

Ties between Health Policy, Early Health Problems, and Lifetime Earnings

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Extant literature indicates that early-life health affects later labor market outcomes such as earnings and work effort. We examine whether this holds for multiple dimensions of health and regardless of a country's health care system. We ask whether mental and physical health problems and poor general health by age 15 have similar or different influences on lifetime earnings. We then ask whether the health care system influenced the estimated effects of early health problems on lifetime earnings. We expect that early health problems reduce earnings and that the most generous system is tied to the least negative long-term effects.

Keywords: early-life health, lifetime earnings, health care system

JEL classification: D 10, H 51, I 14, J 2

1. Introduction

Disparities in health and their effects on well-being, including labor market earnings, are a topic of considerable interest across the world. Some of these effects may start early in life, as extant literature has demonstrated that early-life health has long-lasting effects on labor market outcomes later in life, such as earnings and work effort (Almond and Currie, 2011). But does this hold for multiple dimensions of health and does this hold regardless of the health care system in a country? In this paper, we attempt to shed light on these questions. In particular, we start with the question of whether three separate dimensions of health (mental health problems, physical health problems, and poor general health) by age 15 have similar or different influences on lifetime earnings; second, we ask if they are sizeable. Our main focus is to ask whether the estimated effects of early health problems on lifetime earnings are influenced by the health care system in which the child lived. Our expectation is

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that earnings are reduced by early health problems, especially mental health problems, and that the system does make a difference, with the most generous system tied to the smallest long-term negative effects. However, given the limited treatment for mental health problems at the time our survey participants were young, our expectation is that policy differences will not play as great a role in influencing earnings outcomes tied to early mental health problems.

2. Prior Literature

Much of the work tying early-life health problems to labor market outcomes of adults focuses on a single age later in life and typically reports a positive association between childhood healthiness and labor market outcomes such as employment, earnings, and occupation (Case et al., 2005; Case and Paxson, 2008; Flores and Kalwij, 2014). A few studies use a comparison among siblings to account for unobserved family and neighborhood effects; usually their results are robust to a fixed effects (FE) approach (Black et al., 2007; Fletcher, 2014; Delaney and Smith, 2012; Smith, 2009a). Other studies have used very specific exogenous events around birth such as pandemics and famines, and found that the experience of such health shocks reduced earnings in mid-adulthood (Almond, 2006), but only to a limited extent in early adulthood (Chen and Zhou, 2007), or at the end of working life (Nelson, 2010). Flores et al. (2015) use retrospective and prospective data from the Survey of Health Aging and Retirement in Europe (SHARE) to investigate the association of childhood health and socioeconomic status (SES; education, employment, and income) with labor market outcomes over men's and women's entire life cycle in thirteen European countries. They find a long-term association between childhood health and both average annual earnings and lifetime earnings.

Previous studies have illustrated the multidimensional nature of health (Kalwij and Vermeulen, 2008) and have shown that both childhood-specific diseases and childhood health summary variables contain useful information about adult health (Smith, 2009b). Goodman et al. (2011) use prospectively collected data from the British National Child Development Study (NCDS) to assess the long-term effects of childhood psychological and physical health problems on economic outcomes at ages 23, 33, 42, and 50 years. They find that childhood psychological problems are associated with about 15 % lower hourly wages from early adulthood into middle age. For family income, they also show that the associations with psychological conditions are substantially larger than the ones estimated for suffering from physical health conditions during childhood. Smith (2009a) uses a subsample of U.S. siblings from the Panel Survey of Income Dynamics (PSID) aged 25–47 in 1999 to estimate the associations of childhood self-reported health (SRH) status on an individ-

ual's initial level of annual earnings at age 25 and its average growth between age 25 and age as of 1999. He finds that about 50 % of the overall effect of poor general health was present by age 25, while the remaining 50 % is the consequence of differential individual income growth after age 25.¹ The oldest individuals in his sample are still relatively young from a perspective of lifetime earnings (namely, 47 years old). A follow-up study using data from 2005 (Smith and Smith, 2010) suggests about a 30-percentage point difference in log family income in 2005 for those with psychological problems as a child, with little difference in estimates using siblings and FE or OLS (consistent with Fletcher and others as noted above).

A major issue with studying the long-term influence of early health conditions on lifetime earnings and other outcomes is the data requirements. As pointed out by Smith (2009b), there are limited options for creating such data: (1) collect data prospectively such as existing cohort studies that begin at birth or close to birth, but here the wait is very long; (2) link survey and administrative data, but this is especially problematic on the health side; or (3) collect information retrospectively, especially early health history. With the last option, the issue is accuracy including a fear of coloring bias. Smith explores the question of accuracy in his 2009 *Demography* article (2009b). Smith collected retrospective data from respondents to the U.S.-based Health and Retirement Study, HRS, and from the Panel Study of Income Dynamics (PSID). The HRS is a panel survey of those aged 50 and over at the initial survey. Smith asked whether respondents had had any of a long list of childhood illnesses before age 17. For those who replied yes, he then employed a "set of markers used in the Calendar Life History (CLH) in order to gather additional early health data. The specific markers included house moves, marital events of parents, and date of entry into different levels of schooling before age 17" (Smith, 2009b, p. 391). Smith then used the best past data on prevalence he could find to validate the retrospective data from those in the HRS and those aged 50-plus in the PSID. He found the prevalence rate for all three categories of disease he created to be very close, providing one type of evidence on the accuracy of recall data. He also conducted a retest seven years later of the same HRS sample and found high rates of consistency (95 % for hypertension, 93 % for diabetes, 96 % for cancer, and so on). The self-rated health scale had slightly less robust responses in the retest; a comparison of 1998 responses to 2005 or 2007 found that 60 % gave the same response, 33 % were one point apart on the five-point scale, while 6 % were 2 points apart. Of the cases that differed,

