WOMEN’S SUFFRAGE, POLITICAL RESPONSIVENESS, AND CHILD SURVIVAL IN AMERICAN HISTORY

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Abstract:
Women’s choices appear to place greater weight on child welfare and the provision of public goods than those of men. Improving the status of women is therefore seen as a potent means of increasing investments in children. This paper presents new evidence on how a historical milestone in the advancement of American women— their enfranchisement through suffrage rights—helped children to benefit from the scientific breakthroughs of the bacteriological revolution. Consistent with standard models of electoral competition, I find that suffrage laws were followed by immediate shifts in legislative behavior and large, sudden increases in local public health spending. This growth in public health spending fueled unprecedented door-to-door hygiene campaigns, and child mortality in turn declined rapidly by 8-15% (20,000 annual child deaths nationwide) as cause-specific reductions occurred exclusively among infectious childhood killers sensitive to hygienic conditions.

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GIVE MOTHER THE VOTE
WE NEED IT

OUR FOOD OUR HEALTH OUR PLAY
OUR HOMES OUR SCHOOLS OUR WORK
ARE RULED BY MEN'S VOTES

Isn't it a funny thing
That Father cannot see
Why Mother ought to have a vote
On how these things should be?

THINK IT OVER
1. Introduction


Despite recent interest, this issue is not new; a long history links the status of women with child well-being. For example, the nineteenth century bacteriological discoveries of Ignaz Semmelweis, Louis Pasteur, Joseph Lister, Robert Koch, and others revolutionized scientific knowledge about disease, but it was decades before the public at large (and children in particular) enjoyed their most immediate benefits. Principal among them were the basics of good household hygiene: hand and food washing, water and milk boiling, meat refrigeration, and

¹ Kofi Anan, outgoing Secretary General of the United Nations, recently argued that gender equality is a “prerequisite” for achieving other Millennium Development Goals on infant survival, education, and poverty reduction (United Nations 2005). This view is also reflected in the popular media: “It is now accepted in most institutions… that without an improvement in women's lives,… children will not go to school, childhood disease will persist and younger and younger children, living in the most destructive poverty, will be vulnerable to abuses of all kinds…” (The Atlantic On-Line, 9/02/03). There has also been renewed controversy about whether or not women’s issues belong on child welfare agendas, especially when weighed against technological interventions known to promote child survival. For example, see discussions of the controversy surrounding outgoing UNICEF Executive Director Carol Bellamy (Sylva 2003, Horton 2004).
breastfeeding (Duffy 1990, Meckel 1990). In the United States, good household hygiene was
promoted through unprecedented door-to-door hygiene campaigns – and through charitable
organizations and then government, women were their leading advocates (Smith-Rosenberg
the success of hygiene campaigns to the rising influence of women (Lemons 1973, Meckel 1990,

This paper investigates how a historical milestone in the advancement of American
women – their enfranchisement – influenced child survival, drawing out new quantitative lessons
where there is rich qualitative history. Specifically, it relates the sharp timing of state-level
women’s suffrage laws enacted between 1869 and 1920 to state-level trend breaks in the voting
behavior of legislators, state and local public spending, and age- and cause-specific mortality.
This approach has a number of attractive features. First, America’s system of federalism created
enormous variation across states and over time in laws governing women’s suffrage. This
variation aids in the estimation of their consequences and permits a number of validity tests to
explore natural – but seemingly unfounded – concerns about the possibility of endogenous state-
level legislation. Second, although many related studies have focused on lump-sum transfers to
women, most policies and programs that ‘empower’ women have nuanced incentives with
theoretically ambiguous consequences for children (Becker 1981).³ Women’s suffrage rights
provide a salient example. Third, data from the early twentieth century United States is

² According to Richard Easterlin (1999), “At first, the new knowledge was promoted especially by women reformers
through voluntary organizations. But public health agencies assumed an increasing role…” Explaining this shift in
responsibility is a central objective of this paper.
³ Opponents of women’s enfranchisement often supported their position with arguments about the potential neglect
of children (Flexner and Fitzpatrick 1959). Many empirical studies of women’s status and child welfare have grown
from tests of unitary models of household behavior, focusing on lump-sum transfers targeted to women (Thomas
unusually rich in comparison with the vital statistics, public finance records, and legislative roll call data available in developing countries today.

In general, I find that the extension of suffrage rights to American women helped children to benefit from the scientific breakthroughs of the bacteriological revolution. As predicted by standard models of electoral competition (Hotelling 1929, Duverger 1954, Downs 1957, Shepsle 1979, Wittman 1983, Shepsle 1991, Baumgardner 1993, Alt 1994, Osborne 1995, Husted and Kenny 1997, Lott and Kenny 1999, Persson and Tabellini 2000, Besley and Case 2003, Besley, Persson, and Sturm 2006), support-maximizing politicians responded immediately to shifts in electoral preferences as voting rights were extended to women. Within a single year of suffrage law enactment, patterns of legislative roll call voting shifted dramatically, and local public health spending rose sharply by nearly 45%. Public health historians espouse this view as well. Describing the Sheppard-Towner Act of 1921 (a landmark federal public health appropriation immediately following the 19th Amendment in 1920), Richard Meckel (1990) observes that “fear of being punished at the polls by American women, not conviction of the bill’s necessity, seems to have motivated Congress to vote for it. As one senator admitted to a reporter from the Ladies Home Journal, ‘if the members of Congress could have voted on the measure in their cloak rooms, it would have been killed as emphatically as it was finally passed out in the open’” (Selden 1922, Meckel 1990). Growth in public health spending, in turn, was critical for scaling-up intensive door-to-door hygiene campaigns. Child mortality declined rapidly by 8-15% with the enactment of suffrage laws, and the causes of death that responded were exclusively infectious killers of children that are sensitive to hygienic conditions (diarrheal diseases, diphtheria, and meningitis). Nationwide, these reductions translate into roughly 20,000 averted child deaths each year.
A variety of corroborating validity tests bolster this paper’s major findings. Specifically, there is no evidence of: (1) relative increases or decreases in child mortality, public spending, or legislative behavior just before suffrage laws were enacted, (2) meaningful relationships between the timing of suffrage laws and the timing of other major Progressive Era events, (3) suffrage effects differing between states choosing to grant suffrage rights to women and states having women’s suffrage imposed on them by the 19th Amendment; (4) changes in child survival, public spending, or legislative behavior accompanying important women’s rights initiatives not ultimately leading to voting rights (i.e., ‘placebo’ experiments); (5) systematic relationships between suffrage laws and internal migration; and (6) confounding changes in the composition of births or fertile age women. Taken together, this evidence suggests that the extension of suffrage rights to women was itself likely responsible for substantial improvements in child survival, explaining about 10% of the striking child mortality decline between 1900 and 1930.\footnote{In 1900, one in five children did not survive to age five (US Bureau of the Census 1900). By the 1930s, the probability of dying by age five had declined by 65%, and life expectancy at birth had risen from 47 to 63 (US Bureau of the Census 1936, Preston and Haines 1991, Haines 2001). Much of this mortality decline is explained by reductions in infectious disease deaths as America underwent its epidemiological transition.}

Given the economic and epidemiological similarities between historical America and poorer countries today, I conclude by briefly considering this paper’s implications for contemporary public health and development challenges.

2. Background

2.1 The Historical Advancement of American Women and the Women’s Suffrage Movement

“Separate Spheres” Ideology and Women’s Voluntary Organizations

With the rise of industrialization during the nineteenth century, the social and economic “spheres” of American men and women became more distinct and segregated as men were
disproportionately drawn into jobs away from the home. However, women responded to this segregation by seizing the civic possibilities of their separate sphere and building civic voluntary organizations to promote ‘feminine virtues’ – both for their own edification and for the good of society. Some were comprised of elite, urban women, but more often they were grounded in religion and joined middle class women across many localities. Despite their heterogeneity, women’s voluntary organizations collectively capitalized on the perception of women’s moral superiority as homemakers and caregivers to promote broad public welfare agendas. A term popularized by women’s organizations – “municipal housekeeping” – provides a clear example of this strategy: “Woman’s place is in the home… But Home is not contained within the four walls of an individual home. Home is the community. The city full of people is the Family” (Dorr 1910). This “municipal housekeeping” ideology provided a philosophical foundation for the women’s movement in the late nineteenth and early twentieth centuries, and voluntary organizations supplied critical organizational infrastructure. They also provided a means of advancing a new child health and hygiene agenda during the Progressive Era (Smith-Rosenberg 1985, Meckel 1990, Skocpol 1992).

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5 Among the enormous diversity of women’s organizations, three stand out. One of the early leaders was the Women’s Christian Temperance Union, which sought to combat male irresponsibility on many fronts, including fighting prostitution, promoting temperance agendas in schools, running day nurseries for working mothers, supporting labor reforms to benefit working-class families, and eventually, working for women’s suffrage. Another prominent voluntary organization, the General Federation of Women’s Clubs, began as a literary organization but eventually coalesced into a vast network to advance a women’s and children’s issues. The Federation hosted large biennial conventions, published an official journal, maintained a national office, and created standing committees on civil service reform, education, home economics, pure food, library extension, public health, and industrial and child labor (Skocpol 1992). A third leader organized by the urban elite was the National Congress of Mothers (later to become the National Congress of Parents and Teachers, or the PTA).

6 When “men and women divide the work of governing and administering, each according to his special capacities and natural abilities,” the city “will be like a great, well-ordered, comfortable, sanitary household. Everything will be as clean as in a good home. Every one, as in a family, will have enough to eat, clothes to wear, and a good bed to sleep on. There will be no slums, no sweat shops, no sad women and children toiling in tenement rooms. There will be no babies dying because of an impure milk supply. There will be no ‘lung blocks’ poisoning human beings that landlords may pile up sordid profits. No painted girls, with hunger gnawing their empty stomachs, will walk in the shadows” (Dorr 1910).
The Women’s Suffrage Movement

The birth of the women’s suffrage movement went hand-in-hand with the birth of women’s voluntary organizations. Broad new ideals about women’s public and private roles were manifest both in emerging voluntary organizations and in the agenda articulated by Lucretia Mott and Elizabeth Cady Stanton at the famous women’s rights convention held in Seneca Falls, New York during the summer of 1848. The end of the Civil War invigorated the women’s suffrage movement as the emancipation of slaves and the (ostensible) extension of voting rights to black men in 1870 under the 15th Amendment called new public attention to the issue of expanding the electorate (Flexner and Fitzpatrick 1959).7

State-level suffrage efforts during the late 19th century generally proclaimed social justice as the basis for enfranchising women and emphasized two types of activities – organizing meetings of already-sympathetic women to increase membership in suffrage organizations and discreetly lobbying state legislators (McCammon 2003). The movement had several unanticipated early successes in the west (in the territories of Wyoming in 1869 and Utah in 1870 and later in Colorado and Idaho), surprising both proponents and opponents alike (Flexner and Fitzpatrick 1959, Dubois 1998).8

These early successes were followed by a period of slowed progress and setbacks, however, leading the suffrage movement to shift its focus to reaching the broader public. Women organized informal open-air meetings, delivered street-corner speeches on soap-boxes, distributed flyers, ran newspaper advertisements, and staged parades to raise the visibility of the

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7 In 1869, two new organizations explicitly dedicated to the cause of women’s suffrage emerged: a more radical organization focused on Constitutional change (The National Woman Suffrage Association, led by Elizabeth Cady Stanton and Susan B. Anthony) and a more moderate organization emphasizing state-level reforms (The American Woman Suffrage Association, led by Lucy Stone and Henry Blackwell). The two formally joined forces in 1890, merging to form the National American Woman Suffrage Association (NAWSA).

8 For example, Wyoming’s otherwise staunchly conservative governor at the time, John Campbell, reportedly signed women’s suffrage into law because of a little-known women’s meeting which he enjoyed attending as a child in his hometown of Salem, Ohio (Flexner and Fitzpatrick 1959).
suffrage cause (McCammon 2003). Suffragists also reshaped the content of their message, aligning it more closely with “municipal housekeeping,” stressing women’s superior morality and the potential social benefits of “public motherhood” (McCammon and Campbell 2001, King, Cornwall, and Dahlin 2005). The result was a string of new successes, especially in the West and Midwest. Before the ratification of the 19th Amendment gave women the Constitutional right to vote in 1920, 29 of 48 states had already extended suffrage rights to women. Figure 1 shows the timing of suffrage laws in American states.

