A Life Course Analysis of Geographical Distance to Siblings, Parents and Grandparents in Sweden

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The kinship network of an individual changes over her life course. This study makes a contribution to the demography and cultural geography of kinship by studying how migration and demographic patterns shape the geographical availability of kin in contemporary Sweden. This study examines how distance to siblings, parents and grandparents change over a person's life course using longitudinal administrative register data. The study follows the complete 1970 cohort (N=74,406) and all their kin and studies how individuals distance to their kin change from age 10 (in 1980) to age 37 (in 2007) by means of data on residence for siblings, parents and grandparents. The study reveals surprising continuity in geographical distance to parents after age 25. Distance to living maternal and paternal grandparents, and siblings, see very minor changes after the index cohort reaches their early twenties.

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1. Introduction

It is well known that individuals in different stages of their life course have very different migration patterns. When looking at a family and kin it is important both to take account that different families are in different stages of their family life cycle, and that this process is embedded in period changes that takes place at the same time (Bengtson and Allen 1993; Mabry, Giarrusso and Bengston 2004). As individual members of extended families move frequently over the life course distance between a person and non-resident kin is a function of the age of an individual. Geographical distance and survival of a kin is a fundamental structural characteristic that shapes contact, obligations and provision/acquisition of care. Researchers have speculated

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that the emotional and care giving role of kin might grow in importance in the near future as life expectancy increases (Bengtson 2001; Wachter 1997). However, knowledge on how availability of kin changes over the life course is currently lacking.

This study will examine how geographical distance to siblings, parents and grandparents changes over the life course when an individual ages. I will follow a Swedish cohort from age 10 until they are 37. Questions on geographical distance to kin are dependent on patterns of internal migration, age of the index generation and their kin, preferences for living close/far from kin and mortality patterns. While researchers have examined these determinants by themselves, geographical data on how geographical proximity changes to kin over the life course remains a black box. The question is relevant for understanding how the economic, social and demographic changes the last century have affected relationships with non-resident family members. This study will fill an important gap in the intersection between demography, kinship research and cultural geography.

The following kinship terminology will be used in the study to refer to different kin. The anchor generation born in 1970 will be referred to as the index cohort and individual members will be referred to as ego. All other kinship terms will be in relation to the kinship network (kindred) of the index individuals. I will use the term family of origin to refer to the nuclear family which includes ego, ego's siblings, and his parents. The nuclear family consisting of grandparents and parents of ego will be referred to as the parental family of origin.

2. Background

I will first begin by presenting an overview on previous research on geographical proximity to kin. This will be followed by a discussion of specific factors shaping geographical distance to the specific different kin-dyads examined in the study.

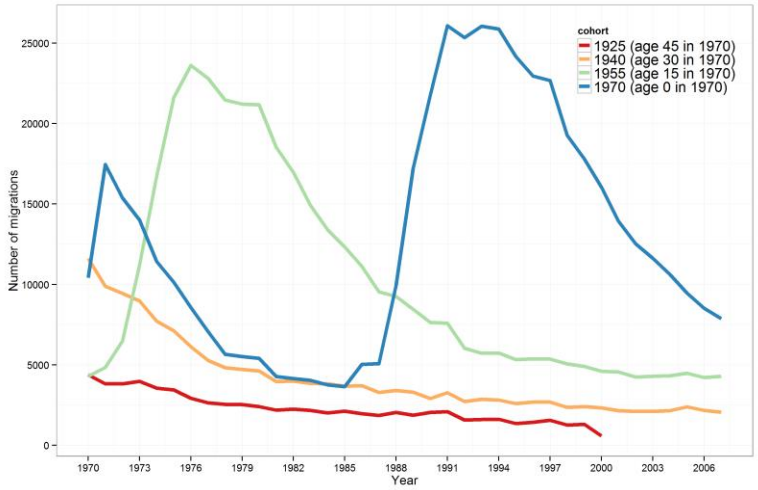
The geography of non-residential families is a topic for research that has seen a growing amount of research. A large number of studies have examined trends and determinants of geographical distance to parents (e.g. Blaauboer, Mulder and Zorlu 2011; Bordone 2009; Hank 2007; Løken, Lommerud and Lundberg 2013; Malmberg and Pettersson 2007; Michielin and Mulder 2007; Mulder and Kalmijn 2006; Rossi and Rossi 1990). This research is often presented in a context of parents as potential resources in for example child care or alternatively of children as

providers of care to elderly parents. There has also been some research on distance to siblings in adulthood (Kok and Bras 2008; White 2001). A small amount of research have looked at distance between adults and their grandparents (Lundholm and Malmberg 2009). Most of these studies have shown how these patterns change by age of the kin, but they have typically relied on cross-sectional data from a given period instead of following the same individuals over their life course. It has also been shown that distance to family members is an important factor shaping migration decisions (e.g. Michielin, Mulder and Zorlu 2008; Pettersson and Malmberg 2009).

