

RESEARCH REPORT

Trends in health inequalities by educational level in a Norwegian total population study

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Objective: To describe levels of inequality and trends in self reported morbidity by educational level in a total Norwegian county population in the mid-1980s and mid-1990s.

Design: Two cross sectional health surveys at an interval of 10 years in the Nord-Trøndelag Health Study, HUNT I (1984–86) and HUNT II (1995–97).

Setting: Primary health care, total county population study.

Participants: Men and women, 25–69 years.

Main results: There was a consistent pattern of increasing self reported health problems with decreasing educational level for three health variables: perceived health, any longstanding health problem, and having a chronic condition. A stable or slight decrease in inequalities over time was found. The prevalence odds ratio for perceived health less than good were 2.71 for men (95% confidence intervals (CI): 2.39 to 3.09) and 2.13 for women (95% CI: 1.85 to 2.46) in the first survey, 2.51 for men (95% CI: 2.27 to 2.78) and 2.06 for women (95% CI: 1.88 to 2.26) 10 years later.

Conclusions: The magnitude of the socioeconomic gradients in health in this population seemed somewhat lower than in Norway as a whole and close to the average in studies from other European countries. There was a slight trend towards smaller differences despite rapid structural changes in working life, turbulence in economy, and more people experiencing unemployment.

Despite rapid economic growth and expanding health care systems after the second world war, there are persistent and even perhaps widening health inequalities in Europe.^{1–4} The magnitude of such inequalities is of great interest because reducing inequalities or the burden of health problems in disadvantaged groups may offer great potential for improving the health status of the population as a whole.^{3–5} Monitoring patterns, trends, and international variations in health differences can suggest possible directions for egalitarian health and welfare policies, and may shed more light on the causes of socioeconomic inequalities.⁶

The view of lay people, as well as of health workers, researchers, and politicians, has been that Norway has small socioeconomic differences in health.^{7–9} This idea is perhaps because of the lack of tradition in measuring health in stratified analyses.⁷ The importance of tackling social differences in health to improve national health status seems to be forgotten or simply not recognised in Norway. International comparisons, however, have indicated substantial inequalities in Norway as well, compared with Scandinavian¹⁰ and other European countries.¹¹ These unexpected findings call for population based analyses to establish more knowledge about the magnitude in health differences in the country.

Data from national health surveys and level of living surveys in Norway and the other Nordic countries have been used to study trends in health inequalities,^{12–14} but because of relatively small data samples in the surveys, there are some problems with the precision of the analyses based on these datasets. No study on trends in health inequalities in a total population has been performed.

A large total county population study has been established in Norway; the Nord-Trøndelag Health Study (HUNT),^{15–16} which was performed as two separate cross sectional surveys with approximately 10 years' interval in the mid-1980s and mid-1990s. This population has been used for health monitoring purposes in Norway,¹⁶ and new surveys will probably be carried out in the future.

During this period structural social changes have occurred in Norway, a development towards the "post-industrial

society". More people were occupied in white collar jobs, the population was better educated, more women entered into paid labour, and the decade was a turbulent one in economic terms—more people experienced unemployment and early retirement from work.^{12–17} Increasing differences in levels of income have been demonstrated since the mid-1980s.¹⁸ Thus a widening health gap may perhaps be expected. However, little is known about the time lag between harmful social changes and negative health effects. It is of interest to examine how these changes may have affected health and social inequalities.

The aim of this study was to describe inequalities and trends in self reported health by socioeconomic status in a Norwegian total population. We used level of education as a measure of socioeconomic status in two cross sectional surveys, HUNT I (1984–86) and HUNT II (1995–97). By means of the regression based Relative Index of Inequality,^{6–19} data were transformed for international comparisons.

