Age at first birth and later life health in Western and Eastern Europe

Much of the research on life course determinants of later life health has focused on cumulated effects of socio-economic disadvantage (Ben-Shlomo and Kuh 2002; Luo and Waite 2005; Wadsworth 1997). Family life courses also involve differential exposures to stresses and supports of various kinds and interact with other health-relevant domains including socio-economic position, health related behaviours and social support (Barban 2013; Graham et al 2006; Grundy and Holt 2000; Grundy and Read 2015). The transition to parenthood is a pivotal life course event the timing and context of which may have important implications for subsequent family and socio-economic trajectories, and for health (Knoester and Eggebeen 2006; Mirowsky 2002). Numerous studies of contemporary Western populations (reviewed below) indicate that an early age at entry to parenthood is associated with worse health and higher mortality in later life.

Several processes are hypothesised to underlie this association between early parenthood and later poorer health. For women, pregnancy, parturition and lactation present physiological challenges which may be greater for young mothers (Pirkle et al., 2014). Young mothers, and fathers, may also be less resilient to the physical, emotional and economic stresses involved in raising children and have fewer stress-buffering resources (Barban 2013; Falci et al 2010; Moffitt et al 2002). Additionally, early parenthood may disrupt educational and career progression and increase the chances of divorce and of high completed family size, all factors associated with socio-economic disadvantage, health damaging stress and poorer later life health outcomes (Ermisch and Pevalin 2005; Grundy and Read 2015; Hofferth et al, 2001; O'Connell and Rogers 1984). Apart from these potential causal mechanisms an important additional, or alternative, explanation for associations is confounding by circumstances earlier in life as childhood disadvantage is associated with increased chances of early parenthood and with poorer socio-economic outcomes and worse later health (Anda et al, 2002; Henretta 2007; Hobcraft and Kiernan 2001; Hobcraft 2008; Maughan and Lindelow 1997; Pudrowska and Carr 2009; Sigle-Rushton 2005).

These linkages between early parenthood and later health may interact with contextual factors which vary between regions, countries and population sub-groups. For example, whether or not early childbearing is regarded as problematic or normative will influence selection into early parenthood and health relevant aspects of the situation, status and future life chances of young parents (Koropeckyj-Cox et al 2007; Maughan and Lindelow 1997). Cross-national studies may provide valuable insights into the extent to which associations between early

parenthood and poorer later health are universal or context specific. Comparisons between Eastern and Western Europe are of particular interest because there has been a longstanding pattern of earlier female marriage and fertility in the East, which implies less selection into early motherhood (Hajnal 1965; Frejka and Sardon, 2004). Additionally, in the state socialist regimes of the former USSR and Eastern bloc countries female education and employment were encouraged, the state provided childcare, housing and other family benefits and returns from better education in terms of occupational advancement or higher income were lower than in the West (Katz 1999; Klesment 2013; Muresan et al 2008; Stankuniene and Jasilione 2008; Zakharov 2008). These factors may all have served to reduce disadvantages consequent on early parenthood.

In this paper we extend the previous literature on long-term health implications of early parenthood by comparing associations in Western and Eastern Europe using retrospective life course data for 11 countries included in the Gender and Generations Surveys. We examine selection into early parenthood through analysis of associations with childhood circumstances; associations between early parenthood and outcomes which may mediate links to health, such as experience of divorce and adult socio-economic status, and finally associations with self-rated health among women and men aged 50-80. We additionally investigate whether early age at first birth in itself or deviation from societal norms appears to be the more important influence on health in later life by undertaking analyses using indicators of age at first birth measured in absolute terms (chronological age) and relative to the mean for the relevant country and birth cohort. We examine effects for both women and men to shed light on the extent to which associations may be biologically or socially influenced.

Background

Early parenthood and later life health and mortality

Delayed motherhood and childlessness are well established risk factors for breast and some other hormonally related cancers (Kvale, et al 1994). Despite this, previous research mainly based on the US or Western European countries, has shown that early motherhood, generally defined as first birth before age 20 or 21, is associated with a range of poorer later life health outcomes. These include higher overall mortality risks (Doblhammer, 2000; Grundy & Kravdal, 2008; Grundy & Kravdal, 2010; Grundy & Tomassini, 2005; Henretta, 2007; Lund, Arnesen, & Borgan, 1990); greater risks of chronic disease and disability (Kington et al 1997; Grundy and Tomassini 2005; Henretta 2007; Read, Grundy and Wolf 2011) and poorer

general health (Grundy & Holt, 2000; Grundy & Read, 2015; Haragus, 2011; Koropeckyj-Cox, Pienta, & Brown, 2007; Waldron, Weiss, & Hughes, 1998).

Some of the fewer studies which have considered men have reported similar, although generally smaller, adverse associations between early fatherhood and mortality (Einio et al 2015; Grundy and Tomassini, 2006; Grundy and Kravdal 2008; 2010) or long-term illness and allostatic load- an indicator conceptualised as indicative of accumulated stress- (Grundy and Read 2015). However Hank (2010) found no association between timing of fertility and the health of older men in Germany and Pudrovska and Carr (2009) reported that the association between age at first birth and the health of US men in mid-life was accounted for by differences in socioeconomic and family status.

Variations in findings for different populations or population subgroups indicative of contextual influences have been reported in some studies. Spence and Eberstein (2009) for example, found that for white US women early childbearing was associated with higher later life mortality while the reverse was the case for Black women, moreover this latter, but not the former, effect persisted after consideration of mediating social, economic and health related factors. Hank (2010) reported an association between early motherhood and later poorer health for women in West, but not East, Germany, a difference he hypothesised might reflect the fact that early childbearing was more 'off track' in West Germany. Differences between Northern and Southern European countries in associations between early motherhood and indicators of socio-economic disadvantage at age 28, a possible mediator of the association with later health, have also been reported (Robson and Berthoud 2001).

Specific biological processes may partially explain the poorer later life health outcomes of young mothers reported in these studies. These include reduced resilience to challenges to nutritional reserves arising from pregnancy, childbirth and lactation which may jeopardise bone density, and bone and pelvic floor damage associated with difficult births which are more common among young mothers (Christensen et al, 1998; Pirkle et al, 2014; Rich-Edwards 2002). However, the fact that associations have been found for men indicates the importance of broader biosocial processes such as those related to selection into early parenthood, the socio-economic and socio-demographic consequences of early parenthood and possible reduced resilience of young parents to these stresses; all factors which may be influenced by context.

Limitations of previous research include the fact that not all studies have been able to take account of antecedent circumstances which influence both timing of parenthood and later life health and some may have lacked sufficient statistical power to detect potentially important associations. Moreover most previous research has focussed on the USA or a rather small selection of Western European countries and considered only one, or in a few cases, two or three, countries (Doblhammer 2000; Grundy 2009; Hank 2010; Pirkle et al 2014). With one or two exceptions, there has been little study of associations in Eastern European countries (Hank 2010; Harugus 2011). The large differences in the political, social, economic and demographic histories of Western and Eastern Europe over the twentieth century, including a pattern of earlier childbearing in the East, make comparisons of associations between early childbearing and later life health potentially informative about underlying mechanisms and relevance of contextual influences.

Eastern and Western European contrasts

Fifty years ago Hajnal (1965) posited a long term historical division of Europe according to patterns of nuptiality prevalent for several centuries until the 1940s. Regions to the East and South of a line running roughly from Trieste to St Petersburg were characterised by early and near universal marriage and fertility for women, with large age gaps between husbands and wives, in contrast to countries to the North and West where female marriage and parenthood were later, age gaps between spouses smaller and substantial proportions remained unmarried. Although it is recognised that the 'Hajnal line' represents something of an over generalisation, in broad terms this differentiation persisted into the second half of the twentieth century (Coleman 1996). In the 1950s and 1960s the post-World War 2 baby boom, when ages at first birth fell and fertility rates rose, was a feature of Western Europe but was more muted in Eastern Europe (Sobotka and Toulemon 2008) and not apparent at all in the Baltic states (Frejka, Sardon, Katus and Kingkade, 2004). As a result East West differences narrowed but then diverged again from the late 1960s when fertility and marriage rates declined and ages at first parenthood increased in many Northern and Western countries. Eastern countries also experienced declines in overall fertility after 1960, but little postponement of marriage and first birth until after 1990 (Berent, 1970; Frejka and Sobotka, 2008).

Apart from differences in marriage patterns, other proximate determinants of fertility have also varied between East and West including the availability and use of different methods of

birth control (Frejka, 2008). Modern contraceptives became available in the West in the 1960s with liberalisation of abortion laws generally following in the late 1970 or 1980s (Rahman, 1998). In the former USSR, Stalin attempted to overturn previously liberal abortion laws in an effort to raise fertility but this policy was abandoned by 1955 after which abortion became freely available and a predominant means of birth control in both the USSR and other Eastern bloc countries (Zakharov, 2008). Pro-natalism prompted further restrictions in some countries at times, most notoriously in Romania. Coercive policies including a ban on previously free abortion, restrictions on contraceptives and other measures were imposed by Caecescau in 1967 and not relaxed until his overthrow in 1989. This brought about the period of 'forced births' (1967-71) when fertility rose considerably before returning to the earlier level as people reverted to use of alternative methods of birth control, including illegal abortion (Muresan, Haragus, Haragus, & Schroder, 2008).

