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Absolute or relative? A comparative analysis of the relationship between poverty and mortality

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Abstract

Objectives: We aimed to examine the cross-national and cross-temporal association between poverty and mortality, in particular differentiating the impact of absolute and relative poverty.

Methods: We employed pooled cross-sectional time series analysis. Our measure of relative poverty was based upon the standard 60 percent of median income. The measure of absolute, or fixed, poverty we based upon the US poverty threshold. Our analyses were conducted on data for 30 countries between 1978 and 2010, a total of 149 data points. We separately studied infant, child and adult mortality.

Results: Our findings highlight the importance of relative poverty for mortality. Especially for infant and child mortality we found that our estimates of fixed poverty is close to zero either in the crude models, or when adjusting for GDP. Conversely, the relative poverty estimates increased when adjusting for confounders. Our results seemed robust to a number of sensitivity tests.

Conclusions: If we agree that risk of death is important, the public policy implication of our findings is that relative poverty, which has close associations to overall inequality, should be a major concern also among rich countries.

INTRODUCTION

Reducing poverty is one of the five headline targets of EU2020, the European Union's strategy for smart, sustainable and inclusive growth. It is obvious that combating poverty remains a key priority for the welfare state in the 21st century. The main reasons are the high prevalence of poverty, even in affluent societies, and its negative consequences for both individuals and society. In this study, we focus on the ultimate consequence of poverty, namely, death. We study the cross-temporal and cross-national relationship between poverty rates and mortality rates in 30 nations. Findings from earlier research comparing the consequences of poverty in affluent countries have indeed suggested that relative poverty is associated with mortality rates (Fritzell et al. 2013).

In this study, however, we will also investigate the association between poverty and mortality using a fixed poverty line by adopting the US poverty threshold across all countries and across time. In particular, we will compare the importance of our relative poverty rate and fixed poverty rates in mortality. The merits of relative versus absolute definitions of poverty are widely discussed, not least within policy circles in the European community. A key question in this paper is therefore the extent to which relative poverty rates are associated with mortality rates after adjustment for fixed poverty rates.

The idea that poverty is related to health is not new. In a sense, it can be seen as a backbone of public health as a discipline. Many of the first welfare state programs were motivated by the desire to weaken the link between poverty and health. The relationship was perhaps most famously expressed in Engels (1845/1987) and Rowntree's (1901) analyses of the conditions of the poor and the working class. Today the link between poverty and health is most obvious on the global scene. Being born in a low-income country, many of which are plagued by malnutrition and severe hardship, dramatically increases the risk of serious health problems and premature death (Marmot et al. 2008).

One way of conceiving absolute poverty is embodied in a fixed, income-based threshold that reflects the minimum amount of income needed to endure, adjusted only for inflation and currencies over time and place. In this paper we chose to use the US poverty threshold (Orshansky 1965), for two reasons. First, it is well-known and widely used in comparative poverty research. Second, it was derived from the minimum dollar cost of providing an adequate, nutritious diet calculated on the basis of food plans existing in the United States. As such, the threshold has an obvious relation to health. From a theoretical perspective, it must be remembered that the US poverty line can hardly be seen as a proper measure of absolute poverty since the original fixed threshold was likely heavily influenced by what was considered acceptable and normal in the society at one specific point in time. Orshansky (1965) was well aware of this: "Yet as yesterday's luxuries become tomorrow's necessities, who can define for today how much is enough*?"*. For a detailed description of the development and discussions of the measure, see (Fisher 1992).

It is perhaps less self-evident that relative poverty rates would be linked to mortality rates among more affluent countries. Relative poverty, on which most international comparisons are based, is commonly calculated as the proportion of the population with incomes below a certain fraction of the median income. The threshold is nowadays typically set at 60% of the median income (Atkinson et al. 2002). A critique that is often raised against such relative poverty calculations is the missing link to absolute living standards among the poor. Hence, a US citizen living below such a threshold has on average more income and better material living conditions than the average citizen in a less affluent country. The relativity of the poverty calculation hides that observation.

On the other hand, those arguing in favor of a relative poverty approach contend that human beings are socially embedded and that poverty must therefore be related to social circumstances. Accordingly, measurements of poverty must be made on the basis of the

overall living standards and lifestyles prevailing in society, as so forcefully articulated by Townsend (1979). To be poor is to lack the opportunity to fully participate in the society in which one lives, and it is therefore likely that relative poverty leads to ill-health or increased mortality risk.

