy measures are discussed in Bone et al. (1995).

2. Methods of measuring health expectancy

2.1 Analytic methods

This report estimates health expectancy using the now widely used method introduced by Sullivan (1971) and popularised through the work of the International Network on Health Expectancy (Robine et al., 1995). This is essentially a *period* approach in which the estimates reflect the hypothetical expectation of an individual who through his/her life experienced age-specific mortality and ill-health rates equal to the current average rates, and is to be distinguished from the *cohort* approach which tracks the actual experience of individuals through their life-time. Sullivan's approach combines mortality table data with information about the prevalence of ill-health from a cross-sectional study. Box 1 contains details of the method of calculation.

Box 1: Calculating healthy life expectancy by the Sullivan method.

1. Obtain the life table schedules l(x) and the expectation of life e(x) at ages x for the year of interest.

   Calculate:

   $$L(x,n) = e(x).l(x) - e(x+n).l(x+n)$$

   L(x,n) is the conventional life table measure of the average number of person years lived in the age interval x to x+n. (Alternatively this may be calculated from mortality rates).

2. Obtain the ill-health rate d(x,n) in each age group observed in a survey or census. Include people in communal establishments. Calculate the average number of persons aged x to x+n living without disability in each age/sex group as

   $$L_{HL}(x,n) = L(x,n).(1-d(x,n))$$

3. Calculate healthy life expectancy as

   $$e_{HL}(x) = (\Sigma L_{HL}(t,n))/l(t)$$

   where the summation is from t=x up to the top age group.

Note. This approach may be adapted for measuring population QALYs by estimating the average QALY tariff q(x,n) in each age group in the population, and replacing (1-d(x,n)) in equation 2 by q(x,n). The resulting measure $L_{HL}(x,n)$ is then the estimated number of quality adjusted life years lived by the population in that age group; and $e_{HL}(x)$ is the estimate of the expected future QALY's for a person aged 'x', assuming the mortality schedule and average tariffs remain unchanged.

This approach is generally agreed to be less satisfactory than true period estimates based on the age-specific rates of transition between good health, ill-health and death (e.g. Manton & Stallard, 1988) but its limitations are now well understood. In particular, Sullivan's method is not suitable for detecting recent abrupt changes in trends, nor for estimating incidence rates, prognosis, or life-time risk. It is however suitable for long term trends and comparisons between populations and subgroups, provided there is little migration among those subgroups.

Direct estimation of transition rates requires some form of registration or longitudinal data. This method is much more difficult to put into practice and has been confined to studies of specific diseases, and in a few countries, to health expectancies beyond 65.

2.2 Measures of Health

Health expectancy is a generic term that can be applied to a range of chronic or irreversible conditions or health events. The approach has been applied to specific diseases such as cancer and dementia; to impairment, disability and handicap (IDH: Duckworth 1983); to events such as admission to long stay institutional care. The present report is concerned primarily with disability related measures. Specific measures are presented for:

- *Limiting Longstanding Illness (LLI)*. Whether or not someone has a longstanding illness that limits their ability to undertake normal activities has been asked in every annual General Household Survey since 1976, and more recently in the 1995 Omnibus Survey. This is essentially a disability measure. A modified form was used in the 1991 Census.

- *Activities of Daily Living (ADL)*. A standard series of questions about degree of difficulty with activities of daily living was asked of people aged 65+ in the *Elderly at Home* survey of 1976, and again in the 1980, 1985, 1991 and 1994 General Household Surveys. These are disability measures, more specific than LLI.

- *The EuroQol Scale*. This was asked in the 1995 Omnibus Survey, and from it expected quality-adjusted life years can be calculated by the health expectancy method. This is a health-related quality of life measure which uses a valuation of each possible health state in relation to perfect health.

Table 1 contains details of each of these scales.

There are two practical difficulties with estimating health expectancy from health measures of this type.

2.2.1 Validity and reliability

All the above are self-assessment scales. This raises the question of whether they are reasonable measures of their respective aspects of health, and whether the responses obtained from each individual are stable and consistent.

- The limiting longstanding illness question is subjective. Although it demonstrates good correlation with independent measures of health, it is possible that answers are culturally conditioned by expectations about health, which throws doubt on its validity for certain types of comparison, for example between ethnic groups or over long time periods. Small wording differences appear to have a big effect on response, as has been demonstrated in recent national surveys (Bone et al., 1995, chapter 3).

- The activities of daily living have formed the basis of many disability scales, through which they have demonstrated reasonable properties, at least when asked of elderly people. They focus on a comparatively narrow aspect of health. These items are more objective in nature than those of the other measures considered here. Even so, responses are known to be sensitive to exact presentation.

- The items in the EuroQol scale are also subjective. However the scaling method is anchored in relation to two states: perfect health, and death. In so far as these are culturally universal the approach may be more suitable for comparative work. Some reliability testing has been undertaken: cf Williams (1995).

2.2.2 Applicability to Children and People in Communal Establishments

The second concerns the applicability of these scales to all types of individual. There is great difficulty in designing disability questions that will be appropriate to all people.

- Abilities may differ even between people thought to be in perfect health. In particular, children are not disabled by being unable to work, cook, or at younger ages, to walk outdoors.

- Abilities are affected by context. In particular, people who might face certain disabilities if living alone, may not do so in a supported environment, such as a residential home. It may be difficult to establish what would be the equivalent abilities of a person living in such an environment.

The result is that it is unusual for surveys of disability related health measures to include all sections of the community. Where they do so, it is necessary for the questions to be very general in nature so that they are applicable in all contexts. (An exception is the 1986-8 UK Disability Survey which used complex scaling to equate questions asked to different sections of the community.) Of the measures examined here:

- Only the limiting longstanding illness question has been asked of all people (in the 1991 Census); though in the General Household Survey it has been applied only to people living in the community.

- The ADL questions are only asked routinely of elderly people (65+) living in the community in the General Household Survey, though they were asked of all adults both in the community and institutions in the 1986-8 Disability Survey.

- The EuroQol questions, though probably of sufficient generality to ask everyone, are asked only of adults (16+) living in the community in the Omnibus Survey.

These omissions have two consequences for the calculation of healthy life expectancy. Where questions have not been asked of people below a certain age, then healthy life expectancy can be calculated only for that age group and above, not from birth. Where questions have not been asked to people in institutions, then it is necessary to impute values for those people in order to make the calculation.

2.3 Residents of Communal Establishments

Imputing health states of residents of communal establishments is important because those living in health care institutions (and this is the majority), are particularly likely to have health problems. This would be more of a problem except that the total number is comparatively small (7 per cent of all people with limiting longstanding illness in the 1991 Census were living in communal establishments).

The general approach is to separate residents of health care establishments from the remainder. It is then assumed that resident staff, and all residents in establishments not for health care, have a similar health status to the general population. (The 1991 Census also includes visitors in communal establishments: these are generally people staying for short periods who would be recorded at their home address in household surveys like the GHS and Omnibus Survey.)

It is first necessary to establish how many people are living in health care establishments in non-census years, by age and sex. In earlier studies various methods have been used. Bebbington (1988) used annual administrative statistics, while Bone et al. (1995) used interpolation between the 1981 and 1991 censuses. Neither of these methods is entirely satisfactory, the first because the administrative records have changed format so much, and the second because years such as 1976 and 1994 involve extrapolation. Instead a new combined approach has been adopted, separating each of the main types of establishment identified by the 1991 Census (excluding children's homes). This method is described in Appendix C, and yields estimates of the intercensal resident population in health care establishments that are more reliable than those published in earlier papers.

The second step is to determine what is the disability rate among people in communal establishments. This is described in more detail in the relevant sections below, but relies heavily on the limiting longstanding illness rate in the 1991 Census, and ADL disability rates in the communal establishments part of the 1986-8 UK Disability Survey.

3. Trends in health expectancy from the General Household Survey

3.1 Findings

This section extends previous calculations of trends in healthy life expectancy in England and Wales based on the General Household Survey (Bone et al., 1995); to include data for 1994. The analytical method (Sullivan's method) is described in the box above. The purpose of this analysis is to examine whether increases in life expectancy are being matched by corresponding improvements in morbidity. This is relevant to predictions of the future demand for long-term care as the population ages.

Table 2 contains full details of the workings of this calculation for each of the years 1976, 1981, 1985, 1988, 1991, 1992 and 1994. This table contains four groups of columns: population and

life table estimates from OPCS (3 columns); estimated age-specific rate of LLI (6 columns); calculation of healthy life expectancy (2 columns); and a comparison between life and healthy life expectancy (2 columns).

The main evidence for the LLI rate is taken from the GHS question concerning limiting long-standing illness, answers of `yes' to both of the following:

- Do you have any long-standing illness, disability or infirmity?
- Does this illness or disability limit your activities in any way?

The figures are taken from the published reports in most years[1] but in 1994 are derived from secondary analysis. These are shown in table 2 (by age group and sex), for the years in the column marked GHS LLI%; together with the sample sizes on which they were based.

To allow for people not living in private households, the method described in §2.3 has been used. Table 2 shows estimates of the numbers of residents in health care related establishments (excluding staff) at each point in time, and also the age/sex specific LLI rates calculated from the 1991 census. From this the overall LLI rate can be estimated.

With this in mind, table 2 shows the life table `l(x)', life expectancy `e(x)', healthy life expectancy `$e_{HL}(x)$', and expectation of years of ill-health `Years LLI', at various ages, for men and women in 1976, 1981, 1985, 1988, 1991, 1992 and 1994. In 1994, healthy life expectancy at birth was 59.2 years for men and 62.2 years for women.

Table 2 continues to confirm the now well established result that although women live longer than men, a greater proportion of their lives will be in ill-health. Based on 1994 rates, men can expect to live 74 years of which 15 will be with limiting ill-health, while women can expect to live 79½ years of which 17½ will be with limiting longstanding ill-health.

Between 1976 and 1994 there has been a phenomenal rise in period life expectancies for both men and women, equivalent to a gain of about 0.2 of a year per annum. By contrast healthy life expectancy (using LLI) has risen by only 0.04 of a year per annum for men, and so unsteadily that it is doubtful whether this is a genuine increase; and not at all for women. The consequence is an increase of over 3 years in life-time expectancy of limiting long-term ill-health, for both men and women. Judged by this standard, all the increase in life expectancy over the last 18 years has been in years of ill-health. This is illustrated graphically in table 3.

[1] The published figures generally apply to GB as a whole but are assumed to apply equally to England and Wales.

3.1.1 Standard Errors

The sampling error of the estimates in table 2 are determined entirely by the sampling error of the age specific LLI rates in the GHS. Using the notation of box 1, the sampling error is:

$$se\{ e_{HL}(x)\} = \frac{1}{l(x)} \sqrt{\sum_{t=x}^{\infty} L^2(t,n).Var\{d(t,n)\}} \quad 1$$

since the age-specific rates `d(x,n)' are independent: and

$$Var\{d(x,n)\} \_ deff\{d'(x,n)\} \, x \, \frac{d'(x,n).(1 - d'(x,n))}{N(x,n)} \quad 2$$

where d'(x,n) denotes the disability rates in the GHS.

Estimated age-specific Deft's (square root of design effect) for LLI with the present design for the General Household Survey were given by Breeze (1990, table A8). These, and the resulting standard errors for the 1994 estimates, are shown in table 3. It will be seen that the standard errors, and resulting sampling errors, are quite small.

3.1.2 Estimated numbers in communal establishments

The General Household Survey data also contains various types of non-sampling error[2]. In so far as the non-sampling errors are consistent from year to year, these should not affect evidence about trends. Probably the main concern in the method is the rough and ready treatment of limiting longstanding illness rates in communal establishments. Rates of limiting long standing illness in communal establishments in the Census would not necessarily be comparable with the GHS. Moreover it is doubtful that LLI rates in communal establishments have remained stationary over 15 years.

Nevertheless, this simple assumption is made tenable for the purpose of estimating overall LLI rates because the estimated number of disabled people in private households greatly outnumbers those in communal establishments. This can be demonstrated by a sensitivity analysis.

Example 1: Assume 100 per cent LLI among males resident in communal health care establishments in 1994. Then the estimate of expected healthy life at birth reduces by less than 0.1 years from that shown in table 2.

Example 2: Additionally assume that for males in 1976, the rate of LLI among males resident in health care establishments is the same as that among males living in the community. Then the estimate of expected healthy life at birth is increased by only 0.4 years. In this case the expected years of LLI would be in 11.2 rather than 11.6 in 1976: and 15.1 rather than 15.0 in 1994.

From these and other examples we conclude that a reasonable range of alternative assumptions about LLI rates in communal establishments will not significantly affect the main conclusions in this section.

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[2] It is known, for example, that the GHS under-represents women in the very highest age-groups.

3.2 ADL related disability for people aged 65, 1980-1994

This section examines trends in healthy life expectancy based on more severe aspects of disability for people aged 65 and over living in England and Wales. Three measures of disability have been included:

- the ability to walk up and down stairs without help;
- the ability to go outdoors without help;
- independence in performing bathing, transfer, feeding, getting to the toilet.

Details of the measures are shown in table 1.

Bone et al. (1995) compared these measures over a number of years, but as they have not always been asked comparably in the GHS, problems of interpretation arose. However, these items were treated identically in 1980, 1985 and 1994, and it is on these years that the present analysis is based. A wider choice of identically defined measures is available for these three years alone. Katz et al's (1963) original ADL scale included continence and dressing as well as the four items in the third of our measures. However, we have chosen to use the same measures as were used by Bone et al. (1995).

Table 4 shows the proportion of people over 65 living in private households in England and Wales, who were dependent in respect of each of the above three measures, in the GHS for 1980, 1985 and 1994. As with the limiting longstanding illness analysis, the private household data was adjusted to account for disabled people living in health related communal establishments based on estimates of numbers in the three years, and the corresponding rates of disablement among elderly residents of such establishments from the UK Disability Survey in 1986. This approach assumes that the rate of disablement in communal establishments is unchanged: for further comments see §3.2.1 below.

