Cross-national Variation in the Prevalence and Long-term Health Effects of Poor Childhood Health and Socioeconomic Disadvantage among Aging Cohorts[1]

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INTRODUCTION

There is a well-established research literature documenting large, persistent, and expanding socioeconomic gradients in health in which those that occupy social niches that provide greater access to material and other socioeconomic resources have better health, lower rates of disability, and lower risk of mortality than their less advantaged peers (1-2). Early work on health gradients focused on documenting their contours across a wide array of health outcomes and the multiple dimensions of socioeconomic position. Much of the research on socioeconomic gradients in health over the past two decades has moved on to explicating the causal processes and mechanisms that underlie disparities (3-4). Two important and related, though rarely integrated, aspects of research on the causes of health inequalities are a) cross-national investigations of inequalities and b) life-course/developmental perspectives that have investigated the long-term impacts of childhood health insults and socioeconomic disadvantage. The former has sought to understand how the magnitude of socioeconomic gradients in health varies internationally and the role that different aspects of local institutional context play in exasperating or mitigating this variation. Since the social gradient has been found to exist at the beginning of life, the later has investigated the role of early life (and prenatal) exposures to socioeconomic deprivation and childhood health insults in the genesis of health gradients. The life course perspective has made important contributions to the long-standing debate about the relative importance of social causation and health-related selection into lower socioeconomic strata in creating health gradients. Each of these lines of research has provided important insights into the social and life course processes that generate socioeconomic inequalities in health. However, researchers working in each of these areas have tended to pay scant attention to the other. The two

perspectives would seem to have a natural affinity for each other as societies vary substantially in the extent to which they take policy action to insulate children and adolescents from socioeconomic deprivation and insults to their health or to ameliorate their more pernicious consequences. For example, across OECD countries the child poverty rate varies from 3.7% in Denmark to 21.6% in the United States (5). Such differences likely play an important role in generating cross-national heterogeneity in overall levels of population health as well as in the magnitude of socioeconomic gradients in health that exist within countries. However, because little effort has been made to synthesize cross-national and life course/developmental perspectives and data a number of important empirical questions remain unexplored and theoretical processes underdeveloped.

BACKGROUND

Health Gradients across International Contexts

Socioeconomic gradients in health have been documented as far back as the early 19th century (6) and have been a long been the object of social inquiry (7). Despite the tremendous growth in research on the gradient, comparative-international approaches to the issue have been limited. Examination of health gradients across international contexts can provide important insights into their genesis. We know, for instance, that the health gradients are nearly universal across a wide variety of international and historical contexts. Such geographic and temporal constancy is integral to the notion of socioeconomic status a *fundamental cause* of health (3). However, much of what we know about how systems of socioeconomic stratification differentially sort individuals into different health trajectories comes from within-country studies. With the exception of the large literature on the population health effects of income inequality (8), scant research has investigated between-country differences in the magnitude of

health gradients or the social processes that generate them. As is often the case with comparative research, one of the major obstacles limiting progress has been the dearth of comparable population-based data across international contexts. The growing availability of internationally comparable data funded or otherwise supported by NIA has made cross-national comparisons easier than ever before.

Of the extant comparative research on health gradients, most has focused on making comparisons within the European context, with occasional comparison made to the US (9-13). However, studies have also looked across the Latin American/Caribbean context (14) and a few have undertaken global comparisons (15-16). Such research has documented large and significant cross-national heterogeneity in within-country health gradients across various dimensions of SES and health. Comparisons with the US, England, and Europe have found that for many health outcomes socioeconomic gradients are larger in the US than they are in either England or Europe as a whole (10). Within Europe, evidence suggests that gradients are generally smallest in Northern Europe and the Nordic/Scandinavian countries, middling in Central and Western Europe and largest in Southern Europe, Eastern Europe/the Baltics, and the UK and Ireland (11; 17). There also is little evidence of trade-off between the overall level of population health and health equity, as countries with the narrowest gradients tending to also be those with best health outcomes writ large (17). Thus while health gradients exist across the socioeconomic distribution and are not simply an issue of those in poverty, there is evidence that populations that do the best job supporting the health of those at the bottom of the socioeconomic distribution are rewarded with both better overall population health as well as narrower health gradients.

In addition to documenting variation in socioeconomic gradients in health, research has begun to investigate the sources of this international variation. This has included studying the effects of compositional differences in such characteristics as smoking, employment, income, wealth, age, sex, and marital status (10; 17). As is the case with within-country gradients, cross-national differences cannot be attributed exclusively to differences in such behavioral and lifestyle factors (11; 17). However, decomposition of the between-country variation in education-health gradients due to compositional differences in individual covariates including age, sex, income, wealth, marital status, employment, immigration status, and smoking demonstrates that if other European countries and the US could achieve distributions in those variables similar to that of the country with the smallest education gradient (Switzerland) then they could achieve similarly narrow gradients (17).