Most moves in Sweden takes place within the municipality (Statistics Sweden 2003). Long distance internal migration is usually associated with employment, major life course events, or educational decisions. In an international perspective, internal migration in Sweden is typical for Europe but lower than in the US (Long 1992). Swedish migration flows have during most of the 20th century been dominated by movement from rural areas characterized by few employment opportunities, towards the larger metropolitan areas. This pattern was reversed in the 1970s (Vining and Kontuly 1978) but has after that continued to shape migration in Sweden (Kupiszewski et al. 2001). This pattern is particularly pronounced for women who more often leave their home municipality (Statistics Sweden 2003). Young adults often move to cities with major universities to acquire tertiary education (Lundholm 2007). In Figure 1 cohort inter-municipality migration rates in 1970-2007 are shown persons born in 1970, and a selection of older cohorts. As can be seen in the figure, migration is much higher in early adulthood and starts do decline after age 25. The figure also clearly indicates that migration rates will be much higher for the 1970 cohort than their parents and grandparents in the study.

Geographical distance to kin is affected by many important factors as individuals move for different reasons in different parts of their life course (Lee 1966; Rossi 1980). As the main outcome of this study is distance is a geographical dyad between ego and an individual kin, changes in distance for the dyad can be the result from a move from either individual in the dyad.

Figure 1: Number of inter-municipality migrations between 1970 and 2007 for selected cohorts.



Source: Registry data compiled by the author.

Perhaps the most important kin relation in adulthood is the relationship with parents. The first major factor affecting geographical distance to parents is circumstances when a person moves out from the family of origin. Because migration propensities are comparatively high in early adulthood (Geist and McManus 2008; Glick 1993), increasing distance between egos and their parents, will most often be the result of a migration by ego. An important life course event in early adulthood is to move out from the family of origin. Sweden is both today and historically characterized by a neo-local pattern of household formation in which adults leave the parental home in the late teens or early twenties (Dribe 2000; Dribe and Stanfors 2005; Hajnal 1982). Three generation households are very rare in Sweden (Sundström 1987). Nest leaving is most commonly not associated with long distance migration in Sweden. Important exceptions are migration to attend tertiary education, as well as migration streams from more rural municipalities to larger cities. Median age at leaving parental home is a little over age 20 for women and a little before age 22 for men for the 1970 cohort (Statistics Sweden 2008). Another factor associated with distance to biological parents during childhood is the prevalence of union dissolution and stepfamily formation (Andersson 2002).

Geographical distance to grandparents is shaped by migration decisions in three generations, those of the grandparents, the parents and the index generation. Like for distance with parents distance is primarily dependent on the index generation's mobility, but migration of either the

parental family of origin or egos family of origin during egos' childhood could also be important. An additional important aspect when looking at geographical distance to grandparents is survival patterns. When the index generation ages a the pool of grandparents will shrink (Wolf 1994). This will in particular be pronounced for patrilineal and male grandparents, sex differentials in life expectancy and age hypergamy (Kolk 2012). As the number of surviving grandparents declines rapidly after age 20, one should be mindful of selection effects influencing geographical distance to kin. Grandparents who have been healthy throughout their lives are going to be overrepresented when looking at distance to older grandparents.

Geographical distance to siblings, unlike parents and grandparents, are also determined by migration propensities of another similar aged individual, on top of the index generation. Full siblings typically share their parental home until they reach early adulthood. Birth order is an important factor mediating distance to siblings, as geographical proximity to siblings for early born primarily are determined by individual migration decision, while in contrast later born will first experience their siblings leaving the parental home.

Litwak and Longino (1987) suggested that ageing parent's migration patterns can be divided into three different stages. The first stage is characterized by location driven migration in which relatively healthy parents move to attractive locations far away from their kin. In the second kin these retirees become less healthy and move closer to their adult children. Finally in a third stage, as the parents get less health, the parents have to move to an institution. Building on this framework (Lin and Rogerson 1995) suggest an alternative three stage model taking both mobility of parents and their children into account. In a broad description of their model children are initially in a first stage dependent on their parents after they leave their parental home. In this stage intergenerational proximity is modest but decreasing. In a second stage adult children and their parents are largely independent of each other and intergenerational proximity is relatively large. In a final stage elderly parents grow increasingly dependent on their adult children, and care-orient migration in both generations increase geographical proximity. Mulder and Kalmijn (2006) found, using cross-sectional survey data, that geographical proximity to kin was largely unchanged during the life course. This was true both for mean distances and for proximity to your closest kin. Due to the cross-sectional design, there were unable to distinguish differences between birth cohorts from age effects.

