

Saving Babies: The Contribution of Sheppard-Towner to the Decline in Infant Mortality in the 1920s

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Enacted in 1922, the Sheppard-Towner Act provided matching grants to states to assist them in providing maternal and infant care education. Although the program was repealed in 1929, the U.S. Children's Bureau concluded that the program helped to decrease maternal and infant death rates in the 1920s. This paper measures the contribution of Sheppard-Towner to declining infant mortality rates by using a panel of data on state-level mortality rates and information on Sheppard-Towner expenditures. In addition, this paper leverages the variation in the types of activities conducted by states to examine whether different activities had differential effects on mortality. Results suggest that Sheppard-Towner activities accounted for 11-12 percent of the decline in infant mortality over the period. Moreover, we find that not all educational activities had equal impact. Interventions that allowed personal one-on-one contact seemed more beneficial than classes and demonstrations. Constructing public health centers and sending public health nurses to visit homes both lowered infant mortality, while conducting health conferences and enrolling midwives in classes did not.

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Introduction

Infant mortality in the United States declined significantly over the first part of the twentieth century, as shown in Figure 1, which plots infant mortality rates in the Birth Registration Area (BRA) from 1915 to 1940.¹ Rising incomes, improved nutrition and housing conditions, and public infrastructure improvements such as water sanitation and sewer systems all contributed to the decline in infant mortality rates, particularly in urban areas (see McKeown 1976; Fogel 1994; Haines 2001; Cutler and Miller 2005; Ferrie and Troesken 2008). In addition, government expenditures on public health and education increased dramatically over this period. Miller (2008) finds that increases in state and local public health and education expenditures caused by the enactment of suffrage decreased mortality from infectious diseases over the period 1900-1936. Fox (2011) uses municipal data on public health expenditures over the period 1923-1932 and also concludes that public health spending lowered infant mortality, although the effect is diminished by the inclusion of city-specific time trends in his model.

Most of the expansion in public health programs occurred at the state and local levels. However, the federal government was also involved in public health initiatives. The U.S. Children's Bureau conducted studies of infant mortality in different American cities, and presented data on infant mortality in other advanced economies. After declaring 1918 as the "Children's Year," the Bureau sought to reduce infant and child mortality by distributing literature and through education programs like conferences and fairs. Efforts to implement a broader and more permanent program aimed at providing prenatal and infant care education finally succeeded in 1921, when Congress passed the Promotion of the Welfare and Hygiene of Maternity and Infancy Act, more commonly known as the "Sheppard-Towner" Act.²

Sheppard-Towner provided matching money to states to spend on public health programs targeted at reducing infant and maternal mortality. Each participating state received \$5,000 outright and then received dollar-for-dollar matching funds up to an explicit cap determined by its population. States used

¹ Infant mortality trended strongly downward despite the fact that the BRA continued to expand until 1932, and many of the states that entered later had higher mortality rates than earlier entrants.

² Prior to Sheppard-Towner, the federal government had also provided money to states to assist in venereal disease control and prevention under the Chamberlain-Kahn Act of 1918.

funds from the program in a variety of ways. Some states used Sheppard-Towner money to organize conferences where physicians and other health professionals would examine children and pregnant women or provide demonstrations on maternal and infant care and hygiene. Many states provided classes for midwives and classes for girls about infant care. Nearly all states sent “prenatal letters” to expectant mothers, while others paid public health nurses to visit new and expectant mothers. Some also used the funds to build public health clinics.

Despite its laudable goals, bitter political battles about the role of the federal government in providing maternal and infant health education ensued and the Sheppard-Towner Act was repealed in 1929.³ Even though the program was short-lived, the Children’s Bureau heralded it as a success and concluded that “the value of maternity and infancy work is reflected in the decrease in infant and maternal death rates in 1928 as compared with those in 1921” (U.S. Children’s Bureau 1931a: 6). This claim has been echoed by historians such as Molly Ladd-Taylor, who writes, “A further indication of the program’s success was the significant decrease in infant mortality during the Sheppard-Towner years” (Ladd-Taylor 1994: 187). On the other hand, infant mortality was trending strongly downward even before 1920. Opponents to Sheppard-Towner disputed its effect and attributed the decline in infant mortality to its pre-existing trend. A 1932 editorial in the *Journal of the American Medical Association* (JAMA) highlights this view:

During the seven and one-half years that the Sheppard-Towner Act was in effect, it cost the people about eleven million dollars in taxes. During that entire time it did not develop a single new idea in the field of maternal and infant hygiene. As shown by the official mortality statistics, it did not accelerate the rate of decline in either the maternal or the infant death rates, by even a fraction of a point per annum (JAMA 1932: 404).