Explaining the Spatial and Temporal Pattern of State-Level Women’s Suffrage Laws

Understanding the timing of state-level suffrage laws is important for evaluating the validity of this paper’s empirical strategy. This section briefly reviews historical evidence; the Validity Tests section presents a variety of more formal statistical evidence.

The most obvious pattern of state-level suffrage law adoption is geographic – all else equal, women in western states could vote before women elsewhere in America (as shown in Figure 1). Some historians argue that frontier conditions were amenable to women’s suffrage for at least two reasons (Brown 1958, Grimes 1967). One is rooted in “municipal housekeeping.” Because women generally supported restrictions on drunkenness, gambling, and prostitution, enfranchising them was seen as a means of re-asserting Puritan values among young, single, transient men in the West (McCammon and Campbell 2001). The other is that the harsh realities and practical demands of frontier life made the distinction of traditional gender roles

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9 Although most laws passed before the 19th Amendment extended full suffrage rights to women, some only extended partial rights (presidential- and primary-only voting rights). These partial suffrage laws were generally enacted in the Midwest shortly before the 19th Amendment. Presidential suffrage laws were enacted in Illinois, Indiana, Iowa, Maine, Minnesota, Missouri, Nebraska, North Dakota, Ohio, Rhode Island, Tennessee, Vermont, and Wisconsin. Primary suffrage laws were enacted in Arkansas and Texas. As described in the data section, this paper’s results are not sensitive to how suffrage rights in these states are coded.

10 The earliest efforts in western territories also sought to attract female settlers to offset gender imbalances among frontier populations (Marilley 1996).
more difficult to maintain as families struggled to establish new homes and communities in the unsettled wilderness (Schiffman 2006).

Other historians argue that idiosyncratic circumstances in each state resulted in the vote for women (Larson 1971, Beeton 1986, McCammon and Campbell 2001, King, Cornwall, and Dahlin 2005). The remarkably poor correspondence between suffrage movement strength and the enactment of suffrage laws generally supports these claims. Historical evidence often cited in support of this view includes: (1) The absence of an organized movement in Wyoming (where the first suffrage law was passed); (2) The absence of a suffrage law in Connecticut (where the first state women’s suffrage organization was established) prior to the 19th Amendment; (3) Equivalent suffrage organization membership in the West and the South (where suffrage efforts were most and least successful, respectively); (4) Early suffrage mobilization in eastern states not followed by early suffrage law enactment; and (5) The correlation between movement strength and suffrage bill introduction not extending to bill passage (Baumgartner and Leech 1998, McCammon 2001, McCammon and Campbell 2001, Schiffman 2006).

Two broad explanations for the timing suffrage laws have also been tested quantitatively: those emphasizing institutional differences across states and those emphasizing differences in the social and economic roles of women. However, this literature yields strikingly contradictory results (McCammon 2003, Cornwall, Dahlin, King, and Schiffman 2004, McConnaughey 2004, King, Cornwall, and Dahlin 2005). The single robust correlate of suffrage law enactment emerging from these studies is the share of women working non-agricultural occupations (King, Cornwall, and Dahlin 2005). This variable presumably reflects changing social norms about the role of women, but because it evolved very gradually over time (Smith and Ward 1985, Goldin

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11 The literature itself has drawn conclusions such as: “Movement mobilization explanations of suffrage success have proved insufficient” (Cornwall, Dahlin, King, and Schiffman 2004).
1990 and 2006), it can be distinguished econometrically from abrupt year-to-year legislative changes governing women’s right to vote (as discussed in detail under *Validity Tests*).

2.2 Women, Hygiene Campaigns, and the “New Public Health”

Early public health efforts targeting infants and children generally emphasized the provision of pure milk to mothers through local milk stations (Duffy 1990, Meckel 1990, Ferrie and Troesken 2005, Lee 2006). In 1906, however, a critical assessment of milk station activities led the Association for Improving the Condition of the Poor (and the New York Milk Committee) to conclude that providing clean milk to infants just scratched the surface of the potential health benefits of good hygiene – and that educating mothers about household hygiene more broadly was the most promising approach for improving infant and child survival (Phillips 1909). This conclusion heralded the beginning of a “new public health”: milk stations and sanitary engineering had fulfilled much of their promise, and further health improvements depended critically on providing widespread information about importance of good personal and household hygiene. This ideological shift was accompanied by demonstrated results; the widely publicized effectiveness of the New York Milk Committee’s household hygiene modification program quickly led to copycat programs around the country (Meckel 1990).

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12 This section draws heavily on Meckel (1990).

13 This new emphasis rapidly gained momentum, as reflected in the names of two of the oldest and most prominent schools of public health established during this period: the Johns Hopkins School of Hygiene and Public Health and the London School of Hygiene and Tropical Medicine. Demographer Edward Bunnell Phelps quantitatively demonstrated that milk stations were not having a significant impact on the urban death rate and called for “universal education which will develop more intelligent motherhood and through the home reduce infant mortality” (Wile 1912). Charles Chapin’s widely-read column in the American Journal of Public Hygiene declared: “Good milk for bottle-fed babies is a necessity, but the education of mothers in the care of children will do more than all else to reduce infant mortality.” Later, the newly-formed Children’s Bureau similarly declared: “It is useless to send pure milk into a dirty home to be handled by an ignorant, dirty mother or older child. It is necessary to reach the mothers, not only to teach them how to care for their baby’s milk, but also to convince them of the necessity of cleanliness.”
However, hygienic home modification required regular home visits and individualized education. Charitable organizations were already conducting these activities on a small scale, but in 1910, the newly formed American Association for Study and Prevention of Infant Mortality argued that only government had the authority, resources, and centralized administrative capacity to effectively coordinate large-scale hygiene campaigns (AASPIM, 1910). What developed were public-private partnerships – local public funds supporting door-to-door hygiene campaigns that built upon the existing infrastructure of philanthropic organizations (Neff 1910, Meckel 1990). The ability to channel new public sector appropriations into standing charitable programs made rapid health improvement possible.

Although physicians and lay health workers were employed, community-based nurses were the true backbone of household hygiene campaigns. Nurses were each assigned a district and made responsible for all families in that district with babies born between the end of May and the beginning of September (when infectious disease incidence and infant/child mortality rates peaked). Learning of a birth either from departmental records or from door-to-door canvassing, nurses visited the new mother, examined the infant and other children in the household, encouraged breastfeeding, and provided intensive person-to-person education about hygienic practices. The nurse would continue visiting the household throughout the summer, monitoring hygienic conditions and the health of all household children. The growing ‘ideology of instructed motherhood’ also created fertile soil for hygiene campaigns to succeed – nurses

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14 According to Richard Easterlin (1999), “In the case of infectious disease control… The most important decision-making units have been households and governments… Of the two, governments have been more fundamental than households, because the adoption of new household methods required education programmes that were largely promoted by governmental agencies.”

15 State health departments also attempted to target mothers outside of cities by conducting statewide maternal education campaigns consisting of traveling exhibits, lantern slide shows, films sent to county fairs, and health officer circuit lectures on infant and child health (Children’s Bureau 1916).
overwhelmingly reported that when the benefits of improved hygiene were demonstrated, mothers eagerly embraced them.

Historians are relatively silent about the relationship between state-level women’s suffrage and state and local hygiene campaigns, but they are outspoken about this relationship at the national level. A salient example is the case of the 1921 Sheppard-Towner Act, a landmark five-year public health appropriation and the single most dramatic expansion of the federal Children’s Bureau. Women’s organizations lobbied hard for passage of the act, and the long-standing perception of women’s superior morality made it difficult for legislators to ignore their demands (Skocpol 1992). Not coincidentally, it was passed immediately after all women were given the right to vote under the 19th Amendment in 1920 – even before actual patterns of female voting had become clear. In the words of one historian, the “principal force moving Congress was fear of being punished at the polls. Politicians feared that women voters would cast a bloc vote or remain aloof from the regular parties” if their convictions about child welfare were not heeded (Lemons 1973).16

3. Data and Empirical Strategy

3.1 Data

To investigate how women’s suffrage was related to child survival, state-level mortality data by age/sex and by cause is needed. However, there was no national system of death records in the United States prior to 1933 (Haines, 2001). The Bureau of the Census first established an official ‘Death Registration Area’ in 1880 and began publishing its annual Mortality Statistics for death registration states (those deemed to have adequate death registration systems) in 1900

16 In the ensuing seven years, the Children’s Bureau alone coordinated a nationwide program that distributed “over 22 million pieces of literature, conducted 183,252 health conferences, established 2,978 permanent prenatal centers, and visited over 3 million homes” (Ladd-Taylor 1986).
(US Bureau of the Census 1900 to 1936, Haines 2001). As shown in Appendix Figure A1, the registration area grew from ten states in 1900 to include all forty-eight states in 1933.\textsuperscript{17} Using the published historical series, I have constructed an unbalanced panel of annual state-level deaths by age/sex and by cause for years 1900-1936.\textsuperscript{18} Descriptive Statistics are shown in Panels A and B of Table 1 (also see the Appendix 1 for a more complete description of the data).

Conducting analyses with an unbalanced panel of state-level deaths raises the potential concern that entry into the death registration area was correlated with the timing of women’s suffrage laws (or their social, demographic, or economic determinants). To explore this possibility, regressions of registration area entry dates were run on state socio-economic characteristics in 1900 (literacy, employment, manufacturing sector wages, and workforce share in the manufacturing sector), the dates of major Progressive Era events (laws governing women’s suffrage, divorce/alimony rights, mother’s pensions, minimum wage and maximum hours of work for women, prohibition, workers’ compensation, child labor, and compulsory education), and the dates that GFWC chapters were founded in each state. The results (not shown) reveal no statistically meaningful relationships.\textsuperscript{19} Figure 2 also plots the distribution of time between death

\textsuperscript{17} Delaware technically entered the death registration area in 1890 but does not appear in the annual Mortality Statistics until 1919.

\textsuperscript{18} I have made this data available on-line at: http://www.nber.org/data/vital-statistics-deaths-historical/; to the best of my knowledge, the state-level Mortality Statistics series has not previously been digitized. Specific causes of death reported consistently throughout the 1900-1936 period include typhoid fever, malaria, small pox, tuberculosis, measles, scarlet fever, whooping cough, diphtheria, influenza, meningitis, pneumonia, childbirth-related causes, diabetes, heart/circulatory disease, nephritis, cancer, violent accidents, and suicide.

\textsuperscript{19} Available upon request. Because the annual mortality statistics are not available before 1900, this paper focuses on suffrage laws that were passed after 1900. Specifically, for states $s$, I estimate: $l_s = \alpha + \mu x_s + \epsilon_s$, where $l$ is the date of death registration entry and $x$ is state-specific covariate (either a state socio-economic characteristic in 1900 or a Progressive Era event. State characteristics in 1900 are available in the 1900 population census (United States Census Office 1902) and were provided by John Lott and Larry Kenny; Progressive Era event dates are available in Skocpol (1992) and Fishback and Kantor (1996) and child labor and compulsory schooling data was provided by Adriana Lleras-Muney.
registration area entry and women’s suffrage rights in each state, showing considerable density around the enactment of suffrage laws.\(^{20}\)

These state-level mortality statistics were then matched to information about when women gained the legal right to vote in each state (Lott and Kenny 1999). As shown in Figure 1, twenty-nine states extended the right to vote to women before Nineteenth Amendment was approved in 1920. Among the other nineteen states, seven approved the amendment and twelve had suffrage imposed on them. In this paper, I follow Lott and Kenny (1999) by not distinguishing partial and full suffrage rights, recognizing the flux of electoral rules during this period and uncertainty among politicians about the inevitability of full enfranchisement following partial suffrage laws. Sensitivity analyses indicate that drawing this distinction does not influence my conclusions.\(^{21}\)

To explore how women’s suffrage was related to the size and composition of public spending, I also matched local and state public finance data with the mortality statistics and legislation data. For hygiene campaigns, local health department spending was most important. To examine how suffrage laws were related to changes in local public finance, I digitized and aggregated annual nominal health-related spending data for all cities with populations exceeding 30,000 listed in the *Statistics of Cities* (1905-1909) and the *Financial Statistics of Cities* (1909-1913, 1915-1919, and 1921-1930) to the state level.\(^{22}\) The specific health-related spending categories that can be harmonized across years include health conservation and sanitation cost

\(^{20}\) The decrease in mortality data coverage seven and eight years before suffrage law enactment is due to the absence of gender-specific mortality data in 1912 and 1913 (seven and eight years before the 19th Amendment was ratified). This paper’s main results are not sensitive to combining sex-specific mortality, for which data is available in 1912 and 1913.

