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Effects of welfare reform policies on Mexican immigrants' infant mortality rates

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ABSTRACT

The welfare reform bill adopted in 1996 limited the eligibility of immigrants on federal funding for welfare use, while vesting states with the authority to create new state-funded substitute benefits for immigrants. This paper capitalizes on this inter-state variation in state welfare rules regarding new immigrants and estimates a triple difference-in-difference estimator that provides evidence on the impact of removing public assistance on Mexican immigrants' infant mortality rates. Using the US linked birth and infant death cohort files from 1995 to 1996 and from 1999 to 2002, I find that infant mortality rates have decreased at a slower rate among children of low-educated Mexican immigrant women compared to their native Mexican-origin counterparts, especially for those mothers residing in less affluent metropolitan counties within their own state. These findings suggest that there may be unintended social costs associated with the Personal Responsibility Work Opportunity and Reconciliation Act, resulting in disparate impact on immigrant mothers and infants.

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1. Introduction

The Personal Responsibility Work Opportunity and Reconciliation Act (PRWORA), or welfare reform law of 1996, effectively ended federal guarantee of income support to poor families with children. It imposed a lifetime limit on public assistance, created additional work requirements, and permitted states to tie assistance to compliance with specified maternal behaviors including reproductive and marital decisions.¹ More importantly, the legislation specified a new set of rules for determining the eligibility of immigrants to receive federal aid including Temporary Assistance for Needy Families (TANF), Medicaid, Supplemental Security Income (SSI), and other food assistance programs. Specifically, aliens immigrating after August 22, 1996 are denied most means-tested federal assistance during their first 5 years of residence in the US. Several states responded to this law by creating state-funded substitute benefit programs in hopes of attenuating any adverse impacts of such legislation on their immigrant population (Zimmerman and Tumlin, 1999).

There is a large and growing literature on the effects of welfare reform policies on immigrant families – mostly Hispanic immigrant families (Borjas, 2003, 2004; Hagan et al., 2003; Haider et al., 2004; Hall et al., 2010; Kaushal and Kaestner, 2001, 2003, 2005, 2007; Van Hook, 2003; Van Hook and Balistreri, 2006). Research has shown that immigrant caseloads fell rapidly following welfare reform, outpacing the decline for native-born citizens even after considering the effect of the changing

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¹ The “illegitimacy bonus” (a federal award of \$20 million to each of the top 5 states that reduce their out-of-wedlock birth rates) and “family cap” (the child exclusion policy in more than 20 states that restricts additional TANF funds to women who give birth while already receiving other forms of assistance) are 2 components of welfare reform that reflect explicit intentions to decrease childbearing among TANF recipients without increasing abortion rates (Wise et al. 1999).

Table 1

State-funded assistance to pre-enactment and post-enactment immigrants following PRWORA: 1996–2002.

State	Pre-enactment immigrants				Post-enactment immigrants					
	TANF	Medicaid	Food assistance	SSI	TANF	Start Year ^a	Prenatal Care	Medicaid	Food assistance	SSI
Alabama	No	Yes	No	No	No	–	No	No	No	No
Alaska	Yes	Yes	No	No	No	–	No	No	No	No
Arizona	Yes	Yes	No	No	No	–	No	No	No	No
Arkansas	Yes	Yes	No	No	No	–	No	No	No	No
California	Yes	Yes	Yes	Yes	Yes	1998	Yes	Yes	Yes	Yes
Colorado	Yes	Yes	No	No	No	–	Yes	No	Yes	No
Connecticut	Yes	Yes	Yes	No	Yes	1997	No	Yes	Yes	No
Delaware	Yes	Yes	No	No	No	–	Yes	Yes	No	No
District of Columbia	Yes	Yes	No	No	No	–	No	No	No	No
Florida	Yes	Yes	Yes	No	No	–	No	No	No	No
Georgia	Yes	Yes	No	No	Yes	1998	Yes	No	No	No
Hawaii	Yes	Yes	No	No	Yes	1998	Yes	Yes	No	No
Idaho	Yes	Yes	No	No	No	–	No	No	No	No
Illinois	Yes	Yes	Yes	Yes	No	–	Yes	Yes	No	No
Indiana	Yes	Yes	No	No	No	–	No	No	No	No
Iowa	Yes	Yes	No	No	No	–	Yes	No	No	No
Kansas	Yes	Yes	No	No	No	–	No	No	No	No
Kentucky	Yes	Yes	No	No	No	–	Yes	No	No	No
Louisiana	Yes	Yes	No	No	No	–	No	No	No	No
Maine	Yes	Yes	Yes	Yes	Yes	1997	Yes	Yes	Yes	Yes
Maryland	Yes	Yes	Yes	No	Yes	1997	Yes	Yes	Yes	No
Massachusetts	Yes	Yes	Yes	No	Yes	1997	Yes	Yes	Yes	No
Michigan	Yes	Yes	No	No	No	–	No	No	No	No
Minnesota	Yes	Yes	Yes	No	No	–	Yes	Yes	Yes	No
Mississippi	Yes	Yes	No	No	No	–	No	No	No	No
Missouri	Yes	Yes	Yes	No	Yes	1998	Yes	No	No	No
Montana	Yes	Yes	No	No	No	–	No	No	No	No
Nebraska	Yes	Yes	Yes	No	Yes	1997	No	Yes	Yes	No
Nevada	Yes	Yes	No	No	No	–	No	No	No	No
New Hampshire	Yes	Yes	No	Yes	No	–	Yes	No	No	No
New Jersey	Yes	Yes	Yes	No	No	–	No	No	No	No
New Mexico	Yes	Yes	No	No	No	–	No	No	No	No
New York	Yes	Yes	Yes	No	Yes	1998	Yes	Yes	No	No
North Carolina	Yes	Yes	No	No	No	–	No	No	No	No
North Dakota	Yes	Yes	No	No	No	–	No	No	No	No
Ohio	Yes	Yes	Yes	No	No	–	Yes	No	No	No
Oklahoma	Yes	Yes	No	No	No	–	No	No	No	No
Oregon	Yes	Yes	No	Yes	Yes	1997	No	No	No	Yes
Pennsylvania	Yes	Yes	No	No	Yes	1997	No	Yes	No	No
Rhode Island	Yes	Yes	Yes	No	Yes	1997	Yes	Yes	No	No
South Carolina	Yes	Yes	No	No	No	–	No	No	No	No
South Dakota	Yes	Yes	No	No	No	–	No	No	No	No
Tennessee	Yes	Yes	No	No	Yes	1997	No	No	No	No
Texas	Yes	Yes	Yes	No	No	–	Yes	No	No	No
Utah	Yes	Yes	No	No	Yes	1997	No	No	No	No
Vermont	Yes	Yes	No	No	Yes	1997	Yes	No	No	No
Virginia	Yes	Yes	No	No	No	–	No	Yes	No	No
Washington	Yes	Yes	Yes	No	Yes	1998	Yes	Yes	Yes	No
West Virginia	Yes	Yes	No	No	No	–	No	No	No	No
Wisconsin	Yes	Yes	Yes	No	Yes	1998	No	No	Yes	No
Wyoming	Yes	No	No	No	Yes	1998	Yes	No	No	No
Number of States offering program	50	50	17	5	19		21	15	10	3

Source: Zimmermann and Tumlin (1999) Table 5 and Table 16. Urban Institute's Welfare Rules Database from 1996 to 2002 (available at <http://anfda-ta.urban.org/wrd/WRDWelcome.cfm>).

