

**Adult Mortality and Geographic Proximity of Parents in Utah
in the 19th and 20th Centuries**

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Abstract

The purpose of this study is to examine the role of parents and the effect that they play in influencing the mortality risk of their adult offspring. Using extensive genealogical and geographic information on adult children and their parents based on the Utah Population Database, we consider how the physical proximity and vital status of parents alters the survival chances of their adult children during their reproductive years (ages 20 to 50). The adult children were born between 1860 and 1899 and with all their children being born in Utah. Men and women alike encounter elevated rates of their own mortality when their parents are not accessible by virtue of geographic separation or death. The death of a mother has the most robust and consistent impact on the mortality risks of adult children. Mothers who are not physically proximate to their adult offspring elevate the risks of mortality of the offspring, particularly when the mothers live outside Utah. Increased offspring mortality risks attributable to their mother's death are reduced when those mothers are not physically proximate. Survival and physical proximity of in-laws have minimal effects on the mortality risks of their sons-in-law and daughters-in-law. Finally, widowhood is associated with significantly elevated risks of mortality for both men and women. In sum, we show the importance that parents of adult offspring have on the survival of these offspring and, by extension, the survival and well-being of the children of these adult offspring.

Introduction

Kinship structure and coresidence patterns of families have long been a central focus among family historians. While the topic of kin availability and coresidence patterns *per se* has been a common theme, little systematic research exists regarding the association between these family characteristics and measures of health and well being among family members, such as the risk of adult mortality. Studies of widowhood and survivor mortality are an exception to this rule. Investigations of survival differences between individuals within intact marriages and those newly widowed have demonstrated that access and proximity of a key family member have significant effects on survival probabilities within a marriage and household. This literature does not address the role that other family members play in altering the risk of mortality in adulthood, especially at ages younger than normally observed in studies of spousal death. The attention given to widowhood has, at least in part, been the result of access to household-level historical data. We extend the literature that focuses on the mortality among the widowed by examining the role of parents and the potential role they play in affecting the mortality risk of their adult offspring. The data used to address this research comes from the Utah Population Database.

Mortality and the Effects of Kin Availability, Co-Residence, and Social Support

An individual's pool of available kin has changed over time as fertility, migration, and mortality patterns have changed. This has been well documented in studies that describe how declines in mortality have led to an increase in the availability of kin (Martin and Culter 1983,

Ruggles 1986, Uhlenberg 1980, 1996). In comparing 1900 to 2000, Uhlenberg (1996) notes there is an unprecedented potential for kinship ties involving older persons afforded by contemporary high survival rates.

Given the availability of kin, prevailing social norms can then effect actual living arrangements. Much of the focus has been on possible household types and the potential for co-residence across generations. This literature has particularly emphasized the living arrangements of the elderly comparing different periods (Ruggles 1996; Schoeni, 1998). For example, Schoeni (1998) demonstrates that between 1900 and 1940 the share of elderly living with an adult child declined; however, the absolute number of years lived in old-age coresidence remained the same.

Mancini and Blieszner (1989: 279) provide a useful review of the intergenerational relations between older parents and adult children. This includes a considerable body of work on the exchange, assistance and support that exists across generations. Some of these studies indicate that “older parents continue to provide support of various kinds to their adult children and are not only the recipients of support....On average, older parents are more likely to give help to their children rather than receive help from their children.”

Historical studies have analyzed the vital function of kin emphasizing kin assistance in crisis situations (Anderson, 1971) and examined the role of kin in the process of migration and adjustment to industrial conditions (Hareven, 1978). It is well established that individuals with greater access to social support, often from kin, have better health and lower levels of mortality (House, Landis, and Umberson, 1988; Ross, Mirowsky, and Goldsteen, 1990). This has been most clearly demonstrated in the case of widowhood where the loss of social and economic support in addition to the strain of bereavement leads to elevated levels of mortality for

surviving spouses (Smith and Zick, 1996; Mineau, Smith, Bean, 2002), particularly among non-elderly widowed individuals. Assistance and resource exchange between adult children and their parents flow in both directions but it largely migrates from parents to children for contemporary U.S. families (Hogan et al, 1993) as well as for pre-industrial societies (Lee, 1997; Kaplan 1994).

The body of work on the mortality effects of adult social relationships on adult mortality has focused more on risks among the elderly. These analyses have examined how adult children affect their parents' survival (Cornell, 1992; Silverstein and Bengston, 1991). Given that resource exchanges tend to flow from parent to adult children, it is important to examine how the absence of these parental resources may increase the risk of adverse health outcomes among adult children.