\(^{21}\) The major distinction relevant to this paper’s analyses is the creation of presidential-only suffrage rights in midwestern states between 1917 and 1919. Excluding these states or re-coding their woman suffrage dates to be 1920 (the ratification of the 19th Amendment) amplifies the infant and child mortality declines that I present in Section 4, but not significantly so.

\(^{22}\) I use samples with cities present in all years, but the results are insensitive to including cities that enter and exit during the 1905-1930 period as well.
payments; health conservation and sanitation outlays; charities, corrections, and hospital cost payments; and charities, corrections, and hospital outlays.\textsuperscript{23} I also collected information about total cost payments and total outlays. Local funds supporting public-private hygiene campaigns (that built on existing charitable infrastructure) are primarily captured by cost payments for charities, corrections, and hospitals. Descriptive statistics for the city-level public finance data are shown in Panel C of Table 1; Appendix 1 describes this data in more detail.

State spending was also important for bolstering local health department activities. Real annual information about state revenue and spending between 1900 and 1931 was provided by Larry Kenny and John Lott (Lott and Kenny 1999).\textsuperscript{24} The specific categories of revenue and spending that are comparable over time include: total public spending, total public revenue, property tax revenue, transportation spending (current and capital expenditures on highways), education spending (current and capital expenditures on elementary and secondary schools) and social service spending (current expenditures on state health boards, charities, hospitals, and corrections). State health board spending captured by the social service spending category was commonly directed to establishing and strengthening city public health departments. Descriptive statistics for the state-level public finance data are shown in Panel D of Table 1.

State and local public finance information is not available for all cities, states, and years between 1900 and 1930 (or 1931). As with the mortality statistics, a potential concern is that the availability of public finance data is correlated with women’s suffrage (or its determinants). To test this concern, probit specifications were used to estimate how the presence of public finance

\textsuperscript{23} The US Bureau of the Census (1914) defined cost payments as “payments of cities and other municipalities for their expenses, interest, and outlays, less amounts which have been returned or are to be returned by reason of error or otherwise.” Outlays are defined as “the costs of property, including land, buildings and equipment, and public improvements more or less permanent in character.”

\textsuperscript{24} Lott and Kenny (1999) obtained the state-level public finance data from the Financial Statistics of States for years 1915-1919 and 1921-1931 and made this series comparable with data provided by John Wallis for earlier years (see Sylla, Legler, and Wallis ICPSR Study # 9728, “Sources and Uses of Funds in State and Local Governments, 1790-1915”).
data in each state - year is correlated with state socio-economic characteristics in 1900 and the
dates of Progressive Era events. Similar analyses were conducted using the share of missing
local public finance data in each state. The resulting estimates (not shown) reveal no statistically
meaningful associations. For both state and municipal public finance data, Figure 2 shows the
distribution of time between year of observation and year of women’s suffrage legislation. The dip
in state-level public finance data coverage is due to an unexplained absence of 1920 data in the ICPSR
Study Number 9728 data compiled by Richard Sylla, John Legler, and John Wallis. This paper’s main results are
not sensitive to excluding states in which women could first vote in 1920.

Data coverage around the years of suffrage law enactment is again high.

Although key public health appropriations during the Progressive Era were made
primarily made at local and state level, to the best of my knowledge, local and state legislative
roll call data have not been systematically compiled (and critical appropriations decisions are
made at the committee and subcommittee level anyway). Nevertheless, legislative responses to
women’s suffrage laws should also be evident at the federal level in the Senate and the House of
Representatives. I therefore obtained roll call data for all votes brought to the Senate and House
floors between 1900 and 1930 (during the 56th through 71st Congressional sessions) from the
publicly available Voteview database (www.voteview.com). Because women’s voluntary
organizations were outspoken advocates of the Progressive Era reform agenda, each Senate and
House bill was coded according to whether or not it was broadly consistent with this agenda.
Votes were then aggregated across legislators and bills to the state-year level separately for the
Senate and the House, yielding the share of possible votes cast by legislators from each state in
each year that were ‘Progressive.’ (For the definition of ‘Progressive’ adopted as well as the
details of how the roll call data were coded, see Appendix 1.)

Finally, I use additional supplemental data sources to conduct a variety of validity tests.

To explore the possibility of confounding social liberalization or changing social norms, I

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25 The dip in state-level public finance data coverage is due to an unexplained absence of 1920 data in the ICPSR Study Number 9728 data compiled by Richard Sylla, John Legler, and John Wallis. This paper’s main results are not sensitive to excluding states in which women could first vote in 1920.
conducted placebo tests using data provided by Marie Cornwall on the timing of state-level efforts to enfranchise women (through referenda and constitutional conventions) that made progress but ultimately failed. This data is the product of archival projects conducted by Marie Cornwall, Brayden King, Eric Dahlin, and Holly McCammon. Additionally, to explore confounding compositional changes acting through fertility or migration, I use 1% samples of the 1900, 1910, 1920, and 1940 population censuses made available through the University of Minnesota Population Center’s Integrated Public Use Microdata Series (IPUMS).

3.2 Empirical Strategy

Exploiting rich spatial and temporal variation in the timing of state-level women’s suffrage laws after 1900, I use a simple difference-in-difference approach to estimate changes in public spending, Progressive voting among legislators, and mortality by age/sex and cause associated with suffrage rights. Specifically, for states $s$ and years $y$, I estimate equations of the following general form:

$$\ln(d_{sy}) = \alpha + \beta v_{sy} + \delta_s + \delta_y + \delta_s \times t + \epsilon_{sy}$$

where $d$ is an outcome of interest (public spending, Progressive voting, or deaths by age/sex or cause) in state $s$ and year $y$, $v$ is a dummy variable indicating whether or not women could legally vote, $\delta_s$ and $\delta_y$ are state and year fixed effects, and $\delta_s \times t$ represents state-specific linear time trends. The parameter of interest in this simple specification is $\beta$.

In this econometric framework, only the timing of state suffrage laws is assumed to be exogenous. Fixed differences across states, common factors varying non-linearly over time (such as the establishment of the Children’s Bureau in 1912), and state-specific differences that
vary linearly over time are all purged from the estimate of $\beta$. Only trend breaks in the outcomes of interest that coincide precisely with the timing of women’s suffrage laws are captured by this parameter. The validity of the identifying assumption is explored in detail in Section 5.

A brief note on the use of deaths rather than death rates as dependent variables is also warranted. Because state-level population counts by age are not available annually between decennial population censuses, annual mortality rates cannot be constructed directly from annual deaths. Population projection techniques commonly used by demographers can be used estimate denominators for these rates, but they are essentially sophisticated methods of interpolation that employ no additional intercensal information. The inclusion of state fixed effects and state-specific time trends therefore accomplishes the same objective.

4. Results

4.1 Political Responsiveness to Women’s Suffrage

Historical accounts clearly suggest that women’s enfranchisement improved child survival through its impact on public spending (Selden 1922, Lemons 1973, Meckel 1990) and that local public health spending growth fueled the Progressive Era’s unprecedented door-to-door hygiene campaigns. This section provides direct evidence on how public spending and legislative behavior responded to suffrage laws, and Section 4.2 then traces these changes in political economy through to child health outcomes.

Public Spending

26 The results are also not sensitive to the inclusion of state-specific quadratic or higher-order trends in equation 1.
Assuming that the policy preferences of men and women differ, standard models of electoral competition predict that the extension of voting rights to women should cause politicians’ support-maximizing policy positions to shift immediately to better reflect women’s preferences (Hotelling 1929, Duverger 1954, Downs 1957, Shepsle 1979, Wittman 1983, Shepsle 1991, Baumgardner 1993, Alt 1994, Osborne 1995, Husted and Kenny 1997, Lott and Kenny 1999, Persson and Tabellini 2000, Besley and Case 2003, Besley, Persson, and Sturm 2006). These immediate shifts should be based on politicians’ expectations of how women will vote – even before women’s voting patterns are actually observed. Following historical accounts, I first investigate changes in the size and composition of municipal public spending related to public health and hygiene. Using residuals obtained by estimating the equation 

$$\ln(p_{sy}) = \alpha + \delta_s + \delta_y + \delta_s \times t + \epsilon_{sy}$$

for municipal public finance measures $p$ (health conservation and sanitation cost payments; charities, corrections, and hospital cost payments; and total cost payments) in states $s$ and years $y$, Figure 3 plots residual means for the five years preceding and following state suffrage law enactment (indexed to the year that women gained voting rights – defined as year 0). It shows no relative increase or decrease in local spending prior to suffrage laws followed by sharp increases that coincide precisely with the laws. The immediacy of these increases is consistent with theoretical predictions. Although hygiene campaign spending is not detailed in the historical public finance data, the primary category capturing hygiene spending is cost payments for charities, corrections, and hospitals. As noted earlier, this is because hygiene campaigns grew as public-private partnerships with public funds scaling-up pre-

27 The event study line in Figure 3 should actually be shifted to one year later than shown (or all data points to one year earlier) for two reasons. One is that fiscal years for municipal governments generally began mid-year but are reported for calendar years corresponding to the latter part of the fiscal year (US Bureau of the Census 1913b). The other is that the Financial Statistics of Cities reports data gathered from both municipal comptroller and treasury accounts, and treasury accounts frequently reflect finances and transactions from the preceding year due to common accounting practices (US Bureau of the Census 1913a).
existing charitable efforts through charitable infrastructure and are therefore reflected in charity spending.\textsuperscript{28}

To examine changes in the size and composition of municipal spending throughout the study period, variants of equation 1 were estimated with local public finance measures as dependent variables. Because the dependent variables are in logarithmic form, the coefficient estimates can roughly be interpreted as percent changes. Panel A of Table 2 shows these results. Women’s suffrage is associated with a 7\% increase in total municipal spending, a 6\% increase in spending on health conservation and sanitation, and strikingly, a 45\% increase in cost payments for charities, hospitals, and corrections. Panel B then reports estimates for state spending. The enfranchisement of women is associated with a 24\% increase in state social service spending, but not with changes in any other state public finance measure.\textsuperscript{29} Although state spending was not directed toward hygiene campaigns or related activities, state health boards played important roles in developing the capacity of local public health departments.

\textit{Voter Turn-out and Legislative Roll Call Behavior}

The changes in public finance shown in Figure 3 and Table 2 – which were instrumental in bringing the hygienic benefits of the bacteriological revolution to the American public – reflect changes in legislative behavior. This section provides direct evidence on changes in the political economy of states.

\textsuperscript{28} Hospitals made negligible contributions to population health until the development of sulfa drugs in the 1930s, and it is doubtful that corrections spending would influence only childhood infectious diseases sensitive to hygienic conditions (see mortality results in section 4.2).

\textsuperscript{29} State social service spending includes appropriations for hospitals, charities, corrections, and state health boards. Given that social service spending is a small share of total spending, increases in total spending are presumably difficult to detect.
First consider patterns of voter turn-out. Figure 4 shows an event study graph (constructed in the same way as Figure 3) of state-level voter participation among adults ages 21 and older. Although participation is not shown by sex, voter turn-out increased abruptly with the enactment of women’s suffrage laws. Regressions (not shown) of voter participation on a suffrage dummy, state and year fixed effects, and state-specific linear time trends imply that turn-out increased by 44% when the franchise was extended to women (Lott and Kenny 1999). This pattern of electoral participation is consistent with expectations among legislators that female voting would be an important strategic consideration in selecting support-maximizing policy positions.

