Economic Inequality and Health: Looking Beyond Aggregate Indicators

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ECONOMIC INEQUALITY AND HEALTH: LOOKING BEYOND AGGREGATE INDICATORS

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ABSTRACT: This paper examines the relationship between relative income inequality and health in Finland, using individual microdata over the period 1993-2005. Our data allows us to analyse a large spectrum of health indicators. Overall, our results suggest that income inequality is not associated with increased morbidity in the population. The results for women differ to quite a large extent from those of men and the pooled sample. There is evidence that an increase in the Gini coefficient is negatively related to the probability of good physical health and no disability retirement. For men, relative income inequality is clearly not important for health.

Keywords: Health, health behaviour, economic inequality, relative income inequality, relative deprivation, Gini coefficient
JEL: I120, I300

BÖCKERMAN, Petri – **JOHANSSON,** Edvard – **HELAKORPI**, Satu – **UUTELA**, Antti, **TULOEROT JA TERVEYS.** Helsinki: ETLA, Elinkeinoelämän Tutkimuslaitos, The Research Institute of the Finnish Economy, 2007, 21 s. (Keskusteluaiheita, Discussion Papers, ISSN 0781-6847; No. 1104).

TIIVISTELMÄ: Tutkimuksessa tarkastellaan suhteellisten tuloerojen ja terveyden välistä yhteyttä Suomessa vuosina 1993-2005. Tulokset osoittavat, että alueellisten tuloerojen kasvulla ei ole yleisesti ottaen yhteyttä lisääntyneeseen sairastavuuteen. Naisten osalta tulokset kuitenkin osoittavat, että tuloerojen kasvulla olisi ainakin jonkin vaikutusta fyysiseen terveyteen sekä työkyvyttömyyseläkkeelle jäämiseen. Tuloeroilla ei ole sitä vastoin vaikutusta miesten terveyteen.

Asiasanat: Terveys, terveyskäyttäytyminen, taloudellinen eriarvoisuus, suhteellinen taloudellinen eriarvoisuus, suhteellinen köyhyys, Gini-kerroin
JEL: I120, I300

1. Introduction

Economic inequality has a bearing on health and health behaviour along with the absolute level of income. Increasing relative income inequality is associated with increased morbidity and premature mortality in the population, based on the evidence (e.g. Rodgers, 1979; Wilkinson, 1992, 1996; Kaplan et al. 1996; Kennedy et al. 1996; Deaton, 2001; Ross, 2004; Subramanian & Kawachi, 2004; Dahl et al. 2006; Wilkinson & Pickett, 2006; Henriksson et al. 2007; Neckerman & Torche, 2007). In particular, Wilkinson and Pickett (2006) conclude in their comprehensive survey of the existing literature that a large majority (70 per cent) of the empirical studies suggests that health is less good in societies where relative income differences are larger.

This finding has gained a great deal of interest both in research and policy debates, because there has been a substantial increase in earnings inequality in a number of OECD countries during the past few decades (e.g. Atkinson, 2007). Consequently, negative health effects may add significantly to the social costs of increasing economic inequality. The question also has high policy relevance, because relative income inequality across the developed countries is heavily affected by tax policies and income transfers by the public sector.

Methodologically, the effect of economic inequality on health is most commonly investigated by using information on regional measures of income inequality (e.g. from US states) that are combined with some other, often survey-based, data that record health and health behaviour at the individual level. However, the robustness of the relationship has been questioned. For example, Deaton and Lubotsky (2003) have shown that there is no relationship between relative income inequality and mortality across the US states once the racial composition has been taken into account in the models.

Most of the existing body of research on economic inequality and health has focused on overall mortality of population (e.g. Gerdtham & Johannesson, 2004), respondents' general self-reported health by using household surveys such as US Current Population Survey (e.g. Mellor & Miloy, 2002), or general indicators of objective health through the use of household surveys such as European Community Household Panel (ECHP) for the EU countries (e.g. Etienne et al., 2007). Moreover, there is a limited amount of research about the effects of economic inequality on cardiovascular disease risk factors and mental problems (e.g. Diex-Roux et al. 2000; Kahn et al. 2000; Sturm & Gresenz, 2002).

By a rather wide margin, most of the available evidence originates from the United States (Subramanian and Kawachi, 2004), where relative income inequality is at the much higher level than in Europe (Atkinson, 2007). Therefore, owing to the structural differences between OECD countries, the US findings are not necessarily relevant in the European context. Accordingly, Subramanian and Kawachi (2004) point out that studies conducted outside US have generally failed to find an association between income inequality and health behaviour.