Based on previously discussed patterns in internal migration and the age profile of migration, and the comparatively generous state-support for elderly in Sweden, one may expect geographical distance to continue to increase through the life course. This pattern will be much stronger in the early twenties when egos leave parental home, but will continue as ego ages as both ego and his kin will continue to migrate for various labor market reasons. These migrations will, in particular if they are done for labor market reasons, typically increase kinship dispersion. As young adults have the highest migration rates in a society, it is primarily migration decisions by the 1970 cohort that affects intergenerational distance across generations. To test this theory I propose the following hypothesis.

> *H1: Geographical distance to siblings, parents, and grandparents will increase continuously over the life course.*

An alternative explanation would be that geographical distance to parents and grandparents instead would follow a U-shaped pattern as both the index generation and parents will move closer to each other to provide care when parents and grandparents age (cf. Lin and Rogerson 1995; Litwak and Longino 1987). This pattern would be stronger for grandparents than parents as the latter typically still are healthy at 2007 when the index cohort is 37. A complicating factor is that parents might relocate closer to grandparents' geographical residency, and by doing so, increase geographical distance to parents. If care oriented migration is a strong driver of intergenerational proximity I propose the following alternative hypothesis:

> *H2: Geographical distance to grandparents, and to a lesser extend parents, will increase initially as the index cohort grows older, but will decline later in ego's life course.*

3. Research Design

This study will use a longitudinal design following the entire Swedish 1970 cohort from 1980 to 2007 and study how distance to siblings, parents and grandparents change over the life course following the same individuals. Longitudinal information on the pool of living kin of the index cohort and their kin will also be an integrated part of the analysis. A key strength of this study is that the same individuals are followed over their life course. In this way the actual experience of a real cohort can be shown and one can see how mortality affects distance to kin as older kin gradually pass away. By following the same cohorts over time many selection issues related to

mortality that would be a problem in cross sectional survey studies are avoided. The use of complete population data also means that one can avoid issues like non-response rate and sample attrition which greatly could bias survey based studies. To examine the effect of age and life cycle-stage on geographical distance to kin longitudinal data is needed. Information on survival and geographical information on adult individuals' parents and grandparents is also required. In this study the multigenerational depth is bounded by the limits of the Swedish multigenerational register, limiting cohorts with information on grandparents to the 1970 cohorts. As the data just look at a single cohort, it is important to consider that one cannot isolate period changes during the study from age pattern as the index generation grows older.

The paper will only examine family relations in the sense of genealogical kinship defined by biological parenthood. Family structure is defined from the biological parents and grandparents an individual had at birth. The study will not examine the role of grandparental and parental separation, or the role of half siblings and stepparents. Registry data is excellent for these kinds of analysis, but one should keep in mind the limitations of this structural view of kinship.

4. Data and Methods

This study is based on administrative data on the complete Swedish population. The index population is all men and women born in Sweden 1970 which also has Swedish born parents (N_{women}= 36,282 women, N_{men}= 38,124 men). The latter condition is necessary to ensure that most individuals can be connected with their kin. These individuals are linked to their full siblings, parents and grandparents by means of the Swedish multigenerational register. Individuals can be linked to their parents starting in the early 1930s, conditioned on that the kin survived until 1960. In practice, virtually the entire cohort can be connected to all their parents and siblings and over 90% to each of their grandparents. All linkage is with biological parents/kin. Geographical information is collected based on 'de jure' residency at the end of every year starting from 1980. Geographical residence is computed using coordinates of population weighted municipality midpoints[2]. A map of municipalities in Sweden is provided in

[2] Sweden had 299 municipalities, together having a population of 9,174,464 individuals in 2007. In 2007 the median municipality population was 15,297, and the median area 673 square kilometers (241 square miles).

Appendix A. Unfortunately, more detailed geographical information is not available in long comparable time series.

