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Income Inequality and Health: A Cross-Country Analysis

By Dean R. Lillard and Richard V. Burkhauser*

Abstract

Using CNEF (Cross-National Equivalent File) panel data from Germany, Great Britain, and the United States we investigate whether self-reported health at a given age (ages 50, 60 and 70) varies systematically with the degree of income inequality at that age and household size-adjusted post-government income at younger ages. We find little evidence that links self-reported health to current income inequality but strong evidence that past income is highly correlated with subsequent self-reported health in all three countries.

JEL Classification: D 31, D 63, I 31

1. Introduction

Much attention has been devoted to the negative correlation between income inequality and health in and across countries. This relationship has been found across a broad set of health measures: infant mortality (Waldman 1992, Wennemo 1993), life expectancy (Wilkinson 1996, 2000), average age at death (Le Grand 1987), mortality (Kennedy et al. 1996, Lynch et al. 1998, Smith et al. 2002), and self-reported health (Kennedy et al. 1998).

Despite the consistent negative relationship identified in these studies, their interpretation and robustness have been severely criticized. Deaton (2001) and Wagstaff and van Doorlaer (2000) argue that this relationship should be estimated with data on individuals followed over time. Judge, Mulligan, and Benzeval (1998) contend that existing cross country comparisons fail to use comparable measures of income that account for taxes, government cash and in-kind transfers, or household size. Wagstaff and van Doorslaer (2000) also

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argue that the large majority of these studies fail to estimate models that can distinguish between the hypotheses that have been advanced either because they lack data on individuals or because they fail to use those data to provide tests of alternative hypotheses.

In this paper we respond to some of these criticisms by using comparable longitudinal data on individuals from three countries – Germany, Great Britain, and the United States. We merge equivalently defined variables on income (accounting for taxes and household size), demographic, and household characteristics drawn from these panel data sets with data on each country's level of income inequality. With these merged data, we then investigate whether an individual's self-reported health at given ages (ages 50, 60, and 70) is correlated with income inequality at that age, controlling for past income and other socio-economic characteristics in each country.

2. Data

We use comparably defined data from the German Socio-Economic Panel (SOEP), the British Household Panel Study (BHPS) and the United States Panel Study of Income Dynamics (PSID) contained in the Cross-National Equivalent File (CNEF).[1] CNEF is a joint effort of researchers at Cornell University, Statistics Canada, the Institute for Social and Economic Research at Essex University, the Institute for Social Research at the University of Michigan, and the German Institute for Economic Research in Berlin. From each wave of the SOEP, BHPS and PSID we draw data on self-reported health, household income, age (year of birth), sex, and marital status. CNEF also contains estimates of the income and social security taxes paid by each household in these three data sets that allows us to measure post-government household income (net of tax, plus transfers). Post-government household size-adjusted income is estimated assuming a scale elasticity of 0.5. See Burkhauser et al. (2001) for a fuller discussion of these data.

Our measure of income inequality is each country's Gini coefficient. The United States and Great Britain Gini series values are based on consistently generated nationally representative cross sectional data sets not contained in CNEF. Germany has no such cross sectional data sets and our Gini values come from the German Socio-Economic Panel discussed above. Burkhauser, Couch, Houtenville and Rovba (2005) show that United States Census produced Gini values prior to income year 1993 based on restricted access Current Population Survey (CPS) data cannot be compared to post-1993 Gini values. The same is true for public use CPS Gini values before and after income year 1995, unless they are corrected to account for the significant

[1] We also append original PSID data from 1970 – 1979 to the CNEF-PSID data.

changes in top coding rules used in both the internal and public use CPS date in the mid-1990s. We use the CPS Gini series in Burkhauser et al. (2005) which is based on public use CPS data, in which each income source of a person is consistently top coded each year at the same percentile in the income distribution, as our measure of income inequality for the United States. Burkhauser et al. (2005) construct Gini values for each year from 1979 to 2000. They measure income at the household level and adjust for household size using an equivalence scale value of 0.5.

Our Gini series values for Great Britain come from Goodman and Shephard (2002). They use the Family Resources Survey and the Family Expenditure Surveys to calculate Gini coefficients for each year from 1961 to 2000. Income is measured at the household level and is adjusted for household size using the McClements (1977) equivalence scale.

