Does Family Size Affect The Mortality Risk? Evidence From Swedish Registers

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SHORT ABSTRACT

Demographic research has paid a lot of attention to the impact of childhood conditions on adult mortality. The aim of this paper is to focus on one of the key aspects of early life conditions, i.e. family size, and to examine the causal effect of growing up in a large family on mortality risk. We use high quality Swedish administrative register data. Given the concerns regarding a potentially spurious correlation between the number of siblings and mortality, we apply a quasi-experimental approach that exploits multiple births as a source of exogenous variation in the number of siblings.

Previous studies have examined the effects of family size on health and mortality in a very specific context of harsh economic conditions and limited access to welfare state support, but there have been no studies of the effect of family size on mortality in modern developed societies. Our goal is to show whether growing up in a large family may be considered as a disadvantage in a country context where resources of most parents are not dramatically scarce and are complemented by a generous welfare state.

EXTENDED ABSTRACT

1. Background

Demographic research has paid a lot of attention to the impact of childhood conditions on adult mortality (Bengtsson and Broström 2009; Montez and Hayward 2011). The aim of this paper is to focus on one of the key aspects of early life conditions, family size, and to examine the causal effect of growing up in a large family on age-specific mortality rates. We build on the literature demonstrating a strong negative association between family size and measures of human capital, such as cognitive skills and education attainment (see Steelman et al. 2002; Jaeger 2008 for an overview). So far, there have been very few studies on the relationship between the number of siblings and another important dimension of human capital, health and longevity. This is an important gap in the literature because the resources that parents invest in their children may have a long-lasting effect on the quality and duration of children's lives (Grundy and Sloggett 2003; Van den Berg et al. 2009). If parents with more children devote less attention towards monitoring child activities and assuring that their children adopt a healthy life style, these effects may be reflected in problems that have an impact on their children's life chances in adulthood.

Previous studies that examine the way in which family size is related to child health indicate that there is a negative relationship, but the degree to which that effect is causal remains unresolved. The difficulty in disentangling the causal effect of growing up in a large family stems from the fact that the decisions on the number of children and the investments in child health may be taken jointly. Hence, the preferences towards larger family may correlate with lifestyle or childrearing habits that lead to lower child health outcomes. Moreover, being raised in a large family is associated with having a greater number of children oneself, and parenthood does have consequences for mortality (Doblhammer 2000; Grundy 2009; Grundy and Kravdal 2008; Hank 2010). For example, parenthood implies stress related to childrearing responsibilities, pressure to raise work effort and lower opportunities for the accumulation of savings (Aassve, Mazzuco and Mencarini 2006; Schultz 2007), and these factors are associated with poorer adult health and mortality.

The studies on the impact of family size on health and mortality that deal with endogeneity of family size concern mostly low- or middle-income countries. Baez (2008) shows that in Colombia a larger number of siblings reduce the chances that children have access to clean water and sanitary sewer facilities. Glick et al. (2007) demonstrates negative effects of family size on nutritional status of Romanian children. Millimet and Wang (2011) show that in Indonesia family size negatively affects the height of children. According to the findings of Rosenzweig and Zhang (2009) in China an additional child significantly decreases the health of all other children in the family. Mixed evidence regarding weight-for-age in the same country is provided by Henderson et al. (2008). The literature on family size and child health includes also studies on more affluent countries but using historical data. Hatton and Martin (2011) examine the trade-off between the number of children raised by parents and child health in poor families in Britain in 1930ies. Their results suggest negative effects on the heights of children, but no such effects are found for body mass index. Smith et al. (2009) analyse the data from Utah Population Database (UPDB), which includes individuals born between the 1800s and 1970s, and find small effects of family size on health outcomes.

Clearly, most studies carried out so far examine the effects of family size in a very specific context of harsh economic conditions and limited access to welfare state support, whereas the evidence for affluent countries with well-developed social policy is missing. This opens up the question of whether growing up in a large family may negatively affect child well-being if parental resources are not dramatically scarce and/or complemented by augmentary social policies.

