New Perspectives on the Fertility Transition in the United States, 1850-1880

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As initially proposed in June 2008, this paper was to use two sources and three methods to examine fertility decline and fertility differentials in the United States between 1850 and 1940. The sources were to include the Utah genealogical database and the 1850-1940 IPUMS microdata samples of the United States census. The latter was to include new high-density samples of the 1880, 1900, and 1930 censuses. The methods were to include birth interval analysis of the genealogical database using event history methods, age-specific marital fertility analyses of the census microdata samples using own-child methods, and cohort-parity analysis (CPA) of the 1900 and 1910 census samples. The results of the three perspectives were to be compared for their usefulness in understanding fertility decline and differentials in the United States.

Unfortunately, the Minnesota Population Center delayed the release of high-density 1880, 1900, and 1930 census samples from March 2009 to 2010. Although slightly higher-density samples of the 1900 and 1910 censuses exist now than were available to researchers in the past—particularly for David and Sanderson's (1986, 1987) Cohort Parity Analysis (CPA) and Tolnay, Graham and Guest's (1982) own-child fertility analysis of the 1900 census—the potential for more refined analyses will increase substantially in the next few months. I have therefore decided to postpone some of the proposed analysis—particularly the proposed reevaluation of CPA using the 1900 and 1910 censuses—and focus on the period before 1880. The following paper reviews scholarship on the fertility transition in the early to mid nineteenth-century United States, discusses the role of stopping, spacing, innovation and adaptation in the early stages of the decline, and tests theories of marital fertility decline—particularly the dominant "target-bequest" and the less-frequently cited secularization-innovation hypotheses—using the 1860 IPUMS and the 1870-1880 linked census samples.

Background

Like other developed countries, the United States underwent a substantial decline in fertility between the nineteenth and twentieth century. Although some aspects of the decline appear to be distinctive (such as its early onset, well before significant mortality decline), it nonetheless furnishes a long-run example of declining fertility amid industrialization, urbanization, declining mortality, increasing participation of women in the paid labor force, and changing systems of old age support. Despite its economic, social, and political importance, however, the timing and causes of U.S. fertility decline are poorly understood. Since the national birth and death registration systems were not complete until 1933—long after fertility decline commenced—researchers have been forced to rely on census data and genealogical records to estimate fertility rates and differentials during the years of most significant fertility decline (e.g., Coale and Zelnik 1963). Figure 1 charts the most commonly cited period estimates of total fertility for the white population from 1800 to the present. These estimates suggest that fertility decline began remarkably early in the United States, preceding the onset of fertility decline in other countries (with the notable exception of France) by three-quarters of a century. Between 1800 and 1933, total fertility is believed to have fallen from over 7 children per woman to below replacement level fertility, a decline of about 70 percent.

Our lack of knowledge of fertility trends and differentials is most severe in the first century of U.S. fertility decline, especially the period before 1880. A few scholars have constructed age-specific fertility measures for population subgroups; for example, Wahl (1986) and Main (2006) examined selected family genealogies, Haines (1978) investigated the Pennsylvania anthracite coal mining region, and Steckel (1992) a small linked sample of northern farm women in the 1850 and 1860 censuses. Prior to the recent release of the 1850-1870 IPUMS samples (Ruggles et al. 1997), however, the only systematic national fertility estimates for the period before 1880 were based on the age structure of the population reported in the federal census. Yasuba (1962) and McClelland and Zeckhauser (1982) estimated white birth rates in the 1800-1860 census years with stable population methods and Coale and Zelnik (1963) estimated annual white birth rates for the period 1855-1960 with reverse-survival techniques. These studies generally agreed that the white birth rate was over 50 births per thousand population in 1800, declined to near 40 in 1850, and ended the century below 30, a decline of approximately 45 percent (Figure 2).

Since the Census Office published age data by sex, state, and county between 1800 and 1860—together with various demographic, economic, and social statistics—child-woman ratios have proven useful in estimating geographic differentials in and correlates of antebellum fertility. Yasuba's pioneering study revealed that child-woman ratios were closely correlated with state-level measures of population density, literacy, and other variables (1962). Yasuba's study stimulated other investigations based on the child-woman ratio, including those by Easterlin (1976), Easterlin, Alter, and Condran (1978), Vinovskis (1976), Leet (1977), Forster and Tucker (1972), Smith (1987), and Haines and Hacker (forthcoming), most of which shifted analysis from the state to the county level (see Haines, 2000, for a recent summary of the literature on the first century of U.S. fertility decline). Figure 3 illustrates the close correspondence between child-woman ratios and estimates of total fertility over time while figure 4 depicts the spatial pattern of child-woman ratios in 1840. The latter suggests much lower fertility in the long-settled eastern parts of the nation—particularly in New England—and much higher fertility in counties on the more recently-settled frontier.

The dominant interpretation that emerged from these studies associates the long-term decline and spatial differentials in child-woman ratios with the cost of establishing new farms. Increasing population densities led to an increase in the cost of farmland, especially near the Atlantic coast and navigable rivers where population densities were highest. As parents increasingly found themselves unable to endow their male children with adequate farmsteads nearby, they adapted by limiting their fertility. Couples in the Northeast, where relatively little undeveloped farmland remained after the turn of the century, were the first to practice successful marital fertility control. Couples on the frontier, where cheap land was readily available, were relatively late in limiting marital fertility. Many variations of the "adaptation" thesis have been posited. Easterlin has suggested that the negative correlation between child-woman ratios and land availability is best explained by the concept of intergenerational transfers of real property from parents to children. As good farmland became scarce, it became increasingly more difficult for parents to endow their children with adequate farmsteads nearby (a highly desired outcome in an era in which old age insurance was largely in the form of children to care for and protect aged parents). Couples adapted to these changing incentives by limiting marital fertility (Easterlin 1976; Easterlin, Alter, and Condran 1978). Sundstrom and

David (1988) contended that the proximity of other alternatives for children, notably non-agricultural employment, is another effective explanation of fertility differentials. They suggested an intergenerational bargaining model, in which parents were seeking to reduce the risk of "child default" (that is, children moving far enough away to be unable to provide old age care). The more favorable ratio of non-agricultural to agricultural wages in a region would lead to a higher risk that children would leave the area close to the parents. An adaptation by the parents would be a larger "bribe" in terms of property, both real and financial, and smaller families would be necessary to achieve that result. Research in this area has most recently been extended by Carter, Ransom, and Sutch (2002), who incorporate family life cycles and the out-migration of children to the frontier in the model.

Although research on early fertility decline in the United States has resulted in the development of innovative theory and is supported by robust associations between child-woman ratios and hypothesized covariates, it generally ignores the findings of U.S. social historians, who tend to stress the importance of social and cultural determinants of fertility decline. Rapid social, religious, and political change following the Revolution, it is argued, led to new ideas about sexuality, health, education, and the role of women in society and the family. Within this modernizing context, American women redefined themselves as the moral guardians of society and exercised their authority within the domestic sphere to limit their number of children. Connections have been suggested between the decline of fertility and the emergence of moral reform groups, the symbolic idea of "Republican motherhood" and the virtue of self-restraint with which it is associated, and the promotion of sexual abstinence by health reformers (Smith 1974; Kerber 1980; Nissenbaum 1980; Degler 1980). It is perhaps instructive that the only other nation to experience an early fertility decline—France—also experienced a late eighteenth-century Revolution that stressed individualist, egalitarian, and anti-patriarchal ideas (Binion 2001).

A few quantitative studies have attempted to assess the importance of ideational factors in the U.S. fertility transition. William Leasure (1982) has proposed that greater adherence to “liberal” religious denominations which encouraged greater individualism and a positive role for women in the nineteenth century (e.g., Congregationalist, Unitarians, Universalist, Presbyterians, Society of Friends) would result in earlier and more rapid fertility declines, which he demonstrated with a state-level analysis. Daniel Scott Smith (1987) found further support for this argument with a study of child-woman ratios in 1860.

In his recent monograph on the demography of Victorian England and Wales, Robert Woods contends that the absence of reliable data has encouraged speculation and loose theory about the origins and causes of English fertility decline. “Hypothesis,” he observes, “has run far ahead of description to the detriment of interpretation” (Wood 2000, p. 112). The characterization also describes the current state of research on U.S. fertility decline. Despite the rich theorizing evident in studies of early U.S. fertility decline, empirical models relying on the child-woman ratio as the dependent variable suffer from an inability to distinguish the relative contributions of nuptiality and marital fertility. Indeed, although most economic historians emphasize the importance of fertility control within marriage, many of the proposed mechanisms may act as simple Malthusian adjustments to marriage. Decreased land availability, for example, may reduce fertility by causing potential marriage partners to delay marriage rather than causing married couples to engage in conscious fertility control.

Trends and differentials in mortality also confound fertility estimation and bias the results of empirical models. Until recently, few life tables were available for the nineteenth-century United States, forcing researchers to make crude assumptions to conduct their analyses. Most cross-sectional geographic analyses of child-woman ratios implicitly assume that mortality did not vary geographically—an assumption at odds with the vast majority of historical mortality research—and indirect fertility estimates typically assume stable or declining mortality in the nineteenth century. Recent studies, however, indicate that prior assumptions of stable or declining mortality in the nineteenth century are false. Research by Haines (1998), Kunze (1979), and Pope (1992) convincingly demonstrates that mortality increased in the mid-nineteenth century. Mortality did not begin its sustained decline until after 1880. Figure 5 summarizes these findings.[1] I have recently shown that this new understanding of mortality has dramatic implications for indirect estimates of nineteenth-century birth rates: instead of declining steadily throughout the first half of the century, white crude birth rates did not decline until the mid-nineteenth century, more closely paralleling the experience of other industrializing countries (Hacker, 2003).