Table 5 shows the results. Life table estimates for 1980, 1985 and 1994 were derived from abridged life tables using all-cause mortality statistics for England and Wales (OPCS DS1) for 1980 and 1985 and comparable figures provided by OPCS for 1994.

Healthy life expectancy for people aged 65+ has improved between 1980 and 1994 with respect to all three of these measures: for example the expectation of years free of any of the four ADL disabilities for men aged 65 has improved from 11.6 years in 1980 to 13.3 years in 1994.

The ability to perform ADLs, and to get up and down stairs without help show a similar pattern. Healthy life expectancy at 65 has increased at a similar rate to total life expectancy, with the result that the proportion of remaining years of life free of these disabilities has been almost stable in this period. So the expectation of years of disability has increased only very slightly: for men possibly not at all.

For the ability to walk outdoors unaided, the improvement has been less, and has not kept up with the improvement in life expectancy. As a result the expectation of years of disability have increased somewhat between 1980 and 1994.

3.2.1 Standard Errors

As design effects for ADL questions in GHS are not quoted, it is not possible to estimate sampling errors. But it is unlikely that these would be any greater than those quoted for LLI in table 3, and it is safe to assume these are small.

3.2.2 Estimated numbers in communal establishments

Once again the main concern will be with the treatment of disability rates in health-related communal establishments. Different procedures for establishing disability were used in the Disability Survey, and rates would not necessarily be comparable with the GHS. Moreover there is evidence that disability rates have been increasing in residential and nursing home facilities (Darton, 1996). A PSSRU survey of local authority supported residents of residential homes (now the majority of all such people) found in 1981 that 77 per cent needed help bathing; and 71 per cent had restricted mobility outdoors. A recent unpublished survey of local authority supported residents suggests that these rates have increased possibly to around 90 per cent and 83 per cent respectively now.

Because a much larger proportion of all people with ADL difficulties come from communal establishments than for LLI, crude assumptions about ADLs are much less satisfactory here. For example, from table 5, one third of all elderly people disabled in one of four ADLs are assumed to be living in a health related communal establishment.

To illustrate the sensitivity of the results to assumptions about health in communal establishments, consider the implications of assuming an increase in dependency as follows. Suppose the age specific disability, for disability in one of four ADLs, was 77 per cent at all ages for both men and women in 1980, and similarly 90 per cent in 1994. This would change the healthy life expectancy at 65, $e_{HL}(65)$, by no more than 0.1 years in any case, and the change through time by no more than 0.2 years. Such a change would have no significant impact on our general conclusions.

3.3 Discussion

Trends from the measures of ill-health and disability from the General Household Survey are variable, but for people over 65 at least, there is a pattern.

The most optimistic picture comes from disability with regard to climbing stairs and in performing ADLs. These are severe disabilities, shared by only 9 per cent and 8 per cent respectively of people aged 65+ in 1994. It appears that there is no expansion in the expectation of disability in these respects. The implication is that an aging population will not result in an increase in the severest forms of disability.

The situation for disability in regard to mobility outdoors is less optimistic. This is a commoner disability, shared by 16 per cent of people aged 65+ in 1994. People do have a greater expectation of living longer without this disability, but also will live longer with it, than

would have been expected in 1980. The implication is that an aging population will result in some increase in this disability, though not by as much as the increase in the numbers of elderly people.

The situation with regard to limiting longstanding illness is most pessimistic. This is a common problem, experienced by 43 per cent of people aged 65+ in 1994. There have been no improvements in the expectation of life free from limiting longstanding illness. The implication is that an aging population will result in a corresponding increase in the number of people with limiting longstanding illness.

This is similar to patterns reported elsewhere. Crimmins et al. (1989) report that between 1970 and 1980 in the USA, for people aged 65 there was no improvement in the proportion of self-reported disability free life, but a marked improvement in relation to confinement to bed, which is closely related to one of the measures in our ADL scale. Robine et al. (1995) summarise a range of international evidence which reinforces this point about greatest expansion at mildest levels of disability.

What does this pattern signify? Possibly the lack of improvement in self rated health is due to greater awareness of ill-health combined perhaps with improving diagnostic techniques identifying diseases earlier. Mobility outdoors, may have been reduced by social as well as health changes: the rise in private and decline in public transport, increased fears of vulnerability among the elderly. The ability to perform specific tasks might seem to some a much more reliable measure of purely health related disability, though here too social changes can be important, such as the decline in informal support, as well as improvements in rehabilitation and aids for managing disability.

An alternative explanation is that, perhaps as a consequence of a differential response of the health care system, that while people are continuing to encounter disability creating conditions at a similar rate, the severest levels of disability are being successfully contained. If these trends continue, then with population aging a future world will need to gear itself to coping with a much larger number of people with minor problems, though the demand for services for severe disablement may not necessarily increase.

4. Healthy Life Expectancy and Quality Adjusted Life Years

4.1 QALYs and LLI

So far the measures of health have been purely yes/no: either a person is healthy or he/she is not. It is clearly more sophisticated to consider severity of ill-health, though this gives rise to the need to be able to rate one state of health against another. Quality Adjusted Life Years (QALYs) rely on the valuing any given state against a state of perfect health which scores 1 and death which scores 0: quality adjusted life years. This score, or tariff, corresponds to the time trade off between the time in perfect health that would be valued equally to a year of the given health (Torrance, 1986)[3]. In practice some states of health may be valued as negative - worse than death.

The calculation of quality adjusted life years has been facilitated by two developments.

The first, as previously mentioned, is the simplified health scale, the five point EuroQol Scale (EuroQol Group, 1990), shown in table 1, which has recently been asked of around 6000 adults living in private households, in the UK Omnibus Survey. Table 6 shows the distribution of each of the five EuroQol scales, and, for each group the proportion with limiting longstanding illness. The second is a regression-analysis based tariff valuing each possible state of the EuroQol Scale, derived from a time-trade study of 3,235 adults (Dolan et al., 1995, table 1). We do not reproduce this here, but some examples will suffice.

- The state corresponding to position 1 on all items - perfect health - has a tariff value of 1.000;
- The state corresponding to position 2 on all items has a tariff value of 0.516;
- The state corresponding to position 3 on all items has a tariff value of -0.594 (worse than death);
- Permanent unconsciousness has a tariff value of -0.402.

The high correlation between limiting longstanding illness and the EuroQol items is self-evident. Indeed, the following group of EuroQol types comprises 78 per cent of the total adult population in the Omnibus Survey, of whom 11 per cent have LLI: 11111, 11112, 11121, 11122, 11211, 11212, 12111, 12112, 21111, 21112, 22111: this group . Of the 22 per cent in the other 234 EuroQol groups, 75 per cent have LLI. Furthermore, using the tariff, people scoring above 0.84 do not usually have LLI, those below mostly do have.

Bebbington (1992) illustrated the use of Sullivan's method to compute Quality Adjusted Life Years given a tariff. Table 7 uses a slightly different method, as shown in box 1. As with other measures of Healthy Life Expectancy, some estimate is required of the average state of health of people in health related communal establishments. Though such establishments are dedicated to maintaining quality of life, it is likely that quality would be rated below the

[3] The time trade-off method. We do not wish to enter the debate over the merits of QALY's versus Healthy Years Equivalents, and alternative methods of valuation such as the standard gamble. (See various papers in J. Health Economics vol 12 part 3, 1993).

average level of people living at home and we have simply assumed an average value of 0.500 would apply to all age groups[4]. With this assumption, the expected quality-adjusted life years at 15 are 51.9 for a man, 54.5 for a woman. This is rather more than the disability-free life expectancy using limiting longstanding illness which is shown for comparison in table 6, from the same individuals in the Omnibus Survey, which is 46.3 years for men and 48.0 years for women. We can infer that QALYs on average indicate a more severe level of ill-health than does limiting longstanding illness.

In other respects, the general pattern of results from QALYs matches that of disability-free life expectancy using LLI. Women have a greater health expectancy than men, but just as a smaller proportion of their life will be lived in good health (LLI) so their average level of QALY will be lower. The pattern across age groups also seem to follow similar trends between the two measures: with a steady decline both in the proportion of remaining life lived in good health (LLI), and in the ratio of expected QALYs to life years; the decline being steeper for men than women. Table 8 compares the pattern of limiting longstanding illness rates and mean QOL tariffs across groups of regions. The two measures are correlated (negatively) 0.78 for men and 0.88 for women; and would lead to similar broad inferences about the regional distribution of good health.

Despite their conceptual differences, in these epidemiological applications of describing and comparing the health of broad groups of the population, defined by age, gender or region, it seems likely that average QALYs are going to lead to similar types of conclusion as comparable `simple' health measures. Table 7 suggests that QALYs produce high expectations of health than does disability-free life expectancy based on LLI. We offer the speculation that in comparing population groups, average QALYs will produce broadly similar results to a measure of health that is correlated with LLI but slightly more severe, more at the level of limited outdoors mobility (see table 1).

4.2 Regional Variations

Table 8 is of interest in its own right. Together with table 9 it provides estimates of regional variations in healthy life expectancy, measured either from LLI rates or by QALYs. In view of the small sample sizes and the clustered design it is only practicable to develop estimates for groups of regions.

Table 8 shows that there are significant variations between regions in average health levels, whether measured by LLI rates or QOL tariffs. Comparing this with the first column of table 9 shows that the pattern of variations in health rates are not dissimilar to the variations in life expectancy.
Table 9 computes the regional LLI healthy life expectancy and QALYs, as well as life expectancies using similar assumptions as before, though additionally that the health rates in health-care institutions are everywhere the same. Regional groupings have been used because

[4] A sensitivity test using 0.000 has also been run: the overall results are little different for the same reason as discussed in section 3.

the sample size with the Omnibus Survey is not sufficiently large to undertake comparisons of each region separately, particularly as the sample is clustered within regions.

In making comparisons between regions, some consideration should be given to the potential effects of migration. For example, it is possible that the retirement migration of healthy, comparatively wealthy people to the south-west may improve health rates among older people and consequently result in an overestimate of the (healthy) life expectancy of an indigenous resident. The opposite argument may be put for London. We are not able to allow for this with the present analysis, but Appendix B presents some previous evidence based on analysis of counties where people lived 10 years previously using the Census based Longitudinal Survey. The conclusion from this is tentative, but suggests that recent migration has only limited impact on local estimates of healthy expectancies.

With these caveats, there are two main conclusions to draw from this analysis.

The first is that variations between regions for all three of these indicators and both sexes follows a broadly South and East versus a North and West divide. This confirms previous and more detailed results based on the Census (Bone et al., 1995).

The second is that because health rates are worst in regions with low life expectancy, the effect on healthy life expectancy is reinforced. The range in life expectancy is two years between the South East and the North/North West/Yorks Humberside region: with QALYs the range increases to 3-4 years, and for healthy life expectancy it is as much as 5 years. This implies a compression of morbidity effect between regions. The explanation of why QALYs are less variable than LLI rates between regions can, from this hypothesis, be attributed to their indicating more severe rates of ill-health.

These results confirm previous regional analysis by Bebbington (1993) using the 1986 Disability Survey, though the differences between regions seem if anything greater than before.

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Table 1: Health Scales

A. Limiting Longstanding Illness

In the General Household Survey (1976-94) and the Omnibus Survey (1995), answers of `yes' to both of the following questions:

1. Do you have any longstanding illness, disability or infirmity? By longstanding I mean anything that has troubled you over a period of time or that is likely to affect you over a period of time.

2. Does this illness or disability limit your activities in any way?

B. Dependency in Activities of Daily Living

In the General Household Survey (1980, 1985, 1994). Based on answers to the following questions:

1. Do you usually manage to get up and down stairs ....
   on your own
   only with help from someone else
   not at all

2. Do you usually manage to go out of doors and walk down the road ...
3. Do you usually manage to get to the toilet ...
4. Do you usually manage to get in and out of bed ...
5. Do you usually manage to feed yourself ...
6. Do you usually manage to bath, shower or wash all over ....

(Nos. 3,4,5 are assumed to be yes for people who find stairs either `very easy' or `fairly easy'). Dependency occurs if the task is managed only with help or not at all. Nos. 3-6 above are combined into a single scale, which identifies people who are "dependent in one or more ADLs".

Table 1: (continued)

C. Health Related Quality of Life from the EuroQol System

In the Omnibus Survey (1995):

Mobility	1.No problems walking about 2. Some problems walking about 3. Confined to bed
Self Care	1. No problems with self-care 2. Some problems washing or dressing self 3. Unable to wash or dress self
Usual Activities	1. No problems with performing usual activities (e.g. work, study, housework, family or leisure activities) 2. Some problems with performing usual activities 3. Unable to perform usual activities
Pain/Discomfort	1. No pain or discomfort 2. Moderate pain or discomfort 3. Extreme pain or discomfort
Anxiety/Depression	1. Not anxious or depressed 2. Moderately anxious or depressed 3. Extremely anxious or depressed

The above define $3^5 = 243$ possible combinations, to which add "unconscious" and "dead" for a total of 245 health states. To use this for evaluating health related quality of life, a scale, or "tariff" is applied to each of these states ranging from 1 (point 1 on all domains) through 0 (dead). Some states may be rated negative (worse than dead). The tariff used in the present analysis derives from a time-trade off exercise with 3000 raters (Dolan et al., 1995).

