Evaluation of Bridges to Moms

A Mixed Methods Study

Prepared for
Health Care Without Walls

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Executive Summary

Background

Bridges to Moms, a program of Health Care Without Walls, provides intensive case management, medical referrals, and social support for homeless and housing insecure women in the prenatal, perinatal and postpartum periods. Services include transportation and food assistance, postpartum wellness checks, housing advocacy, and case management. Since the program began in early 2016, Bridges to Moms has supported 68 women and their 74 newborns.

Bridges to Moms is a community-hospital partnership program between the Obstetrics Department of Brigham and Women's Hospital and Health Care Without Walls, a 501(c)(3) organization which provides services to the homeless and housing insecure in the Greater Boston area.

Bridges to Moms participants are demographically diverse, often with complex medical histories. Bridges to Moms seeks to meet the unaddressed needs of homeless women and their families and ensure that they have improved birth outcomes, consistent access to routine medical care, and stable housing.

Methods

The Institute for Community Health (ICH) is the external evaluator for Bridges to Moms. ICH undertook a mixed methods evaluation utilizing a range of data collection approaches, including review of program and medical records data, a focus group with staff, qualitative interviews with program participants, and assessment of costs. The mixed methods evaluation included a process evaluation, outcomes evaluation, qualitative evaluation, and costing study.

We examined process indicators for all women who enrolled in Bridges to Moms from January 2016 through September 2017 and gave birth during this time period. We compared outcomes for a subset of those women, moms who joined Bridges to Moms at least 30 days before delivery, relative to a comparison group of homeless women who gave birth at Brigham and Women's Hospital during the study period but who were not Bridges to Moms participants. We used appropriate statistical tests to compare continuous outcomes (birth weight, gestational age, length of NICU stay) and categorical outcomes (NICU stay needed). We compared postpartum outcomes in all Bridges to Moms participants and the comparison group. These included access to care, breastfeeding at one month postpartum, and housing stability. Bridges to Moms provided cost data for fixed and variable program costs and we estimated the average cost savings of the program.

ICH held a focus group with Bridges to Moms staff to understand their experiences with the program, and perceptions of the program's successes and challenges. We conducted interviews with three program participants who entered Bridges to Moms at various points in their pregnancy.

Results

Since January 2016, Bridges to Moms has supported 68 homeless women, with enrollment growing steadily over time. Bridges to Moms staff has grown from clinical and social services staff equivalent to 2.68 full time employees in 2016 to 3.98 full time employees in 2017.

From January 2016 through September 30, 2017, 59 homeless pregnant women and new mothers were supported by Bridges to Moms and gave birth. On average, women received support from Bridges to Moms for 354 days before discharge. Bridges to Moms program costs were $840 per participant-month. Transportation and food vouchers, as well as baby items or donated goods were an additional expense of $59 per participant-month.

Bridges to Moms provides support to racially and linguistically diverse women with complex medical histories. Bridges to Moms participants had an average age of 28. More than half of participants (59%) were Hispanic and an additional 34% were Black, non-Hispanic. Approximately two-thirds (63%) of participants spoke English as their primary language; the remainder spoke Spanish. Only 10% of women had stable housing during pregnancy, nearly half (49%) were doubled-up and 39% were living in a shelter. Medical history included depression (30%), anxiety (18%), and pregnancy complications of gestational diabetes (15%) and pre-eclampsia (15%).

Key findings from our evaluation include:

- Slightly more than half (56%) of women enrolled in Bridges to Moms 30 days or more before delivery; 17% enrolled fewer than 30 days before birth and 27% enrolled at delivery or in the postpartum period.

- Bridges to Moms provided **916 taxi vouchers** for transportation to medical appointments for prenatal, postpartum, and primary care and **423 food vouchers** for use at the cafeteria at Brigham and Women's Hospital. Women with infants in the NICU received, on average, one additional food and taxi voucher per month enrolled in the program than those whose infant did not require NICU care, suggesting that Bridges to Moms is able to target resources to support women who require additional medical care.

Access to care

- **Bridges to Moms participants attended 80% of prenatal appointments**. Women enrolled in Bridges to Moms more than 30 days before delivery attended slightly more prenatal appointments, on average, than those in the comparison group (11 vs. 10, p-value 0.2).
- Postpartum attendance was higher among Bridges to Moms participants than among women in the comparison group. Almost **three-quarters (73%) of Bridges to Moms participants attended at least one postpartum appointment**; 63% of women in the comparison group did (p-value 0.2).

Newborn health

- **Mean gestational age was 37 weeks, 3 days** for Bridges to Moms participants who enrolled more than 30 days before delivery, which is slightly lower than that of comparison group infants (38 weeks, 1 day) (p-value 0.2).
- Birth weight was similar in both groups: **2945 grams in infants born to Bridges to Moms** participants who enrolled more than 30 days before delivery, and 3050 grams in infants in the comparison group (p-value 0.5).
- Only 3% of newborns were classified as very low birth weight (<1500 grams) and 15% were of low birth weight (<2500 grams).
- **About one-third (39%) of infants born to mothers enrolled 30 days or more before delivery required NICU attention.**
- NICU stay was shorter for infants born to Brides to Moms participants who enrolled more than 30 days before delivery; **the mean number of days in the NICU was 17,** compared to 36 for comparison group infants (p-value 0.2).

Maternal engagement

- **Infants in the NICU received a daily visit or call from their mother for 90% of all possible days.**
- Bridges to Moms participants visited their infants in the NICU, on average, 86% of the days that they were hospitalized.
- Bridges to Moms participants called the NICU 5% of hospitalized days.

Housing

- Among the 33 women who have exited from Bridges to Moms, more than half (61%) are living in stable housing.

Qualitative interviews with Bridges to Moms participants and a focus group with staff provided additional evidence on the impact of Bridges to Moms. Both staff and participants highlighted the importance of establishing trusting, consistent relationships. In the words of Bridges to Moms participants:

> "They come over and it's like you've known them forever."
>
> "[they] make me feel as though I am seen, I am heard, I am important, I am worthy of having help".

Bridges to Moms provides services that other social service agencies do not or cannot. Staff identified the ability to provide cab vouchers as a cornerstone of the success of the program, as did participants:

> "If you're struggling with transportation, like me, back and forth to appointments, it's really helpful. Not a lot of places actually provide cab vouchers."

Conclusions and Recommendations

Bridges to Moms provides needed social and medical support services to vulnerable homeless pregnant women and new mothers. Women who participate in Bridges to Moms report high levels of satisfaction with the program and highlight that it provides needed support not offered by other organizations or programs. Additionally, both staff and program participants speak highly of the respectful, caring, and consistent relationships which develop between community health workers and those receiving support from Bridges to Moms.

Bridges to Moms provides care to a racially, culturally, and linguistically diverse population. Our findings suggest that early enrollment in Bridges to Moms, at least 30 days before delivery, impacts outcomes. We found higher prenatal care attendance among women who were involved with Bridges to Mom before delivery and a significantly shorter hospital stay for newborns, and thus estimated lower total hospital costs. These findings suggest that early intervention has an impact. The results of our mixed methods evaluation highlight the importance of the program in improving access to care and health outcomes for women during pregnancy and the postpartum period.