METHODS AND MATERIAL

Setting

Nord-Trøndelag is one of 19 counties in Norway, situated in the middle of the country. Its geography and demography has been considered a fair representation of the country as a whole, and the region have shown socioeconomic inequalities in mortality comparable to Norway as a whole.²⁰ However, the county lacks a large city and may therefore be more egalitarian than the whole country because big cities usually shows larger inequalities.^{20–22}

Material

All persons aged 20 years and above (87 285 in 1984–86 and 94 196 in 1995–97) in the county of Nord-Trøndelag in Norway, were invited to participate in the HUNT-study.^{15–16} The participants were screened for self reported health problems and social background data with two questionnaires. The analyses were restricted to men and women aged 25–69 years

for several reasons. By the age of 25 most people have completed their education. We wanted to study health inequalities in the middle age to compare the results with other studies using the same age span. The attendance rates in these age strata were high, 87% in HUNT I for men and 92% for women, in HUNT II somewhat lower at 69% and 80% accordingly.

A comprehensive non-responder study was performed after HUNT I.²³ The study showed no significant selection according to morbidity and there was no consistent association between non-response and educational level in these age groups.

Health outcome measures

In this study, three indicators of morbidity were included, corresponding to those recommended for monitoring health in Europe.^{6,24} Perceived health was measured by the question "How is your present state of health?" (translated from Norwegian) and there were four answer categories, "very good", "good", "fair" and "poor". We combined the categories "fair" and "poor" to yield a measure of perceived health less than good.

Any longstanding health problem was established by asking, "Do you suffer from any long standing limiting somatic or psychiatric illness, disease or disability"? The answer categories were "yes" and "no".

A variable containing a selected number of chronic conditions was constructed. The variable was dichotomised: those having one or more conditions versus no condition. The conditions included were diabetes mellitus, heart diseases, and stroke.

Educational level

The educational level was measured as the highest level of education the person had completed. Using the OECD guidelines,²⁵ we reclassified the original individual data into four classes in HUNT I and into the corresponding three classes in HUNT II (table 1). In the analyses we used three educational levels for both surveys to make data comparable. The greater number of missing data on educational level in HUNT I compared with HUNT II, is attributable to questions on educational level in the first survey being located on the second questionnaire that should be returned by post after the screening day.

Because of the higher number of missing data for this variable in HUNT I, an analysis was performed to see whether there was some selection according to health among the non-responders. Slightly lower levels of health problems were reported among non-responders, for instance 21.8% men reported perceived health less than good compared with 22.8% among responders. A measure of socioeconomic status among these non-responders was not available.

Analyses

In addition to presenting the age adjusted prevalences of health problems in the different groups, the size of the morbidity differences between the educational groups was measured by four complementary summary measures. The odds ratio (OR) and the prevalence difference between the lowest and the highest educational groups are presented first. Both perspectives are important, relative differences (OR) are more readily understood, but the absolute difference is also important, making it possible to show how big proportions or how many people being affected by a health problem attributed to the exposure. The population attributable risk^{6,26} can be interpreted as the proportional reduction in overall morbidity in the population that would occur in the hypothetical case that everyone experiences the prevalence of the highest socioeconomic group, expressed as a percentage of the overall rate. The last summary measure is the regression based Relative Index of Inequality (RII). This index is recommended when making comparisons over time or across populations,^{27,28} its advantage being that it takes into account the different prevalences of morbidity in all the different groups and also the relative size and position of each group. The socioeconomic status of each educational group was quantified as the relative position of that group in the educational hierarchy. This continuous measure of socioeconomic status was related to morbidity prevalences by means of a logistic regression model as the morbidity indicators were defined in a dichotomous way. The resulting OR can be interpreted as the relative risk for having a health problem at the bottom compared with the risk at the top of the educational hierarchy. Details about this index can be found elsewhere.^{6,19}

Statistics

Stratified analysis with a direct adjustment for age using five year age groups were used,²⁹ the standard population being men and women 25–69 years old as of 1 January 1999 in the Nord-Trøndelag County. Confidence intervals were calculated at the 95% level.³⁰ The age adjusted OR between the lowest and highest educational groups and the RII were calculated using logistic regression. The assumptions for the logistic regression model were checked, and adjustment for age was made by including a variable representing five year age groups into the logistic regression model.³¹ All analyses were performed using SPSS 9.0.

