Volume Title: Long-Term Factors in American Economic Growth

Volume Author/Editor: Stanley L. Engerman and Robert E. Gallman, eds.

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-20928-8

Volume URL: http://www.nber.org/books/enge86-1

Publication Date: 1986

Chapter Title: New Results on the Decline in Household Fertility in the United States from 1750 to 1900

Chapter Author: Jenny Wahl

Chapter URL: http://www.nber.org/chapters/c9686

Chapter pages in book: (p. 391 - 438)

8 New Results on the Decline in Household Fertility in the United States from 1750 to 1900

Jenny Bourne Wahl

8.1 Introduction

It is clear that a decline in fertility occurred in the United States during the nineteenth century. But exactly when it began, how rapidly and steadily it proceeded, the best method of measuring it, its proximate determinants, the subgroups of the population chiefly responsible for it, and the socioeconomic forces that produced it are all open questions, despite the fact that each has been subject to considerable scholarly discussion.

Several authors have presented evidence suggesting regular and persistent fertility decline since 1800, while Yasuba (1962) points to the wide regional differences in fertility at that date as evidence of possible prior reduction in fertility, at least in some regions. However, the data on which these conclusions rest are imperfect. National birth and death registration systems were not completed until the 1930s, although there are some data (not necessarily representative of the entire population) from city and state registration systems for the early and middle nineteenth century. Therefore, a large part of the analysis of the fertility decline has had to rely on data from the decennial federal censuses, which did not classify the population by single year of age until 1880.[1]

Jenny Bourne Wahl is an international economist at the Office of Tax Analysis, United States Treasury Department. All opinions are solely the author's.

My thanks go to Gary Becker, Thomas Mroz, Larry Wimmer, and Clayne Pope, to fellow research assistants at the University of Chicago and Brigham Young University, especially Jon Moen, and to an anonymous referee. Special thanks go to Robert Fogel, Michael Haines, Robert Gallman, Stanley Engerman, and Robert Katzmann, and to Catherine Mardikes, Carol Miterko, Marilyn Coopersmith, and Edward Wahl. I appreciate the support of the Walgreen Foundation, the National Bureau of Economic Research, and the American Association of University Women.

Child/woman ratios have been the most common measure of fertility calculated from the census data.[2] Clearly, the ratio is an ambiguous index of fertility since it is influenced by mortality experience and population structure. Thus, two populations with very different underlying fertility schedules might record the same child/woman ratio, given appropriate counterbalancing differentials in mortality and population structure.

In view of these considerations, it is not surprising that the timing and pace of the decline in American fertility remain uncertain. To settle these questions, scholars require household information for the nineteenth and earlier centuries, including comprehensive natality and mortality data for each sample household. The centerpiece of this paper is just such a data set. It is described and appraised in a subsequent section and then used to establish the timing and pace of decline in American fertility before 1900.

The new micro data set is also required to work out the effects of the proximate determinants of fertility and changes thereto. The number of children born to a couple depends on the number of their fertile years that they spend together, the frequency of their intercourse, how often (if at all) and how effectively they use contraception, and their fecundity. The censuses contain no direct information on any of these questions. The new micro data set introduced in this paper has direct information on the first question and considerable information bearing directly on the last three. It also includes data on the incidence of marriage.

The socioeconomic factor that has figured most prominently in the discussion of United States fertility levels in the nineteenth and earlier centuries is the availability of farmland. Benjamin Franklin and T. R. Malthus, among others, proposed that fertility is affected by land availability, and in recent decades this has been brought up again by Yasuba and Easterlin. Easterlin's "bequest" model was applied exclusively to farm families, and it focused on planning across two generations. However, his model is readily adapted to nonfarm circumstances and can take account of other possible factors influencing fertility, such as the economic costs and benefits of children. In this respect, the adapted model can move in the general direction of the work of T. W. Schultz, T. P. Schultz, and Gary Becker, among others, who have sought a general cost-benefit framework for the analysis of fertility. Their models have included such variables as parents' wealth, parents' opportunity costs, life expectation of children, the consumption value of children, production in the family, and so forth. To apply such models to historical questions requires household demographic and economic data. The micro data set that forms the foundation of this paper has been matched to the census so that eventually comprehensive analyses of the socioeconomic determinants of fertility change will be possible. These possibilities are discussed in a subsequent section.

This paper makes use of a new household data set to establish both the timing and speed of the American fertility decline before 1900 and the proximate determinants of this development. The paper also outlines a plan for investigating the effects of socioeconomic factors on fertility.

The data set (discussed in some detail in the following section and in the appendix) consists of demographic information on households, with links established from one generation to the next, and, in some cases, with links to economic data. The data run from the mid–seventeenth century through the nineteenth century and include only white individuals. Three samples are discussed in this paper: samples A and B, the first with a broader geographical coverage than the second, and sample C, a subsample of B that contains economic data. The samples are not representative of the entire population, but they do cover a variety of circumstances and experiences and thus can be used to obtain insights into the broad developments with which this paper is concerned.

The next section describes and appraises the data set. It is followed by sections devoted chiefly to evaluating fertility differences over time and among families which have been grouped by socioeconomic characteristics.

8.2 Description of Data

The empirical work was performed using a large intergenerationally linked genealogical sample of American families to which additional household and economic information has been linked from the decennial federal censuses for 1850–80.

The data are remarkably detailed: birth, marriage, and death dates and places were coded for each individual.[3] For individuals who were found in the census, observations on the value of personal property, the value of real estate, occupation, literacy, age, sex, birthplace, and relationship to the head of household were coded from the information obtained in each of the four census years.[4] An elaborate identification scheme was used first to group individuals into nuclear families and then to connect families through generations. Currently, there is linked information on fertility for three generations and on wealth for two generations.

The data set is also quite large. Sample A was constructed by drawing random samples of the nuclear families contained in each of approximately 1,400 published family histories.[5] The working file for sample A consists of 15,748 individuals from 4,467 nuclear families. Sample B was constructed by recording all data contained in nine published family histories. The working file for sample B contains 16,820 individuals in 5,632 nuclear families.[6] Nuclear families at risk to be found in one of the four censuses must have had at least one family member alive during the census year. The number of families at risk to be found in at least one census year was about 2,500; the number actually found in at least one census was 2,042. The total number of families found in each census was 782 in 1850, 649 in 1860, 661 in 1870, and 706 in 1880.

Recent economic analyses of fertility suggest that the costs and benefits of children varied over time, among regions, between farm and nonfarm families, and by household income (which depended upon the occupation of the head of the household) and wealth.[7] Fortunately, the data in samples A, B, and C were quite well represented over time, space, and occupational and wealth classes. Families in sample A were evenly distributed among the mother's birth cohorts of 1650–1799, 1800–1849, and 1850–99. Half of the families in sample B fell into the 1800–1849 birth cohort and a fourth each into the 1650–1799 and 1850–99 cohorts. In sample A, 40% of all families resided in the New England or Mid-Atlantic states (70% of these in the states of Massachusetts, Pennsylvania, and New Jersey), 17% each in the Midwest or Western states, and 9% in the South. Two-thirds of the families in sample B lived in New England or the Mid-Atlantic states, one-fifth in the Midwest or Plains states, and 7% each in the South and in the West. The percentage of families in sample C who lived on farms was 68% in 1850, 70% in 1860, 68% in 1870, and 52% in 1880. As shown in table 8.1, a large majority of adult males in sample C reported their occupation as "laborer," of which most were farm laborers.

Although sample C was wealthier than another census sample which was drawn by Soltow,[8] nevertheless a wide range of reported wealth

Table 8.1 **Distribution of Occupations for Adult Males**

	Census Years			
Occupations	1850	1860	1870	1880
Professionals and proprietors	12.0%	15.0%	18.0%	24.0%
Craftsmen	12.0	10.0	11.0	11.0
Laborers	73.0	73.0	70.94	61.0
Not in labor force	3.0	2.0	0.06	4.0
Total	100.0%	100.0%	100.0%	100.0%
Number of observations	592	486	488	507

Source: Sample C (see text).
Note: Males who were 20 years of age or older in the census year of observation.

values was present. Families that held no reported wealth were especially well represented.[9]

The subsample linked to the census consists of white, native-born, and literate individuals (98% of the adults in sample C reported themselves as literate).

8.3 Trends in Fertility

8.3.1 Trends in Unstandardized Measures of Fertility

The data in the genealogical samples permit the computation of such unstandardized measures of fertility as the period total fertility rate and child/woman ratios, which have been the principal fertility measures constructed from published censuses and other types of data previously available to historical demographers. The genealogical samples, however, also permit the construction of age-specific marital fertility schedules and cohort total marital fertility rates.[10] Unlike the total fertility rate or child/woman ratios, changes in marital fertility rates reflect only shifts in the marital fertility schedule and are thus independent of changes in average marriage ages, mortality rates, or the age structure of the population. Changes in the total fertility rate would occur even if the fertility schedule is constant if there are changes in such variables as the average age of a woman at her marriage, the mortality rates of husbands and wives, and the percentage of the population ever married.[11] The child/woman ratio is affected by all of the aforementioned variables plus the age distribution of the population and the mortality rates of children. Neither the period total fertility rate nor the child/woman ratio can pinpoint shifts in the underlying age-specific fertility rates.

Trends in the period total fertility rate and the child/woman ratio are shown in table 8.2. There is a general downward trend in these fertility measures, although the timing of the decline in the two series did not always coincide.[12] One may note that, although the trend in the period total fertility rate was similar in samples A and B, the level differed somewhat. However, by the nature of its construction, sample A has a greater proportion of families who lived in regions of higher fertility (see sec. 8.4.2) and of immigrant families, who had more children than native-born Americans (see sec. 8.4.3). Therefore, the difference in the level of the period total fertility rate is partly explained by the difference in distribution of the two samples. The period total fertility rates for sample A are comparable to those calculated by Thompson and Whelpton for 1800–1855 and by Coale and Zelnik for 1860 onward (see Coale and Zelnik, p. 36) for the white population.

The level of the child/woman ratio, at least in the years 1850–90 in sample B, is lower than the level calculated from the censuses of the

Table 8.2 Two Unstandardized Measures of Fertility Computed from the Genealogical Samples, 1700–1889

Years of Observation for Women Aged 15–44 (1)	Child/Woman Ratio (a) (2)	Period Total Fertility Rate (b) (3)	Number of Families (4)
	Sample A		
1700–1709	531	7.0	28
1750–59	658	7.2	42
1800–1809	561	7.0	245
1810–19	570	7.1	328
1820–29	625	6.9	386
1830–39	631	6.6	400
1840–49	641	6.1	370
1850–59	664	5.3	284
1860–69	746	4.8	187
1870–79	850	4.8	98
1880–89	686	3.7	31
	Sample B		
1700–1709	625	6.0	6
1750–59	1228	7.2	17
1800–1809	908	5.0	234
1810–19	717	4.8	202
1820–29	627	4.4	172
1830–39	527	4.2	128
1840–49	415	3.8	90
1850–59	296	3.5	69
1860–69	215	3.4	51
1870–79	289	3.3	29
1880–89	313	3.5	11

Source: Samples A and B (see text).

Note: Secular movement of two unstandardized measures of fertility, including: (a) The child/woman ratio (equal to the number of children aged 0–4 per every 1,000 once- or never-married women aged 15–44 in the period given in col. 1). The secular movements in the ratio show interesting patterns, although the underlying forces producing the patterns are not explored in detail in this paper. (b) The period total fertility rate for women aged 15–44 sums the age-specific fertility rates for women of the given ages during the period. For example, the number of children born to women aged 20–24 during the given period divided by the number of women of that age, multiplied by 5, is the age-specific period fertility rate for the 20–24-year age interval. Note that only those women either once- or never-married are included. Therefore, women who remarried after the death of their first spouse are not included.