Based on our findings we recommend that:

- Bridges to Moms collaborate closely with social workers at Brigham and Women's Hospital to refer and enroll women in Bridges to Moms as early in pregnancy as possible.

- The program continues to provide needed services not addressed by other organizations. Through qualitative evaluation, both staff and participants identified transportation support as an essential offering of the program.

- The staff of Bridges to Moms are the heart of the program and develop strong relationships with participants through consistency and responsive services.

- Ongoing evaluation should play an essential role in continuing to ensure that Bridges to Moms provides impactful care to vulnerable women.

Bridges to Moms offers needed services to homeless women and new mothers, satisfying a need not addressed by other organizations. The young program is beginning to demonstrate positive results in improving health outcomes, increasing access to care, and obtaining stable housing.

Background

Bridges to Moms, a program of Health Care Without Walls, began in January 2016 and provides intensive case management, medical referral, and social support for homeless and housing insecure pregnant women and new mothers. Patients of the obstetrical service at Brigham and Women's Hospital (BWH), a high-risk referral hospital in Boston, are referred to Bridges to Moms, a targeted outreach program that works as a collaboration between BWH Obstetrics and Health Care Without Walls, a local 501(c)(3) non-profit.

Bridges to Moms participants are demographically diverse, united by a common experience of homelessness or housing instability during pregnancy and the postpartum period. Bridges to Moms seeks to meet the unaddressed needs of homeless women and their families and ensure that they have improved birth outcomes, consistent access to routine medical care, and stable housing.

Referrals from BWH are assigned to an outpatient community-based field team managed by a nurse coordinator. The field team, employed and operated by Health Care Without Walls, provides support to women in the prenatal, perinatal and postpartum periods. Bridges to Moms services address complex needs related to social determinants of health: transportation assistance, food security, housing advocacy, and personal safety. Community health workers communicate with enrolled women regularly and connect them to services. A nurse practitioner and nurse midwife conduct prenatal and postpartum wellness checks, alerting BWH Obstetrics staff of clinical issues that they discover during home visits.

During the pilot phase of Bridges to Moms (January 2016- December 2017), all care delivered by the Health Care Without Walls field team was funded through charitable donations and foundation support. Since the start of the program, Bridges to Moms has supported 68 women and their 74 newborns.

Evaluation Methods

The Institute for Community Health (ICH) is the external evaluator for the Bridges to Moms program. ICH conducted a mixed methods evaluation which included four key components:

1. A **process evaluation** to understand program implementation;
2. An **outcome evaluation** to quantify the impact of Bridges to Moms participation on maternal and child health outcomes;
3. A **costing** component to determine the costs incurred and alleviated by Bridges to Moms; and
4. A **qualitative evaluation** to understand program successes and challenges from the perspectives of staff and Bridges to Moms participants.

A summary of the evaluation elements and methods used are presented in Table 1.

Table 1. Evaluation components and methods

Evaluation component	Methods
Process evaluation	Analysis of program records to quantify support received by clients
Outcome evaluation	Analysis of outcomes in Bridges to Moms clients and a comparison group of homeless women at Brigham and Women's Hospital
Costing	Analysis of program costs and estimation of costs associated with child health outcomes
Qualitative evaluation	Focus group with staff and interviews with Bridges to Moms clients

Process Evaluation

Bridges to Moms collects program data on services provided to program participants. ICH quantified program participation and the support received using the following metrics:

- Length of time in Bridges to Moms
- Pregnancy or postpartum status at enrollment
- Number of taxi/transportation vouchers distributed and used
- Number of food vouchers distributed

Women join Bridges to Moms at different times in their pregnancy or in the postpartum period. We defined the time of enrollment in Bridges to Moms as advanced prenatal (more than 30 days before delivery), prenatal (less than 30 days before delivery), and postpartum (at or following delivery).

Outcome Evaluation

To determine the impact of Bridges to Moms participation, we compared program participants with a similar cadre of homeless women who delivered at Brigham and Women's Hospital from July 2015 to December 2017, but who were not enrolled in Bridges to Moms. The intervention group included all Bridges to Moms clients who delivered between program start (January 2016) and September 30, 2017. The intervention group included 59 women in total. For a subset of analyses, we limited the intervention group to women who enrolled in Bridges to Moms 30 days or more before delivery (N=33).

We identified the comparison group by searching the electronic medical record (EMR) at Brigham and Women's Hospital for references to homelessness. The comparison group search was limited by record availability; BWH introduced a new EMR, EPIC, in June 2015 and records collected before then were not available. Hospital registration did not capture housing status so a word search software program, QPID, was utilized to identify charts where relevant words were embedded in the clinical notes. Examples of search terms included "homeless", "homelessness", "couch surfing", "doubled up", "evicted", "shelter", and "housing insecure." A research assistant reviewed identified records for documentation of homelessness or housing

instability and extracted data from the charts of women who met the established inclusion criteria: documented homelessness in the medical record, prenatal care received at Brigham and Women's Hospital, and a delivery occurring at Brigham and Women's Hospital between January 2016 and December 2017. In total, 59 comparison patients were identified.

We reviewed the following outcomes in Bridges to Moms participants and mothers and infants in the comparison group:

Access to care

- Number and percentage of prenatal appointments attended
- Number and percentage of postpartum appointments attended

Newborn health

- Gestational age at birth
- Birth weight
- If neonatal intensive care unit (NICU) attention was required
- Number of days in the NICU, if NICU stay was required

Maternal engagement

For the subset of newborns who required NICU care, we assessed:

- Percentage of days with a maternal visit
- Percentage of days with a maternal call
- Percentage of days with any maternal contact (phone or visit)

Housing

- Secure housing obtained during the postpartum period

See Appendix A1 for detailed definitions of these metrics.

We used an independent t-test for continuous variables and chi-squared test of association for binary variables to determine if outcomes were significantly different in Bridges to Moms participants and comparison moms or infants. Within the Bridges to Moms group, we stratified by time of enrollment (advanced prenatal, prenatal, postpartum) to determine if outcomes differed by when clients began receiving services.

We used linear regression models to assess the impact of Bridges to Moms participation on gestational age and birth weight. We used a logistic regression model to determine the impact of Bridges to Moms on any NICU stay. All regression models included demographic variables associated with poorer health outcomes (race, pregnancy of multiples rather than singleton). We tested models to determine if they satisfied model assumptions.

Costing evaluation

Bridges to Moms provided cost data for Health Care Without Walls' fixed and variable program costs. Fixed costs included staff salaries and office rental costs. Variable program costs included program supports (food vouchers, transportation vouchers, welcome kits for newborns) and staff expenses (transportation, HIPAA-compliant encrypted electronics, communication). Each member of the field team is equipped with an encrypted electronic tablet and smartphone. With limited data available on costs incurred for NICU stays, we estimated the average cost of a NICU stay per day using values drawn from the literature. Average daily hospital costs for neonates were estimated to be $3,500 (Kornhauser & Schneiderman, 2010), a value consistent with those from the peer-reviewed literature (Schmitt, 2006; DiCenzo, 2016).