Evidence from health inequality research tends to support the relative poverty perspective. It has been shown that a clear association between economic resources and health exists in both low and high income countries. This association not only distinguishes the poor from the non-poor but also spans the entire social hierarchy and produces what is nowadays labeled "the social gradient in health" (Marmot 2004). For a more elaborated discussion of the association on relative poverty and health, see (Fritzell et al. 2013).

Since the theoretical dispute about absolute or relative conceptions of poverty might be insoluble, it is more interesting to disentangle the relationship between relative and absolute poverty and important outcomes, such as population health indicators. Mortality is perhaps the best indicator of population health. In a recent study by Mackenbach & Looman (2013) the mortality trends in 25 European countries between 1955 and 1989 were thoroughly examined showing a substantial decrease in overall mortality but also an increased variation between countries.

Our main aim was to examine the relationships between poverty and mortality over both space and time (Razum et al. 2014). We calculated relative poverty rates, fixed poverty rates, and mortality rates for 30 countries for the period of approximately 1980 to approximately 2010. In this paper, we present the results of pooled cross-sectional time series analyses. In the concluding section of our paper, we interpret our findings in the light of the discussion above. The analyses were conducted separately for infants (those <1 year old), children (those 1 through 17 years old), and adults (20 through 64 years old), and were stratified by sex for adults. Although our prime interest was the association between poverty

and mortality, we were simultaneously interested in how welfare states perform. Hence, we also studied the differences between welfare states, following the typical grouping of countries into different welfare regimes (Castles et al. 2010).

METHODS

Data

Data on our main measures of interest—poverty and mortality rates—were retrieved from the Luxembourg Income Study (LIS 2013), the Human Mortality Database (HMD 2013), and the World Health Organization mortality database (WHO 2013). LIS provides a harmonized database that includes multiple waves of microdata on a large number of countries from around 1980 to 2010. For more detailed information on the database, see (Atkinson et al. 1995). The access to harmonized microdata allowed us to calculate both our poverty measures. Mortality rates were primarily based on HMD that provides open access mortality and population data for many countries and time periods.

Our analyses were conducted on observations of poverty and mortality rates from at most 8 points in time between 1978 and 2010, or a total of 149 data points. Two inclusion criteria were set for selecting countries. The first was that LIS data had to be available for at least 2 waves. The second was that mortality data had to be available for the LIS year and the year after to allow for exposure time and to enable us to level out potential yearly fluctuations in the number of deaths in each country.

Poverty rates

In all poverty calculations, we used the disposable income of each household (i.e., income after taking into account cash transfers and direct taxes). For relative poverty, we calculated the income equivalence scale by dividing the household's disposable income by the square root of the number of household members. Then, individuals in households with an equivalent

disposable income lower than 60% of the median income were considered to be poor. These rates were calculated for each data point and separately for two age groups: children (aged 0-17) and adults (aged 18-64).

The fixed poverty threshold for each data point and age group was calculated by adopting the official US poverty line for each year, family size, and household combination. These thresholds are calculated on the basis of before-tax income, excluding capital gains and noncash benefits but including cash benefits such as unemployment compensation, social assistance, and child support. The fixed poverty thresholds are updated each year by the US Census Bureau, taking into account changes in the annual Consumer Price Index.

We transformed the dollar amount of the US poverty threshold into each country's national currency by using purchasing power parities for each respective year. Data on purchasing power parities were retrieved from the Organisation for Economic Co-operation and Development (OECD 2013), the World Bank (2013) and the International Monetary Fund (IMF 2013). Thus, this threshold has, in principle, the same purchasing power relative to a set of standard goods and services at all points in time and in all countries. The absolute poverty level for each country and point in time was then equal to the percentage of persons living in households with an income below the threshold.

Mortality rates

Death rates were calculated on the basis of the yearly number of deaths and the population size in each country. We calculated death rates for three age groups: infants (aged <1 year), children (aged 1–19 years), and adults (aged 20–64 years). To enable a comparison of death rates across countries and points in time, we used the direct standardization method and the European standard population to calculate age-standardized death rates (ASDR) for each age

group. The ASDRs were calculated as deaths per 1000 person-years. Infant mortality rates are presented as crude rates per 1000 person-years.

