RESEARCH REPORT

Effects of Welcome Baby Home Visiting on Maternal and Child Medi-Cal Enrollment and Utilization

Findings from a Merger of Welcome Baby and Medi-Cal Data

February 2017

Prepared for:

first 5 la
Giving kids the best start

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Acknowledgments

This report was funded by First 5 LA. We are grateful to them and to all our funders, who make it possible for Urban to advance its mission.

The views expressed are those of the authors and should not be attributed to the Urban Institute, its trustees, or its funders. Funders do not determine research findings or the insights and recommendations of Urban experts. Further information on the Urban Institute's funding principles is available at www.urban.org/support.

First 5 LA provided financial support for the data analysis and the report. We acknowledge the substantial help of the staff of the California Department of Health Care Services, especially My-Ai Bui, who performed the programming for the data linkage, and Angelique Lastinger, who facilitated our access to the Medi-Cal data. We also appreciate the continual support of our project officer, Pegah Faed, throughout the project.

Executive Summary

Welcome Baby is a voluntary, locally designed home visiting program that was developed as part of First 5 LA's Family Strengthening investment supporting families with children from before birth to age five. To assess the effects of the Welcome Baby program, the Urban Institute and its partner, the University of California, Los Angeles, conducted a six-year mixed methods evaluation of the home visiting program. This paper provides results from a substudy of the larger evaluation, which examines the outcomes of the program on women and infants enrolled in Medi-Cal. The substudy uses Medi-Cal data linked to the survey records for women who participated in the overall evaluation.

Building on previous literature, the research questions for this substudy are as follows:

- Is Welcome Baby associated with increased length of enrollment in Medi-Cal for women or infants in the first or second year after birth?
- Is Welcome Baby associated with higher rates of postpartum visits for women enrolled in Medi-Cal?
- Is Welcome Baby associated with higher rates of preventive visits for children enrolled in Medi-Cal in their first or second year of life?
- Is Welcome Baby associated with a higher rate of all physician visits for children enrolled in Medi-Cal in the first or second year of life?
- Is Welcome Baby associated with a higher or lower rate of emergency department visits for children enrolled in Medi-Cal in their first or second year of life?
- Is Welcome Baby associated with a lower rate of repeat delivery for women enrolled in Medi-Cal in the two years following birth?

Results from the substudy indicate that mothers participating in Welcome Baby, relative to comparison group mothers, were found

- to have longer Medi-Cal enrollment in Year Two postpartum;
- to be more likely to have a postpartum visit within the HEDIS time frame of 21 to 56 days after delivery; and

- to be less likely to have a subsequent delivery covered by Medi-Cal within two years postpartum.

Children participating in Welcome Baby, relative to comparison group children, were found

- to have a higher number of total physician visits in both Year One and Year Two postpartum;
- to have a higher number of well-child visits in both Year One and Year Two postpartum;
- to be more likely to have at least one Emergency Department (ED) visit in Year Two postpartum; and
- to have a higher number of ED visits in both Year One and Year Two postpartum.

These important findings point to potential improvements in maternal and infant health due to Welcome Baby, for mothers and infants enrolled in the Medi-Cal program. The findings may also be helpful in supporting First 5 LA's efforts to develop strategies for sustaining Welcome Baby service delivery in future years.

Effects of Welcome Baby Home Visiting on Maternal and Child Medi-Cal Enrollment and Utilization

Welcome Baby is a voluntary, locally designed home visiting program that was developed as part of First 5 LA's Family Strengthening investment supporting families with children from prenatal to age five. The program is designed to support women and their infants and enhance parental understanding of child development by providing education on topics related to pregnancy and caring for an infant through an empathetic and strength-based approach. Depending on when a woman enters the program, she may have up to nine contacts (or "engagement points") with program staff. First launched in a downtown Los Angeles pilot community called Metro LA, Welcome Baby was originally offered to all women who gave birth at California Hospital Medical Center (CHMC) and who lived within a five mile radius. In 2013, the program was expanded to 13 other communities in Los Angeles County.

To assess the effects of the Welcome Baby program, the Urban Institute and its partner, the University of California, Los Angeles, conducted a six-year mixed methods evaluation of the home visiting program, which included case studies of implementation; focus groups with families, home visitors, and community partners in Metro LA; and a longitudinal household survey of parents (referred to as the Child and Family Survey). Findings from the case studies and focus groups document the successes, challenges, and lessons learned that surrounded the implementation and evolution of Welcome Baby during its early years (Hill et al. 2011; Hill and Adams 2011; Hill and Benatar 2011; Adams et al. 2012; Hill and Wilkinson 2013; Hill, Wilkinson, and Benatar 2014). Meanwhile, the evaluation of the outcomes of the program using the Child and Family Survey—conducted at 12, 24, and 36 months postpartum—identifies the key maternal and child outcomes for women enrolled during the early phase of program implementation. In particular, the analysis shows that Welcome Baby improves breastfeeding retention and affects children's early development in several positive ways (Benatar et al. 2013; Benatar et al. 2014; Sandstrom et al. 2015).

In 2013, First 5 LA asked the Urban Institute to conduct a substudy of this larger evaluation project with a twofold purpose. The first purpose was to explore the feasibility of linking data on Welcome Baby participants and their infants with Medi-Cal [1] eligibility, claims, and encounter data; and the second, if

[1] In California, the Medicaid program is known as Medi-Cal. In this report, we use the term "Medi-Cal" to refer to women enrolled in Medicaid in California, and the term "Medicaid" to refer to the program in other states.

the data sets were successfully linked, was to compare the experiences in Medi-Cal of Welcome Baby participants to those of other comparable Medi-Cal mothers and infants. These data provide a profile of Welcome Baby participants in comparison to other Medi-Cal women who delivered during the same time period, and highlight some additional outcomes of Welcome Baby beyond those identified in the survey data analysis cited above.

To that end, the Urban Institute began working with the California Department of Health Care Services (the state's Medicaid agency) in the fall of 2013 to obtain Medi-Cal data for Welcome Baby participants and their infants, as well as a comparison group, and began receiving data in early 2015. This report details the steps involved in obtaining and linking the data, and highlights findings from an analysis of the merged data set, including the characteristics of the study group, duration of Medi-Cal enrollment, and utilization of services. The study builds on and enhances previous research concerning home visiting and its impact on the Medicaid program.

Prior Studies of Home Visiting and Medicaid

Medicaid covers pregnant women and infants with the assumption that preventive and curative services provided during pregnancy and early childhood will lead to positive health outcomes for the mother and child. Many home visiting programs, including Welcome Baby, target low-income mothers and infants who are enrolled in Medicaid (or Medi-Cal in California). There are a small number of studies that have focused on the relationship between such home visiting programs and Medicaid outcomes.

Home visitors often provide information on public programs to which a mother and her infant may be entitled, so researchers have investigated whether such advice leads to increased enrollment in Medicaid or retention in the program. However, existing studies have not shown a relationship between home visiting and Medicaid enrollment. For example, a study of the Parents as Teachers home visiting program in Northern California (Wagner et al. 1999) used a random assignment design and found no significant impact of the program on Medicaid enrollment for children ages one through three. Olds et al. (2007) studied the children of mothers enrolled in the Nurse Family Partnership (NFP) home visiting program in Memphis, Tennessee. They found no significant difference in Medicaid enrollment over the first decade of life between children of program participants and a randomly selected control group. Finally, the Urban Institute's larger quasi-experimental impact evaluation of Welcome Baby found no difference in health insurance enrollment between Welcome Baby mothers or infants and the

comparison group, at ages one, two, or three (Benatar et al. 2013; Benatar et al. 2014; Sandstrom et al. 2015).

A postpartum doctor visit is recommended for a new mother as a way to provide counseling concerning breastfeeding and family planning, among other topics, and to ensure the new mother is recovering from childbirth appropriately. Meghea et al. (2013) found that mothers who participated in a home visiting program sponsored by Michigan Medicaid, the Maternal and Infant Health Program, were more likely to have an appropriately timed postpartum visit than a propensity score-matched comparison group.

Home visiting programs also have shown a positive impact on infants' use of preventive care. For example, the Maternal and Infant Health Program evaluation found that children of mothers in the program had a significantly higher rate of well-child visits in the first year of life (Meghea et al. 2013). Another Michigan home visiting program—designed to encourage breastfeeding among low-income mothers—also found a positive impact on Medicaid-funded well-child visits among infants of mothers in the program, compared to infants of mothers who requested services but were not contacted (Haider et al. 2014).

In addition to preventive visits, home visiting programs may educate mothers on how to detect signs and symptoms of problems and that could lead to increased use of urgent or emergency care. Another study of NFP in Pennsylvania examined emergency room use and hospitalizations for injuries among NFP home-visited infants and toddlers when compared to a propensity score-matched comparison group (Matone et al. 2011). They found an overall increase in emergency department visits associated with home visiting. In particular, home-visited Medicaid infants had higher rates of superficial injury visits in the first 2 years of life. However, there was no difference in visits or hospitalization for moderate to severe injuries. This study suggests that NFP home-visited women may be more likely to seek care for their infant when the child has a minor injury. However, Haider et al. (2014) in the Michigan study mentioned earlier found no significant difference in emergency department visits or inpatient stays between home-visited infants and others.