Table 2: Life Expectancy and Healthy Life Expectancy: abridged tables between 1976 and 1994, from the General Household Survey limiting longstanding illness question

1976 Men	Pop. (thou)	l(x)	e(x)	GHS LLI %	GHS n	Inst pop	Inst LLI %	All LLI (thou)	All LLI %	$L_{HL}(x)$	$e_{HL}(x)$	$\overline{e_{HL}(x)}$ e(x)	Years LLI
0 - 4	1658	10000	70.0	2.2	905	404	39.8	36.6	2.2	48047	58.4	83	11.6
5 - 14	4091	9817	66.3	6.0	1976	1580	39.8	246.0	6.0	92068	54.6	82	11.7
15 - 44	9985	9786	56.5	9.0	5121	47660	81.7	933.3	9.3	262351	45.3	80	11.2
45 - 64	5583	9411	28.0	24.9	2666	15279	95.2	1400.9	25.1	129709	19.3	69	8.7
65 - 74	1963	7228	12.5	37.9	965	20921	93.2	755.5	38.5	36075	7.1	57	5.4
75+	809	4284	7.4	48.4	519	43573	93.5	411.2	50.8	15588	3.6	49	3.8
Women													
0 - 4	1569	10000	76.1	1.7	811	362	37.2	26.8	1.7	48411	62.1	82	14.0
5 - 14	3876	9858	72.2	4.7	1833	1154	37.2	182.5	4.7	93307	58.0	80	14.2
15 - 44	9678	9837	62.4	8.8	5229	39637	62.8	873.1	9.0	266649	48.7	78	13.7
45 - 64	5901	9603	33.4	23.0	2844	17659	96.3	1370.2	23.2	140108	22.1	66	11.3
65 - 74	2577	8329	16.6	40.0	1213	29235	93.9	1046.6	40.6	44863	8.7	52	7.9
75+	1769	6400	9.8	52.9	963	156196	94.7	1001.1	56.6	27226	4.3	43	5.5

1981 Men	Pop. (thou)	l(x)	e(x)	GHS d LLI %	GHS n	Inst pop	Inst LLI %	All LLI (thou)	All LLI %	$L_{HL}(x)$	$e_{HL}(x)$	$\overline{e_{HL}(x)}$ e(x)	Years LLI
0 - 4	1542	10000	71.1	3.0	882	433	39.8	46.4	3.0	48363	58.7	83	12.4
5 - 14	3639	9853	67.1	8.0	1898	1513	39.8	291.6	8.0	90245	54.7	82	12.4
15 - 44	10603	9826	57.3	10.0	4975	46213	81.7	1093.4	10.3	260949	45.7	80	11.6
45 - 64	5405	9480	28.7	26.0	2707	17731	95.2	1417.6	26.2	128952	19.8	69	8.9
65 - 74	2020	7426	13.1	35.0	1040	19054	93.2	718.1	35.5	39543	7.9	60	5.2
75+	951	4606	7.8	44.0	585	44730	93.5	440.6	46.3	19283	4.2	54	3.6
Women													
0 - 4	1464	10000	77.1	3.0	802	359	37.2	44.0	3.0	47909	61.0	79	16.1
5 - 14	3446	9885	73.0	6.0	1800	1045	37.2	207.1	6.0	93107	56.9	78	16.1
15 - 44	10351	9866	63.1	11.0	5233	37437	62.8	1158.0	11.2	260374	47.5	75	15.6
45 - 64	5635	9659	34.1	26.0	2800	19158	96.3	1478.6	26.2	136518	21.6	63	12.5
65 - 74	2599	8438	17.1	41.0	1289	27554	93.9	1080.2	41.6	44282	8.6	50	8.5
75+	1979	6588	10.4	56.0	1087	167903	94.7	1173.2	59.3	27897	4.2	41	6.2

Table 2: (continued)

1985 Men	Pop. (thou)	l(x)	e(x)	GHS LLI %	GHS n	Inst pop	Inst LLI %	All LLI (thou)	All LLI %	$L_{HL}(x)$	$e_{HL}(x)$	$\frac{e_{HL}(x)}{e(x)}$	Years LLI
0 - 4	1615	10000	71.9	4.0	905	417	39.8	64.7	4.0	47491	58.9	82	13.0
5 - 14	3262	9875	67.8	8.0	1976	1163	39.8	261.3	8.0	90303	54.8	81	13.0
15 - 44	11019	9851	58.0	10.0	5121	39338	81.7	1130.1	10.3	261445	45.8	79	12.2
45 - 64	5421	9525	29.4	27.0	2666	19684	95.2	1477.1	27.2	129485	19.9	68	9.5
65 - 74	1934	7616	13.4	38.0	965	18359	93.2	745.1	38.5	38857	7.9	59	5.5
75+	1079	4856	8.0	43.0	519	48917	93.5	488.7	45.3	21254	4.4	55	3.6
Women													
0 - 4	1536	10000	77.7	3.0	811	328	37.2	46.2	3.0	47723	61.9	80	15.8
5 - 14	3086	9902	73.5	6.0	1833	783	37.2	185.4	6.0	93156	57.7	79	15.8
15 - 44	10764	9885	63.6	11.0	5229	31846	62.8	1200.5	11.2	262256	48.4	76	15.2
45 - 64	5586	9695	34.4	26.0	2844	17979	96.3	1465.0	26.2	137085	22.3	65	12.1
65 - 74	2461	8537	17.3	38.0	1213	27245	93.9	950.4	38.6	47363	9.3	54	8.0
75+	2159	6717	10.5	51.0	963	194417	94.7	1186.1	54.9	31784	4.7	45	5.8

1988 Men	Pop. (thou)	l(x)	e(x)	GHS LLI %	GHS n	Inst pop	Inst LLI %	All LLI (thou)	All LLI %	$L_{HL}(x)$	$e_{HL}(x)$	$\frac{e_{HL}(x)}{e(x)}$	Years LLI
0 - 4	1684	10000	72.4	4.0	882	460	39.8	67.5	4.0	47420	58.5	81	13.9
5 - 14	3144	9877	68.3	9.0	1898	1122	39.8	283.3	9.0	90193	54.4	80	13.9
15 - 44	11245	9854	58.4	11.0	4975	38258	81.7	1264.0	11.2	258716	45.4	78	13.0
45 - 64	5336	9530	29.8	27.0	2707	21712	95.2	1455.5	27.3	129753	19.8	66	10.0
65 - 74	1194	7706	13.7	41.0	1040	20766	93.2	500.4	41.9	37526	7.6	56	6.1
75+	1173	4997	8.2	46.0	585	60134	93.5	568.1	48.4	21129	4.2	52	4.0
Women													
0 - 4	1604	10000	78.1	3.0	802	329	37.2	48.2	3.0	48507	61.2	78	16.9
5 - 14	2978	9905	73.8	7.0	1800	699	37.2	208.7	7.0	92139	56.9	77	16.9
15 - 44	11010	9889	63.9	12.0	5233	30066	62.8	1336.5	12.1	258587	47.7	75	16.2
45 - 64	5458	9701	34.8	26.0	2800	18096	96.3	1431.8	26.2	137626	22.0	63	12.8
65 - 74	2489	8581	17.6	40.0	1289	28979	93.9	1011.2	40.6	46154	8.8	50	8.8
75+	2283	6786	10.8	56.0	1087	229062	94.7	1367.1	59.9	29401	4.3	40	6.5

Table 2: (continued)

1991 Men	Pop. (thou)	l(x)	e(x)	GHS LLI %	GHS n	Inst pop	Inst LLI %	All LLI (thou)	All LLI %	$L_{HL}(x)$	$e_{HL}(x)$	$\frac{e_{HL}(x)}{e(x)}$	Years LLI
0 - 4	1761	10000	73.3	4.0	891	441	39.8	70.6	4.0	47767	59.9	82	13.4
5 - 14	3231	9902	69.0	7.0	1830	892	39.8	226.5	7.0	91394	55.7	81	13.3
15 - 44	11314	9881	59.2	10.0	4808	35903	81.7	1157.1	10.2	262814	46.5	79	12.7
45 - 64	5433	9549	30.6	25.0	2628	24785	95.2	1375.6	25.3	133421	20.6	67	10.0
65 - 74	2027	7940	14.3	40.0	967	22286	93.2	822.7	40.6	39553	8.0	56	6.3
75+	1229	5399	8.7	46.0	606	71309	93.5	599.2	48.8	24070	4.5	51	4.2
Women													
0 - 4	1670	10000	78.8	3.0	891	315	37.2	50.2	3.0	47271	62.8	80	16.0
5 - 14	3050	9923	74.5	5.0	1768	548	37.2	152.7	5.0	95182	58.5	79	16.0
15 - 44	10987	9908	64.5	11.0	4959	28266	62.8	1223.2	11.1	261791	49.0	76	15.5
45 - 64	5527	9731	35.4	25.0	2789	19360	96.3	1395.6	25.2	126056	23.0	65	12.4
65 - 74	2479	9715	18.1	34.0	1212	31323	93.9	861.6	34.8	63139	10.1	56	8.0
75+	2391	6997	11.3	51.0	983	280029	94.7	1341.8	56.1	34696	5.0	44	6.3

1992 Men	Pop. (thou)	l(x)	e(x)	GHS LLI %	GHS n	Inst pop	Inst LLI %	All LLI (thou)	All LLI %	$L_{HL}(x)$	$e_{HL}(x)$	$\frac{e_{HL}(x)}{e(x)}$	Years LLI
0 - 4	1772	10000	73.7	5.0	870	436	39.8	88.8	5.0	47150	59.7	81	14.0
5 - 14	3282	9913	69.4	8.0	1780	883	39.8	262.8	8.0	91137	55.5	80	13.9
15 - 44	11192	9894	59.5	10.0	4610	36364	81.7	1145.3	10.2	262914	46.4	78	13.1
45 - 64	5571	9570	30.9	26.0	2739	25304	95.2	1466.0	26.3	132381	20.5	66	10.4
65 - 74	2049	8016	14.5	40.0	1039	22179	93.2	831.4	40.6	40113	7.9	55	6.5
75+	1234	5497	8.9	49.0	601	71764	93.5	636.6	51.6	23552	4.3	48	4.6
Women													
0 - 4	1683	10000	79.2	2.0	840	309	37.2	33.8	2.0	48687	61.9	78	17.3
5 - 14	3104	9932	74.8	7.0	1694	536	37.2	217.4	7.0	92223	57.5	77	17.3
15 - 44	10855	9919	64.9	13.0	4938	27903	62.8	1425.0	13.1	256904	48.2	74	16.6
45 - 64	5658	9740	35.7	26.0	2864	19657	96.3	1484.9	26.2	138086	22.7	64	13.0
65 - 74	2488	8756	18.3	38.0	1241	31348	93.9	963.0	38.7	48489	9.5	52	8.8
75+	2391	7059	11.5	52.0	972	283457	94.7	1364.4	57.1	34947	5.0	43	6.6

Table 2: (continued)

1994 Men	Pop. (thou)	l(x)	e(x)	GHS LLI %	GHS n	Inst pop	Inst LLI %	All LLI (thou)	All LLI %	$L_{HL}(x)$	$e_{HL}(x)$	$\overline{e_{HL}(x)}$ e(x)	Years LLI
0 - 4	1754	10000	74.2	5.0	787	414	39.8	87.8	5.0	47311	59.2	80	15.0
5 - 14	3371	9922	69.8	9.5	1523	837	39.8	320.5	9.5	89714	54.9	79	14.9
15 - 44	11096	9906	59.9	12.7	4122	36122	81.7	1434.1	12.9	254829	46.0	77	13.9
45 - 64	5759	9604	31.3	26.5	2327	25716	95.2	1543.9	26.8	130684	20.9	67	10.4
65 - 74	2109	8250	14.8	38.5	912	22968	93.2	824.4	39.1	43154	8.5	57	6.3
75+	1214	5724	9.0	45.1	477	72198	93.5	582.5	48.0	26741	4.7	52	4.3
Women													
0 - 4	1669	10000	79.6	4.1	840	290	37.2	68.5	4.1	47800	62.2	78	17.4
5 - 14	3197	9938	75.1	7.2	1623	503	37.2	230.3	7.2	92172	57.8	77	17.3
15 - 44	10734	9927	65.2	12.5	4885	26372	62.8	1355.0	12.6	258037	48.6	75	16.6
45 - 64	5837	9760	36.1	26.3	2642	19708	96.3	1548.9	26.5	136962	23.0	64	13.1
65 - 74	2516	8883	18.6	39.2	1192	32753	93.9	1004.0	39.9	48783	9.8	53	8.8
75+	2345	7191	11.7	48.4	868	291144	94.7	1269.7	54.1	38674	5.4	46	6.4

Table 3: Sampling errors and confidence intervals for healthy life expectancy (LLI base) in 1994

Men	d'(x)	Deft(x)	$e_{HL}(x)$	se	95% Confidence Lower	Upper
0 - 4	5.0	1.02	59.2	0.12	59.0	59.5
5 - 14	9.5	1.02	54.9	0.11	54.7	55.2
15 - 44	12.7	1.03	46.0	0.06	45.9	46.1
45 - 64	26.5	0.99	20.9	0.04	20.8	21.0
65 - 74	38.5	0.98	8.5	0.02	8.4	8.5
75+	45.1	1.08	4.7	0.01	4.7	4.7
Women						
0 - 4	4.1	0.94	62.2	0.14	62.0	62.5
5 - 14	7.2	0.94	57.8	0.13	57.6	58.1
15 - 44	12.5	1.07	48.6	0.07	48.5	48.7
45 - 64	26.3	1.07	23.0	0.05	22.9	23.1
65 - 74	39.2	1.08	9.0	0.02	9.8	9.9
75+	48.4	1.00	5.4	0.00	5.4	5.4

Deft (Square root of estimated design effect) given by Breeze (1990) table A8. Values for 0 - 15 are assumed to apply to 0 - 4 and 5 - 14.