Furthermore, part of the existing studies rely solely on cross-sectional variation in economic inequality (e.g. Diex-Roux et al. 2000; Kahn et al. 2000; Sturm & Gresenz, 2002), which makes it rather hard to detect reliable patterns, because it is not possible to control for the permanent regional differences. Taken together, the evidence on the controversial relationship between relative economic inequality and health is far from conclusive, and there is a plenty of room for additional empirical contributions about this important issue.

Several different micro-level mechanisms for the observed association between aggregate economic inequality and health have been proposed in the literature (e.g. Wilkinson, 1996; Subramanian & Kawachi, 2004). For instance, it has been argued that relative deprivation may cause some people to engage in self-destructive behaviour such as drinking and smoking. Furthermore, economic inequality could lead to under-investment in education and social welfare, which have eventually adverse effects on various health outcomes. In particular, education is a significant indicator of socio-economic status as far as health and lifestyle are concerned, because education is related to valuable personal characteristics such as self-control, position in work, and income and wealth level. Taking this into account, the existing empirical studies do not provide very precise information what are the exact health indicators that are adversely affected by economic inequality among population. Adams et al. (2003) analyse the causal effect of income on a rather long list of health indicators, but they focus their study on Americans aged 70 or older, which makes it rather hard to generalize the results obtained.

In this paper, we examine the previously unexplored relationship between relative income inequality and health in Finland, using individual microdata over the period 1993-2005. Our data allows us to explore a large spectrum of health indicators. The Finnish case is interesting, because despite the fact that the macro-level income inequality is at the low level from the perspective of the international comparison (e.g. Jäntti & Danzinger, 2000), there is still large underlying regional variation in overall economic outcomes and income inequality measures. For example, the Gini coefficients of eighteen Finnish provinces computed from disposable household income range from 0.21 to 0.27 in the year 1993. In addition, regional disparities in the absolute level of income are definitely sharp. As the European Union average is standardized as 100, the level of gross domestic product per capita is 141 in the province of Uusimaa, which constitutes the region around the Helsinki metropolitan area in Southern Finland. By using the same measure, the level of GDP per capita is 75 in Eastern Finland (Behrens, 2003). Moreover, health behaviour and the health outcomes of Finns vary largely by region (e.g. Nummela et al. 2000; Helakorpi et al. 2007). This variation is particularly useful when identifying the effect of relative income inequality on health and health behaviour.

The paper proceeds as follows. We first provide an overview of the data. The methodology is explained and the results are given next. The final section presents conclusions from our findings.

2. Data

The data on individuals' health that we are using originates from the Health Behaviour and Health among the Finnish Population conducted by the National Public Health Institute. This data resembles data from the surveys done for the US Behavioral Risk Factor Surveillance System. The latter data has been used in some of the earlier studies on the relationship between economic inequality and health outcomes (e.g. Diex-Roux et al. 2000).

The Finnish surveys on health and health behaviour started in 1978. They have been repeated annually, using samples of 5 000 randomly selected 15-64-year-old permanently resident citizens. Therefore, the survey constitutes a representative sample of Finns. The sample frame excludes non-citizens, about 4% of the population. The survey is carried out as a postal questionnaire. On average, 73% of those targeted have responded. The core questions have remained the same over the years. The survey contains questions on, e.g., health and health behaviour relavangt for chronic diseases. In particular, in addition to respondents' general self-reported health level, it incorporates a detailed description of self-reported physical and mental health problems. Furthermore, relevant socioeconomic background variables such as years of education, important for health, are reported in the survey.

Table 1. Average health by year.

Year	Good self-reported health	Good physical health	Good mental health	No medicines	No sick leave	No disability retirement
1993	0.71	..	0.84	0.88	0.45	0.92
1994	0.74	0.89	0.82	0.88	0.41	0.91
1995	0.73	0.90	0.82	0.88	0.45	0.91
1996	0.66	0.89	0.82	0.87	0.41	0.91
1997	0.66	0.89	0.80	0.86	0.41	0.91
1998	0.66	0.89	0.81	0.87	0.41	0.91
1999	0.68	0.89	0.82	0.86	0.40	0.92
2000	0.67	0.89	0.81	0.85	0.40	0.93
2001	0.67	0.89	0.82	0.86	0.37	0.92
2002	0.68	0.89	0.82	0.84	0.39	0.92
2003	0.66	0.89	0.81	0.84	0.39	0.93
2004	0.67	0.89	0.83	0.83	0.38	0.92
2005	0.66	..	0.82	0.82	0.38	0.92