RESULTS

Table 1 shows that there was a general increase in educational level in this population from the mid-1980s (HUNT I) to the mid-1990s (HUNT II). There was a reduction in the groups up to lower secondary education, and an increase in the size of

Table 1 Distribution of the population in the Nord-Trøndelag Health Study (HUNT I and HUNT II) over four* and three educational levels. Men and women 25–69 years old

Educational level (4–1) successfully completed	HUNT I (1984–86)				HUNT II (1995–97)	
	Men		Women		Men Number (%)	Women Number (%)
	Number (%)	Level 1 and 2 merged	Number (%)	Level 1 and 2 merged		
4 - Post secondary	3173 (14)		2262 (9)		5119 (22)	5638 (22)
3 - Secondary, upper level	8284 (35)		7542 (31)		11391 (49)	10730 (42)
2 - Secondary, lower level	5133 (22)	12,100 (52)	6690 (28)	14,258 (59)	6639 (29)	9017 (36)
1 - Elementary	6967 (30)		7568 (31)			
Total classified population	23557 (100)		24062 (100)		23149 (100)	25385 (100)
Educational data missing	5482		5307		655	825
Total	29039		29369		23804	26210

*Distribution over four levels only available in HUNT I. Educational levels according to the OECD standard, level 1; elementary 7 years ground school, level 2; secondary, lower level up to 10 years, level 3; secondary, upper level vocational or general education, level 4: post secondary high school or university.

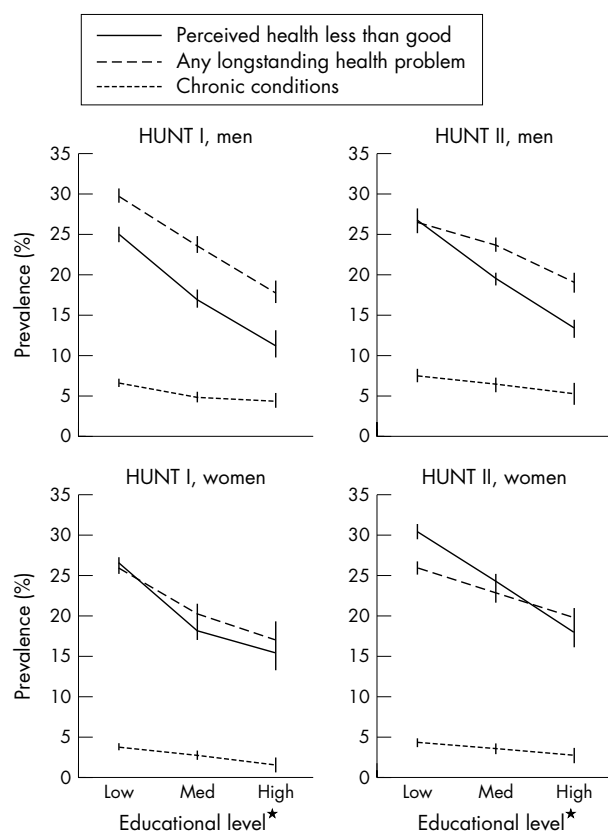


Figure 1 Age adjusted prevalence with 95% confidence intervals of self reported morbidity by educational level in The Nord-Trøndelag Health Study (HUNT I 1984-86, HUNT II 1995-97). Men and women aged 25–69 years. Educational levels according to the OECD standard (25). * Low: Secondary, lower level up to 10 years. Med: Secondary, upper level vocational or general. High: High school and university.

the groups with post-secondary education. This increase was strongest for women.

