BlueCross BlueShield Minnesota

NourishedRx

Maternal Health Food and Nutrition Pilot

Blue Cross and Blue Shield of Minnesota and Blue Plus/NourishedRx

October 16, 2023

BACKGROUND

The prevalence of pregnancy- and birthing-related complications have increased over the past several years in the United States.[1] This includes severe maternal morbidity (SMM), or unexpected outcomes at the time of hospital delivery through six weeks postpartum that cause serious short- or long-term health consequences.[2, 3] Unfortunately, this disconcerting increase is not uniform across racial and ethnic groups as Black, Hispanic, and Asian birthing persons, regardless of age or insurance type, have higher SMM rates compared to White birthing persons.[4] It is evident in the literature that nutrition plays a major role in maternal and infant health and there is ample evidence that nutrition programs like the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) decrease preterm births, low birthweight and infant mortality.[5] Unfortunately, when evaluating outcomes by racial and ethnic groups, Black and Hispanic birthing persons participating in WIC had worse outcomes compared to White birthing persons.[6] Food is Medicine interventions have shown positive health outcomes, and yet the literature on maternal and infant interventions is still emerging.[7]

To address these nutrition-security, maternal health disparity issues, Blue Cross® and Blue Shield® of Minnesota and Blue Plus (Blue Plus) and NourishedRx developed a culturally-congruent food and nutrition education program for Black, Indigenous, People of Color (BIPOC) birthing persons who were members of the Blue Plus Medicaid health plan. In order to hone in on the program's ability to improve social risk rather than medical risk, the pilot deployment of the program excluded members with high-risk pregnancies.

[1] "Trends in Pregnancy and Childbirth Complications in the U.S." Blue Cross Blue Shield Association. June 17, 2020.

[2] Hirai AH, Owens PL, Reid LD, et al. "Trends in Severe Maternal Morbidity in the US Across the Transition to ICD-10-CM/PCS From 2012-2019." JAMA Network Open, 2022 July 28. 2022;5(7):e2222966.

[3] "Severe Maternal Morbidity in the United States." Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, Last Reviewed July 3, 2023.

[4] "Racial and Ethnic Disparities in Maternal Health." Blue Cross Blue Shield Association. September 21, 2023.

[5] Soneji S, Beltrán-Sánchez H. "Association of Special Supplemental Nutrition Program for Women, Infants, and Children With Preterm Birth and Infant Mortality." JAMA Network Open, 2019 December 4. 2019;2(12):e1916722.

[6] Testa A, Jackson DB. "Race, ethnicity, WIC participation, and infant health disparities in the United States." American College of Epidemiology. Annals of Epidemiology, Volume 58, June 2021, Pages 22-28, 1047-2797.

[7] Downer S, Clippinger E, Kummer C, Hager K. Food is Medicine Research Action Plan. The Harvard Law School Center for Health Law and Policy Innovation; Food & Society at the Aspen Institute, January 27, 2022.

OBJECTIVES

Demonstrate the impact of NourishedRx's maternal health nutrition program for birthing BIPOC Blue Plus members with these objectives.

1. Examine key outcomes such as Neonatal Intensive Care Unit (NICU) admissions, preterm births, low birth weight and total cost of care.
2. Evaluate the ability of the program to improve food security and maternal mental health.
3. Assess member engagement and satisfaction with the NourishedRx program.

PROGRAM OVERVIEW

The duration of this study was five to seven months: three to five months prior to the due date and two months postpartum. Participants completed an intake survey that included baseline measurements of physical and mental health and additional exploratory measures (for example, cuisine or food preferences, food sensitivities).

NourishedRx provided personalized nutrition intervention, including home-delivered food and accompanying education and coaching.

Birthing members received customized combinations of home-delivered, medically tailored meals or meal kits and groceries for the household. As applicable, referrals were made to the WIC Program, the Supplemental Nutrition Assistance Program (SNAP) and other community-based resources.

Combinations were tailored to individual specific cultural and taste preferences, clinical and social circumstances, and receptiveness to behavior change. Meals could be modified to adapt to changes in a participant's circumstances. NourishedRx partnered with a diverse array of local food suppliers to enable this deep personalization and the flexibility to adjust to participants' needs.

To facilitate whole-person health and lasting behavior change, participants had on-demand access to nutrition education resources and to registered dietitians for one-on-one phone consults.

Participants were offered their choice of communication channels via phone or email.