^a Start year refers to the year of eligibility adoption for post-enactment immigrants' welfare benefits.

macro economy during the 1990s (Haider et al., 2004; Van Hook, 2003). There have also been reported effects on household economic factors such as food insecurity, earnings, and employment (Haider et al., 2004; Hall et al., 2010; Kaushal and Kaestner, 2001; Van Hook and Balistreri, 2006) as well as effects on access to health insurance (Borjas, 2003, 2004; Hagan et al., 2003; Kaushal and Kaestner, 2003, 2005). Despite the sizeable volume on this topic, however, relatively few studies have examined health outcomes of immigrant women, especially their children. This is surprising for three reasons. First, most of the research examining the effects of PRWORA on access to health care finds a reduction in coverage among immi-

grant households as a result of the reform (Hagan et al., 2003; Kaushal and Kaestner, 2003, 2005, 2007).² Second, welfare reform has been linked to greater economic hardship among poor immigrant households (Hagan et al., 2003). Given the extensive research documenting the adverse effects of childhood poverty on children's health, the effect of welfare reform on child health outcomes seems plausible (Duncan and Brooks-Gunn, 2000). Finally, since childhood health influences subsequent life-chances (Palloni, 2007), to the extent that welfare reform may adversely impact child health outcomes, it may also exacerbate inequality not only during childhood but prospectively during adulthood as well.

Findings from the few studies that have focused on child health outcomes are mixed. A recent study examining certain physical health outcomes (e.g. general health status, sick days, respiratory illness, and emergency room visits) of preschool-aged children found that children of immigrants weaned off of welfare fare significantly worse in terms of their health when compared to peer children of non-immigrant parents weaned off of welfare or peer children of immigrant parents continuing to receive public assistance (Kalil and Crosby, 2010). Although this study uses longitudinal data with detailed information on possible barriers to program participation, the relatively small sample comes from one city (Chicago), making it difficult to generalize the findings at a national level. Kaushal and Kaestner (2007) use data from a nationally representative cross-sectional survey and find no consistent evidence that welfare reform affected the health of children between ages 0 and 14 who live with single immigrant mothers.

The purpose of this study is to extend research on the consequences of welfare reform by examining the impact of PRWORA on infant mortality rates in Mexican immigrant families. Infant mortality is an important indicator of population health, especially for the disadvantaged, and a sensitive measure of the mother's quality of life (Gortmaker, 1979). This is the first attempt to empirically examine reproductive and infant health outcomes in the context of welfare reform. Using data from the National Center for Health Statistics (NCHS) linked birth and infant death cohort files during 1995, 1996, 1999, 2000, 2001, 2002, I employ a triple-difference estimation strategy to estimate the effect of PRWORA on infant deaths. The key finding is that infant mortality rates have risen among children of low-educated Mexican immigrant women, especially for those mothers residing in less affluent metropolitan counties within their own state. These findings suggest that PRWORA may have incurred additional social costs related to pregnancy complications or hospitalizations of immigrant women.

2. Background

2.1. Immigrant provisions of welfare reform

The welfare reform legislation of 1996 includes a number of provisions that specifically limit the extent to which immigrant households can receive public assistance. In determining eligibility for public assistance, PRWORA created new distinctions among immigrants based on date of arrival – pre-enactment vs. post-enactment (i.e. before and after August 22, 1996). Although few pre-enactment immigrants lost welfare benefits³, all post-enactment new immigrants were barred from federally funded TANF and Medicaid assistance (except for emergency and public health services) during the first 5 years upon arrival. The welfare reform also formalized policies stipulating that undocumented and other non-qualified immigrants were ineligible for federal assistance and for most state and local public benefits (Kalil and Crosby, 2010). Following 1996, immigrants' use of means-tested programs fell sharply, outpacing the large declines observed for non-immigrants (Haider et al., 2004; Kaushal and Kaestner, 2003; Kalil and Crosby, 2010; Van Hook and Balistreri, 2006), even exceeding what would be expected given the number of immigrants who became ineligible because of the policy changes (Fix and Passel, 1999). Researchers have attributed the greater-than-expected decline in welfare use among eligible immigrants to the “chilling effect” of PRWORA, which created an atmosphere of confusion and fear among immigrants regarding the potential consequences for their family members' efforts to remain in the US and obtain citizenship or legal status (Fix and Passel, 1999; Hagan et al., 2003).

Of particular interest to this paper is that welfare reform granted states considerable flexibility in implementing the new eligibility rules. Using information from Zimmerman and Tumlin (1999) as well as from the Urban Institute's Welfare Database, Table 1 documents the various programs that states extended to immigrants during the 5-year restriction period. As is shown in Table 1, shortly after the passage of the welfare reform law in 1996, many states circumvented such federal restrictions on benefits to post-enactment new immigrants by using their own state funds to provide services for recent immigrants.⁴ Specifically, by the end of 1998, a total of 19 states chose to provide TANF to new immigrants and 15 states offered access to Medicaid. In addition, 21 states provided prenatal care to new immigrants giving birth to children in the US.

One simple way of describing a state's generosity toward post-enactment new immigrants is to see if it offered TANF, food assistance, Medicaid, or SSI during the initial 5-year restriction period (Borjas, 2003, 2004). It turns out that 23 states went beyond their minimal level of generosity and provided some type of assistance. However, significantly fewer states provided

² Borjas (2003) finds no reduction in health insurance coverage rates among targeted immigrants. He finds that immigrants responded to the cutbacks in the Medicaid program by increasing their labor supply, thereby raising the probability of being covered by employer-sponsored health insurance.

³ Although the initial legislation had included a provision restricting access to pre-enactment immigrants, it was never fully enforced – almost every jurisdiction (50 out of 51) offered both TANF and Medicaid to pre-enactment immigrants (Borjas, 2003). Alabama is the one state that did not provide TANF and Wyoming is the one state that did not provide Medicaid to their pre-enactment immigrants.

⁴ In addition to providing benefits for non-qualified immigrant adults, states also created programs such as the State Child Health Insurance Plan (SCHIP), which was established in 1997, so that children could be covered even if their parents were not. As of May 2004, 21 states used state funds to provide coverage for immigrant children (Fremstad and Cox 2004).

both economic assistance and access to health care to their post-enactment new immigrants. Specifically, only 11 states (California, Connecticut, Hawaii, Maine, Maryland, Massachusetts, Nebraska, New York, Pennsylvania, Rhode Island, and Washington) provided TANF, food assistance, or SSI in addition to Medicaid. Although Medicaid typically includes pregnancy-related services including prenatal care, it is important to differentiate a state that offers Medicaid to its recent immigrants from a state that only offers prenatal care services, or vice versa. This is because many states that only offer prenatal care services to unqualified immigrants are enrolling fetuses in the program, and not necessarily the pregnant women. As a result, there may be differences in the scope of services available to the pregnant woman who is limited to services directly related to the health of her fetus, compared to services available to the pregnant woman receiving Medicaid and who generally have access to prenatal care, delivery, postpartum care, family planning, and other services necessary for the health of both the pregnant woman and her fetus. Among the 11 states, 8 states provided economic assistance (TANF, food assistance, or SSI), health insurance (Medicaid), and access to prenatal care for post-enactment new immigrants.

2.2. Welfare reform and infant mortality among Mexican immigrants

Mexican immigrants comprise the largest and fastest growing Hispanic subgroup in the US (Guzman and McConnell, 2002).⁵ Moreover, they are the single largest origin of unauthorized persons in the US comprising about 58% of the unauthorized population (Bean et al., 2002). By the 1990s, Mexican immigration became more diffuse in geographic destination as some moved away from the southwestern states (such as California and Texas) to other regions of the country (Durand et al., 2005).⁶

Mexicans in general are reported to have relatively low levels of education, income, and health insurance coverage compared to non-Hispanic whites. Yet, research has consistently shown them to exhibit similar infant death rates compared with the non-Hispanic white population and much lower death rates than the non-Hispanic black population, whom they closely resemble with respect to socioeconomic characteristics (Forbes and Frisbie, 1991; Hummer et al., 2007). This phenomenon is commonly referred to as the *epidemiologic paradox* (Forbes and Frisbie, 1991). Recent studies indicate that the similarity in death rates between the Mexican-origin and non-Hispanic white populations is attributable in part to the especially low mortality of the Mexican immigrant population, with the Mexican-origin US-born population experiencing modestly higher death rates than non-Hispanic whites but experiencing much lower death rates than non-Hispanic blacks (Hummer et al., 2007).