The goal of this paper is to disentangle the effect of Sheppard-Towner on infant mortality from its pre-existing downward trend, thereby assessing the contribution that public health educational programs made to the reduction of infant mortality in the 1920s. This research agenda has significant modern policy relevance. Educational programs, like those funded by the Sheppard-Towner program, are still

³ For discussion about the political economy of the law and the politics of state participation, see Moehling and Thomasson, in press)

promoted today as ways to decrease infant mortality.⁴ Yet we do not know if and how such activities contributed to the dramatic reduction in infant mortality that occurred in the U.S. during the early twentieth century. With respect to developing countries today, the literature is inconclusive about whether public health expenditures lower mortality. Several studies have showed that public health expenditures have a minor or statistically insignificant impact on infant and child mortality (Kim and Moody 1992; Mcguire et al., 1993; Aiyer et al. 1995; Musgrove 1996; Filmer and Pritchett 1997; Filmer et al. 1998), while others (Anand and Ravallion 1993; Hojman 1996; Gupta et al 2002) suggest that such expenditures cause substantial decreases in infant deaths.

Part of the difficulty in assessing the impact of public health expenditures on infant mortality lies in the fact that changes in public health outlays may not represent true spending increases. For example, under Sheppard-Towner, some states that participated in the program did not actually increase net expenditures, but rather shifted expenditures from existing public health programs in order to qualify for the federal match. For example, in a letter dated December 8, 1921, from W.S. Rankin, North Carolina's State Health Officer to his counterpart in Tennessee:

I shall not find it difficult, I think, to secure the apportion for North Carolina for the reason that we are spending now practically as much as they have to apportion on infancy and maternity work. The situation, then with respect to this State will mean simply our adjusting our program to meet their approval and their matching their funds dollar for dollar for money now being expended on the same objects as provided in the Sheppard-Towner Act (Rankin, W.S. to Olin West; 8 December, 1921).

While we do examine the impact of Sheppard-Towner expenditures on infant mortality, a key contribution of our work is that we look beyond expenditure measures to examine the impact of the specific activities in which states engaged under Sheppard-Towner. These activities involved very different levels of interaction with mothers and children and therefore may have had differential impacts on infant mortality. Thus, we also separately analyze the effect of nurse visits, conferences, literature,

⁴ See for instance Bill and Melinda Gates Foundation, 2009.

public health centers, and classes for midwives. Our findings show that more direct and personal interventions such as nurse visits were most effective at reducing infant mortality, while conferences and demonstrations had little impact. Moreover, we find a differential effect of Sheppard-Towner interventions on non-white and white infant mortality. Specifically, building public health centers and funding nurse visits to mothers generated much larger reductions in infant mortality for non-whites than for whites. In addition, while prenatal letters reduced white infant mortality, they did not reduce black infant mortality.

Infant Mortality and the U.S. Children's Bureau

Created in 1912, the Children's Bureau was charged with investigating and reporting "upon all matters pertaining to the welfare of children and child life among all classes of our people" (42 U.S.C. Ch. 6. April 9, 1912). In the 1910s, the Children's Bureau focused on studying causes of infant and maternal mortality and creating a birth registration area where all births would be accurately and consistently reported. An examination of nearly 23,000 infants in 8 cities led the Children's Bureau to conclude that the overall infant mortality rate in the U.S. was 111.2 deaths per 1,000 live births, a rate higher than those of many other industrialized countries. Moreover, many of these deaths were believed to have been preventable. For example, the study revealed that the mortality rate for artificially fed infants in the nine months of life was 4.8 times greater than for breastfed infants (Woodbury 1925: 91). Overall, about 29 percent of the deaths were attributable to gastric and intestinal causes, many due to improper feeding and hygiene (Woodbury 1925: 14).

As a result of these studies, the chief of the Children's Bureau, Julia Lathrop, proposed a plan for the "public protection of maternity and infancy" with federal funds (Fifth Annual Report of the Chief, Children's Bureau 1917: 49). The plan called for greater instruction of mothers on the care of infants and greater availability of physicians and hospital care. Instruction could be provided through public health nurses, universities, and extension teaching (Fifth Annual Report of the Chief, Children's Bureau 1917:

47-48). Lathrop suggested that the Smith-Lever Act of 1914 provided a precedent by which the federal government could fund the program using matching grants to states (Fifth Annual Report of the Chief, Children's Bureau 1917: 49).

In July 1918, Representative Jeannette Pickering Rankin (R-Montana) sponsored a bill that contained the basics of Lathrop's proposal. The bill proposed a yearly appropriation of \$10,000 per state, with \$1 million in additional funds to be divided among states based on their share of the U.S. rural population, and contingent on the state legislature approving matching funds. The purpose of the bill was educational in nature; funds were to be used to encourage instruction in hygiene and maternity, and not to provide medical care. Rankin's bill failed to gain traction. Despite the fact that no one appeared before the House Committee on Labor to oppose the bill, it did not reach the floor of Congress (Lindenmeyer 1997: 79). During the next session, Representative Horace Mann Towner (R-Iowa) and Senator Morris Sheppard (D-Texas) introduced proposals similar to Rankin's bill. The Senate passed the bill in December 1920, following three days of debate that centered on questions of funding for the program, and whether the Children's Bureau or the medically-run Public Health Service (PHS) should run the program. In the House, hearings were held at the end of December, but the bill failed to come to a vote before the end of the Congressional session. Supporters of the bill were buoyed by President Harding's endorsement in April 1921 and re-introduced the measures.