1 Interestingly, when unobserved family effects are controlled for (using within-siblings estimates), the estimate of childhood SRH on post-age 25 individual income growth is substantially larger, which Smith attributes to a diminishing role of measurement error due to reporting bias in childhood SRH.

about the same percentage showed improvements as declines. Additional exploration that made use of the incidence of new health issues over the period between waves did *not* find a link between the direction of change in the responses and onset of illnesses, *neither* between the onset of later life minor and major illnesses and changes in self-reported childhood health (Smith, 2009a). Smith summarizes his research on this by saying that “recalled information of health conditions during childhood appears to be a quite useful tool that can be readily added to important demographic and health surveys” (Smith, 2009b, p. 401). We agree and are pleased that on the basis of this work by Smith, similar questions were added to SHARE, which we are able to use in the research reported below.

3. Data

Based on the extant literature, we explore the influence that separate dimensions of early-life health such as the experience of a significant mental, physical, or general health problem have on future earnings over the entire working life. Our measures of health problems are retrospective, consistent with the Smith approach, while our measure of earnings, although mainly retrospective, is also based on answers to an ongoing panel data survey.

We use individual-level data from the first three waves of SHARE, a multidisciplinary and representative cross-national panel of the European population aged 50-plus. Waves 1 (2004/05) and 2 (2006/07) include information on sociodemographic background characteristics, current health, and socioeconomic status, as well as expectations of retirement age.² Most of our data are from the third wave, SHARELIFE (2008/09), which is a retrospective survey conducted in 13 European countries as part of the SHARE project. It contains retrospective information on the early life circumstances and work careers of about 75 % of the individuals who participated in Waves 1 or 2. Additionally, about 78 % of the individuals who participated in SHARELIFE are also included in Wave 4. Our analysis focuses on men. We do not study women since their labor force participation and earnings may differ for reasons that go beyond health, including maternity, childcare, etc. Descriptive statistics on our sample are in table 1 and include, amongst others, all the right-hand side variables we employ below.

We use our respondent’s country of childhood and a four-way system to characterize the health care systems they lived in as children based on descrip-

² Currently, more waves of SHARE data are available, but only the first three waves contain information on (net) wages. However, we also use Wave 4 data to update and replace missing values for expectations with regard to retirement age for individuals who participated in Waves 1 to 3.

Table 1
Sample Means of EXPLANATORY VARIABLES for Europe and Health Care System During Respondent's Childhood^a

	Europe	Full coverage	Considerable cost sharing	Less than full coverage	Socialist
<i>Childhood health variables (0–15 years)^b</i>					
Emotional problems, epilepsy or depression 2+ weeks (0–1) (<i>Mental</i>)	0.015	0.024	0.018	0.009	0.014
Poor self-reported health (0–1) (<i>Poor</i>)	0.019	0.018	0.027	0.014	0.016
Physical health index (worst 2 percentiles) (0–1) (<i>Physical</i>)	0.020	0.022	0.025	0.017	0.016
<i>Other childhood health and SES variables</i>					
Severe headaches or migraines when 0–15 years (0–1)	0.028	0.048	0.036	0.018	0.018
Rooms per person when 10 years old ^c	0.730	0.857	0.885	0.630	0.526
Number of books at home when 10 years old (1–5) ^d	2.101	2.740	2.193	1.713	2.165
Main breadwinner's occupation (in ISCO-88 skill levels) when 10 years old (0–4) ^e	1.971	2.139	1.966	1.883	2.012
Number of facilities at home when 10 years old (0–5) ^f	2.037	3.185	2.228	1.584	1.539
Born in an urban area (0–1)	0.370	0.452	0.334	0.400	0.289
No usual source of care when 0–15 years (0–1)	0.052	0.037	0.030	0.069	0.073
<i>Other control variables</i>					
Age (in years)	62.72	62.73	62.40	62.78	63.20
<i>Mediating factors</i>					
Education level ISCED 0–1 ^g	0.244	0.201	0.148	0.383	0.162
Education level ISCED 2 ^g	0.168	0.096	0.134	0.214	0.207
Education level ISCED 3–4 ^g	0.358	0.390	0.444	0.231	0.445
Education level ISCED 5–6 ^g	0.229	0.314	0.274	0.172	0.186
Years in full-time education	12.61	14.53	13.92	10.26	13.44
Ever married (0–1)	0.940	0.926	0.942	0.939	0.951
Years married since first marriage (Fraction)	0.903	0.857	0.895	0.922	0.920
1+ periods of ill health in adulthood (0–1)	0.195	0.186	0.154	0.204	0.265
2+ periods of ill health in adulthood (0–1)	0.053	0.049	0.039	0.055	0.080
Retired due to own ill health (0–1) ^g	0.124	0.155	0.127	0.109	0.122
N	9,199	1,472	2,907	3,355	1,465

Note: ^a This table depicts the final sample of all men. The first three rows show childhood mental, physical, and self-reported health.

^b Differences across coverage systems are statistically significant at 5% level of significance for Mental and Poor, but not for Physical.

^c The number of rooms includes bedrooms, but exclude kitchen, bathrooms, and hallways.

^d 1 = none or very few (0–10 books), 2 = enough to fill one shelf (11–25 books), 3 = enough to fill one bookcase (26–100 books), 4 = enough to fill two bookcases (101–200 books), 5 = enough to fill two or more bookcases (> 200 books).