Hypotheses

In this study, we analyze how parental survival and residential proximity affects the survival of their adult children between the ages of 20 and 50 during the latter 19th and first half of the 20th centuries in Utah. Individuals in this age range experience a number of family events including the transition to adulthood, marriage, establishment of neolocal residence, initiation of childbearing, and in some cases the death of a spouse. Our data allow us to determine whether parents are living and whether they are proximate to their adult children. The qualitative interaction and assistance patterns between parents and their adult children are not observable in these data. However, interaction and assistance are more likely if parents are alive and in the same geographic area, which may, in turn, enhance the survival prospects of their adult children.

This paper tests a set of hypotheses regarding the association between adult children's survival and the presence or absence of their parents. For ease of exposition and clarity, hereafter we refer to the adult (ages 20-50) child as Ego. Accordingly, parents and children refer to their relationship to Ego.

We develop a simple but feasible Ego-parent proximity measure that is not based upon household structure but shared/non-shared geographic residence. Using the county as the unit of geography, we determine whether Ego was living in the same county at age 20 as a living parent (County Proximate or **CP**), living in a different county at age 20 as a living parent but both living in Utah (State Proximate or **SP**), or living in a state at age 20 different from a living parent (Non Proximate or **NP**). As noted previously, a small percentage of Egos in the CP group include households containing a co-resident Ego and a parent. The vast majority of Egos are in neolocal residential patterns but with parents in the same community or county. Future work will refine the SP group since it contains instances where Ego and parent live in different but contiguous or at least accessible counties. For these hypotheses, we will examine the risk of mortality as a function of parental residential proximity and survival for Egos whose parents are still living when Ego is 20. This is done in order to focus explicitly on parental geographic location. The fact that parents die after Egos 20th birthday is taken into account and forms the basis of some of our hypotheses.

H1: Egos who are CP have the lowest mortality, followed by SP, and then NP.

H2: Egos survival benefits due to having parents who are CP are greatest during the early years of adulthood.

H2.1: This benefit is greatest for female Ego mortality.

H2.2: This benefit is greatest for mothers who are CP.

H3: Egos whose mother/father die experience lower survival than those whose parents survive.

H3.1 The adverse effect of parental death on Ego survival will be greatest for those whose parents are more proximate.

H4: The survival penalty associated with having absent parents (by death or distance) is weaker than the survival loss associated with widowhood.

All of the hypotheses above pertain to Ego's parents. We extend our hypothesis testing by considering the same questions but applied to Ego's in-laws.

Study Population

The Church of Jesus Christ of Latter-day Saints (LDS or Mormon) was established in 1830 in the state of New York. In the years immediately following, its members migrated and created settlements in Ohio, Missouri, Illinois and Iowa. The Mormons entered Salt Lake Valley in 1847; this was the beginning of an organized migration between 1846 and 1870 when over 60,000 pioneers and adherents of the LDS Church migrated from eastern and midwestern United States, as well as from Western Europe, into the U.S. intermountain west (Wahlquist 1974). By the 1880 census there were 143,963 residents enumerated in Utah Territory and the 1900 census enumerated 276,749 residents. The state of Utah was created in 1896. Over time the LDS proportion of the population has varied from a peak in the initial settlement period with about 97 percent in 1870 to lower levels of around 56 percent in 1890 (Allen 1989). About seventy percent of Utah's current 2.3 million residents are members of the LDS Church.

The motivation for focusing on non-coresident family members is derived from the observation that neolocal residential patterns were common but that first degree relatives were often found to live in close proximity to newly married individuals. Published family histories in frontier Utah suggest that newly married couples generally chose a place of residence that did not include co-residence with parents and were physically independent of parental or family ties. Such neolocal residence included instances where new homes were constructed near the home of parents (Stoker 1962). Even in some communal settlements, residents shared a common dining facility but maintained separate living quarters (Pendleton, 1939). During the period of new Utah community settlements, land-use patterns established by Brigham Young always allocated separate family lots. An in-depth analysis of one county in Utah based on merged data between the 1880 manuscript Census and the Utah Population Database shows that neolocal residential patterns were the predominant living arrangement (Mineau and Anderton, 1987). Approximately 81% of couples, married for less than ten years, were found to live in households comprising the couple and their children. During the first five years of marriage, at least one parent of husbands (who married before age 22.5) was likely to live in the same community or county (71%) and an additional small percentage (13%) living in the same household.

This analysis explores the effects that parental survival and their residential distribution patterns have on their adult children's risk of mortality during the adult child's prime reproductive and childrearing years (ages 20-50). The sample is based on age and not age at marriage. Previously, we found that age at marriage had little influence on Ego survival (Smith, Mineau, and Bean, 2002). The paper addresses several aspects of this issue that extends the approach developed in studies of mortality following the death of a spouse. We

first examine how parental mortality during childhood affects adult children's survival. This is followed by an analysis of the timing of parental death and parental residential proximity and their effects on an adult child's risk of mortality. Special attention is given to timing issues of parental location and survival and their impact on their children's risk of mortality. In particular, we consider whether the absence of parents (either by death or distance) has varying mortality effects early or later in their adult child's life. These questions are examined in light of gender differences in mortality and the potential effects that parental gender may have on the survival of same-sex or different-sex adult children.

