Intergenerational and intragenerational correlations in family size across time –fertility continuities in northern Sweden between 1750 and 2007

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Introduction

Intergenerational correlations in fertility, the association between a the number of children of a children and their number of siblings, is of great interest to demographers. The consensus in historical demography is that fertility correlations between generations were weaker in the past (Murphy 1999), and increased throughout the fertility transition (Anderton et al. 1987; Murphy 1999; Reher, Ortega, and Sanz-Gimeno 2008), as fertility was increasingly under deliberate control. There is consistent evidence of intergenerational transmission of fertility in contemporary countries (Murphy and Wang 2001; Dahlberg 2013; Murphy 2013; Kolk 2014a). The extent of fertility correlations in historical populations is somewhat controversial, ranging between almost no correlations (e.g. Imaizume, Nei, and Furusho 1970; Williams and Williams 1974; Gagnon and Heyer 2001), to some correlations (e.g. Pettay et al. 2005). A limitation of previous studies, both contemporary and historical, is that they rarely cover more than a few decades of generations. Thus, it is hard to get good estimates of how intergenerational transmission of fertility has changed over time. The only study looking at fertility correlations at a longer time uses genealogical data, examines a very different historical context (the Caribbean) and suffers from low sample size (Jennings and Leslie 2012).

The goal of this study is to combine contemporary administrative register data, with historical parish registers, and to use data from 1750-2007 to follow the development of fertility correlations. Besides looking at Pearson correlations in family size, we will also use measures on brother/sister correlations in achieved family size (Dahlberg 2013). Thus, we will both be able to look at the degree to which family size is associated across generations (intergenerational correlations), as well as the degree to which the total family influence on fertility has changed (intragenerational correlations). The study uses data from Skellefteå parish in Northern Sweden (Alm Stenflo 1994), and after 1960, parallel data on the same region as well as the complete population of Sweden. This is done through recently digitized parish records for the 1900-1950 period, previously a gap between Swedish historical and contemporary registers (POPLINK 2012).

Importance of fertility correlations within and across generations, and its change over time

Intergenerational transmission of fertility has been studied for over a century in the social sciences. Karl Pearson, one of the founders of mathematical statistics, wrote an article in the late 19th century examining fertility correlations among humans and race horses (Pearson, Lee, and Bramley-Moore 1899). Similarly, Ronald Fisher, another major contributor to contemporary statistics as well as population genetics, examined fertility correlations among the British peerage. These early researchers examined fertility correlations, as it would be a measure to the degree to which life time reproductive success (roughly, the number of surviving grandchildren) is heritable in an evolutionary biological sense.

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Many researchers have theoretically argued that fertility correlations should be low before the fertility transition. A common argument for a lack of intergenerational correlations has been that researchers had no access to deliberate control over fertility (i.e. the first of Coales three preconditions Coale 1973) before the fertility transmission, and thus individual had no possibilities to act on their preferences. This can be viewed as be due to the fact that parents transmit their values to their children, and that due to this acceptance/availability of different lifestyles was of prime importance (Udry 1996; Kolk, Cownden, and Enquist 2014). How one view these explanations are also dependent on opinions of the extent of deliberate fertility control in pre-transitional populations (cf. Henry 1953[1972]; Bengtsson and Dribe 2006; Tsuya et al. 2010; Kolk 2011) and the role of economic explanations for the fertility transition (Casterline 2001). Finally, researchers have speculated on a genetic basis for fertility. If this is related to fecundity of men and women one would expect fertility correlations before the fertility transition (Kosova, Abney, and Ober 2010), while other researchers have found that the genetic contribution to fertility correlations increase during the demographic transition (Kohler, Rodgers, and Christensen 1999). If a genetic heritability is found only after the fertility transition, this would suggest that any genetic aspect of fertility correlations more likely are related to preferences for children, rather than fecundity as such (Rodgers et al. 2001). Population genetic researchers have demonstrated evidence for intergenerational fertility correlations for pre-historic humans by means of genetic data (Heyer, Sibert, and Austerlitz 2005). Thus, there has been intergenerational transmission of fertility in at least some past human societies.