Western and Eastern Europe have also had divergent patterns of mortality and health. In the early part of the twentieth century there was a clear East-West divide with much higher mortality in the East (Caselli 1994). After World War 2 mortality in the Soviet Union and other Eastern European countries improved substantially, and to a greater extent than in the West, leading to some narrowing of the gap during the 1950s and 1960s (Meslé, 2004; Murphy, 2011). However, from the 1970s onwards mortality in the West began a renewed decline in contrast to stagnation, particularly in male mortality, in the East leading to a wider divergence further exacerbated by the sharp increase in adult mortality which followed the collapse of the Soviet Union (Murphy, 2011).

Research questions

The main aim of this study was to establish whether early parenthood was associated with poorer health at ages 50-80, and to a similar extent in groupings of Eastern and Western European countries, and to investigate the salience of different hypothesised underlying pathways. A related secondary aim was to compare the effect of early parenthood measured in absolute and in relative terms to provide further insights into the importance of possible disadvantage (and selection) related to 'off time' or non-normative reproduction. We expected that early motherhood (measured in absolute terms) would be less strongly associated with childhood disadvantage in Eastern than in Western countries because of greater cultural acceptance of early motherhood, but that selection into early motherhood measured in relative terms would be similar in East and West. We also hypothesised that both

early motherhood and, to a lesser extent, early fatherhood, would be less strongly associated with adult outcomes, such as occupational status and experience of divorce, in the East compared to the West because of weaker selection into early parenthood, greater (past) state supports for families with children, and weaker links between educational attainment and occupational advancement and income during the Soviet era. Weaker associations between childhood disadvantage and early parenthood and between early parenthood and adult outcomes imply – if these mechanisms are important- a weaker association between early parenthood and later health in the East compared to the West. However, other influences might have had the opposite effect. The probable worse nutritional status of young women in poorer Eastern countries, for example, might have made early motherhood more physically challenging and harsher socio-economic conditions and poorer health care might have served to compound cumulated stresses linked to early parenthood for both women and men.

In this connection recent, as well as past, divergences between East and West may be relevant. Those in the Eastern countries experienced the disruption and economic hardships attendant on the collapse of the Soviet Union at the end of the 1980s. In the aftermath of this Lithuania and Georgia regained independence and East and West Germany were re-unified. The Western countries considered all have well established social protection schemes, are highly urbanised with high income levels and low mortality. The Eastern countries have much lower levels of GDP per capita – particularly in the South Eastern countries - higher mortality and larger rural populations. The lesser availability in Eastern countries of compensating supports for those with socio-economic or health challenges in the 1990s might have served to further reinforce disadvantages linked to life course experiences, including early parenthood. The relevance of such recent or current conditions – as well as the past- has been demonstrated by the rapid improvements in mortality observed in the former East German population following re-unification (Gjonca et al, 2000).

To achieve our objectives, we first analyse associations between indicators of childhood circumstances and early age at entry to parenthood in order to examine regional differences in selection into early parenthood. We secondly examine associations between early parenthood and later outcomes which might mediate associations with health. For this purpose we selected three indicators; last occupational class, experience of divorce, and eventual family size of four or more children, all of which have been shown to be associated with early parenthood and with health at older ages. In a final step we analysed associations between early age at parenthood and health in a series of models sequentially adding controls for these childhood and adult circumstances.

Data and methods

The analyses are based on wave 1 data from the Generations and Gender Survey (GGS), a cross-national survey of nationally representative samples of respondents aged 18-79 (Vikat et al., 2007). Respondents were asked about current circumstances, including health status, and for retrospective information on childhood circumstances and life course trajectories, including fertility history. The GGS has been fielded in 16 European countries and details of sampling and fieldwork procedures have been reported elsewhere (Fokkema, Kveder and Liefbroer, 2014;Vikat et al. 2007). We excluded five countries which were restricted to adults aged under 65 or lacked information on variables used in the analysis. We used harmonised data from the remaining 11 countries and divided them into Western (Belgium, France, Germany (W), the Netherlands, Norway) and Eastern groupings (Bulgaria, Georgia, Lithuania, Poland, Romania and Russia) along geo-political lines. We divided the data for Germany into former Eastern and Western states. This had to be done on the basis of residence at time of interview. We included those from West Germany in the Western group but excluded the small sample from East Germany as since reunification they have experienced the policies and resources available in the West. Data were collected between 2003 and 2011, with seven of the 11 countries fielding the surveys in 2004-2006. The overall (all age) response rate in these 11 countries was 61% ranging from 42% in Belgium to 86% in Romania (Fokkema, Kveder, & Liefbroer, 2014). Analysis of the representativeness of the data carried out by Fokkema, Kveder and Liefbroer (2014) and Vikat et al. (2007) indicated some underrepresentation of young people (aged 18-34); men; and the less well educated.

We undertook quality checks on the fertility information reported by older people in the GGS sample by comparing it with information on completed fertility (number of children per women) available for birth cohorts from 1930-1958 from the Generations and Gender Program Contextual Database (Spielauer, 2004). In line with other investigations of the whole GGS sample, respondents' reports of number of children ever borne were slightly lower than those presented in the contextual data base, particularly in Romania (Appendix 1). This may reflect lower survival to ages 50-80 among higher parity mothers (estimates in the contextual database are largely derived from historic vital registration data whereas the GGS estimates are obviously drawn from those who survived to be included in the surveys). However there may also be some underreporting of children, perhaps particularly of dead or abandoned children. Romania under the Ceaușescu regime had much higher maternal

mortality (much of it related to illegal abortion) than other European countries (Frejka, 2008) and also high infant mortality and some abandonment of children. The extent of this is not known but in 1990 an estimated 3-4% of children under 14 were in institutions (Stephenson et al., 1992). We also compared distributions by self-rated health in the GGS with results from the Surveys of Health, Ageing and Retirement and in Europe for countries included in both, these showed a good correspondence (Keenan, Foverskov and Grundy 2015).

We present some descriptive analysis for individual countries but in most of the analysis pool data into the Western and Eastern groups as country level analyses would have lacked sufficient statistical power. This division was chosen because of the large social, economic and political differences between Western and former Eastern bloc states but it should be noted that it does not fit exactly with either geographical classifications or the Hajnal typology. In particular Lithuania (which was part of the Soviet Union from 1944 until 1990) lies to the West of the Hajnal line. There are also large differences in terms of standards of living (and early motherhood) within the Eastern group of countries; we therefore undertook additional analyses distinguishing the poorer South Eastern countries (Bulgaria, Georgia and Romania) from the rest (Lithuania, Poland and Russia). We further undertook some analyses stratifying the sample into those born 1921-44 and those born 1945-1961. Apart from differences in age at time of the GGS surveys, these groups have had very divergent experiences. In particular the earlier born lived through World War 2 which had large impacts throughout (and beyond) Europe with particularly heavy casualty tolls and devastation in the former Soviet Union, Poland and Germany. Results from these stratified analyses are not presented but we comment on any notable differences between cohorts.

Respondents aged 50-80 with one or more biological children and complete information on variables included in the analysis (handling of missing data is described below) were included in the analytical sample which comprised some 21,500 women and 17,200 men born between 1923 and 1961.

Measures

The primary variable of interest, early parenthood, was measured using two binary indicators. An absolute measure where early parenthood was categorised as first birth before age 20 for women and age 23 for men, cut-points used in previous studies (Doblhammer, 2000; Grundy & Kravdal, 2010; Henretta, 2007; Read, Grundy, & Wolf, 2011), and a relative measure where early parenthood was defined as more than one standard deviation below the country and cohort (5 year intervals) mean age at first birth for women or men respectively. These

measures were based on information collected on month and year of birth of the eldest living child and so unfortunately exclude births of deceased children. We include in all analyses an indicator of whether or not respondents had had a child who died as a partial control for possible bias arising from this omission. Experience of the death of a child is in itself likely to be associated with parental health, both because of intergenerational continuities in health and because of the traumatic effect of a child's death, and so is of interest as a co-variate in its own right.

Childhood circumstances and educational level

Indicators of childhood circumstances available were respondent's reports of their parents' highest level of education, parents' occupation and parental presence in the childhood home. Parental presence in the childhood home was assessed by a dichotomous question: "Did you live most of your childhood up to the age of 15 with both of your own biological parents?" (yes/no). Educational data were coded using the International Standard Classification of Education (ISCED-97). For parental education, we distinguished between those with low levels of education (ISCED 0-2, no education, primary and lower secondary) and those with medium (ISCED 3-4, upper secondary and non-tertiary post-secondary) or high (ISCED 5-6, tertiary) levels. Occupational data in the GGS were coded using the International Standard Classification of Occupations (ISCO-88). We used the one digit codes to classify parents' occupation when respondents were aged 15 as either white collar (ISCO 1-5) or blue collar, including those working in agriculture (ISCO 6-9)[1]. Appendix 2 shows the occupation classes covered by the different ISCO codes and also how we coded the data from the German survey, which used a different classification system. When information on education or occupation was available for both parents and was discordant we chose the higher. Respondents' own educational level was coded using the ISCED classification described above but we distinguished three groups (low, mid and high) rather than two as for parental education.

Adult intermediate outcomes

Three binary measures of adult life outcomes that may mediate associations between early parenthood and later health were considered: having had 4 of more children; having ever divorced, and last or current occupation being white collar or not. Respondent's last or

[1] A small number of people who had current positions in the armed forces (ISCO 0) were coded as having white collar occupations.

current occupation was coded as white (non-manual) or blue collar (manual) in accordance with the variable for parents' occupation. Homemakers, long-term ill or disabled people, retired people without a job before retirement and others with no history of employment were categorized as non-white collar.