Data are available to construct fertility measures for the years 1710–49 and 1760–99 for both samples, but they have not been processed yet.

total population (not shown). The most likely explanation for this difference is that the census population of women aged 15–44 includes women who remarried after the death of a spouse, while my samples include only once- and never-married women. Therefore, my samples have greater fractions than the census population of women who were not at risk to bear children but who were included in the child/woman ratio calculations. Other factors are also important. Families of sample B were native-born, highly literate, primarily of Northeastern residence, and more likely to be located in urban areas than the total population (at least in 1880). All of these characteristics were associated with lower than average fertility, as will be seen in subsequent sections.

The declines in the series shown in table 8.2 may be due to shifts in the underlying marital fertility schedule, to changes in mortality rates, or to various structural changes. The most likely explanation for a shift in the fertility schedule over time is the onset of attempts to control fertility within marriage. For example, parents could have begun deliberately ending their childbearing before one or both parents became sterile, spacing their children farther apart, or using both methods of control. Families which ended childbearing before secondary sterility set in would have had lower ages at the last birth for the mothers who remained at risk to bear children and lower age-specific fertility rates in the last age intervals than families who continued childbearing. Families which spaced their children farther apart than other families would have had lower age-specific fertility rates in all age intervals in which longer spacing had occurred. Individuals also could have controlled their fertility by marrying later, which would have reduced their time at risk to bear children, or by not marrying at all. However, whereas the individual controls would have been reflected in such measures as the child/woman ratio and the period total fertility rate, they would have had no effect on the marital fertility schedule.

8.3.2 Explaining the Decline before 1850 in the Average Number of Children Ever Born

How much of the variation in the unstandardized measures of fertility shown in table 8.2 was due to a shift in the marital fertility schedule and how much was due to other determinants? Table 8.3, which presents both marital fertility schedules and total marital fertility rates for 10 cohorts of women, indicates that the fertility schedules of cohorts born prior to 1850 were quite stable. The data in table 8.3 reveal that intramarital fertility regulation did not become important in determining the number of children ever born to a family until the latter half of the nineteenth century. Except for the puzzling fall in total marital fertility in the 1800–1812 birth cohort in sample B, age-specific and total marital fertility rates were similar for cohorts prior to 1863 in sample A and for cohorts prior to 1850 in sample B. In subsequent birth cohorts, age-specific marital fertility rates fell primarily in the later age intervals (ages 30–44).

The conclusion that intramarital fertility regulation was not important until the latter half of the nineteenth century, especially in sample A,

Table 8.3 **Marital Age-Specific and Total Fertility Rates for the Genealogical Samples, 1700–1899**

Sample A										
	Birth Cohorts									
Age Intervals	1650–99 (43)	1700–1749 (33)	1750–99 (55)	1800–1812 (69)	1813–24 (62)	1825–36 (132)	1837–49 (145)	1850–62 (201)	1863–74 (121)	1875–99 (87)
20–24	.487	.492	.536	.484	.497	.526	.506	.486	.476	.514
25–29	.407	.372	.420	.408	.437	.408	.449	.413	.355	.362
30–34	.374	.406	.355	.339	.376	.377	.362	.345	.245	.245
35–39	.313	.338	.294	.300	.376	.328	.315	.275	.204	.207
40–44	.226	.199	.261	.228	.223	.195	.236	.166	.096	.139
Total fertility rate for women aged 20–44	9.0	9.0	9.3	8.8	9.5	9.2	9.3	8.4	6.9	7.3

Sample B									
	Birth Cohorts								
Age Intervals	1700–1749 (25)	1750–99 (204)	1800–1812 (130)	1813–24 (68)	1825–36 (62)	1837–49 (51)	1850–62 (75)	1863–74 (28)	1875–99 (41)
20–24	.630	.438	.285	.434	.495	.400	.338	.393	.388
25–29	.345	.367	.259	.371	.340	.411	.251	.320	.308
30–34	.346	.305	.218	.310	.273	.261	.222	.180	.151
35–39	.260	.258	.191	.266	.235	.248	.191	.106	.178
40–44	.236	.166	.135	.150	.150	.148	.118	.026	.008
Total fertility rate for women aged 20–44	9.1	7.7	5.4	7.7	7.5	7.3	5.6	5.1	5.2

Source: Samples A and B (see text).

Note: Age-specific marital fertility rates and total marital fertility rates are given for birth cohorts of women in each genealogical sample. The sample size for the 1650–99 birth cohort of women in sample B was too small to permit calculation of marital fertility rates. The age-specific rate for women aged 20–24 in sample B in the 1700–1749 cohort is probably higher than average because this age group was composed of a small number of women who were more fertile than average. The manner in which sample B was constructed explains both the small sample size and the higher than average fertility of early cohorts. See the text and the appendix.

The measures in this table differ from those in table 8.2 for two reasons: (1) Women included in the calculations of this table must have been married at the time of observation, while in table 8.2 women did not have to have been married to have been included. (2) Within a birth cohort, the age-specific rates in this table were calculated for the same group of women (although women who died at a certain age naturally were excluded from further calculations). Within a period, age-specific rates in table 8.2 were calculated for women who fell in a certain age interval during the given period. Therefore, the cohort rate (this table) was calculated for a birth cohort of women; the period rate (table 8.2) was calculated for women who were alive at a certain point in time.

The numbers enclosed in parentheses for each birth cohort equal the total number of woman-years lived in the 30–34-year age interval divided by 5. Therefore, these numbers represent the hypothetical number of women who would have been at risk to bear children from ages 30–34 if each woman had lived for the entire 5-year interval.

is supported by the trend in the age of the average mother who was at risk to bear children at least until she was 45 years old (see table 8.4). These mothers continued to bear children to an average age of about 38 years until 1850 in sample A and until 1820 in sample B.[13] In subsequent time periods, the average age fell to approximately 32 years for sample A and 33 years for sample B by 1890. This age pattern also supports the conclusion that stopping childbearing before the parents became sterile was probably a more important method of fertility control after 1850 than longer spacing of births.

Although fertility within marriage did not fall substantially until at least the 1850–62 birth cohort, the period total fertility rate declined throughout the nineteenth century. Therefore, other proximate determinants of fertility must have been changing prior to 1850. The average mother's age at marriage was steady throughout the nineteenth century, especially for sample A. However, there was an increase in the average marriage age of about 1½ years in sample A and about 2 years in sample B from 1700 to 1800. Although the sample sizes were too small in the early years to permit much speculation, it is possible that the underlying decline in family size during that time was partly due to a rising marriage age.

The two factors which explain the divergence between the total marital fertility rate and the unstandardized fertility indices in their movement between 1800 and 1850 are the increase in the percentage who never married (see table 8.4) and the rise in the mortality rate (see Fogel's fig. 9.1 in this volume).[14] The increase in the proportion of spinsters indicates that fewer women were exposed to the risk of childbearing than had been before; the decline in life expectation indicates that those who did marry were exposed to the risk of childbearing for a shorter period of time. Life expectancies at age 10 for both sexes during the period 1835–59 were about 20% below those in the quarter-century between 1765 and 1789. After 1860, life expectancies began to increase, so that mortality trends no longer contributed to the decline in family size.

Table 8.5 contains an index of the degree of fertility regulation within marriage, by cohort, which was developed by Coale and Trussell.[15] The results support the hypothesis that intramarital fertility regulation was not an important force in the genealogical samples until the latter half of the nineteenth century. The results also confirm that intramarital fertility regulation appeared slightly earlier in sample B than in sample A, probably owing to regional variations in fertility and differences in regional composition of the two samples.

Table 8.6 contains the conditional parity-specific probabilities,[16] by cohort, of having an additional child. Sample A shows constancy in the parity-specific probabilities, at least through cohorts born in 1825–

Table 8.4 **Some Proximate Determinants of Fertility**

Years of Observation for Women Aged 15–44 during the Period (1)	Number of Families (2)	Average Mother's Age at Marriage (3)	Average Mother's Age at First Birth (4)	Average Mother's Age at Last Birth (5)	Average Mother's Age at Last Birth for Women at Risk to Age 45 (6)	Percentage Ever Married (7)
			Sample A			
1700–1709	28	20.8	22.3	37.0	39.7	—[a]
1750–59	42	22.0	23.3	38.8	39.0	—
1800–1809	245	22.4	23.7	38.1	40.5	—
1810–19	328	22.1	23.4	38.1	40.3	—
1820–29	386	22.0	23.3	37.6	39.8	—
1830–39	400	22.0	23.3	37.1	39.2	—
1840–49	370	22.0	23.4	36.4	38.3	—
1850–59	284	22.0	23.5	35.1	36.8	—
1860–69	187	22.0	23.7	34.4	35.6	—
1870–79	98	21.7	23.3	34.0	34.6	—
1880–89	31	22.1	23.7	31.5	32.9	—

(*continued*)

Table 8.4 (continued)

Years of Observation for Women Aged 15–44 during the Period (1)	Number of Families (2)	Average Mother's Age at Marriage (3)	Average Mother's Age at First Birth (4)	Average Mother's Age at Last Birth (5)	Average Mother's Age at Last Birth for Women at Risk to Age 45 (6)	Percentage Ever Married (7)
			Sample B			
1700–1709	6	22.0	23.6	35.5	42.0	
1750–59	17	22.5	24.2	39.5	40.3	97
1800–1809	234	24.0	25.8	35.9	38.2	90
1810–19	202	24.3	26.1	35.5	37.8	85
1820–29	172	24.0	26.0	35.0	36.4	83
1830–39	128	23.8	25.9	33.7	34.7	80
1840–49	90	23.1	25.3	33.1	34.0	78
1850–59	69	22.7	25.0	32.6	33.7	79
1860–69	51	23.2	25.3	32.5	33.5	80
1870–79	29	22.7	24.6	33.4	35.0	85
1880–89	11	21.5	23.6	32.8	32.9	86

Source: Samples A and B (see text).

Note: The fertility measures listed are useful for evaluating the relative strengths of the proximate determinants of the number of children. Columns 3, 4, and 5 were calculated over the same set of women.

Two important trends are in the average age at last birth for women who were at risk to bear children at least until they reached age 45 and in the percentage of women ever married during their fecund years. The former fell substantially only in the latter half of the nineteenth century, which supports the proposal that fertility regulation within marriage was not strong until after 1850. The latter was significantly lower between 1820 and 1860 than in previous and subsequent periods. Therefore the decline in the period total fertility rate during the first half of the century (shown in table 8.2) was partly due to lower incidence of marriage among fecund women.

[a]Data are available to construct averages for 1710–49 and 1760–99 and percentages married for all periods for sample A, but they have not yet been processed. Sample sizes for the period after 1890 were too small to permit calculations.

Table 8.5 **Coale-Trussell *M* and *m* Tests for Fertility Control**

	Birth Cohorts		
	1825–49	1850–74	1875–99
		Sample A	
M	.957	.970	.944
m	−.105	.182	.346
		Sample B	
M	.674	.732	.741
m	−.057	.308	.333

Source: Samples A and B (see text).

Note: M measures the overall level of fertility in the samples relative to the level of fertility in a natural fertility population (see n. 15); *m* measures the degree of fertility control within marriage which was present in the samples. An increase in *m* signifies an increase in intramarital fertility regulation.

49 and possibly through cohorts born in 1850–74. In sample B, however, the decline in parity-specific probabilities appears to have begun a half-century earlier. Clearly, not all families who had an additional child wanted one. However, suppose that child mortality was not changing through time and that successive generations of parents desired fewer children on average. Under these circumstances, parents would have attempted more stringent regulation of fertility than previous generations of parents. Therefore, the trend in the observed conditional probabilities of having an additional child would reflect the trend in desires to have an additional child. Of course, a downward trend in the observed probabilities could also reflect improving mortality conditions, for parents could have borne fewer children in order to have a given number of surviving children. Therefore, inferences from these probabilities about the timing of the onset of fertility regulation should be made only in conjunction with evidence previously presented in the paper.