Political responses should also be directly evident in the voting behavior of legislators. To the best of my knowledge, historical roll call data is not systematically available for state and local legislatures. (Critical public health appropriations decisions reflected in Table 2 are made at the committee and subcommittee level and would therefore not be evident in roll call data anyway.) To further test the prediction of immediate changes in political behavior, I instead use Congressional roll call data. My specific hypothesis is that as women gained the right to vote in individual states, Congressional representatives from those states should immediately alter their roll call voting to better reflect women’s preferences. Because bills pertaining to local public health and hygiene are seldom presented at the federal level, I instead assess the consistency of Congressional voting with the broad Progressive Era reform agenda promoted by highly-visible women’s voluntary organizations.

Figure 5 (constructed the same way as Figures 3 and 4) shows Progressive voting among legislators in the Senate and the House of Representatives as women gained the right to vote in

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30 Results available on request. The coefficient estimate on the women’s suffrage dummy is .1206 (with a standard error of .0238). Relative to average voter turnout the year before suffrage laws were enacted (27.60%), this is a 44% increase. The voter participation data was provided by Larry Kenny (Lott and Kenny 1999).
legislators’ home states.\textsuperscript{31} With the passage of these laws, roll call voting among senators immediately became more Progressive; no such response is evident in the House. Although the reason for this difference in behavioral response by legislative body is unclear,\textsuperscript{32} the overall pattern is again generally consistent with theoretical predictions. Parametric estimates of $\beta$ in equation 1 for the entire period 1900-1930 (shown in Table 3) suggest that women’s suffrage was associated with a 23% increase in ‘Progressive’ voting in the Senate.

4.2 Mortality by Age/Sex and Cause

My ultimate interest is to trace changes in local political economy linked to women’s suffrage through to changes in child survival. Using residuals obtained by estimating the equation $\ln(d_{sy}) = \alpha + \delta_s + \delta_y + \delta_s \times t + \epsilon_{sy}$ for age specific deaths $d$ in states $s$ and years $y$, Figure 6 plots residual means for age-specific mortality by gender for years relative to women’s enfranchisement. In general, it shows rapid mortality declines for both boys and girls when suffrage legislation was enacted.\textsuperscript{33} The timing of these reductions is again consistent with the proposition that suffrage led to abrupt increases in local public health spending that fueled the Progressive Era’s unprecedented door-to-door hygiene campaigns.

Figure 7 shows estimates of $\beta$ obtained by estimating equation 1 for deaths by sex in each age interval reported consistently over time between 1900 and 1936 (0-1, 1-4, 4-9, 10-14, etc.). In general, women’s suffrage is associated with mortality reductions for children at all ages between age one and age nineteen, but not for infants (defined as those under age one) or for

\textsuperscript{31} The direct election of Senators began in 1913 with the ratification of the 17th Amendment.

\textsuperscript{32} One possible explanation for this pattern of results is that because members of the House represent smaller areas, they know their constituents better than do Senators. By the late 1920s, it became evident that women were not in fact voting as differently from men as was at first anticipated (Meckel 1990, Skocpol 1992). I thank Pam Nickless for suggesting this explanation.

\textsuperscript{33} Deaths under age 1 appear somewhat lower the year before suffrage laws, but Appendix Table A1 shows that this drop is not statistically meaningful. More generally, there is no statistically meaningful association between suffrage laws and infant deaths reported in the main results (as described below, see Figure 7).
adults at any age.\textsuperscript{34} In contrast with contemporary evidence on women’s bargaining power within the household in developing countries, there are no meaningful gender differences in the survival gains associated with women’s suffrage (Duflo 2003, Qian 2005).

These child mortality reductions are large, with point estimates ranging from 8% to 15%.\textsuperscript{35} Because child mortality is heavily concentrated at young ages, the great majority of absolute gains in child survival occurred at young ages. To place these estimates in context, mortality rates in death registration states fell by 72% for children ages 1 to 4 and 59% for children ages 5 to 9 between 1900 and 1930. The proportions of these declines explained by the estimates in Figure 7 are 5% and 10%, respectively.\textsuperscript{36} In absolute terms, these reductions imply approximately 20,000 averted child deaths nationwide each year relative to mortality the year prior to suffrage law enactment.\textsuperscript{37}

I then investigate specific causes of death that declined as women gained the right to vote. State-level mortality data disaggregated simultaneously by age and cause is reported erratically between 1900 and 1936, but changes in cause-specific mortality at all ages can reasonably be attributed to children given that I find no evidence of adult mortality change. Moreover, certain infectious diseases were notorious child-killers that did not strike adults.

Table 4 shows suffrage estimates obtained by re-estimating equation 1 with cause-specific deaths

\textsuperscript{34} Because most infant deaths are birth-related and are concentrated in the neonatal period (the first 28 days following birth), the absence of infant mortality effects is not surprising given the rudimentary state of early twentieth century obstetrics (even relative to other specialties). Midwives delivered a large share of babies but were incapable of managing common complications of childbirth and managed hygiene poorly in the birth setting (Meckel 1990, Preston and Haines 1991). Despite the large shift of childbirth from home to hospital between 1900 and 1930, birth conditions did not improve and may have even deteriorated; maternal mortality rates did not decline at all in absolute terms until the mid-1930s (Thomasson and Treber 2004). Public health campaigns emphasizing hygiene within homes did little to address birth conditions.

\textsuperscript{35} Excluding states in which women were unable to vote until the 19\textsuperscript{th} Amendment was ratified in 1920 yields the same pattern of results.

\textsuperscript{36} To calculate these shares, the fraction of years women could vote in each state between 1900 and 1930 was used to weight the mortality reductions shown in Figure 7.

\textsuperscript{37} This number is obtained by multiplying mean age-specific deaths the year before suffrage laws were enacted at ages for which statistically significant estimates are shown in Figure 7 by the corresponding point estimates in Figure 7, multiplying by 48 to obtain implied nationwide magnitudes at each age, and then summing across ages.
as dependent variables. The only causes of death that responded to suffrage laws were diarrheal
diseases (under age two – a reporting anomaly), meningitis, and diphtheria, with reductions of
11%, 23%, and 24%, respectively. All three were leading infectious killers of children (but not
adults) during the Progressive Era, and importantly, all three can be effectively combated
through good household hygiene.\(^{38}\)

To explore how mortality reductions associated with women’s suffrage evolved over
time, variants of equation 1 were re-estimated with additional suffrage dummy variables lagged
by varying amounts of time.\(^{39}\) As discussed below under \textit{Validity Tests}, there is no evidence that
the composition of births or surviving adult caregivers changed under women’s suffrage.
Instead, any changing mortality effects over time are most likely due to changes in the
composition of surviving children or to behavioral responses to the disease environment (Dow,
Holmes, Philipson, and Sala-i-Martin 1999, Philipson 2000). Figures 8a and 8b show results for
time lags of 3 and 6 years and for time lags of 5 and 10 years, respectively. In general, there is
little evidence of changing suffrage effects over time, and the main suffrage estimates are robust
to lag structure choice. The exception is that survival gains may have eroded for children over
age ten a decade after suffrage laws were enacted. Given the absence of lagged effects at other
ages, this pattern of results probably reflects that those initially saved at younger ages by
improved hygiene were relatively weak and therefore more likely to die at older ages (rather than
reflecting behavioral responses to hygiene campaigns or changes in survival). Appendix 2

\(^{38}\) Meningitis is an inflammation of the membrane surrounded the brain and spinal column generally caused by any
of roughly fifty types of bacteria. Good household hygiene was the best prevention at the time (it is transmitted by
respiratory droplets and other bodily fluids), although there were some early therapeutic successes with intrathecal
equine meningococcal antiserum and then sulfaf drugs before the advent of modern antibiotics. Diphtheria is an
upper respiratory-tract illness caused by airborne bacteria. A partially effective antitoxin became available in the
1890s, but its use was not widespread; sulfaf drugs became the most effective modern therapy. Specific types of
diarrheal disease are not well defined in the historical mortality statistics (other than typhoid fever); the best
preventive household measures were hand and food washing and water and milk boiling.

\(^{39}\) Specifically, for t=3 and t=5, I estimated: \(\ln(d_{t,y}) = \alpha + \beta_1 y_{t,y} + \beta_2 y_{t,y+1} + \beta_3 y_{t,y+2} + \delta_s + \delta_y + \delta_s \times t + \epsilon_{t,y}\)
suggests that there was little mortality convergence among states with higher and lower mortality levels as women began voting.

5. Validity Tests

Natural concerns with the empirical strategies employed in this paper include the possibility of endogenous state-level suffrage legislation and confounding changes in the composition of state populations. This section presents a range of tests that investigate – and fail to corroborate – such concerns.40

First, I assess whether or not there were relative increases or decreases in child mortality, cause-specific mortality, state and local public spending, or Progressive voting just before women’s suffrage laws were adopted (staggered across states and over time in the same pattern as the laws). Any such changes might suggest that estimates of $\beta$ in equation 1 mistakenly capture mean reversion or reflect pre-existing trends. To test for trend breaks just prior to passage of laws, dummy variables denoting time periods two, four, and six years before suffrage ($v_{t-z, t-1}$ for suffrage year $t$ and $z = 2, 4, \text{ and } 6$) were incorporated into variants of equation 1:

$$\ln(d_{sy}) = \alpha + \pi v_{t-z, t-1} + \beta s + \delta_s + \delta_y + \delta_y \times t + \epsilon_{sy}. \quad 41$$

For all dependent variables found to be related to women’s suffrage, Appendix Table A1 reports estimates of $\pi$. All are statistically indistinguishable from zero.

Second, I investigate how suffrage law dates are related to state-level social, economic, and demographic conditions in 1900 (literacy, employment, manufacturing wages, and workforce share in manufacturing), the dates of major Progressive Era laws (governing

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40 For simplicity, I present results throughout this section for all outcomes with statistically significant estimates in Section 4. There are also no statistically meaningful results in this section’s analyses for outcomes with insignificant estimates in Section 4.

41 The results are not sensitive to the specific lead structure chosen.
divorce/alimony rights, mother’s pensions, minimum wage and maximum hours of work for women, prohibition, and workers’ compensation), and the dates that GFWC chapters were established in each state. Specifically, for states $s$, I estimate: $l_s = \alpha + \rho x_s + \epsilon_s$, where $l$ is the date of suffrage law enactment and $x$ is a state-specific covariate. Appendix Table A2 shows estimates of $\rho$ obtained from separate regressions – there are no meaningful relationships between the timing of women’s suffrage laws and any of these covariates.\textsuperscript{42} The timing of suffrage laws does not generally appear related to a broad array of social, economic, and demographic measures. Because the estimates in Appendix Table A2 are imprecise, Figure 9 also shows the distribution over time of state-level suffrage laws and other major Progressive Era events. It reveals no clear pattern of similarities between the distribution of suffrage law years and other important Progressive Era reforms.

Third, if there were state-level social or political trends that fostered both women’s suffrage and better child health, estimates of $\beta$ in equation 1 for mortality, public spending, and roll call behavior should differ between states that voluntarily extended suffrage to women and those that had it imposed on them by the 19th Amendment. Similarly, if getting the “right” people into state legislatures led both to women’s enfranchisement and to increases in public health and hygiene spending – but there was no direct link between the two – there should be no changes in any outcome for states not choosing suffrage rights for women. Following Lott and Kenny (1999), I define voluntary states as those that passed state-level suffrage laws or that

\textsuperscript{42} The timing of suffrage laws is positively correlated with total state population in 1900 at the $p<0.10$ level. This relationship is not statistically meaningful at conventional significance levels and is absorbed by the inclusion of state fixed effects. Analyses not shown but available upon request also suggest no meaningful relationships with the timing of state-level child labor and compulsory schooling laws, although these laws are complex (Lleras-Muney 2002).
voted for the 19th Amendment. Creating a dummy variable for states choosing suffrage, I then incorporate it as well as its interaction with women’s suffrage into a variant of equation 1. Appendix Table A3 reports estimates for this interaction term. Consistent with the identifying assumption, there is no evidence that suffrage effects differed between states that chose suffrage and those on whom it was imposed.