Note: "Good self-reported health" takes the value 1 if the individual denoted that his or her self-reported health as 'good' or 'reasonably good'. Otherwise the variable takes the value 0. The other three alternatives were 'average', 'rather poor', and 'poor'. "Good physical health" takes the value 1 if the individual has not answered that he or she suffers from any of the following illnesses or diseases verified by the doctor: diabetes, myocardial infarction, angina pectoris, heart failure, back illness, rheumatic arthritis, emphysema, chronic bronchitis, or asthma. If the individual suffers from one or several of those, the variable "Good physical health" takes the value 0. "Good mental health" takes the value 1 if an individual has answered that he or she does 'not at all' or 'somewhat' suffers from nervous tension. The variable takes the value 0 if the individual has answered that he or she suffers 'more than in general' or that 'life is almost unbearable'. The variable "No medicines" takes the value 1 if the individual has answered that he or she has not consumed during the past week the following: medicines for high blood pressure, sedatives, or sleeping pills. Otherwise it takes the value 0. The variable "No sick leave" takes the value 1 if the individual has had no days of sickness absence from work during the year. If there has been sickness absence, it takes the value 1. The variable "No disability retirement" takes the value 1 if the individual have not received disability pension during the past 12 months, and 0 otherwise. Source: Authors' calculations from Health Behaviour and Health among the Finnish Population.

Descriptive statistics shows that there has been somewhat of a fall in general self-reported health over the period, which mostly happened in the middle 1990s (Table 1, Column 1). Exactly the same pattern for Finland can be discovered by using the European Community Household Panel (ECHP) over the period 1996-2001 (Böckerman & Ilmakunnas, 2007). For objective health, and the occurrence of disability retirement, there has been virtually no trend over time (Table 1, Columns 2 and 6). Regarding the consumption of medicines and the propensity of taking sick leave, the trend has been upwards, instead (Table 1, Columns 4-5). Moreover, there is a slight tendency to report more mental health disorders over time (Table 1, Column 3).

Table 2. Average health by region.

Region	Good self-reported health	Good physical health	Good mental health	No medicines	No sick leave	No disability retirement
Uusimaa	0.71	0.76	0.80	0.86	0.36	0.93
Varsinais-Suomi	0.68	0.77	0.82	0.87	0.39	0.92
Satakunta	0.66	0.77	0.82	0.86	0.44	0.92
Häme	0.67	0.76	0.83	0.85	0.40	0.92
Pirkanmaa	0.67	0.76	0.82	0.85	0.40	0.92
Päijät-Häme	0.67	0.76	0.83	0.85	0.42	0.93
Kymenlaakso	0.67	0.77	0.83	0.86	0.41	0.91
Etelä-Karjala	0.66	0.73	0.84	0.83	0.41	0.92
Etelä-Savo	0.65	0.76	0.82	0.85	0.43	0.90
Pohjois-Savo	0.66	0.75	0.82	0.83	0.43	0.89
Pohjois-Karjala	0.65	0.73	0.83	0.85	0.45	0.89
Keski-Suomi	0.68	0.74	0.82	0.85	0.43	0.92
Etelä-Pohjanmaa	0.68	0.77	0.83	0.86	0.42	0.91
Vaasan Rannikkoseutu	0.71	0.76	0.85	0.89	0.43	0.91
Keski-Pohjanmaa	0.68	0.74	0.81	0.85	0.42	0.90
Pohjois-Pohjanmaa	0.67	0.75	0.83	0.87	0.41	0.91
Kainuu	0.69	0.76	0.82	0.86	0.46	0.88
Lappi	0.69	0.74	0.84	0.87	0.46	0.90

Note: See notes to Table 1.

Substantial differences in health prevail between regions, according to the Health Behaviour and Health among the Finnish Population. In the region of Uusimaa and western coastal area (Vaasan rannikkoseutu), the probability of having good self-reported health is 0.71, whereas it is only 0.65 in North Karelia (Pohjois-Karjala) that is located in the eastern part of Finland (Table 2, Column 1).Interestingly, however, differences are not by far as large regarding the probability of good physical health (Table 2, Column 2). Also, if anything, the probability of having good mental health is actually lower in the region of Uusimaa compared with the rest of the country (Table 2, Column 3). Furthermore, a striking fact is that the probability of having no sickness absence from work is the lowest in the country’s richest region, Uusimaa (Table 2, Column 5).

