Socioeconomic Inequalities in Health Expectancy in Finland and Norway in the Late 1980s

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Abstract—Studies on health inequalities have usually focused either on mortality or on morbidity. This concerns national studies as well as international comparisons of health inequalities. This paper seeks to bridge the gap by applying health expectancy as a synthetic overall measure of health. The purpose of the study is to compare socioeconomic inequalities in health expectancy in Finland and Norway in the late 1980s. Additionally, the major methodological issues in the use of health expectancy in the study of health inequalities are identified. Data on mortality by level of education derive from linked national follow-up studies (1986–1990) of population censuses. Data on the prevalence of morbidity by level of education derive from nationally representative surveys of the noninstitutionalised adult population in 1985/87. Persons aged 25–74 years were included. Four measures of morbidity were used: limiting long-standing illness, extremely limiting long-standing illness, functional disabilities and perceived less than good health. The association between mortality/morbidity and level of education in each 5-year age/sex group was determined by a regression-based method. Partial life expectancies and partial health expectancies for ages 25–74 were then calculated by using the mortality quotients and morbidity prevalences predicted by the regression model for those at the top and the bottom of the educational hierarchy in each 5-year age group, using an application of the method first presented by Sullivan. Although various measures of health expectancy were used, the result were consistent. In absolute terms the size of socioeconomic inequalities in health expectancy in Finland and Norway is on the same level. In relative terms, however, the size of inequalities in health expectancy is greater in Norway. If one considers premature mortality to be more severe than any indicator of morbidity, the mortality–morbidity mix of the health inequalities is less favourable to Finland, since the size of absolute inequalities in mortality is greater in Finland. Health expectancy measures provide a promising measure for assessing and comparing the pattern and the size of health inequalities.

Key words—health expectancy, life expectancy, health inequalities, Finland, Norway

INTRODUCTION

Since the Black Report (Townsend and Davidson, 1982) health inequalities have been widely studied and discussed in industrialised countries (Macintyre, 1997). Another impetus for studying health inequalities was given by the European regional “Health for All by the Year 2000” programme which emphasised the need to diminish the health inequalities (Targets for Health for All, 1985).

By now there is a large body of literature documenting socioeconomic health inequalities. A growing number of studies have examined to what extent the size of inequalities in health varies between industrialised countries. If inequalities in one country are larger than in another, this would suggest that there is room for improvement in that country and inequalities are not inevitable, but are at least to some extent avoidable (Kunst et al., 1995). Therefore, cross-country comparisons of health inequalities can point out possible directions for policies that aim at reducing socioeconomic inequalities in health.

Cross-country comparisons have concentrated either on mortality (Valkonen, 1989; Vägerö and Lundberg, 1989; Leclerc et al., 1990; Wagstaff et al., 1991; Kunst and Mackenbach, 1994a,b; Kunst et al., 1997a,b) or on morbidity (Karisto et al., 1978; Lundberg, 1986; Aiach and Curtis, 1990; Lahelma et al., 1993, 1994; Lahelma and Arber, 1994; Kunst et al., 1995; van Doorslaer et al., 1997; Cavelaars et al., 1997a,b). No comparative study has yet combined mortality and morbidity; however, there are numerous reasons to combine them into a single measure of health inequalities. First of all, there is an intricate link between mortality and morbidity: most deaths are preceded by longer or...
shorter periods of disease and disability, whereas disease and disability, naturally, prevail only among the survivors. In addition, the continuing mortality decline may modify the average health status of the population if more frail people survive into the older ages. Therefore, in order to develop a comprehensive picture of health inequalities, mortality and morbidity should be studied together, using a synthetic summary measure.

In this study, life table methods were used to combine studies on inequalities in mortality with those on inequalities in morbidity. The summary measure used is health expectancy, which describes how long a person can expect to live healthy if the current age specific mortality and morbidity conditions were to prevail in the future (Katz et al., 1983; Robine et al., 1986; Bebbington, 1988; Crimmins et al., 1989; Robine and Ritchie, 1991; Van Ginneken et al., 1991; Bone, 1992). By combining information on both mortality and morbidity and expressing these in the same measurement unit (years) health expectancy measures are useful in assessing and describing the size of health inequalities. For example when comparing two countries with one having larger inequalities in mortality and the other larger inequalities in morbidity, health expectancy measures make it easier to assess whether these two countries differ in the size of overall health inequalities, taking into account both mortality and morbidity. Sophisticated inequality measures have been developed for comparisons (see, for example, Mackenbach and Kunst, 1997) but these have seldom been applied to life table calculations. In this paper we introduce an application of a regression based method to estimate the size of inequalities in life expectancy and health expectancy.