It seems likely that differences in socioeconomic characteristics of the families in the two samples will account for the somewhat earlier entry of individuals from sample B into the regulation of fertility than was true of the individuals in sample A. So far, the linking of the genealogies to information on wealth and most of the other reported socioeconomic variables has been limited to sample B, so it is not yet possible to identify specifically the factors which explain the overall lag in the onset of regulation in sample A as compared with sample B. However, there is enough variation of both fertility behavior and socioeconomic characteristics in sample B to shed some light on the probable impact of socioeconomic variables on the decline in fertility.

Table 8.6 Observed Parity-Specific Probabilities of Having an Additional Birth

	Birth Cohorts						Percentage Change from the 1800–1824 to the 1875–99 Cohort in the Probability of Having an Additional Birth
Probabilities	1650–1749	1750–99	1800–1824	1825–49	1850–74	1875–99	
				Sample A			
pr12[a]	95.24	94.59	98.02	97.48	94.52	88.61	9.6%
N[b]	63	37	101	278	292	79	
pr23	94.29	97.67	94.44	95.29	90.14	87.84	7.0%
N	70	43	108	297	284	74	
pr34	90.41	89.36	92.23	90.66	90.49	80.00	13.3%
N	73	47	103	289	263	65	
				Sample B			
pr12	73.33	79.65	64.12	54.47	47.06	44.44	30.7%
N	60	226	170	123	68	36	
pr23	80.43	87.91	77.68	69.70	60.00	52.94	31.8%
N	46	182	112	66	35	17	
pr34	87.18	86.83	82.02	63.04	59.09	66.67	18.7%
N	39	167	89	46	22	9	

Source: Samples A and B (see text).

[a] $pr(x)(x + 1)$ is the probability of observing an additional birth given that an xth birth occurred.

[b] N is the number of families at risk to have an additional birth. Although women can (and do) become pregnant shortly after giving birth, there is generally a period of postpartum amenorrhea during which women are infecund. Therefore, families were included in the calculation of $pr(x)(x + 1)$ only if both spouses lived at least 2 years after the birth of the xth child.

8.4 Variations in Fertility and Nuptiality across Subgroups in the Sample

8.4.1 Introduction

Theoretical arguments, sometimes supported by evidence on child/woman ratios, have been put forward regarding the effect of changes in socioeconomic characteristics on the decline in fertility after 1800. Several scholars have argued that fertility declined first in the Northeast (Yasuba 1962; Forster and Tucker 1972; Easterlin 1976). Easterlin's formal model proposed that the parents' fertility was positively related to the expected growth of their capital, which was lower in the rural Northeast.[17] An alternative explanation stressed the rapid rise in urbanization as the principal factor explaining the fertility decline in the Northeast (Potter 1965). It is likely that both the direct (food, clothing, and shelter) and the indirect (especially the forgone labor of the mother) costs of children were higher in the cities than in the rural areas.

A third issue concerns the effect of ethnicity on fertility. Some scholars have suggested that immigrants were likely to have had larger numbers of children than native-born Americans because they were influenced by cultural patterns in their country of birth (Vinovskis and Hareven 1975). Others have argued that while this may have been partly true toward the end of the nineteenth century, before then immigrants came from countries that had smaller families than America.

Wealth is a fourth factor bearing on fertility patterns. One might expect the relationship of household wealth to household fertility to be positive if children are a normal good. However, the empirical results have not been clearcut, for negative relationships of fertility and wealth have been reported, at least in some ranges of wealth (see Simon [1974] for an excellent review). It is possible that the observed fertility/wealth relation is composed of a true wealth effect (which would cause wealth and fertility to be positively related) and a price effect.[18] If the effective price of children were rising with wealth in a certain range of wealth and the price effect dominated the true wealth effect in that range, the observed fertility/wealth relation would be negative.

8.4.2 Fertility Differences among Families Living in Different Regions

The total marital fertility rate was high and fairly steady for a long series of cohorts in each region of the country. It then began falling during the nineteenth century. However, although there was no significant decline in marital fertility prior to the nineteenth century in any region, there were differences across regions in the timing of the decline once it began (see table 8.7).

Table 8.7 Two Fertility Measures, by Region, Sample B

	Birth Cohorts									
	1650–99	1700–1749	1750–99	1800–1812	1813–24	1825–36	1837–49	1850–62	1863–74	1875–99
Mid-Atlantic region										
Number of children ever born	7.3	6.7	6.8	5.1	4.9	4.3	3.7	4.3		
Total marital fertility for women aged 20–44	7.9	8.3	9.0	7.2	6.8	6.7	7.1	6.9		
Number of families	8	10	100	132	40	53	58	159		
Midwest region										
Number of children ever born				5.5	4.8	4.4	4.4	4.6	3.6	4.1
Total marital fertility for women aged 20–44				8.3	8.1	7.2	7.0	6.3	5.3	6.1
Number of families				43	10	19	21	50	13	34
Southern region										
Number of children ever born			9.6	5.7				3.6		
Total marital fertility for women aged 20–44			7.9	12.8						
Number of families			15	11				16		
New England region										
Number of children ever born	8.6	7.4	6.7	4.8	3.8	3.9	3.7			
Total marital fertility for women aged 20–44	8.7	8.4	7.8	8.1	6.9	6.7				
Number of families	17	26	123	49	28	20	7			
Western region										
Number of children ever born						7.3	8.6	7.7	5.6	4.4
Total marital fertility for women aged 20–44						8.1	10.9	7.8	5.8	5.7
Number of families						33	49	78	49	59

Source: Sample B (see text).

Note: Average number of children ever born to a cohort of women contrasted with the total marital fertility rate of the same women, by region of the country.

Fertility regulation within marriage began earliest in the East and moved westward through time. Families in the New England and the Mid-Atlantic regions began controlling fertility as early as the 1800–1812 birth cohort of women, while families in the Midwest had higher marital fertility than Northeasterners until the 1837–49 birth cohort, and Western families had much higher marital fertility than families in other regions at least until the 1863–74 birth cohort. The data for Southern families indicate that their pre-nineteenth-century marital fertility was comparable to marital fertility in other regions. The total marital fertility rate for the South for the 1800–1812 birth cohort exceeded the rate found elsewhere; however, the sample size for this time period for the South was quite small.

Trends in the average number of children ever born (to once-married women) give quite a different picture of fertility than the total marital fertility rate. Although the level varied by region within cohorts, levels in all regions declined continuously across cohorts throughout the nineteenth century. Families living in the New England, Mid-Atlantic, and Midwest regions had similar average family sizes; families living in the West had persistently larger families than those in other areas until the 1875–99 cohort.

It is not surprising that the two indices of fertility have different secular patterns. Variations in the total marital fertility rate come about only by shifts in the marital fertility schedule. These shifts are manifested by changes in birth spacing or lengthening of the open interval after the last child is born and before death or sterility of the parents occurs. However, variations in the number of children ever born result not only from shifts in the marital fertility schedule but also from variations in the average times of entry into and exit from the schedule. The sample sizes are not large enough to permit me to make definitive statements. However, the following paragraphs do shed some light on the degree to which family size varied over time because of marital fertility schedule shifts vis-à-vis other proximate determinants of family size.

Table 8.8 includes the average woman's age at marriage, at first parity, and at last parity. Each average was calculated over all women for whom data were available. Therefore, the averages do not necessarily represent the same set of individuals; however, sample sizes become quite small in some cohorts if regional averages are calculated only on the set of women for whom all three variables had nonmissing values.

The average birth intervals between marriage and first birth and between first and second birth varied only slightly through time.[19] Therefore, shifts in the marital fertility schedule did not occur because of differential spacing over time of early births. However, a lengthening of the open interval after the woman's last birth was an important

Table 8.8 Fertility Means, by Region, Sample B

	Birth Cohorts									
	1650–99	1700–1749	1750–99	1800–1812	1813–24	1825–36	1837–49	1850–62	1863–74	1875–99
Mid-Atlantic region										
Mother's marriage age	24.2	22.5	24.0	23.7	24.1	24.4	26.6	25.8		
Mother's age at her first birth	25.3	24.9	23.9	24.4	25.4	25.5	27.8	25.8		
Mother's age at her last birth	41.8	40.4	37.9	37.0	35.6	35.1	36.6	35.3		
Number of families	8	10	100	132	40	53	58	159		
Midwest region										
Mother's marriage age				22.0	23.7	21.4	24.6	22.9	23.3	22.1
Mother's age at her first birth				24.2	25.6	23.6	25.9	23.3	23.2	24.3
Mother's age at her last birth				38.5	34.3	34.9	35.2	35.2	29.6	32.6
Number of families				43	10	19	21	50	13	34
Southern region										
Mother's marriage age			24.0	23.0				22.5		
Mother's age at her first birth			25.2	19.0				24.3		
Mother's age at her last birth			38.3	33.0				30.6		
Number of families			15	11				16		
New England region										
Mother's marriage age	22.2	23.9	22.9	23.2	23.8	24.0	24.8			
Mother's age at her first birth	25.8	24.0	23.4	25.1	25.2	25.3	25.7			
Mother's age at her last birth	36.0	38.5	37.6	37.0	33.6	34.8	32.7			
Number of families	17	26	123	49	28	20	7			
Western region										
Mother's marriage age						23.3	22.4	20.5	21.1	21.8
Mother's age at her first birth						24.4	23.7	21.7	22.5	23.6
Mother's age at her last birth						39.5	41.1	37.1	35.0	33.1
Number of families						33	49	78	49	59

Source: Sample B (see text).

Note: Proximate determinants of the number of children ever born (shown in table 8.7). The number of observations is the number of families on which number of children ever born could be calculated; however, all averages in this table are calculated on nonmissing values of the variables. Therefore the average mother's age at her first birth can be less than the average woman's age at marriage. The calculations were not constrained to the subset of women on whom all variables were nonmissing because sample sizes for the subset were quite small in some cohorts.

movement through time in all regions. A woman stops bearing children if she or her partner dies, if she or her partner becomes sterile, or if she and her partner decide to have no more children. The average mother's age at her last birth reflects these three factors. Although not shown in table 8.8, the trend in the average mother's age at her last birth if she was at risk until she was 45 years old parallels the trend in the total marital fertility rate for each region. This measure controls for mortality, although it cannot control for women who experienced secondary sterility before age 45. Hence, shifts in the marital fertility schedule, as evinced by the trends in the total marital fertility rate and the average mother's age at her last birth if she was at risk to age 45, explain part of the fall in the average number of children ever born after the 1800–1812 cohort for Northeastern families, after the 1837–49 cohort for Midwestern families, and after the 1863–74 cohort for Western families.

Throughout the nineteenth century, trends in the average time of entry into and exit from the marital fertility schedule were also key in explaining both the decline in the average number of children ever born before the 1850 cohort and the difference in family sizes across regions. The average age at marriage for women rose by 2 years from the 1750–99 cohort to the 1837–49 cohort in the Mid-Atlantic and New England regions. The average age also rose by 2 years in the Midwest from the 1800–1812 cohort to the 1837–49 cohort. An age-specific fertility rate of .5 for women who married at the average age implies a loss of about one child per family in these regions due to an increase in marriage age. The larger family size among Western families was partially due to their low average age at marriage. The average woman's marriage age in the West was 4–5 years lower than the average in the Mid-Atlantic for the 1837–49 and 1850–62 birth cohorts. Therefore, Western family sizes exceeded family sizes in other regions largely because the average Western woman married earlier than the average woman living in regions other than the West.

Marriage ages may have varied over time and across regions because of variations in the desire to limit family size. It is also possible that persons married later because they had more difficulty in acquiring a given level of income that they felt was necessary to establish a home. Of course, the decision to reach a threshold income before marrying may have been tied to decisions on family sizes. However, there is simply not enough evidence at this point to settle the interesting questions of why marriage ages varied over time and space, and how strongly fertility and marriage age decisions were related. It is true, however, that persons who married at later ages had higher age-specific fertility rates in a given age interval than persons who married at earlier ages (not shown). Therefore, within a cohort, variations in marriage ages may not have necessarily reflected differences in the degree of deliberate fertility control by time of entry into the marital fertility schedule. However, it is possible that higher overall average marriage ages through time may have resulted from conscious decisions to increasingly limit family size.