Table 4: Proportion of those aged 65 and over who were dependent by age and sex, 1980, 1985, 1994

A. In one or more ADLs

Age	1980	1985	1994
Men	%	%	%
65-69	4	4	4
70-74	6	4	5
75-79	8	11	6
80-84	18	15	13
85 and over	31	23	18
Women			
65-69	4	3	6
70-74	8	6	7
75-79	10	9	9
80-84	13	19	15
85 and over	36	33	25

B. Unable to get up and down stairs without help

Age	1980	1985	1994
Men	%	%	%
65-69	2	3	6
70-74	5	4	3
75-79	5	7	5
80-84	12	9	8
85 and over	29	25	10
Women			
65-69	3	5	5
70-74	6	7	9
75-79	10	13	11
80-84	28	22	15
85 and over	31	31	29

Table 4: (continued)

C: Unable to get out of doors without help

Age	1980	1985	1994
Men	%	%	%
65-69	3	5	7
70-74	8	6	7
75-79	8	11	9
80-84	17	15	20
85 and over	38	23	24
Women			
65-69	6	8	10
70-74	10	11	13
75-79	16	18	19
80-84	34	33	26
85 and over	52	60	50

D. Bases of Above Tables

Age	1980	1985	1994
Men			
65-69	*751*	*472*	*442*
70-74	*545*	*410*	*435*
75-79	*321*	*297*	*217*
80-84	*168*	*137*	*168*
85 and over	*55*	*44*	*80*
Women			
65-69	*906*	*549*	*507*
70-74	*714*	*573*	*552*
75-79	*566*	*460*	*349*
80-84	*280*	*281*	*264*
85 and over	*202*	*144*	*211*

Data source: General Household Survey 1980, 1985, 1994 (England and Wales only).

Table 5: Life Expectancy and Healthy Life Expectancy: abridged tables for 1980, 1985 and 1994, using three measures of disability for people aged 65+ from the General Household Survey

A: Independent in ADLs

1980 Men	e(x)	GHS disb %	Inst disb %	All disb %	$e_{HL}(x)$	$\frac{e_{HL}(x)}{e(x)}$	Years
65 - 69	12.9	3.7	60.2	4.2	11.6	90	1.3
70 - 74	10.0	6.2	70.6	6.9	8.6	87	1.3
75 - 79	7.6	8.4	79.1	10.1	6.2	82	1.4
80 - 84	5.8	17.9	84.4	22.1	4.1	72	1.6
85+	4.3	30.9	88.0	38.7	2.7	61	1.7
Women							
65 - 69	16.9	4.4	72.3	4.9	14.4	85	2.5
70 - 74	13.3	7.7	85.0	8.8	10.8	81	2.5
75 - 79	10.1	9.9	87.8	12.4	7.7	76	2.4
80 - 84	7.4	13.2	87.9	20.0	5.0	67	2.4
85+	5.3	35.6	93.3	48.3	2.7	52	2.6

1985 Men	e(x)	GHS disb %	Inst disb %	All disb %	$e_{HL}(x)$	$\frac{e_{HL}(x)}{e(x)}$	Years
65 - 69	13.3	4.7	60.2	5.2	12.1	90	1.3
70 - 74	10.4	3.9	70.6	4.6	9.1	88	1.2
75 - 79	7.9	11.4	79.1	12.9	6.5	83	1.4
80 - 84	5.9	13.1	84.4	16.8	4.6	78	1.3
85+	4.5	22.7	88.0	31.2	3.1	69	1.4
Women							
65 - 69	17.3	3.0	72.3	3.6	14.2	82	3.1
70 - 74	13.7	6.0	85.0	7.1	10.5	77	3.2
75 - 79	10.5	11.0	87.8	13.6	7.2	68	3.3
80 - 84	7.8	26.0	87.9	31.4	4.3	55	3.5
85+	5.6	51.0	93.3	60.1	2.2	40	3.4

1994 Men	e(x)	GHS disb %	Inst disb %	All disb %	$e_{HL}(x)$	$\frac{e_{HL}(x)}{e(x)}$	Years
65 - 69	14.8	4.1	60.2	4.7	13.5	91	1.4
70 - 74	11.6	4.8	70.6	5.6	10.3	89	1.3
75 - 79	9.0	5.5	79.1	7.8	7.6	85	1.3
80 - 84	6.9	12.5	84.4	16.4	5.4	79	1.5
85+	5.3	17.5	88.0	27.5	3.8	72	1.5
Women							
65 - 69	18.6	5.5	72.3	6.2	15.6	84	3.0
70 - 74	15.0	6.5	85.0	7.8	12.0	80	2.9
75 - 79	11.7	9.5	87.8	13.2	8.8	75	2.9
80 - 84	9.0	14.8	87.9	21.9	6.1	67	2.9
85+	6.8	24.6	93.3	42.0	4.0	58	2.9

Table 5: (continued)

B: Able to go up and down stairs unaided

1980 Men	e(x)	GHS disb %	Inst disb %	All disb %	$e_{HL}(x)$	~~elwd(x)~~ e(x)	Years
65 - 69	12.9	2.0	28.7	2.2	11.9	93	0.9
70 - 74	10.0	5.1	39.7	5.5	9.0	90	1.0
75 - 79	7.6	5.3	46.3	6.3	6.6	87	1.0
80 - 84	5.8	12.5	55.9	15.2	4.5	79	1.2
85+	4.3	28.6	57.0	32.5	2.9	68	1.4
Women							
65 - 69	16.9	3.4	48.2	3.7	14.7	87	2.2
70 - 74	13.3	5.9	45.2	6.5	11.1	84	2.2
75 - 79	10.1	10.4	53.7	11.8	7.9	78	2.2
80 - 84	7.4	17.5	59.7	21.3	5.3	71	2.2
85+	5.3	31.2	66.3	38.9	3.2	61	2.1

1985 Men	e(x)	GHS disb %	Inst disb %	All disb %	elwd(x)	~~elwd(x)~~ e(x)	Years
65 - 69	13.3	3.2	28.7	3.4	12.4	93	1.0
70 - 74	10.4	3.9	39.7	4.3	9.4	91	0.9
75 - 79	7.9	7.1	46.3	8.0	6.9	87	1.0
80 - 84	5.9	8.8	55.9	11.3	4.9	82	1.1
85+	4.5	25.0	57.0	29.2	3.2	71	1.3
Women							
65 - 69	17.3	4.5	48.2	4.9	14.7	85	2.5
70 - 74	13.7	6.6	45.2	7.1	11.2	82	2.5
75 - 79	10.5	12.8	53.7	14.2	8.0	76	2.5
80 - 84	7.8	22.0	59.7	25.3	5.3	69	2.4
85+	5.6	30.8	66.3	38.4	3.5	62	2.2

1994 Men	e(x)	GHS disb %	Inst disb %	All disb %	elwd(x)	~~elwd(x)~~ e(x)	Years
65 - 69	14.8	5.9	28.7	6.1	13.8	93	1.1
70 - 74	11.6	3.4	39.7	3.8	10.8	92	0.9
75 - 79	9.0	4.6	46.3	5.9	8.1	90	0.9
80 - 84	6.9	8.3	55.9	10.9	6.0	87	0.9
85+	5.3	10.0	57.0	16.7	4.4	83	0.9
Women							
65 - 69	18.6	4.7	48.2	5.1	15.8	85	2.9
70 - 74	15.0	8.9	45.2	9.5	12.1	81	2.8
75 - 79	11.7	11.2	53.7	13.2	9.0	77	2.7
80 - 84	9.0	14.8	59.7	19.1	6.3	71	2.6
85+	6.8	29.4	66.3	38.8	4.2	61	2.6

Table 5: (continued)

C: Mobile outdoors unaided

1980 Men	e(x)	GHS disb %	Inst disb %	All disb %	$e_{HL}(x)$	~~elwd(x)~~ e(x)	Years
65 - 69	12.9	3.2	63.4	3.7	11.6	90	1.3
70 - 74	10.0	7.6	58.8	8.2	8.6	86	1.4
75 - 79	7.6	7.9	67.6	9.3	6.2	82	1.4
80 - 84	5.8	16.8	69.4	20.1	4.1	72	1.6
85+	4.3	37.5	78.0	43.0	2.5	57	1.9
Women							
65 - 69	16.9	6.5	77.9	7.0	13.3	79	3.6
70 - 74	13.3	10.4	81.1	11.4	9.7	73	3.5
75 - 79	10.1	16.3	83.5	18.5	6.6	65	3.5
80 - 84	7.4	32.5	84.5	37.2	3.9	52	3.5
85+	5.3	51.8	91.3	60.5	2.1	40	3.2

1985 Men	e(x)	GHS disb %	Inst disb %	All disb %	elwd(x)	~~elwd(x)~~ e(x)	Years
65 - 69	13.3	4.8	63.4	5.3	12.0	90	1.4
70 - 74	10.4	6.2	58.8	6.8	9.0	87	1.3
75 - 79	7.9	11.4	67.6	12.7	6.5	83	1.4
80 - 84	5.9	15.3	69.4	18.1	4.6	77	1.3
85+	4.5	22.7	78.0	29.9	3.1	70	1.3
Women							
65 - 69	17.3	7.6	77.9	8.2	13.3	77	4.0
70 - 74	13.7	10.7	81.1	11.7	9.7	71	4.0
75 - 79	10.5	17.9	83.5	20.1	6.5	62	4.0
80 - 84	7.8	33.0	84.5	37.5	3.8	49	4.0
85+	5.6	59.6	91.3	66.4	1.9	34	3.7

1994 Men	e(x)	GHS disb %	Inst disb %	All disb %	elwd(x)	~~elwd(x)~~ e(x)	Years
65 - 69	14.8	7.5	63.4	8.0	12.9	87	1.9
70 - 74	11.6	7.1	58.8	7.7	9.9	85	1.7
75 - 79	9.0	9.2	67.6	11.0	7.3	81	1.7
80 - 84	6.9	20.2	69.4	22.8	5.0	73	1.8
85+	5.3	23.8	78.0	31.5	3.6	69	1.7
Women							
65 - 69	18.6	9.9	77.9	10.6	14.0	75	4.7
70 - 74	15.0	13.0	81.1	14.1	10.5	70	4.5
75 - 79	11.7	19.2	83.5	22.3	7.3	63	4.4
80 - 84	9.0	26.1	84.5	31.7	4.8	53	4.2
85+	6.8	50.2	91.3	60.6	2.7	39	4.1

Table 6: EuroQol: Distribution and proportion with Limiting Longstanding Illness, from Omnibus Survey

		In this state %	Of which, with LLI %
Mobility			
1	No problems	83.3	12.3
2	Some problems	16.5	75.2
3	Confined to bed	0.2	68.5
Self care			
1	No problems	95.8	19.8
2	Some problems	3.8	89.4
3	Unable to wash/dress	0.4	85.5
Usual activities			
1	No problems	86.0	13.5
2	Some problems	11.9	78.2
3	Unable usual activities	2.1	89.0
Pain/discomfort			
1	No pain	69.8	8.4
2	Some pain	25.7	50.0
3	Extreme pain	4.5	90.2
Anxiety/Depression			
1	Not anxious/depressed	82.6	17.4
2	Some anxiety/depression	15.2	44.4
3	Extreme anxiety/depression	2.0	77.9
Number		5925	1348

Source: Reanalysis of First Quarter 1995 Omnibus Survey.

Table 7: Healthy life expectancy measured by Limiting Longstanding Illness and Quality Adjusted Life Years, from the Omnibus Survey, 1995

1. Limiting Longstanding Illness

1994 Men	Pop. (thou)	l(x)	e(x)	Home LLI %	n	Inst Pop	Inst LLI %	All LLI (thou)	All LLI %	$e_{LLI}(x)$	Ratio
15 - 44	11096	9906	59.9	12.1	1224	33726	71.5	1367	12.3	46.4	77
45 - 64	5759	9604	31.3	28.4	747	24266	90.0	1649	28.6	21.1	67
65 - 74	2109	8250	14.8	32.4	320	22065	93.1	696	33.0	9.1	62
75+	1214	5724	9.0	42.7	167	70942	93.1	555	45.7	4.9	54
Women											
15 - 44	10734	9927	65.2	12.9	1665	25217	69.9	1355	12.6	47.8	73
45 - 64	5837	9760	36.1	27.7	912	19155	90.0	1697	29.1	22.2	62
65 - 74	2516	8883	18.6	41.4	391	32150	93.9	1076	42.8	9.5	51
75+	2345	7191	11.7	48.9	263	289081	94.7	1281	54.6	5.3	45

2. Quality Adjusted Life Years

1994 Men	Pop. (thou)	l(x)	e(x)	QOL Tariff	n	Inst Pop	Inst QOL	Mean QOL	QALY expctd	Ratio
15 - 44	11096	9906	59.9	0.931	1224	33726	0.500	0.929	52.0	87
45 - 64	5759	9604	31.3	0.846	747	24266	0.500	0.844	25.3	81
65 - 74	2109	8250	14.8	0.797	320	22065	0.500	0.794	11.2	75
75+	1214	5724	9.0	0.710	167	70942	0.500	0.698	6.3	70
Women										
15 - 44	10734	9927	65.2	0.928	1503	25217	0.500	0.927	54.4	83
45 - 64	5837	9760	36.1	0.832	823	19155	0.500	0.831	27.3	76
65 - 74	2516	8883	18.6	0.715	355	32150	0.500	0.712	12.6	67
75+	2345	7191	11.7	0.656	233	289081	0.500	0.637	7.5	64

Source: Home LLI rates and mean QOL tariff from reanalysis of First Quarter 1995 Omnibus Survey. Rates for 16-44 from the survey are assumed to apply to 15-44.

Table 8: Regional Estimates from the 1994 Omnibus Survey: Age Standardised LLI rates and mean QOL tariffs

Men	LLI rate %	Mean QOL tariff	Sample size
North, North West, Yorkshire and Humberside	23.9	0.857	649
East Midlands, West Midlands, East Anglia	21.0	0.891	591
London	19.3	0.880	299
South East excluding London	17.7	0.901	565
South West and Wales	20.2	0.867	378
England and Wales	20.7	0.879	2482
Women			
North, North West, Yorkshire and Humberside	27.9	0.834	857
East Midlands, West Midlands, East Anglia	21.7	0.851	637
London	20.7	0.864	348
South East excluding London	21.5	0.852	607
South West and Wales	28.1	0.843	471
England and Wales	24.4	0.847	2920

Source: Reanalysis of First Quarter 1995 Omnibus Survey. Standardisation uses the four age categories shown in table 6.