To examine the effect of economic inequality on health, we link the Health Behaviour and Health among the Finnish Population, using information on individuals' residence, to IDS data (Income Distribution Survey) that has been produced by Statistics Finland. IDS is an annual household survey. Its most important aim is to monitor income growth in various population groups and to observe the changes in the income and wage dispersion. Each year, the survey collects information from around 10 000 households with approximately 25 000 individuals. The survey uses a rotating panel design where each household remains in the data for two consecutive years and half the respondents are replaced each year by new households. Most of the variables originate from administrative registers. In particular, income measures for households are not self-reported, but obtained directly from the Finnish tax authorities. Hence, IDS data is able to provide a very reliable picture about the evolution of relative income inequality among population in Finland. Indeed, Deaton (2001) points out that many of the earlier studies on economic inequality and health behaviour have been based on self-reported income measures that are known to contain a significant amount of measurement error that hinders efforts to identify robust effects.

IDS data allows us to compute the regional income inequality measures (i.e. the Gini coefficients based on disposable household income) over the period 1993-2005. The Gini coefficient is defined as half of the arithmetic average of the absolute differences between all pairs of incomes in a population, the total then being normalized on mean income. The Gini coefficient ranges from 0.0 (perfect equality) to 1.0 (perfect inequality) (Cowell, 1977). We use the standard OECD-equivalent scale when we calculate the Gini coefficients for the Finnish regions. The OECD-equivalent scale is incorporated to IDS data by Statistics Finland. According to the OECD-equivalent scale, the first adult in the household counts as 1 unit, the next adults 0.7, and each child under the age of 17 counts as 0.5 units. The basic idea of the OECD-equivalent scale is to take into account the scale effects in consumption at the household level. The consumption-units-adjusted Gini coefficients are computed for eighteen Finnish provinces, which constitute the so-called NUTS3 –regions stipulated by the European Union. At this particular level of aggregation, IDS data is able to produce reliable patterns of the level and the changes in regional income inequality. All in all, our matched data contains 13 years and 18 regions.

Table 3. Gini coefficient and real household disposable income by year.

Year	Gini coefficient	Disposable income (2005 €)
1993	0.25	34659
1994	0.25	34799
1995	0.26	34734
1996	0.25	35648
1997	0.27	37751
1998	0.28	39598
1999	0.30	41837
2000	0.31	43883
2001	0.29	43317
2002	0.30	43909
2003	0.30	44467
2004	0.31	45904
2005	0.31	46966

Note: The figures shown in the table are not weighted by the size of the population in the regions. Source: Authors' calculations from IDS data.

Descriptive statistics point out that the level of relative income inequality has increased quite substantially over the period (Table 3, Column 1). This trend is in line with the developments in several other Western countries (Riihelä et al. 2007). Simultaneously, real household disposable income has gone up by over 30% during the period (Table 3, Column 2). Thus, living standards have risen on average, but the upper tail of the income distribution has had the most favourable development. It is interesting to note that incomes actually fell from 2000 to 2001. This is most likely owing to extraordinarily high incomes from dividends and other capital income sources in 2000, which then fell sharply in 2001.

Moreover, there are large permanent differences between regions in terms of income inequality and real disposable household income, according to IDS data (Table 4). The level of income inequality tends to be higher in Southern Finland compared with Eastern and Northern Finland. The country's region Uusimaa, which contains the capital with its surrounding areas has the highest household real disposable income by a rather wide margin. It also has the highest income inequality. Moreover, the evolution of income inequality has been notably different in different regions of Finland (e.g. Loikkanen et al. 1998). Arguably, this is highly useful when identifying the effect of income inequality on health behaviour and health outcomes.

Table 4. Average income inequality and household real disposable income by region (1993-2005).

Region	Gini coefficient	Disposable income (2005 €)
Uusimaa	0.31	46133
Varsinais-Suomi	0.30	40314
Satakunta	0.27	38025
Häme	0.27	38229
Pirkanmaa	0.28	39268
Päijät-Häme	0.29	38513
Kymenlaakso	0.26	38245
Etelä-Karjala	0.27	37339
Etelä-Savo	0.28	38733
Pohjois-Savo	0.27	37072
Pohjois-Karjala	0.28	34882
Keski-Suomi	0.28	37589
Etelä-Pohjanmaa	0.26	38900
Vaasan Rannikkoseutu	0.25	39142
Keski-Pohjanmaa	0.23	40260
Pohjois-Pohjanmaa	0.27	40325
Kainuu	0.25	34927
Lappi	0.26	36070

Note: See notes to Table 3.