One goal of home visiting in infancy is to provide information on family planning and child spacing, with the goal of preventing an unwanted repeat pregnancy. Two random assignment evaluations of home visiting for low-income mothers found fewer repeat pregnancies within two years for program participants. Love et al. (2002) evaluated the Early Head Start nationwide home visiting program for low-income mothers and infants. They found that program participants were 4.2 percentage points less likely to have another birth within 24 months. The Kitzman et al. (2000) study of NFP in Tennessee

found that women visited by NFP nurses had fewer subsequent pregnancies when their child was age 3 than the control group mothers. This did not affect their ultimate family size, however, since by the time their child was age 10 there was no difference in the number of subsequent pregnancies (Olds et al. 2010). Thus, the effect of the NFP program in Tennessee was on child spacing, not on total family size. Urban's larger quasi-experimental impact evaluation of Welcome Baby did not find a significant difference between Welcome Baby participants and the comparison group, either in repeat deliveries within two years or in the average number of younger siblings at age 3 (Sandstrom et al. 2015).

An increase in utilization associated with home visiting could lead to increased Medicaid costs early in life. On the other hand, a reduction in repeat pregnancy could lead to reduced Medicaid cost, since prenatal and delivery care will likely be covered by Medicaid. However, the impact of home visiting on Medicaid costs has not been extensively studied. The only high quality study of home visiting that investigated Medicaid costs, Haider et al. (2014), found a $770 higher annual Medicaid cost for home-visited women, but the difference was not statistically significant. A large randomized evaluation of the national home visiting program, MIHOPE-Strong Start, will examine the impact of home visiting on Medicaid outcomes early in life, including Medicaid costs. Results from the study are not yet available.

The Welcome Baby Program

Welcome Baby focuses on education and support for pregnant women and mothers of newborns. Women are recruited into the program either prenatally, or in the hospital after giving birth. At the time women were recruited for the larger Welcome Baby evaluation in 2010–2011, which was early in the implementation of the program, a majority of women (70 percent) joined the Welcome Baby program in the hospital just after birth.

Women enrolled prenatally receive up to nine engagement points, while those who enroll postpartum receive up to six engagement points. The content of each visit is designed to focus on appropriate topics related to a client's prenatal or postpartum needs at the time of engagement. The engagement points are shown in figure 1.

FIGURE 1

Welcome Baby Engagement Points

Welcome Baby provider staff include outreach specialists, parent coaches, hospital liaisons, and registered nurses. Parent coaches and hospital liaisons have varying degrees of expertise, including college or master's degrees with social work training and other relevant backgrounds. Most of the engagement points are conducted by parent coaches with the exception of the hospital visit following delivery, which is conducted by a hospital liaison, and the 72-hour home visit, which is conducted by a registered nurse. More detail on the Welcome Baby program can be found in previous evaluation reports (Hill et al. 2011; Hill and Adams 2011; Hill and Benatar 2011; Adams et al. 2012; Hill and Wilkinson 2013; Hill, Wilkinson, and Benatar 2014).

Purpose of Study, Research Questions, and Methods

The purposes of this substudy of the larger Welcome Baby evaluation are to explore the feasibility of linking data for Welcome Baby clients to Medi-Cal enrollment and claims records, and, should the linkage be feasible, to use the data to examine the impact of Welcome Baby on Medi-Cal enrollment and utilization. Such results expand the limited previous literature on the relationship between home visiting and Medicaid, in particular for the State of California's Medi-Cal program where results are rare.

Research Questions for the Medi-Cal Substudy

It is plausible that Welcome Baby improves Medi-Cal enrollment and retention and, by encouraging mothers to enroll their children and use appropriate services, increases utilization of services by mothers and children. Welcome Baby may also reduce the rate of repeat pregnancy shortly after birth through family planning counseling. Building on previous literature, the research questions for this substudy are as follows:

- Is Welcome Baby associated with increased length of enrollment in Medi-Cal for women or infants in the first or second year after birth?
- Is Welcome Baby associated with higher rates of postpartum visits for women enrolled in Medi-Cal?
- Is Welcome Baby associated with higher rates of preventive visits for children enrolled in Medi-Cal in their first or second year of life?
- Is Welcome Baby associated with a higher rate of all physician visits for children enrolled in Medi-Cal in their first or second year of life?
- Is Welcome Baby associated with a higher or lower rate of emergency department visits for children enrolled in Medi-Cal in their first or second year of life?
- Is Welcome Baby associated with a lower rate of repeat delivery for women enrolled in Medi-Cal in the two years following birth?

The initial design for this substudy also called for an assessment of the impact of Welcome Baby on Medi-Cal costs in the first two years of life. However, as explained in the Expenditures Analysis section below, this analysis was not feasible. Consequently, this study does not add to the literature concerning any potential increase or decrease in Medi-Cal cost associated with the program.

We restricted the substudy to women age 17 and above delivering singleton live births. The age restriction was imposed by Institutional Review Boards of the Urban Institute and the University of California, Los Angeles; the restriction to singleton live births is typical in health services research studies of pregnancy outcomes.

Study and Comparison Groups for the Medi-Cal Substudy

As described above, this substudy is part of a larger evaluation. Figure 2 shows the selection of the study groups for this substudy. As part of the larger evaluation, women enrolled in the Welcome Baby program in June 2010–September 2011 were recruited to be interviewed three times: when children were approximately ages 1, 2, and 3. Those who agreed constituted the study group in the larger evaluation, of whom 406 were interviewed in Round 3. To conduct this larger quasi-experimental impact evaluation using the Child and Family Survey, a comparison group of women who were not offered Welcome Baby[2] was recruited to participate in the evaluation. Lacking random assignment into the program, the desired comparison group was women with a similar demographic profile who lived in the Metro LA target area, and delivered in the same approximate time period, but were not offered Welcome Baby. The recruited comparison group either delivered at the CHMC just prior to program implementation or delivered at another hospital where the program was not offered. This group was recruited by a mailing to 1964 women by CHMC or WIC[3] program staff. Women were asked to respond if they chose to participate. Those who called back were screened for eligibility (for example, mother's age, when they delivered, and whether they were offered Welcome Baby). Of those who responded to the mail solicitation and were eligible, 264 completed the Round 3 survey.[4]

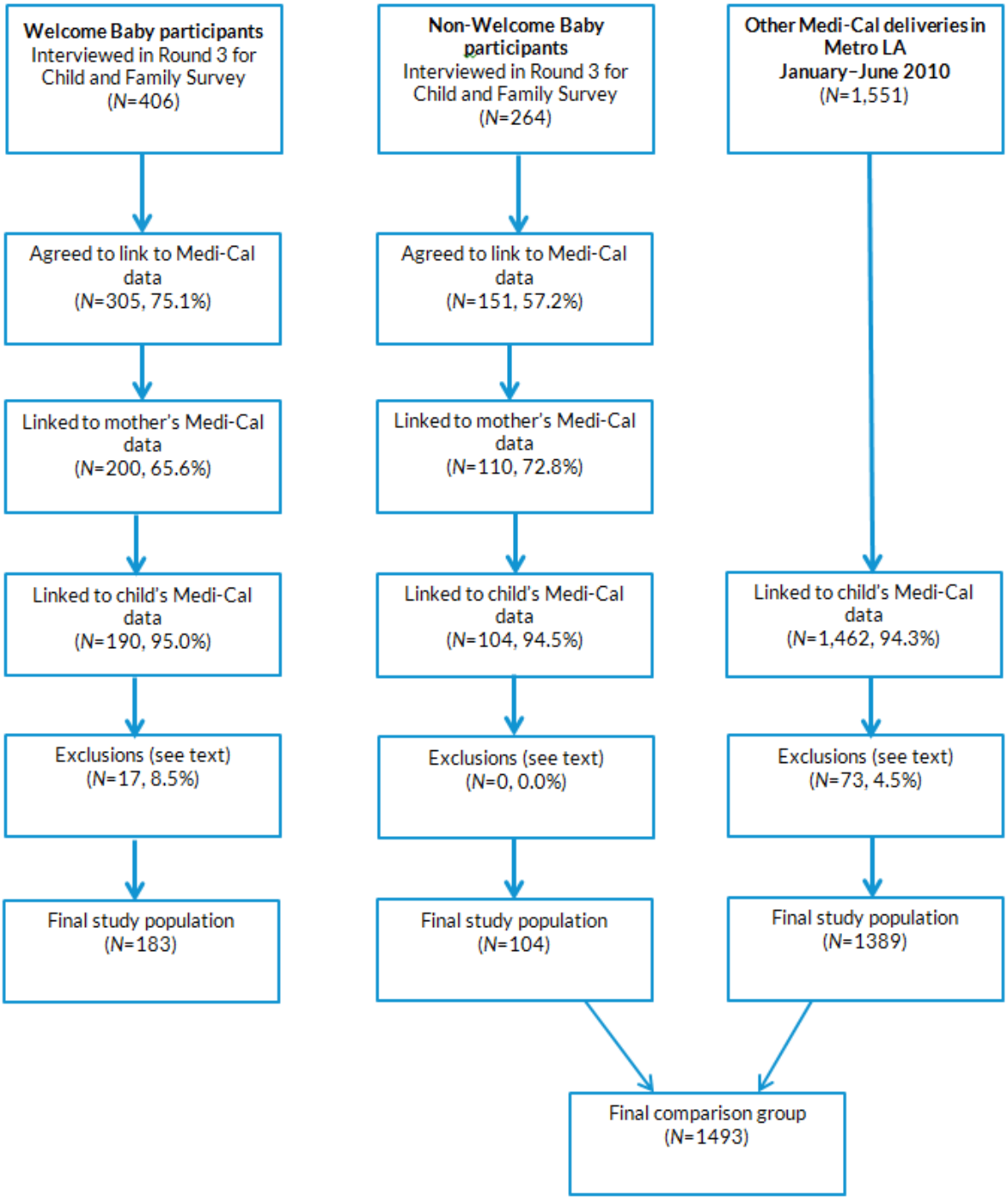
[2] We excluded women who were offered Welcome Baby from the comparison group, in order to avoid selection bias whereby program participants are compared to those who do not want home visiting.