While no group voiced opposition to the Rankin bill in 1918, new resistance to the proposed Sheppard and Towner bills came from two primary sources: the American Medical Association and the Woman Patriots (Lindenmeyer 1997: 83). While the AMA was slow to organize against compulsory health insurance in the late 1910s, the organization took a definitive stance against such a program in 1920 (Burrow 1963: 150). The AMA strongly opposed government control over medical service, and viewed the provision of care for individuals as best achieved "...through voluntary self-taxation of voters in a political unit to pay for the necessary local facilities for the prevention of disease and the promotion

of health” (JAMA, February 5, 1921).⁵ Physicians feared that government intervention would eventually lead to non-medical provision of medical services.

Anti-suffragists joined physicians in opposing the proposed Sheppard-Towner legislation. The Woman Patriots, formerly known as the National Association Opposed to Woman Suffrage, denounced the Act as a communist and feminist plot. Samuel Winslow, an anti-suffragist and chair of the House Committee on Interstate and Foreign Commerce refused to even hold hearings on the bill for several months. Alice Robertson, an anti-suffragist and the only woman in Congress, voted against the bill (Lemons 1990: 157).

Despite the opposition, the bill easily passed in both the House, (279 to 39) and the Senate (63 to 7). Historians argue that Sheppard-Towner passed because members of Congress feared the new, unknown voting power of women. The effectiveness of the women’s lobby and the fear of the House and Senate was noted by Senator Kenyon (R-Iowa), who stated, “If the members could have voted on that measure secretly in their cloak rooms it would have been killed as emphatically as it was finally passed in the open under the pressure of the Joint Congressional Committee of Women” (*Ladies Home Journal* XXXIX (April 1922, p. 95)).⁶

The political debate at the national level did not end after Sheppard-Towner’s enactment. Some states (MA, CT, and IL) never participated in the program. The level of participation among states that did participate varied widely. When the program came up for renewal in 1926, it met with increased

⁵ While the AMA as a whole was opposed, certain groups of physicians within the AMA supported Sheppard-Towner. Pediatricians supported Sheppard-Towner; in fact, the American Academy of Pediatrics was founded as an independent group in 1922 because pediatricians disagreed with the AMA’s stance. Other medical groups also supported the bill’s passage, including the Medical Women’s National Association (Lindenmeyer 1997: 87).

⁶ The idea that Congress had at least some fear of the women’s vote is supported by Lott and Kenny (1999) and Miller (2008). Lott and Kenny (1999) find that suffrage coincided with immediate increases in state government expenditures for functions women generally supported, such as education, sanitation and hospitals. Suffrage also generated more liberal voting patterns among federal representatives. Miller (2008) similarly finds that suffrage laws generated large increases in public health spending. Moehling and Thomasson (in press) also find that time since suffrage had a large impact on the level of state participation in the Sheppard-Towner program.

opposition. Ultimately, a compromise was reached in which the program was extended for an additional two years, with automatic repeal occurring in 1929.

Under the auspices of Sheppard-Towner, states had the autonomy to engage in a variety of different activities designed to reduce infant and maternal mortality and improve the health of children and mothers. During the seven year period in which the Act was in force, physicians conducted 144,777 conferences where they examined children and pregnant women, and nurses and dentists held nearly 40,000 more conferences where they provided general instruction on maternal and child care. States and counties set up 2,978 permanent child and/or prenatal health centers, and public health nurses visited over 3 million women and their children in the last six years of the act. In addition, over 22 million pieces of literature (such as instructional pamphlets and prenatal letters) were distributed nationwide when the Act was in force. Overall, in the last four years of the Act alone, the Children's Bureau estimated that more than 4 million infants and children and about 700,000 pregnant women were reached by some form of the public health work conducted under Sheppard-Towner (Children's Bureau 1931).

Data and Methods

The overall U.S. infant mortality rate in 1922 was 76.2 deaths per 1,000 live births. By the time Sheppard-Towner was repealed in 1929, the infant mortality rate had fallen to 67.6 (Linder and Grove 1947: 574-75). How much, if any, of this decline can be attributed to the activities that states engaged in under the Sheppard-Towner program? Although Sheppard-Towner was passed in 1921, it took many states a couple of years to gear up to accept federal grants and establish programs. Not until its report on the Sheppard-Towner Act for the 1924 fiscal year was the Children's Bureau able to give a systematic accounting of the activities of the states. The Children's Bureau published these data in tabular form and provided state-by-state reports on an annual basis starting in 1925 (U.S. Children's Bureau 1925, 1926, 1927, 1928, and 1931b). As a result, we use state-level Vital Statistics data for the period 1924-1929 on the infant mortality rate (defined as the number of deaths of children under 1 year of age per 1,000 live

births) to test whether a state's participation in Sheppard-Towner had the life-saving effects the Children's Bureau claimed.⁷ Our basic model is:

$$(1) \quad \text{IMR}_{it} = \alpha + \beta * \text{ST}_{it} + \delta_i + \delta_t + \delta_i * t + \varepsilon_{it}$$

where IMR_{it} represents the infant mortality rate in state i in year t , ST_{it} represents the measure of Sheppard-Towner activity for state i in year t , δ_i and δ_t are the state and year fixed effects, and $\delta_i * t$ represents the state specific linear time-trend. This model accounts for differences across states in both the level and trends in mortality rates and identifies the effects of Sheppard-Towner as deviations from those trends. In the fully saturated specification, β is identified by the within-state variation in Sheppard-Towner activities across time.