Our Gini series for Germany comes from time-series produced by the Deutsches Institut für Wirtschaftsforschung (DIW Berlin) in its *SOEP-Monitor* published in 2004. Gini coefficients for household size-adjusted income are given separately for the western states of the Federal Republic of Germany for the income years 1983 to 2002 and for East Germany for the years 1991 to 2002. We restrict our analysis to residents of states in the Federal Republic prior to reunification, i.e., to West Germany. Income is measured at the household level and is adjusted for household size using the modified OECD equivalent scale value (1.0 for the first adult, 0.5 for each additional adult and 0.3 for children).

3. Methods

We follow life course methods and re-label our data with reference to chronological age to compare the health of each individual in our sample at specific ages. For example, for a man aged 50 in 1991, we use his age to re-label his self-reported health status in 1991 as his health at age 50. We do the same with respect to the Gini coefficient value and all other time varying variables. We re-label them from calendar time to the age of the individual in that year.

In pooling data based on age, we collect people who were born in different years. To do so, we assume that everyone follows a common aging process that results in similar outcomes at a given age. Because individuals face different medical technologies by virtue of being born in different years, we include year of birth to control for each person's birth cohort.

Our dependent variable equals one if a person reports being in fair or poor health and equals zero otherwise. This information is readily available from a 5-point scale in the BHPS and the PSID. A similarly phrased SOEP self-reported health question only began to be asked in 1992, so we construct a

comparable measure of health status for Germans based on a self-reported health satisfaction question. This question asks respondents to rate their health satisfaction using an 11-point Likert scale ranging from poor to excellent. This question is available in all SOEP years. From it we create two binary variables that measure if a person was in poor / fair health or not. The first defines poor / fair health as a satisfaction with health level of 3 or lower. The second defines poor health as a satisfaction with health level of 4 or lower. In all analyses reported below we use the second measure. The simple correlations between self-reported health status and this second broader measure of poor health based on the health satisfaction question are .61, .66 and .62 for those aged 50, 60 and 70 respectively.

We start with a parsimonious model that correlates self-reported health to contemporaneous income inequality, controlling only for year of birth. We then add the household size-adjusted post-government income of the individual averaged over all the years we observe such income plus the number of years income was observed. In a final model we additionally control for each person's sex, and whether or not the individual was married in the year health status was reported. We include the number of years an individual participated in the survey to account for sample selection bias (attrition bias).

We append our Gini coefficient measure of inequality to each individual based on the year in which the person turned the age for which health is measured. We estimate all models using maximum likelihood estimation (probit models). Table 1 reports descriptive statistics.

4. Results

Table 2 presents coefficients estimated for probit models that relate being in fair or poor health to the Gini coefficient for the national distribution of household income. We run separate models for individuals aged 50, 60, and 70 years in each country.

In the first column for each country's coefficient estimates, we report the association between health status and the Gini coefficient with only a control for each person's year of birth. In the second column, we add measures of average household size-adjusted post-government income (including the number of years we observed such income). In the third column, we add an indicator for women and for whether a person was married.

Table 1

Sample Means and Standard Deviations

Variable[1]	Germany	Great Britain	United States
	Age 50	Age 50	Age 50
Self reported health is poor[2]	0.19 (0.39)	0.09 (0.28)	0.20 (0.40)
Satisfaction with health is 0 – 3	0.12 (0.32)	–	–
Satisfaction with health is 0 – 4	0.19 (0.39)	–	–
Gini coefficient	0.27 (0.01)	0.34 (0.01)	0.39 (0.01)
Average household size-adjusted income*10^{-4}	4.00 (1.95)	2.04 (1.01)	2.78 (2.09)
Numbers of years in average	7.40 (5.37)	8.69 (2.67)	20.13 (9.40
Female	0.49 (0.50)	0.31 (0.46)	0.43 (0.50)
Married	0.83 (0.37)	0.59 (0.49)	0.88 (0.32)
N	3635	1017	2229
	Age 60	Age 60	Age 60
Self reported health is poor[2]	0.26 (0.44)	0.10 (0.30)	0.31 (0.46)
Satisfaction with health is 0 – 3	0.16 (0.36)	–	–
Satisfaction with health is 0 – 4	0.23 (0.42)	–	–
Gini coefficient	0.27 (0.01)	0.34 (0.01)	0.39 (0.01)
Average household size-adjusted income*10^{-4}	4.07 (2.37)	1.96 (0.91)	2.73 (1.75)
Numbers of years in average	7.94 (5.76)	8.41 (2.95)	21.94 (8.47)
Female	0.50 (0.50)	0.33 (0.47)	0.44 (0.50)
Married	0.80 (0.40)	0.58 (0.49)	0.90 (0.30)
N	3054	695	1494
	Age 70	Age 70	Age 70
Self reported health is poor[2]	0.31 (0.46)	0.10 (0.30)	0.37 (0.48)
Satisfaction with health is 0 – 3	0.18 (0.39)	–	–
Satisfaction with health is 0 – 4	0.26 (0.44)	–	–
Gini coefficient	0.27 (0.01)	0.34 (0.01)	0.39 (0.01)
Average household size-adjusted income*10^{-4}	3.42 (1.95)	1.95 (0.81)	2.48 (1.54)
Numbers of years in average	8.38 (5.84)	8.45 (2.94)	21.21 (8.46)
Female	0.55 (0.50)	0.42 (0.49)	0.39 0.49)
Married	0.68 (0.47)	0.45 (0.50)	0.84 (0.37)
N	1725	699	1055