[3] WIC is the Women, Infants and Children nutrition and education program offered nationwide. Penetration in WIC is very high, so most low-income infants in the target area were enrolled. The WIC program rolls provided an excellent list of possible comparison group members. Due to confidentiality restrictions, neither CMHC nor WIC programs allowed evaluation staff to contact women until they responded to the mailing.

[4] The quasi-experimental outcome evaluation study design is described in more detail elsewhere (Benatar et al. 2013; Benatar et al. 2014; Sandstrom et al. 2015).

FIGURE 2

Selection of Substudy Population



To identify Welcome Baby program participants in the Medi-Cal files, it was necessary to link the identities of the women and infants who were part of the larger evaluation to the state's Medi-Cal

enrollment and claims/encounter files. The Institutional Review Boards of the Urban Institute, the University of California, Los Angeles, and the State of California required written informed consent from evaluation participants to complete the linkage.

Near the time of the third and final interview with Welcome Baby participants and the surveyed comparison group, the evaluation team invited the women in the study to participate in an additional component of the evaluation, the analysis of the impact of the program on Medi-Cal enrollment and utilization. Either during the final interview or via phone or letter (if the interview had already occurred), women were asked to provide written informed consent to have their survey data linked to Medi-Cal enrollment and claims/encounter data. A total of 305 Welcome Baby participants (75.1 percent) and 151 comparison group women (57.2 percent) provided written informed consent. The in-person consent rate was very high (83.5 percent), but the consent rate for those contacted by phone/mail was low (46.5 percent). Most of those who did not provide consent could not be reached by phone or mail.

The list of those consenting to have their data linked was sent to the staff of the California Department of Health Care Services, who agreed to link the list to Medi-Cal enrollment and claims/encounter files. The identifying information included names of mother and child, address, date of birth of mother and child, and delivery hospital. State staff matched the list to Medi-Cal enrollment files and identified 200 (65.6 percent) Welcome Baby women who were enrolled in Medi-Cal for their delivery. For the non-Welcome Baby survey comparison group, 110 mothers were matched (72.8 percent). State staff linked this list to Medi-Cal maternal enrollment and claims/encounter files based on mother's exact name, address and date of birth, with a further relaxation of the criteria to include having only two of the three date fields match, or having only exact first name match (since many new mothers marry). The lack of an identification number (either Medi-Cal number or Social Security Number) for surveyed women was the primary reason that the matched proportion was lower than desirable.

The mothers' records were then matched to infant records based on exact date of birth, exact infant name, infant gender, and exact address or exact family ID (a number assigned by Medi-Cal to link families and available in the mother's record). The result was 190 (95.0 percent) Welcome Baby mothers' records linked to infants and 104 (94.5 percent) linked for the surveyed comparison group.

We augmented the original comparison group used in the larger quasi-experimental impact evaluation to include all women in the Metro LA community who delivered in the period January–June 2010 and were not identified as Welcome Baby program participants or as interviewed comparison

group members. The augmented comparison group for the substudy includes Medi-Cal women who lived in the target area (Metro LA), delivered babies between January and June 2010 (*N*=1551), and could be linked to their infants (*N*=1462, 94.3 percent). This was done for several reasons. First, the original comparison group for the quasi-experimental impact evaluation was very small and was recruited through a mail survey soliciting interest with a low response rate. Because Medi-Cal data were available for all women in the catchment area, this provided an opportunity to expand the comparison group significantly without additional cost. There are advantages and disadvantages to both comparison groups. The original comparison group had the limitation of small sample size and a low response rate to the mail solicitation. However, because the comparison group was surveyed there was the opportunity to screen for whether the woman was offered Welcome Baby (eliminating those who were) and to collect a large amount of data to be used as control variables in the outcome analysis.

On the other hand, the comparison group in this substudy was not interviewed. While Welcome Baby was not thoroughly implemented during January–June 2010, it is likely that some of the women in the comparison group (those delivering at CHMC) were offered the program and some participated to an unknown degree. The Medi-Cal comparison group also contains a few Welcome Baby program participants who did not provide informed consent to link their records, either because they could not be reached (the majority) or refused. Thus, the differences identified between Welcome Baby participants and non-Welcome Baby participants in this substudy are dampened by the inclusion in the comparison group of some women who did participate in the program.[5]

Once the Welcome Baby and non-Welcome Baby mothers and infants to be included in this substudy were identified, the California Department of Health Care Services provided enrollment and claims/encounter records for nine months prior to and two years following delivery for the mother, and two years following delivery for the infant.

There were 80 additional exclusions. These were mothers with multiple births; mothers without delivery claims; mothers with hospital stays above 50 days; mother/infant pairs with no claims or spending; and mothers with only a stillbirth. The majority of exclusions were multiple births. Often studies of birth outcomes and postpartum care exclude such deliveries, because they are high-risk infants with exceptional care patterns. They are also more difficult to match in the Medi-Cal files.

The final study group sample sizes for this substudy (as shown in figure 2) are as follows:

- Welcome Baby participants: 183 mothers and infants.

[5]Throughout the report we refer to this group as "non-Welcome Baby," although it includes some Welcome Baby participants as explained in the text.

- Non-Welcome Baby comparison group: 1,493 mothers and infants.

As illustrated in figure 2, of 406 Welcome Baby mothers who were surveyed for the larger evaluation study in Round 3 only 183 are included in the Medi-Cal substudy (45.1 percent), a rate of sample attrition higher than desirable. The attrition rate is similar for the surveyed comparison group mothers, with only 104 included of 264 we attempted to contact (39.4 percent).

To investigate the bias introduced by this attrition, we compared survey data for mothers who responded to the survey and were matched to Medi-Cal data to those who were not matched (see Appendix A). The matched Welcome Baby mothers were significantly older (by about a year on average) and more likely to be Latina. The age difference was also observed for the surveyed comparison group. There was no significant difference in rates of breastfeeding for matched and nonmatched Welcome Baby mothers, but the matched comparison group was more likely than the unmatched comparison group to breastfeed exclusively during the first four months postpartum. There were no significant differences between matched and unmatched mothers in the other characteristics examined (child gender, high-quality home learning environment at 12 months, and whether the child was at risk for social-emotional delay at 12 months).

Data Sources and Analysis Variables for the Medi-Cal Substudy

The primary data used to answer the substudy research questions are Medi-Cal enrollment and claims/encounter files. These contain information on mother and child enrollment history and use of hospital and ambulatory services.

Analysis variables were extracted from the enrollment and claims/encounter records, as follows:

- Demographic Variables: Mother's age and race/ethnicity, and child gender.
- Enrollment in Medi-Cal: The total months enrolled in Medi-Cal in the two years following delivery, according to basis of enrollment (Emergency Medi-Cal, Full Scope Medi-Cal, or other).
- Enrollment in Risk-based Managed Care: Months enrolled in a risk-based managed care plan over the two years, by plan.
- Delivery Experience: Delivery hospital and Cesarean Section (C-section) birth.

- Mother's Postpartum Visit: Whether mother had a postpartum visit in the 21-56 day period following her delivery hospitalization.
- Child's Use of Services: Whether the child had a preventive visit, any physician visit, or an Emergency Department visit in Year One or Year Two, and the average number of those visits per year.
- Repeat Delivery: Whether the mother had a repeat delivery covered by Medi-Cal within the two years following her delivery.

We used Healthcare Effectiveness Data and Information Set (HEDIS) criteria to define postpartum visits and child preventive care visits, with a slight modification to the child visit measure. These criteria are used by many managed care plans for quality review purposes, and are reported in other research literature. Appendix B provides more information on variable definitions, such as the diagnosis and procedure codes used.

Not everyone in the study is enrolled for a full year in Medi-Cal, and they are eligible for services only when enrolled, so we adjusted the calculation of rates for length of enrollment. This is done by calculating the average monthly rate for the outcome measure and multiplying by 12 months. Only the sample with at least one month of enrollment in the given year is included in that analysis.[6]

Expenditures Analysis

As mentioned, our initial goal was to analyze the impact of Welcome Baby on Medi-Cal expenditures. However, due to managed care penetration and other factors, we were unable to do so. This is because many of the claims/encounter records had no expenditures recorded, although utilization was recorded. This is illustrated in table 1.

[6] As shown later in Figure 3, most mothers were enrolled for most of the year, so adjusting for the length of enrollment does not have a major influence on findings.

TABLE 1

Percent of Claims/Encounter Records with Zero Expenditures over Two Years Postpartum

	Welcome Baby	Non-Welcome Baby
Mothers		
Year 1	34.2	33.6
Year 2	37.5	33.1
Children		
Year 1	60.4	61.7
Year 2	63.0	61.9

Notes: Among those with any spending in the year.

As shown later in the Findings section of this report, enrollment in risk-based managed care plans was very prevalent, especially among infants, and this is the primary reason for missing data on expenditures on the claims/encounter records submitted by managed care plans, since they are not reimbursed on a fee-for-service basis. To perform a thorough cost analysis, it would be necessary to assign proxy expenditures to each claims/encounter record. This was beyond the scope of this study.

Analysis Approach

The report provides data for Welcome Baby participants and non-Welcome Baby participants. A descriptive table provides the characteristics of the Welcome Baby and non-Welcome Baby groups. To test for whether there are statistically significant differences between the two groups, Chi-Square tests are used for dichotomous variables and the T-test is used for age, a continuous variable.