^e 0 = armed forces or no main breadwinner, 1 = first skill level, 2 = second skill level, 3 = third skill level, 4 = fourth skill level.

^f Includes fixed bath, cold and hot running water supply, inside toilet, and central heating.

^g Overall sample size for "Education level" and "Retired due to own ill health" is 9,142 and 5,525 observations, respectively.

tions in the U.S. Social Security Administration's Office of Policy (2002). These four groupings are: full coverage; considerable use of co-payments; limited coverage; and Socialist (full coverage but limited care). Table 2 shows the country of childhood of our respondents by these four groups. Countries with health care systems with full coverage in our data include Sweden, Denmark, and United Kingdom. Those with considerable cost sharing include Austria, Belgium, (West) Germany, Finland, France³, Norway, and Switzerland. The countries with less than full coverage include Greece, Italy, Netherlands, Portugal, and Spain, and finally the countries in our sample with full coverage but limited care (Socialist at the time our sample members were children) include Czechoslovakia, Hungary, Poland, East Germany, and Russia. Because France has attempted to move to a Beveridge system, albeit unsuccessfully, and has characteristics that overlap with such a system that would reduce cost-sharing, we also do a sensitivity test excluding those who grew up in France. In addition, in this sensitivity test we exclude those who grew up in Greece, since as of 1983 there was an expansion of coverage that would change their group (see WHO, 1996).

The sample sizes, with a brief description of the health care system by country, are presented in table 2. Descriptive statistics of all the right-hand-side variables by health care system are given in table 1.

3.1. Measures of Childhood Health

In this research, we use retrospective data on general, physical, and mental health that refer to the period before an individual attained 16 years of age. This categorization is fairly typical in studies of health status: physical health is based on reports of experiencing a set of illnesses that are primarily physical in nature; mental health is based on a set of severe mental illnesses; and general health is based on a more subjective overall assessment of general health (cf. Smith, 2009b). The general measure is commonly used in economic analysis including studies on the income gradient in health (see, for example, Case et al., 2002). We create one measure of general health, one of physical health, and one of mental health. Our general health measure is based on the commonly used self-reported five-point scale, with *excellent* being the highest and *poor* the lowest category of health. From this we select those who report poor health as our *general health* measure. For physical health we ran a polychoric Principal Component Analysis (PCA) using count variables for respiratory

3 Although France has regulated fees that determine insurance reimbursement, providers often charge more (excess charging). Patients pay for outpatient care and then are reimbursed. The average amount coverage paid in the late 1990s was 75 % for doctor visits but 90.2 % for hospital care (Sandier et al., 2004).

Table 2
Distribution of RESPONDENTS in Final Sample by COUNTRY OF ORIGIN with Description of HEALTH CARE COVERAGE

	Full coverage		Considerable cost sharing		Less than full coverage		Socialist	Total	% pop. covered 1960-61 (OECD)	Description for SSA 2002 social security programs, Europe 2002
	0	670	0	301	0	830				
Czechoslovakia	0	670	0	0	0	830	0	637	100	1956 cash sickness benefit; 1994 public health coverage
Finland	0	0	11	0	0	0	0	11	55	Reimbursed partly, so cost sharing since 1963.
Hungary	0	0	0	0	0	0	6	6	-	Public health service
Austria	0	0	301	0	0	0	0	301	78	Cost sharing. Current law since 1955.
Sweden	670	0	0	0	0	0	0	670	100	Some co-pays since 1962.
Netherlands	0	0	0	0	830	0	0	830	71	No co-pays for those included 1964. Higher income separate
Spain	0	0	0	670	0	0	0	670	54	Few co-pays since 1994, but similar before.
Italy	0	0	0	988	0	0	0	988	87	Co-pay drugs.
France	0	0	676	0	0	0	0	676	76	Few co-pays since 1978, but similar since 1943.
Denmark	796	0	0	0	0	0	0	796	95	Reimbursed partly with co-pays since 1945; changes in 1967.
Greece	0	0	0	854	0	0	0	854	44	Few co-pays since 1971 with limited choice of provider.
Switzerland	0	0	440	0	0	0	0	440	74	Few co-pays since 1951 and 1984 except on drugs.
Russia	0	0	0	0	0	0	23	23	-	Sizeable co-pays since 1996.
Belgium	0	0	979	0	0	0	0	979	59	No co-pays since 1991. OOP for specialists.
Norway	0	0	3	0	0	0	0	3	100	Co-pays since 1994, but similar since 1894.
Poland	0	0	0	0	0	0	609	609	-	Co-pays since 1997, but similar since 1907.
Portugal	0	0	0	13	0	0	0	13	19	Ceiling on OOP.
United Kingdom	6	0	0	0	0	0	0	6	100	No copays as of 1974, but added in 1999.
West Germany	0	0	497	0	0	0	0	497	-	No co-pays since 1988/90, but similar since 1935.
East Germany	0	0	0	0	0	0	190	190	-	Co-pays drugs since 1977, but similar since 1911.
Total	1472	2907	2907	3355	0	0	1465	9199	-	Co-pays with exceptions. From 1949 to 1989, co-pays since 1989.