New opportunities for individual-level measurement of fertility decline

Much of the analysis of fertility on the fertility transition in Europe is based on aggregate vital statistics. Such data are not available for the United States, but the recent availability of census microdata allows researchers to generate even more powerful and versatile measures of fertility than would be possible to obtain from vital statistics. To overcome the limitations of

[1] These estimates are from J. David Hacker, "New Decennial Life Tables for the United States, 1800-1900," (under review at *Historical Methods*).

existing historical fertility estimates, we need measures of age-specific general and marital fertility that can be correlated with individual- and county-level socioeconomic data. Own-child methods of fertility estimation can provide this level of detail. Grabill and Cho (1965) developed the reverse-survival method for estimating age-specific births in years preceding a census for research on tabulations of young children by age of mother in the 1910 and 1940 censuses. These own-child methods have subsequently been refined and elaborated (Cho, Retherford, and Choe 1986) and applied to selected public use microdata samples of the U.S. census (Rindfuss and Sweet, 1977; Tolnay, Graham and Guest, 1982; Hacker, 2003).

The IPUMS now includes large microdata samples for every census year between 1850 and 2000, with the exception of 1890 (see Figure 5 for a summary of sample availability, sample density, and the date the data became publically available). Since own-child methods allow fertility to be estimated 15 or more years preceding the census, age-specific fertility rates can be constructed for the nation as a whole and various population subgroups for all years between 1835 and 1999, with the exception of years 1880-1884. These rates can in turn be used to construct various summary measures—such as total fertility rates, and the I_f, I_g, M, and m indexes popularized by the European Fertility Project. Although the usefulness of summary measures has been questioned—especially the ability of I_g and m to date the onset of marital fertility decline (Guinnane 1994; Woods 2000)—they remain useful for comparison across time and space.

The inclusion of a question on the number of children ever born to each woman (parity) in the 1900-1910 and 1940-1990 censuses furnishes another powerful source of long-run fertility data. The data on parity allow the construction of parity progression ratios for cohorts of women born since the mid-nineteenth century. They also make it feasible to carry out cohort-parity analysis (CPA) (David and Sanderson 1986, 1987). A new high-density sample of the 1900 population (up from a sample density of 1-in-760 to 6-in-100) scheduled for 2010 will dramatically increase the potential for CPA in the near future.

The availability of the 1850-1880 and 1900-2000 IPUMS samples also allows researchers to construct empirical models of nuptiality, general fertility, and marital fertility spanning 150 years of behavioral change (see, for example, Rindfuss and Sweet 1977; Steckel 1992; Hacker 1999). Although variable availability is more limited in earlier census years, all IPUMS samples include age, marital status, race, nativity, occupation, literacy, number of own children in the household, and number of own children less than age 5 in the household, among other individual-level variables. All IPUMS samples also include pointer variables indicating the location of spouses and parents in the household, which allows family- and household-level variables to be constructed easily (e.g, spouse's occupation, proportion of own children given a biblical name, presence of boarders and lodgers). Later censuses include more information (e.g. income, level of schooling achieved, number of times married), creating the potential for more sophisticated models.

Although IPUMS census samples before 1940 include fewer variables, they are no longer protected by federal confidentiality provisions, and thus include name and detailed geographic information, which creates additional analytical opportunities. Since children's names are not chosen randomly, for example, given names can be treated as an indicator of parental attitudes (e.g. Hacker 1999). The inclusion of detailed geography in the pre-1940 samples allows city, state, and county-level data to be merged easily and treated as contextual variables in models of fertility. ICPSR dataset 0003, "Historical, Demographic, Economic, and Social Data: The United States, 1790-1970," for example, includes demographic, industrial, agricultural, and religious data collected for each county and has been a popular machine-readable source for demographic studies. Michael Haines has recently enhanced this dataset by adding the urban population of each county and county-level areas. Further enhancements are expected to be made soon by the National Historical Geographic Information System (NHGIS) project, which will include all available aggregate census information for the United States between 1790 and 2000.

Most recently, the Minnesota Population Center (MPC)—the major developer and distributor of IPUMS census files—has released several samples and announced the future release of others that will dramatically increase the source base for studying U.S. fertility decline. In 2008, the MPC released a complete database of all 50 million individuals living in the United States in 1880. The data is compatible with other complete datasets constructed for Norway, Canada, Great Britain, and Iceland, facilitating comparative analyses. Although the data lacks some critical demographic data, such as literacy and school attendance (the dataset was originally constructed by the Church of Latter Day Saints for genealogical purposes), the MPC plans to release samples of the data with complete information. Also in 2008, the MPC released a number of samples of individuals in the 1860, 1870, 1900, and 1910 IPUMS samples linked to the 1880 complete county file, allowing researchers to follow individuals and couples over place and time. The future is even brighter. In 2010, the MPC plans to release new high-density samples of the 1880 census, the 1900 census, and the 1930 census, which will substantially improve our ability to study US fertility decline (these samples were originally scheduled for release in early 2009 and were to represent a substantial source base for this paper).

New Descriptive Measures of U.S. fertility decline

Table 2 reproduces my estimates of age-specific marital fertility rates, the index of martial fertility decline (I_g), *M, m* and the Mean Age at Childbearing for the white population of the United States in years immediately preceding the 1850, 1860, 1870, and 1880 censuses. The estimates were made using the 1850-1880 IPUMS samples, own-child methods, unpublished decennial life tables (now under review) and new estimates of net census under-enumeration. The results indicate that total marital fertility declined 17 percent in the thirty year period. Although marital fertility declined at all ages, the proportionate decline was larger in older age groups. Martial fertility for women age 40-44 fell 47 percent; for women age 20-24 the decline was only 8 percent. Overall, however, the decline in marital fertility among women age 35-40 accounted for two-thirds of the decline in total marital fertility.

Using the conventional "rules of thumb" suggested by Coale (values of *m* greater than 0.2, a decline in I_g of 10 percent, or I_g less than 0.6), the estimates indicate no evidence of parity-dependent marital fertility control until the late 1860s. These results suggest that the onset of marital fertility control was much later than commonly assumed by researchers relying on child-woman ratios. The steady increase of *m* from the 1847-49 period, however, suggests the growing prevalence of parity-dependent control from the middle part of the century, late relative to prior expectations but still early compared to European standards (with the notable exception of France).

Table 3 shows new estimates of marital fertility by census region in census years 1850-1880. The results confirm prior assumptions that women in the northeastern United States were on the vanguard of fertility decline in the United States. The average total marital fertility rate for New England women in the period 1847-49 was 1 to 3 children less than the average of women in other regions. Interestingly, however, the results indicate no evidence of parity-dependent control in New England or any other region. If New England women were consciously controlling their fertility, they were doing so by maximizing the intervals between births at low parities. In a study based on genealogical records of well-documented New England families, Gloria L. Main (2006) makes just such an argument. Although Main does not report average birth intervals, she does report that among mothers marrying between the age of twenty-one to twenty-three, the number of children ever born fell by about from 3.45 in the mid seventeenth century to 2.80 in the mid nineteenth century, representing a decline of about 20 percent. The relatively low values of *M* shown in Table 3 also suggests greater birth intervals among New England women. (Ewbank (1989), however, warns that *M* is affected by the prevalence of childlessness and one-child families and can be a misleading indicator of spacing.)

In the last two decades historical demographers have raised bashing of the European Fertility Project indices of martial fertility from a part-time hobby to an full-time interdisciplinary sport (Bean, Mineau, and Anderton 1990; Guinnane and Okun 1994; Wood 2000; van Bavel 2004; Brown and Guinnane 2007). Simulations suggest that significant proportions of the population may begin practicing “stopping” behavior with little or no change in *m.* All critics have noted that *M* and *m* were designed to detect parity-dependent control in aggregate data; by design, they are poorly suited to detect intentional spacing of births and do not harness the potential explanatory power of individual data on the timing and spacing of births. And spacing, it is argued, makes sense in an era of imperfect birth control knowledge and technology (David and Sanderson 1987). A growing scholarly consensus suggests that the ideal study design relies on individual birth interval data combined with relevant fixed and time-dependent demographic and socio-economic correlates. Data are analyzed with event history methods, which employ proportional hazard models and time-varying covariates (e.g., Bengsston and Dribe 2006). More sophisticated models in development, such as the "cure" model proposed by Alter, Oris, and Tyurin (2007), may have the potential to simultaneously model stopping and spacing behaviors. Unfortunately, there are few historical data that meet the stringent requirements required and even fewer that span the years of the demographic transition. Most studies are based on rural, pre-transition populations with little heterogeneity. The only major studies based on transition populations include Reher and Sanz-Gimeno study of a small village in Spain (2007) and Bean, Mineau, and Anderton's (1990) study of genealogical data collected by the Mormon Church. The latter documents families settling nineteenth-century Utah. Although the best extant study of fertility decline in the U.S. population, the Utah population is distinctive in being the last state population in the United States to adopt parity-dependent marital fertility control (see Ewbank 1991, figure 2). Given the pro-natal emphasis of the Mormon faith, the particular birth control strategies employed by Utah couples—particularly the substantial contribution of spacing behavior to overall fertility decline—may not be representative of the overall U.S. population.

