Original Research

Expanding Prenatal Care to Unauthorized Immigrant Women and the Effects on Infant Health

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OBJECTIVE: To measure the effect of access to prenatal care on unauthorized and low-income, new legal permanent resident immigrant women and their offspring.

METHODS: We used a difference-in-differences design that leverages the staggered rollout of Emergency Medicaid Plus by county from 2008 to 2013 as a natural experiment to estimate the effect on health service utilization for women and health outcomes for their infants. Regular Medicaid pregnancies were used as an additional control in a triple difference design.

RESULTS: Our sample included pregnancies covered by Emergency Medicaid (35,182), Emergency Medicaid Plus (12,510), and Medicaid (166,054). After expansion of access to prenatal care, there was an increase in prenatal visits (7.2 more visits, 95% CI 6.45–7.96), receipt of adequate prenatal care (28% increased rate, CI 26–31), rates of diabetes screening (61% increased rate, CI 56–66), and fetal ultrasonograms (74% increased rate, CI 72–76). Maternal access to prenatal care was also associated with an increased number of well child visits (0.24 more visits, CI 0.07–0.41), increased rates of recommended screenings and vaccines (0.04 increased probability, CI 0.002–0.074), and reduced infant mortality (−1.01/1,000, CI −1.42 to −0.60) and rates of extremely low birth weight (less than 1,000 g) (−1.33/1,000, CI −2.44 to −0.21).

CONCLUSION: Our results provide evidence of increased utilization and improved health outcomes for unauthorized immigrants and their children who are U.S. citizens after introduction of prenatal care expansion in Oregon. This study contributes to the debate around reauthorization of the Children's Health Insurance Program in 2017.

(Obstet Gynecol 2017;130:938–45)
DOI: 10.1097/AOG.0000000000002275

See related editorial on page 935.

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Supported by a grant from the Robert Wood Johnson Foundation for Jens Hainmueller and Maria I. Rodriguez, grant 73792. Maria I. Rodriguez is a Women's Reproductive Health Research fellow; grant 1K12HD085809.

Each author has indicated that he or she has met the journal's requirements for authorship.

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Financial Disclosure
Dr. Rodriguez received grants from the National Institute of Health, personal fees from the World Health Organization, personal fees from Teva, personal fees from the Society of Family Planning Research Fund, and personal fees from Lupin, outside the submitted work. The other authors did not report any potential conflicts of interest.

ISSN: 0029-7844/17

Prenatal care is an important component of preventive health care with multigenerational consequences for women and their families. For the woman, prenatal care promotes health, helps prepare for birth, and prevents and detects complications including anemia, hypertensive diseases of pregnancy, and infection.[1–4] For the neonate, regular prenatal care is associated with decreased incidence of low birth weight and neonatal deaths.[1,3,5]

Barriers to accessing prenatal care are greatest among the populations who would be expected to benefit most from preventive health care: low-income women. Medicaid is the largest payer for obstetric care nationally. Throughout the United States, standard Medicaid provides coverage for all pregnancy-related care, encompassing the antenatal period, childbirth, and postpartum. In contrast, Emergency Medicaid, a federal safety net program for those poor enough to qualify for Medicaid but who cannot meet

the citizenship requirements, covers only acute life-threatening events and obstetric admissions.[6,7]

Under federal law, authorized immigrants in their first 5 years in the United States and unauthorized immigrants are ineligible to participate in full-scope Medicaid using federal funds. For this immigrant population, Emergency Medicaid covers the cost of a birth but not prenatal care or postpartum contraception. Obstetric diagnoses are the majority of claims paid by Emergency Medicaid, accounting for greater than 80% of claims in North Carolina and Oregon.[7,8] States can choose to spend their own funds to provide additional health services for immigrants. The Emergency Medicaid population is often considered highly vulnerable.[9] Indeed, data from California and North Carolina suggest that of the Emergency Medicaid users in those states, 91% and 99% are unauthorized immigrants, respectively.[7,10]

An "unborn child" option in the Children's Health Insurance Program enacted in 2002 and the Child Health Insurance Program Reauthorization Act enacted in early 2009 gave states new options to provide prenatal care coverage with federal matching funds for extending coverage to immigrant children and pregnant women, regardless of their legal status or date of entry to the United States.[11–13] In response, Oregon began piloting a program to expand access to prenatal care for all recent and unauthorized immigrant women in 2008 called CAWEM Plus (Citizen/Alien Waived Emergent Medical Care). In this study, we refer to this program as Emergency Medicaid Plus.