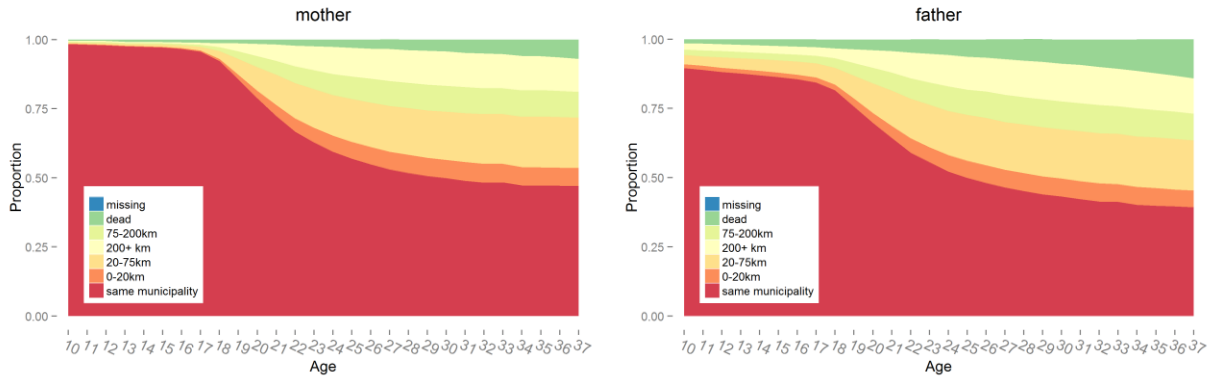
At every year between 1980 and 2007 distance is calculated for all kin dyads in the study. These trends are then presented in time series following men and women born in 1970 from age 10 to age 37. Distance to closest younger sibling, closest older sibling, mothers, fathers and all four sets of grandparents is calculated every year. Sibling sets are defined as children sharing two biological parents, only full siblings will be examined. Data analysis on sibling sets is restricted to distance to the closest younger/older sibling in age. Sibling sets with twins are also excluded when computing information on distance to siblings. Before 1990 reliable mortality data on people above age 75 is lacking in available registries, therefore for 1980-1989 information will only be presented on geographical distance to siblings and parents.

5. Results

The results of the study will be presented as a number of graphs showing distance as to categories of kin as the index generation age. Distance to the mother, father, maternal/paternal grandmother, and younger/older siblings will be presented each showing trends for each dyad. Only results for female egos will be presented in the study, results for male egos were overall qualitatively very similar and can be found in Appendix B. Results for distance to biological parents will be shown first after which I will show distance to grandparents. Finally I will show distance to older/younger sibling.

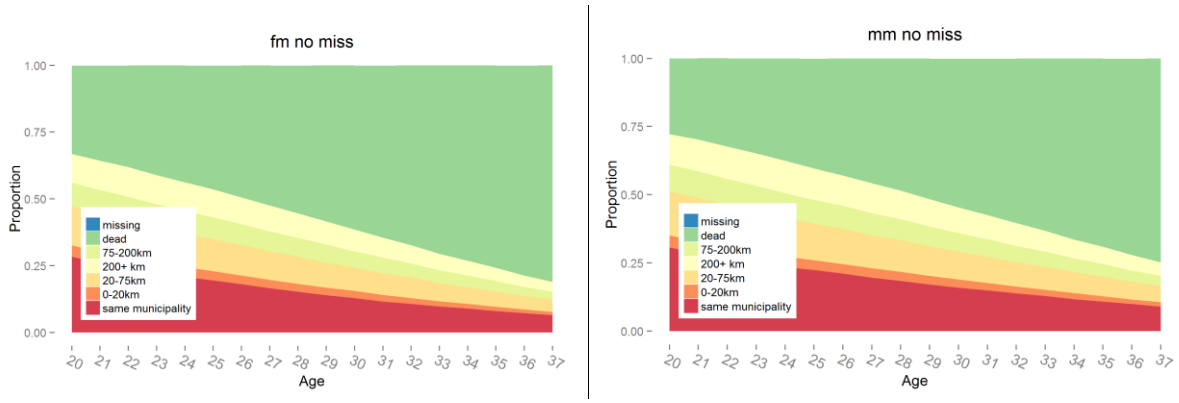
Figure 2 shows geographical distance to ego's father and the mother. The vast majority of children between age 10 and 18 live in close proximity to their biological parents. Most of these individuals share household with their parents, but an increasing fraction live with a separated parent or have recently moved out to an own dwelling. Around age 20, when the index cohort leave parental home, it becomes more common that geographical distance to parents are within short commuting distance. This is increasingly followed by an increase in longer geographical distance between ego and parents. Around age 27 the increase in distance between egos and their parents flattens out and is largely stable from then on until age 37. Distances to fathers are marginally larger than distance to mother. This is most likely mainly due to different custody agreements after parental separation. Fathers unsurprisingly have higher mortality than mothers.

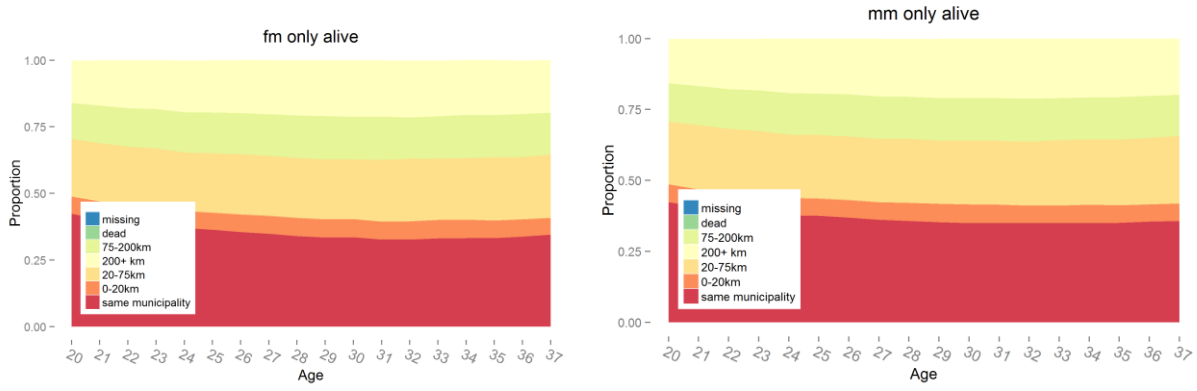
Figure 2: Distance to egos mother and father, by age of the index cohort. Women born in 1970 in Sweden