Although there are now health expectancy estimates for over 30 countries (Robine et al., 1992, 1993; Mathers et al., 1994), cross-country comparisons of health expectancies have been hampered by the incomparability of the method of calculation, the collection of (health) surveys and especially the measures of morbidity (Boshuizen and van de Water, 1994). Especially, there are no cross-country comparisons on the size of socioeconomic inequalities in health expectancy, due also to scarcity of comparable data on mortality and morbidity by socioeconomic status. There are only few (incomparable) estimates of health expectancies by socioeconomic status for individual countries, like Canada (Wilkins and Adams, 1983), England and Wales (Bebbington, 1993), U.S.A. (Guralnik et al., 1993; Crimmins et al., 1996), the Netherlands (van den Bos and van der Maas, 1993; van de Water et al., 1996) and Finland (Valkonen et al., 1997). In this study highly comparable individual level data on mortality and morbidity by educational level in Finland and Norway were used.

The reasons for selecting Finland and Norway for this study were the similarity of the countries and the availability of highly comparable data. Both Finland and Norway are Nordic welfare states with largely comparable educational and health care system, welfare and health policies, culture and social and economical structure (Esping-Andersen, 1990). In both countries the existence of socioeconomic inequalities in health have been documented for both mortality and morbidity indicators (Valkonen, 1989; Lahelma et al., 1993). In both Finland and Norway, people with lower education and from lower occupational classes have higher rates of mortality and they more often report disease, disability and perceived ill health. In the 1970s inequalities (in relative terms) among men in mortality (Kunst and Mackenbach, 1994a,b; see also Valkonen, 1989) as well as in morbidity (Karisto et al., 1978) were slightly larger in Finland, whereas in the 1980s inequalities in morbidity (in relative terms) seemed to be equally large in both countries (Kunst et al., 1992; Rahkonen et al., 1993; Lahelma et al., 1994; see also Mackenbach et al., 1997). In addition, overall levels of mortality and morbidity have been substantially higher in Finland than in Norway.

The purpose of the paper is to determine to what extent the pattern and the size of health inequalities in Finland differ from those in Norway by using the health expectancy as the overall synthetic measure of health. Additionally, the most important methodological issues concerning the use of health expectancy in cross-country comparisons of health inequalities are identified.

MATERIAL AND METHODS

Data

The data on mortality used in this study were derived from the tabulated data base compiled by the EU Concerted Action on “Socioeconomic inequalities in morbidity and mortality in Europe: A comparative study”, coordinated by Erasmus University, Rotterdam (Kunst et al., 1996). Data on morbidity were derived also from the data-base “the Nordic Level of Living Registry” compiled by the Central Statistical Office of Sweden (Vogel, 1991). The original data were from national data sources by statistical authorities.

The Finnish (see Valkonen et al., 1993) and the Norwegian tabulated mortality data were based on the individual level records of the 1980 Census linked with the death records for the periods 1981–1985 and 1986–1990. In both countries practically all (over 99%) death records could be linked to the census (Table 1). Only the latter period is used because the morbidity data were from that period.

The data on morbidity were derived from three studies using identical health questions (Table 1).
The Finnish morbidity data and part of the Norwegian data were derived from the “Survey on Living Conditions” carried out by the statistical authorities of these two countries in 1986/1987 (Vogel, 1991; Lahelma et al., 1993). These studies are based on representative samples of the noninstitutionalised population aged 15 years or more in Finland and 16–84 years in Norway. Additional Norwegian data were derived from the “Health Survey” by Norwegian statistical authorities in 1985. This study was representative of the noninstitutionalised Norwegian population.

Measures of morbidity

Methodological issues first arise when selecting the measure for morbidity. The measurement of morbidity is more complicated than that of mortality and various indicators of (self-reported) morbidity are available. Measures vary from a global perception of one’s own general health status to complex indices measuring the consequences of disease or illness for one’s ability to carry on everyday activities (see, for example, Blaxter, 1989; Bowling, 1991).

In this study four self-reported measures of morbidity were used: limiting long-standing illness, extremely limiting long-standing illness, perceived poor general health status and functional disabilities.

Long-standing illness was measured by the question: “Do you have any long-standing illness, infirmity or disability?” A follow-up question was put to those who responded positively: “Does your illness/disability restrict your work or does it limit your daily activities (painful employment, housework, schooling, studying)?” Those whose response was “to a great deal” or “to some extent” were classified as having a limiting long-standing illness. The response “to a great deal” implied having an extremely limiting long-standing illness. In Norway, this morbidity measure was taken from the Survey on Living Conditions, whereas all other morbidity measures were taken from the Health Survey.

Perceived general health was measured by the following question in Finland: “Which of the following alternatives best describes your present health status?” and in Norway: “How would you evaluate your own general health?”. The response categories in both countries were “very good”, “good”, “moderate or average”, “poor” and “very poor”. Those who perceived their health status as average or poor were classified as having less than good perceived health.