Oregon's structured expansion of Emergency Medicaid Plus provides us with a suitable and rare natural experiment to study the result of providing access to prenatal care for a vulnerable immigrant population. With the introduction of Emergency Medicaid Plus, immigrant women suddenly had access to comprehensive prenatal care. Importantly, the expansion to Emergency Medicaid Plus through a staggered rollout statewide did not change the pool of women who had access to the newly covered care. Moreover, women could not self-select into Emergency Medicaid Plus because eligibility was tied to the county of residence. As shown in Figure 1, the first counties offered Emergency Medicaid Plus in 2008 with stepwise expansion to all 36 counties by 2013.

Previous studies of prenatal care have compared groups with high and low utilization.[3,14–16] In this study we isolate the effect of access to prenatal care from self-selection biases by utilizing the exogenous variation in access to prenatal care that stems from the staggered rollout of the Emergency Medicaid Plus program in a difference-in-differences framework.

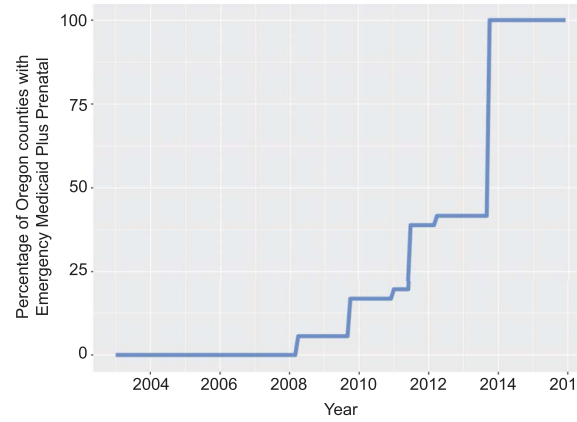

Fig. 1. Rollout of Emergency Medicaid Plus Prenatal across Oregon counties.

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Our objective was to measure the effect of access to prenatal care on unauthorized and low-income, new legal permanent resident immigrant women and their offspring. We specifically examined whether expanding access to prenatal care resulted in utilization of services by women and their infants including prenatal visits, recommended pregnancy care, well child checks, and vaccines. We also assessed effects on infant health outcomes including low birth weight, preterm birth, and infant death. In a separate study, we plan to present the associated maternal health outcomes.

MATERIALS AND METHODS

Medical claims data from January 1, 2003, through October 1, 2015, were obtained through Oregon Health Authority's Department of Health Analytics for all Medicaid claims, encompassing pregnancies under standard Medicaid as well as Emergency Medicaid and Emergency Medicaid Plus. The Oregon Health Authority provided three different types of quarterly data: recipient, claims, and prescription. We used administrative records and personal communication with the Oregon Health Authority to confirm start dates for the expansion of Emergency Medicaid Plus in each of Oregon's 36 counties (see Appendix 1, available online at http://links.lww.com/AOG/B23).

The institutional review boards at Oregon Health & Science University (Protocol 15,633) and Stanford University (Protocol 40,907) approved this research.

Our population consists of reproductive-aged women (12–51 years) and their offspring aged 0–1 year. The Emergency Medicaid and Emergency Medicaid Plus samples include low-income immigrant women who are either unauthorized or have fewer than 5 years of legal permanent residency. We refer

to individuals in this sample as unauthorized immigrants because they predominantly use these programs.[7,17] Our unit of analysis was a pregnancy and only singleton pregnancies were included. To identify each pregnancy episode, we developed an algorithm building on prior literature modified for the Oregon Medicaid claims data (see Appendix 2, available online at http://links.lww.com/AOG/B23).[18] In addition, we relied on a matching algorithm using a validated household identification number in the beneficiary file and other auxiliary information to match pregnancies and infants (see Appendices 3 and 4, available online at http://links.lww.com/AOG/B23).[19]

We examined outcomes related to health service utilization as well as infant health outcomes. Outcomes for utilization by women included prenatal visits and receipt of adequate prenatal care (defined as one visit in the first pregnancy trimester plus a total of nine or more visits overall).[20] A prenatal visit was defined as having one or more claims for prenatal supervision on a distinct day of service. To capture visits not billed as prenatal care, we also counted all outpatient visits during pregnancy, although measures of adequacy are based on prenatal supervision visits only. Routine prenatal care services measured included ultrasonography during pregnancy; vaccination for tetanus, diphtheria and pertussis (Tdap); rhesus (Rh) immunoglobulin administration (for women with Rh-negative blood type); and diabetes screening (see Appendix 5, available online at http://links.lww.com/AOG/B23). Given the limitation of the database, we were unable to identify women with Rh-negative blood type, so results for Rh immunoglobulin administration are for all pregnancies.