To allow for exposure to mortality risk after our poverty measurements and to level out potential yearly fluctuations in death rates, we calculated mortality rates as the average of the ASDR of the year of our poverty measure plus that of the following year. For the purposes of the multivariate analyses, the ASDRs were logged to normalize their strong positively skewed distributions.

Control variables

LIS wave was used as a time measure in all analyses to take into account the widespread decreases in mortality rates over time. Because not all countries provide data in the same year, country-specific data are grouped into waves in LIS. Data were grouped in 5-year intervals (5-year waves) from 1980 to 2000. After 2000, the intervals were changed to 3 and then 4 years. Data points for countries were grouped around waves with a maximum deviation of up to 2 years.

Gross domestic product (GDP) per capita, provided in fixed 2005 US dollar prices and adjusted for yearly purchasing power parities in each country, was included as a proxy for the level of the general economic standard in each country. Data on GDP were derived from the OECD (2013), in some cases complemented with data from the Penn World Table database (2013). Model fit diagnostics indicated a curvilinear association between all four mortality outcomes and GDP. This is strengthened by the theoretical notion of a curvilinear association between income and mortality (Fritzell et al. 2004; Rodgers 1979; Subramanian and Kawachi 2004). We therefore decided to use the logarithm of the GDP per capita.

Regime type. Countries were grouped into categories in accordance with traditional classifications of welfare state regimes (Castles et al. 2010; Esping-Andersen 1990): the Nordic model, the Central European model, the liberal model, the South-European model, the post-socialist model, and the residual category of "other."

Modelling strategy

For regression analyses, we used pooled cross-sectional time series methods with panel-corrected standard errors (Beck and Katz 1995). Country was set as the panel variable and wave as the time variable. Pooled regressions were run using the STATA 12 cross-sectional time-series package with Prais-Winsten regressions and corrections for first-order panel-specific autoregressiveness.

We chose not to include country dummies in our models. Although country-fixed effects models have well-known advantages in terms of dealing with problems of omitted variable bias, they also come at a price. In such models, any time-invariant effects will be eliminated, differences in levels between countries will be eliminated, and any effects prior to t1 will be eliminated (Huo et al. 2008). However, our main rationale was theoretical. We suggest that it is the variation in poverty levels across countries that matters for mortality rather than any yearly fluctuations within the countries; in other words, that it is the large and long-term differences in poverty risks that matter for mortality rather than small, short-term changes. For income inequality, poverty, and health, the stability of both variables becomes a complicating factor for in any fixed effects model (Babones 2008). Still, the inclusion of regime type in our final models captured the country-fixed effects to some extent.

We used step-wise technique in our regressions. We present three forms of Model 1, in which we included a) wave and relative poverty, b) wave and fixed poverty, and c) wave and both poverty variables. In Model 2, we included all the variables in Model 1C plus GDP. In Model 3, we added welfare regime. Tests for multicollinearity were carried out

due to correlation between poverty measures and GDP. Relativity high Variance Influence Factors were found for absolute *child* poverty (8.99) and GDP (6.99). Additional analysis of standard errors showed only modest increase between models, indicating relatively stable estimates (O'brien 2007).

RESULTS

It is important to stress the different pictures our data revealed when we contrasted relative poverty with our fixed poverty levels. First, there were great differences between countries. This is no surprise given that fixed poverty rates are heavily influenced by the level of economic prosperity within each country (and at each point in time). Second, we find dissimilar trends in our poverty estimates. Whereas our fixed poverty rate ended at a lower level in the last wave than in the first wave for almost all countries, the trend was completely reversed when we examined relative poverty rates. In other words, relative poverty rates increased in most countries.

Table 1 shows descriptive statistics for all variables included in our analyses, categorized by country. As previously noted, the fixed poverty rates varied dramatically across countries. The averages of country-level poverty rates varied from close to 0 (Luxembourg) to startlingly high numbers in some of the Eastern European countries. The mortality rates also exhibit notable cross-national variation. For instance, the average mortality rate of male adults varied from 3.39 per 1000 person-years in Israel to above 10 per 1000 person-years in both Estonia and Hungary. The highest mortality rate, 15.6 per 1000 person-years, was found in Russia.