Some researchers have reasoned that the observed change in intergenerational transmission of fertility over time is due to an increasing individual agency over fertility (Udry 1996). In a population where fertility is high due to societal control there can only be very low intergenerational correlations as married couples have no direct influence over their reproduction. If all lifestyles are the same with respect to fertility desires and practices there will be no fertility correlations (Kolk et al. 2014). On the other hand, in a society in which some groups, but not others, gradually adopt a novel behavior correlations can be high (Kolk et al. 2014).

An alternative view of intergenerational correlations instead views low correlations as evidence that parental influence on their children is low (Liefbroer and Elzinga 2012). A society in which children pay no influence to the wishes of their parents will also result in low correlations. These contradictory views are related to the fact that a high correlation can be due to both high covariance, and low variance. A society in which variance in family size is low might have low correlations even though the absolute family size of parents and children are very similar.

A population in which no one practices either parity specific or parity independent would have very low correlations for couples which marry at a similar time. There could however be correlations in marriage timing due to reasons independent of fertility preferences. It is well documented that economic resources where an important condition for marriage in early modern northern Europe. There is also a clear population level association between increasing affluence and lower ages of marriage. Intergenerational stratification can be found in almost all societies including Sweden in the 18th to the 21st century. Thus, similarity in socioeconomic status may explain intergenerational fertility correlations. This appears not to be the case in contemporary Sweden (Dahlberg 2013; Kolk 2014b), but the relationship between fertility and socioeconomic status was likely very different before the 20th century.

Good data on the extent of the extent of fertility correlations in pre-transitional populations would be of much use to get a further understanding both of the nature of intergenerational transmission of fertility, as well as how behavior was passed between generations before and during the fertility transition. Additionally, the simultaneous use of both intergenerational correlations, and brother/sister correlations allows comparisons between a) the change in the degree of transmission of values/knowledge/preferences about children/contraception, and b) historic changes in the importance of overall family background characteristics (e.g. socioeconomic status).

Data

We use a combination of digitized parish register data from the Skellefteå region[2], starting in 1750 until 1950, and contemporary Swedish administrative registers which have micro level information from 1960, and additionally have birth histories from 1932. The historical data was collected by the Demographic Database at Umeå University.

The study will be based on an exceptional combination of national level administrative register data for the second half of the 20th century, together with digitized parish data from northern Sweden between 1750-1950. The historical data is collected by the Demographic Database in Umeå, and cover the Skellefteå region (Alm Stenflo 1994). The recent addition of parish data between 1900 and 1950 (POPLINK 2012) bridges an important gap in historical demography, and will allow for demographic analysis that can combines the perspectives of contemporary family sociology/demography, theories on the demographic transition, and traditional historical demography of pre-industrial populations.

The data includes migration histories of high quality, so it is possible to have a good coverage of exposure to individuals in the study, and create accurate information on all events taking place within the geographical and temporal limits. The historical section of the data includes 152,054 individuals which all are linked through a demographic event (birth/marriage) to another individual in the data. Around a third of our historical dataset can be observed for the entire period within our parishes. The historical and modern register data is linked through a unique and anonymous personal identifier. We have information the complete population of Sweden after 1960 until 2007, including birth records linking children from their parents starting from 1932. Thus, for everyone resident in our historical data we have linkage opportunities to not only people resident to Skellefteå, but over all of Sweden. This is very helpful as cross-regional migration increased during the 20th century.