The index of functional disability was based on the following six items: (1) “Can you climb stairs without difficulty?”, (2) “Can you walk for 5 min at a fairly fast pace without difficulty?”, (3) “Can you read ordinary text in a newspaper without difficulty?”, (4) “Can you hear without difficulty what is said in a conversation between several persons?”, (5) “Can you hear what is said in a normal conversation with at least two others?” and (6) “Personal hygiene?”. In all questions the response categories were “yes” and “no”. Individuals who were unable to manage one or more of the above activities, were classified as having functional disabilities.

Education as a measure of socioeconomic status

Occupational class, education and income are distinct but related components measuring multiple aspects of a person’s socioeconomic status (Liberatos et al., 1988; Valkonen, 1989, 1993; House et al., 1990; Kunst and Mackenbach, 1994c; Krieger et al., 1997). Level of education creates differences between people in terms of access to information and the level of proficiency in benefiting...
from new knowledge, whereas income creates differences in access to material resources. Occupational status includes both these aspects and adds to them benefits accruing from exercise of specific jobs, such as prestige, privileges, power and technical skills (Kunst and Mackenbach, 1994c).

The level of education was used to measure socioeconomic status, because this measure has a number of advantages in life table calculations over other measures of socioeconomic status. First of all, level of education undergoes only small changes over the course of life. Once acquired, usually in early adulthood, education cannot be lost. In the life course perspective it is crucial that individuals stay in the same category over time. Moreover, the health status of an individual does not have as great an effect on education as it may have on occupation and income. In addition, level of education can be measured in a comparable way for all members of the population, including those who are economically inactive. Furthermore, more practical reasons were considered: comparable individual level data on mortality and morbidity by educational level in Finland and Norway was available, whereas no comparable data on occupational class was available.

A three-part classification of education based on individual’s own education was used, on the base of the highest examination s/he has passed (derived from a national register of educational degrees):

1. “Higher education” equals a degree from university or other higher educational institution (at least 13 years).
2. “Secondary education” equals upper secondary school, vocational training, or the matriculation examination (10–12 years).
3. “Basic education” equals compulsory education or less (9 years or less).

An important methodological issue concerns the cohort-comparability of education: is the meaning of specific levels of education the same for different cohorts? The distribution of education is rather skewed (Table 2). Most people in Finland and Norway have a basic education only, especially in the elderly cohorts. The population sizes of the educational levels and therefore also the relative positions of each educational level, vary strongly between cohorts. For example, those with only basic education might be less disadvantaged when most people of their cohort have the same educational achievements as they themselves have (as in the case of older age groups) compared to a situation where most people of their cohort have better education than they themselves have (as in the younger age groups). Hence the relative position in the social structure of a person with a given educational level may vary between cohorts. This problem will be dealt with further on.

**Health expectancy**

The study included persons aged 25–74. The youngest age groups were excluded as most of them have not yet completed their education and the oldest age groups because a large proportion of them are institutionalised and therefore are not included in the morbidity data.

The country, sex and age (5-year age groups) specific probabilities of death by level of education were calculated from the (tabulated) baseline population of 1985 and the number of deaths in the period 1986–1990. From these probabilities of death the partial life expectancies by level of education in the age bracket 25–74 were calculated by using the standard methods (Shryock and Siegel, 1976).

The partial health expectancies between exact ages 25 and 75 by level of education were calculated by applying observed age (5-year age groups) and sex specific prevalences of morbidity to the life-table estimates of the number of person-years lived by the synthetic cohort in each 5-year age interval between ages 25 and 75 (the \( L_x \)-column of life table). The four indicators of morbidity described above were used, respectively, to measure the prevalence of morbidity (by country, sex and level of education). The so-called Sullivan (1971) method of calculating health expectancies was used (for the calculation procedure, see for example Crimmins et al., 1989).

The term “health expectancy” (HE) is used to refer to (partial) health expectancies (between ages 25 and 75) in general, without specifying by which indicator of morbidity it is calculated (Mathers and Robine, 1993). The maximum length of life expect-

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**Table 2. Distribution of level of education (%) by age and sex in Finland and Norway in 1985 (as estimated by the mortality data file)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Age</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>basic</td>
<td>sec.</td>
<td>high.</td>
</tr>
<tr>
<td>Finland</td>
<td>25–44</td>
<td>38</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>45–59</td>
<td>67</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>60–74</td>
<td>79</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>all</td>
<td>53</td>
<td>38</td>
</tr>
<tr>
<td>Norway</td>
<td>25–44</td>
<td>35</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>45–59</td>
<td>56</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>60–74</td>
<td>68</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>all</td>
<td>48</td>
<td>36</td>
</tr>
</tbody>
</table>
ancy between ages 25 and 75 is 50 years. The term "life expectancy with ill health" (LEWIH) is used to refer to the number of years expected to be lived with ill health between ages 25 and 75. The healthy life percentage (HE%) equals the percentage of health expectancy out of life expectancy. In this paper the terms "years of life expectancy lost" and "years of health expectancy lost" are used to refer to the number of years lost in life expectancy and health expectancy between ages 25 and 75, i.e. the maximum length of life expectancy minus the observed length of life expectancy or health expectancy, respectively (see Fig. 1).