[1] All variable measured for year person turned given age.

[2] Sample size for this variable is lower in German samples because the data are only available from 1992 to 2002. Sample sizes for German 50, 60, and 70 year old is 1904, 1908, and 1919 respectively.

Source: Authors' calculation from British Household Panel Study 1991 – 2000, German Socio Economic Panel 1984 – 2002, Panel Study of Income Dynamics 1970 – 2001. Income figures are in constant 2000 British pounds, 2002 German marks, or 2001 United States dollars.

Table 2: **Probit Estimates of the Relationship Between Poor Health and Income Inequality at Ages 50, 60, and 70 in Germany, Great Britain, and the United States**

Variable	Germany			Great Britain			United States		
	Age 50			Age 50			Age 50		
Gini coefficient in Year turned 50	1.388 (4.028)	3.310 (4.073)	3.500 (4.079)	*–19.081* (11.124)	**–27.967** (11.758)	**–28.502** (11.775)	**16.123** (6.878)	**14.785** (7.389)	*14.273* (7.427)
Average of household income*10^{-4}		**–.140** (.027)	**–.129** (.027)		**–.585** (.122)	**–.563** (.124)		**–.514** (.037)	**–.502** (.037)
Square of avg. household income*10^{-6}		**.004** (.002)	**.004** (.002)		**2.967** (1.499)	**2.850** (1.569)		**1.094** (.147)	**1.068** (.150)
Years used in average		*.010* (.005)	*.010* (.005)		*–.029* (.024)	*–.030* (.024)		**–.012** (.004)	**–.011** (.004)
Log likelihood	–1745.6	–1722.4	–1716.9	–297.9	–277.1	–276.1	–1100.3	–947.3	–940.6
Pseudo *R*-Square	.000	.014	.017	.006	.075	.078	.014	.151	.157
N		3635			1017			2229	
			Age 60			Age 60			Age 60
Gini coefficient in Year turned 60	–.430 (4.137)	1.112 (4.187)	1.201 (4.189)	–11.101 (13.071)	–19.770 (13.693)	–19.202 (13.760)	6.340 (9.162)	1.321 (9.883)	1.155 (9.888)
Average of household income*10^{-4}		**–.143** (.022)	**–.141** (.022)		.381 (.479)	.331 (.487)		**–.568** (.047)	**–.565** (.047)
Square of avg. household income*10^{-6}		**.004** (.001)	**.004** (.001)		–19.249 (12.455)	–18.708 (12.608)		**2.432** (.356)	**2.421** (.357)
Years used in average		**.018** (.005)	**.018** (.005)		–.037 (.025)	–.037 (.026)		**–.011** (.004)	**–.011** (.004)
Log likelihood	–1651.7	–1618.3	–1617.5	–224.4	–213.2	–211.8	–916.7	–794.7	–794.4
Pseudo *R*-Square	.001	.021	.021	.002	.052	.059	.005	.138	.138
N		3054			695			1494	