To examine the effect of Sheppard-Towner on infant mortality, we use several different measures of states' participation in the program. The most direct measure would be to use a simple binary measure equal to one if a state participated in the program. However, this variable has little variation since only three states (CT, IL and MA) failed to participate in the program, and it masks significant state-level variation in the extent of participation (Moehling and Thomasson in press). Thus, we instead look at the grant amount accepted per capita. While this is better than the simple binary measure in that it captures more of the variation both across states and over time, as discussed above, it may mask the fact that some states simply shifted expenditures from existing public health categories into Sheppard-Towner to qualify for the federal match.⁸

As a result, we also estimate models in which we use as measures of public health spending, data from the U.S. Census Bureau's *Financial Statistics of the States* on outlays for the "conservation of child life" and the broader category of "health and sanitation." Programs that would fall in the category of the

⁷ We have also estimated the model over the period 1922-1929 and 1915-1929 (excluding the years of the influenza pandemic) and get similar results.

⁸ The state of New Jersey was quite open about the fact that it used the federal grants to replace state appropriations. For instance, in 1922, the New Jersey legislature appropriated almost \$100,000 less for the Department of Health than it had in 1921. This move was explained in the Department's annual report in quite plain terms: the appropriations for the Bureau of Child Hygiene and the Bureau of Venereal Disease Control were being reduced because both would be receiving federal monies for their work (New Jersey Department of Health 1922, 19).

"conservation of child life" would include most of the Sheppard-Towner funded activities, but would also include programs aimed at school-age children. The "health and sanitation" category includes a wide variety of public health programs as well as sanitation programs which were strongly related to the public health.

Key to our analysis, though, is the examination of how different types of activities in which states engaged under the Sheppard-Towner program affected infant mortality. As noted above, states engaged in a wide range of activities with Sheppard-Towner funds. States utilized Sheppard-Towner money to build health clinics, conduct prenatal and child health conferences (where physicians or nurses would examine children and provide information about hygiene and nutrition), and to send public health nurses into homes to examine children and educate mothers. In addition, states used Sheppard-Towner funds to provide training for midwives, classes for older children who may have cared for their younger siblings, and to disseminate free literature on prenatal and infant care. These different types of activities involved very different types of interactions with mothers and their children, and we might expect that some would have a greater impact than others on mortality rates.

We estimate equation (1) for all infants, and also separately for blacks and whites. The black infant mortality rate at the beginning of the period nearly twice that of white infants, as shown in Figure 2. Despite the fact that more states with high black infant mortality rates were entering the BRA during the 1920s, the racial gap in infant mortality rates did not widen appreciably in the 1920s. *A priori*, we do not know whether Sheppard-Towner spending would affect blacks and whites differently. Sheppard-Towner initiatives were targeted at smaller cities and rural areas. Some interventions, such as classes to train midwives, may have benefited blacks more than whites, since the vast majority of Southern blacks used midwives (Ladd-Taylor 1988: 263). On the other hand, the structure of Sheppard-Towner may have limited the effectiveness of the interventions for blacks. For example, while more strict regulation of midwives and midwife classes may have improved the quality of some midwives, the regulations may have served to drive many underground and out of business, thus limiting the ability of blacks to find

birth attendants (Ladd Taylor 1988, p. 269-70). Of further concern is that the decentralization of Sheppard-Towner administration may have reinforced the ability of racist public health workers to discriminate against blacks at the local level. By helping whites and not blacks, these practices may have increased the racial gap in infant mortality.⁹ Perhaps surprisingly, though, state reports to the Children's Bureau, documented efforts to target blacks as well as other minority groups rather than to exclude them. In 1924, for instance, Alabama paid for a black nurse to join the Tuskegee movable school. The nurse joined a carpenter, instructor and agriculturist who traveled around the state teaching black rural families how to improve their homes and their health (U.S. Children's Bureau 1924: 21). In the same year, Florida reported making more prenatal visits to black women (4,033) than to white women (2,406) (ibid: 24).

Results

Summary statistics are provided in Table 1. The mean of the white infant mortality rate in the BRA over the period is about 70 deaths per 1,000 live births, while the non-white infant mortality rate is 128. The means hide considerable variation, so we report the minima and maxima of the variables as well. For example, for those states that did spend money sending public health nurses into homes, the mean value of nurse visits per 1,000 population is 12.60, with a minimum of 0.02 and a maximum of 138. Table 1 shows that the largest impact (in per capita terms) was for “prenatal letters” – literature that provided information on prenatal and well-child care. We include information on the average Sheppard-Towner grant (per capita) accepted by states, as well as the mean of state spending on “conservation of child life” and the broader category of expenditures on health and sanitation, which would also capture state spending on non-Sheppard-Towner health related items as well as sanitation projects.