Table 9: Regional Estimates from the Omnibus Survey: Life and Healthy Life Expectancy at 15

Men	Life Expect	HLE (LLI)	QALYs
North, North West, Yorkshire and Humberside	58.9	43.8	49.8
East Midlands, West Midlands, East Anglia	60.1	46.5	52.9
London	59.4	46.9	51.6
South East excluding London	61.1	48.9	54.2
South West and Wales	60.4	47.2	51.6
England and Wales			
Women			
North, North West, Yorkshire and Humberside	64.2	45.0	52.9
East Midlands, West Midlands, East Anglia	65.2	49.6	54.7
London	65.4	50.5	55.7
South East excluding London	66.1	50.2	55.3
South West and Wales	65.8	45.6	54.7
England and Wales	65.2	47.8	54.4

Appendix A: Information needs for long term health care

This appendix comments on the information needs for predicting future long term health care needs among elderly people, and the suitability of the GHS (and of related, similar surveys).

A1. Information needs

It is first useful to review the information that is needed in order to predict long term health care needs.

Where formal eligibility rules exist for long term health care benefits, these immediately provide the criteria for determining future demand, assuming that takeup is not an issue. Such rules are familiar in regard to state financial benefits, but the present emphasis on assessment suggests that these will increasingly be used to determine the obligation of statutory agencies and private insurers. However, there must be doubt about whether such rules could ever be sufficiently reliable in individual cases, and where they are used at present, for example by local authority care managers they contain scope for discretion and are subject to rapid adjustment in response to changed circumstances. Assessment rules are also relevant in that the future cost of long term health care benefits are also likely to be affected by their use in reimbursement formulae; for example in the Australian resident Classification Index (cf Challis et al., 1995).

Assessment based eligibility criteria and reimbursement formulae are, for the time being only likely to affect certain limited areas within the range of long term health care. The evidence about what factors are more generally relevant to long-term care is of two types.

The first is from research about the demand factors that *de facto* affect the current cost of care. There is a large literature on cost functions even in the UK alone: one example that might be cited because it applies to elderly people in all settings, is that of Snell (1985) who shows that variations in the costs can be explained by physical dependency, mental characteristics, sex and area of residence. Studies of this are detailed about the health factors associated with long term health care costs which may include:

Organic disease[5]
Sensory impairment
Activities of daily living
Mobility
Instrumental activities of daily living
Continence
Cognitive functioning
Behaviour
Depression and anxiety
Nutritional status
Carers health

The second is research concerned with developing predictive models of the cost of long term care. Examples include from the US: Manton et al., 1993 (the National Long Term Care survey); Burner et al. (1992); Weiner et al. (1990). In the UK, Nuttall et al. (1993), and a number of other unpublished models.

[5] Particularly musculoskeletal disease, cardio-vascular diseases, diseases of the chest and lungs, stroke, failing sight (Hunt,1978).

Elsewhere, models are currently being developed in Canada and Australia. These models typically include a much fuller set of domains affecting long term care costs, distinguishing demand and supply: though they employ rather less detailed specifications than the explanatory models. These domains include on the demand side:

Population projections;
Health need rates for long term care (covering the dimensions listed above);
Resources, particularly financial.

And on the supply side:

Health technology;
The availability and adequacy of informal care;
The price of formal care;
The national economy.

These models require to project forward future rates. The simplest apply current rates to population forecasts. However it is possible to be considerably more sophisticated, and all these factors (bar advances in health technology) are included in one model or another. They use quantitative evidence from a range of sources. For health this (at best) involves projecting forwards recent evidence about trends in the incidence; for financial resources, evidence about the growth of private pensions and resources in property; for informal care, from changes in family composition.

From the results of Nuttall et al. (1993) it might be inferred that of these, after population projections what will most determine future costs are the age-specific rates of needs raising health conditions. Recent international evidence, to which the results of section 3 contribute, point to an expansion of disability at moderate levels, but a containment of disability at the severest levels (Robine et al., 1995). The implication would be, if these trends continue, that services helping elderly people at the mild end of disability will need to be expanded, in the extreme case pro-rata with the growth in numbers of elderly people; while services at the severest end of disability may be sufficient if maintained at present day levels.

A2. The General Household Survey

As a regular, general-purpose survey of households, potentially the GHS can contribute to this agenda by monitoring trends in three areas: need-related health characteristics of elderly people, financial resources, and the supply of informal care. Indeed all three of these topics are now regularly included.

In keeping with its overall theme, this report will focus only on the health information, though some of the remarks are applicable to the other two topics. What the GHS provides concerning the health of elderly people has been reviewed in section 3. This is information about 3-4,000 people aged 65 living in private households, for the years 1980, 1985, 1991 and 1994, including:

Activities of daily living
Mobility
Instrumental activities of daily living
Limiting longstanding illness
Use of health care facilities

Sensory impairment

Health evidence from the GHS suffers from three *lacunae*.

The first is that the best method of predicting the future need for long-term health care should be based on the incidence of ill-health, and trends in that incidence. There is no simple method of estimating incidence rates from successive cross-sectional data that does not require heroic assumptions. So we can make no more than a general statement about future needs, not a precisely quantified estimate at various need levels. Nevertheless, this is still more satisfactory - and more optimistic - than the common assumption of planning models that current age-specific need rates will be maintained indefinitely. However, what is required to estimate incidence rates is longitudinal data (Bone et al., 1995).

The second problem is that the GHS, by definition, excludes people living in communal establishments. Section 2 of the report discussed the problems resulting from omitting a group with high needs for long term health care. It is significant how rarely surveys include the needs of all people on a comparable basis: the Census is the noteworthy exception. Some of the difficulties were outlined in the Disability Surveys (Martin et al., 1988). First, there is no satisfactory single sampling frame for people who live, or have been staying a long time in communal establishments. Second, studies of elderly people in the community like GHS focus particularly on disability in relation to long term care needs, but disability is partly environmentally determined, and problems that are exist in normal housing may disappear or be irrelevant in a sheltered environment. Either indicators of need that are not environmentally conditioned must be used (such as handicap or incapacity), or the questions must be related to a standard environment. There is a need to develop methods to cope with both these difficulties.

The third problem with the GHS and similar surveys lies in the weakness of the link between the items included which measure need, and factors which actually determine whether or not services are going to be required. The items listed above were not derived from the evidence of what is most predictive of costs, nor what is being used in assessments and eligibility criteria. It is well known that the GHS omits several of the key domains, including cognitive state, continence, depression and anxiety, carers' health needs. Even with respect those domains that are measured, such as ADLs, it owes more to scales current twenty years ago than those such as Barthel which is more widely used in assessment and used in cost research. It is beyond our scope to review in full the evidence about what measures are most predictive of long term care costs, but this would clearly be the next step.

Appendix B: Using the Longitudinal Survey for establishing the effect of retirement migration on regional measures of healthy life expectancy

A.C. Bebbington and G. Nicolaas[6].

B1. Introduction

This appendix uses the Census Longitudinal Survey (with the 1991 Census integrated) to examine the effect of migration around the country, on estimates of the limiting longstanding illness, according to where people live now, and where they lived in the past. For the reason given in the text, the inherent healthfulness of areas judged from period based mortality or morbidity tables may be misunderstood if no allowance is made for the migration. If in-migrants to an area are different in their health to established residents, this may affect assessments of the innate healthfulness of populations, and hence for example the need for health promotion and preventative care.

B2. The Longitudinal Survey

The LS is based on a one per cent sample of the usually resident population of England and Wales. The initial sample was drawn from 1971 Census records - all those who gave as their date of birth one of four pre-selected days of the year were included in the study. Births and immigrants after the 1971 Census who were born on any of the four pre-selected days have also been included in the sample to ensure that the LS remains representative of the population in England and Wales. For a more detailed description see Fox and Goldblatt (1982).

In principle the LS offers a unique opportunity for the calculation of healthy life expectancy, and of how it is affected by migration.

- It provides an integrated source of information about mortality and other circumstances of individuals. This, for example, permits mortality rates to be calculated for individuals according to social classifications that would not otherwise be available.

- It allows both health and mortality to be related to past events. This is helpful for calculating HLE for indicators that change, such as area of residence or social class.

- It is of sufficient scale to permit estimates for small subgroups, including local areas, for studying migration.

The calculations presented in this appendix are based on those LS members who were recorded at the 1981 Census and subsequently traced at the NHS Central Register (table B1). The limiting long-term illness data refers to the question in the 1991 Census for those LS members from the 1981 cohort who were also recorded at the 1991 Census.

There are, however, three major difficulties in using the LS which mean that we can cannot make exact inferences about healthy life expectancy from the LS.

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[6] National Primary Health Care R & D Centre, University of Manchester

The first concerns limitations on data availability. At present the limiting longstanding is available from the 1991 Census only, and there is not as yet any longitudinal evidence about health. Moreover at the time of this analysis 1991 deaths were not linked in. This severely limits the scope for calculation healthy life expectancy[7].

The second limitation is that this analysis was not able to trace back further than 1981, and hence it is not possible to estimate the period table for place of original residence. In order to construct a migration-independent period estimate of either life expectancy or healthy life expectancy of someone aged X today, living in a particular area, in principle it should be based on all people who were living in that area when they were aged X, regardless of where they subsequently lived[8].

The third difficulty concerns practical problems in linking Census information with the LS. Linkages between the 1981 and 1991 Census cohorts are incomplete. Census under-enumeration and inconsistent recordings of date of birth result in problems linking surviving individuals between the two census. The higher rate of non-linkage among those living in non-private households is of some concern since LLI rates are high among those living in non-private households. However the crude limiting longstanding illness rate in the 1991 linked sample (15.3 per cent) is actually slightly higher than the rate in the 1991 Census for people aged 10 or over (14.7 per cent). There was also a fault in the data supplied, which prevents the calculation of rates for women.

B3. Health and migration in counties

Bone et al. (1995) showed that recent retirement migration is an important explanatory factor for geographical variations in healthy life expectancy. Retirement migration will confuse the calculation of healthy life expectancy of geographical areas. With period based estimates, the expectation of younger people is based on the current experience of older people in the same area. If those older people do not originate in the area, then their experience may not be relevant to the expectations of a younger person. This matters particularly if in-migrants are not only different from residents in their health expectations when they arrive, but stay different as they age.

Table B2 summarises the evidence about the health of people who have migrated in the previous ten years. Migration in this case is between counties of England and Wales. The migration rates:

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[7] Some progress has been made using deaths for 1987-9, which were incorporated into the LS. The method used was to compare HLE using

(a) Age-specific LLI rates in 1991, by area where the person was currently living, from the linked sample LS, and death rates from all 1991 OPCS registration statistics; with

(b) Age-specific LLI rates in 1991, by area where the person was living in 1981; and mortality rates in 1987-9, by where people had been living in 1981.

The approach is unwieldy. Moreover death rates based on reported deaths in 1987-9, after making adjustments for expected deaths and out-migrations in the intervening period, are significantly lower than the rates expected from OPCS registration statistics at that time. We do not know why this is so, and it throws doubt on the comparison of the two measures.

[8] A separate period table would need to be calculated for each age-group separately in order to estimate life expectancy and healthy life expectancy. Each period table would be based on the population who did live in that area when aged X, and will use the death rates and ill-health rates of each subsequent age group among that population.

$$\frac{Number\ of\ \ LLI\ movers + Number\ of\ \ Healthy\ movers}{1981\ Population} \quad 3$$

measure the propensity of people to migrate between counties, by age in 1991.
The odds ratio compares the odds of an ill person having migrated, with the odds of a healthy person having migrated is defined as:

$$\frac{Number\ of\ \ LLI\ movers}{Number\ of\ \ LLI\ stayers} x \frac{Number\ of\ \ Healthy\ stayers}{Number\ of\ \ Healthy\ movers} \quad 4$$

(LLI and healthy refers to state in 1991, not necessarily at the time of the move[9].) If the odds ratio is greater than 1, then the migration rate between 1981 and 1991 is greater among the ill in 1991 than among the healthy: or equally, illness is greater among those who moved than those who stayed put.

This means, from table B2, that up to the age of 75, people who migrated in the previous ten years are on average healthier than stayers. There is a slight peak in migration around the age of 65, when migrants are particularly likely to be healthy. These are pre-retirement migrations. But above the age of 75, that is people who were at least 65 in 1981, movers are more likely to have limiting longstanding illness.

It is of interest to identify the areas to which people migrate, and the effect that migration has on levels of health. Table B3 shows the pattern of movement between counties. While some counties are net exporters and some importers as a result of migration, generally speaking those with high in-migration are those with high out-migration. Table B3 shows the odds ratios for out and in migrations. An odds ratio above 1 for out-migrants signifies that those who left include a higher proportion of people with LLI in 1991 than do those who stayed: the county tends to export its unhealthy population. An odds ratio above 1 for in-migrants signifies that the county imports people who on average are less healthy than current residents. If the in-migration ratio is greater than the out-migration ratio, then migration is tending to reduce the average health in the county, and vice-versa. For example from table B3:

- London: exports relatively ill people, but imports few, and those relatively healthy.
- Cleveland: exports relatively healthy people, but imports few, and those relatively ill.
- Dorset: imports far more than exports, but health of both is similar.
- Northumberland: imports and exports about the same, but imports are less heathy than exports.
- Clwyd: imports a large number of ill people, but loses fewer.

B4. Conclusion

For reasons already given, we cannot calculate healthy life expectancy conveniently from the LS.

In order to establish the net effect of migration on the healthiness of county populations, one can compare the age-standardised disability rates (ASDR) in 1991 of people in the linked sample, according to where they were living in 1991 and where they had been living 10 years previously. Across localities, it is now well established that the age standardised disability rate is usually correlated with life expectancy, so that where age standardised disability rates are lower, healthy life expectancy is greater. We cannot be so sure that this is equally true through time, but if it is then:

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[9] A confidence interval may be determined from the approximation:

s.e.($\log_e \psi$) ≈1/(LLI migrants) + 1/(Healthy non-migrants) + 1/(LLI non-migrants) + 1/(Healthy migrants)

This may be calculated from data given in tables 2 and 3, but is omitted in the interests of clarity.