Scholars critiquing the EFP measures have shown less willingness to critique measures of spacing. At what point does an increase in birth intervals—or a statistically significant coefficient in a Cox model—suggest intentional efforts on the part of couples to reduce family size? Decades of research on the proximate determinants of fertility has shown that birth intervals can vary across time and across populations for a wide variety of reasons, including differences in post-partum infecundability and pathological sterility. We know almost nothing about historical trends in breast-feeding, taboos on intercourse following birth, and secondary sterility resulting from sexually transmitted disease and tuberculosis, and little about the impact of nutritional deficiencies on fecundability. Other reasons for changing birth interval unrelated to couples desire to achieve smaller families may include poor data, changing patterns of coital frequency related to health reforms (such as those promoted by Sylvester Graham in the early nineteenth-century United States), and temporary separation of spouses related to changing work requirements. Although Gloria Main's genealogical study of New England families suggests the growing importance of spacing in the early nineteenth century, data clearly become less complete over time. The percentage of couples known to reach parity two with no recorded birth for 60 months or more between parity 1 and 2 rose from 2.8% in the mid eighteenth century to 16.9% in the mid nineteenth century.

Despite the many valid criticisms of the EFP measures, they still have value. The large increase in *m* between 1850 and 1880 leaves little doubt that parity-dependent control was an innovation of late nineteenth-century Americans that began in the Northeast and diffused west across northern census regions. The evidence also suggests that the innovation of parity-dependent control was likely accompanied by increased spacing of children, which in turn may have been an adaptation to changing economic circumstances.

Secularization-Innovation as an Alternative to the Target-Bequest Thesis

As mentioned earlier, the dominant explanation for U.S. fertility decline and spatial differentials sees the long-term decline in available farm land as key to explaining fertility decline and fertility differentials. Early work by Greven (1970) on seventeenth- and eighteenth-century Andover, Massachusetts illustrated the steps parents took to ensure they provided adequate portions for all their surviving male children. Despite very large families, land was plentiful enough in the first few generations after Andover's founding in the early seventeenth century to ensure that all sons received adequate, and equal, endowments. In the eighteenth century, however, the third generation was faced with a shortage of available land. Many children were forced to move to frontier regions—where land was still plentiful and cheap—to start a new farm. From the parents' point of view, helping sons set up farm locally was preferable. Parents depended on at least one local child to provide help in their old age. It is little surprise that the township saw a decline in partible inheritance and a rise in primogeniture.

Economic historians have interpreted the long-term decline in child-woman ratios in the nineteenth century as evidence that parents sought to achieve a reduced target number of children in order to provide adequate bequests. To model the impact, they have employed a variety of measures of land availability using aggregate data published by the U.S. Census Office, including the number of farms per adult male in the county, the ratio of developed to undeveloped acreage, and the average value of farms. Carter, Ransom, and Sutch (2006) argue convincingly that the average value of a farm is the most logical proxy of the ability and cost of parents to provide farms for their sons. As described in more detail below, individual-level data on parental wealth in personal and real property collected by the 1860 and 1870 censuses allow a further refinement: parental wealth can be assessed relative to the cost of the average farm in the county of residence.

The high levels of mid nineteenth-century marital fertility and the later than expected onset of parity-dependent control described above, casts doubt about the overwhelming importance of declining land availability. If land was becoming scare in some areas in the early eighteenth century, why was marital fertility so high in 1850 and why did parity-dependent control only emerge after the middle of the century? Coale's much-cited three preconditions for the onset of fertility decline may suggest an answer. According to Coale, the following preconditions must be met before marital fertility decline can commence: (1) reducing births has to be socially and economically beneficial, (2) birth control must be culturally acceptable, and (3) there has to be available means of contraception at a reasonable cost (cited in Parkerson and Parkerson 1988). These preconditions are sometimes known as "ready," "willing," and "able." Although declining land availability made marital fertility decline economically beneficial (i.e., couples should have been "ready"), cultural impediments to practicing family limitation strategies or lacking means and knowledge delayed the onset of marital fertility decline.

Few scholars maintain that nineteenth-century Americans lacked the knowledge or means to practice birth control. Coale's second precondition for fertility decline—that birth control must be culturally acceptable—however, has directed a few scholars to investigate the relationship between religion and fertility. The Bible, after all, frequently repeats God's injunction to be fruitful and multiply. High fertility is equated with God's blessing, barrenness with his displeasure. Of particular interest is the account in Genesis of Onan, who reportedly "spilled [his 'seed'] on the ground" to avoid impregnating his brother's wife. God's subsequent execution of Onan can be read as an admonition to avoid *coitus interruptus*, the most accessible and perhaps most frequently used method of birth control in the preindustrial era (Santow 1995). While we cannot be certain that early Americans interpreted the Bible as forbidding family limitation strategies, it is perhaps noteworthy that opponents of birth control in the late nineteenth century labeled the practice of withdrawal as "conjugal onanism" (Brodie 1994, p. 59).[2] Moreover, as Janet Brodie highlights in her excellent history of contraception and abortion in the nineteenth-century United States, antebellum advocates of contraception and their apparent audience were religious liberals or atheists. Robert Dale Owen, Charles Knowlton, Abner Kneeland, Frederick Hollick, and Edward Bliss Foote, for example, all considered themselves freethinkers and were among the leading advocates of birth control. Knowlton was arrested for obscenity for the publication of *Fruits of Philosophy* (1832), which advocated douching with a spermicidal solution (Brodie 1994). (The book was later at the center of the well-known 1877 Bradlaugh/Besant obscenity trial in England when Charles Bradlaugh, a free thinker elected to Parliament, and Annie Besant, a writer who rejected conventions of marriage, intentionally published the book to challenge existing obscenity laws.) The prominence of religious freethinkers in the early promotion of contraception techniques and the support of their right to publish by religious liberals has led Daniel Scott Smith to

[2] Daniel Scott Smith recounts a divorce suit in 1710 Massachusetts, in which a woman charged that her husband practiced Onan's "abominable sin because he feared the charge of children" (1994b).

conclude that “traditional religious sentiments were an obstacle to the public discussion and possibly the private means of family limitation” (1994).

Certainly, the relationship of religion, birth control, and fertility has been well established in the twentieth-century United States. A fertility differential between Roman Catholics and Protestants was documented as early as the 1920s and remained significant until Catholic adherence to the church’s traditional position against contraception declined in the 1960s and 1970s (Groat, Neal, and Knisely 1975; Westoff and Jones 1979).[3] The baptismal rate of members of the Lutheran Church-Missouri Synod, one of the three major Lutheran bodies in the United States, was also appreciably higher than the national birth rate for most of the twentieth century. Perhaps not coincidentally, spokesmen for the Synod vigorously opposed all forms of birth control through the 1930s and did not officially condone the use of contraceptives until the 1960s (Graebner 1969).[4] Finally, the fertility of Hutterites, a small Anabaptist sect in the United States and Canada, was also noted as being distinct in the twentieth century, due in part to Hutterite religious convictions against the use of contraceptives (Eaton and Mayer 1954).[5] Although there was reduced interest in religious determinants of demographic behavior after fertility differentials between Catholics and Protestants narrowed in the 1960s and 1970s, social scientists have recently returned to the

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[3] The fertility differential between Catholic and non-Catholics was often noted before the 1920s but never systematically studied. Janet Farrell Brodie, for example, observes that the late nineteenth century physician Horatio Storer “attributed the large families of immigrants to their religion and commended the Catholic church for its watchfulness concerning birth control, explicitly contrasting it with the silence of the Protestant clergy” (1994, p. 154).

[4] Despite its name, the Missouri Synod is a national group and the ninth largest religious body in the United States. It was of nineteenth-century German immigrant origin, and was the most conservative of the three major Lutheran bodies (Graebner 1969).

[5] Joseph Eaton and Albert Mayer documented an intense hostility to birth control among the Hutterites in the 1950s, who referred to the practice as “murder.” One Hutterite woman argued that “‘worldly’ people who engage in the practice will have to face on the Judgement Day the hundreds of unborn children whom they have ‘killed’.” Eaton and Mayer contend that the Hutterite taboo against birth control “is strongest against the use of mechanical or pharmaceutical birth control devices,” although “coitus interruptus is also regarded as sinful” (1954, pp. 48-50). Hutterite fertility is among the highest ever reliably recorded, and, as a result, has proven useful to demographers as a baseline of “natural fertility” (Henry 1961).

study of religion’s influence on fertility and other demographic behavior. This newer research emphasizes the multiple pathways through which religion may influence demographic behavior (Lehrer 2004; McQuillan 2004; Lynch 2006). Much of this new research has been influenced by the work of Calvin Goldscheider, who suggested that observed correlations between religion and fertility were often spurious, a result of the groups’ different socioeconomic characteristics, not religion. This spurious nature of this “characteristics approach” often becomes apparent when education, income, and residence are controlled in multivariate approaches. Even if differences in fertility persisted after controlling for socioeconomic factors, Goldscheider warned against a too easy identification of fertility differentials with particular church teachings on birth control and childbearing (what Goldscheider termed a “particularized theology” hypothesis). Indeed, Goldsheider argues that the direct role of religious theology in promoting pronatal ideology or discouraging the use of contraception likely is of secondary importance to the indirect role of religion in reinforcing family values and segregated gender roles (2006).

