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Reducing the Risk of Postpartum Depression in a Low-Income Community Through a Community Health Worker Intervention

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Abstract
Objectives To clarify the effectiveness of perinatal social support interventions in reducing postpartum depression among minority, low-income women. *Methods* The Transdisciplinary Research Consortium for Gulf Resilience on Women's Health supported a community-based participatory research project to improve perinatal health among low-income, first-time pregnant women living in a vulnerable Gulf Coast region. Community health workers (CHWs) were partnered with recruited women, and used a mix of mobile technology and home visits to develop a supportive relationship during the perinatal period. *Results* Women enrolled in the CHW-led intervention had lower (F: 2.38, $p = 0.04$) average postpartum depression scores (EPDS) 6 months postpartum than a comparison population. The difference, however, was not seen among women in the intervention group who reported relatively poor relationships with their CHWs. *Conclusions for Practice* Results reinforce the evidence that perinatal social support can affect postpartum depression outcomes. CHWs are increasingly utilized by public programs to reach at-risk populations. We discuss the potential efficacy of CHW programs, but also, the need to pair outreach with effective monitoring and evaluation of the relationship development between CHW and clients.

Keywords Postpartum depression · Perinatal health · Community health workers · EPDS

Significance

"What is already known on this subject?" Postpartum depression has long-lasting impact the health of a woman and her child. Attempts to reduce the risks of perinatal outreach have produced mixed results. "What this study adds?" This manuscript has public health importance through its demonstration of the potential efficacy of individually-based perinatal outreach. Our findings indicate that services provided by CHWs may be particularly effective with low-income populations who have less of an existing support network. Overall, we show that low-income pregnant women who were enrolled in a CHW-led support program had lower postpartum depression scores than a comparable population.

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Introduction

Postpartum depression (PPD) is a non-psychotic mood disorder that can occur at any point during the first year of pregnancy (Cox and Holden 2003). Roughly 13% of women experience depression sometime during the first year after delivery (O'hara and Swain 1996), with the rate being as high as 25% in certain subpopulations (Gavin et al. 2005). Consistent with the general diagnosis of Major Depressive Disorder, PPD can have a scarring effect on the individual's life (Cox and Holden 2003). The more pernicious effects of PPD may be due to its presence during a formational period in the relationship between the woman and infant,

and a critical period for infant development (Lefkovics et al. 2014). As a result, the long-term effects of PPD have found to extend to maternal attachment (Beck 1995), increased depression in partners (Ballard et al. 1994), and child development—both short-term (Gress-Smith et al. 2012), and long-term (Raposa et al. 2014).

PPD is believed to be influenced by an accumulation of risk factors that either produce additional stress or increase the vulnerability of the woman in her process of managing the latent stressors associated with pregnancy (Clatworthy 2012). Dozens of psychosocial, obstetrical, physiological, and medical history risk factors have been found in several decades of research (Beck 1996), but the most consistent predictors of PPD are a history of psychosocial stressors prior and/or during the pregnancy, low income, poor partner relationship, low social support, and stressful life events (Beck 2001). As a result, PPD screening is generally advanced as a two-pronged approach: (1) a systematic health history and (2) an assessment of current psychosocial stressors and symptoms of depression (Horowitz and Goodman 2005).

The United States Preventive Service Task Force recently recommended for the first time that women be screened for depression during pregnancy and after birth (Siu et al. 2016). Undiagnosed depression during pregnancy is the leading risk factor for postpartum depression (Leigh and Milgrom 2008). Information is lacking regarding how rates of depression differ at different stages in the perinatal period (Eberhard-Gran et al. 2004), which has implications for screening and intervention. Additionally, many cases may go undiagnosed and untreated (Banker and LaCoursiere 2014), since estimates indicate that only approximately 15% of women experiencing PPD receive treatment (Cox and Holden 2003).

While effective pharmacologic and psychotherapy treatments exist for PPD, they may create additional disparities for many women due to barriers including access, expense, lack of childcare, and perceived stigma. Public health researchers have sought to develop interventions that can reach a wider population through reducing risk factors or strengthening protective factors (Brugha et al. 2000). Interventions aimed at increasing social support for at-risk women have shown mixed results (Brugha et al. 2000; Clatworthy 2012). Ascertaining the effectiveness of such interventions is hampered by a lack of data regarding the time point at which screening and outreach should be initiated to best predict and modify the risk of PPD.

The objective of this study was to determine whether at-risk pregnant women who participated in a perinatal, community health worker (CHW)-led intervention had significantly lower rates of postpartum depressive symptoms than a comparison population. Secondly, within the intervention population, we determined which prenatal risk factors were predictive of PPD. Thirdly, within the intervention population, we determined whether the accumulation of predictive risk factors was associated with an increase in PPD scores. Finally, we compared postpartum depressive symptoms characterized at two different time periods (6 weeks postpartum, and 6 months postpartum) to analyze the degree of change, and whether socio-demographic, or psychosocial factors were predictive of reduced symptomology of PPD.