The individual woman exited the marital fertility schedule either by death or by the death of her spouse. As mentioned previously, the average age of the mother at her last birth reflects both the deliberate decision to end childbearing and the mortality of the wife and husband. The evidence points toward increasing fertility regulation through time for all regions. However, the trend downward in the average age of the mother at her last birth prior to the time of the onset of fertility regulation reflects increasing mortality through that period. Therefore, part of the decline in average family size prior to the 1800–1812 cohort in the Northeast, the 1837–49 cohort in the Midwest, and the 1863–74 cohort in the West can be attributed to increasing mortality, which reduced exposure to the risk of childbearing. In particular, the combined effects of increasing fertility regulation and mortality which caused the average mother's age at last parity to fall by 5 years in New England from the 1750–99 cohort to the 1837–49 cohort, with an age-specific fertility rate of .2 for the interval, were responsible for reducing the average New England family by about one child.

How do the results from the genealogical samples compare with others' results? First of all, my comparison of alternative measures of fertility contributes to the knowledge of the importance of the timing of shifts in the marital fertility schedule relative to shifts in other proximate determinants in explaining declines in family sizes. In a similar fashion, one may contrast Yasuba's measure of fertility, the child/woman ratio, with my fertility measures. His finding of substantial regional variation in child/woman ratios caused him to speculate that fertility decline occurred prior to the nineteenth century in the earlier-settled regions of the United States (principally the Northeast). As we know, I found no significant decline in the total marital fertility rate in any region until at least the 1800–1812 birth cohort of women (whose childbearing years were from 1815 to 1857). The difference in the two fertility indices may be reconciled by examining the nature of their construction. For the first several decades of the nineteenth century, the average age of women of childbearing years in the earliest-settled states was higher than the average age in the later-settled states (not shown).[20] Although the total marital fertility rate is not affected by the proportion of women in each age interval, the child/woman ratio is highly sensitive to the age distribution of women. Hence, even if the marital fertility schedule were the same for all states, states with a large proportion of women in later age intervals (who have low age-specific fertility rates) would have a low child/woman ratio relative to states with a large proportion in early age intervals. This effect is exacerbated by the later marriages (and thus later childbearing) of women in the earlier-settled states. The child/woman ratio, but not the total marital fertility rate, is affected by the average age of entry into the marital fertility schedule.

The regional variations in fertility and nuptiality in my sample also allow us to evaluate Coale and Zelnik's (1963) results on United States fertility and nuptiality patterns. Applying stable population models to aggregate birthrates, they found that the period total fertility rate fell rapidly from the 1830s to the 1890s. They also reported that the average marriage age of women rose steadily throughout the latter half of the nineteenth century. Although data were not available to them for the first half of the century, they assumed that the average also had risen throughout the first half of the century. The results from the genealogical samples indicate that although the aggregate population experienced a secular fertility decline, shifts in the marital fertility schedules were timed differently across regions. Similarly, although the average age at marriage for women approximated the simple linear trend suggested by Coale and Zelnik, this aggregate trend masks substantial regional differences in nuptiality patterns through time.[21]

8.4.3 Fertility Differences between Native-born and Foreign-born Parents

The average number of children ever born was higher for the foreign-born parents than for the native-born.[22] There are at least two factors responsible for this difference. First, total marital fertility was higher for the foreign born. This was partly a result of closer birth spacing by immigrants (only the interval between marriage and first birth is reported in table 8.9). Higher infant mortality rates among the foreign born are associated with their closer spacing of births.[23] Shorter open intervals after the last birth for the foreign born (not shown) also contributed to their higher marital fertility. Thus, it seems that regulation was more prevalent among the native born, especially in the form of early cessation of childbirth. The second factor responsible for the larger numbers of children ever born to foreigners results from a selection bias. The average woman's age at marriage was similar for the two groups, as was average life expectancy for the native born and the immigrants whose marriages took place in the United States. However, the time at risk to bear children for foreign-born parents was longer on average. This was due chiefly to the fact that some emigration occurred after marriage. Since immigrants could not be observed in the genealogical samples until they arrived in America, those marrying before emigrating were not at risk of dying during the period of time between marriage and emigration. Therefore, foreign-born parents were

Table 8.9 **Average Fertility and Mortality Measures for Foreign- and Native-born Parents**

	Birth Cohorts and Generation of Family															
	1750–99		1800–1812		1813–24		1825–36		1837–49		1850–62		1863–74		1875–99	
	1	>1	1	>1	1	>1	1	>1	1	>1	1	>1	1	>1	1	>1
Mother's death age	69.6	66.3	68.8	61.9	69.9	60.4	66.5	68.5	70.8	67.8	70.0	68.2	69.3	66.2	62.9	62.5
Father's death age	71.7	79.6	71.3	75.8	72.6	67.2	70.0	70.5	73.5	66.9	71.2	71.7	72.7	63.0	66.7	66.5
Mother's marriage age	23.1	21.5	22.6	22.2	22.4	21.6	22.4	22.1	22.4	22.6	21.2	22.6	22.2	22.6	22.3	22.6
Number of children ever born	6.3	6.5	7.2	5.4	7.2	4.1	6.7	5.3	7.3	5.4	7.0	4.4	5.3	3.3	4.8	3.8
Interval between marriage and first birth in months	11.3	17.2	17.1	16.8	15.6	18.8	13.7	17.0	14.5	14.6	13.2	19.0	15.0	22.2	17.3	21.0
Total marital fertility for women aged 20–44	9.6	8.8	9.1	7.6	9.4	9.5	9.4	8.3	9.6	8.1	8.5	8.1	6.7	6.2	7.2	5.5
Number of families	44	147	91	107	56	51	103	57	124	59	153	125	74	73	71	83

Source: Sample A (see text).

Note: Fertility and mortality means listed separately for families with parents who were immigrants to the United States and for families with parents who were born in the United States.

at risk to die, on average, for a shorter period of time than were native-born parents. As a result, the selection process, rather than nuptiality or parental mortality differences, yielded longer average childbearing spans for foreign-born parents.

What might explain the differential marital fertility among the foreign born and the native born? First of all, immigrants tended to be poorer on average than the native-born population. Therefore, as suggested by Becker and Tomes's finding of regression to the mean in wealth (1984), the expectation that children would be better off than their parents was more reasonable for the average immigrant parent than for the average native-born parent. Assuming that parents cared about the welfare of their children, this encouraged higher fertility among immigrants. Second, at least in urban areas, children of immigrants probably began to earn income at an earlier age than children of native-born parents. Therefore, the net cost of children was lower to immigrants and so encouraged higher fertility among them.

The increase through time in the percentage of native-born parents, with their associated lower fertility, contributed to the overall fertility decline.

8.4.4 Fertility Differences among Occupational Groups

Occupational differences partly reflected earnings differentials across families. Therefore, if families were grouped only by the occupation of the head of household, it is likely that fertility differences were more related to wealth differences rather than to occupational differences. Table 8.10 shows that, across all occupations, the percentage of large families fell in later census years.

Families whose heads of household were professionals, proprietors, and craftsmen tended to have a higher percentage of zero- to two-child families than did families whose heads of household were unskilled workers. The fraction of all families who were part of the former group was also larger in later census years. Thus, fertility fell for two reasons: all occupational groups had fewer children, and the weights within the sample shifted so that occupations with low fertility had persistently higher weights.

8.4.5 Fertility Differences between Farm and Nonfarm Families

Both farm and nonfarm residents had smaller families in later census years, as shown in table 8.11. The decline in fertility of farm families resulted primarily from a decrease in the percentage of families who had six or more children and an increase in the percentage of families who had three to five children. In nonfarm families, the average level of fertility was lower in each census year and declined by a greater percentage than the average level of fertility of farm families. The

Table 8.10 Distribution of Family Size, by Occupation of Household Head

	Professional	Proprietor	Craftsman	Laborer
	1850 Census			
Number of children				
0	13%	13%	10%	5%
1–2	16	13	28	18
3–5	37	31	23	28
6 or more	34	43	39	49
Total	100%	100%	100%	100%
Number of households	24	16	40	248
Mean number of children	4.4	4.9	4.5	6.7
	1860 Census			
Number of children				
0	16%	5%	0%	7%
1–2	26	45	27	18
3–5	27	18	40	37
6 or more	31	32	33	38
Total	100%	100%	100%	100%
Number of households	19	22	30	180
Mean number of children	3.9	4.5	4.6	5.9
	1870 Census			
Number of children				
0	17%	0%	4%	6%
1–2	31	21	43	17
3–5	17	42	29	42
6 or more	35	37	24	35
Total	100%	100%	100%	100%
Number of households	23	28	28	174
Mean number of children	3.9	5.0	3.7	5.9
	1880 Census			
Number of children				
0	8%	5%	7%	6%
1–2	31	32	34	15
3–5	37	25	34	52
6 or more	24	38	25	27
Total	100%	100%	100%	100%
Number of households	38	43	29	151
Mean number of children	3.9	4.5	3.9	5.6

Source: Sample C (see text).

Note: Family sizes distributed separately for each occupational classification for the head of household.

Table 8.11 Distribution of Family Size for Farm and Nonfarm Families

	1850 Census		1860 Census		1870 Census		1880 Census	
	Farm	Nonfarm	Farm	Nonfarm	Farm	Nonfarm	Farm	Nonfarm
Number of children								
0	6%	6%	7%	4%	6%	5%	6%	7%
1	7	9	6	12	7	14	6	15
2	7	14	10	20	9	17	7	17
3–5	26	31	32	30	38	31	45	39
6 or more	54	40	45	34	40	33	36	22
Total	100%	100%	100%	100%	100%	100%	100%	100%
Number of households	294	140	237	102	222	103	180	163
Mean number of children	5.6	5.2	5.2	3.9	4.9	3.6	4.6	3.1

Source: Sample C (see text).

Note: Family sizes distributed separately for farm and nonfarm families.

difference in levels can be plausibly ascribed to lower effective prices of children on the farm, the difference in percentage declines to differences in rates of change in effective prices of children. The shift in weights toward nonfarm families was a force contributing to the secular fertility decline.

8.4.6 Fertility Differences among Wealth Classes

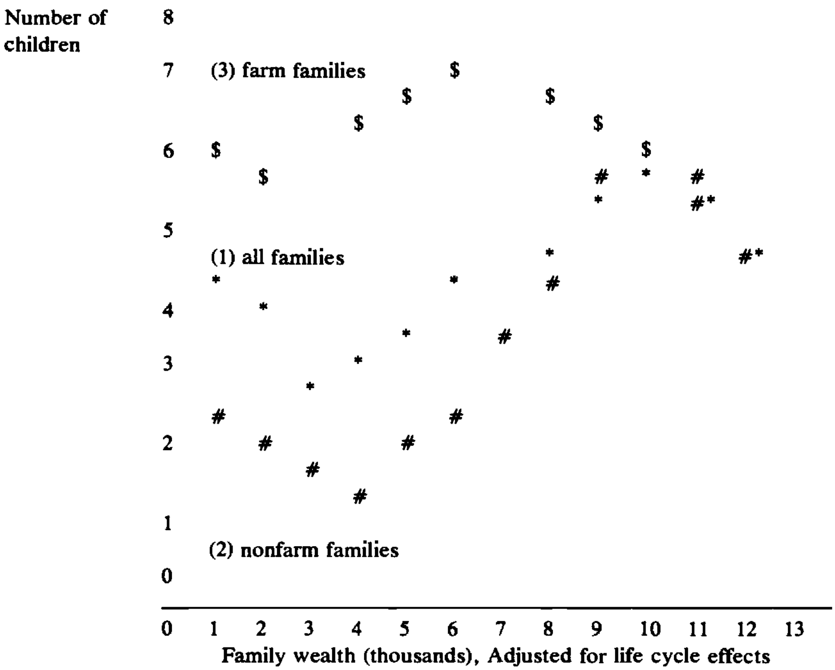
Previous studies have found conflicting empirical evidence on the relationship of household wealth to household fertility. In general, fertility and wealth are reported to have been positively related in pre-nineteenth-century populations and in nineteenth-century rural populations.[24] However, there is evidence of a negative relation of household wealth to fertility in more urbanized populations, at least in some ranges of wealth.[25] An economic approach suggests that the effective price of children was rising with wealth in the ranges where a negative relation appeared.