Unfortunately, there are few reliable data on the relationship between religion and fertility before the twentieth century. One exception is the detailed genealogical and church records compiled by the Church of Later Day Saints. These data show a positive association between religious affiliation with the Mormon church and completed family size, especially among women born in the first half of the nineteenth century. The importance of Mormon pronatalism became relatively less important among women born in the later half of the century, however, as growing urbanism led to a long-term increase in the importance of socioeconomic factors (Bean, Mineau, and Anderton 1990). Another exception to the lack of reliable data on the relationship between religion and fertility in the nineteenth century is a remarkable 1885 city directory for St. Charles, Illinois, which details each woman's religious affiliation and number of children ever born. Using these data, Parkerson and Parkerson found significant differentials between women of "liturgical" and "pietistic" religious orientations, even after controlling for age, occupation of spouse, age at marriage, and nativity.[6] They reason that Pietists' belief in individual free will "nurtured a secular individualism offering women both an alternative to the domestic environment and a realistic option to limit their fertility." This individualistic focus was completely at odds with conservative liturgical groups, such as Roman Catholics, whose emphasis on structured prayer and adherence to church hierarchy "reinforced traditional ideas of deference and the acceptance of an ascribed position in the secular world." Moreover, the emphasis of Pietistic faiths on the need to nurture their children to a state of grace resulted in a movement to have fewer children but of "greater spiritual quality" (1988).

Several studies have introduced proxies of religious sentiment into quantitative analyses of aggregate census data, an approach that this study will extend to the individual-level with the 1860 cross-sectional and 1870-1880 linked IPUMS samples. J. William Leasure noted that the proportion of "church seats" held by five selected religious groups in 1850 was easily the most powerful predictor of change in state child-woman ratios between 1800 and 1860. The five denominations—Congregational, Unitarian, Universalist, Presbyterian, and Society of Friends—were chosen because they tended to be less dogmatic, more tolerant, and more democratic than other groups, such as Roman Catholics and Episcopalians, which were more hierarchical, and Baptists and Methodists, which were more socially restrictive. Leasure reasoned that membership in the five selected denominations should indicate groups of people

[6] The small number of cases probably explains Parkerson and Parkerson's reliance on two broad denominational categories, which may obscure important differences among the various pietistic and liturgical faiths.

who were more receptive to a sense of control in their lives, and that this feeling of control gradually extended to include their reproductive lives (1982; 1983). Unlike Parkerson and Parkerson's distinction of pietistic and liturgical faiths, the five denominations identified by Leasure correspond with known regional variations in child-woman ratios. Congregational, Unitarian, and Universalist churches were especially prominent in New England, the region with the lowest child-woman ratios, and weakest in the South and West, the regions with the highest ratios. Presbyterians were relatively stronger in the Midwest, the region associated with the second lowest child-woman ratios.

In a recent analysis of cross-sectional variations in the 1860 child-woman ratio, Daniel Scott Smith also relied on the proportion of church seats held by individual denominations as independent contextual variables. Smith's study improves on Leasure's by treating selected denominations separately, adding additional independent variables, and shifting the analysis to the county-level, thereby reducing the potential covariance of religious denominations with other state-level variables. The results suggest that denominations most clearly identified with New England—the Universalists, Unitarians, and Congregationalists—had the largest impact on child-woman ratios. Counties with higher proportions of Presbyterians also had lower child-woman ratios in the Old Northwest (Midwest), where Presbyterians closely cooperated with Congregationalists. Surprisingly, the prevalence of the Society of Friends (Quakers)—the fifth religious denomination identified by Leasure as stressing autonomy of thought and an active role for women—was not significantly correlated with lower fertility, suggesting to Smith that it was the "Yankee" religious and cultural tradition that was associated with fertility decline (1994b).

Although a valuable start to including religious variables in models of fertility, Leasure and Smith's measures are at best a crude measure of religiosity. In their introduction to a new edited collection of articles on religion and fertility decline in the Western world, Frans van Poppel and Renzo Derosas suggest that historians "be innovative in their research, and where possible to use indirect indicators for the relevant dimensions." Finally, they encourage researchers to use individual-level data containing biological information, socioeconomic status, education, ethnicity, and other variables so that the interactions between religion and other aspects of a person's position in society can be disentangled (van Poppel and Derosas 2006:10-11).

The following analysis attempts to follow that advice. It investigates economic, demographic, and religious correlates of marital fertility in the nineteenth-century United States using the recently released 1860 and 1870-1880 linked IPUMS census samples (Ruggles et al. 2008). In addition to the county-level measures of religious denominations suggested by Leasure and Smith, it relies on children's names—available in IPUMS samples before 1940—to construct a proxy of parental religiosity. Studies of early American child-naming patterns suggest that parents invested a great deal of thought into naming their children, and that their choices reflected attitudes about themselves and the underlying values of their society (Zelinsky 1970; Smith 1984; Smith 1985; Smith 1994; Tebbenhoff 1985; Fischer 1986; Main 1996; Rutman 1986; Wyatt-Brown 1982; Lieberson and Bell 1984). This analysis assumes that, all else being equal, nineteenth-century parents with a higher proportion of biblically-named children were either: (a) more religious than parents with a higher proportion of non-biblically-named children or, (b) were less open than other parents to sources outside of religion for authoritative positions on various topics. This inference is admittedly crude, and is undoubtedly subject to significant measurement error. Nevertheless, enough parents explicitly turned to secular or religious sources to suggest that child-naming data provides a unique opportunity to explore the important topic of religiosity and its impact on demographic behavior, provided we have enough cases for analysis.

Analysis of names obtained from the 1850-1920 IPUMS samples suggests that the nineteenth-century witnessed a remarkable secularization of the naming pool.The percentage of white, native-born males of native parentage with biblical names plummeted from 67 percent in the 1780 birth cohort to well under 30 percent by 1880. The percentage of females given biblical names fell to less than 20 percent by 1880, although from a lower initial value (just over 50 percent) and on a more irregular trajectory. (For more discussion on nineteenth-century naming practices and their usefulness as a proxy for parental religiosity, see Hacker 1999).

Correlates of Marital Fertility in Farm Families, 1860 and 1870-1880

The following analysis of marital fertility relies on a poisson regression (appropriate for count data) of martial fertility among women in the 1860 cross-sectional and 1870-1880 linked IPUMS samples. The study is restricted to native-born white women of native parentage, the first subgroup of the population known to significantly reduce their fertility. Because the analysis focuses on marital fertility, relies on children’s names as independent variables, and evaluates the impact of parental religiosity vis-à-vis the target-bequest thesis, I further limit the study to women in childbearing ages, who are currently married to native-born spouses of native parentage engaged in farm occupations, and who have children with valid names present in the household. And because nineteenth-century census data do not include duration of marriage, I also limit the samples to women whose eldest child is above the age of children used in the dependent variable. The samples are therefore limited to fecund women. The universe is perhaps overly restrictive, but it has the benefit of minimizing potential biases in census data, which record only family members currently present in the household.

For modeling marital fertility in the 1860 cross-sectional sample, the dependent variable is the number of own children present under age 5. This figure does not reflect infant and childhood mortality or the probable underestimation of children in the census; it is therefore a lower-bound estimate of marital fertility and may incorporate unknown biases. The actual biases are probably small, however. While only a few studies have investigated determinants of infant and childhood mortality in the mid-nineteenth century, they find only small or insignificant differentials (Davin 1993; Steckel 1988). Preston and Haines report significant urban/rural differentials in infant mortality in the late nineteenth century, so we should remain cautious that differentials in marital fertility between urban and rural areas may simply reflect differentials in infant and childhood mortality (1991). Restriction of the sample to farm families, however, greatly reduces the possible mortality differentials due to urbanization.

Both the 1860 and 1870-80 linked samples include individual-level measures of personal and real estate wealth (dollars). These measures allow me to construct a more refined measure of parents' ability to endow children with a nearby farm. The target-bequest hypothesis predicts that wealthy families can provide viable farms for more children than poor families, all else being equal. Parents' ability to provide a nearby farm, however, is affected by the average price of a farm in their area. Rather than rely solely on wealth, I create an index of parents' ability by dividing parents' total wealth (real and personal) by the average value of a farm in their county of residence. Inclusion of husbands' age (and an age-wealth interaction variable) controls for the fact that wealth tended to increase in a linear fashion with age (see Figure 7). Forward-looking couples had a reasonable expectation that their wealth would increase over time. Their decision to accelerate, postpone, or stop childbearing, therefore, was based on their relative wealth and future expectations.

Mean values of the dependent and independent variables used in the model are summarized in Table 4. Table 5 depicts the results of two models for farm women in the 1860 IPUMS sample and the results of two similar models for farm women in the 1870-1880 linked sample. The results show that most expectations were met although a few were not. Marital fertility generally followed the expected age profile. Married women older than the reference age group had fewer surviving children under age of 5 present in the household. Wife's literacy was a significant determinant of lower marital fertility in both samples, a finding consistent with much of the literature of fertility decline in the developing world that identifies women's education and a key factor in the onset of fertility decline. The biblical name variable yielded strong results. Coefficients were positive and significant in all regressions in both samples, confirming expectations that parents' choice of biblical names for their children was associated with higher fertility. The variable remained a significant correlate of marital fertility in models including the church seating variables. These results support the hypothesis that child-naming practices are a reasonable proxy of parental religiosity, and that parental religiosity may have been a significant impediment to the practice of family limitation in nineteenth-century

America. The church seating variables also showed the expected results. The presence of Congregationalists, Unitarians, Universalists, Presbyterians and Quakers resulted in negative coefficients in both census years, supporting the hypothesized relationship between these liberal denominations and lower marital fertility.