Fourth, if this paper’s major results were due to unobserved state-level social liberalization over time, there should also be detectable changes during other periods of liberalization not ultimately resulting in women’s suffrage. To further explore this possibility, I use the years of failed (but in many cases promising) state-level women’s suffrage campaigns as placebo experiments. Specifically, I examine two forms of campaigns: ballot referenda and campaigns that lobbied state constitutional conventions. Appendix Table A4 shows estimates for both referenda and constitutional conventions. None are statistically meaningful with the single exception of deaths among females ages 15-19 for constitutional conventions (and the point estimate for female deaths at ages 15-19 in Figure 7 is itself not statistically different from zero).

Fifth, the enactment of suffrage laws could have induced internal migration, altering the composition of residents in states with suffrage rights relative to those without them. If migration patterns were correlated with vital rates or preferences for public health spending, the interpretation of this paper’s major findings would be more complicated. To investigate the relationship between internal migration and the timing of suffrage laws, I created measures of state-level characteristics using IPUMS 1% population census samples from 1900, 1910, and 1920. Matching state characteristics in each decennial census with the number of years for which women could legally vote in each state and each year, I regress the share of state residents

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43 The states that did not enact suffrage laws before 1920 but ratified the 19th Amendment were Kentucky, Massachusetts, New Hampshire, New Jersey, New Mexico, Pennsylvania, and West Virginia (Lott and Kenny 1999). Figure 1 shows this distinction.
who report being born in that state on the cumulative years of women’s suffrage as well as other state-level socio-economic characteristics. Appendix Table A5 reports these results for a variety of samples and specifications but provides no evidence of confounding patterns of internal migration.  

Sixth, I consider whether or not changes in the composition of births might produce the illusion of child mortality reductions under women’s suffrage. The absence of meaningful suffrage effects on adult mortality shown in Figure 7 suggests that the composition of potential mothers did not change. This concern is also not relevant to child mortality at older ages. However, women’s suffrage may have produced incentives for women to have fewer children – by lowering the relative price of child quality or by raising the return to time spent outside the home, for example (Becker and Lewis 1973). Changes in fertility under suffrage laws would lend credibility to this concern. Because the Bureau of the Census’ birth registration area was not established until 1915 and was incomplete until 1933, fertility responses to suffrage laws must be investigated using population census data.

Exploiting the fact that any fertility effects should vary by women’s age when suffrage rights were granted (and not be present at all among women first able to vote after menopause), I simultaneously make comparisons between women the same age born in different states and between women of different ages born in the same state. Using individual ever-married sample-line women born in states and who were age in the 1940 population census (and

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44 These results do not seem due to selective mortality - there is also no meaningful association when migration only among those ages 21 and older in 1912 is examined (ages at which women’s suffrage is not associated with mortality when the first suffrage law after 1900 was passed).

45 This is also consistent with other findings that maternal mortality did not begin to decline in absolute terms until the 1930s (Thomasson and Treber 2004).

46 This approach based on women’s state of birth (rather than state of residence) is essentially an intent-to-treat analysis.
who were in a five-year age interval $i=15-19$, $20-24$, $…$, $50-54$ when a suffrage law was enacted in their state of birth), I estimate:

\[
 b_{\text{was}} = \alpha + \sum_i \beta_{\text{was}} + \delta_i + \delta_a + \delta_i \times t + \varepsilon_{\text{was}}
\]

where $b$ is the number of lifetime births reported by each woman, $\nu$ is a dummy variable indicating whether or not a woman could first legally vote in a given age interval $i$, $\delta_i$ and $\delta_a$ represent state and age (or birth cohort) fixed effects, $\delta_i \times t$ represents state-specific linear time (or age) trends, and the parameter estimates of interest are the $\beta$s. Because lifetime births can reasonably be modeled as count data and the distribution of lifetime births is left-censored at zero, equation 2 was estimated by maximum likelihood estimation using a negative binomial model. Estimates of $\beta$ are shown in Figure 10. There is no econometric evidence that women’s fertility responded to suffrage laws.

6. Conclusion

This paper argues that the extension of suffrage rights to American women allowed children to benefit much more fully (or rapidly) from the scientific breakthroughs of the bacteriological revolution. Simple hygienic practices – including hand and food washing, water and milk boiling, meat refrigeration, and renewed emphasis on breastfeeding – were among the most important innovations of this revolution in knowledge about disease. Communicating their importance to the American public required intensive door-to-door hygiene campaigns, which women championed at first through voluntary organizations and then through government. Consistent with the predictions of standard models of electoral competition, support-maximizing politicians responded rapidly to changes in the distribution of policy preferences in the electorate as women gained the right to vote. The result was large increases in state and local public health
spending that fueled hygiene campaigns, leading to substantially fewer deaths from leading childhood killers of the day.

Given the common failures of health education campaigns in developing countries today, further research is needed to reconcile contemporary difficulties with this historical success. A wide variety of factors could be important. First, relative to other types of health behaviors like avoiding sexual contact, reducing diets high in saturated fats, and quitting smoking, hygienic behaviors may not be costly to change. Second, in an environment of competing risks, complementary sanitary reforms (like drinking water disinfection) occurring during this period raised the return to simple hygienic health behaviors. Third, the absence of curative measures a century ago strengthened incentives for prevention (i.e., less moral hazard). Fourth, effective health education campaigns are generally labor intensive, and labor inputs in this setting were inexpensive. Campaign organizers recruited school nurses to work during the summer, provided what was then contemporary ‘residency’ training to otherwise unpaid doctors, and enlisted large cadres of volunteers. Fifth, there was considerable latent demand for child health. As Meckel (1990) notes, the emphasis on maternal health education was strongly reinforced by the emerging ‘cult of motherhood.’ Nurses overwhelmingly reported that when the benefits of improved hygiene were demonstrated, mothers eagerly embraced them (Meckel 1990).

This paper’s findings also suggest at least two broader conclusions relevant to contemporary development challenges. One is that strengthening the expression of women’s preferences can improve child health and welfare beyond the special case of lump-sum transfers targeted to women. Unlike such transfers, many policies and programs seeking to ‘empower’

47 I thank Ted Miguel for raising this point.
48 Although the late nineteenth and early twentieth centuries witnessed a feminist movement seeking to expand the acceptable role of women beyond the narrow confines of the Victorian home, as Ida Tarbell observed in her 1912 book The Business of Being a Woman, “nurturing the young has become the passion of the day.”
women introduce nuanced incentives with theoretically ambiguous consequences for children (Becker 1981). As a case in point, opponents of women’s suffrage in the United States often supported their position by invoking the potential neglect of children (Flexner and Fitzpatrick 1959).

The other is that demand-oriented health improvement strategies may deserve more careful attention. In developing countries today, over 10 million children die each year from preventable causes (WHO 2002, Black, Morris, and Bryce 2003). Although international health efforts have traditionally emphasized shifting the supply of health technologies outward, demand for these technologies is also puzzlingly low in many contexts (Bonair, Rosenfield, and Tengvald 1989, Scrimshaw 2001, Rogers 2003, Thornton 2005, Dupas 2006, Abt Associates and PSI 2007). Promoting gender equality may be an important means of increasing household demand for highly beneficial but under-utilized household health technologies.49

References


Figure 1: The Timing of Women’s Suffrage Rights in American States
Figure 2: Density of State-Level Data Relative to Suffrage Laws
Figure 3: City Public Spending and Women's Suffrage Law Timing

- Residual ln(Cost Payments)
- Time Relative to Suffrage Law

Legend:
- Total Cost Payments
- Health and Sanitation Cost Payments
- Charities, Corrections, and Hospital Cost Payments
Figure 4: Women's Suffrage and Share of the Adult Population Voting
Figure 5: Progressive State Votes and Women's Suffrage Law Timing
Figure 6: Residual ln(Age-Specific Mortality) and the Timing of Suffrage Laws

Residual ln(Deaths)

Time Relative to Suffrage Law

Male

Female

Under Age 1  Ages 1-4  Ages 5-9  Ages 10-14  Ages 15-19
Figure 7: Women's Suffrage Laws and Age-Specific Deaths

Note: Standard errors clustered at the state level.
Figure 8a: Women's Suffrage Laws and Age-Specific Deaths
3- and 6- Year Time Lags

Note: Standard errors clustered at the state level.

Figure 8b: Women's Suffrage Laws and Age-Specific Deaths
5- and 10- Year Time Lags

Note: Standard errors clustered at the state level.
Figure 9: The Distribution of Progressive Era Events over Time
Figure 10: Women's Lifetime Fertility by Age at Suffrage Law Enactment

Note: Standard errors clustered at the state level.
### Panel A: Age-Specific Annual Mortality Rate per 1,000 in Each Age Interval in Death Registration States

<table>
<thead>
<tr>
<th>Age Interval</th>
<th>Mean</th>
<th>Standard Deviation</th>
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</thead>
<tbody>
<tr>
<td>Total</td>
<td>17.31</td>
<td>(1.97)</td>
</tr>
<tr>
<td>Under Age 1</td>
<td>163.49</td>
<td>(31.42)</td>
</tr>
<tr>
<td>Age 1-4</td>
<td>18.78</td>
<td>(4.82)</td>
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<tr>
<td>Age 5-9</td>
<td>4.49</td>
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<td>Age 10-14</td>
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<td>Age 15-19</td>
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<td>Age 25-29</td>
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<td>Age 30-34</td>
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<td>Age 60-64</td>
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<td>Age 90-94</td>
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<td>(3.87)</td>
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<tr>
<td>Age 95+</td>
<td>431.91</td>
<td>(4.08)</td>
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</table>

### Panel B: Cause-Specific Annual Mortality Rate per 1,000 Total Population in Death Registration States

<table>
<thead>
<tr>
<th>Cause</th>
<th>Mean</th>
<th>Standard Deviation</th>
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<tbody>
<tr>
<td>Typhoid Fever</td>
<td>0.30</td>
<td>(0.09)</td>
</tr>
<tr>
<td>Malaria</td>
<td>0.06</td>
<td>(0.04)</td>
</tr>
<tr>
<td>Smallpox</td>
<td>0.00</td>
<td>(0.00)</td>
</tr>
<tr>
<td>Scarlet Fever</td>
<td>0.14</td>
<td>(0.04)</td>
</tr>
<tr>
<td>Whooping Cough</td>
<td>0.12</td>
<td>(0.03)</td>
</tr>
<tr>
<td>Diphtheria</td>
<td>0.35</td>
<td>(0.13)</td>
</tr>
<tr>
<td>Influenza</td>
<td>0.14</td>
<td>(0.04)</td>
</tr>
<tr>
<td>Meningitis</td>
<td>0.43</td>
<td>(0.09)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>0.12</td>
<td>(0.03)</td>
</tr>
<tr>
<td>Circulatory Disease</td>
<td>1.58</td>
<td>(0.29)</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>1.47</td>
<td>(0.30)</td>
</tr>
<tr>
<td>Diarrhea under age two</td>
<td>1.14</td>
<td>(0.35)</td>
</tr>
<tr>
<td>Nephritis</td>
<td>0.82</td>
<td>(0.25)</td>
</tr>
<tr>
<td>Suicide</td>
<td>0.10</td>
<td>(0.02)</td>
</tr>
<tr>
<td>TB Lungs</td>
<td>1.64</td>
<td>(0.32)</td>
</tr>
<tr>
<td>TB Other</td>
<td>0.21</td>
<td>(0.06)</td>
</tr>
<tr>
<td>Cancer</td>
<td>0.69</td>
<td>(0.13)</td>
</tr>
<tr>
<td>Accidents and Violence</td>
<td>0.74</td>
<td>(0.14)</td>
</tr>
</tbody>
</table>