In examining the differences in outcomes for the two groups, we created regression-adjusted rates that control for observed characteristics of the mother and baby. The multivariate model takes the form of:

$$Outcome_{i-j} = \beta_0 + \beta_1 WelcomeBaby + \beta_{2-k} Characteristics_{2-k} + \varepsilon$$

Where:

- $Outcome_{i-j}$ includes the Medi-Cal enrollment and health care utilization outcomes mentioned above for mothers and children (separately for Years One and Two);
- WelcomeBaby is an 0/1 indicator of whether the woman participated in Welcome Baby; and

- Characteristics$_{2\text{-}k}$ is a vector of mother and child characteristics including: whether the mother is Latina, whether the mother has Emergency-Medi-Cal (versus all other types of eligibility), the mother's age (continuous), and whether the child is male.[7]

Dichotomous outcomes were estimated using logistic regression; enrollment and visit data were estimated using ordinary least squares regression. The results are presented in figures showing the regression-adjusted proportions or means.

[7] Male infants are known to have higher mortality and morbidity rates than female infants.

Results

The substudy's findings are presented below. These include, first, a descriptive overview of the demographic, eligibility, delivery, and managed care characteristics of the Welcome Baby and non-Welcome Baby study groups. This is followed by a discussion of the differences in outcomes for the groups, controlling for differences in their demographic and eligibility group characteristics. The outcomes include maternal and child Medi-Cal enrollment, maternal postpartum visits, child health visits, and repeat pregnancy.

Characteristics of Study Groups

Welcome Baby participants are demographically similar to other Medi-Cal women residing in Metro LA and delivering babies in this time period (table 2). The only demographic characteristic where the women differ significantly is age. Welcome Baby mothers were slightly older (average age 28) than non-Welcome Baby mothers (average age 27) at the birth of their baby, with more mothers ages 17-19 in the non-Welcome Baby group.

Both groups are largely Latina, with 91.3 percent of Welcome Baby participants and 88.7 percent of nonparticipants identifying as such. Each group also has an African American minority, representing 6.6 percent and 7.6 percent respectively. These differences are not statistically significant.

Welcome Baby participants also resemble nonparticipants with regard to their Medi-Cal eligibility status: 63.4 percent of participants and 64.2 percent of nonparticipants had Emergency Medi-Cal coverage at the time of delivery. Emergency Medi-Cal is available to women, regardless of immigration status, and the program provides pregnant women with benefits that are similar to full-scope Medi-Cal for pregnancy, delivery, and postpartum services. Another 28.4 percent and 29.9 percent of each group, respectively, have full scope Medi-Cal, marking them as documented. The remaining 8.2 percent and 5.9 percent respectively have unknown eligibility.

Delivery Characteristics

One way that the two groups differ is in the place where their infants were born. All Welcome Baby infants and about a quarter of non-Welcome Baby infants (22.7 percent) were born at the California

Hospital Medical Center (CHMC). As mentioned earlier, this includes some Welcome Baby mothers whose data were not linked to Medi-Cal data. Most of the non-Welcome Baby infants were born in other hospitals. The two groups had similar rates of C-section deliveries (35.5 percent and 34.6 percent respectively).

TABLE 2

Characteristics of Study Groups at Delivery

	Study group		
	Welcome Baby	**Non-Welcome Baby**	**Difference significant?**
Number of women	183	1,493	
Demographic characteristics			
Mean age	28	27	Yes*
17–19	7.1%	12.5%	
20–24	23.5%	28.5%	
25–29	27.3%	25.5%	
30–34	22.4%	19.1%	
35–49	19.7%	14.5%	
Child gender			No
Female	46.4%	49.2%	
Male	53.6%	50.8%	
Race/ethnicity			No
Latina	91.3%	88.7%	
African-American	6.6%	7.6%	
White/other	0.5%	2.1%	
Unknown	1.6%	1.5%	
Eligibility status			No
Emergency Medi-Cal	63.4%	64.2%	
Full Scope Medi-Cal	28.4%	29.9%	
Unknown	8.2%	5.9%	
Delivery hospital			Yes*
CHMC	100.0%	22.7%	
Other	0.0%	77.3%	
C-section delivery			No
Yes	35.5%	34.6%	
No	64.5%	65.4%	

Notes: * Difference between groups is statistically significant at the $p < 0.05$ level.

Managed Care Enrollment

Table 3 shows enrollment in risk-based managed care plans for mothers and infants in the year after birth. Los Angeles has a "two plan" Medicaid managed care system, whereby Full Scope Medi-Cal pregnant women and infants are generally mandatorily enrolled in one of two health plans: LA Care or Health Net. The mothers have a choice of plans and can switch plans at any time after initial enrollment. However, women enrolled only for pregnancy, delivery, and the postpartum period through Emergency Medi-Cal are not required to join a managed care plan. As shown in the table, the two study groups—Welcome Baby and non-Welcome Baby—are remarkably similar in their managed care participation and plan choices. About one-third of mothers (31.7 percent and 31.8 percent, respectively) of both groups are enrolled in managed care, with about one-fifth enrolled in the public plan, LA Care. The high rate of fee-for-service enrollment for mothers (68.3 percent and 68.2 percent, respectively) is directly related to Emergency Medi-Cal enrollment, which is only slightly lower (63.4 percent and 64.2 percent respectively, as shown in table 2).

The profile of infants, who are citizens when they are born, is entirely different from their mothers. Almost all (98.9 percent and 97.1 percent, respectively) are enrolled in risk-based managed care, with the dominant plan being LA Care.

TABLE 3

Risk-Based Managed Care Status in Year Following Delivery for Study Group Mothers and Infants

	Welcome Baby (%)	Non-Welcome Baby (%)
Mothers		
Any managed care	31.7	31.8
LA Care only	21.3	21.0
HealthNet only	10.4	8.4
Switched plans	0.0	2.4
Fee-for-service	68.3	68.2
Infants		
Any managed care	98.9	97.1
LA Care only	57.3	60.7
HealthNet only	35.5	28.0
Switched plans	6.1	8.4
Fee-for-service	1.1	2.9

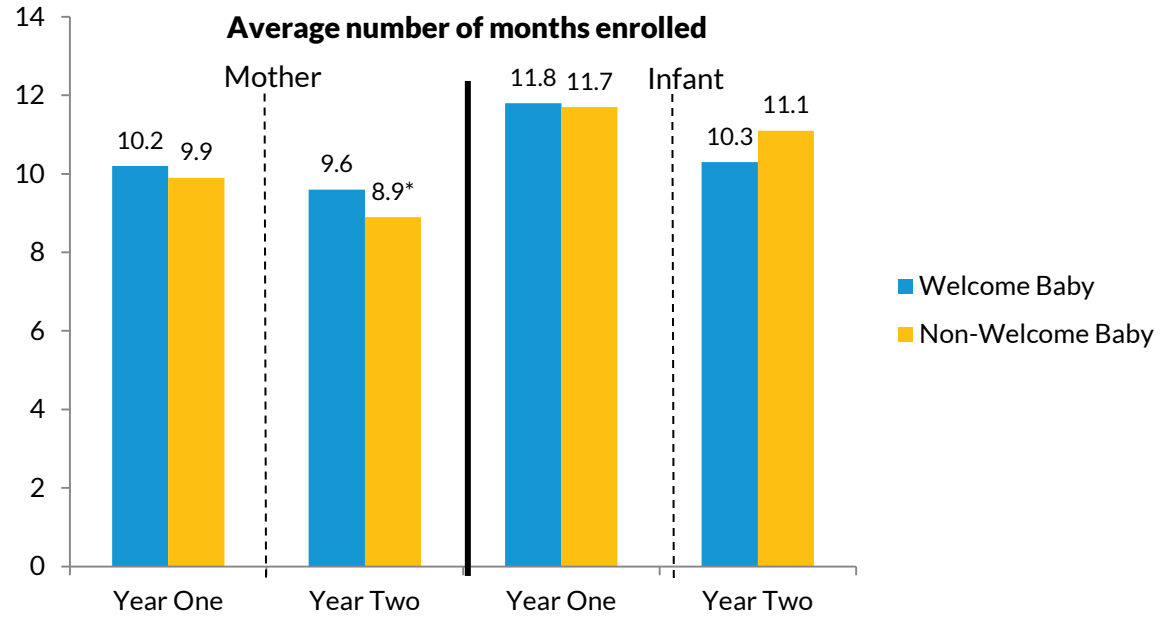
Referring back to the methods section where we discussed missing cost data from claims/encounter records (see table 1), it seems clear that the missing data are directly related to this high prevalence of risk-based managed care for infants, particularly.

Medi-Cal Enrollment

Figure 3 shows maternal and infant retention in Medi-Cal following delivery. As shown, both Welcome Baby and non-Welcome Baby women remain enrolled for some time after delivery, giving them time to receive postpartum services covered by the program. There is no significant difference in their average length of enrollment in Year One, 10.2 and 9.9 months respectively, after adjusting for other characteristics. However, in the following year, Welcome Baby women were enrolled in Medi-Cal for significantly more months than nonparticipants. Specifically, Welcome Baby participants were enrolled an average of 9.6 months, compared to non-Welcome Baby women who averaged 8.9 months. Thus, Welcome Baby is associated with a small but significant increase in Year Two program enrollment for mothers. However, as also shown in the figure, there was no significant association with length of Medi-Cal enrollment for infants in their first and second year of life. Both groups of children had high levels of retention on Medicaid. The lack of difference is not surprising, however, given that Medi-Cal automatically enrolls all citizen infants in families that meet the program's income eligibility criteria and provides 12 months of continuous eligibility; renewal of enrollment is relatively simple if income requirements are met, with another 12 months of continuous enrollment granted at renewal.