Pregnancy outcomes are a function of multiple factors including one's access to health insurance (e.g. primary health care, prenatal care or postnatal care), income, and physical or mental health. Despite the Mexican immigrant mortality advantage, if PRWORA negatively affected one or more of these factors, it may have led to an increase in the infant mortality risks of Mexican immigrant mothers compared to that of Mexican-origin native mothers.

The most obvious pathway linking welfare reform to adverse pregnancy outcomes such as increased infant mortality rates is through declines in health insurance coverage and consequent declines in the use of medical services for women prior to, during, and after pregnancy. Although recent immigrants not eligible for regular Medicaid coverage may obtain care in emergency situations including labor and delivery, routine prenatal care does not qualify (Dubard and Massing, 2009). As shown in Table 1, many states do not provide access to Medicaid or prenatal care for their post-enactment new immigrants during the first 5 years of residence. Prior research on the effects of PRWORA on access to health insurance suggests that PRWORA increased the proportion of uninsured and decreased the use of Medicaid among low-income, particularly immigrant, households (Kaushal and Kaestner, 2005). Welfare reform is also associated with the delay in receiving medical care or receiving no care due to cost and a decline in the number of visits to a health professional for low-educated immigrant women (Kaushal and Kaestner, 2007). Interestingly enough, even research on pregnant women who are eligible for Medicaid suggests that welfare reform is associated with a decrease in insurance coverage and first-trimester prenatal care initiation (Gavin et al., 2007). In addition to the above mentioned pathways, PRWORA could contribute to increased infant mortality risks if disenrollment in Medicaid leads to a reduction in access to high-risk obstetric interventions and intensive health care services for critically ill newborns. As medical advancements have driven down a significant proportion of infant mortality rates over the past two decades in the US, limited access to such medical developments could result in more deaths among high-risk infants (Wise et al., 1999; Wise, 2003).

Another avenue through which welfare reform may affect pregnancy outcomes is changes in family income. Immigrant families are reported to experience higher rates of material hardship, crowded living conditions, and high housing cost burdens compared to low income non-immigrant families (Kalil and Crosby, 2010). The loss of welfare payments will likely increase the financial burden of this disadvantaged group and may put them at greater risk of long-term poverty (Van Hook and Balistreri, 2006). Given the many studies that have demonstrated large effects of poverty on increased infant mortality rates (Gortmaker, 1979; Wise et al., 1999) and on poor child health outcomes (Duncan and Brooks-Gunn, 2000), the relationship between reduced income and increased infant mortality risks seem plausible.

⁵ Mexicans comprise 7.3% of the entire US population and 58.5% of the Hispanic population according to data from the Census 2000 (Information available at: <http://www.census.gov/Press-Release/www/2002/demoprofiles.html>). Between 1990 and 2000, the proportion of Hispanics that claimed Mexican, Puerto Rican, or Cuban origin grew by 52.9%, 24.9%, and 18.9%, respectively (Guzman and McConnell, 2002).

⁶ Regions that experienced a growth in the Mexican immigrant population include Florida, Georgia, Iowa, Minnesota, Nevada, New York, New Jersey, North Carolina, and Oregon.

Finally, welfare reform may lead to adverse pregnancy outcomes by compromising immigrant women's physical or mental health. Since research links chronic stress with poor birth outcomes and elevated infant mortality risk (Giscombé and Lobel, 2005), to the extent that losing economic assistance or health insurance elevates women's probability of experiencing chronic stress, infant mortality risk will also likely increase. For example, women who are forced to move from being on welfare assistance to joining the work force due to such policy changes may encounter job-related physical stress since they are more likely to be engaged in physically demanding work, similar to other low-wage workers (Kaushal and Kaestner, 2007; Wise et al., 1999). Several studies indicate that prolonged standing and long working hours are associated with preterm delivery (Berkowitz, 1995). It is also possible for women to experience psychological distress directly related to the transition from welfare to work itself or from changes in employment they may encounter later on (Kaushal and Kaestner, 2007).

3. Data

I employ data from the National Center for Health Statistics (NCHS) linked birth and infant death cohort file from years 1995 to 1996 (pre-PRWORA period) and from 1999 to 2002 (post-PRWORA period).⁷ Data from 1997 and 1998 are excluded from the analyses due to variation across states in the year of implementing their new welfare rules to post-enactment new immigrants, as is presented in Table 1. Dropping observations from the two immediate years following the passage of PRWORA will also prevent any transitory effects of the welfare law from biasing the estimation (Ashenfelter, 1978). The data set includes information on all infants born alive in the 50 states and DC during these years. The recorded infant deaths are matched to their birth certificates at an exceptionally high rate, between 98% and 99% during the sampling period. Despite the high match rate, the data are weighted to account for infant deaths that are not linked to a matching birth record in all following analyses.⁸

For the present analysis, I restrict the sample to only include birth outcome observations from Mexican women who are not foreign residents. The sample is further restricted by excluding observations that are missing information on the mother's birthplace, age, race/ethnicity, education level, tobacco or alcohol use, prenatal care, infant's birth weight, and gestation period. Next, given the study's interest in the link between a mother's interaction with the welfare system and her infant's health, the analytic sample will only include birth outcome observations of women with low education levels – specifically, those with less than 16 years of education.

There are a total of 1055,654 and 655,062 birth outcome observations for foreign-born and native (i.e. US born) Mexican-origin women, respectively, who meet the above mentioned criteria. Unfortunately, the NCHS linked birth and infant death cohort files do not provide information on household income. This limitation is partly overcome by restricting the sample to births of women with low levels of education. However, to further prevent bias from unobserved household level income, I use information on median household income in 2000 for each woman's resident county obtained from the Small Area Income and Poverty Estimates (SAIPE) program at the US Census Bureau.⁹ Since a woman's resident county is identified only if it has a population of 250,000 or more in the public-use NCHS files, only 562,937 and 318,917 birth observations of the foreign-born and native Mexican-origin women, respectively, have such information.¹⁰ To obtain a more accurate estimate of the effects of welfare reform, the analysis is conducted on both the full sample and a *restricted sample* that only contains birth observations of women residing in these large metropolitan counties that have median household income levels that are less than 130% of their own state's average median household income. The underlying assumption is that these low-income metropolitan counties would have a higher concentration of our target disadvantaged Mexican (female) population than other *non-low-income* metropolitan counties or *non-metropolitan* counties in general, resulting in greater precision in the estimation of the effect (Bauer et al., 2002). There are a total of 417,077 and 258,061 observations of the total foreign-born and native Mexican-origin women from the full sample, respectively, that fall into this category. However, it is important to recognize that estimates from the restricted sample may be greater than the true *average* effect of PRWORA on recent Mexican immigrant women's infant mortality rates if there is an “urban health penalty” for living in large low-income metropolitan areas (Vlahov et al., 2005).

Table 2 contains information on observed characteristics of the full and restricted sample by nativity. Compared to native Mexican-origin women, foreign-born Mexican women in the full sample are slightly older and less educated, much more likely to be married and have a Mexican-origin native as the infant's father, much less likely to smoke or drink during pregnancy, and much more likely to delay or not receive prenatal care at all. These patterns are consistent with existing research on birth outcomes of native Mexican-origin women (Hummer et al., 2007; Scribner, 1996). In the restricted sample, the overall pattern between foreign-born and native women still holds. One attribute that does change, however, is the percentage of women who are residents of the state they gave birth in. When the sample is limited to women residing in less affluent

⁷ Infant birth observations from 1996 are included in the pre-PRWORA period since states began to implement their state-level assistance programs after 1997, as shown in Table 1.

⁸ The assigned weights for infant deaths in the final sample ranged from 1.0 to 1.30 depending on the year and state of residence of the mother. As is pointed out by Hummer et al. (2007), Mexican-origin native women tend to live in states where the successful linkage percentage was slightly lower than in other states. As a result, case weights for infant deaths of Mexican-origin native women are slightly higher on average than among other racial/ethnic groups. Thus, this weighting adjustment results in higher infant mortality rates of Mexican-origin native women than would be generated without using the weights.