### Panel C: Nominal Annual City Government Spending (in 1,000s)

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cost Payments</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Charities, Hospitals, and Corrections Cost Payments</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Health Conservation and Sanitation Cost Payments</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Total Outlays</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Charities, Hospitals, and Corrections Outlays</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Health Conservation and Sanitation Outlays</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Panel D: Real Annual State Government Spending and Revenue Per Capita

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Revenue</td>
<td>$16.51</td>
<td>($7.05)</td>
</tr>
<tr>
<td>Total Spending</td>
<td>$14.94</td>
<td>($8.12)</td>
</tr>
<tr>
<td>Property Tax Revenue</td>
<td>$2.41</td>
<td>($0.70)</td>
</tr>
<tr>
<td>Transportation Spending</td>
<td>$0.88</td>
<td>($0.70)</td>
</tr>
<tr>
<td>Education Spending</td>
<td>$2.46</td>
<td>($0.70)</td>
</tr>
<tr>
<td>Social Services Spending</td>
<td>$2.23</td>
<td>($0.96)</td>
</tr>
</tbody>
</table>

Note: City public finance data is available for years 1905-1909, 1909-1913, 1915-1919, and 1921-1930 (and is therefore unavailable in 1900 and 1920); state public finance data is available for years 1900-1919 and 1921-1931 (and is therefore unavailable in 1920).
### TABLE 2:
Women's Suffrage Laws and Municipal and State Public Finance

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>N</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: Municipal Public Finance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln(Total Cost Payments)</td>
<td>0.077**</td>
<td>(0.031)</td>
<td>3661</td>
<td>0.53</td>
</tr>
<tr>
<td>ln(Health Conservation and Sanitation Cost Payments)</td>
<td>0.063*</td>
<td>(0.036)</td>
<td>3661</td>
<td>0.35</td>
</tr>
<tr>
<td>ln(Charities, Hospitals, and Corrections Cost Payments)</td>
<td>0.451***</td>
<td>(0.115)</td>
<td>3454</td>
<td>0.42</td>
</tr>
<tr>
<td>ln(Total Outlays)</td>
<td>0.005</td>
<td>(0.085)</td>
<td>3658</td>
<td>0.35</td>
</tr>
<tr>
<td>ln(Health Conservation and Sanitation Outlays)</td>
<td>0.157</td>
<td>(0.112)</td>
<td>3629</td>
<td>0.26</td>
</tr>
<tr>
<td>ln(Charities, Hospitals, and Corrections Outlays)</td>
<td>0.486</td>
<td>(0.337)</td>
<td>1462</td>
<td>0.21</td>
</tr>
<tr>
<td><strong>Panel B: State Public Finance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln(Total Revenue)</td>
<td>0.010</td>
<td>(0.084)</td>
<td>673</td>
<td>0.89</td>
</tr>
<tr>
<td>ln(Property Tax Revenue)</td>
<td>0.070</td>
<td>(0.209)</td>
<td>579</td>
<td>0.94</td>
</tr>
<tr>
<td>ln(Total Spending)</td>
<td>-0.057</td>
<td>(0.088)</td>
<td>688</td>
<td>0.87</td>
</tr>
<tr>
<td>ln(Highway Spending)</td>
<td>0.300</td>
<td>(0.215)</td>
<td>667</td>
<td>0.90</td>
</tr>
<tr>
<td>ln(Education Spending)</td>
<td>0.137</td>
<td>(0.157)</td>
<td>689</td>
<td>0.75</td>
</tr>
<tr>
<td>ln(Social Service Spending)</td>
<td>0.206***</td>
<td>(0.071)</td>
<td>688</td>
<td>0.84</td>
</tr>
</tbody>
</table>

Notes: *p<0.10, **p<0.05, ***p<0.01; Standard errors clustered at the state level shown in parentheses. The US Bureau of the Census (1914) defined cost payments as “payments of cities and other municipalities for their expenses, interest, and outlays, less amounts which have been returned or are to be returned by reason of error or otherwise.” Outlays are defined as “the costs of property, including land, buildings and equipment, and public improvements more or less permanent in character.”
### TABLE 3:  
Women's Suffrage Laws and Legislative Behavior

<table>
<thead>
<tr>
<th></th>
<th>ln('Progressive' Senate Votes)</th>
<th>ln('Progressive' House Votes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suffrage Law</td>
<td>0.228***</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td>(0.079)</td>
<td>(0.051)</td>
</tr>
<tr>
<td>N</td>
<td>1110</td>
<td>1399</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.83</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Notes: *p<0.10, **p<0.05, ***p<0.01; Standard errors clustered at the state level shown in parentheses
<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>N</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(Typhoid Deaths)</td>
<td>-0.058</td>
<td>(0.070)</td>
<td>1109</td>
<td>0.97</td>
</tr>
<tr>
<td>ln(Malaria Deaths)</td>
<td>-0.067</td>
<td>(0.130)</td>
<td>911</td>
<td>0.96</td>
</tr>
<tr>
<td>ln(Small Pox Deaths)</td>
<td>-0.237</td>
<td>(0.233)</td>
<td>690</td>
<td>0.55</td>
</tr>
<tr>
<td>ln(Measles Deaths)</td>
<td>-0.061</td>
<td>(0.133)</td>
<td>1094</td>
<td>0.73</td>
</tr>
<tr>
<td>ln(Scarlet Fever Deaths)</td>
<td>0.174</td>
<td>(0.162)</td>
<td>1107</td>
<td>0.89</td>
</tr>
<tr>
<td>ln(Whooping Cough Deaths)</td>
<td>-0.052</td>
<td>(0.090)</td>
<td>1108</td>
<td>0.90</td>
</tr>
<tr>
<td>ln(Diphtheria Deaths)</td>
<td>-0.241*</td>
<td>(0.125)</td>
<td>1106</td>
<td>0.95</td>
</tr>
<tr>
<td>ln(Influenza Deaths)</td>
<td>-0.089</td>
<td>(0.085)</td>
<td>1109</td>
<td>0.97</td>
</tr>
<tr>
<td>ln(Meningitis Deaths)</td>
<td>-0.234**</td>
<td>(0.097)</td>
<td>1107</td>
<td>0.93</td>
</tr>
<tr>
<td>ln(Pneumonia Deaths)</td>
<td>-0.050</td>
<td>(0.042)</td>
<td>1109</td>
<td>0.99</td>
</tr>
<tr>
<td>ln(Diarrhea Deaths Under Two)</td>
<td>-0.114*</td>
<td>(0.065)</td>
<td>1109</td>
<td>0.98</td>
</tr>
<tr>
<td>ln(TB Deaths)</td>
<td>-0.044</td>
<td>(0.042)</td>
<td>1109</td>
<td>1.00</td>
</tr>
<tr>
<td>ln(Childbirth Deaths)</td>
<td>0.001</td>
<td>(0.053)</td>
<td>1109</td>
<td>0.98</td>
</tr>
<tr>
<td>ln(Heart Disease Deaths)</td>
<td>-0.002</td>
<td>(0.030)</td>
<td>1109</td>
<td>0.99</td>
</tr>
<tr>
<td>ln(Diabetes Deaths)</td>
<td>0.038</td>
<td>(0.042)</td>
<td>1108</td>
<td>0.99</td>
</tr>
<tr>
<td>ln(Nephritis Deaths)</td>
<td>-0.003</td>
<td>(0.034)</td>
<td>1109</td>
<td>0.99</td>
</tr>
<tr>
<td>ln(Cancer Deaths)</td>
<td>-0.014</td>
<td>(0.030)</td>
<td>1109</td>
<td>1.00</td>
</tr>
<tr>
<td>ln(Accidents/Violent Deaths)</td>
<td>-0.022</td>
<td>(0.041)</td>
<td>1109</td>
<td>0.99</td>
</tr>
<tr>
<td>ln(Suicide Deaths)</td>
<td>-0.029</td>
<td>(0.030)</td>
<td>1109</td>
<td>0.99</td>
</tr>
</tbody>
</table>

Notes: *p<0.10, **p<0.05, ***p<0.01; Standard errors clustered at the state level shown in parentheses
Appendix 1: Data

Historical Mortality Statistics

No national system of death records existed in the United States prior to 1933 (Haines, 2001). However, the Bureau of the Census established an official ‘death registration area’ in 1880 and began publishing its annual *Mortality Statistics* for death registration states (those deemed to have adequate death registration systems) in 1900 (US Bureau of the Census 1900 – 1936, Haines 2001). As Appendix Figure A1 shows, the registration area grew from ten states in 1900 to include all forty-eight states in 1933.

I have digitized these published mortality statistics for all registration area states for all years 1900-1936 by age and sex and by cause (and have posted them on-line at: http://www.nber.org/data/vital-statistics-deaths-historical/). For males and females, specific age groups are under 1 (infant mortality), 1-4, 5-9, …, 90-94, and 95+. The causes of death followed consistently over time are: typhoid fever, malaria, smallpox, measles, tuberculosis, scarlet fever, whooping cough, meningitis, diarrhea (under age two), diphtheria, influenza, pneumonia, puerperal fever and childbirth-related complications, diabetes, heart disease, kidney disease, cancer, accidents, suicide, and all other causes. Because of changes over time in the Bureau of the Census’ cause of death reporting, some conservative assumptions were also necessary to harmonize this information across years 1900 – 1936.

In addition to quality control efforts in the data entry work (double entry and spot checking), I also verified that summations across age- and cause-specific deaths equaled provided totals. This process revealed a small number of inconsistencies in the printed historical mortality tables:

- 1902: total deaths summed by cause and total deaths summed by age and sex for all reporting states do not agree
- 1912 and 1913: deaths by state and age are not disaggregated by gender in the historical volumes
- 1916: total deaths and the sum of age-specific deaths for females by age in Ohio do not agree
- 1919: total deaths and the sum of age-specific deaths for males by age in Kentucky do not agree
- 1920: total deaths and the sum of age-specific deaths for males in California and for females in Indiana do not agree; total deaths and the sums by age and sex for Kentucky do not agree
- 1924 through 1936: deaths by age are aggregated for ages 1-4 (for earlier years they are provided by single years of age in this interval)
- 1935: total deaths by cause and total deaths by age for Massachusetts do not agree

Historical Municipal Public Finance Data

Annual data on nominal municipal-level health-related spending were digitized for cities with populations exceeding 30,000 using the *Statistics of Cities* for years 1905-1909 and the *Financial Statistics of Cities* for years 1909-1913, 1915-1919, and 1921-1930. The specific categories of health-related city spending harmonized across years include health conservation and sanitation cost payments; health conservation and sanitation outlays; charities, corrections, and hospital cost payments; and charities, corrections, and hospital outlays. Total cost payments and total outlays were collected and included as well. The US Bureau of the Census (1914)
defined cost payments as “payments of cities and other municipalities for their expenses, interest, and outlays, less amounts which have been returned or are to be returned by reason of error or otherwise.” Outlays are defined as “the costs of property, including land, buildings and equipment, and public improvements more or less permanent in character.” Although more disaggregated data is provided in some years (health conservation and sanitation separately rather than combined, for example), the categories constructed are the most disaggregated that can be harmonized across all years.

Missing data also cannot be distinguished from true zeros. For cities present in a given year, if all empty cells are assumed to reflect missing data rather than true zeros, variable-specific missing data rates do not exceed 10% – with the exception of outlays for charities, corrections, and hospitals, for which missing data rates can exceed 70% (analyses of this outlay category should therefore be interpreted with great caution but make no meaningful contribution to this paper’s findings).