FIGURE 3

Length of Medical Enrollment in Years One and Two Following Birth



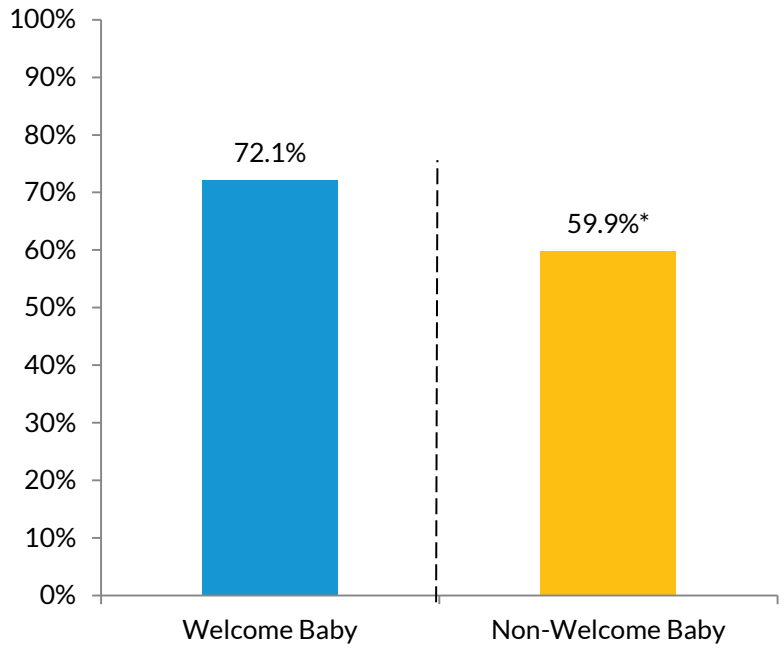
Notes: * Difference between groups is statistically significant at the $p<0.05$ level after adjustment for maternal age, ethnicity, child gender, and eligibility group.

Maternal Postpartum Visits

In contrast to enrollment outcomes, where there are few differences between Welcome Baby and non-Welcome Baby mothers, there is a large and significant difference in receipt of appropriate postpartum care as defined by HEDIS for these two groups (see Figure 4). Most Welcome Baby women (72.1 percent) have an appropriately timed postpartum visit, as opposed to only 59.9 percent of nonparticipants. Since Welcome Baby provides home visits just at the time that mothers would need this important visit, it is very plausible that the program is responsible for at least some of this difference in service use.

FIGURE 4

Percent of Women with Postpartum Visit Covered by Medi-Cal



Notes: * Difference between groups is statistically significant at the $p<0.05$ level after adjustment for maternal age, ethnicity, child gender, and eligibility group.

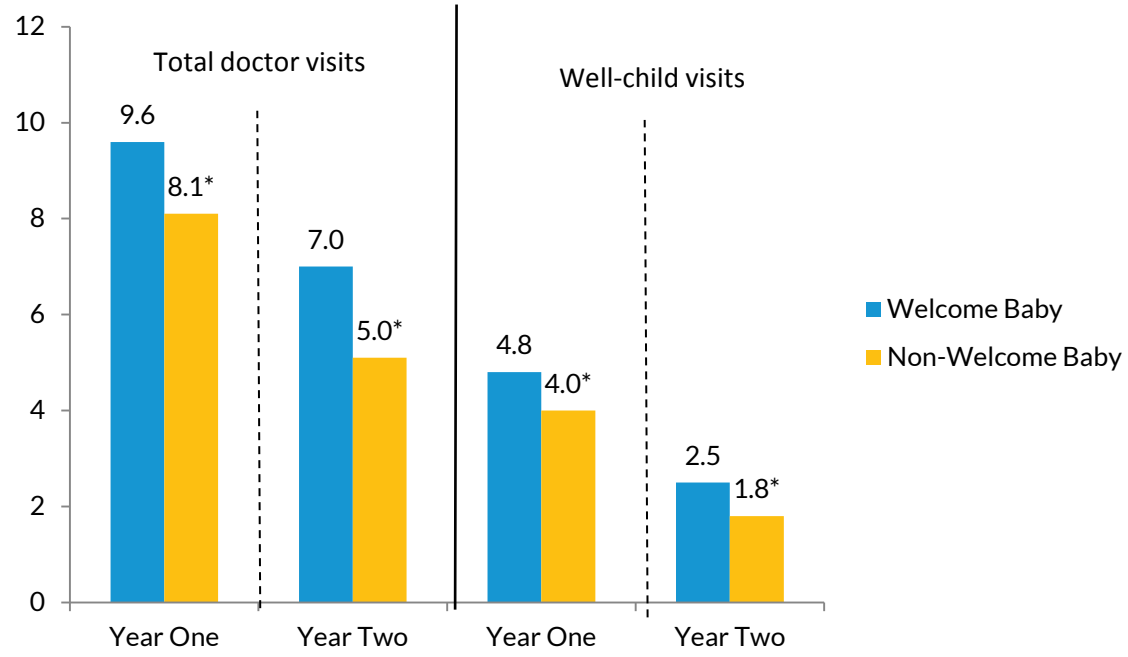
Child Physician Service Use

Welcome Baby home visits may make mothers more aware of the importance of appropriate health care for their children. Indeed, Welcome Baby is positively associated with total physician visits for the children of mothers who participate in the program, and the difference in Year One is sustained in Year

Two (Figure 5). (Total physician visits include both "sick visits" and "preventive care visits.") As shown, Welcome Baby children have an average of 9.6 physician visits in their first year of life compared to 8.1 visits for non-Welcome Baby children. In Year Two, Welcome Baby children have an average of 7.0 total physician visits compared to an average of 5.0 visits for non-Welcome Baby children. Differences for each year are statistically significant.

FIGURE 5

Average Number of Child Doctor Visits and Well-child Visits Covered by Medi-Cal



Notes: * Difference between groups is statistically significant at the $p<0.05$ level after adjustment for maternal age, ethnicity, child gender, and eligibility group.

Also shown in the figure, Welcome Baby mothers also make greater use of preventive care for their children; the group has an average of 4.8 well-child visits in their first year of life and 2.5 in their second year, compared to 4.0 and 1.8 visits in Years One and Two, respectively, for non-Welcome Baby children. These differences are also statistically significant. It appears that even though Welcome Baby home visits are completed when the child is 9 months old, the program has an effect on preventive care use that endures at least through age 2. This is consistent with the sustained improvement in child development outcomes all the way through age 3 observed in Urban's larger Welcome Baby evaluation.

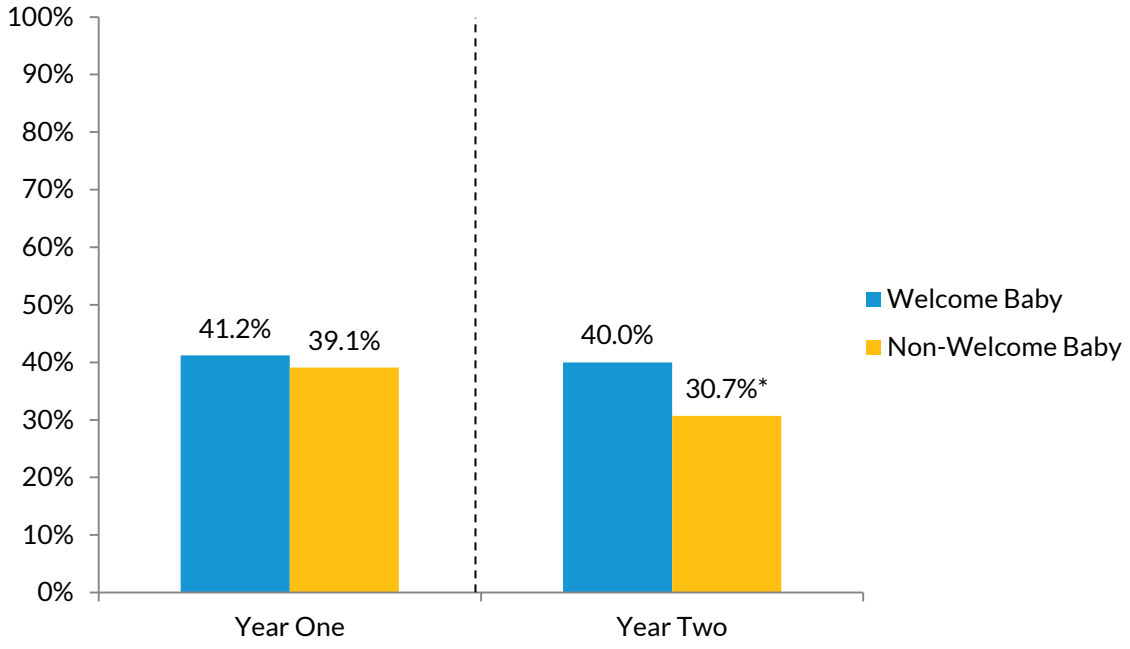
Child Emergency Department Use

Use of the emergency department (ED) could decrease with Welcome Baby home visiting, if the higher rate of other doctor visits prevents more serious problems requiring emergency care. On the other hand, home visits (as shown in previous research) may make mothers more sensitive to children's acute health problems, prompting more ED visits. Figures 6 and 7 show ED use. The first figure shows the proportion of children who ever used the ED in Years One and Two, and the second figure shows the average number of ED visits.