PARTICIPANTS

Blue Plus members who identified as BIPOC and/or had primary language other than English and were within 20 and 27.6 weeks of gestation with high social risk but a low- to moderate-clinical risk pregnancy.

Blue Plus members who were identified as potentially eligible but did not participate in the program were utilized as a control arm for claims analysis.

Study Population

1,158 Blue Plus members were identified as potentially eligible for the program. NourishedRx conducted outreach to these members and screened to confirm program eligibility.

224 contacted and screened

159 eligible

148 enrolled

69% (102 of 148) completed the program

74% (75 of 102) submitted the end-of-program survey and were included in member reported outcome analysis

88% (90 of 102) had delivery claims and were matched to control members for comparative analyses

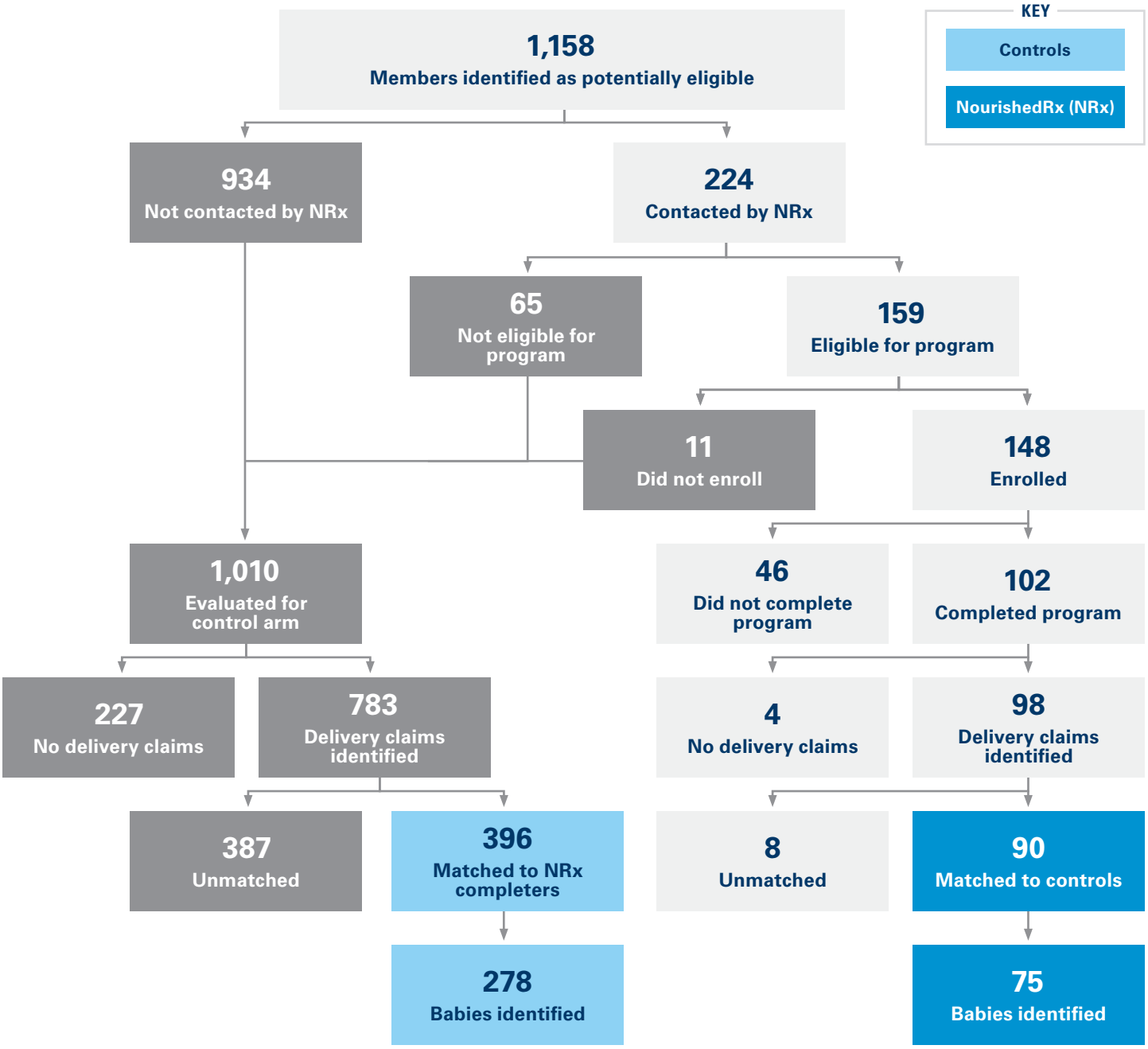
75 babies enrolled at time of birth had claims in the first month

Control population

Of 1,010 Blue Plus members who met the initial program criteria, 396 with delivery claims were matched to program completers and included in analysis. These members had not been contacted, were unable to be contacted or declined to enroll.