- Those areas where the ASDR is higher (worse health) based on where people lived in 1991 compared with where they were living in 1981, healthy life expectancy in those areas based on current rates may *underestimate* the health of the indigenous population.

- Those areas the ASDR is lower (better health) based on where people lived in 1991 compared with where they were living in 1981, healthy life expectancy in those areas based on current rates may *overestimate* the health of the indigenous population.

The analysis is shown in table B4. Negative differences identify areas where indigenous HLE is likely to be underestimated: an example is Northumberland which table B3 showed is an importer of unhealthy people. Positive differences identify areas where indigenous HLS is likely to be overestimated: an example is Warwickshire, which table B3 showed is an exporter of unhealthy people, while movers-in are average.

Curiously London and a number of other authorities which appeared exceptional in table B3, show little difference in ASDR whether it is measured on current residents or those of 10 years previously. In London's case, this is due to a considerable difference in the age structure of the two populations, which are also due to unusual migration patterns. The implication is that ASDR alone may be a limited guide to the effects of migration on health. Whether this also would apply to HLE we cannot be sure. In general, table B4 shows that differences in ASDR measured on current population and that living in an area ten years previously are quite small, at least compared to variations between localities. The implication would seem to be that migration does not overly affect the pattern of health between localities.

Table B1: Data supplied from LS - Traced sample size in 1981, linked sample size in 1991, LLI in 1991, Deaths, 1987-9: Totals, England and Wales

Males

Age	Sample 1981	Survival rate[1]	Sample 1991	LLI 1991[2]	Deaths 1987-9[3]
0-15	59604	79.7	51277	1729	14
16-34	75040	79.7	64052	3665	161
35-39	16991	81.7	15106	1493	54
40-44	15452	81.7	13644	1974	105
45-49	14851	84.5	12946	2881	137
50-54	15148	87.6	12497	3930	234
55-59	15009	86.9	11335	3880	440
60-64	12956	86.1	8590	3215	790
65-69	12027	64.5	6258	2692	1197
70-74	9299	55.6	3638	1865	1352
75-79	5738	39.9	1378	866	1585
80-84	2673	39.9	333	237	1291
85+	1250	39.9	66	50	1100

Females

Age 1981	Sample 1981	Survival rate	Sample 1991	LLI 1991	Deaths 1987-9
0-15	56629	86.5	50414	1523	12
16-34	73745	86.5	65737	3494	76
35-39	16665	80.0	15236	1816	49
40-44	14847	80.0	13402	1958	50
45-49	14674	90.0	13055	2415	82
50-54	15101	87.2	13182	3056	166
55-59	16074	89.1	13389	3790	239
60-64	14562	92.7	11338	4108	484
65-69	14780	76.5	10050	4586	752
70-74	12815	72.4	7106	4829	1028
75-79	10029	48.2	3847	2656	1429
80-84	6144	48.2	1355	1067	1814
85+	4099	48.2	306	256	2748

Notes:

1. Survival rates were estimated from national death rates in 1988, to be used for the calculation of death rates in the LS. In each age/sex group, they are determined as:

$$Rate = \frac{Deaths, 1987 - 9}{Sample\ size, 1981} \; x \; \frac{1}{National\ death\ rate, 1988}$$

Age groups were combined at lowest ages where there were few deaths, and at upper ages which were subsequently aggregated.

2. Age as in 1981.

3. Age at time of death.

Table B2: Health of migrants and non-migrants in England and Wales, during 1981-1991

Males

Age in 1991	LLI in 1991		Healthy in 1991		Migration Rate %	Odds Ratio
	Stayer	Mover	Stayer	Mover		
10-25	1286	233	40757	8135	17	0.91
26-44	2918	573	49071	13170	21	0.73
45-49	1374	141	12156	1563	11	0.80
50-54	1792	165	10340	1105	9	0.86
55-59	2226	187	9734	905	8	0.90
60-64	2821	235	9082	1044	10	0.72
65-69	3406	380	8567	1035	11	0.92
70-74	3739	368	6525	706	9	0.91
75-79	4154	432	5035	427	9	1.23
80-84	3633	395	2844	234	9	1.32
85-89	2371	285	1097	94	10	1.40
90+	1147	176	307	31	12	1.52
Total	30867	3570	155515	28449	15	0.63

Note: Movers are those living in a different county (including Metropolitan counties, London) between 1981 and 1991. Migrants beyond England and Wales are excluded. Figures not available for females. The odds ratio is measured by the rate of out-migration of people ill in 1991, compared with people healthy in 1991. A text footnote gives details.

Table B3: Migration Rate and Health of Migrants between 1981 and 1991 by County (Males)

	LS sample 1991	Migrat'n rate out %	Odds ratio (out)	Migrat'n rate in %	Odds ratio (in)
Metropolitan Counties					
Merseyside	6360	12	.64	6	.77
Greater Manchester	11054	11	.59	7	.53
West Midlands	11157	13	.57	7	.52
South Yorkshire	5789	10	.44	7	.50
Tyne & Wear	4928	10	.52	7	.78
West Yorkshire	8922	9	.71	8	.62
Greater London	26205	19	.82	11	.31
English Shires					
Cleveland	2419	11	.40	6	.86
Humberside	3892	11	.49	10	.54
Durham	2700	12	.43	11	.65
Nottinghamshire	4431	12	.52	12	.53
Cumbria	2258	10	.58	12	.76
Lancashire	6167	11	.66	12	.82
Leicestershire	3790	13	.47	13	.54
Staffordshire	4565	14	.39	14	.52
Derbyshire	4304	11	.61	14	.62
Avon	4148	13	.57	14	.69
Kent	6725	15	.71	17	.85
Cheshire	4274	15	.58	17	.81
Northamptonshire	2526	14	.55	17	.54
Northumberland	1381	16	.69	17	1.00
Essex	6851	15	.63	17	.75
Gloucestershire	2357	15	.84	18	.78
Bedfordshire	2212	21	.55	18	.67
Suffolk	2772	14	.63	18	.69
Shropshire	1782	15	.34	19	.64
Norfolk	3377	12	.65	19	.91
Warwickshire	2249	19	.70	19	.56
Hampshire	6659	17	.53	20	.67
Hertfordshire	4282	23	.73	21	.73
Lincolnshire	2599	18	.70	21	1.01
Oxfordshire	2312	20	.70	21	.51
Devon	4645	13	.69	22	.81
North Yorkshire	3107	17	.70	22	.61
Hereford & Worcestershire	2992	16	.66	22	.77
Wiltshire	2434	19	.89	23	.82
Somerset	2068	17	.62	23	.66
East Sussex	3082	17	.73	24	.66
Surrey	4399	25	.82	24	.69
Berkshire	3083	23	.75	24	.70
Dorset	3043	15	.77	24	.78
West Sussex	3276	16	.87	24	.72
Cambridgeshire	2704	18	.71	26	.69
Cornwall	2218	15	.76	26	.73
Isle of Wight	531	17	.56	26	.80
Buckinghamshire	2729	24	.71	29	.82

Table B3: continued

	LS sample 1991	Migrat'n rate out %	Odds ratio (out)	Migrat'n rate in %	Odds ratio (in)
Wales					
Mid Glamorgan	2367	10	.45	9	.55
West Glamorgan	1599	11	.43	9	.56
Gwent	1943	10	.64	10	.69
South Glamorgan	1742	13	.44	15	.60
Dyfed	1557	12	.37	16	.65
Clywd	1831	12	.75	17	1.01
Gwynedd	1091	13	.78	20	.80
Powys	513	19	.83	24	1.71

Notes:
1. Migrants are those living in a different county (including Metropolitan counties, London) between 1981 and 1991. Migration rates out are the proportion of residents in 1981 living elsewhere in 1991. Migration rate in is the proportion of residents aged 10+ in 1991 living elsewhere in 1981. Migrants beyond England and Wales are excluded.

2. Odds ratio (out) is the rate of out-migration of people ill in 1991, compared with people healthy in 1991. Odds ration (in) is the rate of in-migration of people ill in 1991, compared with people healthy in 1991. Odds ratios of Isle of Wight and Powys are unreliable due to low numbers.

3. Data for females is unavailable.

Table B4: Age Standardised LLI rates, Males, by county of residence in 1981 and in 1991

	County of residence 1981	1991	Diff-erence
Metropolitan Counties			
Greater London	14.74	14.74	-0.01
Greater Manchester	17.59	17.64	-0.05
Merseyside	17.58	17.75	-0.16
South Yorkshire	18.66	18.92	-0.26
Tyne & Wear	18.84	19.06	-0.22
West Midlands	15.89	16.06	-0.16
West Yorkshire	16.47	16.39	0.08
English Shires			
Avon	12.97	13.25	-0.28
Bedfordshire	12.99	13.34	-0.34
Berkshire	12.78	12.63	0.16
Buckinghamshire	12.41	12.96	-0.55
Cambridgeshire	12.93	12.93	0.00
Cheshire	14.92	15.32	-0.40
Cleveland	18.41	18.64	-0.23
Cornwall	14.62	14.70	-0.08
Cumbria	14.21	14.26	-0.05
Derbyshire	15.59	15.53	0.06
Devon	13.92	13.96	-0.04
Dorset	12.67	12.77	-0.09
Durham	19.08	19.49	-0.40
East Sussex	13.78	13.57	0.22
Essex	13.62	13.60	0.01
Gloucestershire	12.82	12.84	-0.02
Hampshire	13.84	13.87	-0.04
Hereford & Worcestershire	13.34	13.24	0.11
Hertfordshire	12.88	13.03	-0.14
Humberside	16.06	15.94	0.12
Isle of Wight	15.20	15.99	-0.78
Kent	13.01	13.14	-0.13
Lancashire	17.16	17.32	-0.16
Leicestershire	14.85	14.78	0.07
Lincolnshire	14.12	14.37	-0.26
Norfolk	13.39	13.50	-0.12
Northamptonshire	13.98	13.54	0.44
Northumberland	14.89	15.43	-0.54
North Yorkshire	13.73	13.41	0.32
Nottinghamshire	16.28	16.20	0.08
Oxfordshire	13.20	12.91	0.30
Shropshire	13.29	13.70	-0.41
Somerset	13.08	12.84	0.25
Staffordshire	16.75	16.70	0.05
Suffolk	14.14	14.03	0.10
Surrey	12.03	11.69	0.34
Warwickshire	14.22	13.66	0.56
West Sussex	13.03	12.66	0.37
Wiltshire	13.42	13.12	0.30

Table B4: continued

	Place of residence 1981	1991	Difference
Wales			
Clywd	15.42	15.79	-0.37
Dyfed	17.17	17.29	-0.12
Gwent	18.71	18.77	-0.06
Glwynedd	12.91	12.62	0.29
Mid Glamorgan	23.19	23.16	0.03
Powys	9.91	10.61	-0.70
South Glamorgan	15.68	16.01	-0.33
West Glamorgan	21.41	21.35	0.05

Notes:

1. These are the age standardised rates among people alive in both 1981 and 1991, according to limiting longstanding illness in 1991. Age groups are as shown in table B2, with all over 80 combined.

2. Figures for Isle of Wight and Powys are based on small numbers and may be unreliable.

Appendix C: Methodology for Estimating the Institutional Population

C1. Introduction

This appendix describes the methodology used for estimating the number of permanent residents in communal establishments providing health or social care. Estimates were calculated for the following categories of establishment, as shown in the relevant 1991 Census volume (CEN 91 CE, Table A):

1.	NHS hospitals/homes - psychiatric	(§C2.1. & §C3.1.)
2.	NHS hospitals/homes - other	(§C2.1. & §C3.1.)
3.	Non-NHS hospitals - psychiatric	(§C2.1. & §C3.1.)
4.	Non-NHS hospitals - other	(§C2.1. & §C3.1.)
5.	Local authority homes	(§C2.2. & §C3.2.)
6.	Housing association homes and hostels	(§C2.3. & §C3.3.)
7.	Nursing homes (non-NHS/LA/HA)	(§C2.4. & §C3.4.)
8.	Residential homes (non-NHS/LA/HA)	(§C2.5. & §C3.2.)

The estimates were calculated for the seven years 1976, 1981, 1985, 1988, 1991, 1992 and 1994, by age-group (0-4, 5-14, 15-44, 45-64, 65-74, 75-84 and 85 & over) and sex. Section C2 describes the methods used for each type of establishment, and Section C3 provides details of the sources of information used.

C2. Calculation of Estimates

C2.1. NHS Hospitals/Homes - Psychiatric; NHS Hospitals/Homes - Other; Non-NHS Hospitals - Psychiatric; Non-NHS Hospitals - Other

The calculation of the total number of resident patients in hospitals in the seven years 1976, 1981, 1985, 1988, 1991, 1992 and 1994 was based on linear interpolation/extrapolation from the 1981 Census for other residents and the 1991 Census for residents - non-staff. In the 1981 Census tabulations National Health Service (NHS) hospitals were combined with non-NHS hospitals, whereas these became separate categories in the 1991 Census tabulations. Secondly, in the 1981 Census the category psychiatric hospitals and homes included homes and hospitals for the mentally handicapped as well as the mentally ill, whereas in the 1991 Census tabulations psychiatric hospitals and homes only included establishments for the mentally ill. Thirdly, in the 1981 Census a number of categories of home, including nursing homes and local authority homes and hostels for the mentally disordered, were included in the hospitals and homes categories. Therefore, estimates of the number of resident patients in hospitals and homes have been calculated for NHS and non-NHS hospitals and homes combined, for psychiatric hospitals and homes (mental illness) and for other hospitals and homes (mentally handicapped and other), excluding nursing and other homes which have been included elsewhere.

The calculation of the total number of resident patients in psychiatric hospitals and homes in the seven years 1976, 1981, 1985, 1988, 1991, 1992 and 1994 proceeded in the following stages:

1. Calculation of estimated number of mentally ill and mentally handicapped patients in psychiatric hospitals and homes in 1981 by age-group (0-15, 16-pensionable age, pensionable age & over) and sex from the relative average daily number of occupied beds in England in 1981 (Department of Health and Social Security, 1985, Table 4.3).