Data

This study draws upon the Utah Population Database (UPDB) for information on a range of kinship and residential characteristics and their influences on the risk of mortality. The UPDB contains information on over six million unique individuals. It includes the genealogies of the founders of Utah and their Utah descendants. These records were computerized in the mid to late 1970s (Skolnick et al., 1979; Skolnick et al., 1981) and have been linked to other data sets, including birth and death certificates, cancer records, driver license records, census records, Social Security Death Index and records from the Center for Medicare and Medicaid Services (CMS).

These genealogical records originated as "Family Group Sheets" filled out by members of the Church of Jesus Christ of Latter-day Saints (LDS or Mormon). A subset were initially selected in 1975-76 and again in 1978-79, and rendered machine-readable, as described in Bean et al., 1990. The criterion for selection was that one or more family members was born

or died on the Mormon Pioneer Trail or in Utah. The purpose was to represent migrants to Utah and their Utah descendants. The initial settlements in Utah occurred in 1847 and the genealogy records for early migrants have birth dating back to about 1760. These 170,000 family group sheets (containing about 1.6 million individuals) have been linked across generations and, in some instances, the records encompass as many as seven generations.

The UPDB is a dynamic database and receives annual updates for Utah births, deaths, cancer records and driver licenses. The database now includes over two million Utah birth certificates from 1947-2004 and about 695,000 death certificates from 1904-2004. Much of the value of this resource depends on the ability to match records on individuals from two or more data sets, known as record linking, and create longitudinally linked data that are able to capture many events associated with an individual. These record linking activities have allowed quality control for demographic information and eliminated duplicate records in the genealogical data.

The Utah Resource for Genetic and Epidemiologic Research (RGE) administers access to these data through a review process of the project proposal. The protection of privacy and confidentiality of individuals represented in these records has been negotiated with agreements between RGE and the data contributors. All research projects require IRB and RGE approval (Wylie and Mineau, 2003).

The representativeness of the genealogy file has been demonstrated in a variety of demographic studies on infant mortality (Lynch et al., 1985; Bean et al., 2002) that have compared Utah rates and patterns to other populations. Other studies have analyzed fertility (Bean et al., 1990), birth spacing (Anderton and Bean, 1985), widowhood (Mineau, 1988;

Mineau et al., 2002), the mortality of husbands and wives (Smith et al, 2002) and the relationship of adult mortality and religion (Mineau et al 2004).

Studies in population genetics have shown that the population is relatively homogeneous genetically and has a low inbreeding rate that is similar to that of the U.S. population (Jorde, 1989; O'Brien et al., 1994). This can be attributed to a large initial founding population, high rates of immigration from a diverse group of outside populations, and active avoidance of close consanguineous marriage. These genetic studies indicate that the population represented in the UPDB is biologically representative of a broad spectrum of the U.S. population and Western and Northern European populations. This population is not representative of the entire population of Utah or heterogeneous sub-populations within the U.S.

Death dates and places are available from the genealogy whether the death occurred in Utah or in other states/countries and are nearly complete through the 1960s. Additional follow-up information beyond the 1960s, as well as confirmation of existing data, comes from three sources: (a) the Utah death certificates that are available from 1904 to present that include death place, (b) the Social Security Death Index with information beginning in the mid 1960s for death both in and outside of Utah, and (c) the CMS beneficiary file that begins about 1976; it provides death dates and death places outside of Utah or a location if the person is alive.

Fertility Information: Complete fertility histories are available in the genealogy, including the birth date and place of each child. Calculations of number of children, first birth and last birth have been made from these records.

Religion Affiliation: The UPDB contains individual religion information relating to the LDS Church, specifically dates of baptism and endowment. Baptism occurs at about age

eight and for converts it could be at any later age. Endowment is a “temple” religious rite that usually takes place early in adulthood before an individual goes on an LDS mission, at the time of a “temple” marriage, or later for converts and reactivated members. Individuals who have records containing either baptism or endowment dates (but not posthumously) are treated as affiliated with the LDS Church. Records in the genealogy that do not contain these dates are classified as having less or no affiliation with the LDS Church.

Religious commitment is based on a classification scheme developed by Bean et al. (1983, 1990) using the timing of an important religious rite, endowment. Individuals who have records containing baptism and endowment dates before age 20 are treated as religiously committed to the LDS church and are used in this analyses; those that are less committed or non-LDS members are omitted.