Of the 396 with delivery claims, 278 babies were enrolled at time of birth and had claims in the first month.

The control sample utilized in analysis was created with a 1: N matching (1 case to multiple controls), with matching based on age category, race/ethnicity, comorbidities, number of prenatal care visits before 20 weeks, social vulnerability index and non-rural dwelling status.



DEMOGRAPHICS

NourishedRx participants were similar to the control arm with regard to race, ethnicity, non-rural dwelling status, level of prenatal care, and low levels of comorbidities, but the control arm skewed younger (more members were less than 35 years old, p=0.002).

Social vulnerability levels may have differed as well, with more control arm members classified as high or moderate to high, and more NourishedRx participants classified as low to moderate, low, or unknown. Because of the high proportion of unknowns, we cannot determine exactly which way this skewed.

	Control arm (n=396)	NourishedRx participants (n=90)	p-value
Demographic characteristics			
Age category (years)			0.002
<35	378 (95.5%)	**77 (85.6%)**	
35-39	16 (4.0%)	**12 (13.3%)**	
40-44	2 (0.5%)	**1 (1.1%)**	
Ethnicity			0.78
Not Hispanic or Latino	287 (72.5%)	**68 (75.6%)**	
Hispanic or Latino	85 (21.5%)	**18 (20.0%)**	
Unknown	24 (6.1%)	**4 (4.4%)**	
Race			0.49
Black or African-American	211 (53.3%)	**54 (60.0%)**	
White (Hispanic)	72 (18.2%)	**11 (12.2%)**	
American Indian/Alaskan Native	15 (3.8%)	**6 (6.7%)**	
Asian	26 (6.6%)	**4 (4.4%)**	
Multiracial	19 (4.8%)	**5 (5.6%)**	
Unknown	53 (13.4%)	**10 (11.1%)**	
Lives in rural area			1.00
No	378 (95.5%)	**86 (95.6%)**	
Unknown	18 (4.5%)	**4 (4.4%)**	
Social vulnerability index			0.04
High	168 (42.4%)	**33 (36.7%)**	
Moderate to high	84 (21.2%)	**12 (13.3%)**	
Low to moderate	14 (3.5%)	**8 (8.9%)**	
Low	8 (2.0%)	**4 (4.4%)**	
Unknown	122 (30.8%)	**33 (36.7%)**	
Clinical measures			
Comorbidities			
Gestational diabetes	3 (0.8%)	**2 (2.2%)**	0.51
Gestational hypertension	0 (0%)	**0 (0%)**	1.00
Prediabetes	0 (0%)	**0 (0%)**	1.00
Prehypertension	0 (0%)	**0 (0%)**	1.00
Preeclampsia	0 (0%)	**0 (0%)**	1.00
Number of prenatal care visits before 20 weeks			0.88
0 visits	143 (36.1%)	**33 (36.7%)**	
1-3 visits	247 (62.4%)	**55 (61.1%)**	
4 or more visits	6 (1.5%)	**2 (2.2%)**	

STATISTICAL ANALYSIS

- Descriptive statistics were performed to describe the demographic and baseline clinical characteristics of the participants
- Comparisons between subgroups used chi-square tests for categorical variables and two-sample t-tests for continuous variables
- Chi-square tests were used to compare the differences in population proportions from baseline to program end and to compare differences in proportions in the NourishedRx arm versus the control arm
- Wilcoxon signed-rank tests were used to compare the median values of scored survey outcomes from baseline to program end
- Two-sample t-tests were used to compare the mean values of ED visits between the NourishedRx arm versus the control arm
- Wilcoxon rank-sum tests were used to compare the median cost values between the NourishedRx arm versus the control arm

MEDICAL CLAIMS ANALYSIS

Pregnancy and birth outcomes were measured based on Blue Plus claims data using relevant ICD-10 and revenue codes.