Note: US Social Security Administration, Office of Policy (2002), Social Security Programs Throughout the World: Europe.

problems (asthma, other respiratory problems and allergies); infectious diseases (polio, severe diarrhea, meningitis/encephalitis, appendicitis, and other infectious diseases); cardiovascular diseases (diabetes or high blood sugar and heart troubles); disorders of the sense organs (chronic ear problems, speech impairment, and difficulty in seeing even with eyeglasses); and other serious health conditions an individual suffered before age 16. Using the first principal component, we create a dummy variable indicating whether an individual is in the bottom or worst two percentiles. This is our index of *childhood physical health*. Our measure of *mental health* is based on responses to questions of whether the individuals experienced emotional, nervous, or psychiatric problems, or epilepsy fits or seizures, or symptoms of depression that lasted at least 2 weeks before age 16.⁴

The frequency of these conditions and the other explanatory variables that we include in our empirical analysis are reported in table 1. In particular, we include various indicators of childhood socioeconomic status (SES) to proxy for parental cultural background (the variable: *number of books at home when 10 years old*); parental occupation (the variable: *main breadwinner's occupation when 10 years old*, in ISCO-88 skill levels); and the household's financial status (the variables: *rooms per person* and *number of facilities at home when 10 years old*). Regarding the parents' financial status dimension, Cavapozzi et al. (2011) show that our variable number of rooms per person in the household is strongly and positively correlated (0.82) with the OECD average disposable income of households with children aged 0–17 and thus serves as “a sound indicator of parental financial status during childhood years” (Cavapozzi et al., 2011, p. 32).⁵

The percentage of the population with each of the three health measures is similar. The three measures of health are largely independent. The correlations between any two of them overall and for each group of countries by health care system are quite low (see table 7). It is worth remembering that one of our main interests in this paper is to compare the relative effects/associations of multiple childhood health measures. As far as we know, there is no exogenous variation that can be used to identify the separate causal effects of childhood physical, mental, and general health. Nevertheless, from a policy perspective (e.g., for the design of prevention policies), it is of crucial importance to gain insight into which of them is most harmful in terms of, for example, the lifetime earnings that an individual accumulates over his working life.

- 4 We also have information on severe headaches or migraines. Since it is not clear whether to call these physical or mental health, we instead control for whether an individual reports she had severe headaches or migraines when aged 0–15 years in our regression estimates.
- 5 The facilities variable includes fixed bath, cold and hot running water supply, inside toilet, and central heating and is meant to serve as an additional proxy for the household's financial situation.

3.2. Outcome Variable: Lifetime Earnings

We create a measure of lifetime earnings or compounded labor income as described in Alessie et al. (2013) and Flores et al. (2015). Briefly, this measure uses the first monthly wage on each job, the last monthly wage on the main job, as well as the current wage from Waves 1–3.⁶ All countries' monetary values are converted to 2006 Euros following the procedure explained in Trevisan et al. (2011). We use a compound real interest rate, $r = 2\%$ (Haider and Solon, 2006). For future labor income (from W3 interview to retirement, R) we use weighted survival probabilities from country- and sex-specific 2009 period life tables from Eurostat.⁷ More accurately, we use $L_{0t} = \sum_{\tau=1}^t (1+r)^{t-\tau} E_{\tau}$ to estimate the compounded labor income if the individual is retired at age t – where E_{τ} are annual earnings from employment at age τ – and $L_{1t} = \sum_{\tau=t+1}^R (1+r)^{t-\tau} E_{\tau}$ to estimate future income, where we assume that future real annual earnings remain constant ($E_{\tau} = E_t, \tau = t+1, \dots, R$). Table 3 below shows sample means and medians of lifetime earnings for Europe and the different health care systems when using our final estimation sample (columns 1) and when restricting the sample to individuals with positive working years (columns 2). The overall mean lifetime earnings for our sample is 1,263,112 Euro (€). The mean is highest in the countries with considerable cost sharing, followed in order by those in countries with full coverage, less than full coverage, and finally Socialist. We note, though, that the calculations are based on country of childhood rather than current country of residence. For the majority of our sample (over 90%), these two locations are the same.

Table 3

Sample Means and Medians of LIFETIME EARNINGS (LTE) for European Men by Health Care Systems During Childhood

	Europe		Full coverage		Considerable cost sharing		Less than full coverage		Socialist	
	Final sample (1)	LTE > 0 (2)	Final sample (1)	LTE > 0 (2)	Final sample (1)	LTE > 0 (2)	Final sample (1)	LTE > 0 (2)	Final sample (1)	LTE > 0 (2)
Sample mean	1,263,112	1,278,680	1,265,740	1,269,189	1,598,515	1,609,032	1,197,398	1,223,658	745,423	754,174
Sample median	939,636	948,932	1,044,144	1,046,160	1,249,256	1,255,415	882,067	892,441	485,292	489,632
N	9,199	9,087	1,472	1,468	2,907	2,888	3,355	3,283	1,465	1,448

Note: The table shows sample median and mean values for lifetime earnings, as well as sample sizes (N) for Europe and by health care system. All amounts are discounted and in purchasing power parity (PPP)-adjusted German Euros of 2006.

⁶ The retrospective data on wages are taken from the retrospective SHARE Job Episodes Panel Data (Brugiavini et al., 2013.)

⁷ We use within-period survival probabilities, i.e., between age t and $t+1$, and allow these to vary across country, gender, and age. We assume the survival probabilities remain constant after 2009.