Distance to grandmothers is presented in figure 2. Results for distance grandfathers are largely similar, with the exception of higher morality, and will not be shown. When examining geographical distance to egos' grandparents, mortality plays an important role. Due to data limitations only time series from 1990 and age 20 are available. At age 20 around 70% have a living maternal or paternal grandmother. At age 37 the probability is only 30% that each of the grandmothers are alive. When only looking at egos that have living grandparents, there is great continuity in geographical distance. There is a small increase in dyads with large distances for egos in their early twenties but from then to the late thirties distance to living grandparents is virtually constant. There are almost no differences between distances to maternal and paternal grandmothers.

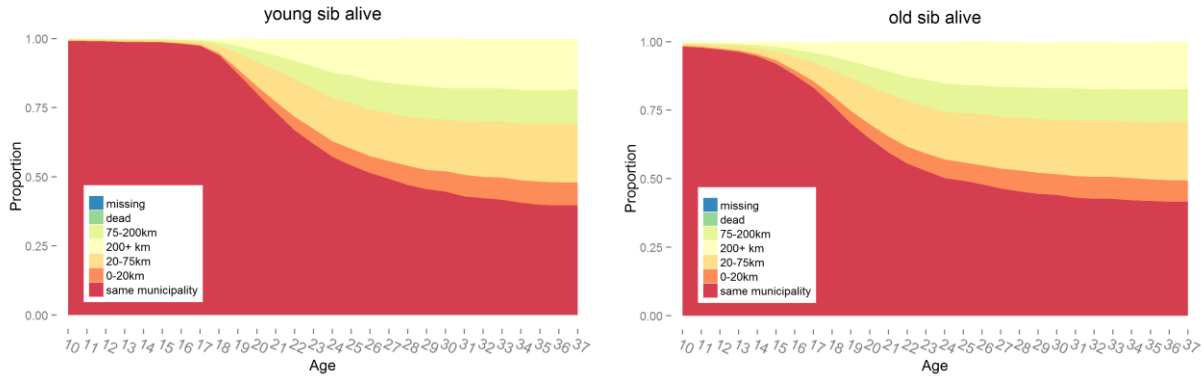
Figure 3: Distance to egos maternal and paternal grandmother, by age of the index cohort. Women born in 1970 in Sweden





In Figure 3 data on geographical distance to younger and older siblings are presented. The graph only shows data on individuals who have either a living younger or older sibling (around 50% in either case). Results including living and missing siblings are included in Appendix B (Figure S4 & S5). Results are broadly similar as results for distance to parents. Siblings live somewhat further away compared to parents. This is likely because the distance of the dyad is conditional on internal migration of two young adults instead of one adult. People live closer to younger siblings than older siblings, as the latter is older therefore more mobile.

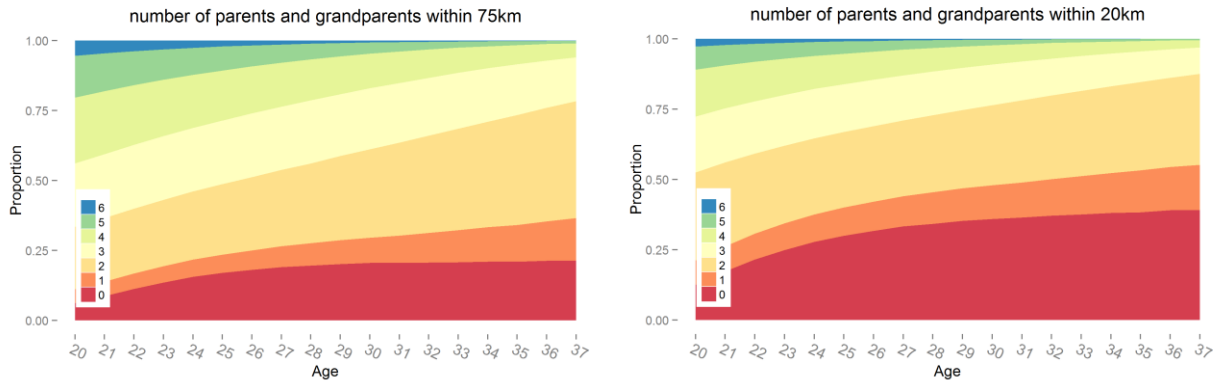
Figure 4: Distance to egos younger and older sibling, closest in age (if such a sibling exist, and is not dead), by age of the index cohort. Women born in 1970 in Sweden