Comparing differences in mortality can be done by comparing life expectancies. Comparing differences in morbidity is, however, more complex, since the length of life expectancy with ill health depends on both the age specific morbidity rates and the length of life expectancy. If two countries with non-equal life expectancy (LE) have the same absolute difference in age-specific morbidity rates between for example educational levels, the country with shorter life expectancy would have smaller absolute differences (in years) between educational levels in health expectancy (HE). This is due to the fact that there are more person-years lived in the country with lower mortality, especially at the older ages. By examining the healthy life percentage (HE%), one can "standardise" the overall level of mortality and study just the differences in morbidity.

The use of partial life expectancies allows for a choice with respect to mortality differences: one can look at relative differences either in survivorship (life expectancy) or in its complement, death (life expectancy lost). Naturally, when there is no upper age limit, i.e. when looking at life expectancy at age 25, only the former case is possible. In this paper we use ratios of life expectancy lost to measure relative differences. One reason to use the "negative" indicator is that when level of mortality decreases, life expectancy approaches the maximum life expectancy (which is 50 years in the age bracket 25–74), and the relative differences in life expectancy, i.e. ratios of life expectancy, diminish to one. Thus, relative differences can be seen more clearly when looking at ratios of life expectancy lost. Furthermore, ratios of life expectancy lost are analogous to rate ratios of mortality, which makes our study more comparable to other studies on mortality differentials.

Measurement of inequalities in health expectancy

One way to determine the size of health inequalities is to compare the life expectancy and health expectancy of those with higher education to the life expectancy and health expectancy of those with basic education. However, the sizes of these two groups differ: the higher educated form a relatively small group (see Table 2). In addition, only the extreme groups are compared. The association throughout the levels of education, including the intermediate groups and the sizes of the groups, is not taken into account. Furthermore, as mentioned in Section 2.4 the meaning of specific levels of education probably varies between cohorts, since their relative sizes have changed between cohorts (Table 2).

These disadvantages are avoided by using a regression-based method developed by Pamuk (1985). In this method the socioeconomic status of a group is operationalised as its relative position in the social hierarchy, i.e. equated to the proportion of the population that has a lower position in the social hierarchy. For example, if the lowest edu-
The health expectancies between exact ages 25 and 75 were calculated in an analogous manner, by using the age-specific morbidity prevalences predicted by the regression model for those at the top and bottom of the educational hierarchy in each 5-year age group, and by applying these prevalences to the corresponding regression-based life table estimates of years lived in each 5-year age interval (the \(L_i\)-column of life table). The difference between the health expectancy of those at the top and those at the bottom of the educational hierarchy can be used as an estimate of the absolute size of inequality in health expectancy.

The regression procedure used in the calculation of the size of inequalities assumes a linear association between mortality/morbidity and level of education. Some nonlinearity was observed in the older cohorts: the mortality probabilities and morbidity prevalences of the highest educational group were lower than predicted. However, because of the small size of this group, this deviation is of minor importance.

### RESULTS

#### Health expectancy between ages 25 and 75 by level of education

On the whole, the Norwegian men and women have better health than their Finnish counterparts. At each educational level, the Norwegians have both a longer partial life expectancy (LE) and a longer partial health expectancy (HE), as measured by limiting long-standing illness (Table 3). The difference between Finland and Norway is larger in HE than in LE.

A clear socioeconomic gradient can be found for LE: the higher the education, the longer the LE and