Methods

Study Overview

Following the 2010 Gulf Oil Spill, pregnant women were identified as a population of public health concern, due to their increased risk for developing adverse health effects after the disaster (Goldstein et al. 2011). The Transdisciplinary Research Consortium for Gulf Resilience on Women's Health (GROWH) was created to examine the interactions of environmental and social disparities on the health of pregnant women living in southeastern Louisiana. Three research projects were designed to assess community-driven concerns of seafood and air quality, and the health and resilience of pregnant women. To address the latter concern, an intervention study within GROWH, *Building Community Resilience through Disaster Mobile Health* (Project 3) evaluated the effect of CHWs in an attempt to improve the health of low-income, women with children in the study area. CHWs were recruited from the study region, trained using a competency-driven curriculum, and certified internally on core public health disciplines, including a subject-specific module on reproductive health. Using a combination of one-on-one interactions and mobile health technology, the CHWs collected data, and provided support to the expectant mother.

Participants

Participants enrolled in Project 3 were first-time pregnant women. They were recruited from Women, Infants, and Children (WIC) clinics in Southeast Louisiana and were required to meet the clinic's eligibility criteria (e.g., low-income and nutritional need), and to be in the first trimester of their pregnancy ("Women, Infants and Children: WIC Eligibility Requirements," 2015). The cohort was recruited between July 2013 and January 2014 and subsequently followed from study baseline (1st trimester of pregnancy) to study completion (6 months postpartum) by their assigned CHW. CHWs interacted with participants via text messaging and phone calls throughout the study period. Psychosocial surveys were administered at five in-person time points: first trimester (1–13 weeks gestation), second trimester (14–27 weeks gestation), third trimester (28–40 weeks gestation), 6 weeks postpartum, and 6 months postpartum. 141 women were

enrolled in the study at baseline, and 102 women remained enrolled at 6 months postpartum. Chi square tests indicated no significant ($p < 0.05$) relationship between drop-out rates and the participants' race, income, education, relationship status, or residence (urban parish vs. rural parish).

As a comparison population, we used female participants in another research project in the GROWH Research Consortium, *The Deepwater Horizon disaster, lifetime adversity, and reproductive-aged women* (Project 1). Project 1 women were from the same Louisiana region, and had a participant population similar to Project 3 (Harville et al. 2015). Project 1 differed from Project 3 in that Project 1 recruited pregnant, postpartum, and other reproductive-aged women. Additionally, Project 1 recruited at sites other than WIC clinics. 1564 women participated in Project 1.

Both studies were approved by the Institutional Review Board at Tulane University's School of Public Health and Tropical Medicine. All participants provided consent at study baseline.

Measures

Depressive Symptoms

The Edinburgh Postnatal Depression Scale (EPDS) is a 10-item self-report scale devised as a screening questionnaire for postpartum depression (Cox and Holden 2003). The instrument includes statements of common depressive symptoms collected on a four-point scale (0–3) to assess intensity of depressive symptoms over the previous 7 day period. The maximum score associated with EPDS is 30. This measure was collected for all women in Project 3 at both postpartum data collection points. Women from Project 1 were selected for analysis if they had completed the EPDS measurement around 6 months (5–7 months) after their most recent pregnancy. Of the 1564 women participated in Project 1 at the time of this analysis, 58 met the criteria and were able to be directly compared to Project 3.

Psychosocial Factors

Mental and physical health indicators were collected at each prenatal and postpartum time point for women in Project 3:

- General health: The SF-12 health survey serves as a generic measure of physical and mental functioning, where respondents are asked to rate their health at that moment (0 = poor- 4 = excellent) (Ware et al. 1995).
- Anxiety: State-Trait Anxiety Inventory (STAI) consists of two separate 20-item self-report scales that measure transient state anxiety and dispositional trait anxiety. (Spielberger and Gorsuch 1983)
- Positive mood: Profile of Mood States (POMS) is a 65-item survey that assesses how the respondent is currently feeling. Lower scores indicate a lesser degree of particular mood experience whereas higher scores indicate a higher degree of particular mood experience (McNair et al. 1971).
- Prenatal psychological distress: Kessler Psychological Distress Scale (K6) surveys for nonspecific distress as a screen for serious mental illness (Kessler et al. 2003).
- Pregnancy and delivery complications: Questions were taken from the Louisiana Pregnancy Risk Assessment Monitoring System (LaPRAMS) survey, which is a population-based survey of women delivering live-born infants in Louisiana in the calendar year (Zapata et al. 2009). The instrument was administered from the sample population at 6-weeks postpartum. Three issues were collected for analysis: (a) whether the pregnancy was planned (1 = yes; 0 = no), (b) whether the woman reported experiencing any delivery-related complications (1 = yes; 0 = no), and (c) whether the baby spent any time in the intensive-care unit after birth (1 = yes; 0 = no).
- Community Health Worker relationship: The Scale to Assess the Therapeutic Relationship in Community Mental Health Care (STAR) measures the therapeutic relationship between clinicians and patients in community psychiatry settings (0 = never- 4 = always) (Mcguire-Snieckus et al. 2007). We previously validated a 9-item version of STAR survey for use in this population, where higher scores indicated a stronger relationship (Lichtveld et al. 2016). The scale was also used to help predict study enrollment in Project 3 (Mundorf et al. 2017)