After examining geographical distance between ego-kin dyads of different kinds, the following figures will examine egos' experiences of multiple kin, only results for women are shown, results for men are found in Appendix B. Figure 5 shows the number of grandparents and parents living

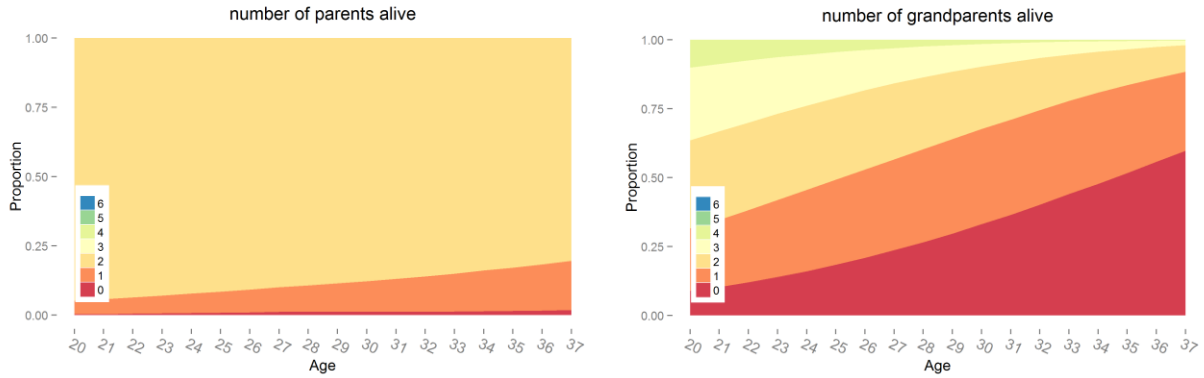
in the same municipality or in a municipality closer than 20 km to ego, and similarly the number of grandparents within 75 km. As can be seen in Figure 5 most people have at least some kin within 20 and 75 km throughout their life course. The number of kin declines as egos age, but this is primarily due to grandparental mortality. Therefore for egos in their 30s, very few have several within a day trip, but only about 20% have no kin nearby, even at age 37. There is a difference between number of kin within 20 and 75 km, suggesting that even if parents and grandparents don't always live very nearby, kinship networks are often concentrated in the same region.

Figure 5: Number of parents and grandparents in the same municipality, or a municipality within 20 and 75 km. Women born in 1970 in Sweden



Mortality in primarily the grandparental generation was one of the major factors affecting the results in Figure 5. In Figure 6 the number of living parents and grandparents over the life course are shown. The results on parental survival show that the number of orphans, families with 2 dead parents in childhood, is very low. The number of egos with one dead parent are however less rare. Very few egos have 4 surviving grandparents, even at age 20. The number of living grandparents then increases fairly linearly as egos age. At age 30, around 30% of egos have no living grandparents, and only 10% have more than two grandparents alive. The results on parental and grandparental survival over the life course suggest that mortality is the main explanation for a decreasing number of geographically proximate kin over the life course.

Figure 6: Number of living parents and grandparents. Women born in 1970 in Sweden



6. Discussion

This study makes several contributions to our understanding of social and geographical kinship over the life course. The most striking finding of the early results is the continuity and lack of change over the life course. Once children have moved out of the parental home geographical distance to their parents appears to be quite stable. When looking at geographical distance to grandparents the continuity is similarly salient. Thus, the first hypothesis (H1) of increasing geographical distance to family members is only supported for young adults. The second hypothesis (H2), suggesting increasing intergenerational proximity is also not supported as geographical distance to grandparents is increasing slightly over time. Overall results for Sweden based on the experience of an actual cohort are similar to what Mulder and Kalmij (2006) found in the Netherlands for a cross section of kin-networks. It appears plausible that the opposing mechanisms of care-oriented migration and individual non-kin related migration both is relevant, and that their effect largely cancels out each other.

Mortality steadily reduces the pool of grandparents but the geographical composition of the surviving kin appears relatively constant, however it is possible that conflicting selecting forces are at work. It appears that a view on the life course in which distance to extended kin steadily increases as the kinship network disappears is too simplified. This has implications for how we understand the availability of kin of adults in family formation ages in western countries.

The results confirm previous results on Swedish family geography in which most people live close to their relatives (Fors and Lennartsson 2008; Lundholm and Malmberg 2009; Malmberg

and Pettersson 2007; Pettersson and Malmberg 2009). The findings also highlights the important part which demography plays in kin availability at higher ages (Murphy 2011; Wolf 1994). It is impossible to examine distance to kin over the life course without considering the huge impact of mortality on the probability of having living grandparents. The degree to which this selection on survival affects intergenerational distance deserves consideration in future research. The overall results highlight the need for more research using a longitudinal approach when studying family geography.