Health

Self-rated health (SRH) was used to measure respondent's health status. Respondents were asked if they considered their general health to be 1) very good, 2) good, 3) fair, 4) bad or 5) very bad. This question has been used widely in surveys and has been shown to be an independent predictor of mortality within populations (DeSalvo, Bloser, Reynolds, He, & Muntner, 2006; Idler & Benyamini, 1997) although it is recognised that there are differences between social groups and between countries in how people assess SRH (Desesquelles, Egidi, & Salvatore, 2009; Dowd & Zajacova, 2010; Huisman, Van Lenthe, & Mackenbach, 2007). After preliminary work in which we established that results using an ordered response category and a dichotomised variable were substantially the same, the measure was dichotomised into good SRH (very good and good) versus fair/bad SRH (fair, bad and very bad). In the Norwegian survey the response categories ranged from excellent to poor so in this case respondents reporting excellent, very good or good health were considered to have good SRH while respondents reporting fair or poor health were considered to have fair/bad SRH.

Other covariates

Age, measured in single years and treated as a continuous variable and country dummies to control for differences in country-level factors associated with the outcomes were included in all models. Other covariates included in the analysis were a binary indicator of whether or not respondents were married at the time of the survey and a binary indicator of whether or not they were living with a spouse or partner at the time of their first birth. These were included because of known associations between marital status and health (Goldman et al 1995) and previous studies suggesting that associations between early parenthood and later health may vary according to whether or not the birth occurred within a co-resident partnership (Koropeckyj-Cox et al., 2007).

Analysis strategy and statistical analysis

In the first step of the analysis we used multivariable logistic regression to estimate the association between childhood circumstances and early parenthood. It is recognised that the direction of association between education and early fertility is ambiguous as early parenthood may

disrupt education (Kravdal and Rindfuss, 2008) so we did not include own education in this model but added it in subsequent analyses. We secondly analysed the association between early parenthood and adult life outcomes, adjusting for childhood circumstances, respondents' own education and whether or not they had been in a co-resident partnership at time of the first birth. We analysed associations between early age at entry to parenthood and self-rated health by fitting series of models adding groups of co-variates in conceptually related blocks. The first of these included age at first birth, and age. We added childhood circumstances in the second step and own education and whether co-resident with a partner at first birth in the third. The final model additionally included the indicators of adult life outcomes (experience of divorce, high parity and occupational status) together with current marital status. All models included the indicator of whether respondents had a child who had died and country fixed effects. We compared parameter estimates for the country groupings by fitting models for the whole sample including interaction terms and report on any significant differences. All analyses were carried out separately for men and women. Robust standard errors were estimated and used throughout in order to allow for clustering of data within countries.

Missing data

The models presented were estimated using listwise deletion to handle missing data. In this complete case analysis the main sample was reduced by 18.2% for women and 17.6% for men. These reductions were mainly due to missing information for the measures of parents' occupations, ranging from 4.2% in West Germany to 11.5% in Georgia, and parents' educational level, ranging from 2.3% in Romania to 18.0% in Russia. For all other measures the proportion of missing data in each country was generally below 2.0% and never above 6.0%, with the exception of respondents' own occupation in Norway where the proportion missing was 18.0%. To improve efficiency in the estimation and correct potential bias in the complete case analysis due to the probability of missing data being associated with both the dependent and independent variables, the analysis was repeated using multiple imputation (MI) to deal with missing data (summary results presented in Appendix 3). The general idea of the MI method used is first to replace missing values with predicted values from an iterative multiple regression approach and incorporate a random error into these predicted values so the variances and co-variances are not underestimated. Secondly this imputation process is run multiple times producing multiple "complete" data sets thereby making it possible to use the variability between the datasets to adjust the standard errors. Parameters from the multiple datasets are combined to a single MI parameter by taking the mean of

parameters across imputations and standard errors are calculated using both the within and the between imputation variance. When specified correctly the MI method produces estimates that are consistent and asymptotically efficient under the assumption that data is missing at random (MAR). The MAR assumption is that if all the variables responsible for the missing data generating mechanism are included in the model then the probability of missing data on a variable is unrelated to the value of this variable, i.e. is random (Little & Rubin, 2002). We used the chained equation method for the MI and included all variables from the analyses in the MI models. The burn-in period was set to 100 iterations and the number of imputed datasets to 20. Trace plots of mean imputed values against iteration numbers were used to assess convergence of the multiple chains and distributions of observed and imputed data were compared to assess that no implausible differences existed. The multiple imputed datasets were analysed jointly using Rubin's rules (Little & Rubin, 2002). MI analyses were implemented using the *mi impute chained* and *mi estimate* commands in STATA 13.

Results

Contextual information and characteristics of the study populations

Table 1 presents some contextual information and descriptive results for key variables for countries included in the study. The values for life expectancy, a summary indicator of period mortality, indicate the much poorer health of those in the East compared with the West for periods relevant to those included in the study. (Unfortunately, reliable comparable data are not available prior to 1950). Life expectancy at birth was 60 or lower for males and below 65 for females in all the Eastern countries in 1950-55, compared with 64-70 for males and 70 or more for females in the Western countries. By 2000-05 life expectancy at birth was above 80 for females and in the range 75-77 for males in all the Western countries considered; in the Eastern countries female life expectancies were similar to those for males in the West and for males only in Poland was life expectancy at birth as high as 70. Further life expectancy at age 65 was above 16.5 years for men and 20 years for women in all the Western, and below 14.5 and 19.0 respectively in all the Eastern, countries considered. Purchasing power parity in US$ in the richest Eastern country (Poland) was half that of the poorest Western country (France) and particularly low in the South Eastern countries. Georgia and Romania were also less urbanised than other countries in either West or East.

Results from the GGS show that the proportions of women who had had their first child before the age of 20 were highest in Bulgaria and Romania. Poland and Georgia also had higher proportions of women who had been teenage mothers than any of the Western

countries considered, although Lithuania was the country in which this proportion was lowest. The proportions of men who had entered fatherhood before age 23 were highest in Bulgaria and Russia and lowest in the Netherlands, Georgia and Lithuania. As would be expected, there was a less clear differentiation between East and West when considering the relative measure of early parenthood, particularly for men. Consistent with other studies (Carlson, 2004; von dem Knesebeck, Verde, & Dragano, 2006), and with the life expectancy information, the proportions reporting fair or poor SRH were very substantially higher in eastern than western countries, particularly in Russia and Georgia, and women reported higher levels of poor self-rated health than men.

Descriptive information for the Western and Eastern country groupings on variables used in the analysis is presented in Table 2. The mean age of women and men in the sample was 62-63 in all regional groupings. Compared with the western group, respondents from the eastern group of countries, particularly those in the South East, included higher proportions whose parents had low education and blue collar or farm occupations. The proportion who had not lived with both parents for most of their childhood was also higher in the East than the West, particularly in the North Eastern group of countries which have high excess male mortality and were also most seriously affected by World War 2. (In all regions, but most particularly the North East, the proportion who did not live with both parents for most of their childhood was higher among those born before WW 2). Among men the proportion with high levels of education was greater in the West than the East (particularly the South East). Among women distributions by educational level were broadly similar in the North East and West, although with less heaping on medium levels in the West, but lower in the South East. The proportions who themselves had had a non-white collar occupation was higher in the West than the East for both men and women, among women the difference was particularly with the South East. Fewer of those in the South East had experienced divorce or not lived with a partner when their first child was born while the proportion with four or more children was lowest in the North Eastern countries. Fewer of those in the West had experienced the death of a child. More women reported this than men; this may be because their children would on average have been born earlier than those of male respondents (because of gender differences in fertility timing) but some under reporting by men is also a possibility. Among women, fewer of those in the North Eastern group were currently married reflecting the greater excess mortality of men in countries included in this group, particularly Russia. .As already noted for separate countries, levels of poor or fair self-rated health were much higher in the East than the West, and higher among women than men.

Childhood circumstances and early parenthood

Results (Odds Ratios and 95% confidence intervals) from logistic regression analyses of associations between childhood disadvantage and early parenthood for women and men in each region are shown in Table 3. The left panel of the table presents results with the absolute measure of early parenthood as the outcome and the right panel presents results with the relative measure as the outcome. Significant differences between models for the West and East in extent of associations are indicated by highlighting in bold. (As noted earlier these were assessed by fitting models including interaction terms to the whole unstratified analysis dataset).

Odds of early parenthood, both measured in absolute and relative terms and for women and men were raised for respondents whose parents had had blue collar (including farm) occupations; for men this association was stronger in the West than the East when the absolute indicator of early parenthood was considered. Low parental education was also associated with higher odds of early parenthood, although further analysis (not shown) revealed that for the North Eastern countries the direction of this association was reversed. For women, not having lived with both parents for most of the time until age 15 was also associated with higher chances of early motherhood; this is consistent with the literature indicating an association between father absence (and even more so presence of a stepfather) and earlier maturation and sexual debut in girls (Belsky, Steinberg and Draper 1991). There was a general negative association between older age and early parenthood. This reflects the higher rates of early parenthood in later born cohorts.