Consistent with previous research, our analysis shows that Welcome Baby children are higher users of the ED than non-Welcome Baby children. Both groups had a similar proportion of children with at least one ED visit in Year One (41.2 percent and 39.1 percent, respectively); the difference is not statistically significant. But in Year Two, Welcome Baby children were significantly more likely to have an ED visit (40.0 percent versus 30.7 percent). Welcome Baby children also made significantly more visits to the ED, in both the first year of life (an average of .88 visit versus .65 visits) and the second year of life (.75 versus .48 visits).

FIGURE 6

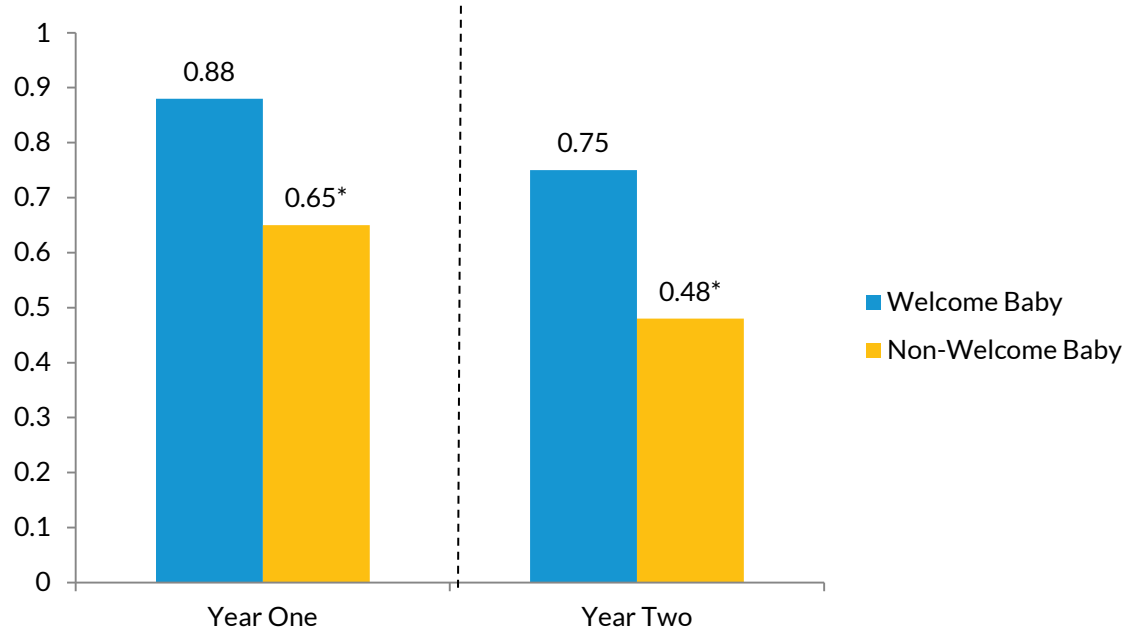
Any Use of the Emergency Department Covered by Medi-Cal, Years One and Two Following Birth



Notes: * Difference between groups is statistically significant at the $p<0.05$ level after adjustment for maternal age, ethnicity, child gender, and eligibility group.

FIGURE 7

Average Number of Child Emergency Department Visits Covered by Medi-Cal, Years One and Two Following Birth



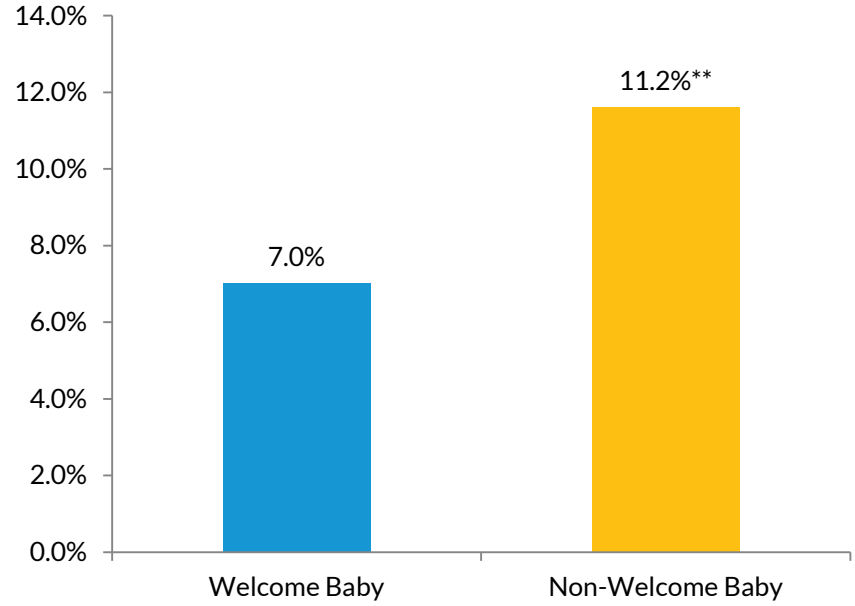
Notes: * Difference between groups is statistically significant at the $p<0.05$ level after adjustment for maternal age, ethnicity, child gender, and eligibility group.

Repeat Delivery

Appropriate birth spacing is important to maternal and child health (Conde-Agudelo et al. 2006; DeFranco et al. 2014). It is possible that the counseling provided by Welcome Baby home visitors helps mothers plan the spacing of their children to avoid unplanned repeat pregnancy and delivery. As shown in Figure 8, only 7.0 percent of Welcome Baby mothers had a repeat delivery within two years that was covered by Medi-Cal. This is compared to 11.2 percent of non-Welcome Baby mothers, which is statistically significant at the $p<0.1$ level. (Other significance tests have been at the 0.05 level.)

FIGURE 8

Repeat Delivery within Two Years Covered by Medi-Cal



Notes: ** Difference between groups is statistically significant at the $p<0.1$ level after adjustment for maternal age, ethnicity, child gender, and eligibility group.

As discussed in the literature review, Urban's Welcome Baby quasi-experimental impact evaluation that used survey data alone did not find a statistically significant difference in this important outcome between Welcome Baby and non-Welcome Baby women who were surveyed. To investigate this discrepancy, we conducted two sub-analyses. First we compared the Medi-Cal repeat delivery outcomes to the survey outcomes for all the women who were surveyed. The results were nearly identical. That is, the women who reported a repeat delivery within two years in the survey were so identified in the Medi-Cal data and vice-versa, with the exception of five cases, a high degree of concordance. Then we examined the difference in repeat deliveries covered by Medi-Cal between Welcome Baby mothers and non-Welcome Baby mothers, after removing the surveyed women from the comparison group. The difference between the two groups was more pronounced (7.0 percent versus 12.0 percent), and was statistically significant at the 0.05 level (data not shown).

Limitations

This substudy has several limitations that should be highlighted. The study uses a quasi-experimental design with a comparison group. The most important limitation is the potential selection bias that is introduced by the following processes: (1) the original sample selection for the overall study; (2) the consent process for linkage; and (3) the matching process from Welcome Baby records to Medi-Cal records. We discuss each of these in turn.

For the larger evaluation, Welcome Baby participants were approached to participate in evaluation interviews. Only about 60 percent of Welcome Baby mothers agreed to participate and were interviewed. The comparison group was even harder to recruit, using a mail survey to solicit interest, since evaluation staff were not able to recruit comparison group women directly. Therefore, selection was an issue for the overall quasi-experimental outcome evaluation, since women who agreed to participate in the evaluation may have been different in unmeasured ways from those who did not agree to participate. For example, they may have been in better or worse health than those who did not agree. The overall analysis controls for measured differences in groups, but not for unmeasured differences.

Further, of those who participated in the larger evaluation's surveys and were approached to provide written informed consent to have their data linked, a substantial number did not agree (most often because they could not be reached). This introduced additional bias, since, again, there may be unmeasured differences in those who consented and those who did not consent. A comparison between those who consented and those who did not shows that older mothers were more likely to consent, as were Latina Welcome Baby women. Again, the analysis controls for measured differences, such as age and ethnicity, but not for unmeasured differences.

Finally, state staff expended great time and effort to match the list of women who responded to the larger evaluation survey to Medi-Cal enrollment and claims/encounter records. However, in the absence of Medi-Cal identification numbers or Social Security Numbers, it was necessary to match based primarily on birth date, name, and address. All of these identifiers are prone to recall and recording mistakes. Yet varying them when matching is likely to lead to false positive matches. For this substudy, we decided to use conservative matching criteria. The match rates to mothers' records were therefore lower than desirable (65.6 percent for Welcome Baby and 72.8 percent for the comparison group). Another study with better linking numbers would undoubtedly reach higher matching rates.

There are additional limitations to the findings deriving from the comparison group that is used in this substudy. Because the larger evaluation study's comparison group was so small, and the response rate to the mail solicitation for recruiting that study very low, we decided to augment the comparison group for this substudy to include all women enrolled in Medi-Cal in the Metro LA target area who had infants born very early in Welcome Baby's roll out when they likely were not offered the program. This group lived in the same geographic area and had similar demographic characteristics to Welcome Baby mothers, and was much bigger than the larger evaluation's comparison group. However, the Medi-Cal files have only a small number of variables to control for potential differences between the two groups in regression analyses. In addition, because not all Welcome Baby participants agreed to be in the overall evaluation or consented to have their records linked, some Welcome Baby participants are included in the comparison group to an unknown degree.

These concerns are mitigated to some extent by two factors. First, our findings are largely consistent with more rigorous studies that used random assignment or propensity scoring methods, as outlined in the literature review. Second, to the extent that Welcome Baby mothers are included in the comparison group, the size and significance level of differences shown here between Welcome Baby and non-Welcome Baby mothers is likely less than would be the case if the Welcome Baby women were excluded from the comparison group.