We examined several markers of infant utilization of health care services in the first year of life. These included the number of well child checks, outpatients visits, and urgent care or emergency department visits as well as receipt of standard vaccinations and screenings in the first year of life. We identified the number of emergency department and urgent care visits using a service location identifier code included in the claims database. A list of *Current Procedural Terminology* codes was used to identify receipt of routine screening and vaccines that are recommended in the first year of life (Appendices 6–8, available online at http://links.lww.com/AOG/B23).

We measured several infant health outcomes including low birth weight (less than 2,499 g), very low birth weight (less than 1,499 g), extremely low birth weight (less than 1,000 g), preterm birth (less than 37 weeks of gestation), and infant death. Death in the first year of life was identified using the recipient database.

Table 1 shows the naïve comparison of mean outcomes between pregnancies under Emergency Medicaid and Emergency Medicaid Plus. Although illustrative, this comparison does not adjust for potential confounding.

To isolate the effect of expanding access to prenatal care from confounding characteristics, we utilized a difference-in-differences approach that exploits the staggered rollout of the Emergency Medicaid Plus. Difference-in-differences methodology is increasingly used as a tool in observational studies of health policy.[21] Studies using a more traditional prepolicy and postpolicy comparison of outcomes are likely to be confounded by a secular trend unrelated to the policy change. Researchers can thus mistake an improvement in an outcome as resulting from a policy change when it could simply be the continuation a pre-existing trend.[21] In contrast, a difference-in-differences approach better isolates the changes associated with a policy by comparing an outcome for exposed and unexposed groups before and after policy implementation. This design controls for unobserved common shocks and time-invariant characteristics.

We estimate the following baseline specification:

$$Y_{ijt} = \alpha + \pi\ Z_{ijt} + \theta\ K_{ijt} + \beta_c + \beta_t + \beta_{cj} T_t + \epsilon_{ijt}$$

where Y_{ijt} is an outcome of interest for pregnancy i in county j and month t, Z_{ijt} is a treatment indicator, coded 1 if Emergency Medicaid Plus was offered in the county where the women was enrolled at the end of pregnancy i, and 0 otherwise, K_{ijt} is a vector of time-varying controls (including an age polynomial and fixed effects for race categories, ethnicity categories, and gravidity, defined as the number of pregnancies identified between 2003 and 2015), β_c are county-level fixed effects, β_t are monthly period fixed effects, $\beta_{cj}T_t$ are county-specific time trends, and ϵ is the error the term.

County fixed effects account for all time-invariant county-level confounders, period fixed effects account for all common confounders that vary by month, and county-specific time trends account for any changes in unobserved confounders that vary at the county level and affect outcomes smoothly over time. The quantity of interest is the coefficient π that identifies the intention-to-treat effect of providing access to prenatal care by switching from Emergency Medicaid to Emergency Medicaid Plus. We clustered standard errors at the level of the county. We also block bootstrapped standard errors as a sensitivity analysis and found a minimal difference in our results. To check the robustness of our results, we also extend this baseline