Table 1. Descriptive statistics for all countries in the dataset

			Country averages across all data points								
								Rates per 1000 person year			
Country	Number of datasets	Dataset range (year), first-last	Child poverty rate (fixed)	Child Poverty rate (60%)	Adult poverty rate (fixed)	Adult Poverty rate (60%)	Infant death rate	Child death rate (age standardized)	Female adult death rate (age standardized)	Male adult death rate (age standardized)	Gross domestic product per capita
Australia	6	1981-2003	20.0	21.5	8.4	14.6	7.3	0.34	2.1	3.9	27191
Austria	4	1987-2004	6.2	14.4	3.4	10.4	6.0	0.31	2.1	4.5	28657
Belgium	4	1985-2000	10.7	12.1	6.0	10.2	7.3	0.33	2.3	4.7	25647
Canada	7	1981-2007	11.3	22.2	5.7	16.1	6.4	0.31	2.1	3.8	29492
Czech Republic	3	1992-2004	73.0	11.9	47.8	7.3	6.2	0.30	2.7	6.4	16955
Denmark	5	1987-2004	4.1	9.5	3.4	9.7	5.8	0.27	2.9	4.6	28673
Estonia	2	2000-2004	80.9	20.7	72.2	17.5	7.5	0.43	3.4	10.8	13318
Finland	5	1987-2004	6.0	7.2	5.7	9.9	4.4	0.28	2.0	5.2	24374
France	6	1979-2005	18.0	15.4	12.1	13.3	6.7	0.34	2.1	5.2	24570
Germany	5	1994-2010	8.7	16.3	4.5	12.6	4.2	0.21	1.9	3.8	31112
Germany, West	3	1978-1989	5.3	11.6	3.0	9.2	10.3	0.41	2.7	5.5	22189
Greece	4	1995-2007	36.0	20.5	25.1	17.0	5.0	0.24	1.5	3.6	22051
Hungary	4	1991-2005	79.0	15.3	67.4	12.7	10.3	0.33	4.0	10.3	13311
Ireland	5	1987-2007	29.1	23.3	14.8	16.3	5.7	0.28	2.2	3.9	29486
Israel	6	1986-2007	45.5	25.3	29.5	17.4	6.6	0.27	1.9	3.4	21263
Italy	6	1986-2008	36.2	25.9	20.5	17.0	6.0	0.24	1.7	3.6	25785
Luxembourg	6	1985-2007	1.6	16.9	0.7	10.4	5.6	0.30	2.2	4.5	54308
Mexico	3	1984-1994	72.0	30.1	77.7	21.1	24.9	0.93	3.8	6.7	10423
Netherlands	5	1987-2004	8.1	12.2	5.8	10.5	6.0	0.25	2.1	3.7	28869
Norway	6	1979-2004	5.6	10.1	4.1	9.9	5.6	0.31	2.1	4.0	36401
Poland	4	1992-2004	86.4	20.2	79.8	14.0	11.1	0.34	2.9	8.1	10371
Russia	4	2000-2010	77.1	26.8	70.0	21.2	11.0	0.66	4.9	15.6	11937
Slovak Republic	4	1992-2007	82.7	14.0	70.0	9.9	8.5	0.32	2.8	7.6	13900
Slovenia	4	1997-2007	22.2	11.1	14.0	10.2	4.1	0.26	2.2	5.3	21340

Spain	6	1980-2007	38.6	22.6	23.5	16.2	6.1	0.30	1.7	4.1	22758
Sweden	6	1981-2005	6.7	7.5	7.3	10.8	4.7	0.22	2.0	3.5	25662
Switzerland	4	1982-2004	5.1	14.7	3.6	10.7	5.7	0.29	1.8	3.6	33347
Taiwan	6	1981-2005	20.3	13.4	13.3	10.3	6.5	0.53	2.8	5.6	16800
United Kingdom	8	1979-2010	22.8	24.4	10.7	15.7	7.0	0.26	2.4	4.0	26663
United States	8	1979-2010	17.7	29.8	7.4	19.0	8.5	0.39	2.8	5.1	36034

Infant mortality

In Table 2, we report the results of a series of regressions with logged 2-year average infant mortality rates as the dependent variable. The parameter estimates for girls and boys were almost identical; accordingly we have presented sex-specific results for adults only.

Model 1A included relative child poverty and 1B included fixed child poverty, whereas Model 1C included both. As seen in Model 1C, the estimate for the relative poverty rate was somewhat attenuated when the fixed poverty rate was adjusted for, while the fixed poverty estimate was not affected by mutual adjustment. Both were significant, although the size of the estimate was somewhat larger for relative than for fixed poverty. In terms of size, the following interpretation can be provided: Model 1A indicated that a one percentage point increase in the relative child poverty rate corresponded to a 1.5% increase in the infant mortality rate, whereas Model 1B indicated a one percentage point increase in the fixed child poverty rate corresponded to a 0.7% increase in infant mortality rate. GDP and fixed poverty rates are highly correlated, and it is therefore not surprising that when GDP was included in the model (Model 2), the fixed poverty estimate dropped to nearly 0. On the other hand, the relative poverty estimate remained roughly the same when GDP was added to the model.