	Age 70			Age 70			Age 70		
Gini coefficient in Year	.269	.502	.501	25.571	23.742	24.036	–14.366	–12.630	–13.663
turned 70	(5.306)	(5.352)	(5.359)	(13.961)	(14.191)	(14.251)	(9.253)	(9.683)	(9.718)
Average of household		**–.165**	**–.161**		-.416	-.398		**–.688**	**–.695**
income*10^{-4}		(.038)	(.039)		(.258)	(.263)		(.072)	(.073)
Square of avg. household		*.005*	*.005*		4.654	4.443		**4.676**	**4.750**
income*10^{-6}		(.002)	(.003)		(4.001)	(4.050)		(.810)	(.809)
Years used in average		.008	.008		-.015	-.016		.000	.000
		(.006)	(.006)		(.024)	(.024)		(.005)	(.005)
Log likelihood	–989.8	–973.6	–971.7	–229.4	–227.0	–226.9	–692.9	–613.1	–611.5
Pseudo *R*-Square	.001	.018	.020	.010	.021	.021	.004	.119	.121
N		1725			699			1055	
Control variables									
Year of birth	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Female, Married	–	–	Yes	–	–	Yes	–	–	Yes

Notes: Dependent variable equals one if a person reports being in "fair" or "poor" health and zero otherwise. Standard errors are in parentheses. Figures in boldface type are statistically different from zero with p values of .05 or less. Figures in italic type are different from zero with p values between .05 and .10. Income figures are in constant 2000 British pounds, constant 2002 German marks, or constant 2001 United States dollars.

Source: Authors' calculations from British Household Panel Study 1991 – 2000, German Socio Economic Panel 1984 – 2002, and United States Panel Study of Income Dynamics 1970 – 2001.

For Germany, the coefficients on the Gini coefficient are positive but not statistically significant in any model at any age.[2] For Great Britain, we find similar insignificant results. However the coefficient on income inequality is positive and significant at the ten percent level for people aged 70 in all three models. For the United States, we find evidence that current income inequality is positively correlated with the probability of being in poor health at age 50. The estimates are significant at the 5 percent level in the basic model and remain so when we add average past income. Its significance weakens when we control for sex and marital status. For the other age groups the simple correlation is close to zero or is *negative.* Hence, we find little evidence of a consistent relationship between health and income inequality in any of our three countries.

In contrast to contemporary income inequality, the coefficient estimates on income shown in Table 2 generally provide support for the hypothesis that the probability of being in poor/fair health is negatively associated with one's past household size-adjusted post-government income. In the fullest specification (the third column of each group) that includes each individual's year of birth, sex, and marital status, higher household size-adjusted post-government income is associated with a lower probability of reporting oneself to be in poor or fair health at age 50 in all three countries. This association is also found for those aged 60 and 70 in Germany and the United States.

Finally, our results confirm what empirical researchers have long known– individuals who remain in panels longer systematically differ from those who attrite earlier. In the BHPS and PSID panels healthier individuals remain in panels longer. When we regress health status on the number of years we observe household income for each individual, the coefficient estimates are negative at all ages in Great Britain and the United States. The coefficient estimates for those countries are statistically different from zero with p values of .05 or less for panel respondents at age 50 and age 60 in the United States (the longest panel). In Germany it appears that less healthy individuals remain longer in the panel. The correlation between length of time in the panel and the probability of being in poor health is positive and statistically different from zero with p values of .05 or less for German panel respondents at age 50 and age 60. This anomalous result bears further investigation.

[2] The coefficient estimates on the Gini are positive for 50 year old Germans when we use the self-reported health variable (which is only available for the years 1992–2002). Those estimates are only significant at the five percent level in one model for those aged 50. For 60 and 70 year olds, the models using self-reported health yield statistically insignificant coefficients.

5. Conclusions

We find no consistent evidence that individuals are more likely to report being in poor or fair health at a given age if they face greater income inequality at that age. We do however find substantial support for the hypothesis that better health status is associated with higher household size-adjusted post-government income at earlier ages in Germany, Great Britain, and the United States.[3] This finding is notable given the substantial differences in the way medical services are provided within these countries and cross-country differences in the importance that an individual's disposable income plays in gaining access to these services.

Finally, we interpret the statistically significant coefficient estimates on the number of years a person was in our sample as a cautionary flag that highlights the importance of accounting for attrition bias. While attention to this problem is always recommended, it is especially important when the outcome of interest is the health of older panel study respondents.

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[3] Our finding differs from those of Deaton and Paxson (2001). Those authors however, investigate the relationship between income and mortality, not income and self-reported health.

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