The Bridges to Moms and comparison group participants included in each component of the quantitative evaluation are described in Figure 1.

Qualitative evaluation

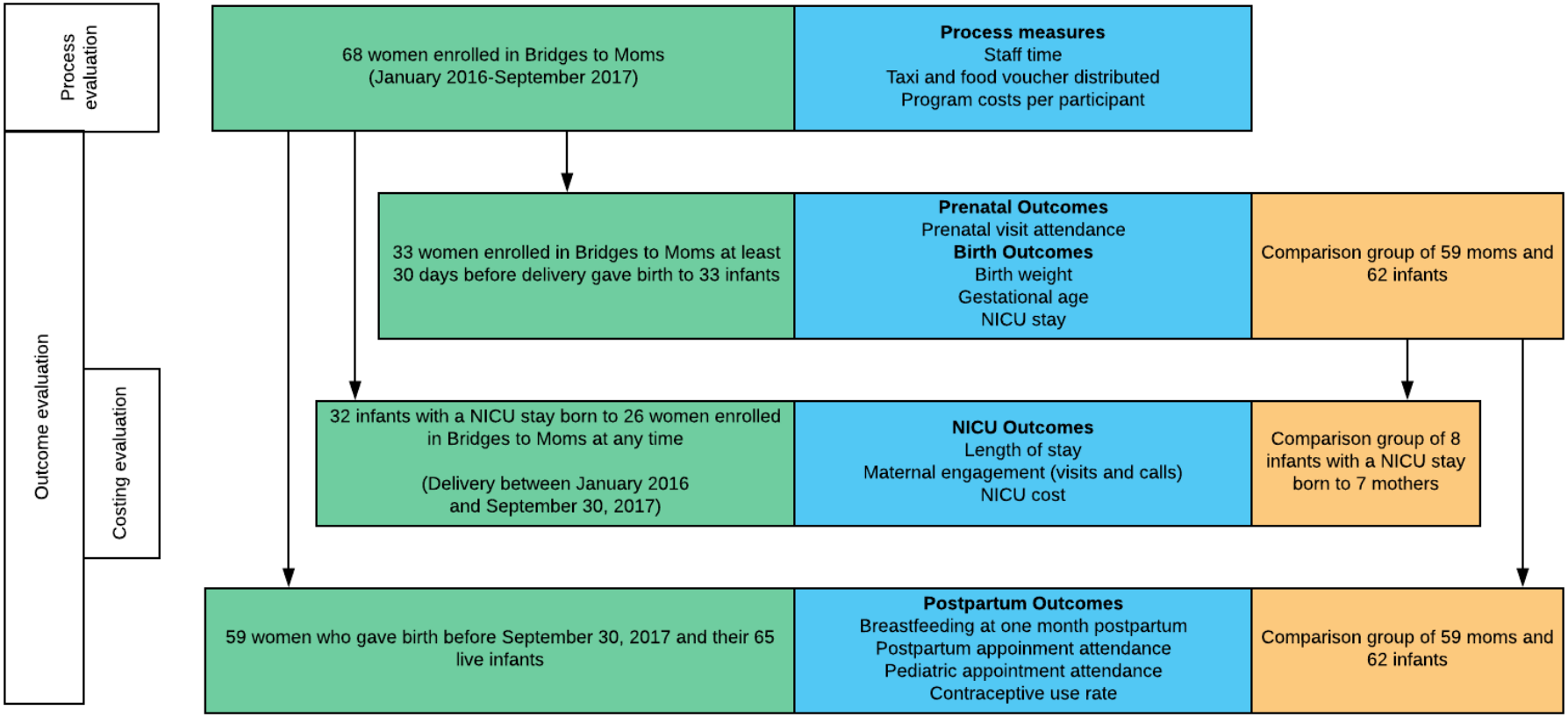
To gain understanding of program implementation, success and challenges, Institute for Community Health conducted a focus group with Bridges to Moms staff and three in-depth interviews with program participants.

The staff focus group included five Bridges to Moms staff and was held in early February 2018. The goals of the focus group included identification of successful program components, implementation challenges, and best practices from the perspective of nursing and community health workers/care coordination staff.

Additionally, Institute for Community Health interviewed three program participants who came from diverse backgrounds and who had varied medical and social needs. We sampled program participants to represent diverse needs and time of joining Bridges to Moms. One woman was pregnant at the time of the interview and two had infants. Of the two mothers with infants, one entered the Bridges to Moms program after giving birth and the other joined approximately four months before delivery. All interview participants were provided with transportation vouchers and a gift card in recognition of their participation. During the interview, participants were asked about their overall pregnancy experience and interaction with the program, successes of the program, and alternatively, ways the program had not been able to meet their needs.

The focus group and interviews were audio-recorded and a member of the research team took detailed notes. During the analysis, we reviewed the interview notes and recordings to identify responses related to program success and challenges and the factors associated with each. Additionally, we compared and contrasted the data from staff and program participants. We identified two main themes related to program success: relationships and responsive services. Additionally, we explored essential program services from the perspective of staff and participants. Finally, we considered program challenges and the future of the program.