⁹ Later in the twentieth century, the widening of the racial gap in infant mortality can be attributed to the fact that whites had better access to improved medical care than blacks (see Almond, Chay and Greenstone 2007).

Table 2 reports the results of the estimation of equation (1) for overall infant mortality rates from 1924-1929.¹⁰ The models include the Sheppard-Towner measures of interest, as well as state fixed effects, year fixed effects, and state-specific time trends.¹¹ The first three rows of the table describe the effect of the financial variables on infant mortality. The Sheppard-Towner accepted grant amount per capita has no statistically significant impact on infant mortality rates during the period, and in fact the coefficient on this variable is positive. But the amount a state accepted from the federal government may be a poor measure of its efforts to improve infant and child health. Although states had to match federal funds above the initial \$5000 grant, some states may have had expenditures that exceeded the match amount.

State spending on “child life” per 1,000 population as well as overall state spending on health and sanitation (also per 1,000) both reduce infant mortality. A one standard deviation increase in child life spending (\$27) reduces infant mortality by 2.8 deaths per 1,000 live births, while a one standard deviation increase in health and sanitation expenditures (about \$188) reduces infant mortality by 6.27 deaths. These results seem at odds with those of Fox (2011) who finds that public health expenditures by cities have no effect on mortality rates once allowing for city time trends. This contrast may reflect the fact that many of the state-level public health initiatives during this time period -- and particularly Sheppard-Towner programs-- were targeted at rural areas.

Of primary interest are the effects of the different types of Sheppard-Towner interventions on infant mortality. We report results (all per 1,000 population) for nurse visits to homes, the number of child health conferences conducted, the number of midwives enrolled in classes, the number of public health centers constructed, and the number of prenatal letters distributed. These are the most common activities states engaged in using Sheppard-Towner funds and are consistently reported for the years 1924

¹⁰ The results are robust to estimating the sample over the period 1922 to 1930. Similarly, estimation using a balanced panel of only states in the BRA for the entire period does not change the results in a significant way.

¹¹ One concern is that the measure of Sheppard-Towner activity is endogenous; a state’s decision to participate in Sheppard-Towner or engage in a particular activity may have been influenced by its infant mortality rate. In other words, the error term for the model of a state’s participation in Sheppard-Towner may be correlated with the error term in equation (1). It is important to note, however, that this will only be a problem for the estimation of β in equation (1) if the correlation is due to do something other than state and year fixed effects and the state specific linear time-trend. Nonetheless, in future work we will instrument for Sheppard-Towner participation by using the timing of the extension of women’s suffrage in a state as well as other state characteristics, such as shifts in the power structure of a state’s legislature.

to 1929. All of the estimated coefficients with the exception of midwives and child health conferences are statistically significant and generate meaningful reductions in the overall rate of infant mortality. Looking at the magnitudes of the estimated coefficients, Table 2 shows that a one standard deviation increase in the number of home nurse visits reduced infant mortality by about 1.8 deaths per 1,000 live births (a decrease of about 2.6 percent when calculated at the mean of the dependent variable). A one standard deviation increase in the number of health centers (per 1,000) lowers infant mortality by 2.25 deaths, and a one standard deviation increase in the number of prenatal letters distributed (an increase of 30 letters per 1,000 population) reduces infant mortality by about 0.2 deaths per 1,000 live births. These results hold even when all the measures are included in the same regression model (see column 9).¹²

These findings suggest that it was the more direct and personal interventions that were effective in reducing infant mortality during the period. Sending nurses to visit the homes of a new mothers likely had a greater impact on the care of infants in an area than could be achieved by holding a child health conference and inviting new mothers to attend.¹³ Likewise, providing child health and prenatal clinics increased access to medical care and instruction. Perhaps the most surprising result is the effect of prenatal letters, but these too were more personal interventions than activities like health conferences. These letters provided basic information about prenatal care, and were a low cost way for public health officials to provide this information. Similarly, they enabled pregnant mothers to gain access to this information at very low cost, which may help to explain their effectiveness.

Table 3 reports the results of estimation of equation (1) separately by race. Panel A reports results for whites while Panel B reports results for blacks. The story that emerges from Table 3 is that public health interventions had different effects on non-white and white infant mortality. Spending on both child life and health/sanitation reduced infant mortality for whites, but did not have a statistically significant effect the non-white infant mortality rate. For whites, a one standard deviation increase in child life spending reduces infant mortality by 1.45 deaths per 1,000 births, while a one standard deviation increase

¹² These results also hold when adding per capita outlays for health and sanitation to the model.

¹³ We can also not discount the possibility of selection bias; it could be that mothers who were more aware of the value of hygiene were more likely to attend child health conferences than other mothers.

in spending on health and sanitation reduces infant mortality by 3.8 deaths. Strikingly, the Sheppard-Towner grant accepted per capita has a *positive* and statistically significant effect on non-white infant mortality. This could reflect an endogeneity problem. However given the inclusion of state fixed effects and state time trends, such a problem could only arise if the year-to-year fluctuations in non-white infant mortality affected the amount a state accepted in federal grants. A more likely explanation that finds support in the lack of significance of the other spending measures is that the bulk of expenditures on public health during the period were aimed at whites rather than non-whites.