We provide new evidence on the causal effects of family size on the risk of mortality based on high quality Swedish register data. Given the concerns regarding a potentially spurious correlation between the number of siblings and mortality, the aim of this paper is to examine the impact of family size on child health outcomes in a quasi-experimental setting that exploits multiple births as a source of exogenous variation in the number of siblings. This research design, called the twin-first approach, was proposed in a seminal study by Rosenzweig and Wolpin (1980). However, to date this design has mainly been applied in research on child educational outcomes.

2. Theoretical predictions

It is commonly observed that family size decreases opportunities for human capital accumulation and living in good health. Research in sociology and economics discusses many mechanisms that may contribute to the disadvantage of children raised in larger families, mainly pertaining to the nature of parental investments in child well-being. The medical literature is less unequivocal and actually indicates that there may be some advantages of having (many) siblings in terms of child health.

According to the resource dilution model advanced by Blake (1981), child development depends crucially on the amount of parental resources invested in its well-being. These resources may encompass both financial means but also the time and attention paid to child activities, which may translate into a lower propensity for risky behaviours and adopting a healthy life style (Mercy and Steelman 1982; Evans 2006). Another form of parental resources that can be potentially 'diluted' is the space in the home environment - the negative effect of family size on child physical and mental health may be moderated through household overcrowding (Solari and Mare 2012; Burström et al. 1999). Living in a home environment that provides insufficient space and privacy for the inhabitants has been shown to raise the level of stress, impede interpersonal relations within family, and hence have detrimental health consequences. Given that parental material and non-material resources are constrained, each additional child decreases the per-child investments made by parents. The larger the family, the greater the dilution of resources, and the more limited are the opportunities for the healthy development of a child.

Economists view both the decisions on the number of children and on investments in child 'quality' as taken jointly (Becker and Lewis 1973; Becker and Tomes 1976). The model of quantity-quality trade-off that parents face when making these decisions has similar implications as the resource dilution model: an increase in parental investments in child development and well-being is more expensive as the number of children increases.

Medical studies propose two opposing mechanisms of the influence of family size on child health. First, according to the hygiene hypothesis, the number of siblings increases exposure to diseases which are spread by means of human interactions (Strachan 1989). In case of many diseases, having experienced them early in life contributes to the development of the immune system and diminishes the risk of more severe health problems in adulthood. The opposing view stresses that the direction

of the effect of early life exposure to diseases depends on their kind – It is possible that some less severe infections increase immune system development and therefore have a positive effect on adult health, whereas more severe infections may have an overwhelmingly detrimental effect on long term health (Mucci et al. 2004; Bengtsson and Broström 2009). Hence, from medical point of view the overall balance of positive and negative influences of being raised in a large family cannot be predicted on theoretical ground and has to be established empirically.

3. Data and methods

Recently, a number of studies have attempted to re-examine the relationship between the number of siblings and child welfare, referring to the econometric methods which deal with the endogeneity of family size. One of the most promising approaches has been proposed by Rosenzweig and Wolpin (1980) and named as "twin-first approach". The basic idea is to use the data on multiple births in order to construct a "control group" for parents with a given number of children. As long as decisions on higher party births are generally non-random, parents who experienced multiple births may be regarded as a random "sample" that may be used for comparisons with families that experienced births of singletons. Twin births are an outcome of a random process and not a result of deliberate decisions driven by a calculus considering future child welfare. Thus, information on twin births can be applied to estimate instrumental variable models that reveal the causal effect of the number of siblings on the child health outcomes such as mortality. The twin-first approach proposed by Rosenzweig and Wolpin (1980) can be regarded as comparable to a natural experiment and has opened up new opportunities for research on the consequences of family size (Schulz 2007, Moffit 2005). A common concern with an instrumental variable approach is weak instruments. This is not a problem using a twin-first approach, a multiple birth is a very strong predictor of eventual number of siblings. Families with a multiple birth have 0.73 to 0.94 additional children, compared to a similar family not experiencing multiple birth.