Early parenthood and adult life outcomes

In the second step of the analysis we examined associations between early parenthood and three adult life outcomes which might mediate associations with later health using logistic regression models which included indicators of childhood circumstances, respondents' own educational level and the indicator of whether or not respondents were living with a partner at the time of the first birth. Results, presented in Table 4, showed that in both West and East early parenthood was positively associated with high parity; for men this association was stronger for those in the West compared with the East. Early parenthood was also more strongly associated with divorce in the West compared with the East for both men and women. In the West but not the East early parenthood for both men and women was associated with slightly higher odds of non-white collar occupation (although for men this association, and the difference between West and East, were not significant when the relative measure of early fatherhood was used). Cohort specific analysis (not shown) indicated that

the associations between early motherhood, divorce and occupation largely reflected the experience of women born after 1946 among whom rates of divorce and women's employment outside the home were higher. Other co-variates included in the models (not shown in the table) were also associated with the outcomes considered with some differences between East and West. For example, blue collar occupation and low education of respondents' parents were positively associated with high parity, and to a greater extent in the East than the West, for both women and men. Parental blue collar occupation was also positively associated with respondents' odds of experience of divorce in the West but not the East. In the case of own educational level, lower education was positively associated with high parity and with non-white collar occupation, in both cases to a greater extent in the West than in the East.

Early parenthood and later life health

Table 5 shows associations between early parenthood and later life fair or poor SRH from a series of models including sequentially added groups of variables; all models also include age, country fixed effects and the dead child indicator. Model 1 includes the early parenthood indicator and age. The childhood circumstance variables were added in Model 2, own education and whether or not respondents were co-resident with a partner at time of the first birth in Model 3 and finally the adult life variables (high parity, ever-divorced, non-white collar occupation) and the current marital status indicator in Model 4. Addition of each group of variables resulted in an attenuation of the association between early parenthood and SRH. Most of the difference between Models 2 and 3 was due to the addition of variables indicating respondent's own educational level, which was strongly associated both with early parenthood and with SRH in both East and West. The addition of the variable indicating whether or not respondents had lived with a partner at the time of the first birth had a smaller effect in the West and virtually none in the East. In the final model early motherhood, measured in either relative or absolute terms, remained associated with SRH in the West but in the East it was only motherhood at a young age relative to the country and cohort mean that remained positively associated with poor health. Effects of early fatherhood were smaller and although the direction of the association between early fatherhood and poor health was always positive, associations were not significant in the West using the absolute measure or in the East using the relative measure of early fatherhood. Differences between Model 3 and Model 4 in estimates of the effect of early parenthood on health were non-existent or trivial in the East but larger in the West, particularly for women, indicating a differing impact of adding controls for the adult life variables.

For women there were differences between the North Eastern and South Eastern country groups in the extent of association between teenage motherhood and later poor health so results from analyses for these sub-regions, and for the West, are illustrated in Figure 1. Comparable results for men are shown in Figure 2. Figure 1 shows that the association between early motherhood, measured in absolute terms, and later health was largest in the West, intermediate in the North East and lowest in the South East where the association was no longer significant once own education was controlled (Model 3). The difference between the West and the South East in the teenage motherhood- health association was significant ($P<0.05$). However there were essentially no differences between the two Eastern sub-regions in levels or patterns of association when the relative measure of early motherhood was used or for men, regardless of the measure of early fatherhood (Figure 2). The Figures illustrate clearly the difference between East and West in the effect of adding control for the adult life variables. In the West these modified associations between early parenthood and health, particularly for women, in the East they had no effect.

Table 6 presents full results from the final fully adjusted model including the absolute indicator of early parenthood; results are shown for all countries together as well as for West and East. Odds Ratios for co-variates from the models including the relative measure of early parenthood were virtually identical (never differing by more than 0.02) and so are not presented. In the combined data for all regions early motherhood and early fatherhood defined in absolute terms were similarly positively associated with poor health, although the effect was not particularly large (OR 1.21/1.20). Odds ratios using the relative indicator (not shown in Table) for the combined sample were rather similar (1.27, 1.11-1.45 for women; 1.21, 1.10-1.35 for men). As already shown in Figure 1, early motherhood in this final model was positively associated with poor self-rated health in the West but not the East (although it was only the difference between the West and South East that was statistically significant); for men the reverse was the case. In terms of associations between other variables and health, older age was, as would be expected, associated with higher odds of poor health; the effect of this was stronger in the East than in the West. Of the childhood circumstance indicators, parental low education was associated with worse SRH for women in West and East and men in the East, but the effect was small. In this fully adjusted model parental occupation was not associated with respondents' own health and associations between not living with both parents in childhood and health were modest. Own higher education was associated with lower odds of poor health, and low education with higher odds. The effect of having had a non-white collar occupation on poor health was stronger in the West than the East. Effects of

having experienced divorce also differed between West and East with an adverse association with health in the former, especially for women, but not the latter. Not being currently married was associated with raised odds of poor health for men but not women. For women not having lived with a partner at the time of first birth was associated with worse health in the West but not the East and having a child who had died with worse health in the East but not the West.

Multiple imputation models

Results from the analysis carried out using multiple imputation to deal with missing data were very similar to those from the complete case analysis. Appendix 3 presents results from the final full model for poor/fair self-rated health using the imputed data. For men in the West the association between fatherhood before age 23 and fair or poor SRH was larger, and statistically significant, in the multiple imputation than in the complete case analysis presented in Table 6. However, in the multiple imputation analysis the odds of poor health associated with being ever-divorced was smaller, and not statistically significant. For women odds of poor health associated with not living with a partner at time of the first child's birth were slightly smaller, and those associated with being ever-divorced slightly larger, in the multiple imputation compared with the complete case analysis. None of these differences were large and other differences between the two analyses were very slight.

Discussion

Most previous studies of long-term health implications of early parenthood have focussed on Western countries and few have been comparative. We investigated associations between childhood circumstances and early parenthood; between early parenthood and high parity, last occupation and experience of divorce and between early parenthood and later life SRH among women and men aged 50-80 in eleven European countries which we divided into Western and Eastern groupings. East-West comparisons are of particular interest because of longstanding patterns of earlier parenthood in the East and past differences in social and economic institutional factors which may have buffered disadvantages consequent on earlier parenthood. We used two indicators of early parenthood, one based on chronological age and the other a relative measure in order to further address the issue of selection. In some analyses we distinguished between two Eastern sub-regions, one comprising South Eastern countries (Georgia, Romania, and Bulgaria) which had higher rates of early motherhood than the other richer North Eastern group.

Respondents in the Eastern countries were less likely than their Western counterparts to have lived with both parents throughout childhood, a likely outcome of the higher mortality, including heavy war time casualties, in the Eastern countries, and higher proportions had parents with low education and in blue collar jobs, particularly in the poorer South Eastern region. However, women in the North Eastern region were as likely as those in the West to have had higher education (and less likely to have only a low level of education) reflecting the emphasis in the former Soviet Union and Eastern bloc countries on women's education and employment. Overall the proportions of women who had had their first child before age 20 were lower in the West than the East, with a particularly large difference between the Western and the South Eastern country groupings. Consistent with many previous studies respondents in the Eastern countries had much higher levels of poor or fair SRH.

Results of our analyses showed that an early age at parenthood was associated with childhood disadvantage as indicated by low parental education and parental blue collar occupation. For men the association was stronger in the West than the East, significantly so in the case of parental occupation. For women differences between East and West in estimates were generally smaller when the relative, rather than absolute, indicator of early motherhood was used. Among women but not men absence of one biological parent in childhood was also associated with early motherhood; this is consistent with the literature on associations between paternal absence (and presence of a stepfather which were unable to investigate) and girls' earlier physical maturation, sexual debut and motherhood (Belsky et al 1991). These results provide partial support for our hypothesis that adverse selection into early parenthood would be greater in the West than the East.

East-West differences in associations between early parenthood and adult outcomes that might mediate links with health – high parity, occupational status and experience of divorce- were clearer and in most cases significant. Early parenthood was positively associated with risk of divorce, high parity (for men) and non-white collar occupation to a greater extent in the West than the East; results using the absolute and relative measures of early parenthood were similar. Stepped models of associations between early age at first birth and SRH also showed that these intermediate outcomes were relevant in the West, but not in the East. In the West odds of poor SRH in models including or excluding these variables differed for women (and to some extent for men), whereas in the East – in both the Northern and Southern sub regions- inclusion of these variables had trivial effects. This lends support to our hypothesis that associations between early parenthood – particularly early motherhood- and these intermediate outcomes would be lower in the East than the West because of greater past state

supports for families, encouragement of female education and labour force participation and weaker links between educational attainment and occupational advancement and income during the Soviet era.

Our main research question concerned the association between early parenthood and health in mid or later life. Consistent with our hypothesis that this would be weaker in the East than the West, we found that the association between birth before age 20 for women and later SRH was greater in the West than the East. The main – and statistically significant - differentiation was between the Western and the South Eastern countries where early motherhood was most common and was not associated with poor SRH in fully adjusted models; results for the North Eastern group of countries were intermediate. In models using the relative measure of age at first birth for women, and all models for men, differences within the Eastern region were very minor.

Limitations

In interpreting these findings various limitations need to be considered. The data we used were cross-sectional and the life course indicators, including on timing of the first birth, came from retrospective reports which may be subject to recall bias. In general it may be expected that women remember the date of their first maternity and this has been confirmed in other studies of European populations which have been able to compare contemporary and retrospective accounts (Poulain et al. 2015) although men's reporting of fertility may be poorer (Rendall et al, 1999). We found that reports of completed fertility generally matched well overall with relevant country data although less so for Lithuania and more particularly Romania. In the latter case this may reflect under reporting of births of children who were placed in 'orphanages' or died during the 'forced births' period following imposition of decree 770 in 1967. For both women and women knowledge and recall of details about parents' occupation and education may be subject to error and was missing for proportions of respondents, although other studies have reported good correspondence between recollected childhood environments and external sources of information (Havari and Mazzonna, 2015). We investigated possible bias arising from missing data through multiple imputation. In general, models using imputed data provided similar results to complete case analysis providing reassurance that this was not an important source of bias. Analyses were by definition restricted to those who survived to be included in the GGS surveys. Earlier life experiences of those from relevant birth cohorts who died before the survey are highly likely to vary from those of survivors. In general this might be expected to lead to some under estimation of the strength of associations between, for example, childhood circumstances and

early parenthood, as non-survival would be greatest among the most disadvantaged. As early parenthood has been found to be associated with raised mortality risks there may also be some underestimation of associations between this and health especially for groups with higher rates of premature mortality, such as men in the East.