<table>
<thead>
<tr>
<th>Country</th>
<th>Level of education</th>
<th>Life expectancy</th>
<th>Health expectancy</th>
<th>Healthy life %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>higher</td>
<td>45.9</td>
<td>36.6</td>
<td>79.8</td>
</tr>
<tr>
<td></td>
<td>secondary</td>
<td>44.0</td>
<td>29.2</td>
<td>66.3</td>
</tr>
<tr>
<td></td>
<td>basic</td>
<td>42.0</td>
<td>25.0</td>
<td>59.6</td>
</tr>
<tr>
<td></td>
<td>all</td>
<td>43.0</td>
<td>27.8</td>
<td>64.6</td>
</tr>
<tr>
<td>Norway</td>
<td>higher</td>
<td>46.5</td>
<td>40.1</td>
<td>86.2</td>
</tr>
<tr>
<td></td>
<td>secondary</td>
<td>45.1</td>
<td>33.5</td>
<td>74.3</td>
</tr>
<tr>
<td></td>
<td>basic</td>
<td>43.7</td>
<td>29.6</td>
<td>67.8</td>
</tr>
<tr>
<td></td>
<td>all</td>
<td>44.7</td>
<td>32.9</td>
<td>73.6</td>
</tr>
<tr>
<td>Norway</td>
<td>higher</td>
<td>47.8</td>
<td>33.7</td>
<td>70.4</td>
</tr>
<tr>
<td></td>
<td>secondary</td>
<td>47.4</td>
<td>30.4</td>
<td>64.2</td>
</tr>
<tr>
<td></td>
<td>basic</td>
<td>46.6</td>
<td>27.2</td>
<td>58.3</td>
</tr>
<tr>
<td></td>
<td>all</td>
<td>47.0</td>
<td>28.9</td>
<td>61.4</td>
</tr>
<tr>
<td>Norway</td>
<td>higher</td>
<td>48.0</td>
<td>35.0</td>
<td>72.9</td>
</tr>
<tr>
<td></td>
<td>secondary</td>
<td>47.6</td>
<td>33.0</td>
<td>69.4</td>
</tr>
<tr>
<td></td>
<td>basic</td>
<td>46.9</td>
<td>30.4</td>
<td>64.8</td>
</tr>
<tr>
<td></td>
<td>all</td>
<td>47.2</td>
<td>31.6</td>
<td>66.9</td>
</tr>
</tbody>
</table>

\(^a\)Maximum length of life expectancy and health expectancy between exact ages 25 and 75 is 50 years.
consequently the less years of life expectancy are lost (Table 3). An analogous gradient can be found for life expectancy with ill health (LEWIH): more education means less years with ill health. Therefore, the socioeconomic gradient is steepest in HE.

A socioeconomic gradient can also be found for the survival curves and the survival curves without limiting long-standing illness by level of education (basic vs more that basic) of Finnish men (Fig. 2). These curves are based on the synthetic cohort used in the calculations. The areas below the survival curve and the survival curve without limiting long-standing illness are equivalent to LE and HE, respectively. The area between the curves of basic and more than basic education is equivalent to the difference between these educational groups in LE (survival curves) and in HE (survival curves without limiting long-standing illness). The difference between the two educational groups in LE is 2.4 years and in HE 6.9 years, and hence 4.4 years in LEWIH. Figure 2 shows that a large part of the difference between basic and more than basic education in HE is already borne at fairly young ages.

A horizontal look at the graph gives an interesting perspective on the difference between the educational levels. For example, 45% of the synthetic cohort of Finnish men with basic education have died or are disabled at the age of 50, whereas the same proportion is found for those with more than basic education at the age of 60, i.e. 10 years later.

Absolute and relative inequalities

The regression-based estimates are used to determine to which extent the size of health inequalities differs in Finland and in Norway. The difference in HE (in years) between the top and bottom of the educational hierarchy among men was on the same level in Norway and Finland (Table 4). The order of the countries, however, was different in the components of HE: the difference was larger in LE in Finland and in LEWIH in Norway. In other words, the size of inequalities (in years) was larger in mortality in Finland and in morbidity in Norway, but when mortality and morbidity are combined, no difference between these two countries could be found.

By comparing the size of absolute difference in the percentage of health expectancy out of life expectancy, i.e. in healthy life percentage (HE%), one can judge whether the larger absolute difference in LEWIH in Norway was due to its longer life expectancy or larger absolute inequalities in morbidity. Since the size of absolute difference in HE% was on the same level in Finland and Norway, the larger absolute difference in HE in Norway was due to its longer LE (Table 4). In other words, the absolute size of inequalities in morbidity was not lar-

![Fig. 2. Survival curve and survival curve without limiting long-standing illness by level of education (basic vs more than basic) of Finnish men aged 25–74, based on the life table estimates.](image)
ger in Norway when the overall level of mortality was standardised.

By examining the relative measure, one can judge whether the larger absolute differences (difference) are due to larger relative differences (ratio) or, alternatively, to a higher overall level. The measure of relative inequality used in this paper based on the LE-lost, HE-lost, HE%-lost or life expectancy with ill health. In each measure, the estimate for those at the bottom of the educational hierarchy is divided by the estimate for those at the top of the hierarchy.

The absolute differences in HE-lost and HE%-lost among men were on the same level in Finland and in Norway (Table 4). However, the relative differences were larger in Norway. The relative differences in LE-lost among men were on the same level in Finland and in Norway, although the absolute differences were larger in Norway. Thus, unfavourable to Finland is in particular its high overall level of mortality. This is, however, compensated by small relative inequalities in morbidity.