4. Results

When addressing our first question on the tie between our three health dimensions and lifetime earnings, we find strong negative ties between all three early health dimensions and lifetime earnings (see table 4). In terms of particular health problems, we find that poor general health and mental health have stronger negative ties to lifetime earnings than physical health. The strong tie to mental health, which we hypothesized above, implies that a male who suffers from such problems during childhood is estimated to earn up to 202,606–243,094 Euros less income during his working life compared to those who do not suffer from such issues. Somewhat unexpectedly, the point estimates of poor general health suggest even stronger ties with estimates of 217,835–256,420 lower lifetime earnings than those men who do not report poor general health during ages 0–15.⁸ These values are about 5 % greater than those for mental health conditions. For childhood physical health, the estimates suggest a range of 132,069–167,832 Euros less, on average, than those without physical health problems, a considerably smaller penalty than for those who experienced a mental health condition or overall poor health. The estimates for physical health are not statistically significant at standard levels. The penalties we estimated for general poor health and mental health problems are approximately one and a half times as large as those for physical health. Thus, it appears that the type of early health problem is relevant for estimating the expected earnings penalty due to an early health condition. The big difference appears to be the smaller expected influence of physical health problems compared to poor general health and mental health.⁹

The strong negative ties between lifetime earnings and both childhood mental health problems and childhood general poor health are consistent with prior research (Goodman et al., 2011; Smith, 2009a) and show that these conditions are likely to lead to lower earnings, possibly due to lower productivity. The lower productivity might be tied to continuing health effects of early health problems, leading to poorer health as an adult. The links could also be tied to early health problems leading to fewer years of schooling, poorer performance in school, or alternatively might represent discrimination, with poten-

⁸ These results are from regressions that either include only the single health measure or include all three health measures. They also include severe headaches (with a negative but insignificant coefficient), various measures of childhood SES, and whether the individual was born in an urban area, in addition to dummy variables for birth year and country at the time of the SHARELIFE interview.

⁹ In the case of physical health, we conducted a sensitivity analysis and included a larger share of individuals in our physical health index, namely those who were at least one standard deviation below the mean (approximately 17 % of the sample). We found that estimating with a larger share of individuals with less severe physical health problems results in smaller negative effects on lifetime earnings (see appendix table 8).

Table 4*Estimates of EARLY HEALTH PROBLEMS on the LIFETIME EARNINGS of Men in Europe*

	(1)	(2)	(3)	(4)
Mental	−202606** (80053)	−243094*** (79305)		
Physical	−132069 (128940)		−167832 (126901)	
Poor	−217835*** (63974)			−256420*** (60952)
R-squared	0.075	0.074	0.074	0.074
Observations	9199	9199	9199	9199

Note: OLS estimates for mental health problems, physical health problems, and poor self-reported health prior to age 16 obtained from estimating linear models on the lifetime earnings (see table 3) of men. All models include all other variables listed in table 1, except age and the mediating factors, plus country dummies and birth-year dummies. Robust standard errors in parentheses. Significance levels: *** $p < 0.01$ ** $p < 0.05$ * $p < 0.10$.

tially negative effects also in the marriage market (Smith, 2009a). In the next analysis we explore the likelihood of several factors that might account for the general pattern of lower earnings of those with each of the three early health problems.

Education, marital status, and health in adulthood can mediate the associations between childhood health and labor market earnings. Table 5 analyzes the associations of general, physical, and mental health problems during childhood with education (years in full-time education and four broad categories of education), marital status (ever being married and duration of marriage), and health through the life cycle (having 1+ or 2+ periods of ill health during adulthood, and retired due to own ill health). Regarding education, only for poor general health do we find evidence of a significant negative association with years in full-time education (column 1). The coefficient suggests a year less education for those with poor health before age 16. Consistent with this finding, the estimates suggest that those with poor health are more likely to have achieved ISCED levels 0–1 (column 2a) and 2 (column 2b) and less likely to have achieved ISCED levels 3–4 (column 2c) and 5–6 (column 2d).¹⁰ There is no association between either of our other two health indicators and education. Thus on the basis of this analysis, with the exception of poor gen-

¹⁰ We use four levels of education defined from the 1997 International Standard Classification of Education (UNESCO, 1997): no education or primary education (ISCED 0–1), lower secondary education (ISCED 2), upper secondary and postsecondary nontertiary education (ISCED 3–4), and tertiary education (ISCED 5–6).

eral health, we do not have evidence that the mediating factor behind lower earnings is less schooling.

For marital status, we find that men who experienced mental or general health problems as children are less likely to have ever been married with the largest association found among those with mental health problems, who are slightly more than 9 % less likely to have ever married than those without mental health problems (column 3). Among those with early mental health problems or early poor health who do marry, the results show that their duration of marriage, as captured by years married since first year of marriage, is also below those of their peers without these health problems (column 4).

Finally, regarding life cycle health, individuals with mental, physical, or general health problems are all more likely to experience at least one episode of ill health during adulthood (column 5). In addition, those with mental health problems or poor general health during childhood are significantly more likely, at a 5 % significance level, to experience two or more episodes of ill health (column 6). The strongest tie is between poor general health as a child and two or more episodes of ill health as an adult. These patterns are all consistent with the pattern of earnings penalties we report above. These results suggest that a major mediating factor in the tie of early poor health to lower lifetime earnings is health issues as an adult, which issues are likely to reduce productivity either on the intensive or extensive margin (lower hourly productivity or fewer days worked). Interestingly, we do not find a statistically significant link between early health problems and an increased probability of retirement due to own ill health, although the coefficients are positive (column 7).

5. Policy Analysis

Does a country's health care system influence the penalty of early health problems? The primary focus of this paper is to ask whether the health care system of a country has an influence on the long-term effects of early childhood health problems. We use the four-way dichotomy to capture the essence of alternative programs: full coverage, considerable cost sharing, less than full coverage, and Socialist. The countries of birth are included and their categorizations are described in table 2.