The data in Table 3 do indicate, however, that non-whites benefited from certain types of Sheppard-Towner activities. Again, classes for midwives and child health conferences appear to have no impact on either whites or non-whites. The variable measuring public health nurse visits per 1,000 population is statistically significant for whites, but is only marginally statistically significant for non-whites (p-value of 0.106). Nevertheless, the estimated coefficient is much larger in magnitude for non-whites. A one standard deviation in nurse visits per 1,000 population reduces black infant mortality by 8.7 deaths per 1,000 births (a decrease of about 6.8 percent when calculated at the mean of black infant mortality). For whites, the same increase generates a decrease in infant mortality by 1.21 deaths, or 1.7 percent. We find similar results when looking at the impact of a one standard deviation increase in the number of health centers constructed per 1,000 population. For whites, this increase reduces infant mortality by 1.85 deaths, but the same increase reduces non-white infant mortality by 8.4 deaths per 1,000 live births. The distribution of prenatal letters reduces white infant mortality by 0.2 deaths per 1,000 live births, but has no statistically significant effect on non-white infant mortality rates.

The differential effect of Sheppard-Towner interventions on non-white and white infant mortality suggests that non-white infant mortality was more responsive to nurse home visits and the construction of public health clinics than white infant mortality rates. To the extent that even rural whites may have been better educated about hygiene than blacks, this makes sense. In addition, since blacks had lower literacy rates than whites, the fact that distributing pamphlets about prenatal care did not lower black infant mortality is not surprising. Moreover, the results do not provide support for the idea that Sheppard-

Towner resources were used to discriminate against blacks, although the results do suggest that increases in broader categories of state spending (child life and health/sanitation) did not reduce non-white infant mortality rates.

Conclusions

When the Sheppard-Towner act was repealed in 1929, the U.S. Children's Bureau strongly asserted that Sheppard-Towner was responsible for the decline in infant mortality during the 1920s. Between the inception of Sheppard-Towner in 1922 and its repeal in 1929, the overall infant mortality rate fell from 76.2 to 67.6 deaths per 1,000 live births. Our findings suggest that the Children's Bureau was a bit too optimistic about the contribution of its programs to the decline in infant mortality. Much of the decline in infant mortality in this period seems to be best explained by a continuation of the trend that began at the turn of the century and was driven by improvements in nutrition, water supplies, and sanitation. Nonetheless, our results do show that a number of the activities states in which states engaged using Sheppard-Towner funds reduced infant deaths.

To get a sense of the magnitude of the total effect of Sheppard-Towner activities, we use the results of Model (9) from Tables 2 and 3 to calculate counterfactual infant mortality rates setting all Sheppard-Towner activity measures to zero. Our estimates indicate that the overall mortality rate would have been about 1 death per 1000 births higher in the absence of any Sheppard-Towner activities, suggesting that Sheppard-Towner explains between 11 and 12 percent of the decline. This aggregate effect, however, is driven primarily by the experiences of non-whites. The white infant mortality rate would have been 0.35 higher whereas the non-white rate would have been 10 higher. While the non-white model is estimated with less precision so the error bounds around this prediction are much wider than for whites, the large difference by race is striking. Blacks do not seem to have been excluded from these programs and in fact, benefited more than did whites.

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Figure 1
Infant Mortality Rate, Birth Registration States, 1915-1940