The total number of children ever born to a couple is related both to lifetime wealth of the family (which equals total lifetime earnings of the family plus net bequests) and to the timing of receipts of income. Most of the previous work done in this area has had to rely on household income as a proxy for household wealth, because large household-level data sets with wealth information simply have not been available. For a number of reasons, reported wealth measures (such as the ones in this data set), especially for two generations of a family, are more valuable than reported income measures in assessing the wealth/fertility relationship. These reasons include: (1) measured income is highly sensitive to transitory components; (2) measured wealth smoothes out at least some of the transitory components and so more accurately reflects lifetime wealth; (3) reported wealth of grandparents can be used to construct measures of expected bequests; (4) reported wealth for persons not earning income is a more accurate measure of resources available to spend than income is; and (5) some timing of receipts of income can be observed for families which were found in more than one census.

The relationship of 1860 household wealth (standardized to age 45 of the household head) to household fertility for all families together, for nonfarm families, and for farm families is graphed in table 8.12. For all families together, the relationship of wealth to fertility was negative in the low ranges of wealth ($0–$3,000), positive in the middle to upper ranges of wealth ($3,000–$10,000), and negative in the highest ranges of wealth.[26] The relationship held for both nonfarm and farm families, although the ranges in which fertility and wealth were negatively associated were different for the two groups.

Intuitively, the observed wealth effect is a combination of a true wealth effect and a price effect. The number of children should have

Table 8.12 Relationship of Family Wealth to Family Size



Source: Sample C (see text).

Note: Relationship of family wealth (standardized to age 45 for the head of the household) to the average number of children. The separate lines are for:

(1) All families together *******.
(2) Nonfarm families #######.
(3) Farm families $$$$$$$.

been positively related to true wealth if children were a normal good; this effect dominated in the wealth range where fertility and wealth were positively related. The number of children should have been negatively related to their effective price. It seems likely that the effective price of children was rising in the ranges where fertility and wealth were negatively related, and that the price effect dominated the true wealth effect in those ranges. A detailed theoretical model which explains the observed relation between fertility and wealth is currently being developed (Bourne 1985).

From 1860 to 1870, mean household wealth in 1860 dollars (corrected for differences in age structure) increased from $5,700 to $6,400.[27] Most of the rise stemmed from shifts in the percentage of families holding $100–$1000 to families holding $1000–$3000 in wealth and in the percentage of families holding $10,000–$11,000 to families holding more than $11,000 in wealth. The cross-sectional relation of fertility to wealth was similar in 1860 and 1870; therefore, some of the secular decline in fertility may be ascribed to a shift in wealth classes toward classes which had lower fertility.

8.4.7 Fertility Differences among Lineal Families

There is some evidence that fertility across two generations of the same family is significantly correlated.[28] For the genealogical samples, family size was positively correlated for all families grouped together, as well as for families in which both the mother and the grandmother were at risk to bear children until the end of their fecund years (see table 8.13).

Variations in nuptiality and the degree of fertility regulation across lineal families are key in explaining the correlation. Averages of mother's age at marriage, at first birth, and at last birth (see table 8.14) differ significantly at the 95% level; spacing of low-parity births was not significantly different across families. As an example of differences across lineal families, families descended from John Edminster of Scotland (history 4) had fewer children than families descended from Robert Winchell of England (history 5) because marital fertility was relatively low, age at marriage relatively high, and age at last birth relatively low compared to the same measures for the Winchell descendants.

Although it is helpful to break down the differences in family sizes across lineal families by examining proximate determinants, it is likely that the differences both in proximate determinants and in fertility outcomes arose chiefly because of familial variations in underlying socioeconomic variables. A detailed analysis (Bourne 1985) suggests that wealth differences and residence (nonfarm or farm) explained nearly all of the variation in family sizes across lineal families.

Table 8.13 Correlation of Family Size Across Two Generations

	Correlation	Number of Families	Significance
		Sample A	
Total children	.184	2658	99%
Total children, mother and grandmother at risk to age 45	.139	460	95%
		Sample B	
Total children	.192	2694	99%
Total children, mother and grandmother at risk to age 45	.144	503	95%

Source: Samples A and B (see text).

Note: Sizes of families correlated across two generations. These correlations are uncorrected for wealth and the birth cohort of the mother.

Table 8.14 **Average Fertility Measures, Grouped by Family History**

	Number of Family History								
	1	2	3	4	5	6	7	8	9
Number of children ever born	5.1	5.2	3.3	3.9	5.9	5.8	4.8	5.0	4.3
Mother's marriage age	22.8	23.6	27.3	22.8	22.1	23.4	22.3	24.2	22.0
Mother's age at her first birth	24.6	24.2	37.3	24.9	23.3	25.0	24.0	25.6	24.0
Mother's age at her last birth	35.3	36.0	38.8	32.5	35.8	37.0	33.0	35.9	32.8
Total marital fertility for women aged 20–44	7.9	5.7	10.8	5.9	7.3	9.7	3.8	8.2	5.9
Number of families	74	54	3	148	96	95	14	483	81

Source: Sample B (see text).

Note: Separate calculations of fertility variables for each of the nine family histories in sample B. The averages are calculated for the set of women on whom all variables are nonmissing. The differences in the averages (excluding histories 3 and 7) are significant at the 95% level.

8.5 Conclusion

The preliminary analysis of the new genealogical data answers questions regarding when the historical fertility decline began in the United States, what methods of fertility control were most prevalent through time, and what socioeconomic characteristics of the household were especially important in influencing fertility.

The number of children ever born to the average woman in the sample declined throughout the nineteenth century. Up until the 1850–62 birth cohort of women the principal factors responsible for the decline were decreases in the proportion of women ever marrying and in the life expectancy of women of childbearing years. Thereafter, the decline was chiefly due to the restriction of childbearing within marriage, primarily through early cessation of childbearing rather than by increases in the intervals between births.

The sample exhibits no important regional differences in the marital fertility schedule prior to the nineteenth century. During the nineteenth century, the number of children ever born to the average married woman fell more rapidly in New England and the Middle Atlantic than in other regions, principally because of earlier regulation of fertility within marriage and declining life expectation for women of childbearing years. Intramarital fertility regulation was perceptible as early as the 1800–1812 birth cohort of women in families who lived in the New England and Mid-Atlantic regions. However, regulation within marriage was not strongly apparent among families who lived in the Midwest until the 1850–62 cohort. Furthermore, families who lived in the West did not control fertility within marriage to a large degree until the 1875–99 cohort. The average age at marriage for women differed both in the level and in the rate of change over time for the various regions of the country.

Up to the 1800–1812 birth cohort, the number of children ever born per woman was about the same for foreign-born and native-born women. But after the 1800–1812 birth cohort, the average for the native born lay below that of the foreign born. There was somewhat earlier fertility regulation among the native born. However, a primary determinant of the larger family size among immigrants was their longer average time at risk to bear children. This result is related to the sample selection process rather than to mortality or nuptiality differences: immigrants were not observed in the genealogical sample until the time of their arrival in the United States. Hence, the period of time between marriage and emigration was not one in which immigrants could have died, although native-born husbands and wives, who differed only in that they did not emigrate, could and did die during a comparable time period.

Families whose heads of households were not laborers (i.e., professionals, proprietors, and craftsmen) had fewer children than other families, but families of all occupational groups experienced lower fertility as time passed. Farm families were larger than nonfarm families. The relationship of household wealth to fertility was quite interesting: fertility and wealth were negatively related in the lowest and highest ranges of wealth and positively related in the middle range. The weights of the sample also shifted over time, with the nonlaborer occupational groups, nonfarm families, and wealth classes which experienced lower fertility receiving ever larger weights as time passed. Some fertility differences were also exhibited among the genealogies, although elsewhere I deduce that these differences were explained principally by wealth and residential differences.

The size and detail of the new intergenerationally linked household data set have been exploited to substantiate the speculation that household fertility differed sharply both in level and in trend over time across socioeconomic subgroups in nineteenth-century America. The next step will be a thorough theoretical and empirical examination of the relative strengths of the socioeconomic variables which have been shown to underlie the historical decline in household fertility in the United States.

Appendix

Construction of Sample A

Within a family history, the first male immigrant to the United States with recorded country of departure and state of destination was located. All information on him, his spouse, and his children and grandchildren was recorded. This information includes the day, month, year, and place of birth, marriage, and death for each individual. In some cases, an additional set of three later generations of the family was selected randomly from the same history. Therefore, from any one history, the data (from the first three generations) are structured as follows:

first male immigrant and spouse

child 1 and spouse .... child $n(1)$ and spouse

child 1 and spouse	..... child $n(2)$ and spouse	child 1 and spouse	.... child $n(3)$ and spouse

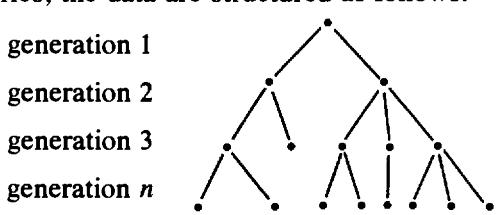
The entire sample may be diagrammed over time and space as a set of these triangles, with each triangle representing data from a different history.

As mentioned in the text, there are 15,748 individuals from 4,467 nuclear families in about 1400 published family histories in sample A. One-third of the families fell into the mother's birth cohort of 1650–1799, one-third in the 1800–1849 cohort, and one-third in the 1850–99 cohort. Regionally, 40% of the families lived in New England or the Mid-Atlantic, 17% each in the Midwest or West, and 9% in the South.

Analytical work was done only for once- and never-married individuals, although the working file contains individuals with multiple marriages. Fecund women who did not remarry after the death of a spouse (and thus had no more children after the spouse's death) are included in calculations of the child/woman ratios and period total fertility rates of table 8.2, but fecund women who remarried (and possibly had more children after the death of their first spouse) are not. On the other hand, both are included in others' calculations of these measures from overall census data. Therefore, my measures tend to be lower than reported measures compiled from the censuses.

Construction of Sample B

Currently, all information from nine published family histories is contained in the working file. A total of 16,820 individuals from 5,632 nuclear families are represented. As in sample A, the first immigrant to the United States with recorded departure and destination places was located in the history. Date and place information on him, his spouse, and all his descendants was recorded. Therefore, for each of the nine histories, the data are structured as follows:



The diagram makes it clear that nuclear families from a given history were concentrated heavily in the cohorts born near the end of the recorded history. All nine histories were published in the nineteenth or twentieth century; all of the first male immigrants were born in the seventeenth century. Therefore, most of the observations were clustered in the 1800–1849 birth cohort (50%), while the rest were divided evenly between the 1650–1799 and 1850–99 cohorts. Unlike sample A, which consists of over 40% immigrants, sample B has but nine immigrant families. For comparative purposes, the Statistical History of the United States reports 12% of the population as foreign born in 1850, 16% in 1860, 17% in 1870, 16% in 1880, 18% in 1890, and 16% in 1900. Sample B is also less representative regionally than sample A.

Construction of Sample C

Individuals from sample B were matched by hand to the same individuals in the 1850, 1860, 1870, and 1880 federal manuscript census schedules. Families were reconstructed from the matched data and then linked through generations. As a result, an observation in sample C contains both genealogical and census information on individuals and their spouses, children, and parents. Some information on siblings is also present. As in sample B, sample C consists chiefly of native-born bloodline individuals, although spouses may have been foreign born.