Families and residence information: The families included in the current study are based on information from three generations. We selected Ego s who had been born from 1860 through 1899 and survived to age twenty. In addition we selected those who married and had at least one child. Those with multiple marriages were omitted from analysis.

Changes in kin availability were assessed between birth and age twenty as well as any new changes occurring between ages 20 and 50. Thus, the calendar years in which death could be observed spanned the years 1880 to 1949. All Ego s in the sample are restricted to individuals whose first and last child were born in Utah. Thus, Ego s and their parents need not have been born in Utah; however, the selected Ego’s children were born in Utah. Complete birth and death information (date and place) is available for all Ego s and parents; complete birth information (date and place) is available for Ego’s children and it is Ego’s children’s

birthplaces that allow us to locate Ego's geographic residence when ego was between 20 and 50.

To test hypotheses concerning geographic proximity, Ego's county of residence between ages 20 and 50 is defined as the county in Utah of their first child's birth. (Using the county of birth in Utah for latter born children was also explored with little effect on the results; this finding reflects in part the fact that the sample is restricted to Egos whose children were all born in Utah). Each Ego was assigned a county of residence based on one of the 29 counties in Utah, four of which are urban counties for this analysis. No counties outside Utah are considered with respect to Ego's county of residence designation. Both of Ego's parents are required to have been alive at the time Ego reaches age 20.

To establish physical proximity between Ego and parent, we compare the county in Utah in which Ego bore their first child to the county in which Ego's parent died. If these counties were the same, they are County Proximate (CP). When both Ego and parent lived in counties in Utah but they differ, they are called State Proximate (SP). Finally, if a parent dies outside Utah, then they are categorized as Not Proximate (NP). Some models create a single category comprising the SP and NP groups that are then compared to the CP group.

Statistical Methods

All survival models are estimated using Cox proportional hazards models with the following form:

$$h(t,i) = h_o(t)exp(\mathbf{b}x_i)$$

where $h(t,i)$ is the mortality hazard rate for person (i) at t years after age 20 up to age 50, $h_0(t)$ is the baseline hazard rate, β is a vector of unknown regression coefficients, and x_i are observed covariates for person (i). We emphasize in the results section the relative risks (RR) of mortality which are transformed β coefficients such that $RR = \exp(\beta)$.

To test some of our hypotheses, we examine whether relevant variables have non-proportional effects indicating the **effect** of a covariate changes with time. While we tested for these non-proportional effects in the models described below, none proved to be significant and hence are not shown here. For other hypotheses, time-varying covariates are introduced, a specification indicating that the **values** of the covariates change with time. In this latter category, we consider widowhood and parental death.

To account for possible shared unobserved heterogeneity among siblings, we also examine the sensitivity of our estimates with and without allowance for shared (unobserved) frailty within a sibship. The proportional hazard rate model is expanded as follows:

$$h(t,i,j) = z_j h_0(t) \exp(\mathbf{b}x_{ij})$$

where j now refers to a sibship and z_j is a sibship-specific effect for sibship j that captures environmental and genetic factors shared by siblings that is not captured by the observed covariates. This specification is estimated based on the assumption that the z_j follows a gamma distribution with mean 1. If the variance of this distribution is 0, then that indicates no shared frailty. As the variance of the distribution rises, then that is evidence suggesting shared risks of mortality among siblings. For our models, the variance of the frailty distribution is not significantly different from 0 and thus models with and without the incorporation of frailty give nearly identical results. For models that incorporate shared familial effects among

siblings, the sample is restricted to individuals in sibships that meet all of the inclusion criteria and that include two or more siblings.

Results

The analysis is based on two sets of samples that impose restrictions on the data appropriate for a given set of models. The “full” sample includes Egos whose parents were both alive at the time of Egos 20th birthday and for whom we have complete dates of birth and death as well as geographic location information. The UPDB contains 19,260 females and 15,998 male for this full sample. The “restricted” sample is also used and is a subset of the full sample by virtue of an additional constraint: records must also have complete dates of birth and death and location data for both of Egos in-laws. Sample sizes for this latter set are 11,970 females and 11,741 males. We should note that there are fewer males than females who reach age 20, particularly for the full sample. This is partially the result of higher mortality of males at early ages.

In Table 1, the results of Cox proportional hazard models are shown for females. These estimates rely on the simpler variant of geographic proximity where the physical proximity of parents measures whether they are county proximate or not. For the full sample (model 1), Egos with mothers who are not county proximate have significantly poorer survival prospects (RR=1.12) in relation to women whose parents are county proximate. Model 1 (table 1) also indicates that female Egos experiencing the death of a mother encounter an elevated risk of death in relation to Egos whose mothers do not die (RR=1.15). There are no significant influences of Ego mortality based on paternal proximity or mortality. A larger adverse

mortality effect of widowhood is found with a relative risk that exceeds that associated with maternal death (RR of 1.29 vs. 1.15).