The following table summarizes the number of cities present in each year:

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Cities</th>
<th>Year</th>
<th>Number of Cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1905</td>
<td>154</td>
<td>1918</td>
<td>227</td>
</tr>
<tr>
<td>1906</td>
<td>158</td>
<td>1919</td>
<td>227</td>
</tr>
<tr>
<td>1907</td>
<td>159</td>
<td>1921</td>
<td>183</td>
</tr>
<tr>
<td>1908</td>
<td>159</td>
<td>1922</td>
<td>261</td>
</tr>
<tr>
<td>1909</td>
<td>159</td>
<td>1923</td>
<td>249</td>
</tr>
<tr>
<td>1910</td>
<td>184</td>
<td>1924</td>
<td>248</td>
</tr>
<tr>
<td>1911</td>
<td>193</td>
<td>1925</td>
<td>247</td>
</tr>
<tr>
<td>1912</td>
<td>195</td>
<td>1926</td>
<td>251</td>
</tr>
<tr>
<td>1913</td>
<td>199</td>
<td>1927</td>
<td>251</td>
</tr>
<tr>
<td>1915</td>
<td>204</td>
<td>1928</td>
<td>251</td>
</tr>
<tr>
<td>1916</td>
<td>213</td>
<td>1929</td>
<td>251</td>
</tr>
<tr>
<td>1917</td>
<td>219</td>
<td>1930</td>
<td>311</td>
</tr>
</tbody>
</table>

In 1905 there were 154 cities with a population of at least 30,000 included in the Statistics of Cities. By 1930, 311 cities met these requirements and were included in the Financial Statistics of Cities. Only 112 cities are observed in all years, but only 8 cities dropped out of the sample before 1930 (the rest joined the sample after 1905 and remained in the sample through 1930).

Historical State Public Finance Data

Historical information about annual state revenue and spending in real 1967 dollars per capita was provided by John Lott and Larry Kenny and is the same state public finance data used in Lott and Kenny (1999). This data harmonizes state public finance information from a large archival project conducted by Richard Sylla, John Legler, and John Wallis with support from National Science Foundation (see Sylla, Legler, and Wallis ICPSR Study # 9728, “Sources and Uses of Funds in State and Local Governments, 1790-1915”) with data from the Financial Statistics of States for years 1915-1919 and 1921-1931. It also includes pre-1915 data provided
by John Wallis not available in ICPSR Study # 9728 from Arkansas, California, Connecticut, Florida, Georgia, Idaho, Iowa, Kentucky, and West Virginia.

The specific categories of per capita revenue and spending that are comparable over time include: total public spending, public revenue, property tax revenue, transportation spending (which combines current and capital expenditures on highways), education spending (which combines current and capital expenditures on elementary and secondary schools) and social service spending (which combines current expenditures on state health boards, charities, hospitals, and corrections).

**Voteview Congressional Roll Call Data**

Key public health appropriations during the Progressive Era were primarily made at the state and especially the local level. To the best of my knowledge, state and local legislative roll call data have not been systematically compiled (and critical appropriations decisions are made at the committee and subcommittee level anyway). Nevertheless, legislative responses to women’s suffrage laws should also be evident at the federal level in the Senate and the House of Representatives. I therefore obtained roll call data for all votes brought to the Senate and House floors roughly between 1900 and 1930 (for the 56th through 71st Congressional sessions) from the publicly available Voteview database (www.voteview.com) maintained by Keith Poole. This data includes the date that each bill was brought to a vote, how each representative voted on each bill, the home state of each representative, and a brief description of each bill’s substantive legislative proposal.

Because women’s voluntary organizations were outspoken advocates of the Progressive Era reform agenda, each Senate and House bill was coded according to whether or not it was broadly consistent with this agenda. In deciding whether or not a bill was ‘Progressive,” I adopted the following definition taken from [http://www.digitalhistory.uh.edu/modules/progressivism/index.cfm](http://www.digitalhistory.uh.edu/modules/progressivism/index.cfm): “Progressivism is an umbrella label for a wide range of economic, political, social, and moral reforms. These included efforts to outlaw the sale of alcohol; regulate child labor and sweatshops; scientifically manage natural resources; insure pure and wholesome water and milk; Americanize immigrants or restrict immigration altogether; and bust or regulate trusts. Drawing support from the urban, college-educated middle class, Progressive reformers sought to eliminate corruption in government, regulate business practices, address health hazards, improve working conditions, and give the public more direct control over government through direct primaries to nominate candidates for public office, direct election of Senators, the initiative, referendum, and recall, and women's suffrage.” Using this definition, each bill was specifically coded as Progressive, Anti-Progressive, or neither. Agreement between the two individuals coding these bills in a 10% sample of all bills was approximately 75%.

Next, the share of all possible votes cast by representatives from each state in each year that were coded as Progressive was calculated. Using legislator by bill observations, each representative’s vote was first coded as “Yea,” “Nay,” “Not voting,” or “Other”. Yea includes “Yea,” “Paired Yea,” and “Announced Yea,” and Nay includes “Nay,” “Paired Nay,” and “Announced Nay.” A vote was considered Progressive if it was a Yea vote for Progressive bill or as Nay vote for an Anti-Progressive bill. Using each legislator’s home state, votes were then aggregated across legislators and bills to the state-year level, yielding the number of Progressive votes cast by legislators from each state in each year. Dividing these numbers by the total possible number of votes yields the share of votes that were Progressive for each state and year.
by legislative body. The total possible number of votes was calculated to account for legislator
deaths and states gaining statehood between 1900 and 1930.

IPUMS Population Census 1% Samples: 1900, 1910, 1920, and 1940

For analyses of how fertility responded to women’s suffrage, I use the 1% sample of the
1940 population census made available through the Integrated Public Use Microdata Series
(IPUMS) by the University of Minnesota’s Population Center. Although not all women were
asked questions about children ever born, sample-line women married and of fertile age (defined
as 14+ years of age) at the time of the population census were asked to how many children they
had ever given birth.

Analyses of internal migration utilize 1% samples from the 1900 and 1920 population
censuses and a 1.6% sample from the 1910 census. Weights provided are used to correct for
oversampling: 20% oversampling of Alaskans, Hawaiians, and persons enumerated on the
American Indian schedules in 1900 and oversampling of Hispanics, Blacks, Alaskans,
Hawaiians, and persons enumerated on the American Indian schedules in 1910. The population
census did not ask explicit migration questions until 1940, and this information is limited to self-
reported information about internal movement in the preceding five years. I construct an
alternative measure using self-reported state of birth and current state of residence, treating the
share of current residents born in different states as a proxy for cumulative internal migration
across state boundaries (the appropriate level of analysis for the purposes of this paper).

Women’s Suffrage Dates – Legislation, Constitutional Conventions, and Referenda

A variety of validity tests examine unsuccessful state-level efforts to enfranchise women.
These efforts generally took the form of ballot initiatives of referenda and direct lobbying efforts
leading up to state constitutional conventions. Archival projects conducted by Marie Cornwall,
Brayden King, Eric Dahlin, and Holly McCammon coded information on rules governing state
legislative activity and the dates of all state-level efforts to extend the right to vote to women.
These dates are used in this paper’s analyses.

Other Progressive Era Reform Dates

Additional validity tests examine the correlation between women’s suffrage law dates
and the dates of other major state-level Progressive Era reforms and events. Most of these dates
were obtained from Skocpol (1992): divorce/alimony laws, mother’s pension laws, state General
Federation of Women’s Clubs (GFWC) chapter establishment, women’s maximum hour laws,
women’s minimum wage laws, and prohibition laws. State workers’ compensation law dates
were obtained from Fishback and Kantor (1996).
Appendix 2: Mortality Convergence

If women’s preferences placed relatively greater weight on public health activities, states with higher infant/child mortality rates might have experienced larger increases in public health spending and larger mortality declines following suffrage legislation. To test how state responses varied with the level of baseline mortality, I estimate:

\[
\ln(\text{spend}_{st}) = \alpha + \kappa \ln(\bar{d}_s) + \phi y + \lambda(\ln(\bar{d}_s) \times y) + \delta + \delta y + \varepsilon_{sy}
\]

where \(\text{spend}\) is a state or municipal public spending measure, \(\bar{d}\) is mean age-specific deaths (ages 0-1, 1-4, 4-9, 10-14, or 15-19) in the five years preceding women’s enfranchisement in state \(s\), all other variables are defined as before, and the parameter of interest is \(\lambda\).1

Appendix Table A6 shows estimates of \(\lambda\), which can be interpreted as elasticities of public spending with respect to baseline (pre-suffrage) mortality. For state spending (shown in Panel A), these estimates suggest no meaningful relationship between baseline mortality and any type of state spending other than social service spending. Although significant only at the p<0.10 level, the bottom row of Appendix Table A6 suggests elasticities of approximately 0.04 – states with higher mortality when suffrage laws were passed increased social service spending (including public health spending) relatively more. Panel B shows even smaller but statistically significant increases in municipal outlays for charities, corrections, and hospitals. Similar analyses were repeated using \(\ln(\text{age-specific deaths})\) as dependent variables. Although the resulting point estimates for \(\lambda\) are all negative, they are not statistically distinguishable from zero (as shown in Appendix Figure A2), suggesting that the relatively larger (but very modest) increases in state and local spending in high-mortality states had no additional effect on child survival.

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1 For states entering the Census of the Bureau’s death registration area less than five years before women gained the right to vote, I use mean age-specific mortality for the available pre-suffrage years.
Appendix Figure A1: The Timing of Death Registration Area Entry in American States
Appendix Figure A2: Age-Specific Mortality Elasticities with Respect to Pre-Suffrage Mortality

Female

Male

Elasticity

Age Group

Estimate  90% CI  95% CI
<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>1-2 Years Before Law</th>
<th>1-4 Years Before Law</th>
<th>1-6 Years Before Law</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(Male Deaths Under 1)</td>
<td>-0.002 (0.028)</td>
<td>0.041 (0.066)</td>
<td>0.068 (0.070)</td>
</tr>
<tr>
<td>ln(Male Deaths 1-4)</td>
<td>0.038 (0.035)</td>
<td>0.086 (0.074)</td>
<td>0.114 (0.077)</td>
</tr>
<tr>
<td>ln(Male Deaths 5-9)</td>
<td>-0.005 (0.044)</td>
<td>0.033 (0.072)</td>
<td>0.082 (0.081)</td>
</tr>
<tr>
<td>ln(Male Deaths 10-14)</td>
<td>-0.024 (0.027)</td>
<td>-0.007 (0.069)</td>
<td>0.017 (0.070)</td>
</tr>
<tr>
<td>ln(Male Deaths 15-19)</td>
<td>-0.003 (0.030)</td>
<td>0.034 (0.061)</td>
<td>0.024 (0.047)</td>
</tr>
<tr>
<td>ln(Female Deaths Under 1)</td>
<td>-0.029 (0.023)</td>
<td>0.025 (0.063)</td>
<td>0.047 (0.068)</td>
</tr>
<tr>
<td>ln(Female Deaths 1-4)</td>
<td>0.049 (0.040)</td>
<td>0.083 (0.079)</td>
<td>0.117 (0.084)</td>
</tr>
<tr>
<td>ln(Female Deaths 5-9)</td>
<td>0.022 (0.043)</td>
<td>0.058 (0.074)</td>
<td>0.092 (0.092)</td>
</tr>
<tr>
<td>ln(Female Deaths 10-14)</td>
<td>-0.022 (0.035)</td>
<td>0.017 (0.068)</td>
<td>0.020 (0.054)</td>
</tr>
<tr>
<td>ln(Female Deaths 15-19)</td>
<td>-0.031 (0.027)</td>
<td>0.021 (0.052)</td>
<td>0.058 (0.042)</td>
</tr>
<tr>
<td>ln(Diphtheria Deaths)</td>
<td>-0.110 (0.096)</td>
<td>-0.049 (0.104)</td>
<td>0.129 (0.117)</td>
</tr>
<tr>
<td>ln(Meningitis Deaths)</td>
<td>0.050 (0.087)</td>
<td>0.058 (0.113)</td>
<td>0.006 (0.111)</td>
</tr>
<tr>
<td>ln(Diarrhea Deaths Under Two)</td>
<td>-0.056 (0.054)</td>
<td>0.001 (0.075)</td>
<td>0.119 (0.090)</td>
</tr>
<tr>
<td>ln(State Social Service Spending)</td>
<td>0.129 (0.106)</td>
<td>-0.038 (0.159)</td>
<td>-0.053 (0.145)</td>
</tr>
<tr>
<td>ln(Municipal Health Conservation and Sanitation Spending)</td>
<td>-0.053 (0.250)</td>
<td>0.213 (0.270)</td>
<td>0.449 (0.330)</td>
</tr>
<tr>
<td>ln(Municipal Charities, Hospitals, and Corrections Spending)</td>
<td>0.131 (0.121)</td>
<td>0.080 (0.180)</td>
<td>0.059 (0.197)</td>
</tr>
<tr>
<td>ln(&quot;Progressive&quot; Senate Votes)</td>
<td>-0.046 (0.119)</td>
<td>0.036 (0.096)</td>
<td>0.130 (0.088)</td>
</tr>
</tbody>
</table>