In general, living in north and east (e.g. North Karelia and Kainuu) means low incomes, whereas south and west generally are associated with higher incomes. It is also interesting to note that differences in real household disposable income between regions are not as large as differences in the level of regional GDP per capita. The reason for this is that the public sector in Finland is fairly active in terms of regional policy, which effectively entails transfers from the high-income regions to the low-income regions (Loikkanen et al. 1998).

3. Methods

In this paper, we examine models where individuals' self-reported health indicators are statistically explained by relevant background variables (gender, age, marital status and the years of education) and regional income inequality measure covering the period 1993-2005 with year dummies. In particular, we include the average absolute level of disposable household income to all models, because the absolute level of income matters for overall health outcomes(e.g. Fuchs, 2004). The absolute level of income that is incorporated to the models is the logarithm of real average disposable household income at the regional level. Nominal values are deflated by the consumer price index that refers to the Finnish economy, because Statistics Finland does not produce regional consumer price indexes. Mellor and Milyo (2002) use family income as one measure of income in their regressions, but this is problematic, because family income is definitely more endogenous with respect to individual-level health outcomes than income measured at the regional level.

The models that we estimate have a following general structure:

$$Y_{ijt} = \alpha_j + \beta X_{ijt} + E_{jt} + \lambda_t + \varepsilon_{ijt}$$

where Y is the outcome (the health measures from the Health Behaviour and Health among the Finnish Population) for individual *i* living in province *j* in year *t*. X is a vector of individual characteristics (gender, age, marital status and the years of education), *E* represents regional income inequality measured by the Gini coefficient that is computed from IDS data for provinces, α and λ represent unobserved determinants of lifestyle behaviours associated with the region and survey year, and ε is an error term. In this fixed-effects model, the effect of relative economic inequality on health and health behaviour is identified by intra-region variations, relative to the corresponding changes in other regions.

We take into account the fact that observations of our matched data are clustered by provinces in the calculation of standard errors of estimates. Moulton (1990) has stressed that otherwise standard errors would be seriously biased downwards in a matched data set that combines aggregate variables such regional income inequality measures on micro units, because there is a correlation of error terms within regions. The calculation of standard errors for estimates without taking into account the clustering of observations by provinces would easily lead to the wrong conclusion about the existence of statistically significant relationship between income inequality and health. Interestingly, Subramanian and Kawachi (2004) mention in their survey of the literature that this particular problem in the identification of the statistically significant relationships between relative economic inequality and health outcomes has not been taken into account in most of the existing studies.

As a robustness check, we estimate the models separately for genders, because of biological differences and social norms the determinants of health behaviour may differ between males and females. By pooling all observations together in the estimation of the models, we impose the restriction that the determination process of health behaviour is exactly the same between males and females.

4. Results

We estimate Probit models, because our dependent variables are health indicators (0/1). The results from linear probability models would be almost similar, though. To make it easier to interpret the results, marginal effects are given. We also take into account the large permanent differences between the regions in health outcomes by controlling for year and regional fixed effects. The results from the pooled sample that combines both genders reveal that an increase in relative income inequality leads to few if none effects on our measures of health (Table 5). Only in the case of consumption of medicines there is some evidence in favour of the hypothesis, although the effect is not significant at conventional levels (Table 5, Column 4). However, it is still worth dwelling on the magnitude of the effect. The coefficient -0.133 means that for one unit increase in the Gini coefficient, the probability of not consuming medicines for high blood pressure, sedatives, or sleeping pills decreases by 13.3 percentage points. During the period of investigation, the Gini coefficient has risen from 0.25 to 0.31 on average, and thus the associated fall in the probability is 0.8 percentage points.

In general, the absolute level of regional income is not statistically significant in the models (Table 5). We include years of education among the individual-level control variables, which largely captures the existence of positive income effects on health, because highly educated persons have substantially higher incomes. However, it is interesting to see that an increase in household disposable income has a negative association to the "no sick leave" variable, almost significant at conventional levels (Table 5, Column 5). This result is surprising at first sight, but it is most likely due to the procyclicality of sickness absence (e.g. Holmlund, 2004). Thus, in good times the probability of sick leave is higher.

Table 5. Probit estimates for the probability of good health.