In addition to looking at individual level covariates, others have examined at the differential impact of institutional contexts such as welfare state regimes. (10-11; 16; 18-22). Nation states vary widely in the degree to which they buffer populations from the vicissitudes of the market (employment/income protection), provide public/social services, are active agents of economic opportunity and resource redistribution, are centralized/fragmented, and universal or exclusionary (23-25). While different studies employ different welfare-state typologies, evidence suggests that health gradients are typically larger in the US with its less generous and fragmented liberal welfare state. Within the European context, those countries with what Ferrera (24) describes as Bismarkian welfare states (Austria, Belgium, France, Germany, Luxembourg. Netherlands, Switzerland) have the narrowest gradients, followed by the Scandinavian (Esping-Anderson's Social democratic) welfare states (Denmark, Finland, Norway, Sweden), and Anglo-Saxon (liberal) have the largest gradients (Ireland, UK) (10; 16; 18-22).

Childhood/Developmental Influences on Adult Health

A second important thread of research seeks to integrate the study of health gradients within a developmental/life course perspective. This perspective begins with the premise that the health of individuals is not static, nor can it be divorced from the cumulative impacts of lived experience, which include exposures associated with individual placement within social and economic hierarchies. Social scientists are beginning to investigate how adult health and physical functioning are linked to early life exposures with the goal of assessing what Hayward and Gorman have called 'the long arm of childhood' (26). This literature suggests that substantial gains in understanding adult health can be made from better knowledge of its determinants over the life course. It also suggests that the broad parameters of individual health trajectories and socioeconomic gradients therein may, in part, be forged very early in life, as unhealthy and socioeconomically disadvantaged children become unhealthy and socioeconomically disadvantaged adults.

Two general theoretical perspectives have been offered to describe how health unfolds over the life course. The *critical period* approach posits that negative events occurring during developmentally salient periods may permanently alter the trajectory of health over the life course (27). While health insults may occur at very early ages (even in- utero), it is not until much later that these effects manifest themselves in disease pathologies. The most well-known and controversial example of critical period effects are the fetal-origins of diabetes and cardiovascular disease proposed by Barker (28). Barker hypothesizes that poor maternal nutrition at critical periods during gestation results in fetal growth retardation, which alters the structure and function of important tissues associated with insulin, blood pressure, and lipid regulation. In

turn this increases the risk of adult chronic disease most notably cardiovascular disease and diabetes.

In his concept of "biological embedding" Hertzman (29) provides a similar though much less reductionist perspective which posits that the conditions under which early cognitive, emotional, and psychosocial development occur are critical to health over the life course. If the early childhood environment is not conducive to healthy development this may lead to developmental delays, poor psychosocial adjustment, and higher lifetime levels of stress and poor health. As childhood and adolescence are vitally important periods of both physical maturation and social and cognitive development, the experience of poor childhood health and socioeconomic disadvantage may be especially detrimental to later life health trajectories regardless of subsequent adult health-related and socioeconomic factors.

Alternatively, the *cumulative insult* model suggests that exposures accumulate over the life course and that it is this lifetime accumulation that is important. The cumulative insults approach posits that there are social, environmental, and behavioral exposures over the life course, which alters an individual's risk of disease in addition to any critical period effects (27). Under this conception, poor health and socioeconomic disadvantage in childhood represent two of many possible health-related insults over the life course, the effects of which may be either compounded by continued social, economic, and physical deprivation or partially or wholly ameliorated by upward social mobility and or healthy adult lifestyle.

Previous research has explored the connections between the socioeconomic characteristics of family of origin and adult health. Such studies have found that those from disadvantaged backgrounds have more health-related risk factors (30) and increased risk of chronic diseases, including depression (31), cardiovascular disease (32-33), and stroke (34).

Those from disadvantaged social backgrounds also tend to have worse self-rated health (35), higher mortality rates (36-37) low physical functioning at midlife (38-39) and disability trajectories (40).

There is also an extensive body of research linking childhood health status to adult health outcomes. Much of the early research in this area was based on the use of height as a proxy of early life health and nutrition (41). Such studies typically found a negative association between achieved adult height and adult morbidity and mortality (42). A few studies have directly investigated the relationship between childhood and adult health using various population-based surveys. Among these are a small number of prospective investigations using the British cohort studies (43; 44; 45; 46). More recently studies have investigated this relationship using retrospective reports of childhood health in US-population-based studies finding significant associations between serious infectious disease in childhood and various adult chronic diseases including cardiovascular disease, cancer, and lung conditions (47). Similarly, previous research has found that poor childhood health to be associated with poor self-rated health, work-limiting disability, and chronic disease (48), functional health trajectories (40), and physical performance (49), and helps explain socioeconomic and race-ethnic disparities in health (40; 50).

The present Study

The goals of this paper are twofold. First, to estimate between-country differences in the prevalence of poor childhood health and socioeconomic disadvantage among aging cohorts in 17 countries covered by the HRS family of studies (ELSA, SHARE, TILDA, MHAS, CHARLS, CRELES). Second, test whether the impact of poor childhood health and socioeconomic disadvantage on later-life health outcomes varies across international contexts and how those effects compare to the impact of later life adult socioeconomic position.