⁹ Available at: <http://www.census.gov/did/www/saie/data/statecounty/data/2000.html>

¹⁰ Unfortunately, information on county identification codes is missing for all births occurring in 2002. Therefore, the restricted sample only includes birth data for years 1995, 1996, 1999, 2000, and 2001.

Table 2

Characteristics of low-educated Mexican-origin women giving birth within the 50 states and DC: years 1995–1996; 1999–2002.

Variables	Full sample		Restricted sample ^a	
	Foreign-born ^b	Native ^c	Foreign-born ^b	Native ^c
% Of births in year:				
1995	11.66	13.98	16.24	17.55
1996 ^d	12.82	14.97	17.33	18.67
1999	15.72	16.81	19.81	20.63
2000	18.01	17.38	22.23	21.30
2001	20.16	18.00	24.39	21.86
2002	21.63	18.87	– ^e	– ^e
Age at birth	25.58 (5.65) ^f	23.45 (5.59)	25.69 (5.66)	23.61 (5.63)
% With education level:				
8 years or less	40.24	6.95	39.11	7.07
9–11 years	30.44	34.53	30.51	33.61
12 years	22.96	40.31	23.46	40.09
13–15 years	6.35	18.21	6.92	19.23
% Resident	87.61	84.60	96.16	95.53
% Married	62.83	53.01	62.71	55.05
% Infant boy	50.93	51.04	50.93	51.00
% Single birth	98.21	98.03	98.21	98.10
% Smoked	0.83	5.64	0.87	4.33
% Alcohol	0.24	0.89	0.24	0.80
% Father Mexican	79.04	59.47	78.10	62.92
% Born in hospital	99.0	99.60	98.44	99.59
% Delivered by MD	84.14	89.50	85.18	91.37
% Prenatal visit began:				
1st trimester	64.46	73.77	64.80	74.23
2nd trimester	25.48	20.36	24.66	20.10
3rd trimester	6.95	4.12	6.78	3.82
No prenatal care	3.12	1.74	3.75	1.85
# of prenatal visits	9.80 (4.25)	10.92 (4.24)	9.60 (4.32)	11.09 (4.29)
No. of observations	1055,654	655,062	417,077	258,061

^a The restricted sample includes women residing in large counties with a population of 250,000 or more that have median income levels that are less than 130% of their own state average median income.

^b Foreign-born (i.e. immigrant) women include all Mexican-origin women who are born outside of the US territories.

^c Native women include all Mexican-origin women who are born in the 50 states and DC.

^d Although PRWORA was enacted in August of 1996, all infant birth observations from 1996 are included in the pre-PRWORA period since states began to implement their state-level assistance programs after 1997, as shown in Table 1.

^e County information is missing for all birth data from 2002.

^f Standard errors are in parentheses.

metropolitan counties, the fraction of non-resident births decreases significantly for both foreign-born and native women. Given the greater economic constraints imposed on the restricted sample, this is not too surprising.

The analysis relies on three divisions of the data. First, the observations are categorized as before or after PRWORA (1995, 1996 vs. 1999, 2000, 2001, 2002). Second, Mexican women are divided into two mutually exclusive categories: foreign-born and native women. And third, the country is divided into two groups: the less generous states (i.e. reformed states) and the more generous states (i.e. non-reformed states).¹¹ A state is classified as “more generous” if it offered post-enactment new immigrants at least some type of economic assistance program (TANF, food assistance, or SSI) as well as Medicaid during the 5-year bar. As mentioned in the previous section, there are a total of 11 states that are considered more generous based on the criteria. The remaining 39 states and DC are classified as “less generous” states. Different definitions of state generosity are examined in later analyses.

4. Methods

The link between public assistance and infant mortality rates is difficult to measure because a built-in spurious correlation precludes researchers from drawing credible inferences: women who are most likely to experience infant deaths are also the women who are most likely to qualify for and participate in welfare programs. The impact of removing public assistance on Mexican immigrants' infant mortality rates could be identified through an exogenous change in the receipt of

¹¹ The less generous states are referred to as the reformed states because they restricted post-enactment immigrants' participation in public means-tested programs following PRWORA, whereas the more generous states retained most of their pre-PRWORA benefit levels.

benefits wherein the government denies aid to some households and provides aid to others. The huge changes in eligibility for public assistance introduced by PRWORA provide a unique opportunity to estimate the impact of an exogenous change in the level of public assistance for recent immigrant families (Hall et al., 2010).

To estimate the impact of PRWORA on recent Mexican immigrants' infant mortality rates, the basic strategy is to track birth outcomes for Mexican immigrant women residing in non-generous states before and after they were subject to the new welfare rules, and then compare these changes with the corresponding changes for Mexican immigrant women residing in generous states who were not subject to reductions in their welfare benefits. This comparison generates the so-called “difference-in-difference (DID)” estimator (Card and Sullivan, 1988):

$$\Delta^2_{\text{Immigrant}} = (Y^{\text{PostPRWORA}}_{\text{RS, Immigrant}} - Y^{\text{PrePRWORA}}_{\text{RS, Immigrant}}) - (Y^{\text{PostPRWORA}}_{\text{nonRS, Immigrant}} - Y^{\text{PrePRWORA}}_{\text{nonRS, Immigrant}}) \quad (1)$$

where the subscript RS denotes residence in a state that strictly complied to PRWORA by limiting economic assistance and health insurance to recent immigrants. $Y^t_{r, \text{immigrant}}$ indicates whether the infant of an immigrant woman in region r dies within 1 year since birth at time t (Pre-PRWORA or Post-PRWORA). As described in the background section, public assistance was denied for post-enactment new immigrants during their initial 5 years of residence for immigrants residing in non-generous states during the post-PRWORA years but not during pre-PRWORA years, whereas in neither period did such a restriction apply to recent immigrants in generous states. The estimator in Eq. (1) assumes that, were it not for the welfare reform in 1996, changes in infant mortality risks for immigrants would have been similar across regions. Because native born people were exempt for these restrictions and thus native Mexican-origin women were eligible for public assistance throughout the study period, it is natural to use infant mortality rate changes for native Mexican-origin women to control for idiosyncratic shocks that may have affected the economic and social conditions within these states. The resulting “difference-in-difference” estimator is the following (Borjas, 2003, 2004; Myers, 2007):

$$\Delta^3 = \Delta^2_{\text{Immigrant}} - \Delta^2_{\text{Native}} \quad (2)$$

where Δ^2_{Native} is the native Mexican-origin woman analog to Eq. (1). In Eq. (2), changes in infant mortality risks for native women (relative to other immigrant women) are presumed to reflect region-specific period effects, and the impact of PRWORA to Mexican immigrant women is estimated by the extent to which infant mortality outcome changes for immigrant women residing in less generous states (relative to other immigrants in generous states) differed from the relative changes experienced by native women residing in less generous states.

For ease of exposition, I will refer to estimates based on Eq. (1) as *double-difference* estimates and estimates based on Eq. (2) as *triple-difference* estimates. It is convenient to compute the double- and triple-difference estimators within a regression framework. For double differences, birth observations of immigrant mothers from 1995 to 1996 and from 1999 to 2002 are pooled to estimate the following regression:

$$Y_{is} = \alpha + \beta_1 \text{PostPRWORA}_{is} + \beta_2 \text{ReformState}_{is} + \beta_3 \text{PostPRWORA}_{is} * \text{ReformState}_{is} + \epsilon_{is} \quad (3)$$

where Y_{is} indicates whether the infant of woman i in state s dies within 1 year since birth, PostPRWORA_{is} is a dummy variable equal to 1 if the observation refers to the post-PRWORA period (1999–2002) and 0 if it refers to the pre-PRWORA period (1995–1996), ReformState_{is} is set to 1 if woman i resides in a non-generous state that strictly complied with the federal welfare reform rules (i.e. states did not offer economic and medical assistance to post-enactment new immigrants during the 5-year bar) and 0 otherwise, and ϵ_{is} is a random error term. The coefficient β_3 measures the double-difference defined in Eq. (1).