The models provide no support, however, for the target-bequest hypothesis. The coefficient for parents' relative wealth was for all intensive purposes zero in all models, suggesting the parental wealth had no impact on marital fertility. If a couples' decision to accelerate, postpone, or stop childbearing was related to their ability to endow children with an adequate land and resources, there is no evidence of that relationship in the 1860 census or in the linked 1870-80 census. These results suggest the ecological correlations between county-level measures of land availability and child-woman ratios are either the result of nuptiality or are spurious.

CONCLUSION

Demographic historians have long suspected that cultural factors played an important role in the decline of fertility in the United States. Unfortunately, "culture" is difficult to define and even more difficult to measure. This study attempted to integrate one component of culture, religion, into a quantitative analysis of marital fertility in 1860 and the period 1870-1880. While no direct assessment is available of parents' religious affiliation or religiosity, indirect measures proved to be significantly correlated with the marital fertility of women in IPUMS samples of the 1860 census and women in the linked 1870-1880 IPUMS sample. Analysis of county-level church seating capacities indicated that the presence of liberal church denominations was associated with lower marital fertility, providing support for the hypothesis that liberal religious beliefs reduced cultural impediments to adopting family limitation strategies. The fact that early advocates of birth control in antebellum America were religious liberals or freethinkers further supports this conclusion.

Naming data included in the IPUMS samples also suggests a close relationship between religion and marital fertility. Parents who chose a higher proportion of biblical names for their children were found to have higher marital fertility, even after controlling for other variables, such as age, occupation, literacy, and wealth. The results support evidence that individuals with traditional religious beliefs often opposed the public discussion and private use of contraception. The evidence indicates that parental religiosity was an important determinant of marital fertility in nineteenth-century America.

Surprisingly, given its prominent position in the economic history literature on fertility decline, declining land availability and parents' increasing inability to endow children with adequate portions in heavily-developed areas with high farm prices proved to be an insignificant factor in explaining marital fertility differentials. The evidence presented in this study supports the hypothesis that the onset on marital fertility decline in the United States was not a long-term adjustment to the changing costs of providing for children, but rather an innovation in the "thinkability" of practicing family limitation strategies related to secularization.

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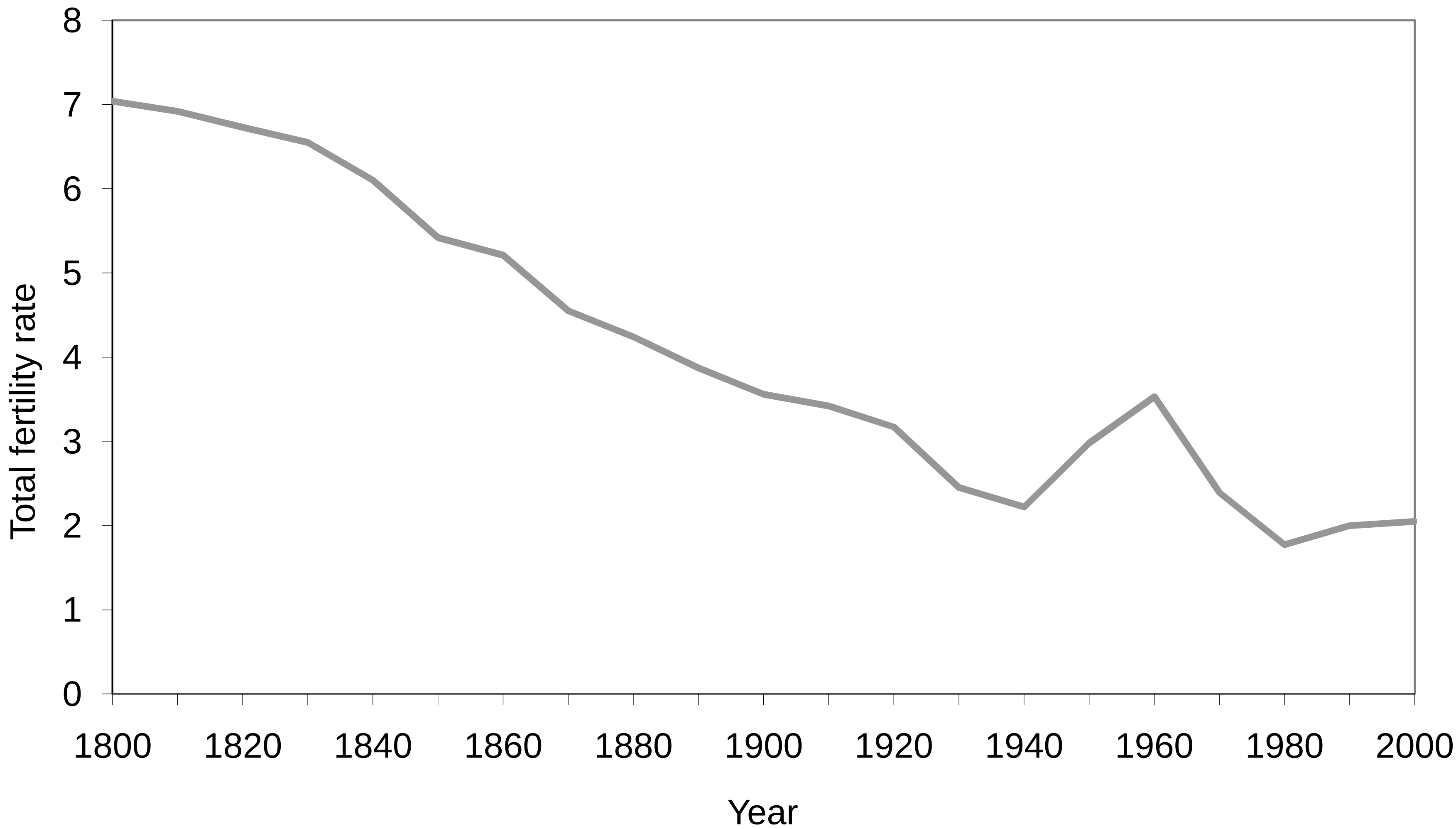
Figure 1. Total Fertility in the United States, 1800-2000 (white popuation)



Source: U.S. Bureau of the Census, Historical Statistics of the United States, Colonial Times to 1970, Bicentennial Edition (GPO, Washington DC, 1974), p. 49.