METHODS

Data

This study utilizes data from seven sources. Data for the US comes from the Health and Retirement Survey (HRS). Begun in 1992, the HRS is a long-term panel study of approximately 28,000 Americans over the age of 50 and born before 1959, designed to investigate the economic and health transitions associated with retirement (61). It combines extensive information on both socioeconomic and health status. The original data collection took place using in-home face-to-face interviews and a standard survey instrument. Follow-up takes place every second year. Data for England come from the English Longitudinal Study of Ageing (ELSA) (62). ELSA is a sample of approximately 11,000 English men and women aged 50 and older and their partners and was begun in 2002. Five follow up waves have since been completed at two-year intervals. At wave 3 (2006-07) and extensive life history survey was completed including childhood health histories. Data for Ireland come from The Irish Longitudinal Study of Aging (TILDA). Begun in 2009, TILDA includes approximately 8,500 Irish men and women aged 50 and older. A second wave of data was collected in 2012 (63). Data for continental Europe come from the Survey of Health, Aging, and Retirement in Europe (SHARE) which sampled 45,000 individuals aged 50 and older in Central Europe. Wave 1 (2004) included Austria, Belgium, Denmark, France, Germany, Switzerland, Italy, the Netherlands, Sweden, Greece, and Spain. Wave 2 (2006-07) added Czech Republic and Poland. Wave 3 (2008-2009) consisted of the SHARELIFE survey, which collected extensive life history data including childhood health histories (64). For comparison we also include three middle-income countries. Data for Mexico come from the Mexican Health and Aging Study (MHAS). In 2001 MHAS collected data on 15,402 individuals born before 1951 and is national-representative of the Mexican population aged 50 and older. In

2003 a follow up wave was collected including 14,386 of the original sample (65). In 2012 a third wave was collected and included an additional sample of individuals born 1952-1962. Data for China come from the China Health and Retirement Longitudinal Study (CHARLS) (66). CHARLS is a nationally representative sample of the non-institutionalized Chinese population aged 45 and older. The baseline wave, collected in 2011, includes 17,587 respondents. A follow up is planned for 2013 and then every 2 years. Finally, the Costa Rican Longevity and Healthy Aging Study (CRELES) is a nationally representative study of the Costa Rican Population aged 60 and older born before 1945. Begun in 2005, CRELES sampled 2,827 men and women. Two follow-up waves have been conducted in 2007 and 2009. In 2010, CRELES sampled an additional 2,798 individuals born 1945-1955 (67).

The structure and content of ELSA, SHARE, TILDA, MHAS, CHARLS, and CRELES were modeled after the HRS. The resulting strong concordance between the 7 data sets facilitates their integration and comparison. In addition, RAND has produced harmonized versions of all but CRELES. This project will draw upon both the raw data as well as the RAND harmonized versions. While CRELES is not part of the harmonization, the structure and content of the survey are comparable to the others.

Measures

Childhood Health and Social Conditions

Childhood health is measured using retrospective childhood health histories captured by each survey. The HRS pioneered the collection of childhood health histories in an experimental module in the 1996 wave. In subsequent waves all respondents provided histories. Childhood health histories modeled after those in the HRS have been fielded in the studies used here. While not identical there is substantial comparability across studies. All studies except MHAS included

a retrospective subjective assessment of overall childhood health that is based on the question *"how would you rate your health as a child?"* Childhood refers to the period from birth through to 16 and response categories include excellent, very good, good, fair, and poor. We analyze this measure in both its original ordinal metric as well as dichotomized in the comparison between excellent/very good/good vs fair/poor as suggested by prior literature (49). Previous work has shown such assessments to be reliable over time (49) are correlated with birth weight (49) and retrospective reports of specific common childhood conditions (70). ELSA, HRS, and SHARE respondents were also asked if *any health conditions led them to miss a month or more of school*, and if they had ever had any of a series of common *childhood conditions.* While the specific list of conditions varies a bit from survey to survey they all include infectious conditions (e.g. Measles, Mumps, Polio,), Asthma, Diabetes, Chronic respiratory/bronchitis, Speech/vision impairment, Allergies, Heart trouble, Epilepsy, as well as assessment of emotional-psychological conditions (Depression, Emotional, nervous, or psychological problems) (9). We create a dichotomous indicator of whether the respondent experienced each of these and a fourth for whether they experienced any of the above. From this we create a series of dummy variables for the most numerous conditions based on ICD-9 codes including *infectious, circulatory, respiratory, genitourinary, digestive, skeletal/muscular, symptoms/ill-defined conditions, injuries,* and *other* for remaining conditions. Those three studies also assessed the *timing of onset* and *duration* of childhood conditions. Evidence suggests that retrospective assessments of childhood conditions are valid and reliable compared to contemporaneous physician assessments (71) and correlate well with contemporaneous population prevalence estimates (72). MHAS has a more limited assessment of childhood health. Respondents were asked respondents if "before you age ten, did have any serious health problem that affected your normal activities for a month

or more"? They were also asked to compare their health before age 10 to other children their age (better, about the same, or worse). In addition, respondents were asked if before age ten they had tuberculosis, rheumatic fever, polio, typhoid fever, or a concussion. We will also utilize respondent adult *height* which is often used as a proxy for early life exposure to infectious disease and nutritional deprivation (73-74). Some research suggests that the association between height and adult health outcomes goes away once childhood health status is accounted for (47; 49).