Methods

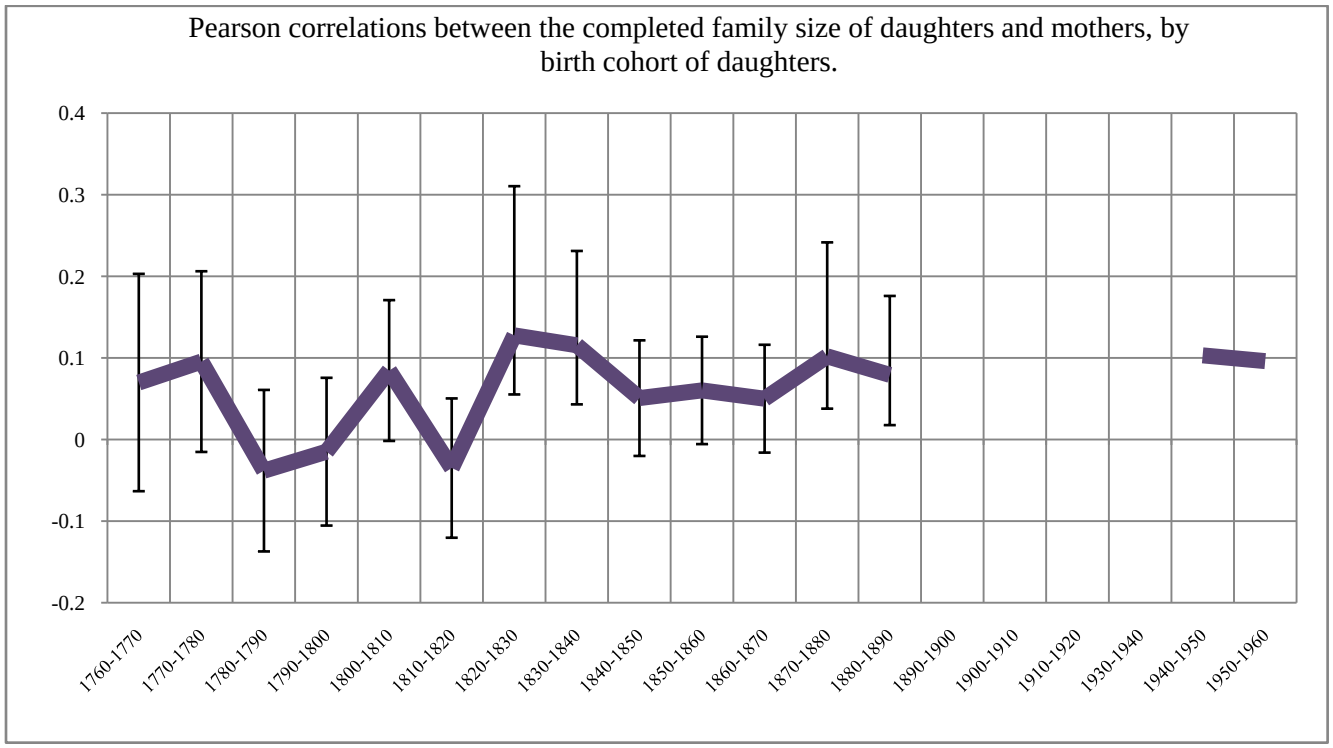
We both use classical correlational methods such as intergenerational correlations in fertility, and multi-level regression models. Using OLS, fertility researchers have found a consistently positive, yet rather weak, correlation (typically between 0.1 and 0.15) between parents' and children's completed family size in developed countries (e.g. Murphy 1999). A limitation with these studies is that they consider only one aspect of family background; namely, parents' number of children. In this study, we estimate the total effect of family background on completed fertility and age at parenthood using sibling correlations (SC). Through multilevel models using

a shared identifier for siblings it is possible to decompose how much of the variance in the population is shared between same-sex siblings and thus estimate intragenerational correlations. We will present results both for period trends, as well as by cohort of the younger generation.

This method of comparing siblings can be regarded as an omnibus measure of family background effects as it captures the effects of everything shared by the siblings including genes, parental influences, and neighborhood effects. The stronger the sibling similarity, the more important these shared factors (Mian, Shoukri, and Tracy 1991). The sibling correlation has two interpretations. First, it can be interpreted as the correlation between two randomly drawn siblings from one randomly drawn family. Second, it is the proportion of the total variance in age at first birth and final family size that can be attributed to family of origin. Additionally, we will show the degree of absolute resemblance in family size between parents and children. That is, the proportion of children that exactly replicate the family size of their parents. This perspective is more rarely used due to the fact that it can be hard to interpret when family size fluctuates between generations, but is still interesting for understanding why correlations change over time.

Results

We have data for the historic and contemporary period individually but we would additionally need these data sources do be linked, at the time of writing a database with linked data will be delivered to us shortly. Here we present preliminary data from analysis of our contemporary and historic data without this linkage. Below we present results for female intergenerational correlations in family size, by birth cohort. Our preliminary data shows moderate (0.05-0.1) correlations in family size already in the 20th century. We find substantive correlations already before the fertility transition. Previous research on an increase in fertility correlations over the fertility transition is supported. Further analysis will bridge the gap in the data by linked data material as well as examine intragenerational correlations.



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