Notes

1. In the 1800–1820 censuses, the relevant age groups (by sex) for fertility analyses were ages 0–9, 10–15, 16–25, and 26–44. In 1830 and 1840 the relevant groups were changed to ages 0–4, 5–9, 10–14, 15–19, 20–29, 30–39, and 40–49. In 1850 and 1860 an age-class of under one year was added, and in 1870, single year ages were tabulated for those under age 5 and quinquennial age groupings were tabulated for those aged 5–79.

2. A child/woman ratio is the ratio of the number of children in a certain age group to every thousand women in a certain age group. The age groups used for the children are usually either 0–9 years or 0–4 years; the age groups used for the women are 15–44, 20–44, 15–49, or 20–49. Clearly, the structure of the available data determines which age groups are used. See, e.g., Yasuba (1962), Forster and Tucker (1972), Potter (1965), Haines (1977), and Easterlin (1968).

3. Birth years were recorded for 91% of the individuals in the sample and death years for 72% of the individuals.

4. The data were quite consistent internally. Ages reported from the census differed from ages reported from the genealogies for only 3% of the observations. Birthplaces, if recorded in both sources, differed in only 5% of the observations.

5. Family histories are compiled by individuals or family organizations and attempt to list all the descendants of a patriarch, with dates and places of their births, deaths, and marriages.

6. Sample A was collected first, with an eye toward geographical representativeness of the sample. As collection proceeded, we realized that it would be less costly to collect all information from each family history as raw data, then to select and reweight the various family characteristics by computer rather than by hand. Therefore, sample B

consists of data on all individuals represented in a family history. The linkage to census data of genealogical data from a few family histories was also much less costly than the linkage of data from numerous histories. Since the former group was composed of many more people with the same surname than the latter group, the search for names in the manuscripts was cheaper for the former group.

7. For example, see Yasuba (1962), Coale and Zelnik (1963), T. W. Schultz (1974), Simon (1974), Becker (1981), T. P. Schultz (1981), and Haines (1984).

8. The average value of real estate holdings of adult males in 1850 was $3,034 in sample C; Soltow (1975) reported the average as $1,103 for his sample of the 1850 census.

9. Families who reported no wealth made up 62% of all families in 1860 and 60% in 1870. Soltow (1975) reported figures of 62% for both census years from his sample.

10. An age-specific fertility rate equals the number of children born to women in a specific age interval (usually a 5-year interval) divided by the number of woman-years lived during the interval. The total fertility rate is the sum of the age-specific rates multiplied by the interval length. An age-specific marital fertility rate is calculated similarly to an age-specific fertility rate, except the denominator equals the number of woman-years in the interval during which women are married and both spouses are living. The total marital fertility rate is the sum of the age-specific marital rates multiplied by the interval length.

A period rate sums the age-specific rates of women alive during the period, whereas a cohort rate sums the age-specific rates of a birth cohort of women.

11. The period total fertility rate reported in table 8.2 equals the sum, over all age intervals, of the total number of children born to women in a given age interval during the period divided by the total number of women within the interval, multiplied by the interval length. The denominator includes both once- and never-married women. Therefore, a change over time in the percentage of lifelong spinsters would affect this index of fertility without affecting the marital fertility schedule.

12. The increase in the child/woman ratio for sample A from 1800 to 1880 is puzzling, for child/woman ratios obtained from censuses of the total population show a continuous decline during the period. However, the recording of vital events, particularly deaths, was more complete in later years in my samples. Since it is necessary to have birth and death dates for both women and children in order to compile a child/woman ratio from my samples, it is possible that secular variations (by actual age at death) in the recording of death dates caused the apparent rise in the child/woman ratio. A greater proportion of young women, who have higher fertility than older women, contributes to increases in the child/woman ratio. If age structure and underlying fertility patterns were not changing through time, but a higher percentage of younger women could be included in the ratio because of increasing accuracy in recording of death dates of women who died young, the observed child/woman ratio would increase. Changes in the age structure and in fertility patterns could, of course, mitigate or exacerbate this effect.

13. In the Mineau et al. study (1979) of a Mormon natural fertility population (a population exhibits "natural fertility" if there is no apparent tendency of couples to prevent additional births after a certain number of births have occurred), the average age at last birth for women who were at risk to age 45 was 40.5. In Smith's study (1977) of an eighteenth-century French natural fertility population, the average age was 40.1.

14. Again, I have not found a completely satisfactory explanation for the secular increase in the child/woman ratio in sample A. See n. 12.

15. Coale and Trussell (1978) have derived a standard natural fertility schedule of age-specific marital fertility rates from a set of empirically observed populations and have devised two statistics: M, which measures the overall level of fertility in the observed marital fertility schedule as compared to the standard natural fertility schedule, and m, which measures deviations from the standard schedule. They hypothesized that the pattern of deviations departs from the natural fertility schedule in a typical way if fertility control was present in the population being studied. The value of m is independent of the level of fertility and depends solely on the age structure. It is calculated such that if the observed fertility schedule deviates from the natural fertility schedule in a typical fashion, the value of m at all ages greater than 24 is identical. The value of m should be

zero if no fertility control was present. The value of m was approximately one for populations observed in Western countries in the early 1960s.

16. The observed conditional probability of having a $(k + 1)$th birth is also called the kth parity progression ratio. See, e.g., Curtin et al. (1979).

17. Easterlin (1976) hypothesized that parents want to provide their children with as good a start in life as they themselves had. Therefore, the number of children parents can afford depends upon the prospective return to parents' capital within the parents' lifetime. Suppose the parents were part of an agricultural society based on family units, with a multigeniture system of inheritance and favorable mortality conditions. In such a society, the expected rise in land prices would give a fair indication of the expected growth in parents' capital. Within the context of nineteenth-century America, land prices were increasing by much higher percentages in the later-settled regions than in the earlier-settled regions. Therefore, parents living in the later-settled regions would have been able to provide more children with as good a start in life as they had than parents living in earlier-settled regions.

18. Michael Haines has pointed out to me that the manner in which wealth is received should have a bearing on the "price effect." That is, a windfall, perhaps in the form of a bequest, would probably have little or no "price effect" on fertility. However, increases in wealth which result from increases in wage earnings would be more likely to be associated with both a "wealth effect" and a "price effect." See sec. 8.4.6 for a more complete discussion.

19. The table does not report these averages. For instance, the average interval between marriage and first birth cannot be calculated directly from the table because the average age at marriage was calculated over all married women, including those with no children. The mother's age at her first birth, obviously, could be calculated only for those who reported at least one birth.

20. The period 1800–1860 was one of remarkable East-West migration, and the migrants were heavily concentrated among people aged 18–30 (see Villaflor and Sokoloff 1982).

21. Although the simple average of marriage ages of women from the genealogies fluctuated through the century, the weighted average, with appropriate regional weights assigned from census population estimates, had a general upward trend (not shown).

22. Tolney et al. (1982) also reported larger families among immigrants to the United States. Correspondence from Michael Haines indicates that a similar result is suggested by the 1900 census recall data.

23. Breastfeeding prolongs the period of reduced fecundity following a birth. If an infant were to die, the mother would return to a normal level of fecundity earlier than if the infant were still breastfeeding. Therefore, the mother would be at risk to have another child earlier than a mother whose child did not die. Although infant mortality was higher in sample A for children born to foreign-born parents (which led to closer birth spacing), the average number of surviving children, as well as total children ever born, was higher for foreign-born parents than for native-born parents.

24. Examples of populations in which a positive relation of fertility and wealth was found include fifteenth-century Tuscany (Klapisch 1972; Herlihy 1977), fifteenth- and eighteenth-century Italy (Livi-Bacci 1977), rural Canada in 1861 (McInnis 1977), rural United States in 1865 (Bash 1955), and rural nineteenth-century Germany (Knodel 1979).

25. Knodel (1974) found a negative relation of fertility to wealth for families living in German cities in the early 1900s. Becker and Lewis (1974) found a negative relation for twentieth-century United States families for the lowest ranges of wealth. There is also some evidence that members of the patrician class in ancient Rome had small families relative to lower-wealth families.

26. Michael Haines reports a similarly shaped curve for a nineteenth-century Philadelphia sample.

27. Reported wealth in 1870 was deflated by the Warren-Pearson wholesale price index for all commodities (see the Statistical History of the United States 1965).

28. For example, see Johnson and Stokes (1976), Ben-Porath (1975), and Becker (1981).

Comment Michael R. Haines

This paper makes use of a new data set to study the decline in fertility in colonial America and the United States between roughly 1750 and 1900. The data consist of longitudinal information on individuals and families collected from family histories kept at the Genealogical Society's libraries in Utah. The work is fundamentally descriptive and demographic, although an economic perspective on the costs and benefits of children (e.g., Becker 1981) is provided. The basic analysis presents calculation of fertility, nuptiality, and mortality measures, usually on a cohort basis but sometimes in period form, for women born between about 1650 and 1900. (This implies, of course, that the cohort rates in, for example, table 8.3 extend to periods beyond 1900. Period rates are given in table 8.2 up to 1889.)

Two principal data sets are used. Both contain the demographic information from a number of published family histories. They provide data on dates and places of births, deaths, and marriages and on family relationships for parents, children, spouses, and other relatives. These data permit the calculation of derivative demographic information (e.g., age and marital status by date) and also standard measures of fertility and mortality. Sample A contains 15,748 individuals from 4,467 nuclear families, and sample B consists of 16,820 individuals in 5,632 nuclear families. Sample C is a subset of sample B to which economic data (including occupation and wealth) have been linked from the manuscripts of the United States censuses of 1850–80. The reason for the existence of two separate samples seems related to sampling strategy, if my interpretation of note 6 is correct. Sample A was apparently an attempt to gain spatial and temporal representativeness by sampling the original male immigrants from selected family histories and then, in some cases, following the family for three generations. (Wahl does not explain why the three generations were sampled in some cases and not in others.) Sample B apparently abandoned this goal and followed all the descendants of a male immigrant in nine family histories. The reason was apparently easier logistics.

In any event, Wahl acknowledges that these samples are not representative of the United States population over this period, nor are they geographically representative. (For example, New England appears overrepresented relative to the South.) It is important thus to emphasize that the results in this paper, while extraordinarily valuable for the insights they provide, must be used and interpreted with care.

Michael R. Haines is professor of economics at Wayne State University.

These comments were originally written for the NBER Conference on Income and Wealth, "Long-Term Factors in American Economic Growth." The present version has been rewritten to reflect a substantial revision of the original paper.

The samples contain white, largely literate, and mostly native-born individuals. They are geographically concentrated in the Middle Atlantic and (earlier at least) New England regions. This was owing to settlement patterns to some extent, but the South is, by any standard, underrepresented. For 1850–80, it seems that laborers (a category which unfortunately lumps farm laborers and other laborers together) had a large representation relative to craftsmen and proprietors (especially farmers). Finally, even with such large initial samples, some fairly small cell sizes appear when subdivision is made over time and across regions, occupations, and so forth. Thus the samples do not replicate the whole population nor do they probably provide, in a few cases, very accurate estimates.

One way to pursue this further is to compare results from Wahl's samples with standard demographic measures from other sources. In table C8.1 I compare the child/woman ratios (children 0–4 per 1,000 women aged 15–44) from unadjusted published census data for the white population with those reported in table 8.2 of the paper. I also compare period total fertility rates for the white population given in Coale and Zelnik (1963, p. 36) with those given in Wahl's table 8.2.