2. Calculation of estimated number of mentally ill patients in psychiatric hospitals and homes in 1981 by age-group (0-15, 16-59, 60-64 and 65 & over) and sex from 1981 Census age-distributions for other residents in communal establishments in England and Wales (CEN 81 CE, Table 2).

3. Calculation of estimated number of mentally ill patients in psychiatric hospitals in 1981 by excluding estimated number in homes and hostels for the mentally disordered.

4. Calculation of estimated number of mentally ill patients in psychiatric hospitals and homes in 1981 by age-group (0-4, 5-14, 15-44, 45-64, 65-74, 75-84 and 85 & over) and sex from 1981 Census age-distributions for other residents in communal establishments in England and Wales (CEN 81 CE, Table 2).

5. Total number of patients in psychiatric hospitals by age-group (0-15, 16-44, 45-64, 65-74, 75-84 and 85 & over) and sex in England and Wales in 1991 taken from the 1991 Census for residents - non-staff in NHS and non-NHS psychiatric hospitals (CEN 91 CE, Table 3), and total number of patients in age-groups 0-4, 5-14 and 15 estimated from 1991 Census age-distribution for residents - non-staff in communal establishments (CEN 91 CE, Table 2), producing estimated total number of patients in age-groups 0-4, 5-14, 15-44, 45-64, 65-74, 75-84 and 85 & over.

6. Calculation of estimated total number of patients in psychiatric hospitals for 1976 from the estimates in stages 4 and 5 by linear extrapolation, and calculation of estimated total number of patients by age-group and sex, assuming that the age- and sex-distributions were the same as in 1981.

7. Calculation of estimated total number of patients in psychiatric hospitals by age-group and sex for 1985 and 1988 from the estimates in stages 4 and 5, by linear interpolation.

8. Calculation of estimated total number of patients in psychiatric hospitals for 1992 and 1994 from the estimates in stages 4 and 5 by linear extrapolation, and calculation of estimated total number of patients by age-group and sex, assuming that the age- and sex-distributions were the same as in 1991.

The calculation of the total number of resident patients in other hospitals and homes in the seven years 1976, 1981, 1985, 1988, 1991, 1992 and 1994 proceeded in the following stages:

1. Calculation of estimated number of mentally ill and mentally handicapped patients in psychiatric hospitals and homes in 1981 by age-group (0-15, 16-pensionable age, pensionable age & over) and sex from the relative average daily number of occupied beds in England in 1981 (Department of Health and Social Security, 1985, Table 4.3).

2. Combination of estimated number of mentally handicapped patients in hospitals and homes in 1981 from stage 1 with tabulated number of other patients in hospitals and homes, by age-group and sex.

3. Calculation of estimated number of mentally handicapped and other patients in hospitals and homes in 1981 by age-group (0-15, 16-59, 60-64 and 65 & over) and sex from 1981 Census age-distributions for other residents in communal establishments in England and Wales (CEN

81 CE, Table 2).

4. Calculation of estimated number of mentally handicapped and other patients in hospitals in 1981 by excluding estimated number in nursing homes.

5. Calculation of estimated number of mentally handicapped and other patients in hospitals and homes in 1981 by age-group (0-4, 5-14, 15-44, 45-64, 65-74, 75-84 and 85 & over) and sex from 1981 Census age-distributions for other residents in communal establishments in England and Wales (CEN 81 CE, Table 2).

6. Total number of patients in other hospitals by age-group (0-15, 16-44, 45-64, 65-74, 75-84 and 85 & over) and sex in England and Wales in 1991 taken from the 1991 Census for residents - non-staff in NHS and non-NHS hospitals (CEN 91 CE, Table 3), and total number of patients in age-groups 0-4, 5-14 and 15 estimated from 1991 Census age-distribution for residents - non-staff in communal establishments (CEN 91 CE, Table 2), producing estimated total number of patients in age-groups 0-4, 5-14, 15-44, 45-64, 65-74, 75-84 and 85 & over.

7. Calculation of estimated total number of patients in other hospitals for 1976 from the estimates in stages 5 and 6 by linear extrapolation, and calculation of estimated total number of patients by age-group and sex, assuming that the age- and sex-distributions were the same as in 1981.

8. Calculation of estimated total number of patients in other hospitals by age-group and sex for 1985 and 1988 from the estimates in stages 5 and 6, by linear interpolation.

9. Calculation of estimated total number of patients in other hospitals for 1992 and 1994 from the estimates in stages 5 and 6 by linear extrapolation, and calculation of estimated total number of patients by age-group and sex, assuming that the age- and sex-distributions were the same as in 1991.

Notes on the Calculations

1. For 1981, the number of residents in homes and hostels for the mentally disordered was defined as the estimated number of permanent residents in local authority homes for people with mental illness and learning disabilities, since these homes were specifically included in the category of psychiatric hospitals and homes (CEN 91 CE). The estimated numbers of residents in other categories of home were not excluded because this produced negative estimates.

2. Although some nursing homes cater for patients with mental illness or learning disabilities, these homes are a minority, accounting for under 9 per cent of nursing home beds in 1982 (Department of Health and Social Security, nd). For 1981, the number of mentally handicapped and other patients in hospitals was estimated by excluding the total estimated number of patients in nursing homes, and no adjustment was made to the psychiatric hospitals and homes category for nursing homes catering for patients with mental illness or learning disabilities.

C2.2. Local Authority Homes

The calculation of the total number of permanent residents in local authority homes in the seven years 1976, 1981, 1985, 1988, 1991, 1992 and 1994 proceeded in the following stages:

1. Calculation of estimated total number of permanent residents in homes for elderly people and people with physical disabilities in England by age-group (<65, 65-74, 75-84 and 85 & over) and, where possible, sex.

2. Calculation of estimated total number of permanent residents in homes for elderly people and people with physical disabilities in Wales by age-group (<65, 65-74, 75-84 and 85 & over) and sex.

3. Calculation of estimated total number of permanent residents in homes for people with mental illness and people with learning disabilities in England, including unstaffed local authority homes, by age-group (<65, 65-74, 75-84 and 85 & over) and, where possible, sex.

4. Calculation of estimated total number of permanent residents in homes for people with mental illness and people with learning disabilities in Wales, including unstaffed local authority homes, by age-group (<65, 65-74, 75-84 and 85 & over) and sex.

5. Combination of estimates from stages 1 and 3 and from stages 2 and 4.

6. Calculation of estimated total number of permanent residents in homes in England by age-group (<65, 65-74, 75-84 and 85 & over) and sex, for years for which the sex-distribution was not available (1988, 1991, 1992 and 1994), from the 1991 Census sex-distribution for each age-group for residents - non-staff in local authority homes (CEN 91 CE, Table 3).

7. Calculation of estimated total number of permanent residents in age-groups 0-15, 16-44 and 45-64 from 1991 Census age-distribution for residents - non-staff in local authority homes for England and Wales separately (CEN 91 CE, Table 3).

8. Calculation of estimated total number of permanent residents in age-groups 0-4, 5-14 and 15 from 1991 Census age-distribution for residents - non-staff in communal establishments for England and Wales separately (CEN 91 CE, Table 2).

9. Combination of estimates from stage 5, 6 and 7 to produce estimated total number of permanent residents in age-groups 0-4, 5-14, 15-44, 45-64, 65-74, 75-84 and 85 & over for England and Wales combined.

Notes on the Calculations

(a) Elderly and Physically Disabled

1. For years in which the age-distribution of permanent residents was not available or was incomplete, the age-distribution of permanent residents was assumed to be the same as for all residents (England: 1976, 1981, 1988, 1991, 1992 and 1994; Wales: 1991, 1992 and 1994).

2. The age-distribution of permanent residents for whom the age was recorded as not known was assumed to be the same as for residents for whom the age was recorded (England: 1988).

(b) Mental Illness and Learning Disabilities

1. As a consequence of the variability in the age-groupings used in the sources of statistics on homes for people with mental illness or learning disabilities, initial estimates for England for 1976 to 1992 and for Wales for 1976 to 1994 were obtained for residents aged under 65 and for residents aged 65 and over, and the proportions of residents in the age-groups 65-74, 75-84 and 85 and over were then assumed to be the same as in local authority homes for people with mental illness or learning disabilities in England in 1994.

2. For 1976, the total number of permanent residents in both England and Wales was calculated as the number of residents in staffed homes plus the estimated number in unstaffed homes, assuming that the occupancy rate and the age-distribution of residents in unstaffed local authority accommodation were the same as in staffed local authority accommodation, adjusted by the ratio of permanent to all supported residents in homes in England in 1994.

3. For 1981 and 1985, the total number of permanent residents in England was calculated as the number of supported residents, adjusted by:
   (i) the ratio of permanent to all supported residents in homes in England in 1994;
   (ii) the ratio of residents to supported residents for 1989 (the nearest year for which information was available).

4. For 1988, the total number of permanent residents in England was calculated as the number of supported residents, adjusted by:
   (i) the ratio of permanent to all supported residents in homes in England in 1994;
   (ii) the ratio of residents to supported residents for 1989 (the nearest year for which information was available);
   (iii) the ratio of residents in staffed and unstaffed homes to residents in staffed homes in England in 1994 (1988 being the first year when residents in unstaffed homes were explicitly excluded from the RA6 and RA10 returns on supported residents).

5. For 1991 and 1992, the total number of permanent residents in England was calculated as the number of supported residents, adjusted by:
   (i) the ratio of permanent to all supported residents in homes in England in 1994;
   (ii) the ratio of residents to supported residents;
   (iii) the ratio of residents in staffed and unstaffed homes to residents in staffed homes in England in 1994.

6. For 1994, the total number of permanent residents in England was calculated as the number of supported permanent residents, adjusted by:
   (i) removal of the estimated number of supported permanent residents in homes for elderly mentally infirm people, assumed to correspond to the increase in supported persons aged 65 and over in homes for people with mental illness between 1993 and 1994, adjusted by the ratio of supported permanent residents to all supported residents;
   (ii) the ratio of residents to supported residents;
   (iii) the ratio of residents in staffed and unstaffed homes to residents in staffed homes.

7. For 1981 to 1994, the total number of permanent residents in Wales was calculated as the number of residents in staffed homes plus the estimated number in unstaffed homes, assuming that the age-distribution of residents in unstaffed local authority accommodation was the same

as in staffed local authority accommodation, adjusted by the proportion of permanent residents in England in 1994.

C2.3. Housing Association Homes and Hostels

Information on the number of hostel bedspaces contained in the annual reports of the Housing Corporation for 1988/89 and 1989/90, together with the results of the 1994 Housing Corporation survey of stock owned by registered housing associations, suggests that the annual growth in the number of hostel bedspaces, excluding individual shared housing bedspaces, was approximately 10 per cent between 1988/89 and 1994.

The calculation of the total number of residents in housing association homes and hostels in the seven years 1976, 1981, 1985, 1988, 1991, 1992 and 1994 proceeded in the following stages:

1. Total number of residents in age-groups 0-15, 16-44, 45-64, 65-74, 75-84 and 85 & over) by sex in England and Wales in 1991 taken from the 1991 Census for residents - non-staff in nursing homes (CEN 91 CE, Table 3), and total number of residents in age-groups 0-4, 5-14 and 15 estimated from 1991 Census age-distribution for residents - non-staff in communal establishments (CEN 91 CE, Table 2), producing estimated total number of residents in age-groups 0-4, 5-14, 15-44, 45-64, 65-74, 75-84 and 85 & over.

2. Calculation of estimated total number of residents by age-group and sex for 1976, 1981, 1985, 1988, 1992 and 1994 from the 1991 Census totals, assuming an annual growth rate of 10 per cent.

C2.4. Nursing Homes (Non-NHS/LA/HA)

Department of Health statistics on private hospitals, homes and clinics in England are available for 1982 onwards, but from 1994 nursing homes and hospitals have been separated in the statistics and the statistics have included the number of occupied beds as well as the number of registered beds. For Wales, separate statistics for registered beds in nursing homes and hospitals have been published for 1989 onwards, but corresponding figures for 1982 to 1987 have been supplied by the Welsh Office. The statistics for England relate to 31st December for each year up to and including 1986, and those for Wales relate to 31st December for each year up to and including 1987. Where necessary, estimates have been calculated for the financial year using linear interpolation.

The calculation of the total number of patients in nursing homes in the six years 1976, 1981, 1985, 1988, 1991 and 1992 proceeded in the following stages:

1. Calculation of estimated total number of nursing home beds for England and Wales separately for 1981 and for England for 1985, 1988, 1991 and 1992.

2. Calculation of estimated number of nursing home beds for children, elderly long-stay and other categories for England and Wales separately for 1981, 1985 and 1988 and for England for 1991 and 1992.

3. Combination of estimates from stage 2 for England and Wales for 1981, 1985 and 1988, and combination of estimates from stage 2 for England with tabulated number for Wales for 1991 and 1992.

4. Total number of patients by age-group (0-15, 16-44, 45-64, 65-74, 75-84 and 85 & over) and sex in England and Wales in 1991 taken from the 1991 Census for residents - non-staff in nursing homes (CEN 91 CE, Table 3), and total number of patients in age-groups 0-4, 5-14 and 15 estimated from 1991 Census age-distribution for residents - non-staff in communal establishments (CEN 91 CE, Table 2), producing estimated total number of patients in age-groups 0-4, 5-14, 15-44, 45-64, 65-74, 75-84 and 85 & over.

5. Calculation of estimated total number of patients in age-groups 0-4, 5-14, 15-44 and 45-64 by sex for 1981, 1985, 1988 and 1992, assuming that the occupancy rate for nursing home beds for children and other categories and the age- and sex-distributions were the same as in 1991.

6. Calculation of estimated total number of patients in age-groups 65-74, 75-84 and 85 & over by sex for 1981, 1985, 1988 and 1992, assuming that the occupancy rate for nursing home beds for elderly long-stay and the age- and sex-distributions were the same as in 1991.