Figure 1 shows the age adjusted prevalences with 95% confidence intervals for three morbidity indicators by educational level in HUNT I and HUNT II. We found a significant increase in self reported health problems with decreasing educational level for all the indicators in both surveys.

The size of the health inequalities for the four morbidity indicators is presented in tables 2 to 4. The tables also allow for comparing results between genders, and between the two cross sectional surveys.

Table 2 shows that the overall prevalence for perceived health less than good seemed to be stable from HUNT I to HUNT II. About one quarter of the population aged 25–69 reported fair or bad health. The OR between the lowest versus highest educational groups was slightly reduced for men from HUNT I to HUNT II. Approximately 13% higher prevalences of perceived health less than good were found in the lowest educational groups compared with the highest groups. The population attributable risk decreased from HUNT I to HUNT II for both sexes. The reduced size of the groups with low education contributes to this trend, because a smaller number of people belonged to the high prevalence groups. The RII showed a consistent but not statistically significant time trend towards reduced inequalities from HUNT I to HUNT II.

In table 3 we show that the overall prevalences of people reporting any longstanding health problem were approximately at the same level as for the perceived health variable. However, there was a decreasing tendency in the overall prevalence from HUNT I to HUNT II for this measure. All the summary measures showed a reduction in inequalities. The reduction in RII was statistically significant for men, and for women the overlap of the confidence intervals was very small.

The overall morbidity prevalence measured with the chronic conditions variable, was about 7% for men and 4% for women (table 4). For men, but not for women, the inequalities in health by educational level seemed to be smallest for this health variable. The inequalities seemed to be greater for women than for men. We found a non-significant trend

Table 2 Inequalities in perceived health less than good by level of education*, summary measures. Men and women aged 25–69 years, in The Nord-Trøndelag Health Study (HUNT I and HUNT II)

Summary measure	HUNT I (1984–86)		HUNT II (1995–97)	
	Men	Women	Men	Women
Overall prevalence (%)	22.8	24.4	21.7	25.6
Prevalence OR (95% CI), lowest v highest educational level	2.71 (2.39 to 3.09)	2.13 (1.85 to 2.46)	2.51 (2.27 to 2.78)	2.06 (1.88 to 2.26)
Prevalence difference, lowest minus highest educational level (%)	13.6	11.1	13.4	12.6
Population attributable risk (%)	45	33	34	29
Relative Index of Inequality (95% CI)	3.80 (3.29 to 4.38)	3.21 (2.75 to 3.74)	3.53 (3.10 to 4.02)	2.82 (2.49 to 3.19)

*Three levels of education used as for HUNT II data in table 1.

Table 3 Inequalities in any longstanding health problem by level of education*, summary measures. Men and women aged 25–69 years, in The Nord-Trøndelag Health Study, (HUNT I and HUNT II)

Summary measure	HUNT I (1984–86)		HUNT II (1995–97)	
	Men	Women	Men	Women
Overall prevalence (%)	28.4	24.8	24.2	22.7
Prevalence OR (95% CI), lowest v highest educational level	2.23 (1.99 to 2.49)	1.86 (1.61 to 2.12)	1.59 (1.44 to 1.74)	1.49 (1.36 to 1.64)
Prevalence difference, lowest minus highest educational level (%)	11.9	9.0	7.4	6.4
Population attributable risk (%)	32	27	19	16
Relative Index of Inequality (95% CI)	2.63 (2.31 to 2.99)	2.32 (2.00 to 2.69)	1.85 (1.64 to 2.10)	1.81 (1.59 to 2.06)

*Three levels of education used as for HUNT II data in table 1.