### Other morbidity indicators

Two other measures of morbidity were used, namely functional disabilities and perceived less than good health, to find out whether the order of Finland and Norway in the size of inequalities in HE depends on the measure of morbidity. Also another cut-off point for limiting long-standing illness was used, that is, extremely limiting long-standing illness.

The results concerning these three measures were largely in accordance with the above results, although the prevalence of morbidity and the length of HE differ. Substantial socioeconomic inequalities could be found for HE according to each measure of morbidity. The absolute size of inequalities in HE according to perceived health was somewhat larger than according to functional disabilities, or limiting or extremely limiting long-standing illness (Table 5).

Also according to functional disabilities and perceived less than good health, the absolute difference in HE and HE% between those at the top and at the bottom of the educational hierarchy among men was on the same level in Finland and Norway, while the relative inequalities were larger in Norway.

The main result concerning extremely limiting long-standing illness was that a stricter cut-off point implies smaller absolute differences (Tables 4 and 5). Furthermore, this morbidity measure suggests that also the absolute inequalities in HE were larger in Norway than in Finland.

### Women compared to men

This paper has thus far been restricted to men only. However, substantial health inequalities could also be found among women (Table 6). The absolute and relative size of inequalities in HE was only slightly smaller among women than among men, especially when measured by perceived health or functional disabilities. However, according to limiting

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### Table 4. The size of inequalities (based on the regression estimate) for life expectancy, life expectancy with ill health, health expectancy and healthy life percentage, between exact ages 25 and 75, calculated by using limiting long-standing illness (LLI) as the indicator of morbidity. Finland and Norway, men aged 25-74 years

<table>
<thead>
<tr>
<th>Country</th>
<th>Life expectancy lost</th>
<th>Life expectancy with ill health</th>
<th>Health expectancy lost</th>
<th>Healthy life % lost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>all</td>
<td>7.0</td>
<td>15.2</td>
<td>22.2</td>
</tr>
<tr>
<td></td>
<td>difference*</td>
<td>5.0</td>
<td>7.7</td>
<td>12.7</td>
</tr>
<tr>
<td></td>
<td>ratio*</td>
<td>2.1</td>
<td>1.7</td>
<td>1.8</td>
</tr>
<tr>
<td>Norway</td>
<td>all</td>
<td>5.3</td>
<td>11.8</td>
<td>17.1</td>
</tr>
<tr>
<td></td>
<td>difference*</td>
<td>3.7</td>
<td>9.1</td>
<td>12.8</td>
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<tr>
<td></td>
<td>ratio*</td>
<td>2.1</td>
<td>2.2</td>
<td>2.1</td>
</tr>
</tbody>
</table>

*In each measure, ratio (difference) is the estimate for those at the bottom of the educational hierarchy divided by (minus) the estimate for those at the top of the hierarchy.

### Table 5. The size of inequalities (based on the regression estimate) for life expectancy with ill health, health expectancy and healthy life percentage, between exact ages 25 and 75, calculated by using perceived less than good health (PH), functional disabilities (FD) and extremely limiting long-standing illness (XLLI) as the indicator of morbidity. Finland and Norway, men aged 25–74 years

<table>
<thead>
<tr>
<th>Country</th>
<th>Life expectancy with ill health</th>
<th>Health expectancy lost</th>
<th>Healthy life % lost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>all</td>
<td>20.1</td>
<td>27.1</td>
</tr>
<tr>
<td></td>
<td>difference*</td>
<td>9.6</td>
<td>14.6</td>
</tr>
<tr>
<td></td>
<td>ratio*</td>
<td>1.6</td>
<td>1.7</td>
</tr>
<tr>
<td>Norway</td>
<td>all</td>
<td>10.3</td>
<td>15.6</td>
</tr>
<tr>
<td></td>
<td>difference*</td>
<td>11.3</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td>ratio*</td>
<td>3.9</td>
<td>3.0</td>
</tr>
</tbody>
</table>

*In each measure, ratio (difference) is the estimate for those at the bottom of the educational hierarchy divided by (minus) the estimate for those at the top of the hierarchy.
Inequalities in health expectancy

Table 6. The size of inequalities (based on the regression estimate) for life expectancy, life expectancy with ill health, health expectancy and healthy life percentage, between exact ages 25 and 75, calculated by using limiting long-standing illness (LLI), perceived less than good health (PH) and functional disabilities (FD) as the indicator of morbidity. Finland and Norway, women aged 25–74 years