Figure 2. Estimates of white birthrates in the United States, 1790-1890

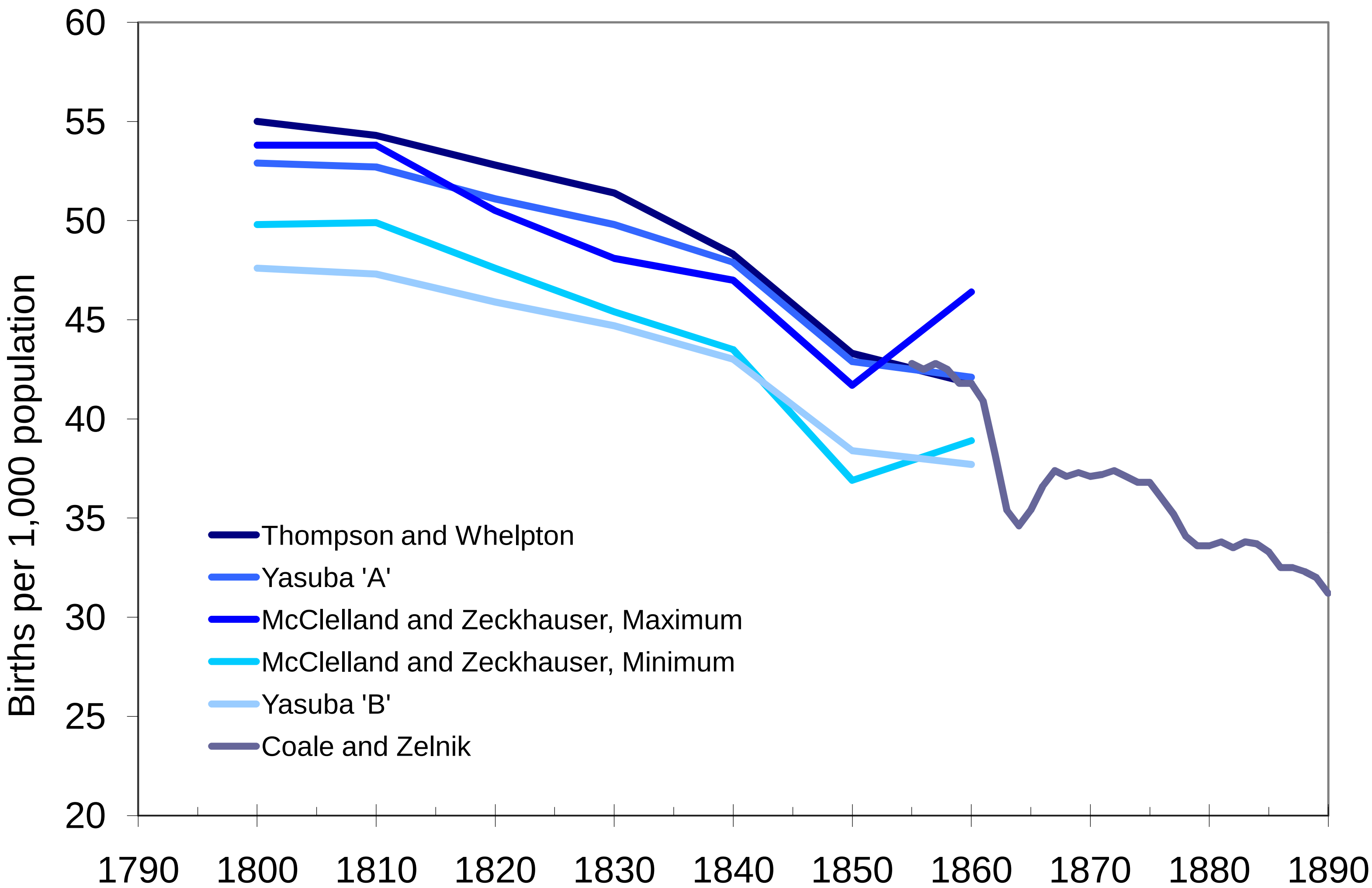


Figure 3. White child-woman Ratios in the United States, 1800-1990

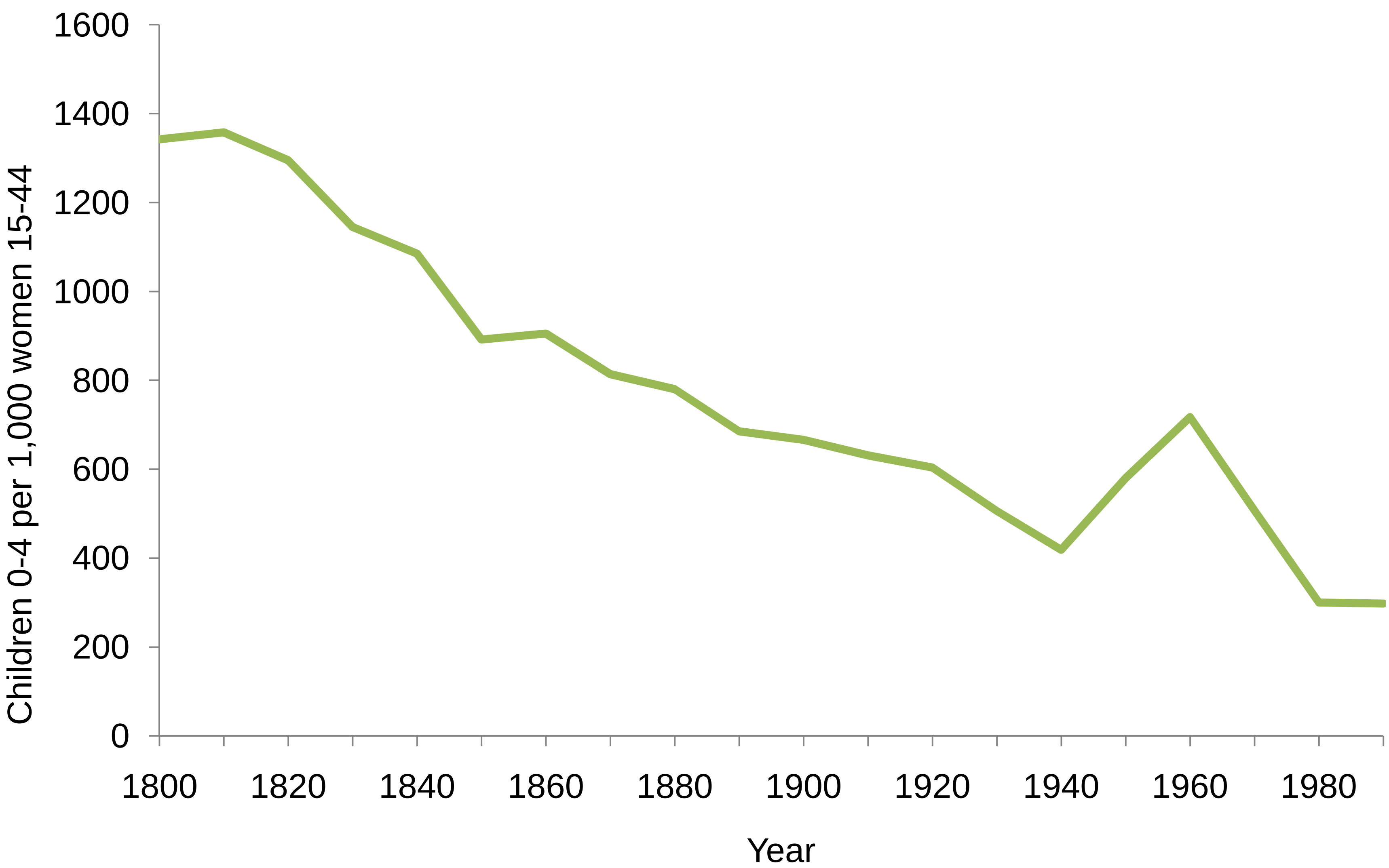


Figure 4. White Child-Woman Ratios. United States, Counties, 1840

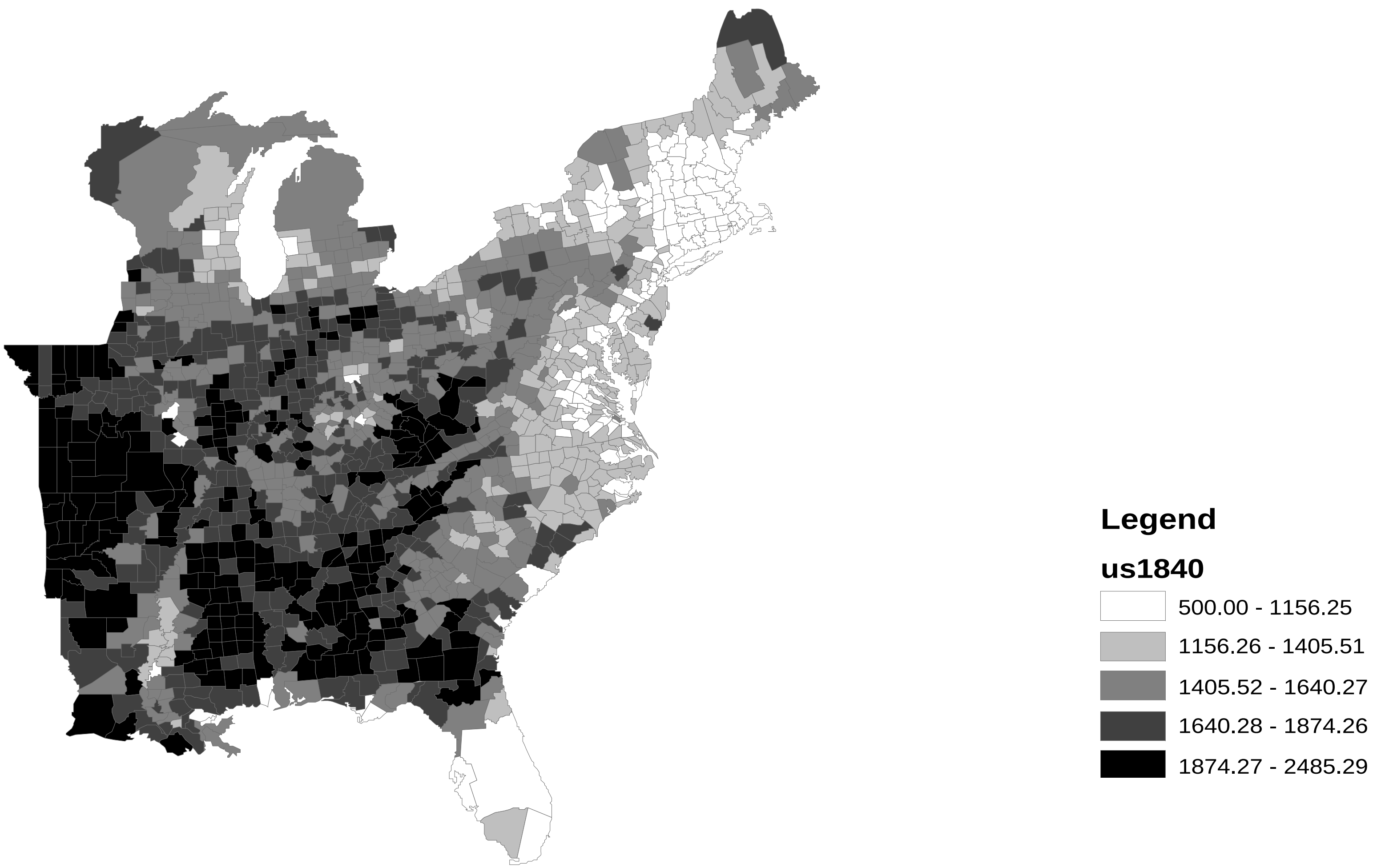
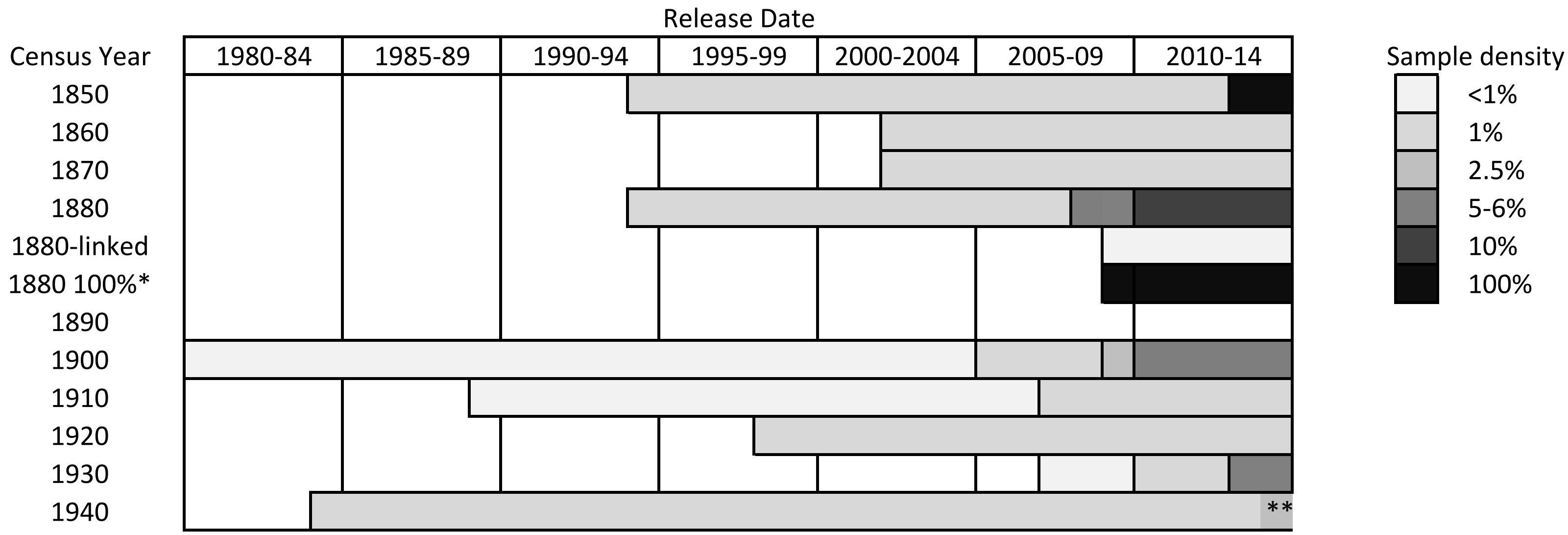