For triple-differences, we add the birth data for Mexican-origin native women and estimate:

$$Y_{is} = \alpha + \beta_1 \text{PostPRWORA}_{is} + \beta_2 \text{ReformState}_{is} + \beta_3 \text{Immigrant}_{is} + \beta_4 \text{PostPRWORA}_{is} * \text{ReformState}_{is} + \beta_5 \text{PostPRWORA}_{is} * \text{Immigrant}_{is} + \beta_6 \text{ReformState}_{is} * \text{Immigrant}_{is} + \beta_7 \text{PostPRWORA}_{is} * \text{Immigrant}_{is} * \text{ReformState}_{is} + \epsilon_{is} \quad (4)$$

where Immigrant_{is} is an indicator variable equal to 1 if the woman is born outside of US territory (i.e. foreign born) and 0 if the woman is born within the 50 states and DC. The coefficient β_7 represents the triple-difference defined in Eq. (2).

In the triple-difference regression analyses, I also include controls for mother's age, education, marital status, residency, smoking and drinking behavior, birth plurality, place (facility) of delivery, attendant at delivery, and whether the father is of Mexican-origin. State dummy variables are also included to control for any fixed differences across each state (of residency). The standard errors are clustered at the state level to account for any dependence between observations within a state. Due to endogeneity concerns about access to prenatal care (that is, factors that determine whether a woman seeks prenatal care would most likely influence whether she receives public assistance or not – such as residing in a less generous state), the regression is initially estimated without controls for variation in the receipt of prenatal care. However, to further examine if the loss of public benefits influenced immigrants' infant mortality rates through changes in their receipt of prenatal care (i.e. mediation effects), the triple-difference regression is re-estimated including controls for when the mother initiated prenatal care visits. Eq. (4) is estimated using both ordinary least square regression (i.e. linear probability model) and logistic regression to account for any nonlinearity concerns.

Since the NCHS data is cross-sectional, it is not possible to directly control for unobserved individual fixed differences across women. As a result, the above estimates will be biased if there are unobserved differences correlated with a woman's

choice to live in a more or less generous state following the welfare reform and with her propensity to experience poor birth outcomes such as the death of an infant. Although this is a limitation, existing research suggests that low-skilled female immigrants are not attracted to states with generous welfare packages (Kaushal, 2005). Furthermore, the inclusion of state dummy variables reduces the likelihood that the results are biased by destination selection. The coefficient β_7 is an unbiased estimate as long as one assumes that, controlling for observed characteristics, the mean relative trend in infant mortality rates between the pre- and post-PRWORA periods for recent Mexican immigrants would have been identical to native Mexican-origin women had there not been the welfare reform.

5. Results

Table 3 presents the year-specific rates of death (per 1000 births) and number of live births for US infants by year, maternal ethnicity/race, nativity, and state generosity. The overall infant mortality rates for different racial and nativity groups are shown in column (5) of the table. They reflect what is widely known about infant mortality patterns in the US: the highest rate is exhibited among infants of native non-Hispanic black women, and the lowest overall rates are exhibited by infants of foreign-born (i.e. immigrant) Mexican women. In addition, most ethnic groups appear to have experienced a decline in infant mortality rates overtime except for the native Mexican-origin women residing in the more generous states.

Turning to the effects of PRWORA, Table 3 explores the relative difference in infant mortality rates between the pre-PRWORA and post-PRWORA years by the generosity level of the state of residence for both Mexican immigrant women and native Mexican-origin women. For Mexican immigrants, infant mortality rates dropped between the pre-PRWORA and post-PRWORA periods for both those who are residing in more and less generous states. However, the magnitude of the decrease is slightly larger for those residing in more generous states by about 0.61 deaths. Yet, the difference in the decline rate is not statistically significant. For Mexican-origin natives, infant mortality rates increased between the two time periods for those residing in more generous states, whereas it slightly decreased for those residing in less generous states. The relative difference in the number of deaths is approximately 2.30 and is statistically significant at the 5% level. Differencing these differences in the number of infant deaths between Mexican immigrants and natives allows one to estimate the effect of welfare reform for Mexican immigrants residing in less generous states. I find that welfare reform has contributed to an increase in infant mortality risk by approximately 3 deaths per 1000 births for recent Mexican immigrant women.

Table 4 presents results from the linear probability model (LPM) and logistic regression model of the triple-difference estimate for the full and restricted samples. It also includes estimates from the mediation analysis using information on a woman's utilization of prenatal care services during pregnancy. By controlling for various socioeconomic characteristics, the regression approach helps one determine if the differential trends in infant mortality rates observed between the more and less generous states arise because different types of immigrants tend to live in different states, or if the variation can be attributed to state-specific trends in economic activity or social conditions.

Findings from LPM model indicate that the 1996 welfare reform increased infant mortality rates of recent Mexican immigrant women by about 3.1 deaths (per 1000 births). This estimate is statistically significant at the 1% level. Interestingly, the triple-difference estimate in Table 4 is very similar to that from Table 3 which is obtained without accounting for state differences or individual observed characteristics. Next, the mediation analysis indicates that the increase in infant deaths associated with loss of public benefits is not mediated by changes in immigrant mothers' tendency to receive prenatal care – the triple-difference coefficient changes from 0.00309 to 0.00306 when controls for prenatal care are included. Lastly, when the sample is restricted to infant births among women residing in large metropolitan counties with median household income levels less than 130% of the state median, the triple-difference estimate almost doubles. Specifically, the federal cutbacks are estimated to have increased recent Mexican immigrant infant mortality rates by 5.9 deaths (per 1000 births) in low-income metropolitan counties. Other covariates have the expected signs: infant deaths are less common for women who are married, more educated, non-smokers, non-drinkers, giving birth to a boy, giving single births, who report the child's father to be of Mexican-origin, and who are giving birth in hospitals.

Estimates that account for nonlinearity in the logistic regression of Table 4 are similar to those from the LPM. In short, welfare reform increases the odds of an infant dying within 1 year of birth for recent Mexican immigrants and the increase is not mediated by changes in access to prenatal care services. The effect is much larger for births occurring in low-income metropolitan counties.

An important step in the construction of the empirical framework is the classification of a state into the “more” and “less” generous categories. As presented in Table 1, states made many different decisions regarding their offers of state-funded assistance to recent immigrants in the post-welfare reform period. I have chosen a very simply classification to summarize all of these activities based on the following question: “Did the state provide any state-funded assistance in terms of financial resources and access to health insurance for the post-enactment new immigrants during the 5-year bar?” However, it is important to examine if the results are sensitive to the definition of the variable describing the state's generosity. Such analyses will allow one to better understand the specific role of each public benefit program on preventing negative infant birth outcomes.

Table 5 contains the sensitivity of results from the triple-difference estimate in Eq. (4) for the full sample. Each column represents outcomes obtained from using a different specification of the variable ReformState_{it} based on three factors: state

Table 3

Trends in infant mortality rates (IMRs) for low educated women in the 50 states and DC (number of deaths in 1000 births) – full sample: years 1995–1996; 1999–2002.

Year	Pre-PRWORA				Post-PRWORA								(5)
	(1) Women in less generous states ^a		(2) Women in more generous states ^b		(3) Women in less generous states ^a				(4) Women in more generous states ^b				
	1995	1996	1995	1996	1999	2000	2001	2002	1999	2000	2001	2002	
<i>I. Mexican women</i>													
<i>A. Foreign-born (Immigrant)^c</i>													
IMR	5.01	4.93	6.22	4.23	4.83	4.36	4.63	4.60	4.13	4.26	4.10	4.53	4.68
No. of live Births	113,278	125,394	9,814	9,938	153,340	175,072	195,784	210,249	12,597	15,011	17,077	18,100	1,055,654
Double Difference ^d				0.61 (6.05)									
<i>B. Native^e</i>													
IMR	6.42	6.50	3.91	5.30	6.24	5.75	5.91	6.25	5.88	7.95	5.61	6.81	6.16
No. of live Births	88,775	95,200	2,816	2,832	106,707	110,204	114,133	119,783	3,399	3,647	3,746	3,820	655,062
Double difference ^d				−2.39 ** (1.15)									
Triple difference ^f												3.00 ** (1.30)	
<i>II. Native non-hispanic white</i>													
IMR	6.52	6.38	5.45	5.36	6.16	6.25	6.33	6.45	4.97	5.22	5.25	5.25	6.25
No. of live Births	1,143,600	1,125,837	239,292	231,847	1,137,233	1,141,300	1,118,157	1,098,850	265,907	263,977	261,828	255,276	8,283,104
<i>III. Native non-hispanic black</i>													
IMR	13.21	13.21	11.97	11.90	13.16	13.01	12.89	13.40	11.29	11.00	10.26	13.41	13.30
Births	366,048	361,773	66,311	63,095	368,381	379,060	373,199	368,469	75,644	80,160	80,111	368,469	2950,720

Source: Cohort linked birth and infant death files for the United States, National Center for Health Statistics; 1995–1996; 1999–2002.