	Good self-reported health	Good physical health	Good mental health	No medicines	No sick leave	No disability retirement
Gini coefficient	0.174	-0.084	-0.006	-0.133	-0.029	-0.032
	(0.89)	(0.71)	(0.05)	(1.34)	(0.17)	(0.56)
Income	-0.121	0.012	0.030	0.074	-0.128	0.001
	(1.33)	(0.23)	(0.61)	(1.44)	(1.62)	(0.02)
Age	-0.008	-0.004	-0.001	-0.008	0.003	-0.004
	(35.49)**	(13.21)**	(4.83)**	(69.00)**	(17.67)**	(37.62)**
Female	0.017	-0.002	0.001	0.005	-0.059	0.007
	(3.49)**	(0.65)	(0.47)	(1.69)	(8.52)**	(2.46)*
Years of education	0.013	0.006	-0.008	0.002	0.008	0.008
	(20.01)**	(14.03)**	(13.03)**	(4.28)**	(10.93)**	(14.21)**
Married	0.043	0.017	0.029	0.040	0.033	0.044
	(8.50)**	(5.52)**	(6.35)**	(10.56)**	(6.72)**	(18.36)**
Varsinais-Suomi	-0.031	0.014	0.013	0.018	0.022	-0.003
	(2.88)**	(2.53)*	(2.40)*	(3.01)**	(2.55)*	(0.63)
Satakunta	-0.042	0.014	0.016	0.015	0.060	0.002
	(3.42)**	(2.36)*	(2.45)*	(2.17)*	(6.29)**	(0.34)
Häme	-0.038	0.001	0.025	0.007	0.020	-0.004
	(3.15)**	(0.16)	(4.14)**	(1.07)	(2.16)*	(0.78)
Pirkanmaa	-0.050	0.008	0.012	-0.004	0.029	-0.004
	(4.54)**	(1.38)	(2.08)*	(0.58)	(3.19)**	(0.90)
Päijät-Häme	-0.035	0.013	0.026	0.015	0.047	0.006
	(2.59)**	(1.90)	(4.01)**	(2.03)*	(4.41)**	(1.22)
Kymenlaakso	-0.025	0.018	0.026	0.019	0.034	-0.004
	(2.23)*	(3.63)**	(4.33)**	(2.98)**	(4.02)**	(0.80)
Etelä-Karjala	-0.040	0.000	0.032	0.001	0.032	0.002
	(2.95)**	(0.06)	(4.60)**	(0.17)	(3.08)**	(0.43)
Etelä-Savo	-0.047	0.009	0.009	0.016	0.065	-0.012
	(3.82)**	(1.57)	(1.48)	(2.34)*	(6.80)**	(2.30)*
Pohjois-Savo	-0.050	0.003	0.013	-0.005	0.053	-0.021
	(3.25)**	(0.35)	(1.61)	(0.57)	(4.36)**	(2.91)**
Pohjois-Karjala	-0.069	-0.019	0.020	0.007	0.066	-0.020
	(3.14)**	(1.57)	(1.83)	(0.58)	(3.72)**	(2.01)*
Keski-Suomi	-0.046	-0.010	0.017	0.001	0.058	0.001
	(3.26)**	(1.30)	(2.26)*	(0.14)	(5.04)**	(0.18)
Etelä-Pohjanmaa	-0.026	0.010	0.023	0.010	0.056	-0.014
	(2.66)**	(2.18)*	(4.16)**	(1.64)	(7.18)**	(2.79)**
Vaasan Rannikkoseutu	0.008	0.004	0.038	0.030	0.060	-0.009
	(0.89)	(0.99)	(7.15)**	(5.77)**	(8.56)**	(2.16)*
Keski-Pohjanmaa	-0.016	-0.030	-0.000	-0.010	0.062	-0.016
	(1.88)	(5.48)**	(0.00)	(1.77)	(8.54)**	(4.16)**
Pohjois-Pohjanmaa	-0.053	-0.014	0.023	0.001	0.047	-0.016
	(7.21)**	(3.31)**	(5.06)**	(0.14)	(7.70)**	(4.30)**
Kainuu	-0.007	-0.003	0.012	0.020	0.083	-0.019
	(0.38)	(0.31)	(1.37)	(2.02)*	(6.23)**	(2.29)*
Lappi	-0.030	-0.005	0.032	0.019	0.079	-0.011
	(1.93)	(0.57)	(3.89)**	(2.21)*	(6.29)**	(1.51)

Table 5. Probit estimates for the probability of good health (continued).