7. Acknowledgments

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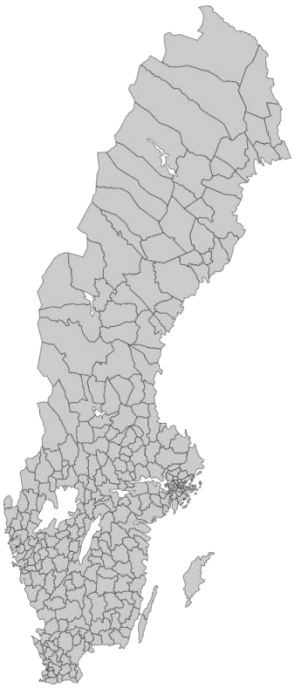
Appendix A: Map of municipalities in Sweden



Appendix B: Results for men born in 1970

Figure S1: Distance to egos mother and father, by age of the index cohort. Men born in 1970 in Sweden

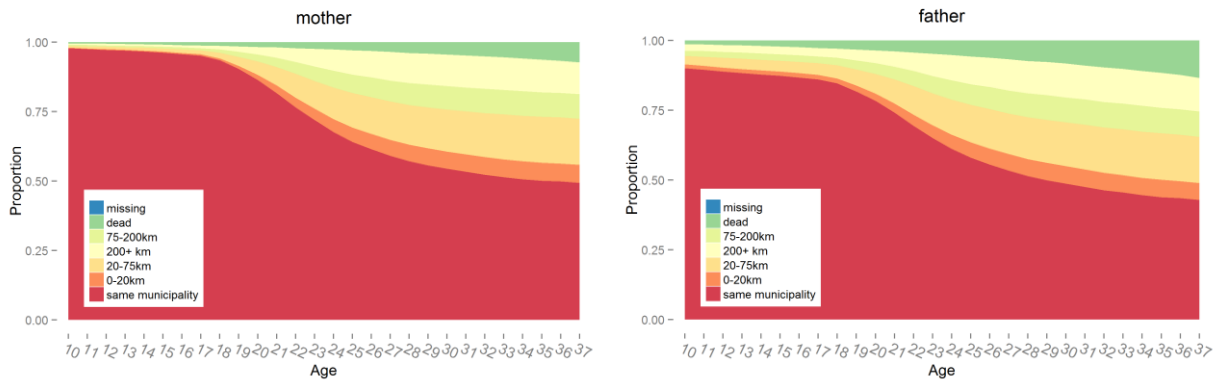


Figure S2: Distance to egos maternal and paternal grandmother, by age of the index cohort. Men born in 1970 in Sweden