Conclusions

These results partially confirmed our hypotheses that there would be differences between Western and European groups of countries in the extent of selection into early parenthood and East-West differences in associations between early parenthood and subsequent outcomes, including later life health. They also suggested that, as hypothesised, some of the association between early parenting and later health may be mediated by occupational progression and risks of divorce and high parity but that this varied between Western and Eastern European countries being important in the former, but not the latter. This indicates that structural aspects of social and economic organisation are important influences on disadvantages associated with early parenthood, and so potentially modifiable.

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Table 1. Descriptive information for countries included in the study: per capita income; life expectancy indicators and percent urban in 2005; and proportions with an early age at first birth and fair, bad or very bad self-rated health.

		West					**East (N)**			**East (S)**		
		BEL	FRA	DEU (W)	NLD	NOR	LTU	POL	RUS	BGR	GEO	ROU
Contextual information												
PPP$/1000 per capita 2005		33.0	30.4	32.1	37.0	48.4	14.7	13.8	11.8	9.9	4.2	9.5
% Urban 2005		97	77	73	83	78	67	62	74	71	53	54
Life expectancy at birth:	M	65.1	64.1	65.3	70.6	70.9	57.3	58.6	53.9	60.5	56.7	58.6
1950-55	F	70.1	69.9	69.6	73.2	74.4	64.0	64.2	62.0	63.7	64.4	62.8
2000-05	M	75.2	75.8	75.6	76.2	76.6	65.7	70.3	58.6	68.7	68.9	67.9
	F	81.3	83.1	81.4	81.0	81.8	77.5	78.7	72.0	75.6	76.1	75.2
Life expectancy at age	M	16.7	17.8	17.0	16.5	17.3	13.1	14.4	11.0	13.1	14.1	13.4
65:	F	20.4	22.1	20.3	20.2	21.0	17.7	18.6	15.4	16.2	18.3	16.2
2000-05												
GGS results (%)												
Women												
Age first birth < 20		6.2	10.5	8.9	6.0	11.3	6.1	12.8	8.6	17.6	11.5	16.9
AFB>1 SD below mean		12.2	10.5	10.9	13.9	13.4	12.8	11.6	12.4	11.0	10.7	11.4
Fair/bad self-rated health		31.4	41.3	36.7	31.6	31.4	84.1	69.4	94.7	68.0	89.2	68.6
N		*970*	*1,770*	*1,149*	*1,328*	*1,940*	*1,424*	*4,870*	*2,224*	*1,640*	*1,690*	*2,563*
Men												
Age first birth < 23		10.6	14.5	12.5	9.4	15.9	9.7	15.1	17.5	16.6	9.6	12.9
AFB>1 SD below mean		10.0	9.1	9.7	11.7	12.4	11.1	8.8	9.7	10.5	12.1	12.5
Fair/bad self-rated health		27.7	36.4	40.6	23.1	29.1	75.3	61.3	84.1	53.0	79.8	56.6
N		*981*	*1,485*	*1,072*	*1,067*	*1,859*	*1,420*	*3,192*	*1,036*	*1,656*	*1,227*	*2,198*

Sources: World Bank, World Development Indicators, 2015; UN DESA Population Division (2014); UN DESA Population Division (2014); analysis of GGS.

Table 2: Distribution of respondents by country group and variables used in the analysis.

	WOMEN				MEN			
	West			**All East**	**West**			**All East**
		East (N)	**East (S)**			**East (N)**	**East (S)**	
Age, mean(SD)	62.2 (8.4)	62.8 (8.3)	62.7(8.4)	62.8 (8.4)	62.3(8.3)	62.4(8.2)	62.6(8.6)	62.5 (8.4)
Age at first parenthood								
AFB <20(F)/23 (M)	9.0	10.6	15.5	12.6	13.1	14.2	13.3	13.8
AFB > 1+ std. dev. below mean	12.2	12.0	11.1	11.6	10.7	9.5	11.8	10.6
Not living with partner at 1st birth	14.4	11.4	8.9	10.4	10.0	8.5	6.1	7.3
Any dead child	6.0	9.2	7.8	8.7	4.8	5.5	5.9	5.7
Childhood factors								
Parents' educational level low	59.8	74.2	79.5	76.4	59.9	73.4	81.8	77.3
Parents' occupation blue collar	54.2	71.7	79.0	74.7	56.2	73.4	80.0	76.5
Not living with both parents	6.2	14.2	8.2	11.7	5.9	11.2	7.4	9.4
Own educational level								
High	21.6	20.6	14.1	18.0	30.7	20.5	18.3	19.5
medium	37.5	50.1	38.7	45.4	41.4	55.4	47.1	51.4
low	40.9	29.3	47.2	36.6	27.9	24.1	34.7	29.1
Adult life outcomes								
Non-white collar occupation	36.6	44.9	60.9	51.4	40.6	68.1	67.4	67.8
Ever divorced	19.9	16.7	6.2	12.4	17.6	13.0	7.1	10.2
4+ biological children	14.0	10.5	11.3	10.8	13.4	8.8	9.6	9.2
Not currently married	36.0	49.0	38.1	44.6	18.9	18.2	14.2	16.3
Self-rated health fair/poor	34.8	78.5	74.4	76.8	31.5	69.0	61.0	65.2
N	7,157	8,518	5,893	14,411	6,464	5,648	5,081	10,729

West: Belgium, France, (W) Germany, Netherlands, Norway. **East (N):** Lithuania, Poland, Russia. **East (S)** Bulgaria, Georgia, Romania

Table 3: Results from logistic regression analysis of associations between childhood circumstances and early age at entry to parenthood

	AGE FIRST BIRTH < 20 (F) / < 23 (M)						AGE FIRST BIRTH 1+ STD. DEV. BELOW MEAN					
	West			**East**			**West**			**East**		
	OR		95% CI	OR		95% CI	OR		95% CI	OR		95% CI
WOMEN												
Age	0.97	**	0.95-0.99	0.98		0.96-1.00	**0.98**	***	0.98-0.99	**0.99**	**	0.99-0.99
Parents occupation: Blue collar	1.36	**	1.10-1.67	1.54	***	1.34-1.78	1.46	**	1.15-1.85	1.55	***	1.35-1.77
Parents education: Low	1.96	***	1.58-2.43	1.53	***	1.24-1.90	1.85	***	1.60-2.14	1.60	***	1.32-1.94
Not living with both parents in childhood	1.53	*	1.08-2.17	1.55	**	1.16-2.06	1.49	**	1.15-1.92	1.34	**	1.06-1.69
N			*7157*			*14411*			*7157*			*14411*
MEN												
Age	**0.97**	***	0.96-0.98	**0.98**		0.97-1.00	1.00		0.99-1.00	1.00		0.99-1.01
Parents occupation: Blue collar	**1.43**	**	1.31-1.56	**1.29**	***	1.22-1.36	1.44	***	1.26-1.64	1.38	***	1.26-1.52
Parents education: Low	1.42	*	1.05-1.92	1.15		0.86-1.53	1.30	***	1.13-1.49	1.21		0.83-1.77
Not living with both parents in childhood	1.12		0.87-1.46	1.12		0.93-1.34	1.14		0.95-1.35	1.14		0.91-1.43
N			*6464*			*10729*			*6464*			*10729*

West: Belgium, France, (W) Germany, Netherlands, Norway. **East**: Bulgaria, Georgia, Lithuania, Poland, Romania, Russia. *P<0.05, **P<0.01; ***P<0.001. Models include country fixed effects and dead child indicator; **BOLD** indicates significant difference between West and East (P<0.05).

Table4. Results from logistic regression analysis of associations between early age at entry to parenthood and adult life outcomes

	AGE FIRST BIRTH < 20 (F) / < 23 (M)						**AGE FIRST BIRTH 1+ STD. DEV. BELOW MEAN**					
	West			**East**			**West**			**East**		
	OR		95% CI	OR		95% CI	OR		95% CI	OR		95% CI
WOMEN												
4+ children	2.15	***	1.72-2.69	1.91	***	1.66-2.21	2.28	***	1.89-2.89	1.88	***	1.53-2.31
Ever-divorced	**2.25**	*******	1.50-3.38	**1.30**	*****	1.02-1.66	**2.12**	*******	1.46-3.08	**1.29**	*****	1.04-1.60
Non-white collar occ.	**1.18**	*****	1.02-1.37	**1.06**		0.95-1.20	**1.23**	***	1.12-1.34	**1.05**		0.99-1.12
N			*7157*			*14411*			*7157*			*14411*
MEN												
4+ children	**2.10**	*******	1.80-2.45	**1.63**	***	1.29-2.07	**2.44**	***	2.13-2.80	**1.70**	***	1.35-2.15
Ever-divorced	**1.42**	*******	1.19-1.70	**1.27**	*	1.06-1.51	**1.51**	***	1.33-1.71	**1.19**	*	1.02-1.38
Non-white collar occ.	**1.18**		0.93-1.50	**0.98**		0.90-1.07	1.26		0.90-1.76	0.91		0.76-1.11
N			*6464*			*10729*			*6464*			*10729*

West: Belgium, France, (W) Germany, Netherlands, Norway. **East:** Lithuania, Poland, Russia, Bulgaria, Georgia, Romania. *P<0.05, **P<0.01; ***P<0.001. Models include age; parents' occupation; parents' education; whether lived with both parents in childhood; own education; whether living with partner at first birth; whether any child had died and country fixed effects. **BOLD** indicates significant difference between West and East (P<0.05).