Figure 5. Integrated Public Use Microdata Samples of the United States Census covering First Demographic Transition



* Limited set of variables

**Without confidentiality restrictions

Figure 6. Life Expectancy at birth, white population of the United States, 1790-1900

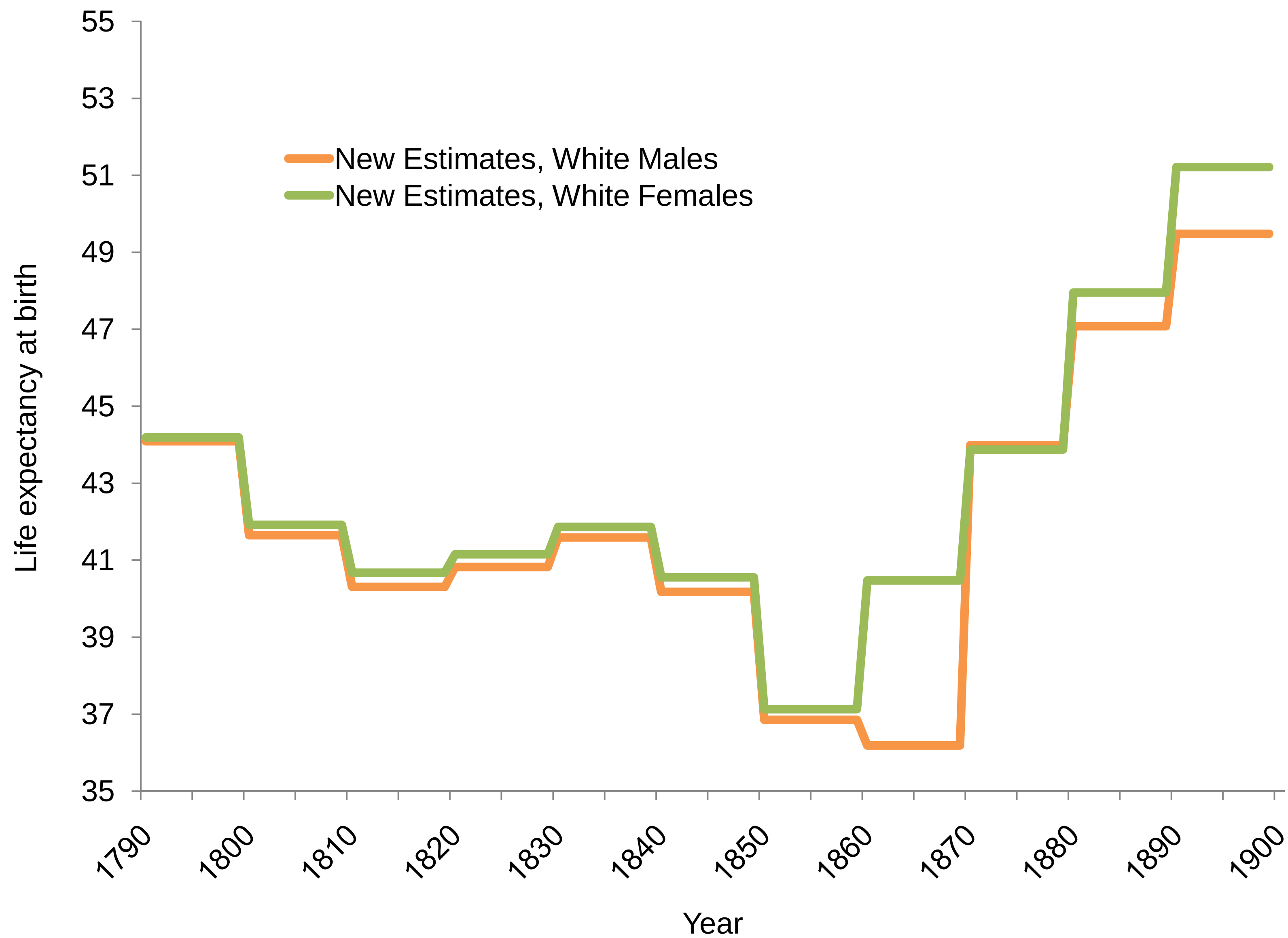
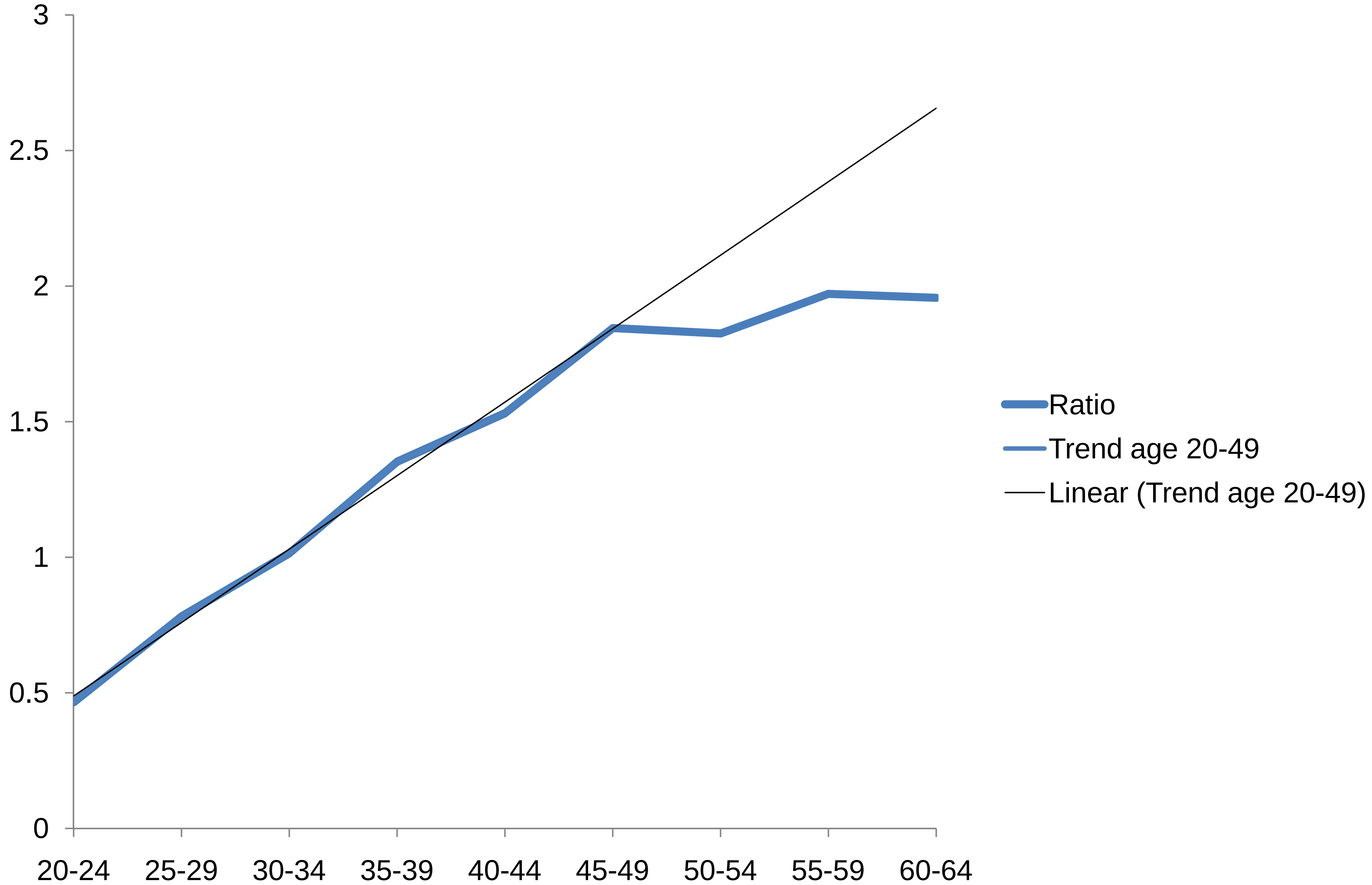