Childhood socioeconomic conditions will be assessed primarily by *Paternal Occupational Standing* standardized to ISCO. While each individual study collected a variety of other measures of childhood socioeconomic conditions there is not sufficient comparability to permit similar cross-national comparisons as those for childhood health. The analyses will also adjust for a wide variety of controls that may be related to the magnitude of health gradients or that may confound their association with early life conditions. These include *age, birth cohort, sex, marital status, smoking history*, and *body mass index.*

Preliminary Results

Variation in the Prevalence of Poor childhood Health

Figure 1 presents preliminary analysis of international variation in the prevalence of poor childhood self-reported health among aging cohorts. Those countries highlighted in red have prevalence rates that statistically different from the United States. Prevalence rates of poor childhood health ranged from a low of 5.7% in Italy to 23.4% in China. Ten countries had rates of poor childhood health that were significantly higher than in the US. These include the UK, Austria, Germany, the Netherlands, Spain, France, Switzerland, Belgium, China, and Costa Rica. Subsequent analyses will investigate country differences in the prevalence of specific childhood

conditions including asthma, allergies, diabetes, heart disease, epilepsy, Respiratory infections/chronic bronchitis, chronic ear infections, chronic headaches/migraines, and emotional/nervous/psychological problems. It will also investigate cross-national differences in the prevalence of disadvantaged socioeconomic position in childhood.

Variation in the Impact of Poor childhood Health

We next present preliminary analysis of formal test for differences in the impact of poor childhood health on the probability of having any chronic health condition, mobility limitation, ADL limitation, and Excellent/Very Good self-rated health. This analysis is presented in Figures 2-5. Figure 2 presents the country-specific estimates of the effect of poor childhood health on the probability of having any chronic condition. In this analysis the US is used as the reference group. In the US those who experienced poor childhood health were 2.34 times more likely to report having any chronic health condition in adulthood than their healthy childhood peers. This was statistically significant. There also appears to be substantial heterogeneity in the impact of poor childhood health across countries. In Austria poor childhood health is only associated with about a 22 percent increase in the risk of chronic disease. However, in Sweden the risk of chronic disease is more than tripled among those who experienced poor childhood health relative to their healthy peers. The countries shaded in red represent those where the estimated impact of poor childhood health is statistically significantly different from the US. This includes England, Switzerland ($p<.10$), Austria, France, and Belgium. The estimated impact in other countries may be larger or smaller than in the US however, those differences were not statistically significant.

Figure 3 presents estimates for any mobility limitation. In the US poor childhood health is associated with a statistically significant 63% increase in the odds of having any mobility limitation. While there is a lot of heterogeneity in the estimated impact of poor childhood health

only in Switzerland and Germany are these differences significant. In Germany, the impact if poor childhood health is significantly larger than it is in the US. Conversely, in Switzerland the effect is smaller (no effect). For the other countries there is no evidence that the impact of poor childhood health is different than it is in the US.

Figure 4 presents estimates of any ADL limitation. In the US there is no statistically significant of impact of poor childhood health on the odds of reporting any ADL limitation. However, for most of the other countries there is a significant adverse effect of poor childhood health. In England, Austria, Germany, France, Spain, Sweden, Denmark, the Netherlands, Poland, poor childhood health increases the risk of ADL limitation by at least 50%. The deleterious effect of poor childhood health is largest in Ireland where it is associated with a 2.5 times increased risk of ADL limitation.

Figure 5 presents estimates of excellent/very good self-rated health. In the US those who experienced poor childhood health were about half as likely to report being in excellent or very good health as their healthy peers who had healthy childhoods. Unlike the other outcomes there were no statistically significant differences in the impact of poor childhood health across countries.

The full PAA paper will expand the countries analyzed to include China, Mexico, and Costa Rica and will include formal tests for differences in the impact of childhood SES as well.