Figure 1. Intervention and comparison group by evaluation component

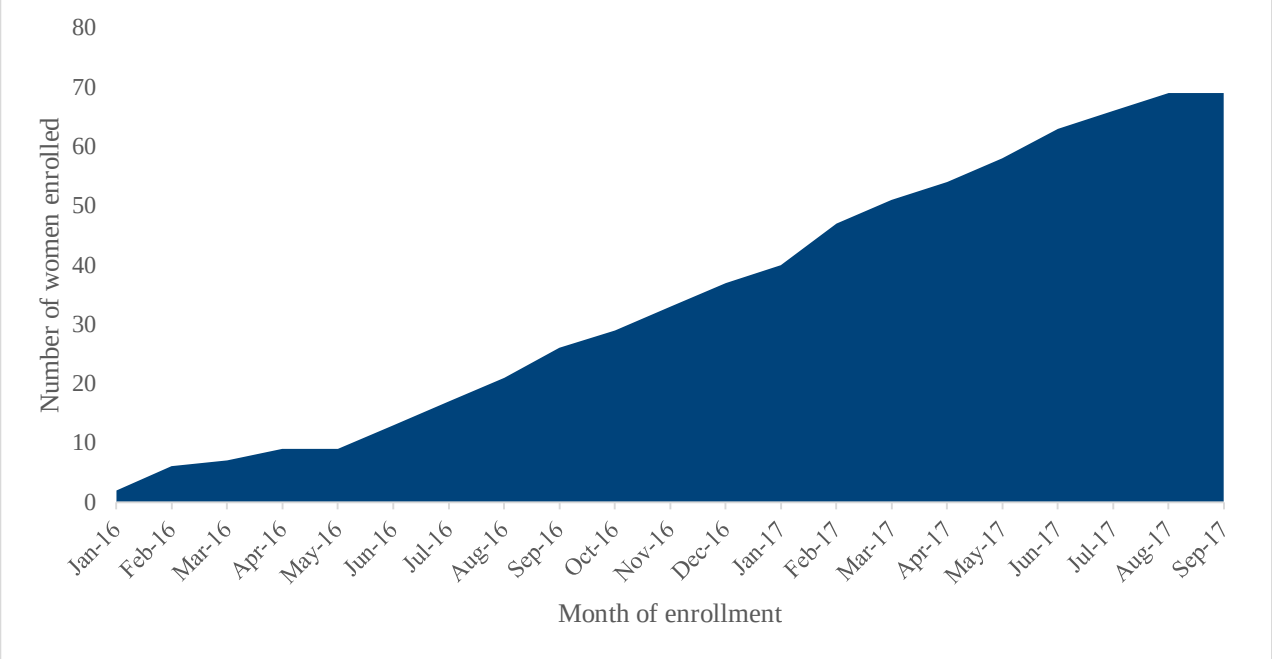


Results

Process Evaluation

Between January 2016 and September 30, 2017, Bridges to Moms supported 68 homeless or housing insecure women, with enrollment growing steadily over time (Figure 1). In 2016, Health Care Without Walls' Bridges to Moms staff, equivalent to 2.68 full time employees provided services to 33 women. In 2017, staffing expanded to include the equivalent of 3.98 full time employees who provided care to an additional 35 women enrolled through September 2017.

Figure 2. Cumulative enrollment in Bridges to Moms



Of the 68 women enrolled over this 21-month period, 33 (49%) have finished receiving services from the program. On average, women received support from Bridges to Moms for 354 days before discharge. The program aims to provide support through the first year of the child's life and data on length of enrollment suggest that the program achieves this aim.

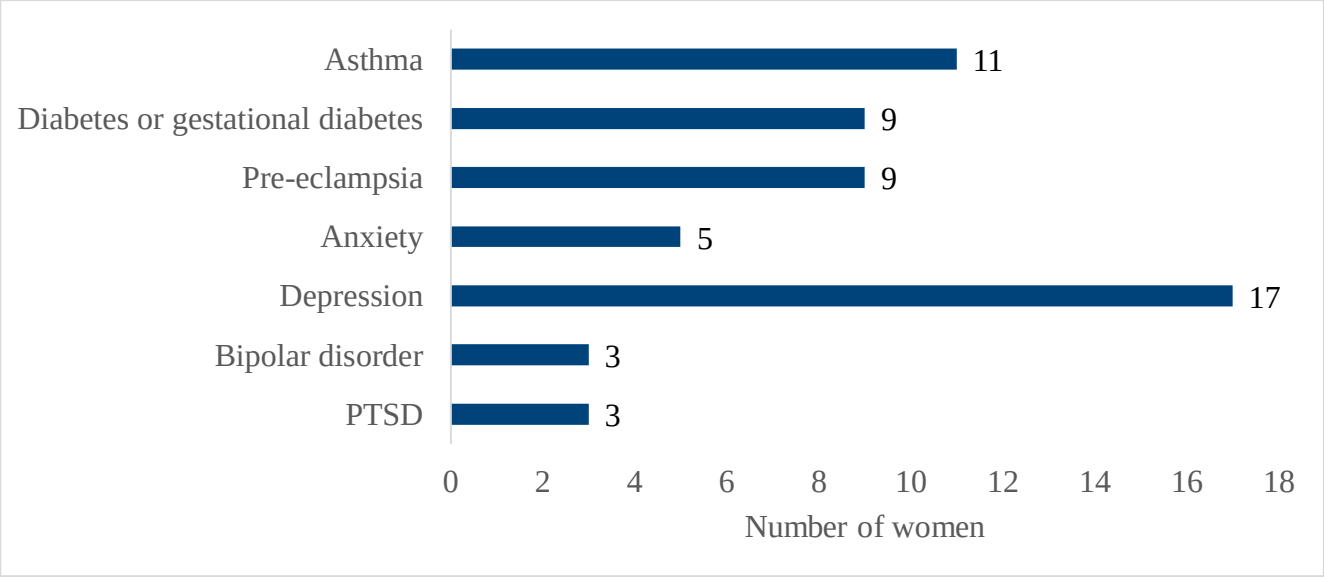
There were 59 women who gave birth from January 2016 to September 2017. The 59 women who were enrolled in Bridges to Moms and gave birth during the study period were enrolled for a total of 620 program months during the study period. On average, Bridges to Moms program costs were $840 per participant-month. This figure does not include the costs of transportation and food vouchers, as well as baby items or donated goods. These expenses were an additional $59 per participant-month.

We limited our analysis to the 59 women who delivered between January 2016 and September

30, 2017, so that we could examine both birth and postpartum outcomes. This represents 87% (59/68) of all women enrolled in Bridges to Moms during the study period. Bridges to Moms participants (N=59) had an average age of 28 and ranged in age from 17 to 42. The majority of participants (59%) were Hispanic and an additional 34% were Black, non-Hispanic. Approximately two-thirds (63%) of participants spoke English as their primary language; the remainder spoke Spanish. Only 10% of women had stable housing during pregnancy, nearly half (49%) were doubled-up in illegal or unsafe housing and 39% were living in a shelter.

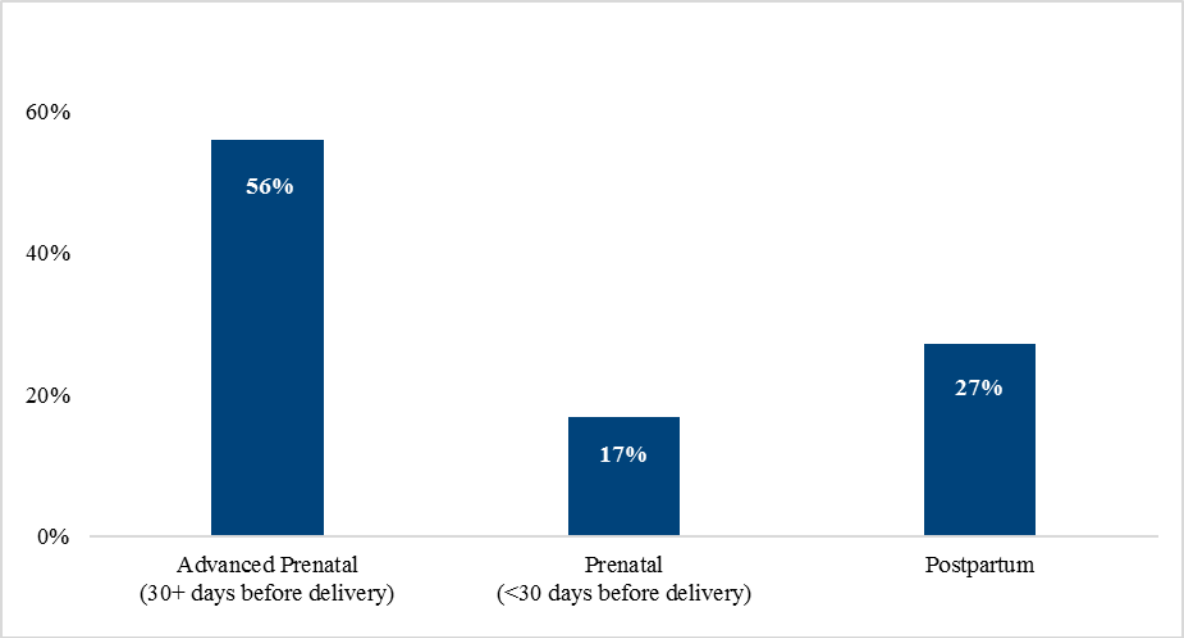
The women enrolled in Bridges to Moms have a complicated medical history, many with chronic conditions and mental illness. Figure 2 displays some of the most common conditions, including various mental health concerns, pregnancy-related disease, and chronic illness.