^a Less generous states include the 39 states and DC that are not included in the “more generous state” category below.^b More generous states include 11 states: CA, CT, HI, MD, MA, MN, NE, NY, PA, RI, and WA.^c Foreign-born (i.e. immigrant) women include all Mexican-origin women who are born outside of the US territories.^d The double-difference estimate is defined in Eq. (1). It calculates the relative difference in infant mortality rates between pre-PRWORA and post-PRWORA time periods across the two different types of states for immigrant and native Mexican-origin women, respectively. The data are weighted to account for infant deaths that are not linked to a matching birth record. Standard errors are in parentheses.^e Native women include all Mexican-origin women who are born in the 50 states and DC.^f The triple-difference estimate is defined in Eq. (2). It calculates impact of PRWORA on the relative trend in immigrant infant mortality rates. The data are weighted to account for infant deaths that are not linked to a matching birth record. Standard errors are in parenthesis.

Table 4

Effect of welfare reform on infant death among low-educated Mexican immigrants.

	Linear probability model			Logistic regression model ^a		
	Full sample	Mediation Analysis	Restricted Sample ^b	Full sample	Mediation Analysis	Restricted Sample ^b
Post-PRWORA	0.00211*** (0.00075)	0.00212*** (0.00074)	0.00367* (0.00192)	1.482** (0.231)	1.482** (0.233)	2.779 (2.052)
Less generous State	0.00574*** (0.00076)	0.00558*** (0.00078)	0.00459** (0.00185)	1.230 (0.173)	3.390*** (0.495)	2.876* (1.822)
Immigrant	0.00156 (0.00097)	0.00153 (0.00096)	0.00439** (0.00217)	1.351 (0.280)	1.337 (0.275)	3.159 (2.652)
Post-PRWORA*	–0.00251*** (0.00077)	–0.00256*** (0.00076)	–0.00412** (0.00193)	0.633*** (0.100)	0.629*** (0.100)	0.332 (0.246)
Less generous state	–0.0031*** (0.00104)	–0.0030*** (0.00102)	–0.00570*** (0.00202)	0.544*** (0.110)	0.552*** (0.110)	0.230** (0.169)
Post-PRWORA*	–0.00270*** (0.00098)	–0.00285*** (0.00096)	–0.00501** (0.00218)	0.605** (0.126)	0.592** (0.122)	0.254 (0.214)
Less generous state	0.00309*** (0.00107)	0.00306*** (0.00104)	0.00586*** (0.00204)	1.800*** (0.369)	1.781*** (0.361)	4.432*** (3.281)
Immigrant*						
Less generous state						
Prenatal care at 1st trimester		–0.01052*** (0.00184)			0.332*** (0.028)	
2nd trimester		–0.01099*** (0.00185)			0.303*** (0.025)	
3rd trimester						
Resident	–0.00316*** (0.00045)	–0.00322*** (0.00043)	–0.00251*** (0.00038)	0.608*** (0.031)	0.602*** (0.029)	0.648*** (0.041)
Married	–0.00049*** (0.00010)	–0.00043*** (0.00010)	–0.00043** (0.00018)	0.906*** (0.016)	0.917*** (0.0(0.016)	0.913*** (0.031)
Infant boy	0.00093*** (0.00009)	0.00094*** (0.00010)	0.00069*** (0.00017)	1.194*** (0.020)	1.196*** (0.020)	1.151*** (0.029)
Single birth	–0.02356*** (0.00166)	–0.02355*** (0.00166)	–0.02154*** (0.00271)	0.173*** (0.008)	0.173*** (0.008)	0.174*** (0.013)
Smoked	0.0037*** (0.00049)	0.00349*** (0.00049)	0.00380*** (0.00109)	1.550*** (0.071)	1.494*** (0.070)	1.636*** (0.165)
Alcohol	0.00312** (0.00153)	0.00279 (0.00149)	0.00447* (0.00223)	1.433*** (0.195)	1.350** (0.176)	1.667*** (0.289)
Mother's education level						
8 years or less	0.00066*** (0.00010)	0.00053*** (0.00010)	0.00031 (0.00027)	1.138*** (0.024)	1.110*** (0.022)	1.068 (0.063)
9–11 years	0.00048*** (0.00016)	0.00043*** (0.00016)	0.00010 (0.00019)	1.090*** (0.029)	1.079*** (0.029)	1.017 (0.037)
13–15 years	–0.00071*** (0.00019)	–0.00069*** (0.00019)	–0.00050 (0.00037)	0.869*** (0.032)	0.872*** (0.032)	0.901 (0.077)
15 years old or less	0.00593*** (0.00098)	0.00588*** (0.00096)	0.00242 (0.00134)	2.007*** (0.169)	1.990*** (0.166)	1.473** (0.250)
16–19 years old	0.00116*** (0.00022)	0.00115*** (0.00022)	0.00100*** (0.00022)	1.226*** (0.054)	1.225*** (0.054)	1.216*** (0.063)
30–34 years old	–0.00127*** (0.00024)	–0.00126*** (0.00024)	–0.00106*** (0.00029)	0.799*** (0.039)	0.802*** (0.039)	0.820*** (0.046)
35 years old or older	0.00141*** (0.00020)	0.00140*** (0.00021)	0.00122*** (0.00026)	1.288*** (0.050)	1.284*** (0.052)	1.263*** (0.068)
Father is Mexican	–0.00125*** (0.00027)	–0.00106*** (0.00026)	–0.00082** (0.00030)	0.806*** (0.032)	0.834*** (0.034)	0.859*** (0.045)
Born in hospital	–0.00297 (0.00154)	–0.00293** (0.00133)	–0.00207** (0.00092)	0.525** (0.140)	0.553*** (0.122)	0.579** (0.126)
Delivered by MD	0.00220*** (0.00025)	0.00214*** (0.00025)	0.00245*** (0.00024)	1.693*** (0.097)	1.674*** (0.095)	1.954*** (0.173)
No. of observations	1710,716	1710,716	675,138	1710,449	1710,449	674,638

Note: The omitted categories are no prenatal care, non-resident, not married, infant girl, multiple births, did not smoke, did not drink, 12 years of education, age between 20 and 29, father is non-Mexican, not born in hospital, and attendant at delivery is not a Doctor of Medicine (MD). Above regressions include individual state dummies that are not reported here. Standard errors are in parentheses.

* Indicates p -value <0.1.

** Indicates p -value <0.05.

*** Indicates p -value <0.01.

^a Odds Ratio from the logistic model is presented.

^b The restricted sample includes women residing in large counties with a population of 250,000 or more that have median income levels that are less than 130% of their own state average median income.

Table 5

Sensitivity of results to definition of state generosity among low-educated Mexican immigrants in full sample.