Table 4 Inequalities in chronic conditions by level of education*, summary measures. Men and women aged 25–69 years, in The Nord-Trøndelag Health Study (HUNT I and HUNT II)

Summary measure	HUNT I (1984–86)		HUNT II (1995–97)	
	Men	Women	Men	Women
Overall prevalence (%)	7.3†	4.2†	7.4†	3.9†
Prevalence OR (95% CI), lowest v highest educational level	1.56 (1.25 to 1.95)	2.45 (1.52 to 3.96)	1.49 (1.27 to 1.74)	1.86 (1.47 to 2.36)
Prevalence difference, lowest minus highest educational level (%)	2.3	2.3	2.2	1.7
Population attributable risk (%)	24	53	19	28
Relative Index of Inequality (95% CI)	2.10 (1.64 to 2.69)	2.51 (1.69 to 3.73)	1.71 (1.40 to 2.10)	2.32 (1.71 to 3.16)

*Three levels of education used as for HUNT II data in table 1; †one or more of: diabetes mellitus, heart disease, and stroke v no chronic condition.

towards reduced inequalities from HUNT I to HUNT II using this morbidity indicator.

DISCUSSION

There was a consistent gradient of higher prevalences of self reported health problems with decreasing educational level in this Norwegian population. However, the levels of these differences are considerably lower than results from an earlier comparative study using national data.¹¹ There was a trend towards smaller inequalities over time, in terms of the regression based RII.

It is interesting to see a narrowing of inequalities at a time when the lowest educated group was getting smaller. It is often assumed that as an extreme social group gets smaller, its health indices will become more distant from the average. However, we observed that the age adjusted prevalence of health problems was fairly stable in the lowest educated groups, but increased somewhat in the highest educated group (fig 1). The increase in prevalence for the highest educated group might perhaps be attributable to this group becoming larger and therefore closer to the population average. Anyhow, the trend towards smaller differences measured with the RII explicitly takes into account changing relative positions of educational groups.

The socioeconomic status of a person is determined by occupation, education, and income together. Using education as a measure of socioeconomic status has advantages and drawbacks.⁶ Once established, the level of education is almost not subject to change, and therefore perhaps less applicable than occupation and income when it comes to tackling important intervention questions. The general increase in education in the population, partly by making education compulsory, may weaken education as a proxy for socioeconomic status. Still, stratification by education is probably the best measure when comparing results from different populations.³² In addition it is generally available for both sexes, excludes few members of the population, is less subject to negative adult health selection and it is a clearly hierarchical measure. Education and occupational class are strongly correlated. Similar analyses have been performed using occupational status for men (but not for women) with an approximation to the Erikson Goldthorpe Portocarero (EGP) social class scheme in HUNT.^{22–33} The inequalities found with this approach were at the same level and with the same consistent pattern from high to low status. Unlike the present analysis of education, the analysis on occupation could not reveal a tendency towards decreasing inequalities from the mid-1980s to the mid-1990s. So far no data on income have been available in HUNT.

Measuring morbidity is not without problems either; the triad of concepts illness, sickness and disease illustrates the complexity.³⁴ We have studied health problems as they are perceived by people themselves, and thus rely on self reported survey data. Self reported health problems have advantages as

they describe people's wellbeing in a developed society better than medically confirmed disease or death.²⁴ Even the most subjective among these measures, perceived health, has been shown to be a strong predictor of mortality.³⁵

Do people in different social classes report health problems differently? In other words, can the higher prevalences of health problems in the lower educational groups be attributable to a relative over-reporting? This artefact hypothesis has not been confirmed in earlier studies.³⁶ In fact, any such bias might just as well be opposite^{37–38} and lead to a small underestimation of the differences.

We used indicators recommended for international comparisons and for monitoring inequalities in health to minimise the comparability problems.⁶ However, the conditions included in the chronic conditions indicator are not exactly the same as in the studies compared with, mainly because of few available variables in HUNT I. Nevertheless, this variable is recommended as it reflects the most objective disease concept.⁶

The question of whether the results are biased because of non-response may be raised. The attendance rates were generally very high, but somewhat higher in HUNT I than in HUNT II. The non-responder study in HUNT I showed no significant selection according to health or mortality, and no consistent association between non-response and educational level among the non-responders compared with the responders in the age groups in this sub-study.²³ Slightly lower attendance rates among people in the largest municipalities were found, but no municipality had lower rates than 84.5%. The non-responder study in HUNT II, which can be found at www.hunt.folkhelsa.no, was much less comprehensive but suggests similar patterns of non-attendance as in HUNT I. When it comes to the missing data on the health questions, we found negligible higher proportion of missing data in the lower social classes. Our overall conclusion is that none of these problems could have distorted the results in any serious way, but there might be a slight general underestimation of health inequalities.