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Figure 1. Cross-National Variation in the Prevalence of Poor Childhood Health

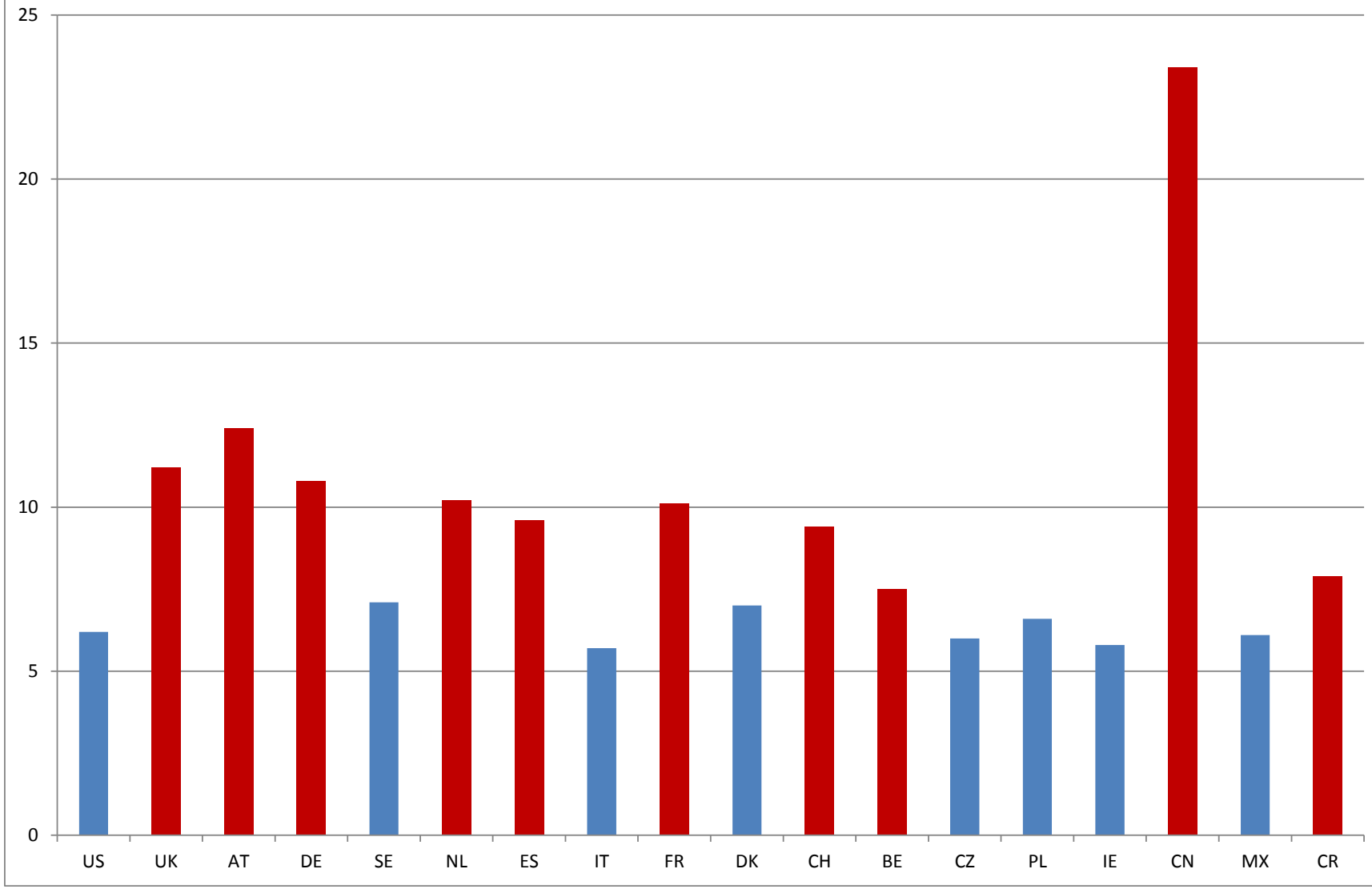