Table 1. Descriptive Statistics: Maternal and Infant Outcomes by Insurance Group

Insurance	Emergency Medicaid (EM)	Emergency Medicaid Plus Prenatal (EMP)	Medicaid	EM vs EMP
No. of supervision visits (count)	0.24±1.22	8.52±5.21	6.11±4.17	8.27 (8.18 to 8.37)
No. of outpatient visits (count)	0.29±1.75	12.23±7.27	11.04±8.68	11.94 (11.81 to 12.07)
Early visit (0/1)	0.02±0.13	0.50±0.50	0.56±0.50	0.48 (0.47 to 0.49)
Early visit and 9 or more visits (0/1)	0.01±0.08	0.43±0.50	0.41±0.49	0.43 (0.42 to 0.44)
Rh immunization (per 1,000)	7.70±87.43	22.46±148.19	89.39±285.30	14.76 (12.01 to 17.51)
Tdap vaccination (0/1)	0.01±0.08	0.32±0.47	0.27±0.45	0.31 (0.30 to 0.32)
Glucose testing (0/1)	0.02±0.14	0.73±0.45	0.75±0.44	0.71 (0.70 to 0.71)
Fetal ultrasonography (0/1)	0.04±0.21	0.87±0.34	0.88±0.33	0.83 (0.82 to 0.83)
No. of well child checks (count)	4.92±2.54	5.21±2.93	4.38±2.50	0.30 (0.24 to 0.35)
No. of outpatient visits (count)	9.14±5.81	10.27±5.82	9.54±6.07	1.12 (1.00 to 1.24)
No. of emergency department visits (count)	0.22±0.70	0.68±1.22	0.38±0.95	0.46 (0.43 to 0.48)
Screenings and vaccinations (0/1)	0.82±0.38	0.90±0.30	0.79±0.41	0.08 (0.07 to 0.09)
Low birth weight (per 1,000)*	49.63±217.19	59.95±237.41	61.01±239.34	10.32 (5.58 to 15.06)
Very low birth weight (per 1,000)†	3.75±61.14	3.52±59.20	4.68±68.25	−0.24 (−1.45 to 0.98)
Extremely low birth weight (per 1,000)‡	1.76±41.94	0.72±26.81	1.77±42.04	−1.04 (−1.69 to −0.40)
Preterm birth at less than 37 wk of gestation (per 1,000)§	66.32±248.84	75.46±264.14	78.93±269.63	9.14 (3.83 to 14.45)
Death in first 365 d (per 1,000)‖	1.08±32.85	0.32±17.88	1.32±36.29	−0.76 (−1.23 to −0.30)

Rh, rhesus; Tdap, tetanus, diphtheria and pertussis.

Data are means±SD or difference in means between EM and EMP (95% CI). n=35,182 for EM; n=12,510 for EMP; n=166,054 for Medicaid.

* n=1,746 for EM; n=750 for EMP; n=10,130 for Medicaid.

† n=132 for EM; n=44 for EMP; n=777 for Medicaid.

‡ n=62 for EM; n=9 for EMP; n=294 for Medicaid.

§ n=2,333 for EM; n=944 for EMP; n=13,106 for Medicaid.

‖ n=38 for EM; n=4 for EMP; n=219 for Medicaid.

specification to a triple difference framework and include a third comparison group by adding pregnancies that used standard Medicaid in the same counties and at the same time. The triple difference model ensures robustness to potentially confounding trends within the same county that are specific to the immigrant population that utilized Emergency Medicaid and correlated with the introduction of Emergency Medicaid Plus in a given county.

All analyses, unless otherwise stated, were preregistered and posted in a preanalysis plan with Evidence in Governance and Politics.[22] Evidence in Governance and Politics is a research network with the aim of strengthening research and evidence-based policymaking. Members can register relevant analysis plans to help prospectively clarify goals and avoid post hoc data mining.

RESULTS

Our sample included pregnancies covered by Emergency Medicaid (35,182), Emergency Medicaid Plus (12,510), and Medicaid (166,054) (see Appendix 9, available online at http://links.lww.com/AOG/B23, for descriptive statistics). Women in Emergency Medicaid and Emergency Medicaid Plus were predominantly Hispanic ethnicity (80% and 77%, respectively), whereas the Medicaid population was predominantly non-Hispanic (80%).

Figure 2 compares the use of prenatal care coverage and the number of prenatal visits before and after rollout of the Emergency Medicaid Plus program. The program was rapidly adopted with more than 95% of unauthorized immigrant pregnancies billed to the new program after its rollout. There was also a marked increase in the number of prenatal visits from an average of zero to approximately 12 outpatient visits during the pregnancy period.