1994	0.037	-0.001	-0.029	0.004	-0.036	-0.007
	(3.10)**	(0.13)	(2.41)*	(0.57)	(2.79)**	(1.46)
1995	0.024	0.009	-0.020	0.002	-0.004	-0.004
	(2.53)*	(0.89)	(1.69)	(0.27)	(0.51)	(0.85)
1996	-0.050	0.001	-0.020	-0.005	-0.048	-0.003
	(5.86)**	(0.13)	(2.87)**	(0.62)	(4.84)**	(0.59)
1997	-0.043	-0.002	-0.046	-0.020	-0.034	-0.005
	(2.95)**	(0.25)	(5.90)**	(3.12)**	(3.09)**	(0.83)
1998	-0.039	-0.003	-0.031	-0.005	-0.025	-0.000
	(2.97)**	(0.30)	(3.05)**	(0.59)	(1.73)	(0.07)
1999	-0.023	0.002	-0.022	-0.020	-0.032	-0.002
	(1.57)	(0.29)	(1.93)	(2.04)*	(2.32)*	(0.35)
2000	-0.032	0.004	-0.040	-0.029	-0.036	0.004
	(1.54)	(0.65)	(3.22)**	(2.48)*	(1.77)	(0.60)
2001	-0.030	0.002	-0.025	-0.021	-0.061	0.002
	(1.49)	(0.36)	(2.26)*	(1.78)	(4.00)**	(0.41)
2002	-0.013	(reference)	-0.020	-0.030	-0.047	0.004
	(0.93)		(1.79)	(2.45)*	(2.63)**	(0.88)
2003	-0.040	-0.002	-0.029	-0.038	-0.045	0.006
	(2.31)*	(0.23)	(2.21)*	(3.52)**	(3.38)**	(1.02)
2004	-0.027	-0.001	-0.018	-0.047	-0.045	-0.005
	(1.31)	(0.16)	(1.38)	(3.98)**	(2.65)**	(0.58)
2005	-0.025	..	-0.021	-0.050	-0.053	-0.003
	(1.28)		(1.22)	(3.33)**	(2.96)**	(0.40)
Observations	43883	37256	43883	43883	43883	43883

Notes: Robust z statistics in parentheses. * significant at 5%; ** significant at 1%. Observations are assumed to be clustered by provinces. Reported coefficients are marginal effects. For dummy variables, this entails the effect of changing the variable in question from 0 to 1, while holding the other explanatory variables constant at their means. The reference category for the regional dummies is Uusimaa. The reference category for the year dummies is 1993, except for in column 2 where it is 2002.

The individual-level control variables included to the models reveal the well-known pattern of better educated persons have a much higher level of health (Table 5). However, this is not true for mental health, where the more educated have actually worse health (Table 5, Column 3). Women have better self-reported health, but they are substantially more prone to be absent from work. Indeed, Holmlund (2004) notes that it has become a stylised fact of the literature that women have significantly higher sickness absence rates than men. The effect of age on the probability of no sick leave is positive, which may seem surprising. However, this most likely reflects selection effects within the older workforce. Thus, older individuals that work and are not retired are those who are the healthiest and probably also the most motivated to work.

In the Finnish case, it is important to take into account the permanent regional differences (and the year effects), because they are substantial and highly statistically significant (Table 5). The indicators for the regions reveal that the difference between general self-reported health between Southern Finland and some parts of Eastern and Northern Finland is so large that the average education level should be around 4-5 years longer in some parts of Eastern and Northern Finland in order to compensate their lower level of self-reported health compared with Southern Finland (Table 5, Column 1).

Table 6. Probit estimates for the probability of good health for women.

Variable	Good self-reported health	Good physical health	Good mental health	No medicines	No sick leave	No disability retirement
Gini coefficient	0.755	-1.523	-0.646	-0.638	-0.687	-1.265
	(1.05)	(-1.61)	(-1.07)	(-0.77)	(-1.32)	(-1.70)
Income	-0.211	0.463	0.486	0.453	-0.121	0.502
	(-0.70)	(1.11)	(1.43)	(1.44)	(-0.51)	(0.97)
Age	-0.019	-0.019	0.001	-0.045	0.009	-0.036
	(-23.84)**	(-7.75)**	(1.26)	(-40.73)**	(13.35)**	(-23.41)**
Years of education	0.042	0.034	-0.030	0.019	0.017	0.085
	(12.74)**	(11.84)**	(-11.62)**	(6.45)**	(10.08)**	(11.80)**
Married	0.100	0.084	0.123	0.185	0.197	0.370
	(8.46)**	(2.95)**	(5.46)**	(6.89)**	(12.24)**	(12.90)**
N	23648	21915	23648	23648	23648	23648

Notes: See notes to Table 5. All models contain the unreported controls for regions and years.