Figure 7. Ratio of total wealth to average farm price in county by age, White Farm Couples, 1860



Sources and Methods for the Study of U.S. Fertility Decline

Source	Methods	Measures	Representative Studies
Published Census Reports	Stable Population	Crude Birth Rates	Yasuba 1962 Coale and Zelnik 1962 McClelland and Zeckhauser 1982 Hacker 2003
Published Census Reports	Ecological Regression	Child-Woman Ratios *(by county 1800-1860)*	Yasuba 1962 Easterlin 1976; Easterlin *et al* . 1978 Sundstrom and David Carter, Ransom & Sutch 2004 Haines and Hacker 2010
Census Microdata Samples	Own-Child - Descriptive	ASMFR, TMFR, I_g, *M* , *m*	Haines 1978 Tolnay *et al.* 1982 Hacker 2003
Census Microdata Samples	Own-Child - Analytical	Co-residing own children	Hacker 1999
Census Microdata Samples	Cohort Parity Analysis		David and Sanderson 1986; 1987
Genealogical Databases	Descriptive	ASMFR, TMFR, I_g, *M* , *m* Birth intervals Parity progression	Bean, Mineau & Anderton 1990 Main 2006
Genealogical Databases	Event History Methods	Birth interval analysis	Anderton *et al* . 1987 Jennings, Sullivan & Hacker 2008

Table 2. Marital Fertility Estimates, Currently Married White Women, United States

Rates, Measures, and Women's age	*Period 1847-49*	*1857-59*	*1867-69*	*1877-79*	*Percentage change 1848-1878*	*Contribution to TMFR decline 1848-1878*
ASMBR						
20-24	.462	.466	.416	.424	8%	13%
25-29	.393	.385	.345	.339	14%	19%
30-34	.353	.329	.285	.279	21%	26%
35-40	.265	.247	.211	.206	22%	21%
40-44	.148	.134	.116	.103	30%	16%
45-49	.035	.028	.024	.018	47%	6%
TMFR						
20-49	8.28	7.94	6.98	6.85	17%	100%
Index of marital fertility						
I_g	0.767	0.739	0.647	0.630	18%	
Coale and Trussell						
M	0.924	0.917	0.825	0.855		
m	0.089	0.182	0.217	0.289		
Hinde and Woods						
M	1.130	1.139	1.018	1.037		
m	-0.027	0.074	0.101	0.186		
Weir						
MAC	30.2	29.9	29.8	29.6		

Source: Integrated Public Use Microdata Series (Ruggles & Sobek et al. 1997).

Table 3. Marital Fertility Estimates, Currently Married White Women

	1847-1849						
	New England	*Mid-Atlantic*	*East-North Cent.*	*West-North Cent.*	*South Atlantic*	*East-South Cent.*	*West-South Cent.*
ASMBR							
15-19	.294	.363	.472	.395	.448	.451	.332
20-24	.290	.380	.433	.418	.387	.457	.327
25-29	.278	.318	.344	.332	.385	.375	.285
30-34	.221	.276	.307	.325	.339	.362	.283
35-40	.164	.212	.229	.259	.253	.264	.230
40-44	.094	.117	.133	.209	.146	.136	.098
45-49	.023	.026	.037	.014	.031	.026	.015
TMFR 20-49	5.35	6.65	7.41	7.79	7.70	8.10	6.19
I_g	.336	.421	.479	.497	.500	.533	.413
M	.644	.783	.872	.816	.860	.958	.700
m	.105	.119	.117	-.096	.004	.117	.024

	1857-1859						
	New England	*Mid-Atlantic*	*East-North Cent.*	*West-North Cent.*	*South Atlantic*	*East-South Cent.*	*West-South Cent.*
ASMBR							
15-19	.340	.414	.461	.529	.465	.487	.300
20-24	.343	.382	.402	.369	.399	.416	.343
25-29	.289	.320	.363	.380	.345	.365	.300
30-34	.244	.241	.295	.291	.296	.335	.248
35-40	.155	.177	.236	.258	.238	.258	.242
40-44	.089	.094	.128	.116	.138	.128	.114
45-49	.011	.017	.029	.038	.017	.025	.016
TMFR 20-49	5.65	6.15	7.26	7.25	7.17	7.63	6.31
I_g	.355	.392	.470	.478	.469	.509	.413
M	.737	.807	.855	.827	.835	.888	.717
m	.305	.329	.111	.039	.095	.087	.044

	1857-1859						
	New England	*Mid-Atlantic*	*East-North Cent.*	*West-North Cent.*	*South Atlantic*	*East-South Cent.*	*West-South Cent.*
ASMBR							
15-19	.420	.414	.508	.525	.427	.461	.298
20-24	.283	.344	.387	.392	.366	.369	.350
25-29	.246	.291	.319	.336	.319	.352	.325
30-34	.196	.203	.281	.273	.277	.281	.273
35-40	.129	.164	.204	.219	.210	.211	.230
40-44	.066	.084	.104	.104	.113	.133	.085
45-49	.004	.012	.018	.021	.032	.026	.004
TMFR 20-49	4.62	5.50	6.57	6.73	6.59	6.86	6.34
I_g	.289	.347	.424	.443	.427	.449	.419
M	.628	.726	.813	.831	.765	.801	.778
m	.385	.344	.210	.205	.082	.090	.170

	1857-1859						
	New England	*Mid-Atlantic*	*East-North Cent.*	*West-North Cent.*	*South Atlantic*	*East-South Cent.*	*West-South Cent.*
ASMBR							
15-19	.315	.522	.499	.526	.517	.469	.352
20-24	.342	.373	.370	.380	.417	.411	.395
25-29	.256	.282	.293	.313	.351	.338	.328
30-34	.193	.227	.233	.255	.287	.294	.282
35-40	.142	.153	.186	.209	.234	.224	.244
40-44	.053	.076	.095	.108	.111	.115	.128
45-49	.004	.014	.015	.014	.021	.026	.019
TMFR 20-49	4.95	5.62	5.96	6.39	7.11	7.04	6.99
I_g	.297	.350	.381	.418	.460	.464	.454
M	.718	.766	.756	.789	.874	.853	.817
m	.543	.415	.265	.205	.200	.167	.101

Source: Integrated Public Use Microdata Series (Ruggles & Sobek et al. 1997).

Table 4. Means of Variables Used in the Models

	1860 cross-sectional sample	1870-80 linked sample
Dependent Variables		
Number own children age 0-4	1.09	
Number own children age 0-9 (in 1880)		2.23
Independent Variables		
Mothers' chacteristics		
Age 20-24	-	0.32
25-29	-	0.38
30-34	0.34	0.31
35-39	0.35	-
40-44	0.31	-
Number of own children age 0-4 (in 1870)		1.32
Literacy	0.87	0.89
Husbands' characteristics		
Wealth relative to average farm value	1.48	0.89
Couples' characteristics		
Proportion own children biblically named	0.41	0.28
Proportion "liberal" churches in county	0.18	0.17
Number of Cases	5,200	3,345

Table 5. Poisson regression of marital fertility in the United States

	1860 cross-sectional sample		1870-80 linked sample	
	Model 1	Model 2	Model 1	Model 2
Mothers' chacteristics				
Age 20-24	-		*ref.*	*ref.*
25-29	-		-0.234 ***	-0.231 ***
30-34	*ref.*	*ref.*	-0.532 ***	-0.531 ***
35-39	-0.213 ***	-0.208 ***	-	
40-44	-0.568 ***	-0.551 ***	-	
Number of own children age 0-4 (in 1870)			0.178 ***	0.177 ***
Literacy	-0.170 ***	-0.108 **	-0.144 ***	-0.122 **
Husbands' characteristics				
Wealth relative to average farm value	0.002	-0.001	0.002	0.009
Couples' characteristics				
Proportion own children biblically named	0.158 ***	0.122 *	0.144 **	0.131 **
Proportion "liberal" churches in county		-0.718 ***		-0.350 ***
Intercept	0.387 ***	0.470 ***	0.867 ***	0.904 ***

*p<.05; **p<.01; ***p<.001

Models includes controls for husband's age and age and wealth interaction.