Table 1 Here

Model 2 (Table 1) addresses how parental mortality and geographic proximity may interact to affect female Ego mortality. The patterns of significant effects from Model 1 persist in model 2 indicating a lack of statistical interaction between parental mortality and proximity. This means that a parent's death does not have statistically different effects on their daughter's mortality depending on the location of the parents. It is worth noting, however, that when parents are not county proximate, their deaths are associated with a smaller (albeit insignificant) effect on their daughters mortality in relation to daughters with county proximate parents.

The remaining two models in Table 1 are based on the restricted sample that permits an assessment of how in-laws affect female Ego mortality risk. Models 3 and 4 parallel the analysis for Models 1 and 2, respectively. The pattern of mortality in these latter models is quite similar to the estimates generated with the full sample: non-proximate mothers and mothers who die are associated with elevated risks of Ego mortality. There is no impact of in-law mortality or proximity with one exception. In model 4 (that includes interaction terms), the rate ratio 1.15 for "Father-In-Law Dies" means that when a father-in-law dies who is also county proximate, female Egos experience excess mortality (no such effect was detected for other types of fathers-in-law who die). This association may be due to a reduction in access to wealth or resources that was available when the father-in-law was alive. It is noteworthy that a mortality effect was not detected for Ego's own biological father. It is possible that the impact

of maternal mortality, which is included in the model, dominates the effects of mortality among fathers

Among male Egos (Table 2), we observe some similar patterns to those reported for females but with new associations. For both models 1 and 2, we find that males have elevated mortality risks when their mothers die (RR=1.21 in Model 1) but now we observe that their risks are also increased when their fathers die (RR=1.15 in Model 1). In Model 2 (with interactions), there is evidence that supports the idea that a mother's death has weaker effects on male Ego mortality when that mother is not county proximate (RR=0.82). While the effects of mother and father mortality are significant, they are much smaller than the nearly two-fold increase in male Ego mortality associated with widowhood (RR=1.92).

Table 2 Here

In model 3 (Table 2), the effects that in-laws have on male mortality are summarized. We note the robust effects of a maternal death on their son's risk of mortality for these models but a diminished (to the point of being insignificant) impact of father's mortality. In comparing model 3 and 4, where model 4 includes interaction terms, we observe the lack of any significant effects of the interaction between parent-in-law proximity and vital status. Accordingly, we focus on the results of model 3 that indicate insignificant effects of in-laws on male Ego survival.

The analyses thus far have focused on the effects of parents being county proximate or not. Tables 3 and 4 elaborate on these analyses by allowing for separate effects of having parents that are state-proximate and non-proximate.

Tables 3 and 4 Here

We gain some new insights about female Ego mortality from model 2 (Table 3). Specifically, the main effects of having a mother living outside Utah is significant (RR=1.33, $p<.05$), a relative risk that is larger than the main effect of having a mother who lived in Utah but in a different county (RR=1.13, $p<.10$). It appears that the impact of having a geographically remote mother is sufficiently strong that its influence does not change depending on whether Ego's mother lives or dies.

The strong adverse consequences of having remote mothers (outside Utah) are observed again in Models 3 and 4 based on the more restricted data set. Consistent with the earlier findings in Table 1 and 2, there is no evidence that in-law proximity or mortality affects female Ego survival. It is worth noting that the relative risks associated with widowhood are still significant but somewhat weaker than the influence of having a geographically remote mother.

For male Egos, Table 4 shows that mother proximity now has an effect once we distinguish the mothers who are state proximate and non proximate. In particular, Model 2 (Table 4) shows that for male Egos with non proximate mothers, they have elevated risks of mortality (RR=1.38, $p<.05$). The negative influence of a mother's death is again observed in this model but it has a significant interaction with the non-proximate-mother variable: mothers who die remotely from Ego have much weaker effects on Egos survival than mothers who live nearby.

The importance of fathers-in-law arises again in Model 4. Male Egos are found to have a somewhat elevated risk of mortality if the father-in-law dies, and similar to the discussion regarding non proximate mothers, this effect is greatest when the father-in-law lives nearby and weakest when long distances separate him from his son-in-law.

Discussion

The historical period examined here (born between 1860 and 1899) spans periods encompassing first a period of hardships associated with migration to the West, uncertain food supplies, limited medical care, and physical hazards followed by a time with fewer hardships as transportation and a developing infrastructure in the West enhanced the quality of life and reduced the risks of mortality. While fertility rates for this cohort were steadily dropping, women could still expect to bear an average of 8.65 children for those born in 1860 and approximately 5 children for those born at the end of the 19th century (Mineau, Smith, and Bean, 2005). This level of childbearing coupled with the prevailing patterns of proximate neolocal residence suggests that for male and female Egos ages 20 to 50, the presence of parents and the potential childrearing assistance that they represent is important for the survival of both Ego and Ego's children (Hawkes, 2003).