Figure 3. Disease burden among Bridges to Moms participants



Bridges to Moms clients are referred to the program by social workers at Brigham and Women's Hospital. Women are referred during any stage of pregnancy or in the postpartum period. Slightly more than half (56%) of women enrolled in Bridges to Moms 30 days or more before delivery and one-fifth (17%) enrolled fewer than 30 days before birth. The remaining clients (27%) enrolled at delivery or in the postpartum period.

Figure 4. Bridges to Moms enrollment by pregnancy and postpartum status



Bridges to Moms provided a total of 916 taxi vouchers for transportation to medical appointments for prenatal, postpartum, and primary care. On average, program participants used slightly more than one taxi voucher per month over their time enrolled in Bridges to Moms. Additionally, Bridges to Moms provided 423 food vouchers for use at the cafeteria at Brigham and Women's Hospital. Women were encouraged to use the vouchers whenever they attended the hospital, whether at a prenatal appointment or while visiting a newborn in the NICU. As expected, women with infants in the NICU received additional support from Bridges to Moms in the form of vouchers for transportation and food. Women with infants in the NICU received 400 vouchers during their infants' NICU stays. Women with an infant in the NICU without a known source of transportation used 190 vouchers, 45%, on average, of vouchers received. Women with a documented alternative form of transportation used 44% of vouchers on average; this is not statistically significant (p-value 1.0) lower than those without alternative means of transportation. On average, women with an infant who required a NICU stay received one additional food and taxi voucher per month enrolled in the program than those whose infant did not require NICU care. The number of infants requiring NICU stay are small, and these results should be interpreted with caution.

More than half (56%) of food vouchers were provided to women who had a newborn in the NICU. This suggests that Bridges to Moms is able to target resources to support women who require additional medical care.

Figure 5. Taxi and food vouchers distributed from January 2016 to September 2017

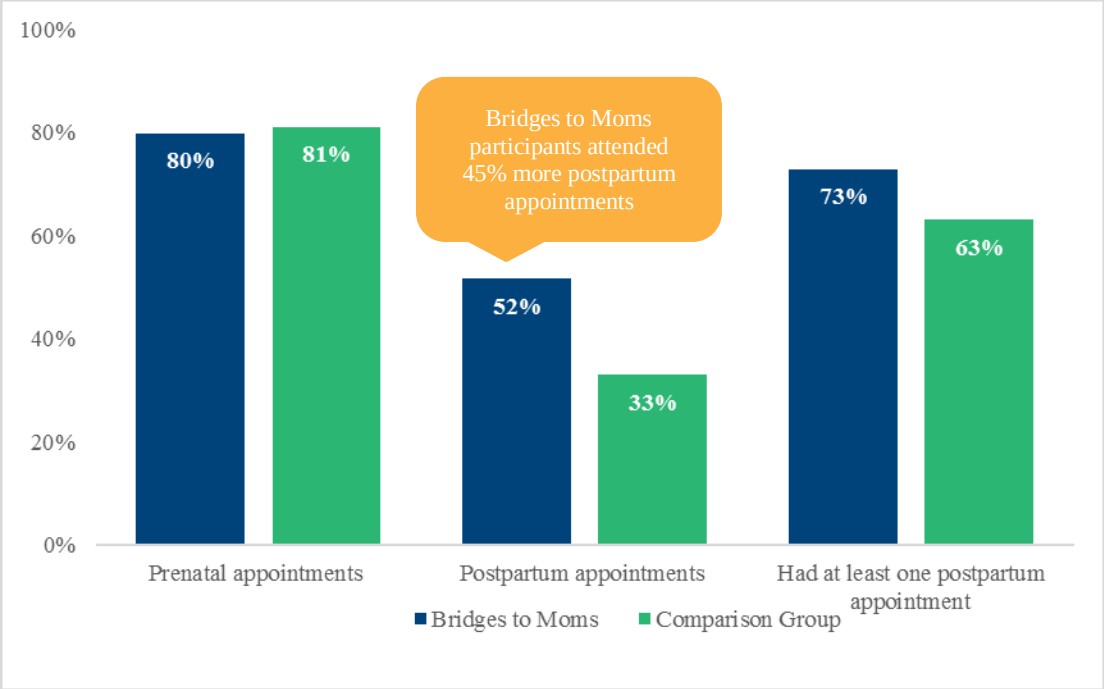
Outcome Evaluation

We determined the impact of Bridges to Moms on access to care, health, and housing stability, using a comparison group of women who delivered at Brigham and Women's Hospital but who were not enrolled in Bridges to Moms. Bridges to Moms participants were similar to women in the comparison group (see Appendix 2) in terms of demographics (race, language of care); alcohol, drug, and tobacco use; and pregnancy history. The comparison group was younger than Bridges to Moms participants with a mean age of 24, compared to 28 among Bridges to Moms participants. Additionally, Bridges to Moms participants were more likely to report a previous pre-term birth.

Bridges to Moms improves access to care. Bridges to Moms participants attended 80% of prenatal appointments; comparison group participants attended 81%. When we consider prenatal attendance among women enrolled in Bridges to Moms more than 30 days before delivery, we found that Bridges to Moms participants attended an average of 11 prenatal appointments, whereas women in the comparison group attended an average of 10 (p-value 0.2). In fact, women who joined Bridges to Moms less than 30 days before delivery or at time of delivery attended an average of 7 prenatal appointments, which is significantly lower than those attended by women in Bridges to Moms at least 30 days before delivery (p-value 0.005). This suggests that early intervention supports access to care.

Postpartum attendance is higher among Bridges to Moms participants than among women in the comparison group. Almost three-quarters (73%) of Bridges to Moms participants attended at least one postpartum appointment, whereas 63% of women in the comparison group did (p-value 0.2). Women receiving Bridges to Moms support attended 52% of scheduled postpartum visits; women in the comparison group attended only 33% (p-value 0.006).

Figure 6. Percentage of prenatal and postpartum visits attended



We assessed newborn health for women enrolled in Bridges to Moms 30 days or more before delivery (N=33). The program hypothesizes that participation for at least 30 days can impact birth outcomes such as gestational age and birth weight. A summary of newborn health outcomes for all Bridges to Moms participants, including those enrolled in the program at the time of delivery, can be found in Appendix 3.