The findings for women differ to quite a large extent from those of men and the pooled sample (Table 6). Here, although the coefficient are significant only at the 10% level, it is fair to say that an increase in the Gini coefficient is negatively related to the probability of good physical health and no disability retirement (Table 6, Columns 2 and 6). What makes the result interesting is that the magnitudes are fairly large. The coefficient of -1.52 for the probability of good physical health means that one unit increase in the Gini coefficient would decrease the probability of good physical health by 152 percentage points (Table 6, Column 2). On average over the period the Gini coefficient has increased by 0.06, which would translate into a decrease of around 9 percentage points in the probability of good physical health. The equivalent increase in the probability of no disability retirement would be some 7 percentage points. For the probability of good physical health, this is equivalent to the effect of around 2.5 years of additional education, and for the probability of no disability retirement, this is equivalent to the effect of around 2 years of education.

Table 7. Probit estimates for the probability of good health for men.

Variable	Good self-reported health	Good physical health	Good mental health	No medicines	No sick leave	No disability retirement
Gini coefficient	0.193	0.698	0.737	-0.784	0.637	0.705
	(0.26)	(0.81)	(0.86)	(-1.06)	(0.93)	(0.74)
Income	-0.478	-0.360	-0.310	0.376	-0.612	-0.495
	(-1.59)	(-1.07)	(-0.81)	(0.96)	(-2.29)**	(-1.27)
Age	-0.028**	-0.025**	-0.008**	-0.050**	0.009**	-0.042
	(-33.41)	(-21.71)	(-10.46)	(-61.74)	(13.52)	(-30.50)**
Years of education	0.035**	0.037**	-0.030**	0.001	0.026	0.078
	(11.92)	(10.49)	(-9.18)	(0.45)	(8.11)**	(15.85)**
Married	0.170**	0.128**	0.113**	0.276**	-0.049	0.482
	(6.89)	(4.71)	(5.25)	(9.47)	(-2.98)**	(19.52)**
N	20235	18743	20235	20235	20235	20235

Notes: See notes to Table 5. All models contain the unreported controls for regions and years.

For men, income inequality is clearly not important for health (Table 7). On the other hand, higher regional real household disposable income has a negative effect on the probability no sick leave during the year. Again, this most likely reflects the cyclicality of sickness absence. An apparent reason for the finding that relative income inequality has more bearing on the health outcomes of women in Finland is that their overall income stream is more dependent on income transfers by the public sector, because they are more often out of the labour force than men. There has been quite substantial reduction of income transfers by the public sector since the great depression of the early 1990s in Finland (e.g. Riihelä et al. 2007), which may have hurt women more.

Furthermore, as an additional check of robustness, we have estimated our baseline specifications reported in Table 5 separately for low educated persons, because it is possible that relative income inequality have a significantly larger effect on their health outcomes compared with average population. This differential effect based on socioeconomic status would be consistent with the so-called weak income inequality hypothesis (e.g. Mellor & Milyo, 2002). There is some earlier evidence from other Nordic countries that is in accordance with this hypothesis. Dahl et al. (2006) have reported that the effects of economic inequality on mortality are particularly marked among socioeconomically disadvantaged groups in Norway, and the findings by Henriksson et al. (2007), through the use of Swedish census, point out that there could be a differential impact from income inequality on mortality, dependent on individuals' social position. Taken together, our results do not change much when estimating the models separately for those individuals that have at most 10 years of education. (The results are not reported in tables.) There is some weak indication at 10% significance level that relative income inequality has a negative effect on the probability of no disability retirement among low educated, however. Otherwise, the conclusions remain exactly the same.

5. Conclusions

This paper examines the relationship between relative economic inequality and health in Finland, using individual microdata over the period 1993-2005. Our data allows us to examine a large spectrum of health indicators. Overall, our results show that income inequality is not associated with increased morbidity in the population. The results for women differ to quite a large extent from those of the pooled sample. There is evidence that an increase in the Gini coefficient is negatively related to the probability of good physical health and no disability retirement. For men, income inequality is clearly not important for health.

All in all, the Finnish evidence demonstrates that relative income inequality is not always harmful for health outcomes. The effects are dependent on the context. Our findings for Finland are consistent with the observation by Subramanian and Kawachi (2004) according to which studies conducted outside US have generally failed to find an association between relative income inequality and health behaviour.

One potential limitation of the paper is that in all Nordic countries, the level of public spending on health care and education is relatively much higher than in the US, which may explain that few effects would be found when studying these countries. However, as Gerdtham and Johannesson (2004) argue in their study regarding Sweden, this particular feature should not invalidate as such the effect of relative income inequality on health, because public consumption is actually more heavily targeted towards low-income groups in the United States than in the Nordic welfare states, where almost all citizens are entitled to public consumption.

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