A final important limitation is that the presence of risk-based managed care, and consequent missing Medi-Cal expenditures on claims/encounter records, prevented an analysis of the impact of Welcome Baby on Medi-Cal costs. Conclusions about possible cost impacts for Medi-Cal must be drawn from utilization analyses.

Discussion

This report has presented findings from a substudy of the Urban Institute's quasi-experimental impact evaluation of the Welcome Baby home visiting program's outcomes for Welcome Baby women and their children. This substudy set out to accomplish two primary goals.

First, it explored the feasibility of linking Welcome Baby data to data from the state Medi-Cal program. We demonstrated the feasibility of doing this linkage. However, the timeline for achieving the linkage was longer than expected. This was due to the need for multiple IRB reviews; obtaining informed consent from a large, dispersed group of women; negotiating with state staff; and the need to use state staff to perform the linkage under conditions of many competing priorities. Linkage rates were lower than desirable, but yielded samples that were useful for research. Linkage rates would be higher with a valid Medi-Cal number for mother and child.

Second, contingent on successful linkage of the two data sets, we studied whether Welcome Baby was associated with positive (or negative) outcomes among Medi-Cal mothers and children. The results suggest that participation in Welcome Baby home visiting is associated with increases in mothers' Medi-Cal enrollment duration and mothers' and children's use of appropriate health care services during the two years following birth. In particular, Welcome Baby mothers, relative to comparison group mothers, were found

- to have longer Medi-Cal enrollment in Year Two postpartum;
- to be more likely to have a postpartum visit within the HEDIS time frame of 21 to 56 days after delivery; and
- to be less likely to have a subsequent delivery covered by Medi-Cal within two years postpartum.[8]

Welcome Baby children, relative to comparison group children, were found

- to have a higher number of total physician visits in both Year One and Year Two postpartum;
- to have a higher number of well-child visits in both Year One and Year Two postpartum;
- to be more likely to have at least one ED visit in Year Two postpartum; and

[8] This finding is significant at the $p<.10$ level; other findings are significant at the $p<.05$ level.

- to have a higher number of ED visits in both Year One and Year Two postpartum.

All of these differences were statistically significant after adjusting for maternal and child characteristics.

Furthermore, these findings reinforce the results from previous studies concerning the relationship between home visiting and Medicaid. Results demonstrate that mothers who receive Welcome Baby have higher rates of postpartum care (as with Meghea et al. 2013), and that children receive both a higher number of recommended well-child visits (as with Haider 2014; and Meghea 2013) and higher physician visits overall.

This study finds increased utilization of the ED among children of Welcome Baby participants, which is in line with findings from the Nurse-Family Partnership home visiting program (Matone 2011). The data do not reveal the reasons why Welcome Baby mothers were more likely to take their child to the ED. There could be underlying differences in the children's health status that we have not measured. It is also likely, given higher overall doctor use and preventive care use, that these mothers are more attuned their children's health needs. Since emergency department care is expensive and some visits may be unnecessary, more research is needed concerning ways to educate mothers about appropriate services when children have accidents or have routine childhood illnesses such as asthma, flu, and colds. It may be perfectly appropriate to use the ED for moderately acute care when no other services are available, but it may also be possible to use alternative physician services or other urgent care services in the community.

Finally, our finding of lower rates of subsequent deliveries within two years postpartum among Welcome Baby mothers (versus women in the comparison group) is consistent with the findings of two random assignment studies (Kitzman 2000, Love 2002). This important finding points to potential improvements in maternal and infant health due to Welcome Baby family planning counseling.

Unfortunately, we were ultimately unsuccessful in conducting analyses of expenditures, given problems with the expenditure data described above. However, the utilization data provide some hints about likely cost impacts. The services that increased with Welcome Baby are outpatient services (either physician or ED visits). Outpatient services are relatively inexpensive compared to hospital costs and could be expected to prevent future health problems. A reduction in repeat delivery certainly would reduce Medi-Cal costs within two years. A more comprehensive and longer term study is needed to further investigate these important outcomes, since governments and health plans need to know the cost consequences of, and potential savings associated with, investments in home visiting. Still, with regard to sustainability, these analyses provide First 5 LA with compelling results that may persuade

health plan officials to cover Welcome Baby home visiting as another preventive health service, given the positive outcomes of increased preventive care use (as measured using HEDIS criteria) and decreased rates of repeat delivery.

In summary, these results provide First 5 LA with a template for pursuing future studies of Welcome Baby and Medi-Cal. We encourage First 5 LA to work with the California Department of Health Care Services well in advance when planning similar studies in the future. In that regard, if such a study is planned, it would be important to obtain written informed consent in advance as well as to obtain accurate Medi-Cal identification numbers from program participants. Using random assignment to identify a control group, and linking Medi-Cal records over a longer period of time, would also strengthen the credibility and policy-relevance of future findings.

Glossary

Best Start LA: Best Start brings together parents and caregivers, residents, organizations, businesses, government institutions and other stakeholders to collectively build a vision and develop strategies to create the best possible community for young children and their families. It is supported by First 5 LA.

California Department of Health Care Services (DHCS): The mission of the California Department of Health Care Services is to provide Californians with access to affordable, high-quality health care. It administers the Medi-Cal program, funding health care services for about 12.5 million Medi-Cal members. About one-third of Californians receive health care services financed or organized by DHCS, making the department the largest health care purchaser in California.

California Hospital Medical Center (CHMC): California Hospital Medical Center is a 318-bed nonprofit hospital that has been providing care for over 127 years. It is located in the Metro LA geographic area.

HEDIS: The Healthcare Effectiveness Data and Information Set (HEDIS) is a tool used by more than 90 percent of America's health plans to measure performance on important dimensions of care and service. Altogether, HEDIS consists of 81 measures across 5 domains of care.

First 5 LA: First 5 LA was created in 1998 to invest Los Angeles County's allocation of funds from California's Proposition 10 tobacco tax. Since then, First 5 LA has invested more than $1.2 billion in efforts aimed at providing the best start for children from prenatal to age 5 and their families in the county.

Medicaid: Medicaid is a public health insurance program, jointly funded by federal and state governments, to provide coverage to low-income people in all states. It is administered by states, and state eligibility and coverage guidelines vary greatly.

Medi-Cal: Medi-Cal is California's Medicaid program.

Metro LA: The Metro LA Best Start community encompasses parts of four different Los Angeles neighborhoods-Pico-Union, Koreatown, and the Byzantine Latino Quarter, and South LA.

Postpartum Visit: The American College of Obstetricians and Gynecologists recommends a doctor visit about 6 weeks after birth, to check the mother's physical health and provide guidance and counseling concerning breastfeeding and contraception.

Child Preventive Care Visit: The American Academy of Pediatrics produces a periodicity schedule that recommends certain doctor visits and immunizations depending on the age of the child.

Risk-Based Managed Care: A form of managed care in which health plans are paid a capitated premium (usually monthly) regardless of the services provided or billed.

Welcome Baby: A voluntary, locally designed home visiting program that was developed as part of First 5 LA's Family Strengthening investment supporting families with children ages prenatal to five.

WIC: The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) provides federal grants to states for supplemental foods, health care referrals, and nutrition education for low-income pregnant, breastfeeding, and nonbreastfeeding postpartum women, and to infants and children up to age five who are found to be at nutritional risk.

Appendix A. Comparison of Linked and Nonlinked Survey Participant Characteristics

TABLE A.1

Characteristics of Surveyed Women According to Linkage to Medi-Cal Records

	Welcome Baby Survey			Non-Welcome Baby Surveyed		
	Consented and Linked	Not Consented or Not Linked	Significant Difference?	Consented and Linked	Not Consented or Not Linked	Significant Difference?
Mother's Age Mean Age	28	27	Yes*	29	27	Yes*
17-19	7.1%	14.4%	Yes*	5.2%	13.5%	Yes*
20-24	23.5	30.6		15.5	21.6	
25-29	27.3	21.0		35.1	24.8	
30-34	22.4	17.7		20.6	24.8	
35-49	19.7	15.6		23.7	14.0	
Missing	0.0	0.6		0.0	1.4	
Child Gender Female	46.4	46.5	No	43.3	52.7	No
Male	53.6	53.5		56.7	47.3	
Race/Ethnicity Latina	91.3	78.4	Yes*	95.9	93.7	No
African-American	6.6	15.3		2.1	3.6	
White/Other	0.5	4.5		1.0	2.3	
Missing/No Response	1.6	1.8		1.0	0.5	
Exclusive breastfeeding during the first four months postpartum	40.4	38.7	No	41.2	28.2	Yes*
High home quality learning environment at 12 months	72.7	67.1	No	55.1	61.6	No
Not at risk for social-emotional delay, 12 months	84.5	78.6	No	68.9	71.2	No
Total:	100%	100%		100%	100%	

Note: *p<.05

Appendix B. Approach to Defining Critical Variables from the Medi-Cal Claims/Encounter Records

Below we include additional detail on the approach to defining several critical variables relevant to our analysis of the Welcome Baby impact on Medi-Cal enrollment and health care utilization in the first two years postpartum. These include the following: eligibility group, delivery episode, cesarean section delivery, postpartum visits, the one-year and two-year postpartum time periods, child doctor visit utilization (calculated separately for each of the two years after birth), child preventive care utilization (calculated separately for each of the two years after birth), child emergency department utilization (calculated separately for each of the two years after birth), as well as adjusting doctor and preventive care visits for length of enrollment (calculated separately for each of the two years after birth), repeat delivery within two years. We chose these measures because they are important health care outcomes and their analysis is well supported by the Medi-Cal data available.