We compared outcomes for the 33 women enrolled in Bridges to Moms at least 30 days before delivery with all women in the comparison group. Mean gestational age was similar for program participants (37 weeks, 3 days) and the comparison group (38 weeks, 1 day) (p-value 0.2). Likewise, birth weight was similar in both groups. Infants born to Bridges to Moms participants had a mean birth weight of 2945 grams and those born to mothers in the comparison group had a mean birth weight of 3050 grams (p-value 0.5). Among infants born to Bridges to Moms participants, 3% of newborns were classified as very low birth weight (<1500 grams). Similarly, 3% of infants in the comparison group were very low birth weight. Less than one-fifth, 15% of infants born to Bridges to Moms participants and 13% of those born to mothers in the comparison group were of low birth weight (<2500 grams). There were no statistical differences in prevalence of low and very low birth weight between Bridges to Moms participants and those in the comparison group. The mean one minute Apgar score among neonates born to Bridges to Moms participants was 7 and it was 8 among comparison group infants. The five minute Apgar scores were 9 in both groups. There were no significant differences in Apgar scores at either time point.

When we compared outcomes in Bridges to Moms participants with those in the literature, we found that our outcomes were consistent. An analysis of birth outcomes in homeless women in

the United States found that mean gestational age was 38.6 weeks (Richards, Merrill, Baksh, 2011). Mean birth weight was 3242 grams, with 1.6% prevalence of very low birth weight and 7.1% low birth weight (Richards et al. 2011). The prevalence of low birth weight and very low birth weight infants were slightly higher in Bridges to Moms participants, although not statistically significantly different.

Multiple linear regression results found women in Bridges to Moms had a non-statistically significant lower birthweight (mean 206 grams lower) than women in the comparison group, when accounting for race and multiple births. As expected, being born as a singleton was associated with a statistically significantly higher mean birthweight in the adjusted model.

In the adjusted model, women in Bridges to Moms had an estimated gestational age 1.2 weeks lower than the comparison group, when adjusting for race and multiple births. These analyses are limited to women who enrolled in Bridges to Moms at least 30 days before delivery or who were in the comparison group.

Table 2. Regression Models of Bridges to Moms

	Birth Weight		**Gestational Age**	
	Parameter estimate	p-value	Parameter estimate	p-value
Bridges to Moms	-206.0 gm	0.13	-1.2 weeks	0.08
Race	148.8 gm	0.30	0.90 weeks	0.19
Singleton	878.5 gm	0.002*	2.5 weeks	0.05

**Statistically significant p-value.*

Slightly more than one-third (39%) of infants born to mothers enrolled 30 days or more before delivery required NICU attention, whereas only 13% of infants born to mothers in the comparison group did (p-value 0.003). However, NICU stay was shorter for infants born to Brides to Moms participants; the mean number of days in the NICU was 17, compared to 36 for comparison group infants (p-value 0.2). Additionally, within the Bridges to Moms program, we found a significant difference in length of stay in NICU between infants born to moms enrolled more than 30 days before delivery and those who joined at birth (mean difference of 35 days).

We assessed maternal engagement—visits and phone calls by mothers while their infants were in the NICU—for both intervention and comparison groups. There were 32 infants born to Bridges to Moms participants, including those who enrolled in the advanced prenatal, prenatal, and postpartum period, and 8 infants born to comparison group mothers, who spent time in the NICU. We found high levels of maternal engagement in both groups. On average, infants in the NICU that Bridges to Moms supported received a daily visit or call from their mother for 90% of all possible days; comparison group infants received a visit or call for 92% of all days. Bridges to Moms participants visited their infants in the NICU, on average, 86% of the days that they were hospitalized. Comparison group mothers visited, on average, 80% of hospitalization days. Additionally, Bridges to Moms participants called the NICU 5% of hospitalized days, whereas comparison group mothers called 15% of days. There were no significant differences in maternal

engagement, although the number of infants in the comparison group requiring NICU stay was low, suggesting caution when interpreting the findings.

Nearly two-thirds (61%) of all Bridges to Moms participants were breastfeeding or combination feeding (breastfeeding and formula feeding) at one month postpartum. Among Bridges to Moms participants without an infant in the NICU, 64% were breastfeeding or combination feeding at one month postpartum. Among comparison group women, this was 73%. Both groups demonstrated similarly high rates of breastfeeding at one month after birth (p-value 0.4).

We found relatively high use of birth control among Bridges to Moms participants. Nearly one-fifth (19%) of women were using some form of birth control immediately following delivery and by the end of the postpartum period, 92% of women were using some birth control. Methods range from long acting and permanent methods such as an IUD and tubal ligation, to short term methods including pills and condoms.

Among the 59 Bridges to Moms participants, 33 have completed one year with the program and been formally discharged. Among those 33 women, more than half (61%) are living in stable housing, defined as living in an apartment or other secure housing. An additional, 24% are living in a shelter, while only five women (15%) live doubled up. In contrast, 3% of women in the comparison group live in stable housing, 76% live in a shelter, and 19% live doubled up. Housing during the postpartum period is significantly better for women in the Bridges to Moms groups than for those in the comparison group (p-value <0.001).

85% of Bridges to Moms graduates live in stable housing or a shelter

In addition to supporting access to housing, Bridges to Moms promotes continued access to health care. Among mothers who have completed Bridges to Moms, 91% have an identified primary care provider and 66% have a documented pediatrician for their child.

Cost evaluation

We determined costs associated with NICU stay for infants born to mothers in both the Bridges to Moms and comparison groups. On average, among all Bridges to Moms participants, neonate hospital stay was 18 days, among those with a NICU stay it was 36. Similarly, comparison group infants in the NICU had an average stay of 35 days. Using data from Kornhauser and Schneiderman, we calculated an average total cost for predicted NICU stay.

On average, infants born to Bridges to Moms participants with a NICU stay had an estimated total hospital cost $3,281 greater than infants born to those in the comparison group who also had a NICU stay (p-value 0.9). We estimated average infant hospital costs in the comparison group to be $124,688, whereas those born to women in Bridges to Moms were $127,969. The difference in average expected cost was smaller when comparing women who joined Bridges to Moms more than 30 days before delivery. Among those women, babies born to Bridges to Moms participants had a mean expected cost of hospital stay of $23,970. In fact, infants born to women who joined Bridges to Moms more than 30 days before delivery had a lower cost for NICU stay

than did women in the comparison group ($60,846 vs. $124,688, respectively, p-value 0.2). Additionally, women who joined Bridges to Moms more than 30 days before delivery had lower costs than Bridges to Moms participants who joined in the 30 days preceding delivery or after delivery ($60,846 vs. $173,895, p-value <0.01). These results suggest that early intervention by Bridges to Moms has a meaningful impact on costs.