To explore our question, in table 6 we run a regression in which our aggregate measure of lifetime earnings is the dependent variable and each of our early health indicators are included along with interactions with the four types of health care systems. In addition to the childhood variables in table 1, we include dummy variables for health care systems, year of birth, and current country of residence. As for table 4 (and table 5), we control for the current

Table 5
Marginal Effects of EARLY HEALTH PROBLEMS on EDUCATION, MARITAL STATUS, and HEALTH DURING ADULTHOOD for Men in Europe^a

	Full-time education (1)	(2a)	Educational attainment		Ever married (3)	Years married since year of marriage (4)	1+ ill health periods (5)	2+ ill health periods (6)	Retired due to own ill health (7)
	Years	ISCED 0-1	ISCED 2	ISCED 3-4	ISCED 5-6	Fraction	(0-1)	(0-1)	(0-1)
Mental	-0.097 (0.359)	0.030 (0.026)	0.007 (0.006)	-0.009 (0.008)	-0.028 (0.024)	-0.145*** (0.034)	0.094** (0.039)	0.062** (0.027)	0.004 (0.036)
Physical	-0.003 (0.312)	-0.023 (0.020)	-0.005 (0.005)	0.007 (0.006)	0.021 (0.019)	-0.034 (0.024)	0.097*** (0.034)	0.016 (0.019)	0.054 (0.038)
Poor	-0.988*** (0.340)	0.047** (0.022)	0.011** (0.005)	-0.014** (0.007)	-0.044** (0.021)	-0.057** (0.027)	0.104*** (0.035)	0.091*** (0.026)	0.053 (0.035)
Severe headaches or migraines	0.011 (0.275)	-0.020 (0.018)	-0.005 (0.004)	0.006 (0.005)	0.019 (0.017)	0.003 (0.014)	0.026 (0.026)	0.002 (0.014)	0.056* (0.029)
Rooms (an increase of one room)	0.871*** (0.135)	-0.070*** (0.009)	-0.016*** (0.002)	0.021*** (0.003)	0.065*** (0.009)	-0.003 (0.008)	-0.022* (0.011)	0.001 (0.006)	-0.017 (0.013)
Number of books at home when 10 years old	0.869*** (0.051)	-0.065*** (0.003)	-0.015*** (0.001)	0.019*** (0.001)	0.061*** (0.003)	0.004 (0.003)	0.002 (0.005)	0.001 (0.002)	-0.012** (0.005)
Main breadwinner's occupation when 10 (in ISCO-88 skill levels)	0.510*** (0.067)	-0.032*** (0.004)	-0.007*** (0.001)	0.010*** (0.001)	0.030*** (0.004)	-0.005 (0.004)	-0.010* (0.005)	-0.005* (0.003)	-0.001 (0.006)
Number of facilities at home when 10 years old	0.277*** (0.038)	-0.022*** (0.002)	-0.005*** (0.001)	0.007*** (0.001)	0.021*** (0.002)	-0.001 (0.002)	-0.006* (0.003)	-0.005** (0.002)	-0.006* (0.003)
Born in urban area	0.497*** (0.103)	-0.052*** (0.007)	-0.012*** (0.002)	0.015*** (0.002)	0.048*** (0.006)	-0.015** (0.006)	-0.006 (0.009)	0.009* (0.005)	-0.019** (0.010)
Had no usual source of care when between 0-15 years old	-0.622** (0.246)	0.002 (0.015)	0.000 (0.003)	-0.000 (0.004)	-0.002 (0.014)	0.006 (0.011)	0.003 (0.019)	-0.002 (0.010)	0.008 (0.020)
R-squared	0.312					0.037			
Pseudo R-squared	9199	0.145	<i>b</i>	<i>b</i>	<i>b</i>	0.036	0.034	0.056	0.072
Observations	9199	9142	<i>b</i>	<i>b</i>	<i>b</i>	9199	9199	9199	5525

Note: ^a All models include all other variables listed in Table 1, except age plus country dummies and birth-year dummies. Models 1 and 4 show OLS estimates. Models 2(a)-(2d) shows marginal effects from an ordered probit model and Models 3-7 show marginal effects from probit models. Robust standard errors in parentheses. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.
^b Model 2 Pseudo R-squared and observations reported in column for model 2a.

Table 6

Estimates of Interaction Terms Between EARLY HEALTH PROBLEMS and Indicators of HEALTH CARE SYSTEMS on LIFETIME EARNINGS of Men in Europe

Mental × Full coverage	−265823** (118764)
Mental × Considerable cost sharing	−163892 (173446)
Mental × Less than full coverage	−163885 (122353)
Mental × Socialist	−296989*** (108709)
Poor × Full coverage	−192 (151048)
Poor × Considerable cost sharing	−183690 (116369)
Poor × Less than full coverage	−428427*** (107970)
Poor × Socialist	−214922** (100461)
Physical × Full coverage	−411359*** (122544)
Physical × Considerable cost sharing	87180 (302594)
Physical × Less than full coverage	−348379** (138345)
Physical × Socialist	49546 (93610)
Had no usual source of care when between 0–15 years old	32220 (76284)
Severe headaches or migraines	−17371 (86424)
Rooms (an increase of one room)	35588 (43075)
Number of books at home when 10 years old	23914 (15551)
Main breadwinner's occupation when 10 (in ISCO-88 skill levels)	34705* (19389)
Number of facilities at home when 10 years old	44878*** (11483)
Born in urban area	42494 (37472)
Considerable cost sharing	−259675* (152662)
Less than full coverage	−680078*** (180729)
Socialist	−532525*** (158910)
Constant	1287569*** (188076)
R-squared	0.076
Observations	9199

Note: OLS estimates from linear models on the lifetime earnings of men. Regression also includes year of birth and country dummy variables. Health care systems are dummy variables with Full Coverage as the reference system. Robust standard errors in parentheses. Significance levels: *** $p < 0.01$ ** $p < 0.05$ * $p < 0.10$.

country of residency using a set of dummy variables in these estimates in order to take into account basic differences in the economy, which are likely to also influence earnings. We acknowledge that there may be country-specific time varying factors that we are not able to take into account.