Table 2 shows estimates of the intention-to-treat effect from the difference-in-differences and the triple difference models. After expansion to Emergency Medicaid Plus, there was an increase in the number of prenatal visits (7.21 additional visits per pregnancy, 95% CI 6.45–7.96) and the number of outpatient visits (9.82 additional visits, CI 9.04–10.59) for unauthorized immigrant women. There was also an increase in the probability that unauthorized immigrant women had at least one prenatal visit in the first trimester (32 percentage point increase from baseline of

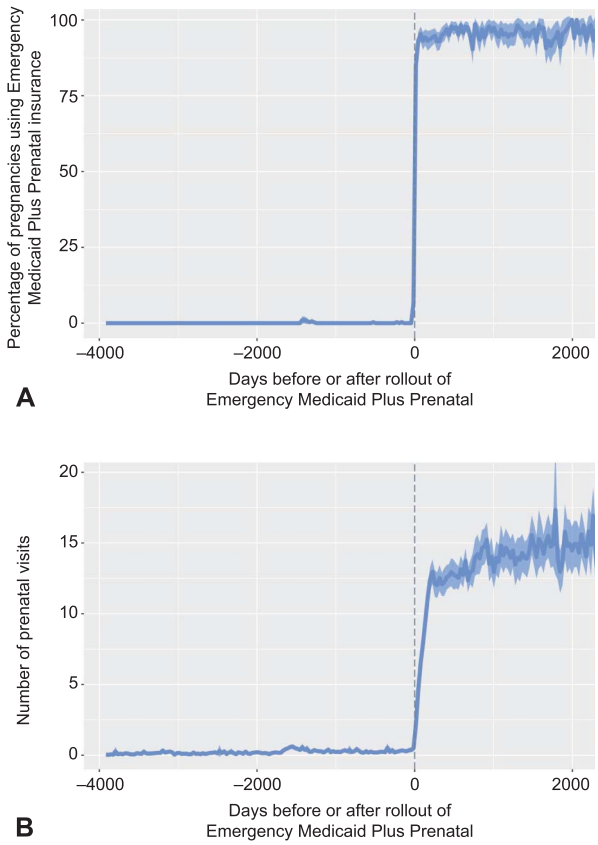

Fig. 2. Uptake of Emergency Medicaid Plus Prenatal (EMP). **A** and **B** show the average jump in use of prenatal care associated with the introduction of EMP. The figures are in event time and aggregate the stepwise introduction from 2008 to 2013 to time 0 where the program became active. **A**. The share of pregnancies in the Emergency Medicaid sample that use the EMP insurance increases rapidly after the rollout of the EMP program across Oregon counties. **B**. The number of outpatient visits per pregnancy similarly increases. *Blue lines* denote monthly means with 95% CIs.

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2%, CI 29–36) and received adequate prenatal visits (28% increase from baseline of 1%, CI 26–31). Moreover, with expansion to Emergency Medicaid Plus, there was an increased likelihood of having Rh immunoglobulin administration during pregnancy (0.8% increase above baseline rate of 0.8%, CI 0.4–1.2), vaccination for Tdap (19% increase from baseline of 1%, CI 13–25), diabetes screening with oral glucose tolerance testing (61% increase from baseline of 2%, CI 56–66), and fetal ultrasonography (74% increase from baseline of 4%, CI 72–76). These estimates were consistent using both the difference-in-differences and triple difference specifications, although the effect on Rh immunoglobulin administration is not consistent across specifications and the effect on Tdap vaccinations shrinks.

Table 3 shows the effects on the utilization of care for infants of unauthorized immigrant women. With expansion of Emergency Medicaid Plus, there was an increase in the number of well child checks (0.24 more visits, CI 0.07–0.41), the number of emergency department and urgent care visits (0.16 more visits, CI 0.05–0.28), and the probability of receiving recommended screenings and vaccinations (4% increase from a baseline of 82%, CI 0.2–7.4) during the first year of life. These estimates were consistent using both the difference-in-differences and triple difference specifications, but with important exceptions. The effect on the number of outpatient visits is slightly larger in the triple difference model (0.74 more visits, CI 0.36–1.11) and the effect on emergency department and urgent care visits is no longer significant in the triple difference model (0.05 more visits, CI −0.03 to 0.13).

As shown in Table 3, there were also several improved health outcomes for infants after the rollout of Emergency Medicaid Plus. There was a decrease in the probability of extremely low-birth-weight infants (−1.33 reduction in extremely low birth weight/1,000 live births, CI −2.44 to −0.21) and a decrease in infant mortality in the first year of life (−1.01 reduction in infant mortality/1,000 live births, −1.42 to −0.60). Both of these results were consistent across the difference-in-differences and triple difference specifications. We found no consistent effects on the probability of low and very low birth weight and preterm birth.