Definition of State Generosity ^a	Original (Cash assist + Medicaid)	Cash assistance only	Prenatal care only	Medicaid only	Cash assist + Prenatal care	Cash assist + Medicaid + Prenatal care
Post-PRWORA	0.00211*** (0.00075)	–0.00064 (0.00091)	–0.00029 (0.00023)	0.00046 (0.00037)	0.00106 (0.00092)	0.00223*** (0.00080)
Less generous State	0.00574*** (0.00076)	0.00296** (0.00140)	0.00007 (0.00062)	–0.00038 (0.00087)	–0.00657*** (0.00065)	0.00601*** (0.00143)
Immigrant	0.00156 (0.00097)	–0.00060 (0.00084)	–0.0008*** (0.00029)	0.00001 (0.0004)	0.00174** (0.00080)	0.00234* (0.00123)
Post-PRWORA [*]	–0.00251*** (0.00077)	0.00034 (0.00093)	–0.00021 (0.00045)	–0.00088** (0.0004)	–0.00145 (0.00093)	–0.00262*** (0.00081)
Less generous state	–0.0031*** (0.00104)	0.00028 (0.00102)	–0.00010 (0.00033)	–0.00147*** (0.00037)	–0.00173* (0.00102)	–0.00310*** (0.00115)
Immigrant	–0.00270*** (0.00098)	–0.00048 (0.00085)	–0.00088** (0.00041)	–0.00501** (0.00048)	–0.00291*** (0.00080)	–0.00347*** (0.00123)
Less generous state	0.00309*** (0.00107)	–0.00046 (0.00105)	0.00003 (0.0005)	0.00159*** (0.00039)	0.00167 (0.00105)	0.00305*** (0.00118)
Immigrant [*]						
Less generous state						
Number of generous States (ReformState _{is} = 0)	11	19	21	15	13	8
Number of observations	1710,716	1710,716	1710,716	1710,716	1710,716	1710,716

All of the above regressions control for mother's age, education, marital status, residency, smoking and drinking behavior, birth plurality, state fixed effects, and whether the father is of Mexican-origin.

^a The variable ReformState_{is} is 0 if state provided the specified benefits to post-enactment immigrants during the 5-year bar, and 1 otherwise.

provision of cash assistance (TANF, food assistance, or SSI), health insurance (Medicaid), and prenatal care to recent immigrants during the 5-year bar.

The first column of Table 5 contains the triple-difference estimate from the original LPM model that defines a state to be generous if both economic resources and health insurance are provided to recent immigrants. Results from the sensitivity analysis indicate that when state generosity is based on the provision of either cash assistance or prenatal care services or both (without access to health insurance), the relative risk of infant death is not different between Mexican immigrant and native Mexican-origin women. On the other hand, when an index of state generosity based solely on the state's provision of health insurance to recent immigrants is constructed, infant mortality rates of Mexican immigrants are estimated to experience a relative increase by about 1.6 deaths (per 1000 births) following the welfare reform compared to that of natives. Lastly, when the index is based on the state's provision of all three services (cash assistance, health insurance, and prenatal

Table 6

Effects of welfare reform on infant death for other disadvantaged native women populations: full sample.

Disadvantaged group vs. not disadvantaged group	Teen vs. adult ^a	Not married vs. married ^b	Less educated vs. more educated ^c
Post-PRWORA	–0.00040 (0.00039)	–0.00024 (0.00028)	–0.00038 (0.00030)
Disadvantaged group	0.00065 (0.00094)	0.00226*** (0.00054)	0.00143*** (0.00044)
Less generous State ^d	–0.00088*** (0.00028)	–0.00086*** (0.00019)	–0.00072** (0.00031)
Post-PRWORA [*]	–0.00004 (0.00099)	–0.00053 (0.00059)	–0.00011 (0.00036)
Disadvantaged group	0.00004 (0.00041)	–0.00016 (0.00030)	–0.00010 (0.00033)
Less generous state	–0.00023 (0.00101)	–0.00074 (0.00056)	0.00010 (0.00048)
Disadvantaged group [*]	0.00004 (0.00101)	–0.00016 (0.00056)	–0.00010 (0.00048)
Less generous state	0.00030 (0.00105)	0.00076 (0.00062)	0.00037 (0.00040)
Post-PRWORA [*] disadv. group [*]			
Less generous state			
Number of observations	3894,916	3894,916	3894,916

Note: All of the above analyses are conducted on a 25% random sample of the total population for each year. Regression estimates are weighted accordingly.

^a Teen mothers indicate women giving birth at age 19 or less and adult mothers indicate women giving birth at age 20 or above. Regression controls for mother's race, education, marital status, residency, smoking and drinking behavior, birth plurality, state fixed effects, place of delivery, attendant at birth, and whether the father is of Mexican-origin.

^b Regression controls for mother's race, age, education, residency, smoking and drinking behavior, birth plurality, state fixed effects, place of delivery, attendant at birth, and whether the father is of Mexican-origin.

^c Less educated indicates women with 12 years of education or less and more educated indicates women with 13 years of education or more. Regression controls for mother's race, age, marital status, residency, smoking and drinking behavior, birth plurality, state fixed effects, place of delivery, attendant at birth, and whether the father is of Mexican-origin.

^d Definition of state generosity is the same as in Table 4. States are considered generous if they provide cash assistance and health insurance to their recent immigrants during the 5-year bar.

care), the triple-difference estimate is similar to the original estimate of about 3.1 deaths (per 1000 births). These findings indicate that health insurance coverage of (pregnant) women is an integral aspect of state-funded programs affecting infant mortality rates, and that access to prenatal care services alone does not prevent infant deaths among low-educated Mexican immigrants. In addition, state provision of economic resources contingent upon access to health insurance appears to decrease infant mortality risks of Mexican immigrants further.

Finally, in Table 6, I conduct comparisons within the population of several native households to examine if the state generosity variable is isolating the effect of programs supporting immigrants or simply indicating the level of state assistance provided to its disadvantaged populations (Borjas, 2004). Comparisons are made between teenage (19 years old or younger) and non-teenage mothers (20 years old or older); married and not married women, and more educated (i.e. 13 or more years) and less educated women (i.e. 12 years or less). Given the large population of infant births during the 6 year sampling period, a 25% random sample of the population is created for each comparison. I weight the data to account for the random sampling process as well as for infant deaths that are not linked to a matching birth record. Results indicate that the state-funded programs had no impact on the relative trend in infant mortality rates of other native groups. The triple-difference coefficients in these sensitivity tests are all numerically small and insignificantly different from zero. These findings suggest that the federal cutbacks clearly affected the infant mortality rates of targeted recent Mexican immigrants, but had little impact on other native disadvantaged groups.

6. Conclusion

Although the effects of PRWORA on immigrant adult outcomes have been widely examined, relatively few studies have explored its impact on child health outcomes despite its strong relevance. Since the welfare reform of 1996, new immigrants were differently affected by welfare eligibility rules depending upon the state in which they resided and the calendar year. The present study uses this variation to estimate the effect of welfare reform on low-educated Mexican immigrants' infant mortality rates using a triple-difference estimation strategy. I used concatenated data from the US linked birth and infant death files from 1995 to 1996 and from 1999 through 2002, which provided over 1.7 million births and more than 8900 infant deaths for Mexican-origin women to analyze. The findings clearly show that the welfare reform is associated with an increase in infant mortality rates for low-educated Mexican immigrant women residing in states with little (or no) support for their post-enactment new immigrants. The impact on infant mortality is larger for women residing in less affluent metropolitan counties. Mediation analysis reveals that Mexican immigrant's high infant mortality rates following the welfare reform do not result from changes in their receipt of prenatal care services.

These findings suggest that PRWORA may have incurred additional social costs related to pregnancy complications or hospitalizations of immigrant women. In other words, the fiscal benefits of the immigrant provisions of PRWORA may potentially be eroded by the risk of increased health care costs resulting from more immigrant families making use of emergency care related to pregnancy complications that cannot be denied. A recent study in North Carolina confirms this trend by showing a rapid growth of more than 20% in emergency Medicaid spending for childbirth and complications of pregnancy for recent and undocumented immigrants from 2001 to 2004 (Dubard and Massing, 2009). The study also indicates that childbirth and complications of pregnancy accounted for 82% of total emergency Medicaid spending and 91% of all hospitalizations in North Carolina, a state that does not provide any state-funded economic assistance or health services to its post-enactment new immigrants during the 5-year bar (Dubard and Massing, 2009).