To establish whether this study population has average, high or low inequalities in health the results were compared with parallel Norwegian, Nordic, and European studies. The generalisability from the HUNT Study to Norway has generally been considered good because of representative geography, demography, and average socioeconomic mortality inequalities in the region in the 1970s.^{16–20} However, one explanation might be the lack of a big city in the county, as big cities usually demonstrate greater inequalities than rural areas.^{20–21} The national¹² and Nordic¹⁴ studies on health inequalities also used cross sectional data from the mid-1980s and mid-1990s. In these studies similar educational levels and dependent variables were used; self perceived health and limiting longstanding illness. The gradients in the national and Nordic studies were at the same level or greater compared with the results from this HUNT Study. Further research on explanations of these findings is of interest.

Key points

- Even in a rural area of Norway, inequalities in health was found as large as elsewhere in Europe.
- A slight decrease in health inequalities was found between the 1980s and 1990s.
- The trend contrast with economic crises and increasing income inequalities in the same period.
- The decrease might have been attributable to decreasing inequalities in educational attainment in the population.

In 1993 Feinstein provided a review of the current situation in Europe, and concluded with low morbidity differentials in Norway, thereby representing the traditional view.⁸ In contrast, results from Mackenbach *et al* in the *Lancet* in 1997,¹¹ showed a RII approximately 5.8 for men and 4.7 for women for self perceived health from national health survey data in 1985. These differences have bewildered and worried both researchers and policy makers in Norway. Compared with these results we found a RII at approximately 3.7 for men and 3.0 for women in this study (table 2). The inequalities in this county population seemed to be on average compared with several European countries.^{11, 28} Taken into account that the region has no big cities and traditionally is considered to be rather “equal”, this result is quite against the common view.

However, we found a trend towards smaller inequalities in this study, and no evidence of increasing health inequalities as shown in other European populations⁴ either in this study or in an earlier study using occupational status among men.²² This trend is small but consistent across several health variables. But increasing income differences is observed in Norway since the mid-1980s,¹⁸ and this phenomenon call for trend analysis on health levels and inequalities by income, too. If the increasing income differences produce more health inequality or a generally higher level of health problems,³⁹ these effects must be time lagged. This time lag will probably be shortest for self perceived health, the most global and subjective of our health measures. In fact, we observed slightly increasing general tendencies to report perceived health less than good from the 1980s to the 1990s (fig 1). But simultaneous with rising income inequalities, the educational differences in this population are reduced. Thus, contrasting processes may influence future trends in inequality. Other factors may be important as well, for example, the general living conditions and health related behaviours also change over time.

Educational inequalities in health may arise from the ability of this variable to reflect different life course accumulations of material and psychosocial hazards to which people have been exposed.⁴⁰ Potential harmful structural changes have taken place in Norway and these are likely to have affected the life of people.^{12, 41} The slightly decreasing health inequalities found in this material that therefore might be regarded as unexpected, could be a result of educational policies focused on improving results in people who find school most difficult, thus reducing social inequalities in determinants of health. However, if educational attainment comes to be differently reflected by social position in adulthood, this would also change the relation of education to health. The results in this study do not rule out increasing health inequalities according to income in the same period.

Further studies on educational differences in health should explore the cognitive, material, social or psychological resources gained through education, which might contribute to the health effects. Without this knowledge, we cannot hope to answer important intervention questions.⁴²

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