We conducted a number of nonprespecified sensitivity tests. To examine whether providing prenatal care changed the population utilizing Emergency Medicaid, we estimated the effect of Emergency Medicaid Plus expansion on the covariates replicating the difference-in-differences and triple difference specifications. The results indicated no substantive compositional shifts in age, number of pregnancies, race, or ethnicity of the population (Appendix 10, available online at http://links.lww.com/AOG/B23). To examine the robustness of the mortality results, we expanded the time horizon to estimate the effects on infant death per 1,000 infants at 2 and 3 years after birth. The difference-in-differences and triple difference estimates were significant and consistently negative across these additional time intervals, corroborating the reduction in infant mortality (Appendix 11, available online at http://links.lww.com/AOG/B23). Second, we conducted Fisher exact tests, which showed that the infant

Table 2. Effect of Emergency Medicaid Plus Prenatal on Utilization for Women

Outcome	DID Model Effect 95% CI	Triple DID Model Effect 95% CI
No. of supervision visits (count)	7.21 (6.45–7.96)	8.02 (7.01–9.03)
No. of outpatient visits (count)	9.82 (9.04–10.59)	9.33 (8.63–10.02)
Early visit (0/1)	0.32 (0.29–0.36)	0.35 (0.31–0.39)
Early visit and 9 or more visits (0/1)	0.28 (0.26–0.31)	0.29 (0.24–0.34)
Rh immunization (per 1,000)	8.18 (4.66–11.69)	−2.27 (−9.89 to 5.34)
Tdap vaccination (0/1)	0.19 (0.13–0.25)	0.09 (0.00 to 0.18)
Glucose testing (0/1)	0.61 (0.56–0.66)	0.71 (0.67–0.74)
Fetal ultrasonography (0/1)	0.74 (0.72–0.76)	0.78 (0.75–0.80)

DID, difference-in-differences; Rh, rhesus; Tdap, tetanus, diphtheria and pertussis.
Data are estimate from DID model and triple DID model (robust 95% CI) (clustered by county).
All models include county fixed effects, month fixed effects, county-specific time trends, and covariates (age polynomial, race fixed effects, ethnicity fixed effects, and gravidity fixed effects [defined as the number of pregnancies identified between 2003 and 2015]). n=47,692 for DID models and 213,746 for triple DID models.

mortality rate significantly declined after the Emergency Medicaid Plus expansion for mortality measured at 1, 2, and 3 years after birth (Appendices 12–14, available online at http://links.lww.com/AOG/B23). The tests also showed that during the same timeframe, infant mortality, if anything, increased for the standard Medicaid pregnancies (Appendices 15−17, available online at http://links.lww.com/AOG/B23).

DISCUSSION

Understanding how expanding access to prenatal care influences both health outcomes and costs is of national relevance as states strive to meet the triple aim of increasing quality and access care while simultaneously reducing the costs.[23] As of 2015, 32 states and the District of Columbia have opted to provide some level of prenatal care for unauthorized immigrant women through Medicaid or the Children's Health Insurance Program.[12] Funding for the Children's Health Insurance Program is extended through 2017 and the scope of the program at renewal is likely to be a topic of debate.

To inform these policy debates, we leveraged a rare natural experiment in which unauthorized immigrant women eligible for Emergency Medicaid gained access to prenatal care coverage by the expansion of the Emergency Medicaid Plus program in Oregon. We found that expanding access to prenatal care considerably increased both utilization of and quality of prenatal care and women were much more likely to receive adequate care and recommended preventive health services. Because the infants are U.S. citizens by birth, they have the same access to care regardless of whether their mothers had prenatal care or not, yet we found a significant increase in infants receiving recommended preventive health services and improved health outcomes after expansion of prenatal care. A

Table 3. Effect of Emergency Medicaid Plus Prenatal on Utilization and Health Outcomes for Infants