Notes: *p<0.10, **p<0.05, ***p<0.01; Standard errors clustered at the state level shown in parentheses
### APPENDIX TABLE A2: Correlates of Women's Suffrage Law Timing

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>N</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year Joined Death Registration Area</td>
<td>-0.114</td>
<td>(0.120)</td>
<td>48</td>
<td>0.02</td>
</tr>
<tr>
<td>Population in 1000s, 1900</td>
<td>0.002*</td>
<td>(0.001)</td>
<td>48</td>
<td>0.07</td>
</tr>
<tr>
<td>Total Mortality Rate per 1000, 1900</td>
<td>0.071</td>
<td>(0.233)</td>
<td>10</td>
<td>0.01</td>
</tr>
<tr>
<td>Year of State Alimony/Divorce Law</td>
<td>0.184</td>
<td>(0.279)</td>
<td>11</td>
<td>0.05</td>
</tr>
<tr>
<td>Percent of the Native White Population 21+ Illiterate, 1900</td>
<td>0.449</td>
<td>(0.400)</td>
<td>45</td>
<td>0.03</td>
</tr>
<tr>
<td>Per Capita Capital Investment in Manufacturing, 1900</td>
<td>-10.297</td>
<td>(14.148)</td>
<td>45</td>
<td>0.47</td>
</tr>
<tr>
<td>Per Capita Wage in Manufacturing, 1900</td>
<td>-0.080</td>
<td>(0.057)</td>
<td>45</td>
<td>0.04</td>
</tr>
<tr>
<td>Year of State GFWC Chapter</td>
<td>-0.085</td>
<td>(0.337)</td>
<td>48</td>
<td>0.00</td>
</tr>
<tr>
<td>Year of State Mother's Pension Law</td>
<td>1.335</td>
<td>(0.835)</td>
<td>40</td>
<td>0.06</td>
</tr>
<tr>
<td>Year of Women's Maximum Hour Law</td>
<td>-0.079</td>
<td>(0.460)</td>
<td>39</td>
<td>0.01</td>
</tr>
<tr>
<td>Year of Women's Minimum Wage Law</td>
<td>1.105</td>
<td>(0.984)</td>
<td>15</td>
<td>0.09</td>
</tr>
<tr>
<td>Year of Prohibition</td>
<td>-0.162</td>
<td>(0.283)</td>
<td>48</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Notes: *p<0.10, **p<0.05, ***p<0.01; GFWC: General Federation of Women's Clubs
### APPENDIX TABLE A3:
Women's Suffrage Laws and Mortality in Voluntary vs. Mandatory States

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>N</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(Male Deaths Under 1)</td>
<td>0.000</td>
<td>(0.094)</td>
<td>1062</td>
<td>0.99</td>
</tr>
<tr>
<td>ln(Male Deaths 1-4)</td>
<td>0.021</td>
<td>(0.104)</td>
<td>1062</td>
<td>0.99</td>
</tr>
<tr>
<td>ln(Male Deaths 5-9)</td>
<td>0.135</td>
<td>(0.099)</td>
<td>1062</td>
<td>0.98</td>
</tr>
<tr>
<td>ln(Male Deaths 10-14)</td>
<td>0.079</td>
<td>(0.085)</td>
<td>1062</td>
<td>0.98</td>
</tr>
<tr>
<td>ln(Male Deaths 15-19)</td>
<td>0.024</td>
<td>(0.075)</td>
<td>1062</td>
<td>0.99</td>
</tr>
<tr>
<td>ln(Female Deaths Under 1)</td>
<td>-0.001</td>
<td>(0.092)</td>
<td>1062</td>
<td>0.99</td>
</tr>
<tr>
<td>ln(Female Deaths 1-4)</td>
<td>0.030</td>
<td>(0.099)</td>
<td>1062</td>
<td>0.99</td>
</tr>
<tr>
<td>ln(Female Deaths 5-9)</td>
<td>0.108</td>
<td>(0.098)</td>
<td>1062</td>
<td>0.98</td>
</tr>
<tr>
<td>ln(Female Deaths 10-14)</td>
<td>0.131</td>
<td>(0.090)</td>
<td>1062</td>
<td>0.98</td>
</tr>
<tr>
<td>ln(Female Deaths 15-19)</td>
<td>0.004</td>
<td>(0.067)</td>
<td>1062</td>
<td>0.99</td>
</tr>
<tr>
<td>ln(Diphtheria Deaths)</td>
<td>0.060</td>
<td>(0.151)</td>
<td>1106</td>
<td>0.95</td>
</tr>
<tr>
<td>ln(Meningitis Deaths)</td>
<td>0.167</td>
<td>(0.160)</td>
<td>1107</td>
<td>0.93</td>
</tr>
<tr>
<td>ln(Diarrhea Deaths Under Two)</td>
<td>-0.002</td>
<td>(0.131)</td>
<td>1109</td>
<td>0.98</td>
</tr>
<tr>
<td>ln(State Social Service Spending)</td>
<td>0.008</td>
<td>(0.093)</td>
<td>688</td>
<td>0.84</td>
</tr>
<tr>
<td>ln(Municipal Health Conservation and Sanitation Spending)</td>
<td>0.307</td>
<td>(0.274)</td>
<td>3661</td>
<td>0.26</td>
</tr>
<tr>
<td>ln(Municipal Charities, Hospitals, and Corrections Spending)</td>
<td>0.518</td>
<td>(0.684)</td>
<td>3454</td>
<td>0.42</td>
</tr>
<tr>
<td>ln(&quot;Progressive&quot; Senate Votes)</td>
<td>-0.025</td>
<td>(0.129)</td>
<td>1110</td>
<td>0.83</td>
</tr>
</tbody>
</table>

Notes: *p<0.10, **p<0.05, ***p<0.01; Estimates shown for the interaction between a dummy variable for states voluntarily choosing suffrage and the presence of a women's suffrage law; Standard errors clustered at the state level shown in parentheses
## APPENDIX TABLE A4:
### Constitutional Convention and Referendum Placebo Estimates

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Constitutional Convention</th>
<th>Referendum</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(Male Deaths Under 1)</td>
<td>-0.002 (0.032)</td>
<td>-0.028 (0.056)</td>
</tr>
<tr>
<td>ln(Male Deaths 1-4)</td>
<td>0.034 (0.040)</td>
<td>0.005 (0.063)</td>
</tr>
<tr>
<td>ln(Male Deaths 5-9)</td>
<td>0.027 (0.040)</td>
<td>-0.018 (0.065)</td>
</tr>
<tr>
<td>ln(Male Deaths 10-14)</td>
<td>-0.038 (0.033)</td>
<td>-0.072 (0.052)</td>
</tr>
<tr>
<td>ln(Male Deaths 15-19)</td>
<td>-0.036 (0.032)</td>
<td>-0.060 (0.046)</td>
</tr>
<tr>
<td>ln(Female Deaths Under 1)</td>
<td>-0.004 (0.032)</td>
<td>-0.022 (0.051)</td>
</tr>
<tr>
<td>ln(Female Deaths 1-4)</td>
<td>0.033 (0.044)</td>
<td>0.016 (0.061)</td>
</tr>
<tr>
<td>ln(Female Deaths 5-9)</td>
<td>0.019 (0.037)</td>
<td>-0.030 (0.067)</td>
</tr>
<tr>
<td>ln(Female Deaths 10-14)</td>
<td>-0.041 (0.035)</td>
<td>-0.057 (0.049)</td>
</tr>
<tr>
<td>ln(Female Deaths 15-19)</td>
<td>-0.063** (0.027)</td>
<td>-0.076 (0.040)</td>
</tr>
<tr>
<td>ln(Diphtheria Deaths)</td>
<td>0.098 (0.088)</td>
<td>0.010 (0.111)</td>
</tr>
<tr>
<td>ln(Meningitis Deaths)</td>
<td>0.080 (0.079)</td>
<td>-0.057 (0.096)</td>
</tr>
<tr>
<td>ln(Diarrhea Deaths Under Two)</td>
<td>-0.013 (0.080)</td>
<td>-0.044 (0.078)</td>
</tr>
<tr>
<td>ln(Social Service Spending)</td>
<td>-0.185 (0.176)</td>
<td>0.104 (0.241)</td>
</tr>
<tr>
<td>ln(Municipal Health Conservation and Sanitation Spending)</td>
<td>0.013 (0.134)</td>
<td>-0.022 (0.147)</td>
</tr>
<tr>
<td>ln(Municipal Charities, Hospitals, and Corrections Spending)</td>
<td>-0.011 (0.175)</td>
<td>0.347 (0.447)</td>
</tr>
<tr>
<td>ln(&quot;Progressive&quot; Senate Votes)</td>
<td>0.119 (0.110)</td>
<td>0.032 (0.110)</td>
</tr>
</tbody>
</table>

Notes: *p<0.10, **p<0.05, ***p<0.01; Standard errors clustered at the state level shown in parentheses
### APPENDIX TABLE A5:
Women's Suffrage Laws and Internal Migration

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years of Women's Suffrage</td>
<td>-0.002</td>
<td>-0.001</td>
<td>-0.002</td>
<td>0.000</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>State Fixed Effects</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>144</td>
<td>96</td>
<td>48</td>
<td>144</td>
<td>96</td>
</tr>
<tr>
<td>R²</td>
<td>0.8074</td>
<td>0.8385</td>
<td>0.8122</td>
<td>0.9889</td>
<td>0.997</td>
</tr>
</tbody>
</table>

Notes: *p<0.10, **p<0.05, ***p<0.01; Standard errors shown in parentheses. All regressions include mean state Duncan socio-economic index score, family size, and number of children in each household as well as the share of each state's population: married, living in urban areas, literate (among those ages 10+), in the labor force (among those ages 16+), owning their home, in broad age groups (0-4, 5-14, 15-24, 25-44, and 45+), and in racial groups (White, Black, American Indian, and other).
### APPENDIX TABLE A6:
Public Spending and Pre-Suffrage Mortality

<table>
<thead>
<tr>
<th>Dependent Variable, Mean 1-5 Years Before Suffrage Law</th>
<th>Independent Variable, Mean 1-5 Years Before Suffrage Law</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post*ln(Female Deaths Under 1)</td>
<td>Post*ln(Female Deaths 1-4)</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>ln(Total Revenue)</td>
<td>-0.001</td>
</tr>
<tr>
<td></td>
<td>(0.020)</td>
</tr>
<tr>
<td>ln(Property Tax Revenue)</td>
<td>-0.100</td>
</tr>
<tr>
<td></td>
<td>(0.105)</td>
</tr>
<tr>
<td>ln(Total Spending)</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>(0.026)</td>
</tr>
<tr>
<td>ln(Highway Spending)</td>
<td>0.084</td>
</tr>
<tr>
<td></td>
<td>(0.062)</td>
</tr>
<tr>
<td>ln(Education Spending)</td>
<td>0.033</td>
</tr>
<tr>
<td></td>
<td>(0.031)</td>
</tr>
<tr>
<td>ln(Social Service Spending)</td>
<td>0.034*</td>
</tr>
<tr>
<td></td>
<td>(0.018)</td>
</tr>
</tbody>
</table>

**Panel A: State Public Finance**

**Panel B: Municipal Public Finance**

Notes: *p<0.10, **p<0.05, ***p<0.01; Standard errors clustered at the state level shown in parentheses; each estimate and standard error obtained from a separate regression.