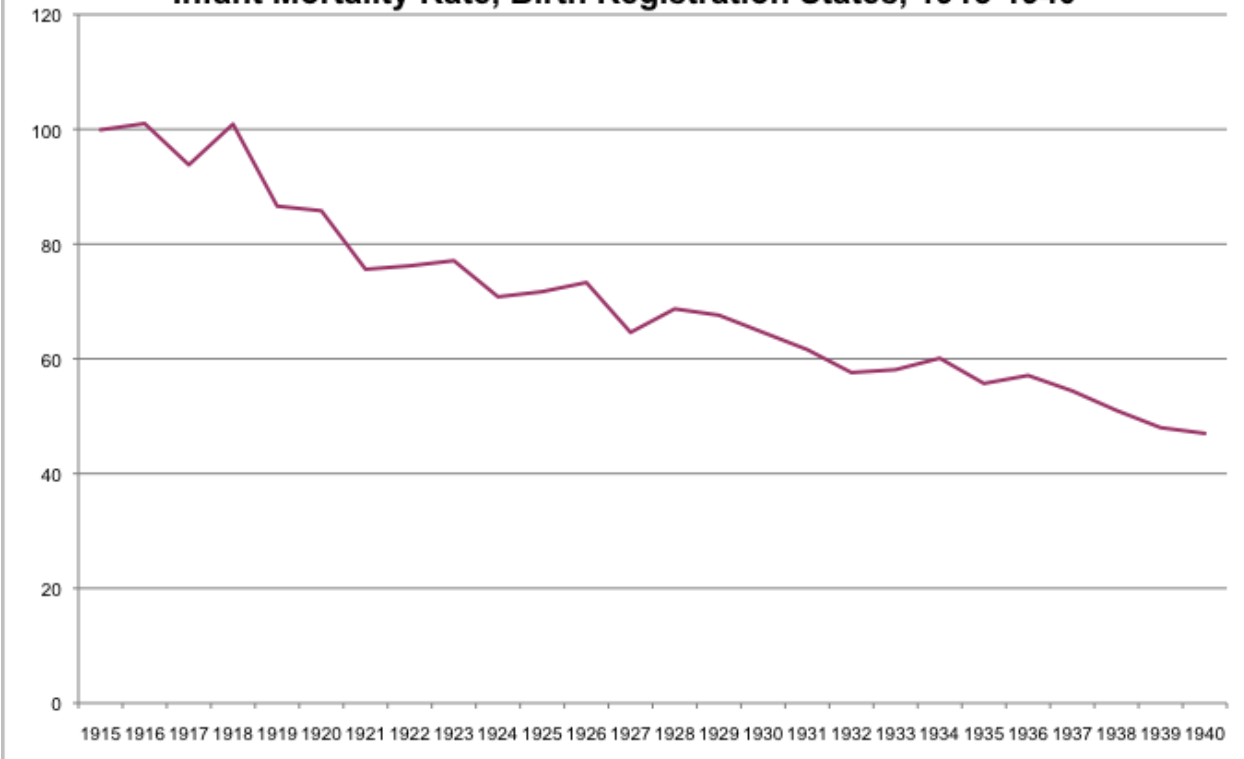


Figure 2: White and Nonwhite Infant Mortality: 1916-1940

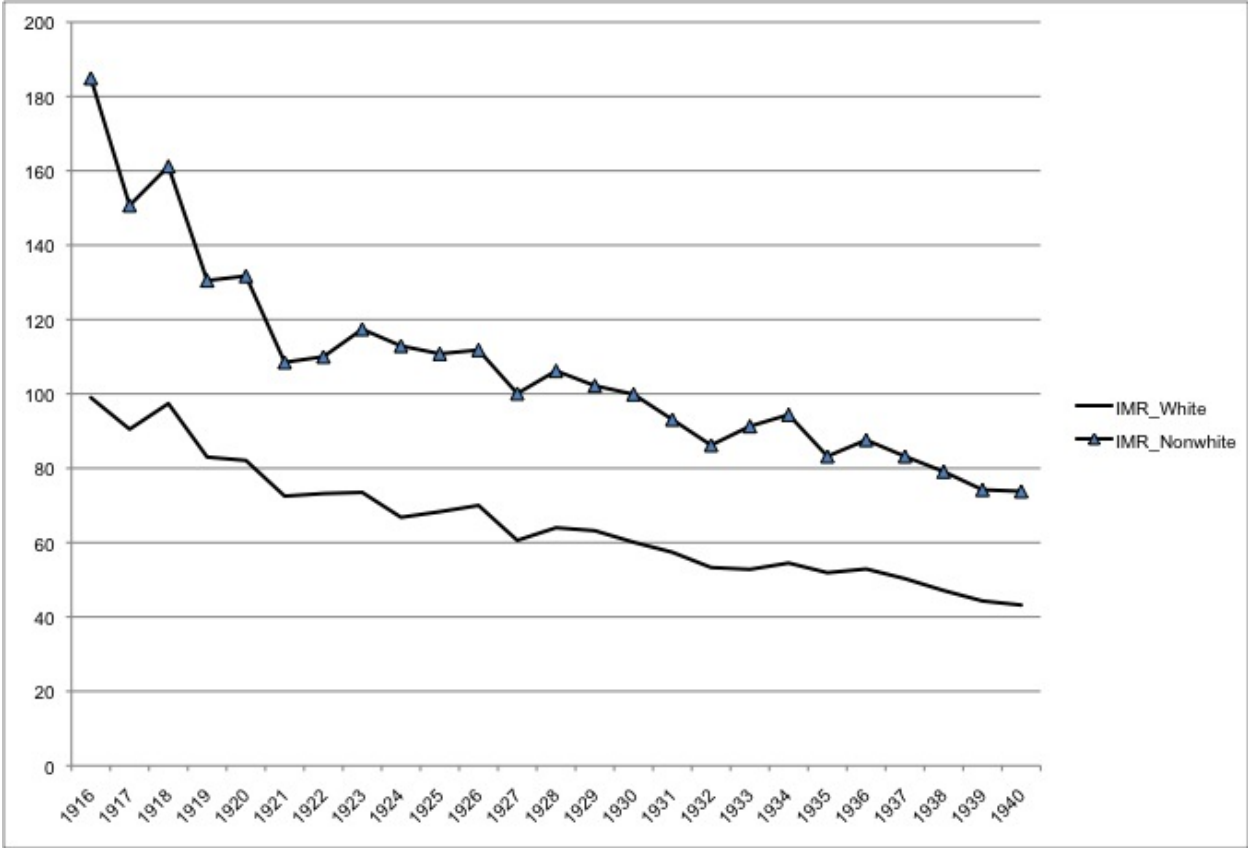


Table 1: Descriptive Statistics of State-level Variables Used in Regression Models, 1924-1929