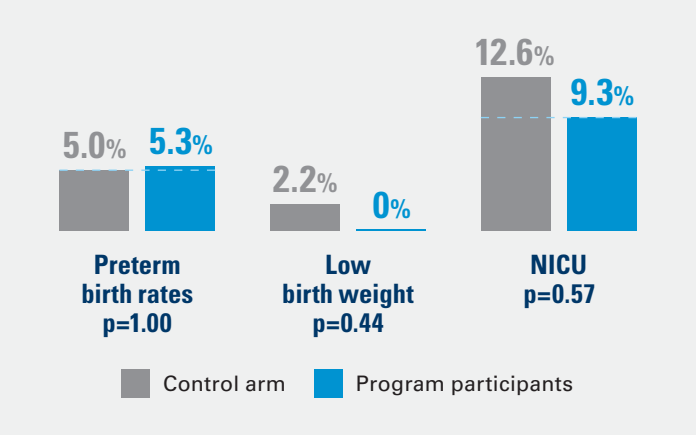
Pregnancy outcomes

The rate of preterm premature rupture of membranes in the birthing member was very low in both NourishedRx participants and in the control arm. Preterm premature rupture of membranes (with onset of labor within 24 hours of rupture) was flagged by presence of ICD-10 code O42.01.

Birth outcomes

Babies born to members who were NourishedRx participants had similar or directionally lower rates of preterm birth than those born to control arm members. There were no low birth weight babies in the program participants.

- Preterm birth, defined as birth at <37 weeks gestation, was flagged by presence of ICD-10 codes P07.2 or P07.3
- Low birth weight, defined as <2,500 grams at birth, was flagged by presence of ICD-10 codes P07.0 or P07.1
- NICU admission was flagged by presence of revenue codes 172, 173 or 174



Healthcare utilization and costs were measured based on Blue Plus claims data using relevant ICD-10, revenue codes, and dates of service; analysis only included members who were continuously enrolled for the time period of interest.

Emergency department (ED) visits by birthing members in the months just before and after delivery showed a strong directional trend toward reduced healthcare utilization in the NourishedRx arm.

- Birthing member healthcare utilization was measured by the number of ED visits between 27 weeks gestation and 2 months postpartum
- Costs were calculated as the sum of allowed amount for all claims with service dates within a specified window

	ED visits on average | p=0.12
Program participants	0.23 (SD=0.47, n=87)
Control arm	0.37 (SD=0.78, n=375)

  - Birthing member medical costs were summed for the delivery of the baby as well as for the period of six months before delivery to six weeks after delivery
  - Baby medical costs were calculated as the sum of allowed amount on all claims within the window of birth to three months

Medical claims costs

Costs showed a consistent trend toward savings in the NourishedRx arm, with median savings of more than $200 for both the birthing member and baby in the time window around delivery.

	Control arm	NourishedRx participants	Savings	p-value
Baby: Birth to three months	$2,135 IQR=$1,932 n=262	**$1,925 IQR=$1,044 n=71**	$211	0.07
Birthing member: Six months pre-delivery to six weeks post	$8,877 IQR=$4,917 n=360	**$8,640 IQR=$2,937 n=72**	$236	0.59
Birthing member: Delivery	$5,344 IQR=$2,107 n=396	**$5,321 IQR=$1,528 n=90**	$23	0.97

PHYSICAL AND MENTAL HEALTH

Overall health-related quality of life was measured using the "Healthy Days Measures" from the Centers for Disease Control and Prevention (CDC).[1] Participants were asked: "How many days during the past 30 days was your physical/mental health not good?" Responses range from 0 to 30 or "Not sure." "Not sure" responses are excluded from analysis.

Depression symptoms and risk were measured by the Patient Health Questionnaire-2 (PHQ-2).[2] This tool inquires about the frequency of depressed mood and anhedonia over the past two weeks. A PHQ-2 score ranges from 0-6. A score of 3 or more indicates major depressive disorder is likely.

Physical and mental health was good at program start and remained stable.

FOOD AND DIET BEHAVIORS

The vast majority of participants who completed the end-of-program survey reported that program had a positive impact on their food and diet behaviors:

88%
agreed or strongly agreed that their current diet is right for their health and wellbeing

97%
agreed or strongly agreed that their experience with the program improved their knowledge and confidence in eating healthy food

99%
agreed or strongly agreed that their experience with the program will positively affect their food choices going forward

[1]Moriarty DG, Zack MM, Kobau R. The Centers for Disease Control and Prevention's Healthy Days Measures – Population tracking of perceived physical and mental health over time, Health Qual Life Outcomes, 2003.
[2]Arroll B, Goodyear-Smith F et al. Validation of PHQ-2 and PHQ-9 to screen for major depression in the primary care population, Ann Fam Med, 2010.