The results for the child/woman ratios are, frankly, rather discouraging. While the national pattern from census data exhibited fairly steady declines over time from relatively high levels, sample A showed a monotonic *increase* from low to high levels. Early in the nineteenth century, sample B experienced a high level not out of line with the national child/woman ratios. On the other hand, the rate of decline in sample B was much more rapid than for the country as a whole. Wahl recognizes this problem and advances the explanation that it occurred because only once- and never-married women were included. Fecund women who remarried after the death of the first spouse were excluded, at least for sample A (app. 8.A.1). It is not explained whether the same exclusions characterized sample B; and, if so, why the child/woman ratios in sample B showed a decline whereas those in sample A did not. Also, why would the exclusion of remarried women have caused a rise in the ratios in sample A? It must be assumed that remarried women had systematically higher fertility and either that their incidence decreased over time (despite a suggestion that mortality was increasing prior to the Civil War) or that the fertility differential diminished. In note 12, Wahl suggests that possibly improved recording of death dates led to more younger women being included in the sample. This is possible, but the effect would have had to have been quite large. It could bias other analysis. And it could be examined directly by just looking at the age-sex distribution over time. The *very* low levels of child/woman ratios in sample B toward the end of the nineteenth century are troubling as pertains to representativeness.

Table C8.1 Fertility Measures: A Comparison of the Wahl Genealogical Samples with Measures for the White Population of the United States, 1800–1890

	Child/Woman Ratios[a]			Total Fertility Rates[b]		
	Wahl			Wahl		
Period	Sample A	Sample B	United States	Sample A	Sample B	United States
1800			943			7.04
1800–1809	561	908		7.0	5.0	
1810			944			6.92
1810–19	570	717		7.1	4.8	
1820			897			6.73
1820–29	625	627		6.9	4.4	
1830			828			6.55
1830–39	631	527		6.6	4.2	
1840			876			6.14
1840–49	641	415		6.1	3.8	
1850			654			5.42
1850–59	664	296		5.3	3.5	
1860			668			5.21
1860–69	746	215		4.8	3.4	4.61
1870			610			4.55
1870–79	850	289		4.8	3.3	4.47
1880			586			4.24
1880–89	886	313		3.7	3.5	4.18
1890			579			3.87
1900			508			3.56

Source: Wahl, table 8.2; United States Bureau of the Census (1975), ser. A, pp. 119–34; Coale and Zelnik (1963), table 2.

[a]Children 0–4 per 1,000 women aged 15–44.

[b]The sum of age-specific overall fertility rates for women 15–44.

The period total fertility rates are much more encouraging, since both samples exhibited declines over the nineteenth century. Peculiarly, however, sample A had higher total fertility rates in the early nineteenth century than did sample B, exactly the reverse of the situation with the child/woman ratios. It is noted that sample A had more families from higher fertility regions and from among the foreign born (who also had higher fertility). This makes the differentials in total fertility rates in table 8.2 more plausible, but it tends to make results from samples B and C less convincing. Perhaps it is best at this point to consider sample A as more representative, to regard samples B and C as special subgroups (i.e., white, literate, largely living in the Northeast), and to disregard the child/woman ratios as possibly an aberration of tabulation procedures. They are, however, disturbing and remain a nagging reminder that the results in this paper may not be as informative as could be hoped.

At this point, it should also be pointed out that only husband-wife nuclear families are used for fertility analysis, which is appropriate for analysis of marital fertility. It is not clear, however, whether this had any effect on the tabulations related to the child/woman ratios. Also, were families with greater complexity excluded from analysis? Would this impart biases? Further, at the end of the paper there is a discussion of fertility differences among extended families. It appears that the extension considered is only upward or downward and that nuclear families alone were related. It is also not clear if extension is applied to coresident kin (the usual definition). If so, this is a place where household fertility (used in the title) and family fertility differ.

Among the major findings: "The number of children ever born to the average woman in the sample declined throughout the nineteenth century," which is quite consistent with the previous work (Thompson and Whelpton 1933; Yasuba 1962; Coale and Zelnik 1963; Forster and Tucker 1972). The more interesting result is the fact that early in the century, fertility declines were caused by changes in nuptiality (increases in proportions of females who never married) and increases in adult female mortality. The divergences between cohort children ever born and cohort total marital fertility rates (for women aged 20–44) that are observed in table 8.7 (with the total marital fertility rates always being higher) are traceable to nuptiality and mortality differences. Cohort total marital fertility rates did not decline for sample A until the birth cohort of 1850–62, although decline in total marital fertility rates may have set in for sample B as early as the birth cohort of 1813–24. The declines were not large until the birth cohort of 1850–62 for sample B. The declines in total marital fertility rates for both samples in the seventeenth and eighteenth centuries must, I believe, be taken with some caution. These were likely natural fertility populations, and, historically, natural fertility populations have exhibited fluctuations in marital fertility (Smith 1977).

One question remains, however: If those *were* natural fertility populations, why were the total marital fertility rates *consistently* lower in sample B than in sample A (table 8.3)? As table 8.4 indicates, although the average age of woman at first marriage was somewhat higher in sample B than in sample A in the nineteenth century, the mean age at first birth was greater by a larger amount (in B relative to A). This implies a longer delay, and perhaps spacing behavior, in sample B. This result is confirmed by the low values of M (table 8.5) for sample B relative to sample A in the Coale-Trussell (1974, 1978) model fitted to these data. The conclusion must be that some spacing was taking place early or that there were biological and/or non-fertility-related behavioral differences between the samples. Age-specific marital fertility rates at ages 20–24 and 25–29 were also lower in sample B than in sample A for the birth cohorts of 1750–99 and later, also indicating some differences between the samples in behavior at this early age not usually characterized by controlling behavior.

In terms of fertility control within marriage, it becomes evident in the Coale-Trussell *m* index in table 8.5 for sample B only for the birth cohort of 1850–74 and in sample A only for the birth cohort of 1875–99. On the other hand, stopping behavior at older ages is evident in table 8.4, controlling for mortality (i.e., "average mother's age at last birth for women at risk to age 45"), for both samples early in the nineteenth century (on a period basis). The decline in age at last birth was, however, more pronounced in sample B. This is also seen in the lower levels and more rapid declines in age-specific marital fertility rates at ages 30–44 in sample B over the nineteenth century, as well as in the higher *m* values in table 8.5.

The peculiar nature of sample B in relation to sample A is evident throughout: lower age-specific marital fertility rates at almost all ages for all birth cohorts after 1750–99; consequently lower total marital fertility rates; lower period total fertility rates; higher average age at marriage; proportionately still higher mother's average age at first birth; lower average age at last birth, even taking into account mortality; earlier apparent fertility control within marriage. There is some evidence that spacing as well as stopping behavior was characteristic of this group from early in the nineteenth century. Both samples, however, did exhibit the more conventional pattern of stopping as the century progressed. Table 8.6, which gives the probabilities of progressing from one parity to the next, shows another anomaly. At very low parities (i.e., one, two, and three) sample B had lower parity progression probabilities at these early parities which declined more than those for sample A. It is unfortunate that the parity distributions and the parity progression probabilities for higher parities were not given. Overall, however, unless there was some higher incidence of subfecundity and sterility at early ages and parities in sample B (which is possible by chance considering the small genetic pool of only nine family histories), there is evidence that sample B was peculiar in that it gave evidence of early spacing, early stopping, *and* later marriage.

This peculiarity, or at least difference, concerning sample B is disturbing because sample B is the basis for analysis by region (tables 8.7 and 8.8), by occupation (table 8.10), by farm-nonfarm residence (table 8.11), and by wealth (table 8.12). (Remember that sample C is derivative from sample B.) The fertility differentials are, in some cases, not too surprising: laborers had higher fertility than other groups, farm families had more children than nonfarm families, the foreign born had larger families than the native born. (There is some confusion concerning rural/urban differences. Farm versus nonfarm residence is not equivalent to rural versus urban residence, and so the discussion should reflect this.)

Regional differences are a bit hard to summarize (tables 8.7 and 8.8). It does seem that declines began earliest in New England and the Middle Atlantic regions and gradually spread to the Midwest and West. (Results for the South are based on such small numbers and intermittent observations as to be of little value.) This, of course, fits with the findings and views of Yasuba (1962), Forster and Tucker (1972), and Easterlin (1971, 1976). Unfortunately, the New England region is lost to observation after the birth cohort of roughly 1825–36. The Midwest and Middle Atlantic regions appeared to converge over time. The West exhibited early marriage and high fertility until quite late. (Were any of the Western families in sample B Mormons, a high fertility group?) These regional differences are difficult to analyze easily because of small cell sizes and irregular coverage. The results seem to confirm prior work.

Results on wealth are of interest, in that a curvilinear pattern was found. This has interesting implications for the relationship of wealth (and permanent income) to fertility and holds possibilities for future research on the relative importance of wealth versus price effects over various ranges of wealth. Unfortunately, the sample is restricted to the linked families (for the censuses of 1850, 1860, and 1870 for sample C), and so the analysis must be limited in time and to the peculiarities of sample B.

The analysis of correlation across generations is unclear. Are these truly coresident extended households, or are they merely linked noncoresident households? The positive correlation between fertility across generations is of interest, although the effect of behavioral differences aimed at differential fertility regulation across lineages may be confused with biological differences and behavioral differences not related to fertility. Table 8.14 does reveal substantial differences across family histories, although some histories with few cases (e.g., nos. 3 and 7) should probably be excluded from analysis.

This paper reveals that much of the early decline was through nuptiality adjustment (a "Malthusian" transition, to use the terminology of Coale 1974). It is asserted in the paper that there was an important effect from interruption of marriage via mortality, which apparently was increasing prior to the Civil War. (See Robert Fogel's paper in this volume.) The effect of mortality is, however, possibly overrated. Its effect should have been expressed in a larger gap (relative or absolute) between average mother's age at last birth (which takes mortality into account) and average mother's age at last birth for women at risk to age 45 (which removes the mortality effect). I have taken these values from table 8.4 and calculated the absolute difference and the ratio of the mean age at last birth to the mean age at last birth at risk to age 45. The results are given in table C8.2. The idea is that mean age at last birth to risk at age 45 revealed the stopping age without mortality,

Table C8.2 Comparison of Mother's Average Age at Last Birth with Mother's Average Age at Last Birth at Risk to Age 45: Genealogical Sample, 1700–1899

	Sample A				Sample B			
Years	(1)	(2)	(2) − (1)	(1)/(2)	(1)	(2)	(2) − (1)	(1)/(2)
1700–1709	37.0	39.7	2.7	.9320	35.5	42.0	6.5	.8452
1750–59	38.8	39.0	.2	.9949	39.5	40.3	.9	.9801
1800–1809	38.1	40.5	2.4	.9407	35.9	38.2	2.3	.9398
1810–19	38.1	40.3	2.2	.9454	35.5	37.8	2.3	.9392
1820–29	37.6	39.8	2.2	.9447	35.0	36.4	1.4	.9615
1830–39	37.1	39.2	2.1	.9464	33.7	34.7	1.0	.9712
1840–49	36.4	38.3	1.9	.9504	33.1	34.0	.9	.9735
1850–59	35.1	36.8	1.7	.9538	32.6	33.7	1.1	.9674
1860–69	34.4	35.6	1.2	.9663	32.5	33.5	1.0	.9701
1870–79	34.0	34.6	.6	.9826	33.4	35.0	1.6	.9543
1880–89	31.5	32.9	1.4	.9574	32.8	32.9	.1	.9967

Source: Bourne (1985), table 4.
Note: (1) Mother's average age at last birth.
(2) Mother's average age at last birth at risk to age 45.

and the mean age for all women revealed the effect with mortality. The table reveals no trend in favor of *reducing* fertility between 1800–1809 and 1870–79 for sample A. In fact, the absolute and relative differences declined, pointing to an effect acting to *increase* actual fertility (and to close the gap between total marital fertility rates and children ever born). The results for sample B also showed a decline in the gap between 1800–1809 and 1840–49 and then an increase to 1870–79. For this sample, then, fertility decline was counteracted by mortality prior to 1850 and then modestly assisted by it. The real effect of mortality in reducing fertility by shortening the childbearing period was between the period 1750–59 and the beginning of the nineteenth century (1800–1809).