Qualitative results

> *"Knowing that [the] person has the potential to be there for you, to support you, and treat you as a human, despite your struggles, is more than impactful: it's life changing."—Bridges to Moms participant*

Why the program works: Building relationships

> *"They come over and it's like you've known them forever."- Bridges to Moms participant*

Bridges to Moms staff spoke at length about the importance of developing warm, respectful relationships with the Bridges to Moms participants. The emphasis on building these relationships was reflected in the program participants' responses. Women in the program spoke about how the positive relationships that staff built with them sets Bridges to Moms apart from other service organizations. Bridges to Moms participants expressed that they have felt stigma living in a shelter and accessing government benefits. Similarly, staff spoke about the misconceptions that they heard while accessing services with their clients and claims that pregnant women abuse the system. The staff at Bridges to Moms were perceived to be free of this type of judgment, and

> *"Every person is an individual, and we treat them that way. And I think that is part of the success of getting moms to trust us, and getting them to their appointments." – Bridges to Moms Community Health Worker*

the women felt supported by the staff. Speaking about program staff, one participant stated, **"[they] make me feel as though I am seen, I am heard, I am important, I am worthy of having help".** Another woman credited the warmth of the staff as what "…kept me to actually follow through and follow up with the program. It was nice to have a connection with a human, and not feel like I was sitting with a robot who wanted to get through their paperwork for the day."

Another key factor to program success is the consistency of Bridges to Moms; when staff say they will visit, call a client back, or make another promise, they follow through. Participants said that this was a refreshing change from other programs that they have worked with, where staff

fail to answer their phones or follow through.

Why the program works: Responsive services

> *"If I have any doubt, I call them. For example, I didn't know where Boston Housing was. I had an application, but I don't speak English. So I called… and told her, and when they came to see me they helped me fill it out."- Bridges to Moms participant*

In addition to providing social services and referral to other organizations or agencies, the Bridges to Moms staff act as advocates. Staff believe advocating for the women is a major component of their job, and one of the parts that is vital to success. Women sometimes share information with staff that they do not share with their doctor; staff encourage them to take action. Program participants recalled how staff helped them navigate housing applications and encouraged them when they ran into bureaucratic challenges.

Women and staff credit the program's success to the flexible model of care, allowing women to change visits on short notice, and communicate via text or email. This flexible model also allows staff to be there "at the right time." Staff said that being with the women during this period allows them to "catch a lot issues before they are full blown" and respond to evolving needs.

Vital program components

The Bridges to Mom program offers an array of services, but the two aspects of the program that both staff and participants continually referred to as vital to the program were financial and material support. In addition to fostering strong relationships, the program enabled women to access needed services and items.

Bridges to Moms supported women in attending medical appointments and provided baby equipment and items. The cab vouchers which Bridges to Moms provides for mothers to travel to and from their prenatal and post-partum appointments were discussed frequently during both the staff focus group and interviews with the program participants. **Staff identified the ability to provide cab vouchers as a cornerstone of the success of the program.** Allowing the vouchers to be used for travel to and from the hospital allows women to receive proper prenatal care, bond with their baby in the NICU, and seek medical care for themselves.

> *"If you're struggling with transportation, like me, back and forth to appointments, it's really helpful. Not a lot of places actually provide cab vouchers."- Bridges to Moms participant*

Financial support in the form of emergency funds and food vouchers also played a large role in the women's experience. When one participant went through all the steps of the housing process only to be faced with a surprise fee, Bridges to Moms was able to subsidize a portion of the fee, which the woman says was "crucial to getting the apartment" that she and her family have now. Staff discussed the challenges faced by women when trying to apply or secure stable housing,

and felt the ability of Bridges to Moms to provide financial assistance, in addition to advocacy, was important.

Additionally, Bridges to Moms provides mothers with essential baby care items such as a breast pump, stroller, and diapers. One woman received a double stroller. Before receiving the new stroller, she had to push two strollers to travel with both of her young children. Another woman mentioned the importance of receiving diapers. Staff talked about the impact of giving material support and meeting the needs of women during the postpartum period.

Challenges

Staff identified challenges in fully supporting women and helping them achieve positive health outcomes. The largest challenge identified was getting women into stable housing. This barrier affects other milestones and health outcomes. The challenge of securing stable housing stems from a lack of local available housing that the women are able to access. Accessing available housing is often complicated by an onerous application process.

Staff also identified maintaining contact with the participants as a challenge. Working with a transient population means that phone numbers and addresses change frequently, and can make it difficult to consistently contact women.

The women interviewed did not feel that they had encountered any programmatic challenges during Bridges to Moms. On the contrary, one woman said **"based on my experience I'd say that [the program is] the best and it offers wonderful help. I think it's perfect."**

Growing Bridges to Moms

Bridges to Moms staff felt that expanding the Bridges to Moms network to gain more connections would be beneficial to the services that they are able to provide. Particularly with the housing challenge in mind, staff believe having a connection to agencies, such as an "inside person" who understands what Bridges to Moms is and the women they represent, could help their clients.

Bridges to Moms participants expressed anxiety at the idea of transitioning out of the program one year after birth. Although most were comfortable with the program ending after one year, they felt having a set end date may be too strict. Staff similarly suggested that program graduation could be based on milestone completion.

Both staff and Bridges to Moms participants talked about the need for expanded funding in the future. Staff pointed to limited funding as a current limitation to providing additional services. Participants raised the idea of additional funding as a pre-emptive understanding that funding is always a source of difficulty for small non-profits, and not due to any deficit that they had felt.

Conclusions

Bridges to Moms provides needed social and medical support services to vulnerable homeless

pregnant women and new mothers. Women who participate in Bridges to Moms report high levels of satisfaction with the program and highlight that it provides support not offered by other organizations or programs. Additionally, both staff and program participants speak highly of the respectful, caring, and consistent relationships which develop between community health workers and those receiving support from Bridges to Moms.

Bridges to Moms provides care to a racially, culturally, and linguistically diverse population. As the program enrolls nearly half of women shortly before or after delivery, we are unable to demonstrate a statistically significant impact on birth outcomes. However, in the postpartum period, women in Bridges to Moms have better access to stable housing, increased engagement with primary care, and high levels of maternal bonding.

Our findings suggest that early enrollment in Bridges to Moms, at least 30 days before delivery, impacts outcomes. We found higher prenatal care attendance among women who were involved with Bridges to Moms before delivery. Additionally, we found a significantly shorter hospital stay, and thus estimated lower total hospital costs, among infants born to women who joined Bridges to Moms 30 days before delivery relative to those who joined shortly before or after delivery. These findings suggest that early intervention has an impact.

Analyses are limited by a small sample size, especially when considering birth outcomes among women enrolled for more than 30 days in the program. Statistical testing should be interpreted with caution given the small sample size. Additionally, our analyses are limited by lack of documentation of homelessness in the medical record. We struggled to identify a comparison group given the limited documentation of homelessness. It is possible that our comparison group patients were not referred to Bridges to Moms because they are significantly different in some way, accounting for the minimal differences that we see between the two groups. The cursory documentation of homelessness inhibits our ability to identify a robust comparison group, and also points to inadequate documentation of important components of the social history of patients. However, even with limited ability to perform statistical testing, the qualitative results provide evidence of the impact of the Bridges to Mom program and the central role it plays in supporting vulnerable families.