An important challenge that arises using the approach proposed by Rosenzweig and Wolpin (1980) is related to the fact that, as it has been shown in the medical literature, children born in multiple births tend to have lower birth weight which is in turn related to poorer health outcomes later in life. A solution proposed by Black et al. (2010) relies on restricting the sample to the older siblings of children born in the multiple births. Specifically, we construct an indicator of a multiple birth at *n* birth, limit the analytical sample to children born in families that experienced at least *n* births and then examine the mortality of children born before the *n*th birth. In other words, multiple births are used only to construct an instrumental variable, but the mortality of these children is not analysed.

We use data from Swedish registers that cover the full population and provide links between children and their biological parents as well as siblings. The sample consists of individuals born in Sweden whose personal identity number can be linked to the personal identity numbers of their parents and siblings. We link these individuals to their biological children and full siblings through a unique personal identification number. The registers contain information on year and month of birth, which makes it possible to identify children born in multiple births. The nature of Swedish register data puts certain constraints on our selection of cohorts. The linkage between parents and their children is only reliable after 1991. Thus, we can only focus on individuals that survived to that point. Our current preliminary sample restricts us to examine deaths between age 20 and age 30 for the 1972- 1977 cohorts, age 30 to 40 for the 1962-1967 cohorts, age 40 to 50 for the 1952-1957 cohorts, and age 50

to 60 for the 1942- 1947 cohorts. These age-specific data provide sufficient subsamples of individuals in families that experienced multiple (the subsamples for specific time intervals amount to between 7888 and 26137 siblings of twins). We study cohorts born before the introduction of assisted reproductive technologies (the first in vitro fertilization birth in Sweden took place in 1982), as their introduction reduce the degree to which multiple births can be considered an exogenous shock.

In our preliminary analysis presented in the following part of the abstract, we use a linear probability model to examine the decrease in survival during the 10 age span from one additional sibling. In the next step, we plan to estimate two stage least square models with an instrument based on data on multiple births and outcome variables defined as the probability to survive in a 10 year age interval. The instrument variable is variable set to unity for multiple births at the nth birth (for n equal to at least two) and zero otherwise. Separate estimations will be carried out for children from families with at least n births and for mortality rates in ten years intervals.

4. Preliminary results

Our preliminary results suggest a significant association between number of siblings and mortality shows. The association is related to the baseline mortality, stronger at earlier ages. The association is stronger for men than for women, and is in the latter case often not statistically significant. In our future work we plan to examine to what extent this association can be considered as causal by means of instrumental variable models.

Table 1: Linear probability models examining the effect of number of siblings on mortality

	death at 30	death at 30	death at 40	death at 40	death at 50	death at 50	death at 60	death at 60
Number of siblings	Men	Women	Men	Women	Men	Women	Men	Women
β	0.0008***	0.0001	0.0007***	0.0003***	0.0008***	0.0003**	0.0009***	0.0003
SE	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0002)
CI (95%)	0.0005 - 0.0011	-0.0001 - 0.0003	0.0004 - 0.0009	0.0001 - 0.0005	0.0005 - 0.0011	0.0000 - 0.0006	0.0005 - 0.0013	-0.0001 - 0.0006
Constant								
β	0.0044***	0.0023***	0.0065***	0.0038***	0.0172***	0.0119***	0.0465***	0.0326***
SE	(0.0004)	(0.0002)	(0.0004)	(0.0003)	(0.0006)	(0.0005)	(0.0008)	(0.0006)
CI (95%)	0.0036 - 0.0051	0.0018 - 0.0028	0.0058 - 0.0072	0.0032 - 0.0043	0.0161 - 0.0183	0.0110 - 0.0128	0.0450 - 0.0479	0.0313 - 0.0338
Number of individuals.	308,966	293,387	355,570	338,957	308,821	296,368	347,858	339,965

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