Our general findings can be summarized in a phrase: demise from death and distance. Men and women alike encounter elevated rates of their own mortality when their parents are not accessible by virtue of geographic separation or death. During reproductive ages at a time of high fertility, the lack of parents, and in some cases parents-in-law, translates into a loss of social and economic support that increases the likelihood of premature death. However, while parents comprise a key component of a larger kinship network, there are others, such as siblings and cousins, who also fill similar roles. Thus, we have considered only a part, albeit a key part, of this support system in the present analysis.

While we have emphasized the role of socioeconomic support and grandparenting, other mechanisms may be at work that are consistent with our results. It is possible that a common exposure could lead to familial clustering of mortality such as the 1918 influenza

pandemic. Another possibility is that proximate residence may lead to greater caregiving on the part of adult offspring for aging or frail parents. Such caregiving might lead to an increased risk of death of the parents (since they are frail) and an increased mortality risk for Ego because of the potential stress of caregiving and the loss of grandparenting assistance that they might otherwise have had. There are additional complicating factors that could not be addressed in this analysis including the possibility that some Egos might be estranged from their families and physical distance might be desirable or at least not viewed as a detriment. Another possibility is that parental deaths may represent a benefit because of the prospects of inheriting some of the family's wealth earlier rather than later in life. How such bequests could have affected our analysis is not known since data on this behavior were not available.

There are factors that may have made our results conservative. First, the analysis statistically controlled for the possible influences of attachment to the LDS Church but it is still the case that the majority of the subjects were active members of the LDS church. Accordingly, the lack of access to parents may have been buffered by the presence of other church members in the neighborhood and community that provided compensatory social support, especially related to childrearing. Another potential source of bias may have arisen from the manner in which we determined physical proximity. Recall that we compared the place of birth of Ego's (first) child to the place of the parent's place of death. Complex migration patterns and temporary co-residence prompted by a child's birth could not be captured in this study. It is likely, therefore, that we have classified some ego-parent pairings as geographically remote when they more contact between Ego and parent actually occurred.

Extensions of our analysis will follow that will help to elaborate the role of parents on Ego survival. In particular, we will broaden the interval that defines the cohort of interest in

order to assess how the associations reported here are sensitive to secular shifts in migration, fertility, and mortality schedules. Another refinement will be the development of a finer time gradation that links the vital status and proximity of parents to periods when an Ego is an expectant parent or during the first years of life of Ego's children. If the stress of parenthood experienced by Ego occurs at a time of limited or absent parental support, we should expect to see stronger mortality influences on Ego survival.

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References

- Anderson, M. (1971). Family Structure in Nineteenth Century Lancashire. Cambridge: Cambridge University Press.
- Anderton, D.L. and Bean, L.L. (1985). Birth spacing and fertility limitation: a behavioral analysis of a nineteenth century frontier population. Demography, 22, 169-183.
- Bean, L.L., Mineau, G.P. and Anderton, D.L. (1983). Residence and religious effects on declining family size: an historical analysis of the Utah population. Review of Religious Research 25:91-101.
- Bean, L.L., Mineau, G.P., and Anderton, D.L. (1990). Fertility Change on the American Frontier, Adaptation and Innovation. Berkeley: University of California Press.
- Bean, L.L., Mineau, G.P. and Smith, K.R. (1999). The effect of pioneer life on the longevity of married couples. In R.W. Walker and D.R. Dant (eds), Nearly Everything Imaginable: The Everyday Life of Utah's Mormon Pioneers. (387-403). Provo, Utah: Brigham Young University Press.
- Bean, L.L., Smith, K.R., Mineau, G.P., Fraser, A., & Lane, D. (2002) Infant deaths in Utah 1850-1939. Utah Historical Quarterly, 70:158-173.
- Cornell, LL. (1992) Intergenerational relationships, social support and mortality, Social Forces, 71: 53-62.
- Hareven, T.K. (1978) The dynamics of kin in an industrial community. In: J. Demos and S.S. Boocock (eds.) Turning Points: Historical and Sociological Essays on the Family.
- Hawkes, K. (2003). Grandmothers and the evolution of human longevity. American Journal of Human Biology 15:380-400.
- Herman, A.A., McCarthy, B.J., Bakewell, J.M., Ward, R.H., Mueller, B.A., Maconochie, N.E., Read, A.W., Zadka, P. and Skjaerven, R. (1997). Data linkage methods used in maternally-linked birth and infant death surveillance data sets from the United States (Georgia, Missouri, Utah and Washington State), Israel, Norway, Scotland and Western Australia. Paediatric and Perinatal Epidemiology, 11, 5-22.
- Hogan, D.P., D.J.Eggebeen, and C.C. Clogg. 1993. The structure of intergenerational exchanges in American families. American Journal of Sociology 98:1428-1458.
- House J.S., K.R. Landis, D. Umberson. 1988. Social relationships and health. Science 241: 540-545.
- Jorde, L.B. (1989). Inbreeding in the Utah Mormons: an evaluation of estimates based on pedigrees, isonymy, and migration matrices. Ann Hum Genet, 53, 339-355.