Our findings for the influence of a country's health care system on long-term earnings effects of an early health problem are clearest for those with early poor health. And in this case, the results match our hypothesis. Those with early poor health who lived in a country with less than full coverage face the greatest lifetime earnings penalty followed by those who grew up in a Socialist country with limited health care. In sharp contrast, those who grew up in a country with full coverage did not experience any penalty in terms of lifetime earnings (those with poor early health who grew up in a country with considerable cost sharing have a negative coefficient but it is not statistically significant). So, our results are consistent with the idea that more comprehensive health care coverage with little if any cost sharing would lead to more effective care for children, perhaps because parents were in a position to pursue care for their child with poor health without regard for direct costs of that care. Excluding those living in France and Greece, we have fully consistent results for those with early poor health (see table 9).

Our predictions for the tie between health care policy and the penalties for those with early mental health problems are far less precise, presumably because at the time most of these men were boys, the health care system did not really cover mental health problems or did so only for those institutionalized. Nevertheless, we noted in our results above that there were large average penalties in terms of labor market earnings for those with early mental health problems. Here our results suggest that those who grew up in Socialist countries with likely limited, if any, access to care for mental health problems indeed were the most penalized in terms of lifetime earnings on average. The next most heavily penalized were those in countries with full coverage, a somewhat surprising finding. Those with mental health problems as a child in the other systems (considerable cost sharing and less than full coverage) also show similar negative earnings penalties but the coefficients are not statistically significant. Still, the full set of results suggests that those with early mental health problems were penalized heavily in terms of lifetime earnings under all of these health care systems. This is not surprising given the very limited care for mental health problems under all four health systems at the time when these boys were growing up.¹¹

Turning to early physical health problems, we noted earlier that on average those with an early physical health problem did not experience a statisti-

¹¹ Again, our results excluding France and Greece in table 9 are fully consistent with these results.

cally significant penalty in lifetime earnings, as captured by the considerably smaller coefficients on early physical health problems than for mental health or poor early health problems. Still, we explored if there were differences by health care system, though the reader should view these with some skepticism. We find that for men who experienced physical health problems as a boy, the penalty is largest if they grew up in a system with full coverage followed by those who grew up in a system with less than full coverage. We find this first result surprising. Our explanation for this is that in the countries with full coverage, children were more likely to survive (the mortality rate for these countries is lower in the 1950s, 1960s, and 1970s across all ages of children [infants, 1–4, 5–9 and 10–14], suggesting that those who survived were more seriously ill on average than those in other countries included in our analysis [based on data from the Human Mortality Database]). We also note that there is no suggestion of any penalty for those with physical health problems as a boy on lifetime earnings for those who grew up under a Socialist system or a system with considerable cost sharing. Our thought on this is that our index may be too heterogeneous such that only some of the underlying diseases might be expected to have long-run implications for the individual. Our sensitivity estimates excluding France and Greece again show that those who grew up in a system of full coverage do worst, but these results suggest that those in a system with considerable cost sharing also do significantly worse in terms of lifetime earnings (table 9).

We conducted one other sensitivity test in which we interact only the experience of early poor health and of early physical health by our four categories of health care systems. We do this because at the time most of these men were less than age 16, there was little care available for mental health problems. These results, reported in table 10, are consistent with those discussed above.

6. Conclusions

In this paper, we explore the effect of three dimensions of early-life health problems on lifetime earnings. We use individual-level data from the first three waves of SHARE, a multidisciplinary and representative cross-national panel of the European population aged 50-plus. Waves 1 (2004/05) and 2 (2006/07) include information on sociodemographic background characteristics, current health, and socioeconomic status. Most of our data are from the third wave, SHARELIFE (2008/09), which is a retrospective survey conducted in 13 European countries as part of the SHARE project. We use the country of childhood for those in our sample and a four-way system to characterize their country's health care systems. These include full coverage, considerable use of copayments, limited coverage, and Socialist (full coverage but limited care).

Countries with health care systems with full coverage in our data are Sweden, Denmark, and United Kingdom. Those with considerable cost sharing include Austria, Belgium, (West) Germany, Finland, France, Norway, and Switzerland. Countries with less than full coverage include Greece, Italy, Netherlands, Portugal, and Spain, and those with full coverage but limited care (Socialist at the time our sample members were children), include Czechoslovakia, Hungary, East Germany, Russia, and Poland. We use this four-way classification to capture what we expected would be important determinants of early health care use—fullness of coverage and cost sharing requirements.

In terms of particular health problems, we find that the early experience of poor general health and mental health have stronger negative ties to lifetime earnings than physical health. Our results for health care policy find that for those who experienced poor health as a child, those growing up under Socialist health care systems, and those in systems characterized by less than full coverage experience the greatest earnings losses as an adult. In contrast, those with poor early health who grew up in a system characterized by full coverage do not experience any earnings loss. For those growing up with an early mental health problem, those living under a Socialist policy again experience the greatest loss of earnings over the life cycle. In this case, however, all those who had an early mental health problem experience sizeable penalties in terms of lifetime earnings.