Table 5: Results from logistic regression analysis of associations between early age at first parenthood and fair/poor self-rated health

	AGE FIRST BIRTH < 20 (F) / < 23 (M)						AGE FIRST BIRTH 1+ STD. DEV. BELOW MEAN					
	West			East			West			East		
	OR		95% CI	OR		95% CI	OR		95% CI	OR		95% CI
WOMEN												
Model 1	1.80	***	1.36-2.38	1.41	***	1.20-1.64	1.81	***	1.47-2.23	1.47	***	1.34-1.60
Model 2	1.66	**	1.23-2.25	1.32	***	1.14-2.25	1.68	***	1.33-2.10	1.38	***	1.26-1.51
Model 3	1.40	**	1.03-1.89	1.12		0.99-1.27	1.42	***	1.10-1.83	1.18	***	1.09-1.27
Model 4	1.30	*	1.01-1.69	1.11		0.98-1.25	1.33	*	1.06-1.67	1.16	***	1.07-1.26
N			*7157*			*14411*			*7157*			*14411*
MEN												
Model 1	1.41	***	1.22-1.63	1.39	***	1.26-1.53	1.61	***	1.36-1.93	1.32	***	1.17-1.49
Model 2	1.34	***	1.15-1.55	1.36	***	1.24-1.50	1.53	***	1.26-1.85	1.29	***	1.14-1.46
Model 3	1.17	*	1.02-1.35	1.23	***	1.14-1.32	1.33	**	1.09-1.62	1.17	*	1.01-1.35
Model 4	1.13		1.00-1.27	1.23	***	1.14-1.32	1.26	**	1.06-1.49	1.15		1.00-1.32
N			*6464*			*10729*			*6464*			*10729*

West: Belgium, France, (W) Germany, Netherlands, Norway. **East:** Lithuania, Poland, Russia, Bulgaria, Georgia, Romania. *P<0.05, **P<0.01; ***P<0.001.

Model 1: age; early age at first birth (Ref=no); Model 2: +childhood circumstances variables; Model 3: + own education and whether living with partner at first birth; Model 4 +ever-divorced; non-white collar last/current occupation; whether currently married/partnered. All models include country fixed effects and dead child indicator.

Table 6: Full results from logistic regression analysis of associations between early age at first parenthood and fair/poor self-rated health

	All			**West**			**East**		
	OR		95% CI	OR		95% CI	OR		95% CI
WOMEN									
Age first birth < 20	1.21	*	1.03-1.42	1.30	*	1.01-1.69	1.11		0.99-1.35
Age	1.05	***	1.04-1.07	**1.03**	***	1.01-1.05	**1.07**	***	1.06-1.07
Parents occupation: Blue collar	1.07	*	1.00-1.14	1.10		1.00-1.22	1.03		0.93-1.14
Parents education: Low	1.18	*	1.01-1.37	1.18	*	1.01-1.39	1.17	***	0.91-1.51
Not living with both parents in childhood	1.26	***	1.15-1.38	1.20		0.97-1.48	1.27	***	1.15-1.40
Own education: High	0.68	***	0.56-0.83	0.76	**	0.62-0.93	0.60	***	0.47-0.78
Own education: Low	1.37	***	1.28-1.46	1.32	***	1.21-1.43	1.42	***	1.29-1.55
Not living with a partner at birth of 1st child	1.11		0.97-1.28	**1.41**	**	1.14-1.73	**0.98**		0.86-1.13
Has deceased child	1.30	**	1.10-1.53	**1.04**		0.85-1.28	**1.55**	***	1.44-1.67
Last/current occupation: Not white collar	1.45	**	1.17-1.79	**1.89**	**	1.32-2.72	**1.20**	*	1.02-1.41
Ever divorced	1.26	*	1.02-1.55	**1.61**	***	1.35-1.91	**0.96**		0.88-1.05
4+ children	0.96		0.83-1.10	**0.90**		0.75-1.08	**1.12**		0.99-1.28
Not currently married	1.15	*	1.03-1.29	1.04		0.98-1.10	1.19		0.96-1.47
N	*21568*			*7157*			*14411*		
MEN									
Age first birth < 23	1.20	***	1.13-1.29	1.13		1.00-1.27	1.23	***	1.14-1.32
Age	1.06	***	1.05-1.07	**1.04**	***	1.03-1.05	**1.07**	***	1.06-1.08
Parents occupation: Blue collar	1.03		0.95-1.11	1.05		0.96-1.14	0.98		0.84-1.14
Parents education: Low	1.09	**	1.03-1.16	1.05		0.95-1.16	1.13	**	1.04-1.23
Not living with both parents in childhood	0.95		0.80-1.12	**1.10**	*	1.01-1.20	**0.87**		0.69-1.09
Own education: High	0.66	***	0.56-0.77	0.65	***	0.95-1.16	0.64	**	0.48-0.84
Own education: Low	1.29	*	1.06-1.57	1.27	***	1.12-1.43	1.27		0.91-1.78
Not living with a partner at birth of 1. child	1.08		0.99-1.18	1.11		0.96-1.28	1.10		0.96-1.26
Has deceased child	1.23	**	1.08-1.39	1.31	**	1.11-1.54	1.18		0.98-1.42
Last/current occupation: Not white collar	1.43	***	1.18-1.74	**1.87**	***	1.48-2.35	**1.21**	*	1.02-1.43
Ever divorced	1.03		0.86-1.22	**1.24**	**	1.07-1.43	**0.85**		0.63-1.13
4+ children	1.03		0.88-1.20	1.11		0.86-1.44	1.01		0.86-1.18
Not currently married	1.18	***	1.11-1.26	1.15	**	1.06-1.25	1.17	**	1.05-1.30
N	*17193*					*6464*			*10729*

West: Belgium, France, (W) Germany, Netherlands, Norway. **East :** Lithuania, Poland, Russia, Bulgaria, Georgia, Romania. *P<0.05, **P<0.01; ***P<0.001.Models include country fixed effects. **BOLD** indicates significant difference between West and East (P<0.05).

Table A.1. Coding of occupation variables

ISCO-88	**Occupation codes in German survey**
WHITE COLLAR 1. Legislators, senior officials and managers 2. Professionals 3. Technicians and associate professionals 4. Clerks 5. Service workers and shop and market sales workers	WHITE COLLAR Highly skilled profession (medicine, lawyer, etc.) Self-employed Civil servant, judge, officer Clerk
BLUE COLLAR 6. Agricultural, forestry and fishery workers 7. Craft and related trades workers 8. Plant and machine operators and assemblers 9. Elementary occupations	BLUE COLLAR Worker Paid family worker Farmer

Table A2: Full results from logistic regression analysis of associations between early age at first parenthood and fair/poor self-rated health; results using multiple imputation

	All			West			East		
	OR		95% CI	OR		95% CI	OR		95% CI
WOMEN									
Age first birth < 20	1.20	**	1.05-1.36	1.26	*	1.01-1.56	1.10	*	1.00-1.22
Age	1.05	***	1.04-1.06	**1.03**	***	1.02-1.04	**1.07**	***	1.06-1.07
Parents occupation: Blue collar	1.05		0.99-1.11	1.07		0.98-1.56	1.02		0.93-1.11
Parents education: Low	1.20	**	1.05-1.38	1.20	*	1.04-1.39	1.20	***	0.94-1.51
Not living with both parents in childhood	1.24	***	1.14-1.34	1.22	**	1.05-1.41	1.23	***	1.11-1.36
Own education: High	0.70	***	0.59-0.83	0.76	***	0.67-0.86	0.62	***	0.49-0.78
Own education: Low	1.37	***	1.27-1.49	1.30	***	1.19-1.42	1.45	***	1.34-1.56
Not living with a partner at birth of 1st child	1.06		0.94-1.20	**1.29**	**	1.11-1.51	**0.93**		0.81-1.08
Has deceased child	1.32	***	1.15-1.51	**1.14**		0.98-1.33	**1.48**	***	1.32-1.67
Last/current occupation: Not white collar	1.49	**	1.19-1.86	**1.94**	***	1.42-2.64	**1.19**		0.99-1.44
Ever divorced	1.24	*	1.04-1.47	**1.49**	***	1.24-1.79	**0.96**		0.89-1.04
4+ children	0.95		0.83-1.09	**0.91**		0.76-1.10	**1.12**		0.99-1.28
Not currently married	1.15	*	1.02-1.30	1.06		0.94-1.19	1.18		0.94-1.48
N	*26588*			*9212*			*17376*		
MEN									
Age first birth < 23	1.24	***	1.19-1.30	1.22	***	1.15-1.29	1.23	***	1.15-1.32
Age	1.05	***	1.04-1.07	**1.04**	***	1.03-1.05	**1.07**	***	1.06-1.08
Parents occupation: Blue collar	1.05		0.97-1.14	1.06		0.96-1.17	1.01		0.87-1.17
Parents education: Low	1.08		1.00-1.16	1.05		0.92-1.19	1.10		0.99-1.22
Not living with both parents in childhood	1.04		0.92-1.19	1.11	**	1.03-1.21	0.98		0.80-1.22
Own education: High	0.68	***	0.60-0.78	0.67	***	0.59-0.76	0.66	**	0.52-0.84
Own education: Low	1.28	**	1.08-1.53	1.25	***	1.11-1.42	1.25		0.91-1.73
Not living with a partner at birth of 1. child	1.07		0.97-1.18	1.13		0.98-1.30	1.07		0.92-1.25
Has deceased child	1.25	***	1.16-1.34	**1.36**	***	1.25-1.48	**1.17**	***	1.07-1.27
Last/current occupation: Not white collar	1.46	***	1.24-1.72	**1.82**	***	1.54-2.16	**1.26**	**	1.10-1.44
Ever divorced	1.01		0.86-1.18	**1.15**		0.94-1.40	**0.86**		0.65-1.12
4+ children	1.00		0.87-1.14	1.05		0.82-1.35	0.99		0.90-1.07
Not currently married	1.21	***	1.12-1.31	1.20	***	1.11-1.31	1.18	**	1.05-1.33
N	*21006*					*8209*			*12797*