Table 2. Associations between logged infant (aged <1) mortality rates and explanatory factors[a]. Results of pooled cross-sectional time series analyses for all 30 countries in the data, between 1978 and 2010. Standard errors in parenthesis N (observations): 149

	Model 1			Model 2	Model 3
	A	B	C		
Relative child poverty rate (%)[b]	0.015 (0.004)		0.009 (0.003)	0.011 (0.003)	0.008 (0.006)
Fixed child poverty rate (%)[c]		0.007 (0.001)	0.007 (0.001)	0.001 (0.002)	0.002 (0.002)
Wave[d]	-0.187 (0.012)	-0.165 (0.010)	-0.175 (0.011)	-0.143 (0.014)	-0.141 (0.017)
Gross domestic product per capita (logged)				-0.442 (0.107)	-0.411 (0.125)
Welfare regime (ref. Nordic)					
Central European					0.178 (0.053)
Liberal					0.149 (0.116)
South European					-0.079 (0.086)
Post-socialist					0.057 (0.109)
Other					0.103 (0.153)
Constant	2.369 (0.079)	2.354 (0.046)	2.238 (0.066)	6.694 (1.053)	6.284 (1.240)

[a] When outcomes are transformed to the logarithmic scale, coefficients can be interpreted as percent change after exponentiating the coefficient.
[b] Headcount ratio at 60% of median income.
[c] Headcount ratio at US poverty line, adapted to national currencies using purchasing power parities.
[d] Time measure, 3 to 5 year intervals from 1980 to 2010.

Earlier research has shown that poverty rates are strongly associated with regime types (Bäckman 2009; Fouarge and Layte 2005; Fritzell and Ritakallio 2010). The Nordic (reference category in the analysis) and Southern European regime types clearly had the lowest infant mortality risks. The non-significant estimate for post-socialist countries compared to the reference category (the Nordic countries) might look surprising. One should here remember that we control for the high poverty rates and low GDP per capita in the post-socialist countries. Still, it is evident that many factors other than GDP and poverty are of importance to differences between regimes.

Child mortality

In Table 3 we report the results of a series of regressions with age-standardized child mortality rates as the dependent variable.

Table 3. Associations between logged age-standardized child (aged 1–17) mortality rates and explanatory factors[a]. Results of pooled cross-sectional time series analyses for all 30 countries in the data, between 1978 and 2010. Standard errors in parenthesis, N (observations): 149

		Model 1		Model 2	Model 3
	A	B	C		
Relative child poverty rate (%)[b]	0.013 (0.002)		0.007 (0.002)	0.010 (0.001)	0.014 (0.003)
Fixed child poverty rate (%)[c]		0.004 (0.001)	0.003 (0.001)	-0.001 (0.001)	-0.003 (0.002)
Wave[d]	-0.142 (0.009)	-0.126 (0.009)	-0.135 (0.009)	-0.110 (0.012)	-0.133 (0.012)
Gross domestic product per capita (logged)				-0.340 (0.114)	-0.215 (0.122)
Welfare regime (ref. Nordic)					
Central European					0.069 (0.048)
Liberal					0.013 (0.066)
South European					-0.044 (0.089)
Post-socialist					0.355 (0.096)
Other					0.440 (0.170)
Constant	-0.810 (0.043)	-0.766 (0.042)	-0.834 (0.046)	2.537 (1.140)	1.277 (1.240)

[a] When outcomes are transformed to the logarithmic scale, coefficients can be interpreted as percent change after exponentiating the coefficient.
[b] Headcount ratio at 60% of median income.
[c] Headcount ratio at US poverty line, adapted to national currencies using purchasing power parities.
[d] Time measure, 3 to 5 year intervals from 1980 to 2010.