Variable	Obs.	Mean	Std. Dev.	Min	Max
<u>Infant mortality rate (per 1000 births)</u>					
Overall	231	69.99	14.00	46.60	145.50
White	231	65.65	12.38	45.20	142.00
Non-white ^a	219	128.25	45.96	47.60	318.20
<u>Sheppard-Towner activities (per 1000 in pop.)</u>					
Home nurse visits	231	6.65	17.62	0.0000	138.85
Conditional on > 0	122	12.60	22.68	0.0190	138.85
Midwives enrolled in classes	231	0.15	0.59	0.0000	6.90
Conditional on > 0	57	0.60	1.08	0.0044	6.90
Health centers established	231	0.0050	0.0136	0.0000	0.1045
Conditional on > 0	127	0.0090	0.0174	0.0002	0.1045
Child health & prenatal conferences	231	0.37	0.81	0.0000	6.22
Conditional on > 0	200	0.42	0.85	0.0012	6.22
Prenatal letters distributed	231	1.94	21.74	0.0000	330.26
Conditional on > 0	123	3.65	29.74	0.0001	330.26
<u>Expenditure data (\$ per 1000 in population)</u>					
Sheppard-Towner grant accepted	231	12.14	11.49	0.00	92.95
Conditional on > 0	206	13.62	11.31	0.76	92.95
Outlays on the conservation of child life	231	30.44	27.11	2.17	180.14
Outlays on health and sanitation	231	304.70	188.52	81.83	1092.49

^aData for non-whites excludes observations from New Hampshire and Vermont. The non-white populations in those states during the sample period were very small and for some years the non-white infant mortality rates are reported as zero.

Notes: Annual population estimates used to calculate per capita figures were constructed by linearly interpolating between the census years of 1920 and 1930.

Sources: Infant mortality rates are from Linder, Forrest E. and Robert D. Grove. (1947). *Vital Statistics Rates in the United States 1900-1940*. Washington: U.S. Government Printing Office, 1947. Sheppard-Towner activities and accepted grant amounts: U.S. Children's Bureau (1924-1928 and 1931); outlay data: U.S. Bureau of the Census (1925-1930).

Table 2: State-level Regression Models for Overall Infant Mortality Rates, 1924-1929

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sheppard-Towner grant accepted	0.238 (0.204)								
Outlays on the cons. of child life		-0.092 (0.048)							
Outlays on health and sanitation			-0.021 (0.008)						
Home nurse visits				-0.079 (0.011)					-0.086 (0.017)
Midwives enrolled in classes					0.398 (0.797)				0.278 (0.838)
Health centers established						-129.583 (41.553)			-131.922 (43.650)
Child health & prenatal conferences							-0.872 (2.111)		0.476 (1.173)
Prenatal letters distributed								-0.006 (0.003)	-0.006 (0.003)
Number of states	46	46	46	46	46	46	46	46	46
Number of state-year observations	231	231	231	231	231	231	231	231	231

Notes: Standard errors in parentheses. Dependent variable for all models is the overall infant mortality rate. Independent variables are all scaled to be per 1000 persons in the population. All models include state fixed effects, state-specific linear time trends, and year fixed effects. Standard errors calculated to allow for clustering by state.

Table 3: State-level Regression Models for Infant Mortality Rates by Race, 1924-1929

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	<u>Panel A: Whites</u>								
Sheppard-Towner grant accepted	0.149 (0.185)								
Outlays on the cons. of child life		-0.054 (0.032)							
Outlays on health and sanitation			-0.020 (0.008)						
Home nurse visits				-0.054 (0.012)					-0.078 (0.016)
Midwives enrolled in classes					0.292 (0.992)				0.129 (0.980)
Health centers established						-106.400 (54.616)			-106.078 (58.268)
Child health & prenatal conferences							0.637 (1.535)		1.873 (0.850)
Prenatal letters distributed								-0.007 (0.003)	-0.007 (0.003)
Number of states	46	46	46	46	46	46	46	46	46
Number of state-year observations	231	231	231	231	231	231	231	231	231

Table 3: *Continued*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	<u>Panel B: Non-whites</u>								
Sheppard-Towner grant accepted	2.871 (0.955)								
Outlays on the cons. of child life		-0.508 (0.403)							
Outlays on health and sanitation			0.022 (0.091)						
Home nurse visits				-0.382 (0.232)					-0.263 (0.252)
Midwives enrolled in classes					0.951 (2.329)				0.980 (2.198)
Health centers established						-481.607 (239.245)			-505.801 (257.036)
Child health & prenatal conferences							-13.006 (8.895)		-9.521 (6.766)
Prenatal letters distributed								-1.160 (1.815)	-1.481 (1.779)
Number of states	44	44	44	44	44	44	44	44	44
Number of state-year observations	219	219	219	219	219	219	219	219	219

Notes: Standard errors in parentheses. Dependent variable for all models is the overall infant mortality rate. Independent variables are all scaled to be per 1000 persons in the population. All models include state fixed effects, state-specific linear time trends, and year fixed effects. Standard errors calculated to allow for clustering by state.