Eligibility Group

Several eligibility groups were defined using the Aid Code variable. The full scope, zero share of cost group includes values 30, 32, 33, 34, 35, 38, 39, 45, 59, 60, 64, 72, 82, 86, 3A, 3C, 3D, 3E, 3H, 3L, 3N, 3P, 3R, 3U, 4F, 4M, 6E, 7A, 7J, 8P, 8R, H4, H5, and 6N. The full scope, share of cost group includes values 37, 83, and 87. The Emergency Medi-Cal group includes values 3T, 3V, 5T, 7C, 7K, 8T, C5, D8, 58, 5F, C6, D9, and 48. The remaining group includes codes 6S and 44 and is identified as something other than Emergency Medi-Cal, including restricted benefits for reasons other than Emergency Medi-Cal.

Delivery

The delivery date was first defined at the claims level as the mother's inpatient surgical date or inpatient admission date (if the surgical date was missing), as long as the claim met one of the diagnosis codes found to be associated with a delivery or a cesarean section related code. The delivery codes included the following codes: V240, V274, V3001, V302, V3100, V3101, V311, V312, V3200, V321, V322,

V3300, V3301, V332, V3400, V3401, V341, V342, V3500, V3501, V351, V352, V3600, V362, V3700, V3701, V371, V372, V3900, V3901, V391, V392, 64001, 64081, 64091, 64101, 64111, 64121, 64131, 64181, 64191, 64201, 64202, 64211, 64212, 64221, 64222, 64231, 64232, 64241, 64242, 64251, 64252, 64261, 64262, 64271, 64272, 64291, 64292, 64301, 64311, 64321, 64381, 64391, 64421, 64511, 64521, 64601, 64611, 64612, 64621, 64622, 64631, 64641, 64642, 64651, 64652, 64661, 64662, 64671, 64681, 64682, 64691, 64701, 64702, 64711, 64712, 64721, 64722, 64731, 64732, 64741, 64742, 64751, 64752, 64761, 64762, 64781, 64782, 64791, 64792, 64801, 64802, 64811, 64812, 64821, 64822, 64831, 64832, 64841, 64842, 64851, 64852, 64861, 64862, 64871, 64872, 64881, 64882, 64891, 64892, 64901, 64902, 64911, 64912, 64921, 64922, 64931, 64932, 64941, 64942, 64951, 64961, 64962, 64971, 64981, 64982, 650, 65101, 65111, 65121, 65131, 65141, 65151, 65161, 65171, 65181, 65191, 65201, 65211, 65221, 65231, 65241, 65251, 65261, 65271, 65281, 65291, 65301, 65311, 65321, 65331, 65341, 65351, 65361, 65371, 65381, 65391, 65401, 65402, 65411, 65412, 65421, 65431, 65432, 65441, 65442, 65451, 65452, 65461, 65462, 65471, 65472, 65481, 65482, 65491, 65492, 65501, 65511, 65521, 65531, 65541, 65551, 65561, 65571, 65581, 65591, 65601, 65611, 65621, 65631, 65641, 65651, 65661, 65671, 65681, 65691, 65701, 65801, 65811, 65821, 65831, 65841, 65881, 65891, 65901, 65911, 65921, 65931, 65941, 65951, 65961, 65971, 65981, 65991, 66001, 66011, 66021, 66031, 66041, 66051, 66061, 66071, 66081, 66091, 66101, 66111, 66121, 66131, 66141, 66191, 66201, 66211, 66221, 66231, 66301, 66311, 66321, 66331, 66341, 66351, 66361, 66381, 66391, 66401, 66411, 66421, 66431, 66441, 66451, 66461, 66481, 66491, 66501, 66511, 66522, 66531, 66541, 66551, 66561, 66571, 66572, 66581, 66582, 66591, 66592, 66602, 66612, 66622, 66632, 66702, 66712, 66801, 66802, 66811, 66812, 66821, 66822, 66881, 66882, 66891, 66892, 66901, 66902, 66911, 66912, 66921, 66922, 66932, 66941, 66942, 66951, 66961, 66971, 66981, 66982, 66991, 66992, 67002, 67012, 67022, 67032, 67082, 67101, 67102, 67111, 67112, 67121, 67122, 67131, 67142, 67151, 67152, 67181, 67182, 67191, 67192, 67202, 67301, 67302, 67311, 67312, 67321, 67322, 67331, 67332, 67381, 67382, 67401, 67402, 67412, 67422, 67432, 67442, 67451, 67452, 67482, 67492, 67501, 67502, 67511, 67512, 67521, 67522, 67581, 67582, 67591, 67592, 67601, 67602, 67611, 67612, 67621, 67622, 67631, 67632, 67641, 67642, 67651, 67652, 67661, 67662, 67681, 67682, 67691, 67692, 67801, 67811, 67901, 67902, 67911, 67912, V270, V3000, V301, V3201, V331, V3601, and V361.

Reference deliveries that had at least one claim with a cesarean section surgical or diagnosis code were identified as cesarean section deliveries. The codes used included surgical codes beginning with 740, 741, 743, 744, and 749 and diagnosis codes 64981, 64982, 66970, 66971, V3001, V3101, V3201, V3301, V3401, V3501, V3701, and V3901.

Then, those delivery claims that occurred within the correct time period were identified as reference delivery claims. The earliest and latest reference delivery claims by person were used as the beginning and end, respectively, of the reference delivery episode.

Postpartum Visits

HEDIS criteria were used to define the postpartum visit measure. Accordingly, claims with one of the postpartum visit codes shown in the box below that occurred in the 21-56 day period following the mother's delivery episode were identified as postpartum visit claims. These claims were also restricted to those that had a claim type of 4 or 5 (codes found to be associated with doctor visits) and nonadjustment claims. Mothers that had at least one claim that met these conditions were reported as having a postpartum visit.

Postpartum Visit	
CPT Code	57170, 58300, 59400*, 59410*, 59430, 59510*, 59515*, 59610*, 59614*, 59618*, 59622*, 88141-88143, 88147, 88148, 88150, 88152-88154, 88164-88167, 88174, 88175, 99501, 0503F
HCPCS	G0101, G0123, G0124, G0141, G0143-G0145, G0147, G0148, P3000, P3001, Q0091
ICD-9 Procedure Code	89.26, 91.46
ICD-9 Diagnosis Code	V24.1, V24.2, V25.1, V72.3, V76.2
LOINC	10524-7, 18500-9, 19762-4, 19764-0, 19765-7, 19766-5, 19774-9, 33717-0, 47527-7, 47528-5
UBREV	0923

*Can only be used if the claim form indicates when postpartum care was rendered

One-Year and Two-Year Postpartum Time Periods

The one-year postpartum period was defined as the period beginning after the end of the reference delivery episode and ending 365 days later. The two-year postpartum period was defined as the period beginning after the end of the one year postpartum period and ending 365 days later. These two years are used as the reference time periods for several maternal and child enrollment and health care utilization measures, described in more detail below. Because infants can remain on their mother's record for months after delivery, maternal claims identified as infant claims by the diagnosis code were counted toward infants, unless they occurred after a six month period if the mother was identified as having a repeat delivery within two years.

Child Doctor Visit Utilization

Child doctor visits were defined as all visits that are reported as EPSDT visits or that have a claim type of 4 or 5 (which reflect Outpatient and Medical/Allied claim types, respectively, and are associated with health care visits). It excludes claims with an emergency room place of service, adjustment claims, and claims with a procedure code beginning with 7 or 8 (which reflect radiology, pathology, or laboratory claims). If multiple doctor visit claims occur on the same day, only one such claim is counted, and doctor visit claims that occur within a day of another doctor visit claim are also counted together. This measure was calculated separately for each of the two years after birth.

Child Preventive Care Utilization

Child preventive visits were defined using well-child primary diagnosis codes V201, V202, V700, V2031, V2032, V703, V705, V706, V708, and V709 and procedure codes 99381, 99382, 99391, and 99392. Claims that had at least one of these codes in addition to a claim type of 4 or 5 were counted if they were not an adjustment claim, did not indicate the emergency room as the place of service, and did not have a procedure code beginning with 7 or 8 (which reflect radiology, pathology, or laboratory claims). If multiple well-child related claims occur on the same day, only one such claim is counted, and well-child claims that occur within a day of another well-child claim are also counted together. This measure was calculated separately for each of the two years after birth.

Child Emergency Department Utilization

Child emergency department visits were defined using the emergency room place of service code (POS_CD="0"), the emergency admission necessity code (INPAT_ADMIT_TYPE_CD="1"), and the emergency room admission source code (ADMIT_SRC="7"). If a claim had at least one of those values and was not an adjustment claim, then it was counted. If multiple emergency department related claims occur on the same day, only one such claim is counted, and emergency department related claims that occur within a day of another emergency department claim are also counted together. This measure was calculated separately for each of the two years after birth.

Repeat Delivery within Two Years

Any mothers who had at least one claim with a delivery diagnosis code that occurred between 8 months after the reference delivery and up to 2 years later were identified as having a repeat delivery within two years. These Medi-Cal claims/encounter results were benchmarked against the Welcome Baby repeat delivery survey results for groups 1-3 and were shown to be consistent.

Adjusting Doctor and Preventive Care Visits for Length of Enrollment

Doctor and preventive care visits are adjusted for length of enrollment in the given year by creating an annualized number of visits. This is done by calculating the average monthly rate for the outcome measure and multiplying by 12 months. Only the sample with at least one month of enrollment in the given year is included in that analysis. This measure was calculated separately for each of the two years after birth.

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