ENGAGEMENT AND SATISFACTION

Upon completion, participants were asked to complete a survey on satisfaction, endline measurements of physical and mental health, and additional exploratory measures (for example, breastfeeding practices, confidence in self-care).

Engagement

Engagement with NourishedRx was measured based on the success rate of attempted food deliveries, completion of nutrition coaching sessions and survey completion rates.

99.9%
successful attempted food deliveries

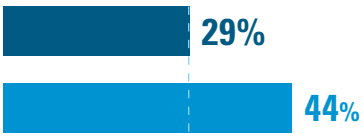
98% (100 of 102)
completed midpoint survey

74% (75 of 102)
completed end-of-program survey

Community resources and benefits

Enrollment rates: WIC

SNAP



Satisfaction

Net Promoter Score improvement ratings

NourishedRx

Food satisfaction: 5-point scale

4.8
Health and wellbeing

4.8
Freshness

4.8
Ease of preparation

4.6
Flavor

Food insecurity

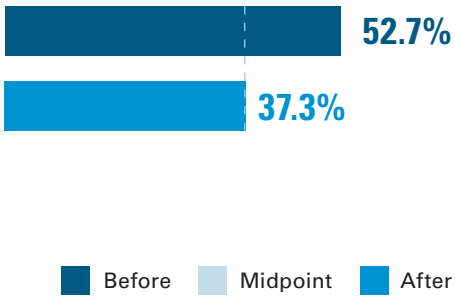
Food insecurity was member-reported via the Hunger Vital Sign 2-question screener.* This tool asks how often in the past 12 months they have:

1. Worried their food would run out before they had money to buy more.
2. Run out of food and did not have money to buy more.

Responses are categorical, and participants are considered at risk of food insecurity if they respond anything other than "never" to either question.

Food insecurity showed a strong directional improvement over the course of the program.

Risk improvement rating



*Hager ER, Quigg AM et al. Development and Validity of a 2-Item Screen to Identify Families at Risk for Food Insecurity, Pediatrics, 2010.

DISCUSSION AND CONCLUSIONS

This study demonstrates that a comprehensive nutrition program for highly vulnerable birthing populations can be successfully served to produce meaningful outcomes.

Medicaid populations like the one served are typically challenging to reach. The NourishedRx program's ability to engage with these members and alleviate food insecurity risk shows promising opportunity. These unusually successful engagement rates may be due to the provision of preference-sensitive and culturally concordant food to the entire household, as well as to ongoing engagement by NourishedRx Wellness Associates/navigators.

The strong directional trends seen here in reducing risk of food insecurity, ED utilization, and medical costs are compelling, although future analysis may improve study power by addressing some of the limitations of this analysis:

- Despite being a vulnerable population, the member population was young and had very low rates of comorbidities and mental health burden at baseline, in part due to the exclusion of high-risk pregnancies. Expanding the program to a larger cohort will provide more statistical power to see incremental improvements even in a relatively healthy population.
- Despite the matching process used to select the control group, the control group was statistically significantly younger than the NourishedRx group, with a higher proportion of the members being less than 35 years old. This may have led to the control group having lower medical spend than the NourishedRx group would have had in the absence of the program.
- The Blue Plus program, even in the absence of the NourishedRx program, provides access to high quality, relevant services that may lead birthing members to have better outcomes and lower costs at baseline than other birthing, BIPOC Medicaid cohorts. In particular, in this study we saw that only five percent of the control arm births were preterm births, as compared to an average of 10.4 percent for BIPOC women across Minnesota.*
- Further analysis is planned once a full twelve months of post-delivery data is available for both birthing person and newborns to better understand the impact of this intervention over a longer period of time.

Blue Plus and NourishedRx are currently working on a program expansion which will enable improved statistical power to further evaluate the positive directional trends demonstrated in this evaluation.

As this program demonstrated, offering a program of healthy food, nutrition education and health coaching to vulnerable populations of birthing Medicaid members may positively impact maternal and baby health outcomes and lower medical costs related to pregnancy, delivery and infant care.

Anchor Outcomes Data validation and report preparation by Anchor Outcomes.

BlueCross BlueShield Minnesota

Contact your Blue Plus or NourishedRx representative for more information.
bluecrossmn.com | **nourishedrx.com**

*"State summary for Minnesota," March of Dimes, 2021.