Our current hypothesis tied to the pattern of penalties for those with early mental health conditions is that at the time these males were young there was little available care except for those with severe mental health problems, who were likely institutionalized. Our guess is that under-diagnosis or lack of treatment lies behind the results. We hope that in the future, as data become available, researchers will study the pattern for boys who grew up in the 1990s or later, when diagnosis and care for mental health conditions began to be more available.

Our policy conclusions are that early health conditions matter, and matter differentially, with poor general health and mental health mattering more to lifetime earnings than early physical health problems. The costs to these individuals in terms of earnings losses are large and deserving of resources. Second, regardless of type of health condition, those who grew up with full coverage tended to experience smaller lifetime earnings losses, with the exception of those with physical health problems who were more likely to survive if they grew up in a country providing full coverage. Health policy would seem to have long-run consequences.

7. Appendix

Table 7

Correlations Between EARLY HEALTH PROBLEMS in Europe by Indicators of Health Care Systems

Europe	Mental	Physical	Poor
Mental	1.00		
Physical	0.07	1.00	
Poor	0.13	0.12	1.00
Full coverage			
Mental	1.00		
Physical	0.13	1.00	
Poor	0.11	0.12	1.00
Considerable cost sharing			
Mental	1.00		
Physical	0.06	1.00	
Poor	0.17	0.18	1.00
Less than full coverage			
Mental	1.00		
Physical	0.04	1.00	
Poor	0.15	0.08	1.00
Socialist			
Mental	1.00		
Physical	0.03	1.00	
Poor	0.03	0.03	1.00

Table 8

Estimates of EARLY HEALTH PROBLEMS on LIFETIME EARNINGS of Men in Europe^a

	(1)	(2)
Mental	-208452*** (79714)	
Physical ^b	-12199 (42416)	-27056 (41894)
Poor	-228843*** (63115)	
R-squared	0.075	0.074
Observations	9199	9199

Note: ^a See note to table 4 for details on the specification, standard errors, and levels of statistical significance.

^b A larger fraction of respondents are considered: all those who scored at least one standard deviation below the mean, which includes about 17 % of all respondents.

Table 9

Estimates of Interaction Terms Between EARLY HEALTH PROBLEMS and Indicators of HEALTH CARE SYSTEM on LIFETIME EARNINGS of Men in Europe

Mental × Full coverage	−266226** (118987)
Mental × Considerable cost sharing	−111035 (131978)
Mental × Less than full coverage	−174948 (129941)
Mental × Socialist	−314404*** (109242)
Poor × Full coverage	11238 (150230)
Poor × Considerable cost sharing	−35508 (103246)
Poor × Less than full coverage	−429045*** (105151)
Poor × Socialist	−235691** (97325)
Physical × Full coverage	−419154*** (119127)
Physical × Considerable cost sharing	−216207** (92914)
Physical × Less than full coverage	−6863 (155161)
Physical × Socialist	62860 (95625)
Had no usual source of care when between 0–15 years old	27990 (63786)
Severe headaches or migraines	−38054 (56451)
Rooms (an increase of one room)	70580* (40013)
Number of books at home when 10 years old	42996*** (13857)
Main breadwinner's occupation when 10 (in ISCO-88 skill levels)	11370 (18957)
Number of facilities at home when 10 years old	30360*** (9382)
Born in urban area	51185 (35352)
Considerable cost sharing	−267618* (158289)
Less than full coverage	−661187*** (168166)
Socialist	−535380*** (162955)
Constant	1216676*** (175391)
R-squared	0.115
Observations	7669

Note: Sensitivity analysis excluding respondents who spent most of their childhood in France or Greece. OLS estimates from linear models on the lifetime earnings of men. Regression also includes year of birth and country dummy variables. Health care systems are dummy variables with Full Coverage as the reference system. Robust standard errors in parentheses. Significance levels: *** $p < 0.01$ ** $p < 0.05$ * $p < 0.10$.

Table 10

Estimates of Interaction Terms Between EARLY HEALTH PROBLEMS and Indicators of HEALTH CARE SYSTEM on LIFETIME EARNINGS of Men in Europe

Poor × Full coverage	−6240 (150159)
Poor × Considerable cost sharing	−177422 (114809)
Poor × Less than full coverage	−422919*** (107045)
Poor × Socialist	−217252** (101287)
Physical × Full coverage	−418046*** (121570)
Physical × Considerable cost sharing	88486 (302242)
Physical × Less than full coverage	−347386** (138184)
Physical × Socialist	46979 (94860)
Mental	−210405*** (79512)
Had no usual source of care when between 0–15 years old	32227 (76272)
Severe headaches or migraines	−18587 (86264)
Rooms (an increase of one room)	35133 (43053)
Number of books at home when 10 years old	23816 (15549)
Main breadwinner's occupation when 10 (in ISCO-88 skill levels)	34721* (19383)
Number of facilities at home when 10 years old	44914*** (11478)
Born in urban area	42507 (37459)
Considerable cost sharing	−256588* (152193)
Less than full coverage	−677168*** (180167)
Socialist	−531752*** (158508)
Constant	1285105*** (187820)
R-squared	0.076
Observations	9199

Note: Sensitivity analysis not interacting mental health problems. OLS estimates from linear models on the lifetime earnings of men. Regression also includes year of birth and country dummy variables. Health care systems are dummy variables with Full Coverage as the reference system. Robust standard errors in parentheses. Significance levels: *** $p < 0.01$ ** $p < 0.05$ * $p < 0.10$.

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