Lee, R.D. 1997. Intergenerational relations and the elderly. Pp. 212-233 in K. Wachter and C. Finch (Eds) Between Zeus and the Salmon: The Biodemography of Longevity. Washington D.C.: National Academy Press.

Lynch, K.A., Mineau, G.P., and Anderton, D.L. (1985). Estimates of infant mortality on the western frontier: the use of genealogical data. Historical Methods, 18,155-164.

Mancini, JA and Blieszner, R. (1989) Aging parents and adult children: research themes in intergenerational relations, Journal of Marriage and the Family, 51:275-290.

Mineau, G.P. (1988). Utah widowhood: a demographic profile. In: A. Scadron (Ed). On Their Own: Widows and Widowhood in the American Southwest 1848-1939 (140-165). Chicago: University of Illinois Press.

Mineau, G.P. and Anderton, D.L. (1987). Household formation systems and the role of proximate kin. Paper presented at annual meeting of Population Association of America, Chicago, April 30-May 2.

Mineau, G.P., Smith, K.R, and Bean, L.L. (2002). Historical trends of survival among widows and widowers. Social Science and Medicine, 54, 245-254.

Mineau GP, Smith KR, and Bean LL. (2005) Research on the Historical Demography of Families and Health. In: Handbook of Families & Health, Crane DR and Marshall ES (ed). Sage Publications, Thousand Oaks, CA.

O'Brien, E., Rogers, A.R., Beesley, J., and Jorde, L.B. (1994). Genetic structure of the Utah Mormons: a comparison of results based on DNA, blood groups, migration matrices, isonymy, and pedigrees. Human Biology, 66, 743-759.

Pendleton, M.A., (1939) The Orderville United Order of Zion. Utah Historical Quarterly, VII:4, 141-159.

Ross, C.E., J. Mirowsky, and K. Goldsteen. 1990. The impact of the family on health. Journal of Marriage and the Family 52:1059-1078.

Ruggles, S. (1986) Availability of kin and the demography of historical family structure, Historical Methods, 19:93-102.

Ruggles, S. (1996) Living arrangements of the elderly in American: 1880-1980, Pp. 254-63 in Aging and Intergenerational Relations: Historical and Cross-Cultural Perspectives.

Schoeni, RF. (1998) Reassessing the decline in parent-child old-age coresidence during the twentieth century, Demography, 35:207-313.

Silverstein, M., and V.L Bengston.1991. Do close parent-child relations reduce the mortality risk of older parents? Journal of Health and Social Behavior 32: 382-395.

Skolnick, M., Bean, L., Dintelman, S., and Mineau, G. (1979.) A computerized family history database system, Social Science Research, 63, 506-523.

Skolnick, M., Bishop, D., Carmelli, D., et al. (1981). A population-based assessment of familial cancer risk in Utah Mormon genealogies. In: Genes, Chromosomes, and Neoplasia. New York, NY: Raven Press.

Smith, K. R., and C.D. Zick. (1996). Risk of mortality following widowhood: age and sex differences by mode of death. Social Biology, 43: 59-71.

Smith, K. R., G. P. Mineau, L.L. Bean. (2002) "Childbearing and Post-Reproductive Longevity." Social Biology 49(3-4):185-205

Stoker, S.N. (1962). Sarah Nelson Stoker. In: The Knud Nelson Family From Denmark to America. Bountiful UT: Carr Printing.

Uhlenberg, P. (1980). Death and the family. Journal of Family History, 5:313-20.

Uhlenberg, P (1996). Mortality Decline in the twentieth century and supply of kin over the life course. The Gerontologist, 36:681-85.

Wylie, J.E. and Mineau, G.P. (2003). Protecting privacy and promoting research with biomedical databases. Trends in Biotechnology 21(3):113-6.

TABLE 1. Effects of Parental Proximity & Vital Status on Mortality Risks of Female Egos.
Proximity is based on County Proximate (see text) versus all others.