Figure 2: Effect of Poor Childhood Health on Having Chronic Condition

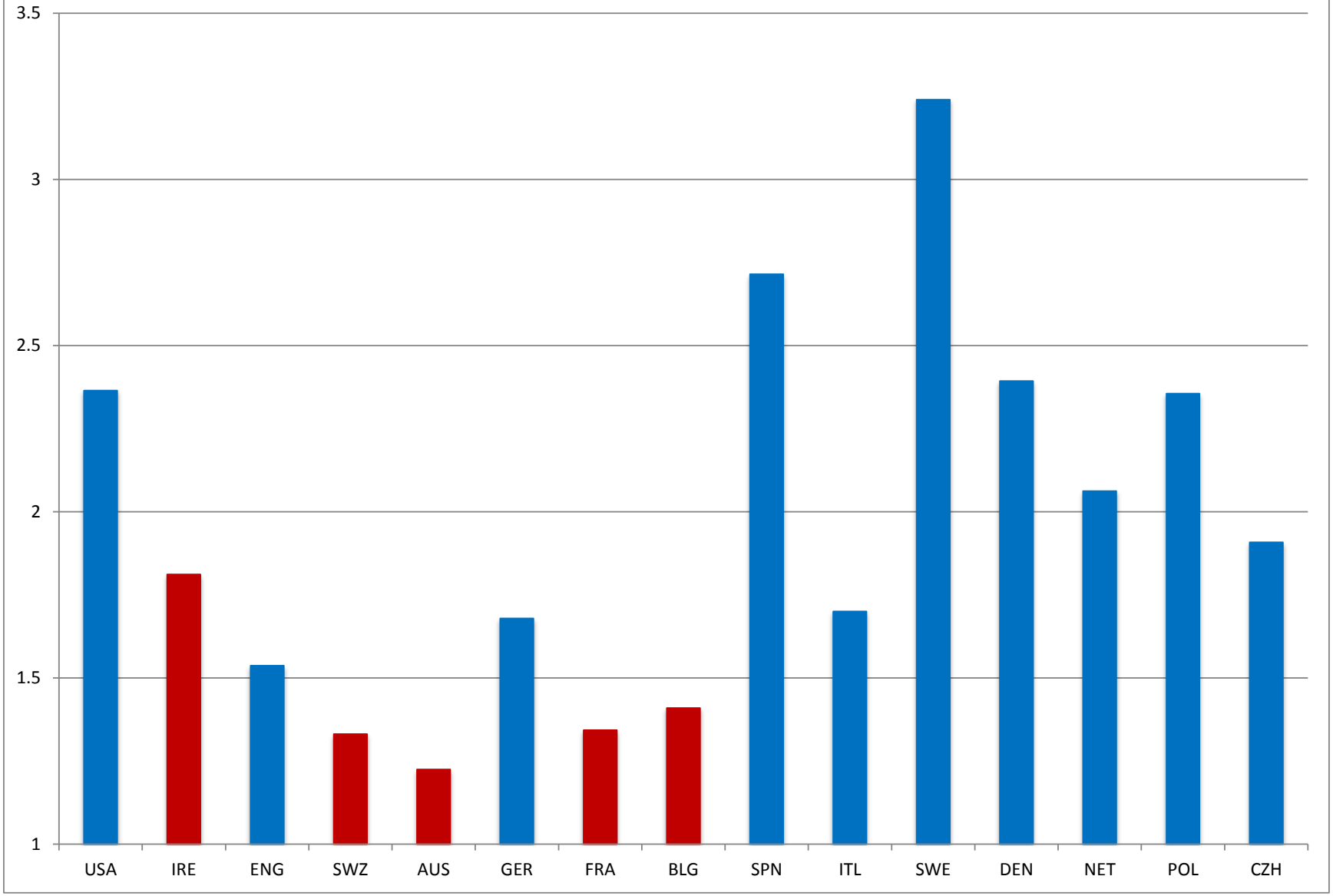
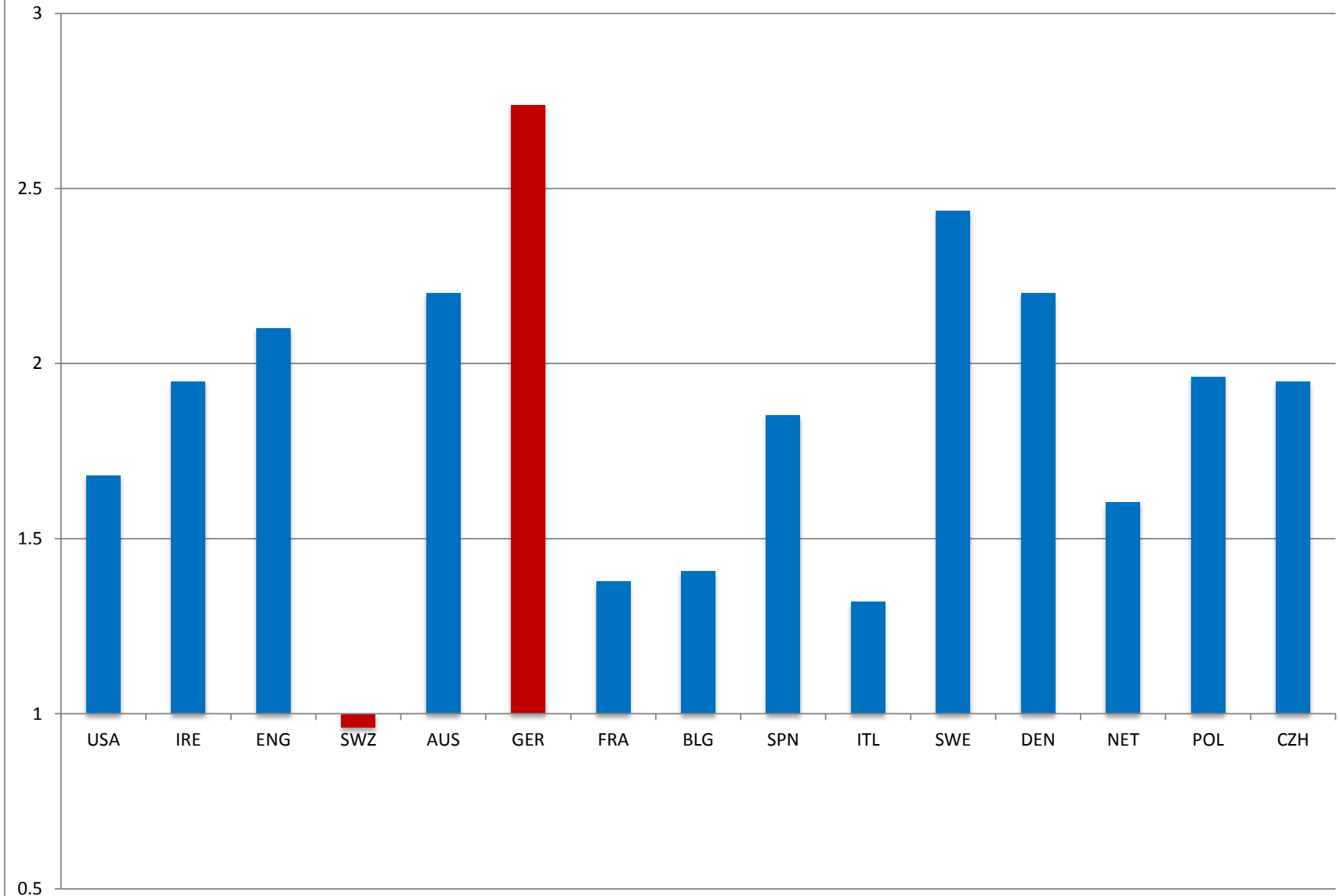