West: Belgium, France, (W) Germany, Netherlands, Norway. **East**: Bulgaria, Georgia, Lithuania, Poland, Romania, Russia. *P<0.05, **P<0.01; ***P<0.001.Models include country fixed effects. **BOLD** indicates significant difference between West and East (P<0.05).

Figure 1. Associations between early motherhood and SRH (Odds Ratios, 95% CIs) from sequential models by region.

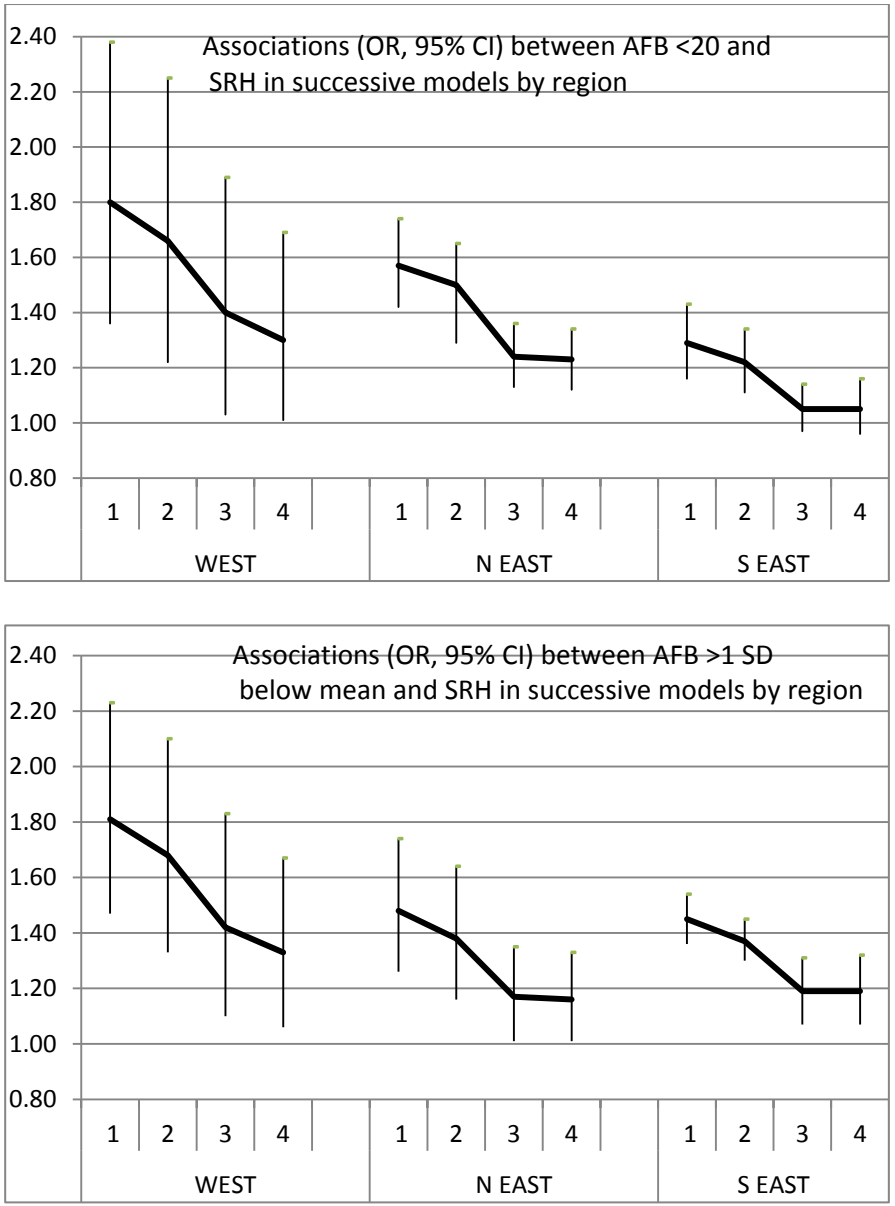
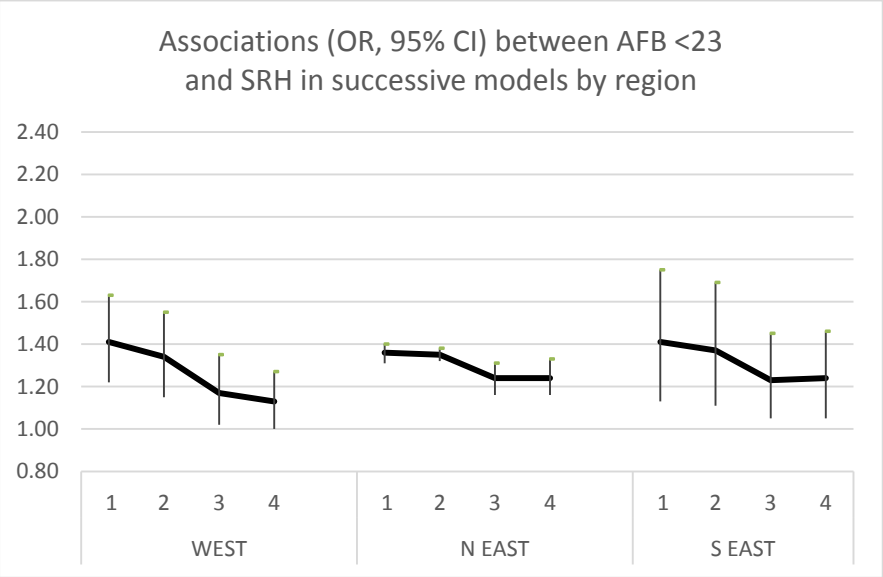
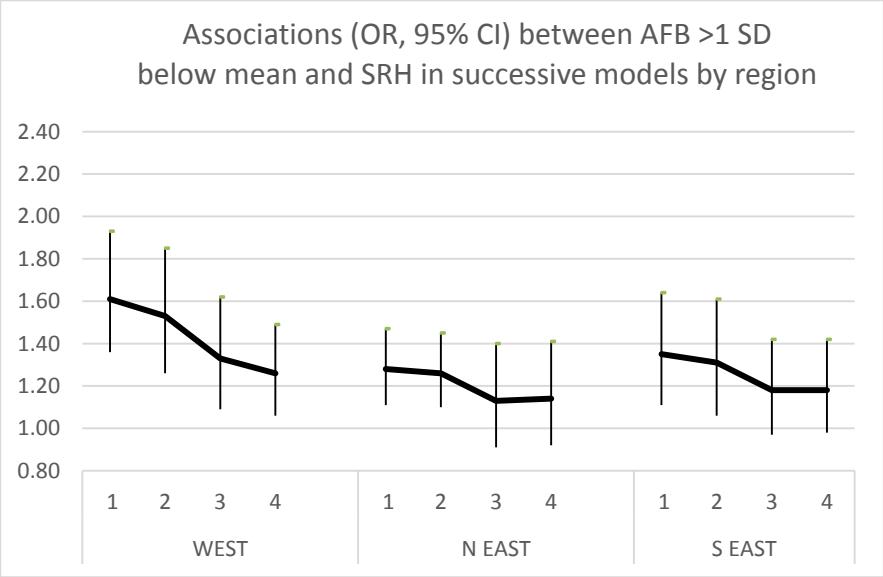


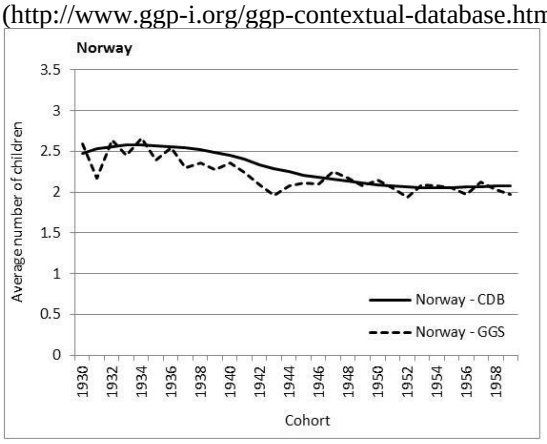
Figure 2. Associations between early fatherhood and SRH (Odds Ratios, 95% CIs) from sequential models by region.