The results of the first 3 parts of Model 1 regarding child mortality are quite similar to those found for infant mortality. The estimates are considerably larger for relative poverty than for fixed poverty. However, the simultaneous inclusion of the two poverty variables attenuated the relative poverty estimate, whereas the fixed poverty estimate remained about the same. The inclusion of GDP (Model 2) had a strong impact on the fixed poverty estimate but did not strongly affect the relationship between relative poverty and mortality. If anything, the association became stronger. In the final model including regime types, the relative poverty estimate actually increased. Notably, the regime coefficients indicated that the large advantage the Nordic cluster held among infants was not seen among children, at least not in comparison to countries belonging to Central European and Liberal regime types. The disadvantage of the post-socialist countries and the regime type "other"

was, on the other hand, more evident even though we controlled for differences in poverty and GDP.

Adult mortality

The results for adult women and men are shown in Table 4. Once again, we found interesting shifts in the importance of relative and fixed poverty in the various models. Moreover, the rank order of regimes was clearly different in adults than in children.

The first model showed that fixed poverty had an impact on mortality in both women and men. The size of the estimate was roughly halved after adjustment for GDP (Model 2). This held true for both sexes, although the estimate in the crude model was much larger for men. After inclusion of regime type, however, the relationship between fixed poverty and mortality disappeared. The inclusion of regime type had a totally different impact on the relative poverty estimates. Whereas relative poverty made only a meagre contribution to mortality in the first models, it made a significant and strong contribution to mortality in both women and (especially) men in the final model.

Finally, with regard to the regime variable, it is notable that the Nordic cluster had a significant advantage over only the post-socialist cluster. The Southern European cluster clearly outperformed all the other regimes types, which is in line with earlier research showing that life expectancy in several of the Southern European countries is among the highest in Europe and worldwide. We also know that these countries are less favorably ranked when it comes to poverty rates. In a sense, the regime variable captures and highlights whatever it is that is specifically health-promoting in these countries, and the resulting estimate of the association between mortality and poverty is thereby adjusted for that regime-specific factor or factors. For men in particular, we noted that the former socialist bloc of countries preformed extremely poorly, even after controlling for their GDP and absolute and relative poverty rates.

Table 4. Associations between logged age-standardized mortality rates and explanatory factors among women and men aged 20–64[a]. Results of pooled cross-sectional time series analyses for all 30 countries in the data, between 1978 and 2010. Standard errors in parenthesis, N (observations): 149

	Model 1			Model 2	Model 3
	A	B	C		
Women					
Relative adult poverty rate (%)[b]	0.008 (0.008)		0.000 (0.003)	0.001 (0.002)	0.012 (0.005)
Fixed adult poverty rate (%)[c]		0.006 (0.001)	0.006 (0.001)	0.003 (0.001)	0.000 (0.001)
Wave[d]	-0.069 (0.010)	-0.059 (0.005)	-0.059 (0.005)	-0.042 (0.007)	-0.052 (0.009)
Gross domestic product per capita (logged)				-0.256 (0.065)	-0.290 (0.076)
Welfare regime (ref. Nordic)					
Central European					-0.044 (0.039)
Liberal					-0.014 (0.054)
South European					-0.413 (0.063)
Post-socialist					0.116 (0.076)
Other					-0.030 (0.112)
Constant	1.029 (0.071)	0.937 (0.029)	0.934 (0.042)	3.513 (0.660)	3.826 (0.765)
Men					
Relative adult poverty rate (%)[b]	0.007 (0.011)		-0.014 (0.007)	-0.013 (0.006)	0.022 (0.008)
Fixed adult poverty rate (%)[c]		0.010 (0.002)	0.010 (0.002)	0.004 (0.002)	-0.003 (0.001)
Wave[d]	-0.073 (0.013)	-0.060 (0.006)	-0.052 (0.008)	-0.019 (0.012)	-0.063 (0.011)
Gross domestic product per capita (logged)				-0.459 (0.119)	-0.461 (0.094)
Welfare regime (ref. Nordic)					
Central European					-0.004 (0.031)
Liberal					-0.184 (0.054)
South European					-0.280 (0.059)
Post-socialist					0.470 (0.083)
Other					-0.143 (0.087)
Constant	1.818 (0.117)	1.610 (0.058)	1.751 (0.100)	6.324 (1.153)	6.218 (0.920)

[a] When outcomes are transformed to the logarithmic scale, coefficients can be interpreted as percent change after exponentiating the coefficient.
[b] Headcount ratio at 60% of median income.
[c] Headcount ratio at US poverty line, adapted to national currencies using purchasing power parities.
[d] Time measure, 3 to 5 year intervals from 1980 to 2010.