7. Calculation of estimated total number of patients by age-group and sex for 1976, assuming that the age- and sex-distributions were the same as in 1981.

For 1994, the calculation of the total number of patients in nursing homes proceeded in the following stages:

1. Calculation of estimated total number of patients by age-group (under 18, 18-64, 65-74, 75-84 and 85 & over) in Wales, assuming the same occupancy rate as in England.

2. Combination of estimates from stage 1 with tabulated number for England.

3. Calculation of estimated total number of patients by age-group and sex using 1991 Census age- and sex-distributions.

Notes on the Calculations

1. For 1976, the number of nursing home beds in England and Wales was estimated to be 15000, based on a linear extrapolation from the growth in beds between 1981 and December 1982.

2. In 1981, the total number of beds in private and voluntary hospitals and nursing homes in England and Wales was about 30000 (Cmnd 8173, 1981), and the proportion of beds in nursing homes was assumed to be the same as in 1982.

3. For 1985, the total number of nursing home beds in both England and Wales for March was linearly interpolated from the figures for December 1984 and December 1985.

4. For 1988, the total number of nursing home beds in Wales for March was linearly interpolated from the figures for December 1987 and March 1989.

5. For the years 1982 to 1992, the number of nursing home beds in England was estimated as the total number of beds minus the number of beds in institutions with operating theatres.

6. For the years 1981 to 1992, the distribution of nursing home beds for children, elderly long-stay and other categories in England was assumed to be the same as in 1994, and was not constrained by the distribution in nursing homes and hospitals since homes catering exclusively for elderly people were often classified in the returns to the Department of Health as catering for 'general specialties' (Laing and Buisson, 1992).
7. For 1981, the distribution of nursing home beds for children, elderly long-stay and other categories in Wales was assumed to be the same as in 1982.

C2.5. Residential Homes (Non-NHS/LA/HA)

The calculation of the total number of permanent residents in residential homes (Non-NHS/LA/HA) in the seven years 1976, 1981, 1985, 1988, 1991, 1992 and 1994 proceeded in the following stages:

1. Calculation of estimated total number of permanent residents in homes for elderly people and people with physical disabilities in England by age-group (<65, 65-74, 75-84 and 85 & over) and, where possible, sex.

2. Calculation of estimated total number of permanent residents in homes for elderly people and people with physical disabilities in Wales by age-group (<65, 65-74, 75-84 and 85 & over) and sex.

3. Calculation of estimated total number of permanent residents in homes for people with mental illness and people with learning disabilities in England, including unstaffed local authority homes, by age-group (<65, 65-74, 75-84 and 85 & over) and, where possible, sex.

4. Calculation of estimated total number of permanent residents in homes for people with mental illness and people with learning disabilities in Wales, including unstaffed local authority homes, by age-group (<65, 65-74, 75-84 and 85 & over) and sex.

5. Combination of estimates from stages 1 and 3 and from stages 2 and 4.

6. Calculation of estimated total number of permanent residents in homes in England by age-group (<65, 65-74, 75-84 and 85 & over) and sex, for years for which the sex-distribution was not available (1988, 1991, 1992 and 1994), from the 1991 Census sex-distribution for each age-group for residents - non-staff in local authority homes (CEN 91 CE, Table 3).

7. Calculation of estimated total number of permanent residents in age-groups 0-15, 16-44 and 45-64 from 1991 Census age-distribution for residents - non-staff in local authority homes for England and Wales separately (CEN 91 CE, Table 3).

8. Calculation of estimated total number of permanent residents in age-groups 0-4, 5-14 and 15 from 1991 Census age-distribution for residents - non-staff in communal establishments for England and Wales separately (CEN 91 CE, Table 2).

9. Combination of estimates from stage 5, 6 and 7 to produce estimated total number of permanent residents in age-groups 0-4, 5-14, 15-44, 45-64, 65-74, 75-84 and 85 & over for England and Wales combined.

Notes on the Calculations

(a) Elderly and Physically Disabled

1. For years in which the age-distribution of permanent residents was not available or was incomplete, the age-distribution of permanent residents was assumed to be the same as for all residents (England: 1976, 1981, 1988, 1991, 1992 and 1994; Wales: 1991, 1992 and 1994).

2. The age-distribution of permanent residents for whom the age was recorded as not known was assumed to be the same as for residents for whom the age was recorded (England: 1988).

(b) Mental Illness and Learning Disabilities

1. As a consequence of the variability in the age-groupings used in the sources of statistics on homes for people with mental illness or learning disabilities, initial estimates for England for 1976 to 1992 and for Wales for 1976 to 1994 were obtained for residents aged under 65 and for residents aged 65 and over, and the proportions of residents in the age-groups 65-74, 75-84 and 85 and over were then assumed to be the same as in residential homes for people with mental illness or learning disabilities in England in 1994.

2. For 1976, the total number of permanent residents by sex in both England and Wales was calculated as the number of residents in homes by sex, assuming that the sex-distribution for each age-group was the same as in England in 1981, adjusted by the ratio of permanent to all supported residents in homes in England in 1994.

3. For 1981, 1985 and 1988, the total number of permanent residents in England was calculated as the number of supported residents, adjusted by:
   (i) the ratio of permanent to all supported residents in England in 1994;
   (ii) the ratio of residents to supported residents for 1989 (the nearest year for which information was available).

4. For 1991 and 1992, the total number of permanent residents in England was calculated as the number of supported residents, adjusted by:
   (i) the ratio of permanent to all supported residents in England in 1994;
   (ii) the ratio of residents to supported residents.

5. For 1994, the total number of permanent residents in England was calculated as the number of supported permanent residents, adjusted by:
   (i) removal of the estimated number of supported permanent residents in homes for elderly mentally infirm people, assumed to correspond to the increase in supported persons aged 65 and over in homes for people with mental illness between 1993 and 1994, adjusted by the ratio of supported permanent residents to all supported residents;
   (ii) the ratio of residents to supported residents, assuming that the age-distribution of residents in small homes corresponds to that for homes with 4 or more residents.

6. For 1981 to 1992, the total number of permanent residents by sex in Wales was calculated as the number of residents in homes by sex, assuming that the sex-distribution for each age-group was the same as in England, adjusted by the ratio of permanent to all supported residents in homes

in England in 1994.

7. For 1994, the total number of permanent residents in Wales was calculated as the number of residents in homes, adjusted by the ratio of permanent to all supported residents in homes in England in 1994.

C2.6. Total

The estimated total number of permanent residents in the above categories of communal establishment in the seven years 1976, 1981, 1985, 1988, 1991, 1992 and 1994 by age-group (0-4, 5-14, 15-44, 45-64, 65-74, 75-84 and 85 & over) and sex was obtained by summation. For elderly people, the estimated total number of permanent residents in quinary age-groups (65-69, 70-74, 75-79, 80-84 and 85 & over) by sex was also obtained using the 1991 Census age-distribution for residents - non-staff in communal establishments (CEN 91 CE, Table 2).

C3. Sources of Information

C3.1. NHS Hospitals/Homes - Psychiatric; NHS Hospitals/Homes - Other; Non-NHS Hospitals - Psychiatric; Non-NHS Hospitals - Other

1981: Office of Population Censuses and Surveys (1983) *Census 1981. Communal Establishments. Great Britain*, CEN 81 CE, HMSO, London.

1991: Office of Population Censuses and Surveys (1993) *1991 Census. Communal Establishments. Great Britain*, CEN 91 CE, HMSO, London.

C3.2. Local Authority Homes; Residential Homes (Non-NHS/LA/HA)

(a) Elderly and Physically Disabled: England

1976: Department of Health and Social Security. *The Statistics of Residential Accommodation for the Elderly and for Younger Physically Handicapped People. At 31 March 1976. All Residents in Local Authority, Voluntary and Private Homes. RA/1976/2*.

1981: Department of Health and Social Security (1982) *The Statistics of Residential Accommodation for the Elderly and for Younger Physically Handicapped People at 31 March 1981. England. All Residents in Local Authority, Voluntary and Private Homes. RA/81/2*.

1985: Department of Health and Social Security. *Residential Accommodation 1985. Analysis of Permanent Residents by Home-Type, Function, Age and Sex for Each LA; Analysis of Short-Stay Residents by Home-Type, Function, Age and Sex for Each LA*.

1988: Department of Health. *Residential Accommodation for Elderly and for Younger Physically Handicapped People: All Residents in Local Authority, Voluntary and Private Homes. Year Ending 31 March 1988. England. RA/88/2*.

1991: Department of Health. *Residential Accommodation for Elderly and for Younger Physically*

Handicapped People: All Residents in Local Authority, Voluntary and Private Homes. Year Ending 31 March 1991. England. RA/91/2.

1992: Department of Health (1993) *Residential Accommodation for Elderly and for Younger Physically Disabled People: All Residents in Local Authority, Voluntary and Private Homes. Year Ending 31 March 1992. England. RA/92/2*.

1994: Department of Health (1995) *Residential Accommodation for Elderly People and People with Physical and/or Sensory Disabilities: All Residents in Local Authority, Voluntary and Private Homes. Year Ending 31 March 1994. England. RA/94/2*.

(b) Elderly and Physically Disabled: Wales

1976: Welsh Office. *Residential Accommodation for the Elderly and Younger Physically Handicapped. Year Ended 31st March 1976*.

1981: Welsh Office. *Residential Accommodation for the Elderly, Younger Physically Handicapped and Blind. Year Ended 31st March 1981*.

1985: Welsh Office (1985) *Residential Accommodation for the Elderly, Younger Physically Handicapped and Blind: Year Ended 31/3/85*, Welsh Office, Cardiff.

1988: Welsh Office (1989) *Residential Accommodation for the Elderly, Younger Physically Handicapped and Blind: Year Ended 31/3/88*, Welsh Office, Cardiff.

1991: Welsh Office (1992) *Residential Accommodation for Elderly People and People with Physical or Visual Disabilities: Year Ended 31/3/91*, Welsh Office, Cardiff.

1992: Welsh Office (1993) *Residential Accommodation for Elderly People and People with Physical or Visual Disabilities: Year Ended 31/3/92*, Welsh Office, Cardiff.

1994: Welsh Office (1995) *Residential Care Homes and Nursing Homes in Wales: 1994*, Welsh Office, Cardiff.

(c) Mental Illness and Learning Disabilities: England

1976: Department of Health and Social Security. *Homes and Hostels for the Mentally Ill and Mentally Handicapped at 31 March 1976. England. A/F 76/11*.

1981: Department of Health and Social Security. *Homes and Hostels for the Mentally Ill and Mentally Handicapped at 31 March 1981. England. A/F 81/11*.

1985: Department of Health and Social Security. *Homes and Hostels for the Mentally Ill and the Mentally Handicapped, at 31 March 1985. England. A/F 85/11*.

1988: Department of Health. *Residential Accommodation for Mentally Ill and Mentally Handicapped People: Local Authority Supported Residents at 31 March 1988. England. A/F 88/11B*.

1991: Department of Health. *Residential Accommodation for People with Mental Illness and People with*

Learning Disabilities: Local Authority Supported Residents at 31 March 1991. England. A/F 91/11B.

1992: Department of Health. *Residential Accommodation for People with Mental Illness and People with Learning Disabilities: Local Authority Supported Residents at 31 March 1992. England. A/F 92/11B*.

1994: Department of Health (1995) *Residential Accommodation for People with Mental Illness and People with Learning Disabilities: Local Authority Supported Residents. Year Ending 31 March 1994. England. A/F 94/11B*.

(d) Mental Illness and Learning Disabilities: Wales

1976: Welsh Office. *Activities of Social Services Departments. Year Ended 31st March 1976*.

1981: Welsh Office. *Activities of Social Services Departments. Year Ended 31st March 1981*.

1985: Welsh Office (1986) *Activities of Social Services Departments: Year Ended 31/3/85*, Welsh Office, Cardiff.

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1994: Welsh Office (1995) *Activities of Social Services Departments: 1993-94*, Welsh Office, Cardiff.

Welsh Office (1995) *Residential Care Homes and Nursing Homes in Wales: 1994*, Welsh Office, Cardiff.

C3.3. Housing Association Homes and Hostels

1991: Office of Population Censuses and Surveys (1993) *1991 Census. Communal Establishments. Great Britain*, CEN 91 CE, HMSO, London.

C3.4 Nursing Homes (Non-NHS/LA/HA)

(a) England

1981: Cmnd 8173 (1981) *Growing Older*, HMSO, London.

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1985: Department of Health and Social Security (1987) *Private Hospitals, Homes and Clinics Registered Under Section 3 of the Nursing Homes Act 1975, as amended by the Health Services Act 1980 and Paragraph 24 of Schedule 4 to the Health and Social Services and Social Security Adjudications Act 1983. 31 December 1984. National and Regional Summaries*.

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1988: Department of Health (1989) *Private Hospitals, Homes and Clinics Registered Under Section 23 of The Registered Homes Act 1984. England. National, Regional and District Summaries for the Financial Year 1987/88*.

1991: Department of Health (1992) *Private Hospitals, Homes and Clinics Registered Under Section 23 of The Registered Homes Act 1984. England - Position as at 31 March 1991*.

1992: Department of Health (1993) *Private Hospitals, Homes and Clinics Registered Under Section 23 of the Registered Homes Act 1984. England - Position at 31 March 1992*.

1994: Department of Health (1995) *Private Hospitals, Homes and Clinics Registered Under Section 23 of the Registered Homes Act 1984. Volume 1 - England, Regional Health Authorities and Regional Office Areas. Financial Year 1993-94*.

(b) Wales

1981: Cmnd 8173 (1981) *Growing Older*, HMSO, London.
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1991: Welsh Office (1992) *Health and Personal Social Services Statistics for Wales. No. 18, 1991*, Welsh Office, Cardiff.

1992: Welsh Office (1993) *Health and Personal Social Services Statistics for Wales. No. 19, 1992*, Welsh Office, Cardiff.

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