The evidence presented in the paper does suggest that a "neo-Malthusian" transition (i.e., control of marital fertility) was beginning in the early nineteenth century, more in sample B than in sample A and also more related to stopping than spacing behavior. This is not a case of "either/or" but of "more or less." The data point to stopping via declines in mother's average age at last birth to risk at age 45 as early as 1800–1809 in both samples (table 8.4). The analysis of spacing behavior must await a study of birth interval lengths, which is not provided here. Also, further study is needed of the role in the fertility decline of shifting weights among subgroups and regions having differential fertility.

The results in this paper form a complement to earlier work by Warren Sanderson (1979) and the paper in this volume by Paul David and Warren Sanderson. Sanderson (1979, table 2) found that nuptiality changes were important in fostering declines in total fertility rates in the nineteenth century, but the effect was not dominant except during the decade 1880–90. More than half of the declines in total fertility rates were due to declines in marital fertility. It is important to reconcile these findings.

Overall, this paper constitutes an important first step in analyzing what is potentially a most valuable window on the past. There are many other possible uses for the data (e.g., the mortality paper by Robert Fogel in this volume). More can be done with the fertility analysis, and I am confident that it will be. But doubt as to the representativeness of this sample remains: the low fertility of samples B and C; the differences between samples A and B; the peculiar child-woman ratio results; the fact that the samples are white, literate, and mostly native born. There are thus reasons to regard the findings as pertaining to a "leading" group in the demographic transition. As such, it is an important source of information on the fertility decline in the United States, peculiar because it occurred in a largely rural, agrarian context early in the nineteenth century.

References

Adams, J., and Kasakoff, A. 1983. Migration and life-cycle in the American north: Age-specific migration rates, 1700 to 1850. Discussion paper.

Alter, G. 1984. Fertility analysis with linked and unlinked population register samples from nineteenth century Belgium. Working paper.

Amemiya, T. 1981. Qualitative response models: A survey. *Journal of Economic Literature*, vol. 19.

Barclay, G. 1958. *Techniques of population analysis*. New York: Wiley.

Bash, W. 1955. Differential fertility in Madison County, New York, 1865. *Milbank Memorial Fund Quarterly*, vol. 33.

Bean, L., et al. 1978. The Mormon historical demographic project. *Historical Methods*.

Becker, G. S. 1965. A theory of the allocation of time. *Economic Journal*, vol. 75.

———. 1976. *The economic approach to human behavior*. Chicago: University of Chicago Press.

———. 1981. *A treatise on the family*. Cambridge: Harvard University Press.

Becker, G. S., and Lewis, H. G. 1974. Interaction between quantity and quality of children. In *Economics of the family*, ed. T. W. Schultz. Chicago: University of Chicago Press.

Becker, G. S., and Tomes, N. 1984. The rise and fall of families. National Opinion Research Center discussion paper.
Ben-Porath, Y. 1975. First-generation effects on second-generation fertility. *Demography,* vol. 12.
———. 1980. Child mortality and fertility. In *Population and economic change in developing countries,* ed. R. Easterlin. Chicago: University of Chicago Press.
Bongaarts, J. 1978. A framework for analyzing the proximate determinants of fertility. *Population and Development Review.*
Bourne, J. 1985. An intergenerational model of household fertility with a new approach to wealth estimation. Working paper.
Coale, A. 1975. The demographic transition. In *The population debate: Dimensions and perspectives.* New York: United Nations.
Coale, A., and Demeny, P. 1966. *Regional model life tables and stable populations.* Princeton: Princeton University Press.
Coale, A., and Trussell, T. J. 1974. Model fertility schedules: Variations in the age structure of child bearing in human populations. *Population Index* 40:185–258.
———. 1978. Technical note: Finding the two parameters that specify a model schedule of marital fertility. *Population Index* 44:203–13.
Coale, A., and Zelnik, M. 1963. *New estimates of fertility and population in the United States.* Princeton: Princeton University Press.
Curtin, L., et al. 1979. A note on the analysis of parity progression ratios. *Demography,* vol. 16.
David, P., and Sanderson, W. 1984. Rudimentary contraceptive methods and the American transition to marital fertility control, 1855–1915. NBER Working Paper.
Easterlin, R. 1961. Influence in European overseas emigration before World War I. *Economic Development and Cultural Change,* vol. 9.
———. 1968. *Population, labor force, and long swings in economic growth.* New York: National Bureau of Economic Research.
———. 1971. Does human fertility adjust to the environment? *American Economic Review* 61:399–407.
Fogel, R. W. 1977. The economics of mortality in North America, 1650–1910. Research proposal submitted to the National Science Foundation.
Fogel, R. W., et al. 1982. Uses of intergenerational data sets: The problem of time scales. Preliminary draft.
Forster, E., and Tucker, C. 1972. *Economic opportunity and white American fertility ratios, 1800–1860.* New Haven: Yale University Press.
Gautier, E., and Henry, L. 1958. La population de Crulai, paroisse Normandie au XVII[e] et au XVIII[e] siècles. Paris: INED.
Grabill, C., et al. 1958. *Fertility of American women.* New York: Wiley.

Haines, M. 1977. Fertility decline in industrial America: An analysis of the Pennsylvania anthracite region, 1850–1900, using own-children methods. *Population Studies,* vol. 32.

———. 1979. *Fertility and occupation: Population patterns in industrialization.* New York: Academic Press.

———. 1984. Ethnic differences in marital fertility during the fertility decline: Philadelphia, 1850–1880. Conference paper for the Population Association of America.

Henry, L. 1956. Anciennes familles genevoises: Etude demographique: 16ᵉ-20ᵉ siècles. INED cahier 26. Paris: Presses Universitaires de France.

———. 1961. Some data on natural fertility. *Eugenics Quarterly,* vol. 18.

Herlihy, D. 1977. Deaths, marriages, births, and the Tuscan economy (ca. 1300–1550). In *Population patterns in the past,* ed. R. Lee. New York: Academic Press.

Hershberg, T., and Dockhorn, R. 1976. Occupational classification. *Historical Methods.*

Johnson, N., and Stokes, C. 1976. Family sizes in successive generations: The effects of birth order, intergenerational change in lifestyle, and familial satisfaction. *Demography,* vol. 13.

Karlin, S., and Taylor, H. 1975. *A first course in stochastic processes.* New York: Academic Press.

Kearl, J., and Pope, C. 1983. Wealth mobility: The missing element. *Journal of Interdisciplinary History,* vol. 13.

Keyfitz, N., and Flieger, W. 1968. *World population.* Chicago: University of Chicago.

Klapisch, C. 1972. Household and family in Tuscany in 1427. In *Household and family in past time,* ed. P. Laslett. London: Cambridge University Press.

Knodel, J. 1974. *The decline of fertility in Germany, 1871–1939.* Princeton: Princeton University Press.

———. 1977. Family limitation and the fertility transition: Evidence from the age patterns of fertility in Europe and Asia. *Population Studies,* vol. 32.

———. 1979. From natural fertility to family limitation: The onset of fertility transition in a sample of German villages. *Demography,* vol. 16.

Kunze, K. 1984. The effects of age composition and changes in vital rates on nineteenth century population estimates from new data. Ph.D. dissertation. University of Utah.

Kuznets, S. 1958. Long swings in the growth of populations and in related economic variables. *Proceedings of the American Philosophical Society,* vol. 102.

Leasure, J. 1962. Factors involved in the decline of fertility in Spain, 1900–1950. Ph.D. dissertation, Princeton University.
Lee, R. 1978. *Econometric studies of topics in demographic history.* New York: Arno.
Livi-Bacci, M. 1977. *A history of Italian fertility.* Princeton: Princeton University Press.
McInnis, R. 1977. Childbearing and land availability: Some evidence from individual household data. In *Population patterns in the past,* ed. R. Lee. New York: Academic Press.
Malthus, T. 1798. An essay on the principle of population. London.
Mineau, G., et al. 1978a. Introduction of family limitation in a natural fertility population. National Institute of Health Research Working Paper.
———. 1978b. Natural fertility of once married couples. National Institute of Health Research Working Paper.
———. 1979. Mormon demographic history II. The family life cycle and natural fertility. *Population Studies,* vol. 33.
Okun, B. 1958. *Trends in birth rates in the United States since 1870.* Baltimore: Johns Hopkins Press.
Potter, J. 1965. The growth of population in America, 1700–1860. In *Population in history,* ed. D. Glass and D. Eversley. Chicago: Aldine.
Razin, A., and Ben-Zion, U. 1975. An intergenerational model of population growth. *American Economic Review.*
Rosenzweig, M., and Schultz, T. P. 1984. The demand and supply of births: Estimating a production function for U.S. Fertility. Conference paper for the Population Association of America.
Saad, A. 1981. Intergenerational occupational mobility in 19th century America. Thesis seminar paper, University of Chicago.
Sanderson, W. 1979. Quantitative aspects of marriage, fertility and family limitation in nineteenth century America: Another application of the Coale specification. *Demography* 16:339–58.
———. 1984. New interpretations of the decline in the fertility of white women in the United States, 1800–1920. Working paper.
Schultz, T. P. 1981. *Economics of population.* Reading, Mass.: Addison-Wesley.
Schultz, T. W. 1974. *Economics of the family.* Chicago: University of Chicago Press.
Simon, J. 1974. *The effects of income on fertility.* Chapel Hill, N.C.: Carolina Population Center.
Smith, D. S. 1977. A homeostatic demographic regime: Patterns in West European family reconstitution studies. In *Population patterns in the past,* ed. R. Lee. New York: Academic Press.
Soltow, L. 1975. *Men and wealth in the United States, 1850–1870.* New Haven: Yale University Press.

The statistical history of the United States from colonial times to the present. 1965. Stamford, Conn.: Fairfield.

Thompson, W., and Whelpton, P. 1933. *Population trends in the United States*. New York: Wiley.

Tolney, S., et al. 1982. Own-child estimates of U.S. white fertility, 1886–99. *Historical Methods,* vol. 15.

Tomes, N. 1981. The family, inheritance, and the intergenerational transmission of inequality. *Journal of Political Economy.*

United States Bureau of the Census. 1975. Historical statistics of the United States: Colonial times to 1970. Washington: Government Printing Office.

van de Walle, E. 1976. Household dynamics in a Belgian village, 1847–1866. *Journal of Family History,* vol. 1.

Vielrose, E. 1965. *Elements of the natural movement of population.* Oxford: Pergamon.

Villaflor, G., and Sokoloff, K. 1982. Migration in colonial America: Evidence from the militia muster rolls. *Social Science History.*

Vinovskis, M., and Hareven, T. 1975. Marital fertility, ethnicity, and occupation in urban families: An analysis of South Boston and the South End in 1880. *Journal of Social History.*

Weir, D. R. 1982. Life under pressure: Questions for a comparative history of economics and demography in France and England, 1670–1870. Center Discussion Paper 407, Economic Growth Center, Yale University.

Willigan, J., and Lynch, K. 1982. *Sources and methods of historical demography*. New York: Academic Press.

Willis, R. J. 1974. Economic theory of fertility behavior. In *Economics of the family,* ed. T. W. Schultz. Chicago: University of Chicago Press.

Wrigley, E. 1966. Family limitation in preindustrial England. *Economic History Review,* 2d ser., vol. 19.

———. 1968. Mortality in preindustrial England: The example of Colyton, Devon, over three centuries. *Daedalus,* vol. 97.

———. 1975. Baptism coverage in early 19th century England—the Colyton area. *Population Studies,* vol. 29.

Wrigley, E., and Schofield, R. 1981. *A population history of England, 1541–1871: A reconstruction*. London: Edward Arnold.

Yasuba, Y. 1962. *Birth rates of the white population in the United States, 1800–1860*. Baltimore: Johns Hopkins Press.

Young, C. 1978. French historical demography. *Working Papers in Demography,* vol. 9.