Model	<i>Full Data</i>		<i>Restricted Data</i>	
	1	2	3	4
Father dies	0.989	1.013	0.969	0.999
Mother dies	1.146*	1.194*	1.174*	1.199*
Father not proximate	1.025	1.056	0.970	1.009
Mother not proximate	1.122*	1.164*	1.163*	1.182*
Father dies × not proximate		0.922		0.898
Mother dies × not proximate		0.863		0.928
Father-in-law dies			1.101	1.145+
Mother-in-law dies			0.958	0.939
Father-in-law not proximate			1.058	1.118
Mother-in-law not proximate			0.979	0.959
Father-in-law dies × not prox.				0.877
Mother-in-law dies × not prox.				1.072
Widow	1.287*	1.287*	1.357*	1.358*
* p<0.05,+ p<0.10				
Entries are relative risks estimated using Cox proportional hazards regression.				

TABLE 2. Effects of Parental Proximity & Vital Status on Mortality Risks of Male Egos.
 Proximity is based on County Proximate (see text) versus all others.

Model	<i>Full Data</i>		<i>Restricted Data</i>	
	1	2	3	4
Father dies	1.150*	1.156*	1.136+	1.103
Mother dies	1.210*	1.279*	1.224*	1.297*
Father not proximate	1.043	1.059	1.069	1.025
Mother not proximate	0.999	1.069	1.018	1.094
Father dies × not proximate		0.979		1.098
Mother dies × not proximate		0.816+		0.817
Father-in-law dies			1.069	1.150+
Mother-in-law dies			1.041	1.059
Father-in-law not proximate			1.080	1.175+
Mother-in-law not proximate			0.971	0.984
Father-in-law dies × not prox.				0.807
Mother-in-law dies × not prox.				0.943
Widower	1.923*	1.921*	2.203*	2.211*

* p<0.05,+ p<0.10
 Entries are relative risks estimated using Cox proportional hazards regression.

TABLE 3. Effects of Parental Proximity & Vital Status on Mortality Risks of Female Egos. Proximity is based on County Proximate, State Proximate and Non Proximate (see text).

Model	<i>Full Data</i>		<i>Restricted Data</i>	
	1	2	3	4
Father dies	0.989	1.012	0.968	0.998
Mother dies	1.149*	1.195*	1.177*	1.200*
Father state proximate	1.026	1.079	0.961	1.015
Father not proximate	1.048	0.986	1.030	1.010
Mother state proximate	1.074	1.128+	1.106	1.137
Mother not proximate	1.346*	1.326*	1.426*	1.390*
Father dies x state proximate		0.862		0.852
Father dies x not proximate		1.168		1.061
Mother dies x state proximate		0.819+		0.892
Mother dies x not proximate		1.101		1.115
Father-in-law dies			1.098	1.140+
Mother-in-law dies			0.956	0.939
Father-in-law state prox.			1.020	1.067
Father-in-law not prox.			1.131	1.213
Mother-in-law state prox.			1.020	0.999
Mother-in-law not prox.			0.929	0.921
Father-in-law dies x state prox.				0.896
Father-in-law dies x not prox.				0.846
Mother-in-law dies x state prox.				1.078
Mother-in-law dies x not prox.				1.023
Widow	1.282*	1.284*	1.347*	1.348*

* p<0.05,+ p<0.10
 Entries are relative risks estimated using Cox proportional hazards regression.

TABLE 4. Effects of Parental Proximity & Vital Status on Mortality Risks of Male Egos. Proximity is based on County Proximate, State Proximate and Non Proximate (see text).

Model	<i>Full Data</i>		<i>Restricted Data</i>	
	1	2	3	4
Father dies	1.149*	1.155*	1.136+	1.100
Mother dies	1.213*	1.279*	1.228*	1.305*
Father state proximate	1.058	1.046	1.081	0.994
Father not proximate	1.020	1.156	1.085	1.251
Mother state proximate	0.959	0.998	0.985	1.038
Mother not proximate	1.178	1.375*	1.182	1.342+
Father dies x state proximate		1.025		1.196
Father dies x not proximate		0.798		0.764
Mother dies x state proximate		0.900		0.865
Mother dies x not proximate		0.487*		0.577
Father-in-law dies			1.070	1.152+
Mother-in-law dies			1.044	1.062
Father-in-law state prox.			1.014	1.019
Father-in-law not prox.			1.238*	1.550*
Mother-in-law state prox.			0.981	0.985
Mother-in-law not prox.			1.003	1.046
Father-in-law dies x state prox.				0.992
Father-in-law dies x not prox.				0.474*
Mother-in-law dies x state prox.				0.989
Mother-in-law dies x not prox.				0.765
Widow	1.914*	1.912*	2.178*	2.168*

* p<0.05,+ p<0.10
 Entries are relative risks estimated using Cox proportional hazards regression.