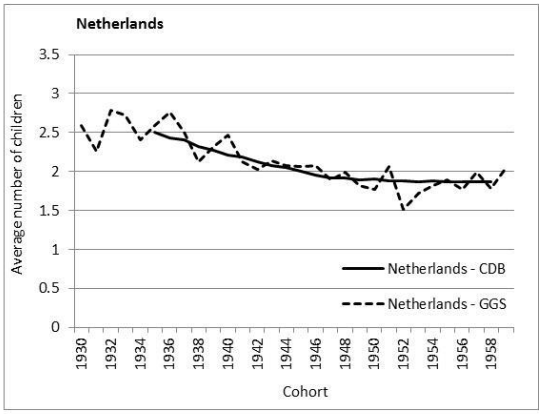


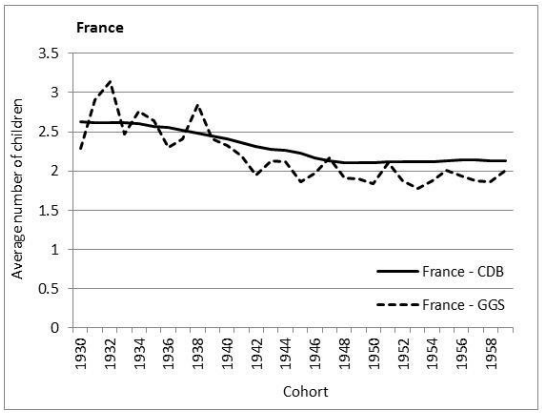


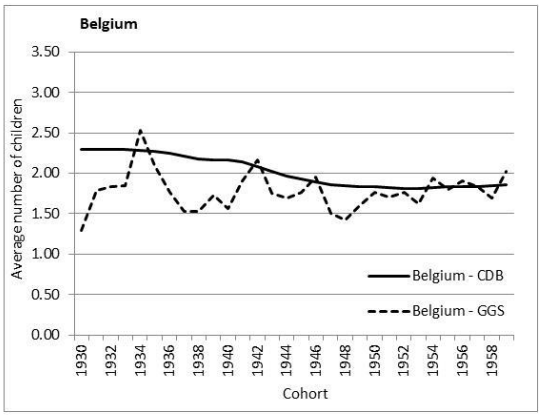
Appendix Figure 1.: Distribution by completed fertility (number of children per women) for birth cohorts from 1930-1959

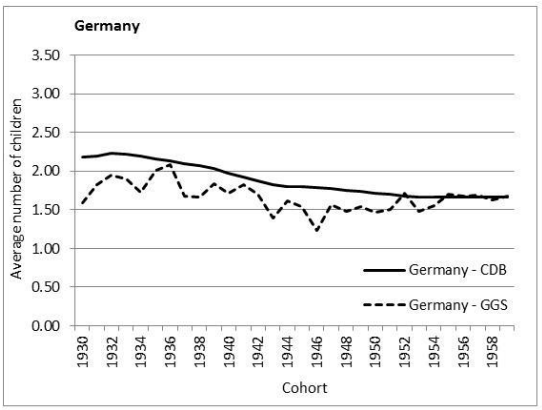
Contextual data extracted 29/03/2014 from: Generations and Gender Program - Contextual Database (http://www.ggp-i.org/ggp-contextual-database.html)

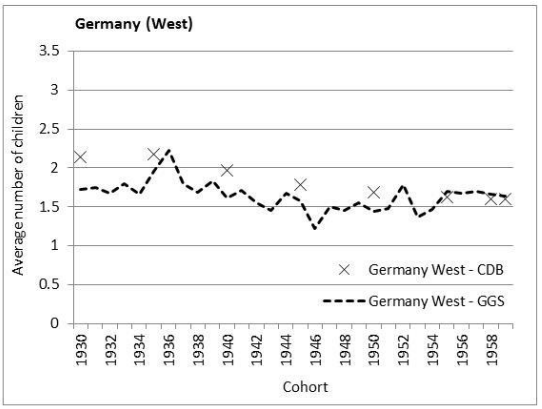


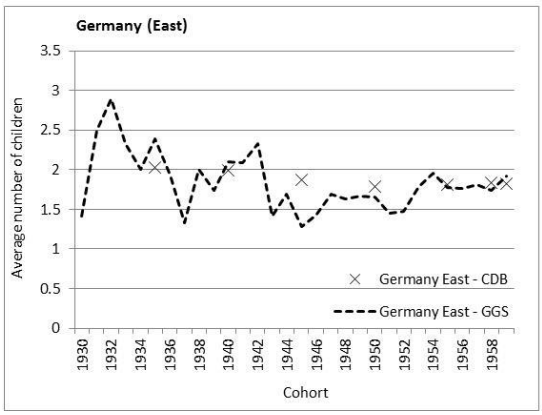


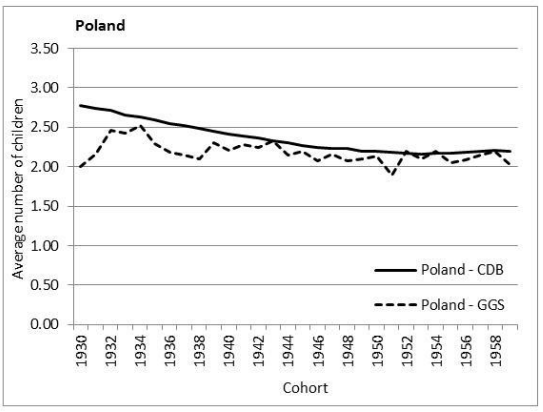


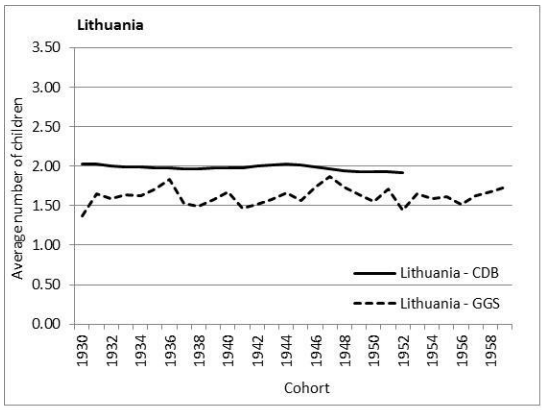




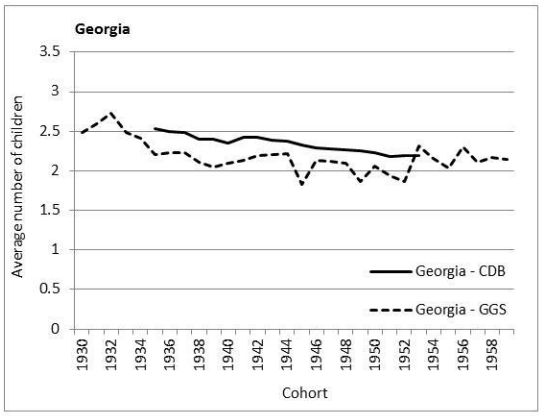


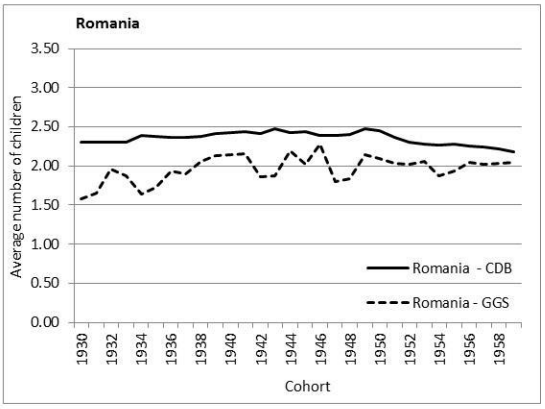


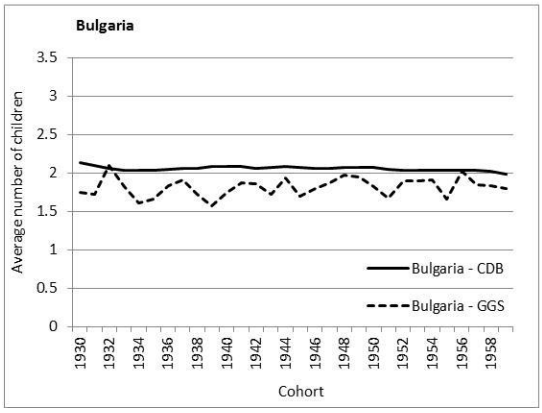



Lithuania
Average number of children
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1930 1932 1934 1936 1938 1940 1942 1944 1946 1948 1950 1952 1954 1956 1958
Cohort
Lithuania - CDB
Lithuania - GGS


Russia
Average number of children
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1930 1932 1934 1936 1938 1940 1942 1944 1946 1948 1950 1952 1954 1956 1958
Cohort
Russia - CDB
Russia - GGS


Georgia
Average number of children
3.5
3
2.5
2
1.5
1
0.5
0
1930 1932 1934 1936 1938 1940 1942 1944 1946 1948 1950 1952 1954 1956 1958
Cohort
Georgia - CDB
Georgia - GGS


Romania
Average number of children
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1930 1932 1934 1936 1938 1940 1942 1944 1946 1948 1950 1952 1954 1956 1958
Cohort
Romania - CDB
Romania - GGS


Bulgaria
Average number of children
3.5
3
2.5
2
1.5
1
0.5
0
1930 1932 1934 1936 1938 1940 1942 1944 1946 1948 1950 1952 1954 1956 1958
Cohort
Bulgaria - CDB
Bulgaria - GGS