Further examination of the sensitivity of results to various specifications of the *state generosity* measure indicates that access to health insurance is an integral aspect of state-funded programs affecting infant mortality rates, and that access to prenatal care services alone does not prevent infant deaths among low-educated Mexican immigrants. In addition, state provision of cash assistance in addition to health insurance appears to have the largest effect on infant mortality risks of Mexican immigrants. These findings suggest that recent efforts by many states to expand the provision of prenatal health services to women who are not eligible to receive federal benefits (such as Medicaid) may not be enough to improve their birth outcome measures.

An important limitation of this study is that information on women's citizenship status or length of stay in the US (or date of arrival in the US) is not available. As a result, the study uses information on mother's birth place to estimate the aggregate impact of welfare reform for all Mexican immigrant women relative to Mexican-origin native women. In some sense, however, the use of the mother's birth place is preferred in estimating the effect of PRWORA since the reliability of immigrants' self-reported citizenship status has been questioned by researchers and since studies suggest that the reform had a much broader "chilling" effect than on whom it was focused (i.e. post-enactment recent immigrants) (Borjas, 2004; Haider et al., 2004). Lastly, despite the econometric techniques employed to control for unobserved differences, it is still possible that some omitted variable correlated with one's choice to reside in a more or less generous state and with the chance of having poor birth outcomes is driving any observed association between these variables.

References

- Ashenfelter, O., 1978. Estimating the effect of training programs on earnings. *The Review of Economics and Statistics* 60 (1), 47–57.
- Bauer, T. K., G. S. Epstein, and I. N. Gang, 2002. Herd Effects or Migration Networks? The Location Choice of Mexican Immigrants in the U.S. IZA Discussion Paper No. 551. Available at SSRN: <<http://ssrn.com/abstract=327560>>.

- Bean, F.D., Van Hook, J., Woodrow-Lafield, K., 2002. Estimates of Numbers of Unauthorized Migrants Residing in the United States: The Total, Mexican, and Non-Mexican Central American Unauthorized Populations in Mid-2002". A Study conducted for the Pew Hispanic Center, Washington, DC.
- Berkowitz, G.S., 1995. Employment-related physical activity and pregnancy outcome. *Journal of American Medical Women's Association* 50 (5), 167–169.
- Borjas, G.J., 2003. Welfare reform, labor supply, and health insurance in the immigrant population. *Journal of Health Economics* 22, 933–958.
- Borjas, G.J., 2004. Food insecurity and public assistance. *Journal of Public Economics* 88, 1421–1443.
- Card, D., Sullivan, D., 1988. Measuring the effect of subsidized training programs on movements in and out of employment. *Econometrica* 56, 497–530.
- Dubard, C.A., Massing, M.W., 2009. Trends in emergency medicaid expenditures for recent and undocumented immigrants. *Journal of American Medical Association* 297 (10), 1085–1092.
- Duncan, G.T., Brooks-Gunn, Jeanne., 2000. Family poverty, welfare reform, and child development. *Child Development* 71 (1), 188–196.
- Durand, J., Massey, D.S., Capoferro, C., 2005. The new geography of Mexican immigration. In: Zúñiga, V., Hernández-León, R. (Eds.), *New Destinations: Mexican Immigration in the United States*. Russell Sage Foundation.
- Fix, M., Passel, J., 1999. Trends in Noncitizens' and Citizens' Use of Public Benefits Following Welfare Reform. Urban Institute Research Report. The Urban Institute, Washington, DC.
- Forbes, D., Frisbie, W.P., 1991. Spanish surname and anglo infant mortality: differentials over a half-century. *Demography* 28 (4), 639–660.
- Fremstad, S., Cox, L., 2004. Covering New Americans: A Review of Federal and State Policies Related to Immigrants' Eligibility and Access to Publicly Funded Health Insurance. Kaiser Commission on Medicaid and the Uninsured, Washington, DC. Available at <http://www.kff.org/medicaid/7214.cfm>.
- Gavin, N.I., Adams, E.K., Manning, W.G., Raskind-Hood, C., Urato, M., 2007. The impact of welfare reform on insurance coverage before pregnancy and the timing of prenatal care initiation. *Health Services Research* 42 (4), 1564–1588.
- Giscombe, C.L., Lobel, M., 2005. Explaining disproportionately high rates of adverse birth outcomes among African Americans: the impact of stress, racism, and related factors in pregnancy. *Psychological Bulletin* 131, 662–683.
- Gortmaker, S.L., 1979. Poverty and infant mortality in the United States. *American Sociological Review* 44, 280–297.
- Guzman, B., McConnell, E.D., 2002. The hispanic population: 1990–2000 growth and change. *Population Research and Policy Review* 21, 109–128.
- Hagan, J., Rodriguez, N., Capps, R., Kabiri, N., 2003. The effects of recent welfare and immigration reforms on immigrants' access to health care. *International Migration Review* 37 (2), 444–463.
- Haider, S., Schoeni, R.F., Bao, Y., Danielson, C., 2004. Immigrants, welfare reform, and the economy. *Journal of Policy Analysis and Management* 23 (4), 745–764.
- Hall, M., Graefe, D.R., De Jong, G., 2010. Economic self-sufficiency among immigrant TANF-leavers: welfare eligibility as a natural experiment. *Social Science Research* 39 (1), 78–91.
- Hummer, R.A., Powers, D.A., Pullum, S.G., Gossman, G.L., Frisbie, W.P., 2007. Paradox found (again): infant mortality among the Mexican-origin native population in the United States. *Demography* 44 (3), 441–457.
- Kalil, A., Crosby, D., 2010. Welfare leaving and the health of young children in immigrant and native families. *Social Science Research* 39 (2), 202–214.
- Kaushal, Neeraj., 2005. New immigrants' location choices: magnets without welfare. *Journal of Labor Economics* 23, 59–80.
- Kaushal, N., Kaestner, R., 2001. From welfare to work: has welfare reform worked? *Journal of Policy Analysis and Management* 20 (4), 699–719.
- Kaushal, N., Kaestner, R., 2003. Welfare reform and health insurance coverage of low-income families. *Journal of health economics* 22, 959–981.
- Kaushal, N., Kaestner, R., 2005. Medicaid and welfare reform: welfare reform and health insurance of immigrants. *Health Services Research* 40 (3), 697–722.
- Kaushal, N., Kaestner, R., 2007. Welfare reform and health of immigrant women and their children. *Journal Immigrant Health* 9, 61–74.
- Myers, C.K., 2007. A cure for discrimination? Affirmative action and the case of California's proposition 209. *Industrial and Labor Relations Review* 60 (3), 379–396.
- Palloni, Alberto., 2007. Childhood health and the reproduction of inequalities. *Demography* 43, 587–615.
- Scribner, R., 1996. Paradox as paradigm – the health outcomes of Mexican Americans. *American Journal of Public Health* 86 (3), 303–305.
- Van Hook, J., 2003. Welfare reform's chilling effects on noncitizens: changes in noncitizen welfare reciprocity or shifts in citizenship status? *Social Science Quarterly* 84 (3), 613–631.
- Van Hook, J., Balistreri, K., 2006. Ineligible parents, eligible children: food stamps receipt, allotments, and food insecurity among children of immigrants. *Social Science Research* 35, 228–251.
- Vlahov, D., Galea, S., Freudenberg, N., 2005. The urban health "Advantage". *Journal of Urban Health: Bulletin of the New York Academy of Medicine* 82 (1), 1–4.
- Wise, P.H., 2003. The anatomy of a disparity in infant mortality. *Annual Review of Public Health* 24, 341–362.
- Wise, P., Chavkin, W., Romero, D., 1999. Assessing the effects of welfare reform policies on reproductive and infant health. *American Journal of Public Health* 89 (10), 1513–1521.
- Zimmerman, W., Tumlin, K., 1999. *Patchwork Policies: State Assistance for Immigrants under Welfare Reform*. Assessing the New Federalism Occasional Paper Number 24. The Urban Institute, Washington, DC.