Bridges to Moms provides needed support to vulnerable women during an important time. Our evaluation demonstrates that the program meets the needs of women with challenging medical and social histories. Bridges to Moms works to address social determinants of health. The targeted support of the program improves health outcomes by addressing unmet needs related to housing, transportation, and food security. The results of our mixed methods evaluation highlight the importance of the program in improving access to care and health outcomes for women during pregnancy and the postpartum period.

Recommendations

Bridges to Moms works to improve maternal and child health in the region's most vulnerable populations. The results of this evaluation demonstrate that despite supporting women with complicated medical and social histories, Bridges to Moms is able to engage women in medical care and supportive services throughout the prenatal and postpartum periods.

Based on our findings we recommend that:

- Bridges to Moms collaborate closely with social workers at Brigham and Women's Hospital to refer and enroll women in Bridges to Moms as early in pregnancy as possible. A small sample size limited our ability to identify statistically significant differences between participants in the program for more than 30 days and a comparison group, but the results suggest an impact, especially among women enrolled early in pregnancy. Early enrollment provides additional opportunity for Bridges to Moms to support women in achieving healthy birth outcomes at delivery.

- Bridges to Moms continue to provide needed services not addressed by other organizations. On average, women used one to two taxi vouchers per month during their enrollment in Bridges to Moms, representing travel to medical appointments and visits to the NICU that may not have occurred without the support of the program. Indeed, in the focus group and interviews, both staff and participants identified transportation support as a vital program component which is not often offered by other agencies.

- Bridges to Moms continue to foster maternal engagement with neonates in the NICU through transportation and food assistance and case management services. Anecdotally, we see lower rates of children taken into foster care among women who are better engaged with their children from birth. There could be long term cost savings of reduced foster care referrals.

- Bridges to Moms continue to hire dynamic, engaged, empathetic staff. Program participants universally noted the importance of their relationships with the field team. They valued their nonjudgmental support and their willingness to meet the mothers where they are.

- Bridges to Moms continue to evaluate the impact of the program as the number of women enrolled continues to grow. This early evidence suggests that Bridges to Moms has an impact on access to care, health outcomes, and maternal engagement. With additional participants, Bridges to Moms may be able to identify for which subpopulations the program has the most impact.

Bridges to Moms offers needed services to homeless women and new mothers, satisfying a need not addressed by other organizations. The young program is beginning to demonstrate positive results in improving health outcomes, increasing access to care, and obtaining stable housing.

Appendix 1

Table A1. Definitions of outcomes

Access to care		
Number and percentage of prenatal appointments attended	Numerator: Number of prenatal care appointments attended by mother Denominator: Total number of prenatal care appointments scheduled by mother	Missing data were excluded from both the numerator and denominator
Number and percentage of postpartum appointments attended	Numerator: Number of postpartum care appointments attended by mother Denominator: Total number of postpartum care appointments scheduled by mother	Missing data were excluded from both the numerator and denominator
Newborn health		
Gestational age at birth	Weeks and days	
Birth weight	Grams	
If neonatal intensive care unit (NICU) attention was required	Any NICU attention required (yes/no)	
Number of days in the NICU	Time from NICU admission to hospital discharge	Among those who required a NICU stay
Maternal engagement		
Percentage of days with a maternal visits	Numerator: Days with a documented visit by mother while infant was in NICU Denominator: Number of days infant was in NICU	Among those who required a NICU stay
Percentage of days with a maternal call	Numerator: Days with a documented call by mother while infant was in NICU Denominator: Number of days infant was in NICU	Among those who required a NICU stay
Percentage of days with any maternal contact (phone or visit)	Numerator: Days with a documented visit or call by mother while infant in NICU Denominator: Number of days infant in NICU	Among those who required a NICU stay
Housing		
Percentage of women with secure housing obtained during postpartum period	Numerator: Women who indicate they are living in a house or an apartment at or after discharge Denominator: Number of women with infant discharged	Analysis is for each woman, not each infant (multiples are only counted once in the numerator and denominator)

Appendix 2

Table A2.1 Demographic data for Bridges to Moms participants and comparison group

	Bridges to Moms N=59		**Comparison Group** N=59	
	N	%	N	%
Race/Ethnicity				
African	2	3.4%	0	0%
Black, non-Hispanic	20	33.9%	16	27.1%
Hispanic	35	59.3%	40	67.8%
White, non-Hispanic	2	3.4%	3	5.1%
Language of Care				
English	37	62.7%	43	72.9%
Spanish	21	35.6%	16	27.1%
English and Spanish	1	1.7%	0	0%
Insurance*				
Private Insurance	1	1.7%	11	18.6%
Public Insurance	56	94.9%	48	81.4%
Medicare	2	3.6%	1	1.7%
Medicaid	56	100.0%	47	79.7%
Health Safety Net	8	14.3%	0	0%
Both public and private	2	3.4%	0	0%
No insurance	2	3.4%	0	0%
Housing during pregnancy				
Unstable	1	1.7%	1	1.7%
Doubled-Up	29	49.2%	19	32.2%
Shelter	23	39.0%	37	62.7%
Stable housing	6	10.2%	2	3.4%
Age (Mean and Std. dev.)	28.37	6.1	23.93	5.0
Pre-pregnancy BMI (Mean and Std. dev.)	28.11	7.4	27.07	6.3
Unknown pre-pregnancy BMI	12	20.3%	31	52.5%
Parity and gravidity				

Previous pregnancies (Mean and Std. dev.)	2.76	1.7	2.9	1.8
Term pregnancies (Mean and Std. dev.)	1.10	1.2	1.00	1.2
Pre-term pregnancies (Mean and Std. dev.)	0.37	0.6	0.19	0.6
Abortions or miscarriages (Mean and Std. dev.)	0.90	1.4	0.71	1.1
Living children (Mean and Std. dev.)	1.41	1.4	1.17	1.3
Substance use				
Alcohol use at program enrollment	4	6.9%	2	3.4%
Drug use at program enrollment	9	15.5%	5	8.5%
Smoking at program enrollment	3	5.2%	5	8.5%

**May sum to more than 100% as women can have more than one insurance.*

Appendix 3

Table A3.1 Outcomes for all infants in Bridges to Moms and comparison group

	Bridges to Moms (1) N=65		Bridges to Moms Advanced prenatal enrollment (2) N=33		Comparison Group N=62	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Birth outcomes						
Gestational age, weeks	36.2	4.0	37.4	2.7	38.2	3.1
Birth weight, grams	2670.5	893.9	2945.1	673.7	3050.4	645.2
Discharge weight, grams	2943.6	481.2	2929.9	457.2	3014.8	420.7
Requires NICU stay						
Yes	32 (49.2%)		13 (39.4%)		8 (12.9%)	
No	33 (50.8%)		20 (60.6%)		54 (87.1%)	
Days in NICU*	36.6	35.9	17.4	22.9	35.6	37.4

(1) Bridges to Moms groups includes all infants born to Bridges to Moms participants, regardless of when the mother enrolled in the program.
(2) Bridges to Moms advanced prenatal enrollment only contains infants born to mothers who enrolled in Bridges to Moms at least 30 days before delivery.

**Among those who had a NICU stay.*

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