Figure 3: The Effect of Poor Childhood Health on Any Mobility Limitation



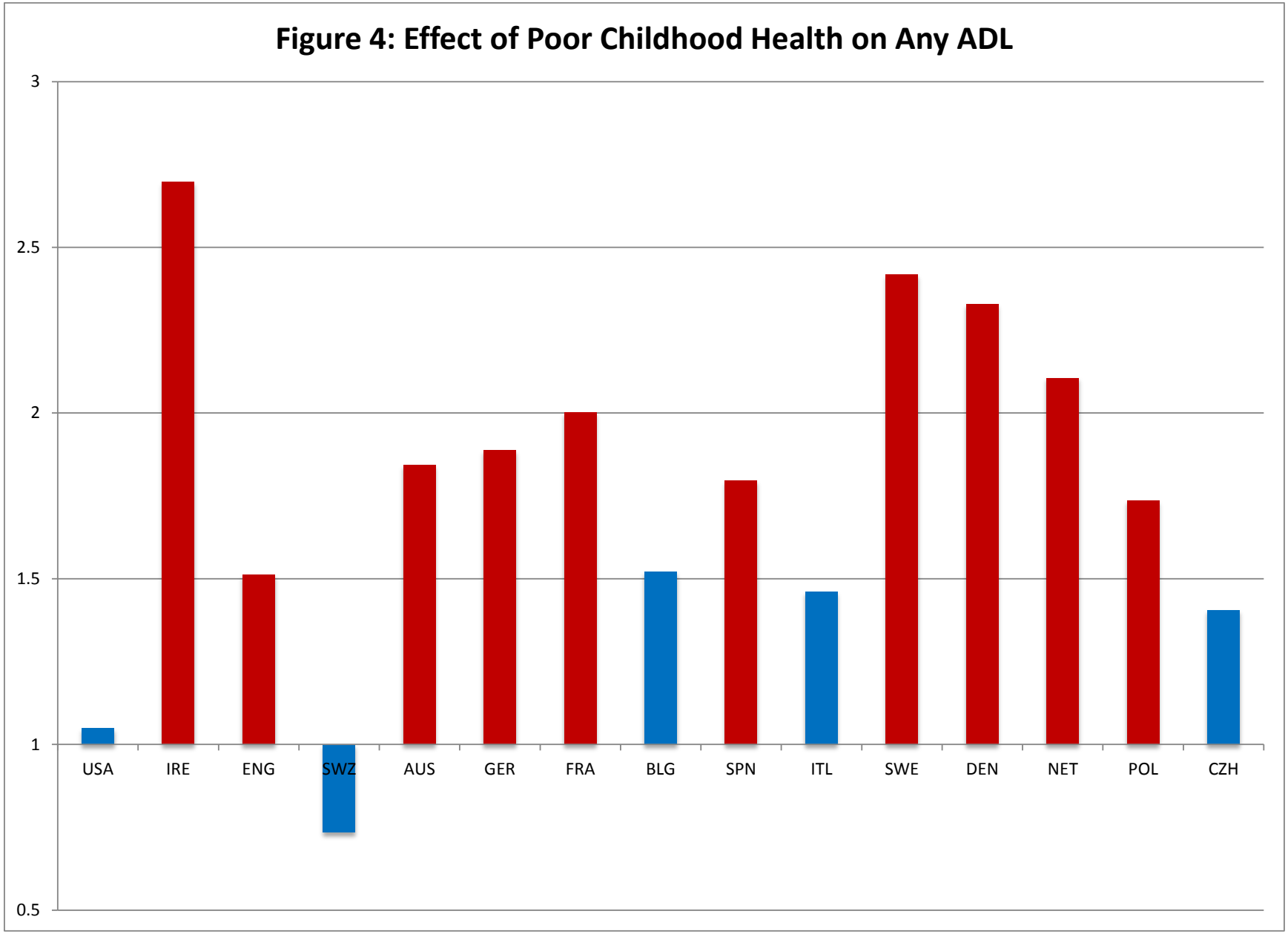


Figure 4: Effect of Poor Childhood Health on Any ADL
3
2.5
2
1.5
1
0.5
USA
IRE
ENG
SWZ
AUS
GER
FRA
BLG
SPN
ITL
SWE
DEN