Sensitivity analyses

It is particularly difficult to get an accurate picture of the prevalence of poverty, or income more generally, among young adults (Björklund 1993). We therefore reran all analyses for adults excluding those below 25 years of age in our poverty calculations. The results changed only marginally. A second type of sensitivity test referred to relative poverty. We reran all

regressions with relative poverty rates calculated from 40% and 50% instead of 60% of the median income. The directions and levels of significance of the estimates were very similar to those found in the original analyses, but the effect sizes of relative poverty were stronger for infants and children than those found in the original analyses. In other words, use of the 60% poverty threshold, as in the main analyses, can be regarded as a conservative strategy.

Even though we pooled the cross-sectional and time-series data to increase the number of observations, the results could have been strongly be influenced by the data on a single country. To check for influential cases we applied a sort of jackknife procedure, in which we in turn excluded each country. Countries most influential for the poverty estimates were Israel, Mexico, Russia and Slovenia. Although the sizes of the estimates were altered, the general direction and interpretation of the estimates remained. In summary, we find our results to be robust for a number of tests.

DISCUSSION

Earlier research suggests that in affluent countries, the level of relative poverty seems important for mortality (Fritzell et al. 2013). In this study, in addition to relative poverty, we used a fixed poverty rate – the American poverty threshold – to examine the association between poverty and mortality. We were particularly interested in whether or not the importance of relative poverty would remain after adjustment for fixed poverty.

In summary, our main findings concerning the two indicators of poverty (separating infants, children, and adults) are as follows: in infants, we found that after adjustment for GDP, the estimate of the association between fixed poverty and mortality approached zero. On the other hand, the estimate of the association between relative poverty and mortality changed only marginally after adjustment for GDP. The pattern of associations in the models of child mortality was similar to the pattern in the models of infant mortality.

The stronger association between relative poverty and mortality than fixed poverty and mortality was visible in the crude models, and the difference increased in magnitude after adjustment for GDP, and again after adjustment for welfare regime type. For adults, we found a positive and significant association between relative poverty rates and mortality rates only in the final model, in which we included GDP and welfare regime type, a somewhat surprising finding but one that closely resembles earlier findings. It seems that by adjusting for regime type, we managed to adjust for unobserved confounding country characteristics, and when these fixed effects were taken into account, the association between relative poverty and mortality appeared. The fixed poverty rate was more strongly associated with mortality risk in adults than in children; the estimate attenuated by about half after adjustment for GDP and even more after welfare regime type was taken into account.

In line with earlier findings, we also noted that strong regime differences exist (Fritzell et al. 2013). In some cases, these differences became even more evident after taking GDP and relative and fixed poverty into consideration. Furthermore, these differences between regime types also vary widely between infants, children, and adults. The outcomes are particularly negative in children and adults (but not infants) in post-socialist countries; the most obvious positive exception for adults was the cluster of Southern European countries.

Our study has not directed attention to why poverty affects mortality and health. Our finding that relative poverty is of importance may, to some, suggest that psychosocial stress mechanisms are at work rather than material factors (Lynch et al. 2000). However, we would rather state that many psychosocial and material factors work in a causal chain perspective in which psychosocial processes have a material base (Fritzell et al. 2007). Several such processes maybe at work, such as the sense of relative deprivation due to social comparisons (Kondo et al. 2008). Furthermore, more direct effects in which poverty reduces cognitive performance has recently been suggested (Mani et al. 2013).

As mentioned earlier, the effects of poverty levels on mortality may be modified by various country-level factors. While not shown in this study, it is close at hand to attribute such factors to health care and social service systems: in a well-functioning care system, the consequences of poverty on health may not be as harsh as in less well functioning systems (Nelson & Fritzell 2014). It is beyond the scope of this study to examine to which extent health care systems may modify the relationship between poverty and mortality. However, it is important to note that our welfare state regime variable captures all system-specific effects that are common to each regime type.

In Europe, there is presently a heated debate about relative and absolute poverty. To what extent should our prime and even sole focus be on absolute misery and despair rather than on relative differences in standards of living? This discussion partly concerns measurements of poverty within countries but has obvious implications for between-country differences. Should we focus solely on increasing growth, and as a possible side effect, diminishing absolute poverty, or should we also be concerned with growing inequalities within countries and with relative poverty rates? To the extent that we agree that risk of death is important, our findings suggest that relative poverty rates matter.

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