Outcome	DID Model Effect 95% CI	Triple DID Model Effect 95% CI
Well child check (0/1)	0.01 (−0.00 to 0.01)	0.01 (0.01–0.01)
No. of well child checks (count)	0.24 (0.07 to 0.41)	0.29 (0.14–0.44)
No. of outpatient visits (count)	0.21 (−0.06 to 0.49)	0.74 (0.36–1.11)
No. of emergency department visits (count)	0.16 (0.05 to 0.28)	0.05 (−0.03 to 0.13)
Screenings and vaccinations (0/1)	0.04 (0.002 to 0.074)	0.05 (0.02 to 0.07)
Low birth weight (per 1,000)	1.84 (−6.74 to 10.42)	4.80 (0.30 to 9.30)
Very low birth weight (per 1,000)	1.29 (−0.70 to 3.28)	−0.66 (−1.80 to 0.48)
Extremely low birth weight (per 1,000)	−1.33 (−2.44 to −0.21)	−1.28 (−2.08 to −0.49)
Preterm birth at less than 37 wk of gestation (per 1,000)	2.46 (−8.05 to 12.97)	10.12 (3.15 to 17.09)
Death in first 365 d (per 1,000)	−1.01 (−1.42 to −0.60)	−1.40 (−1.99 to −0.82)

DID, difference-in-differences.
Data are effect estimate from DID model and triple DID model (robust 95% CI) (clustered by county).
Low birth weight=2,499 g or less; very low birth weight=1,500 g and less; extremely low birth weight=1,000 g or less. Emergency department visits include urgent care. All models include county fixed effects, month fixed effects, county-specific time trends, and covariates (age polynomial, race fixed effects, ethnicity fixed effects, and gravidity fixed effects [defined as the number of pregnancies identified between 2003 and 2015]). n=47,692 for DID models and 213,746 for triple DID models.

possible explanation for this finding is that increased contact with the health system during pregnancy led women to be more connected with care after their children were born. Future research is needed to determine the precise mechanisms driving this effect.

We also found a significant decrease in both the probability of extremely low-birth-weight infants and infant death with access to prenatal care. Our estimates suggest that pregnancies covered under Emergency Medicaid Plus saw a reduction in infant mortality by approximately 1.01 per 1,000. As a point of comparison, this reduction is greater than the 30-year reduction in infant mortality from sudden infant death syndrome associated with the "Back to Sleep" campaign.[24,25] This reduction in infant mortality linked to access to prenatal care represents a meaningful gain in a public health metric where the United States lags behind other developed countries.[26] The reduction we observed in extremely low-birth-weight infants likely contributes to the decrease in infant mortality rate in our population. Although we were unable to stratify preterm birth for this analysis, extremely low birth weight (less than 1,000 g) is correlated with early prematurity and high mortality.[24,27]

Previous studies of expansion coverage for immigrants through the Children's Health Insurance Program and the Child Health Insurance Program Reauthorization Act have shown increased utilization of prenatal care but have been unable to differentiate between foreign-born women who may already have insurance coverage and those who are affected by the expansion.[12,13] Our study corroborates these important findings related to prenatal care access, which a growing body of literature links to improved health and economic indicators in the subsequent generation.[28] Moreover, because we are able to specifically isolate immigrant women who gain coverage through Oregon's expansion, we are better able to measure related health outcomes.

Our study has a number of limitations. Like with any study using claims data, input errors or omissions could have affected our results. The claims database did not include information on socioeconomic status, education, or other obstetric risk factors that might help better contextualize the results. Women ineligible for Emergency Medicaid Plus may have obtained prenatal care through self-pay or uncompensated care that would not be reflected in the claims database. Although this may mean we overstate the increase in utilization for women, the bias on health outcomes for infants is toward the null. We captured infant mortality by using the date of death recorded in the claims recipient database rather than a death registry, which would have been more comprehensive and identified more deaths.[27] If, as the results suggest, women with access to prenatal care were more connected to the health care system and more likely to bring in their children for preventive services, we would be more likely to also identify the death of their infants and this would bias the infant mortality effects toward the null. Our results should be interpreted with some caution in application to other states because Oregon has a relatively small population with significant demographic differences from other regions of the United States and has also adopted a number of reforms such as Medicaid expansion under the Affordable Care Act that may indicate a favorable environment for expansion of government-sponsored insurance. However, because the expansion is statewide, it does encompass economic, health system, and environmental heterogeneity that increases generalizability.

In sum, our results provide evidence of an unusual success story in preventive care with excellent uptake in the target population and subsequent reduction in morbidity and mortality in the next generation. Policymakers can use this information as they decide the fate of similar programs.

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