NET
POL
CZH

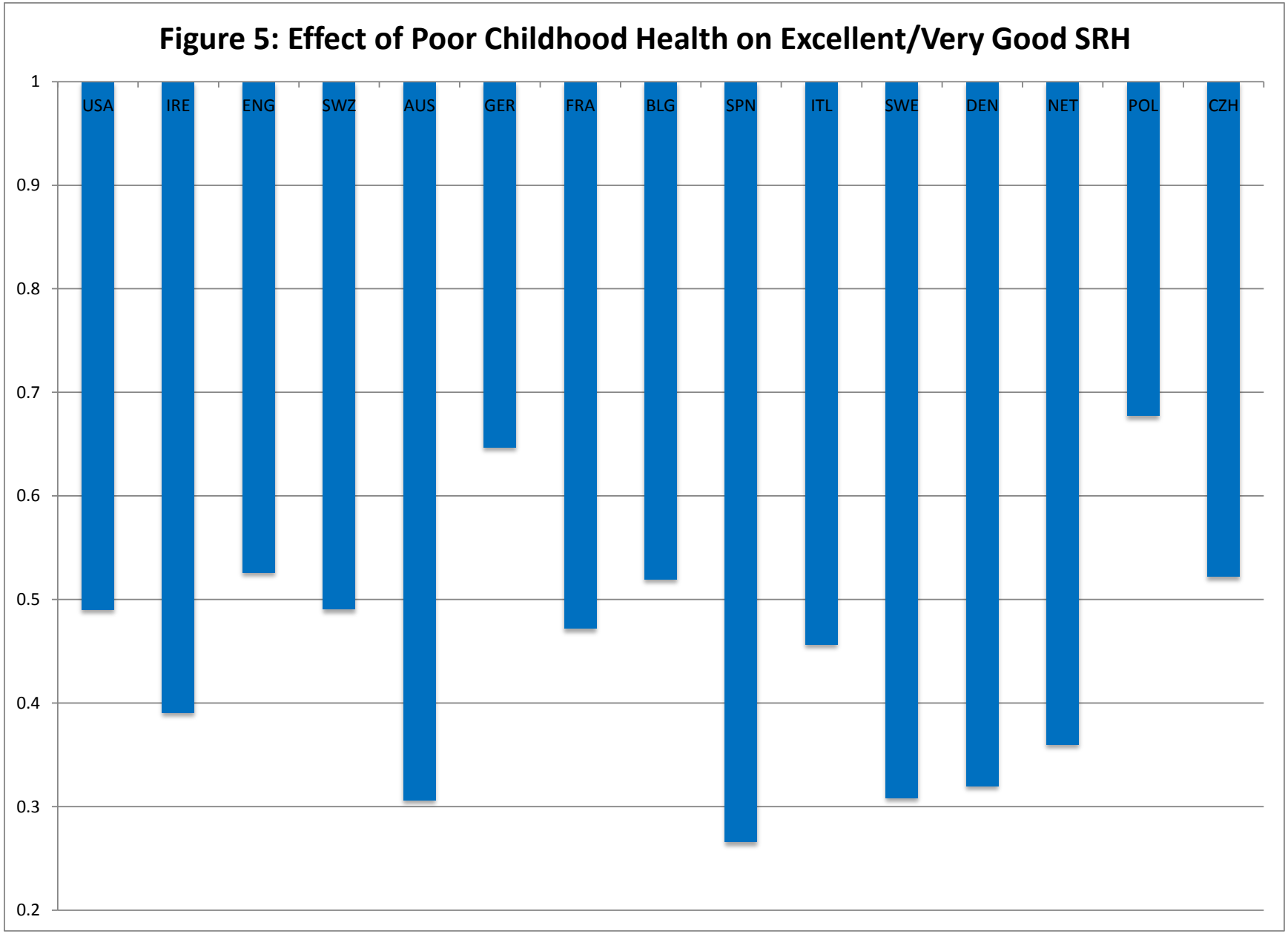


Figure 5: Effect of Poor Childhood Health on Excellent/Very Good SRH
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
USA
IRE
ENG
SWZ
AUS
GER
FRA
BLG
SPN
ITL
SWE
DEN
NET
POL
CZH