<table>
<thead>
<tr>
<th>Country</th>
<th>Life expectancy lost</th>
<th>Life expectancy with ill health</th>
<th>Health expectancy lost</th>
<th>Healthy life % lost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LLI</td>
<td>PH</td>
<td>FD</td>
<td>LLI</td>
</tr>
<tr>
<td>Finland</td>
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<td>18.1</td>
<td>22.5</td>
<td>11.1</td>
</tr>
<tr>
<td>difference</td>
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<td>6.5</td>
<td>11.4</td>
<td>6.4</td>
</tr>
<tr>
<td>ratio</td>
<td>1.8</td>
<td>1.4</td>
<td>1.7</td>
<td>1.8</td>
</tr>
<tr>
<td>Norway</td>
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<td>15.6</td>
<td>12.4</td>
<td>7.3</td>
</tr>
<tr>
<td>difference</td>
<td>1.5</td>
<td>6.3</td>
<td>13.3</td>
<td>7.0</td>
</tr>
<tr>
<td>ratio</td>
<td>1.7</td>
<td>1.5</td>
<td>3.7</td>
<td>3.1</td>
</tr>
</tbody>
</table>

*In each measure, ratio (difference) is the estimate for those at the bottom of the educational hierarchy divided by (minus) the estimate for those at the top of the hierarchy.

long-standing illness, the size of inequalities was much smaller among women than among men.

The main difference in women’s pattern of inequalities compared to men was that the size of inequalities in LE (i.e. mortality) was smaller.

Women had slightly larger absolute inequalities (in years) in LEWIH (i.e. morbidity) than men. However, when mortality was standardised (i.e. looking at HE%) the size of inequalities in morbidity was on the same level as among men.

Also the order of Finland and Norway in the size of inequalities in HE was similar to that among men: the size of absolute inequalities was on the same level in these two countries in HE, but the size of relative inequalities was larger in Norway.

DISCUSSION

Health inequalities are substantial in both Finland and Norway. In both countries the higher educated can expect to live longer and have more healthy years than their less educated counterparts. In fact, the higher educated not only have a shorter life expectancy with ill health but they also have a higher proportion of total life expectancy spent in good health. Therefore, the higher educated can expect to have both absolutely and relatively less years with ill health than the less educated (see also Valkonen et al., 1997).

Our results are in accordance with other studies on socioeconomic differentials in health expectancy indicating that the socioeconomic gradient is much steeper in health expectancy than in life expectancy. The common finding that the difference between men and women is smaller in health expectancy than in life expectancy is also confirmed by our study. Among those with higher or secondary education men actually have a longer partial health expectancy between ages 25 and 75 than women (calculated by limiting long-standing illness), although women have a longer partial life expectancy (Table 3).

Judging from the overall synthetic measure of health analysed in this study, partial health expectancy in the age bracket 25–74 years, the size of absolute socioeconomic health inequalities is on the same level in Finland and in Norway. However, compared to Finland, the size of relative inequalities in health expectancy is larger in Norway, due to the lower overall level of mortality and morbidity.

Inequalities in the components of health expectancy were also studied. The absolute inequalities in mortality are larger in Finland than in Norway. This is due to the higher overall level of mortality in Finland, but not due to larger relative inequalities. The Norwegians and the Finns have equally large absolute inequalities in morbidity (in terms of proportion of expected healthy years out of all expected years), but the Norwegians have larger relative inequalities.

The results should not be interpreted to imply that the years of ill health are experienced only at the end of the life course after the years of good health. Since the number of survivors decreases with age, the years of ill health and the health inequalities are more evenly distributed over the life course than one would expect from the morbidity data (see Fig. 2). This illustrates the importance of studying mortality and morbidity together.

Methodological issues

According to the regression-based estimates, the size of inequalities in health expectancy was on the same level in absolute terms in Finland and Norway. If only the extreme educational groups are compared, the absolute inequalities would be larger in Finland. This is because the higher educated differ from other educational groups especially in Finland, due to their exceptionally low morbidity and mortality. Since they are a relatively small group, their contribution to the overall health inequalities is limited. Comparing those with basic education only to all those with more than basic education, on the other hand, would give similar results as the regression-based method.

Three different morbidity indicators were used mainly for methodological reasons: to cover various dimensions of morbidity and to cross-validate the results. Despite the fact that the length of health expectancy depends strongly on the measure of morbidity, the results were highly consistent: according
to all indicators substantial socioeconomic inequalities in health expectancy were found and the size of inequalities was on the same level in Finland and Norway in absolute terms.

The absolute size of inequalities depended on the prevalence of the morbidity indicator: according to perceived less than good health (PH) and limiting long-standing illness (LLI). The size of inequalities in years was considerably larger than according to functional disabilities (FD). This also applies to different cut-off points of limiting long-standing illness: extremely limiting long-standing illness indicated smaller absolute inequalities than limiting long-standing illness. Since the precise magnitude of health inequalities depends on the measure of ill health chosen, there is no one measure of the size of inequalities in health expectancy.