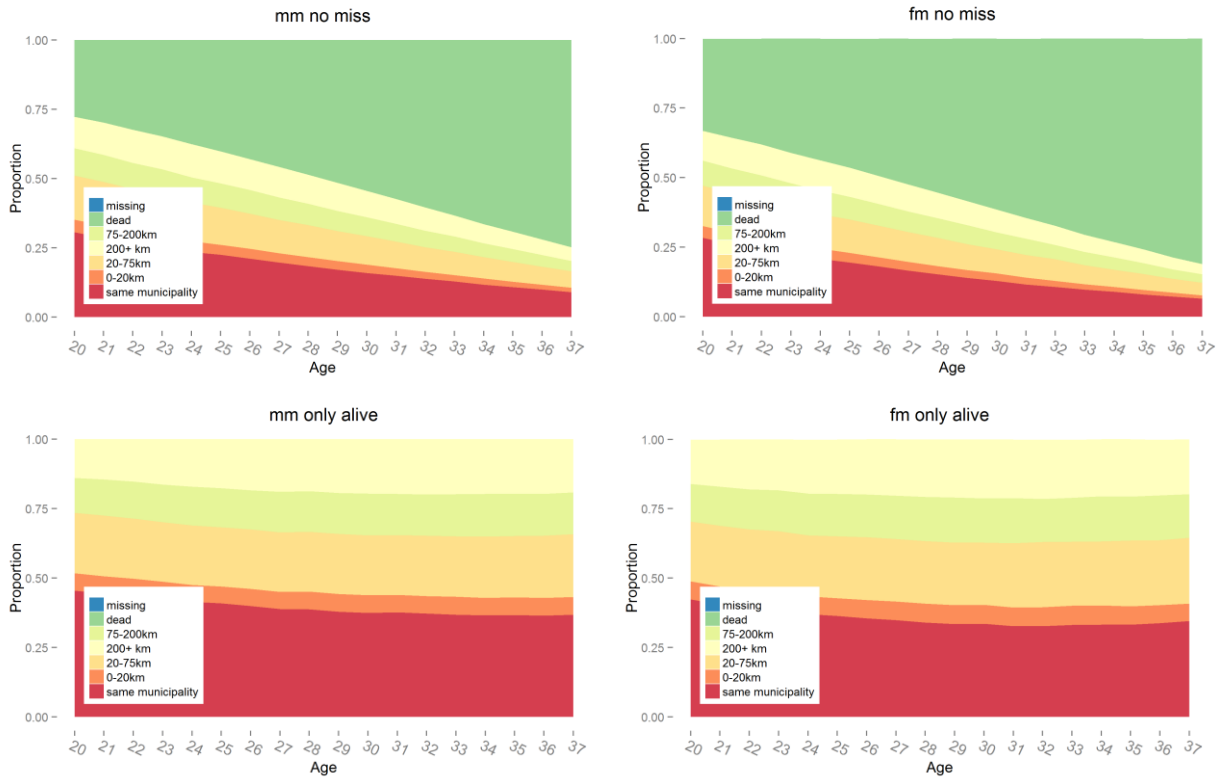


Figure S3: Distance to egos younger and older sibling, closest in age (if such a sibling exist, and is not dead), by age of the index cohort. Men born in 1970 in Sweden

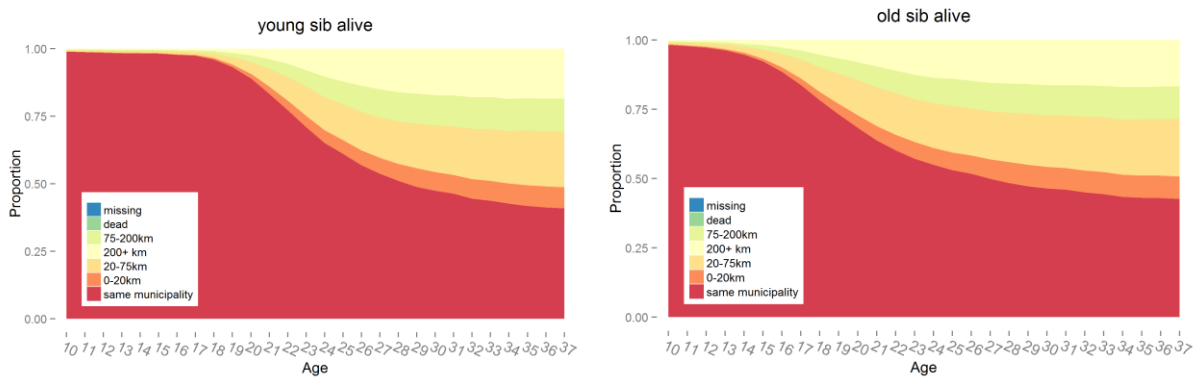


Figure S4: Distance to egos younger and older sibling, including egos with a dead or no such sibling, closest in age (if such a sibling exist, and is not dead), by age of the index cohort. Women born in 1970 in Sweden.

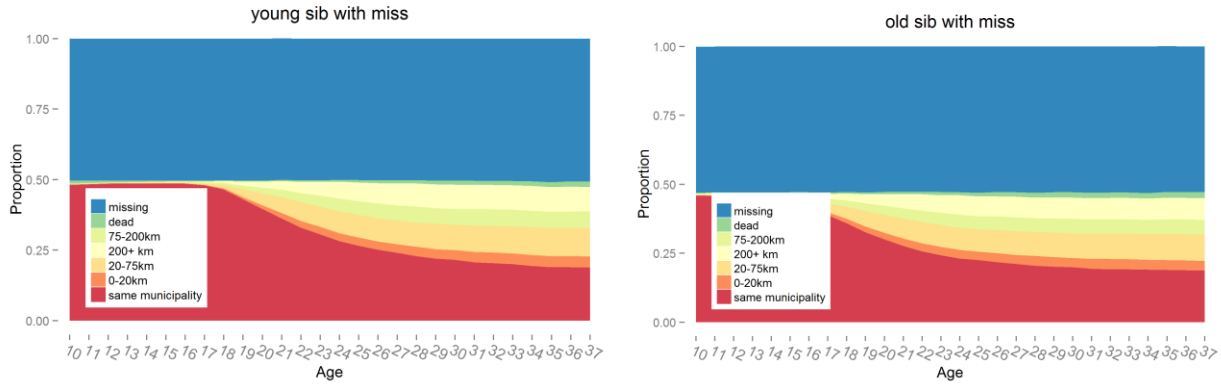


Figure S5: Distance to egos younger and older sibling, including egos with a dead or no such sibling, closest in age (if such a sibling exist, and is not dead), by age of the index cohort. Men born in 1970 in Sweden