LLI indicated smaller relative inequalities than FD or PH in Norway, but not in Finland. One could expect LLI and FD to give similar results, since they both are functional measures, i.e. they take into account coping in one's physical and social environment. However, adaptation to socio-environmental factors (due to e.g. health and welfare programs) may play a greater role in LLI because this measure covers a broader (and more subjective) area of activities than FD, which are based on limited number of concrete tasks, like walking for 5 min at a fairly fast pace without difficulty.

The reporting tendencies may vary with socioeconomic status. Recent studies from Norway on social class (Elstad, 1996) and the Netherlands on education (Schrijvers et al., 1994; Mackenbach et al., 1996) indicate that socioeconomic health differentials are underestimated by self-reported health data because of relative underreporting by the lower social strata. The level of misreporting by socioeconomic status may vary according to morbidity measure. However, it is not likely that there are marked differences between LLI and FD, since they both measure the functional consequences of morbidity, and since the relative underreporting by the lower social strata has been observed in various measures of morbidity, like long-standing illness (Elstad, 1996), chronic lung disease, heart disease and diabetes (Mackenbach et al., 1996) and cancer (Schrijvers et al., 1994). We lack studies on the level of misreporting by socioeconomic status in Finland, but there are few reasons to expect the reporting tendencies to vary notably between Finland and Norway since both countries are quite similar Nordic welfare states.

The association between inequalities in mortality and inequalities in morbidity

There is a complex relationship between inequalities in mortality and inequalities in morbidity. One hypothesis relates to mortality selection of people according to their health. According to this hypothesis, when absolute mortality rates are high and deaths occur principally among people with poor health, the surviving population remains healthy. This health selection occurs more among lower educated people, thus reducing morbidity differences by education. Therefore large inequalities in mortality are to be related to fairly small inequalities in morbidity.

This hypothesis can be specified by the so-called theory of insult accumulation (see, for example, Alter and Riley, 1989). This theory describes how survived sicknesses influence later health. These damages accumulate over time, adding the likelihood that future exposures, hazards and episodes will produce a disease or result in death. When mortality rates decline, some individuals who were most likely to die under the higher mortality regime survive and these “new or marginal survivors” are frail and susceptible to health problems (Verbrugge, 1984).

Since a cohort in which mortality is low includes more susceptible individuals at every age, low mortality is likely to be associated with higher morbidity (Alter and Riley, 1989). From this point of view, large inequalities in mortality are expected to be related to fairly small inequalities in morbidity.

Another hypothesis emphasizes that inequalities in mortality and inequalities in morbidity have common determinants. Since most deaths are preceded by periods of ill-health, high rates of (more severe forms of) morbidity are to be associated with fairly high rates of mortality (see, for example, Verbrugge, 1982). From this point of view, it might be expected that large inequalities (particularly) in more severe forms of morbidity are to be related to large inequalities in mortality.

However, as the larger inequalities in mortality in Finland as compared to Norway are accompanied by equally large absolute inequalities in morbidity, the results of this study suggest that there is no support to any of the above hypotheses, or that they compensate each other.

Comparing inequalities in health expectancy in Finland and in Norway

In the 1970s socioeconomic inequalities in mortality (among men) (Kunst and Mackenbach, 1994a, b; see also Valkonen, 1989) and morbidity (Karisto et al., 1978) were larger in Finland than in Norway. The synthetic overall measure, health expectancy, shows that health inequalities were on the same level in these two countries in the late 1980s, although the level of mortality as well as morbidity were still substantially higher in Finland. However, if one considers premature mortality to be more severe than any indicator of morbidity, the mortality-morbidity mix of the health inequalities was less favourable to Finland, since the size of absolute inequalities in mortality was larger in Finland.
Health expectancy and health policy

Both Finland and Norway are committed to egalitarian health and welfare policies. Both countries also have their national “Health for All by the Year 2000” programmes with the targets of increasing the average level of health and reducing the differences between socioeconomic groups. Health expectancy measures provide a promising measure for evaluating whether these goals have been achieved or not.

Health expectancy measures have advantages in the monitoring of the pattern and the size of health inequalities. First of all, information on mortality and morbidity is combined into one figure which gives a more comprehensive picture of health inequalities than mortality or morbidity separately. Secondly, health expectancy measures can also take into account the “positive” side of the health continuum, that is survivorship and good health, instead of the “negative” side only, that is death and ill health. Thirdly, the results can be presented in a measure that has a clear interpretation for researchers, policymakers and laymen alike, i.e. in years of life, instead of the more abstract mortality and morbidity rates. Finally, health expectancy measures direct attention to the absolute differences in the size of health inequalities, which is particularly important from the public health perspective.

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REFERENCES

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