Sociodemographic Factors

Demographics were collected from participants in both Project 3 and Project 1 at baseline including information on marital status, family income, age, and region. We also recorded the race and ethnicity of the woman. While they are not considered consistent predictors of PPD, they are widely-regarded social determinants of health. The parishes sampled in Southeast Louisiana have high African-American population that are strongly associated with poverty rates, as New Orleans, African-American families are six times more likely to live in poverty than White families (Hawkins and Maurer 2012).

Data Analysis

Independent t-tests were used to measure the difference in average EPDS scores between Project 1 and Project 3. To explore the predictors of PPD, we used a multiple regression with EPDS as the dependent variable. Linear correlations

were measured through Pearson's correlation coefficient, non-normal correlations were measured through Spearman's Rho, and associations were measured through odds ratios.

To assess how the risk factors combined to affect EPDS, we created an index score based on the number of known risk factors that we identified in a participant at each study data collection point. Demographic risk factors (unplanned pregnancy, low-income, single) were calculated as dichotomous yes/no. We used the clinical cut-off criterion for high risk (scores ≥ 12) for the Kessler-6 survey. For surveys for other risk factors that did not have a clinical cut-off criterion we classified women who had scores in the 75th percentile of the study population as having the risk factor.

Results

Table 1 shows the demographics of participants in both the intervention group (Project 3) and the comparison group (Project 1). Most of the women were relatively young, African-American, and living in a metro region. Both groups had a low income, but a greater proportion of the comparison group had an annual income > $10,000 (< 0.05 p value of Chi-square Test between populations).

Table 1 also shows the difference in EPDS scores (at 6 months postpartum) across the two studies. Women in the intervention group had lower ($t = 2.38$, $p = 0.02$) EPDS scores at 6 months postpartum [mean 4.15 (SD 3.71)] than the comparison population [mean 6.26 (SD 6.16)]. The difference was not significantly affected after adjusting for differences in income and relationship status. We also compared EPDS scores (at 6 months postpartum) of women in Project 3 and the women in Project 1 who were also enrolled in WIC (n = 45) to account for the possible confounding role of the WIC programming in affecting EPDS scores. Women in the control group who were enrolled in the WIC program had a higher average EPDS score [mean 6.29 (SD 6.23)] at 6 months postpartum ($t = 2.15$, $p = 0.04$).

The differences in average EPDS scores between Project 1 and Project 3 were then explored within specific population groups (e.g., race, income, region, etc.). The difference in mean EPDS scores was largest when comparing across studies among women that were (a) single (not married or with a partner), (b) White, non-Hispanic, or (c) living in the rural region of the study area (Table 1).

STAR scores collected at 6 months postpartum had a moderate, significant relationship with EPDS scores at the same time point (Spearman's Rho = −0.234, $p = 0.018$). Additionally, women who rated their CHW relationship among the poorest in the cohort (25th percentile STAR scores) had a higher average EPDS score than the rest of the women in Project 3 ($t = -2.894$, $p = 0.005$), and did not significantly differ from women in Project 1.

Next, we examined how the predictors of EPDS changed over the course of pregnancy within the intervention group (Table 2). Psychosocial measures of PPD predictors administered included sociodemographic information (low income, relationship status), pregnancy wontedness (whether the pregnancy was unwanted), anxiety (State and Trait Anxiety), physical health (SF-12 GH), psychological distress (Kessler-6), and positive mood (TMD). None of the prenatal time points produced a significantly predictive

Table 1 Comparison of average EPDS scores between two study groups at 6 months postpartum and within population groups

Variables	Intervention N	Intervention mean (SD)	Control N	Control mean (SD)	T value	p value
Overall non-stratified	103	4.15 (3.71)	58	6.26 (6.16)	2.38	0.02
Overall WIC-enrolled	103	4.15 (3.71)	45	6.29 (6.23)	2.15	0.04
Income: < $10,000	53	3.91 (3.69)	16	5.38 (6.02)	0.93	0.37
Income: > $10,000	45	4.69 (3.95)	33	6.36 (5.74)	1.44	0.15
Married/partner	45	4.22 (3.94)	24	4.29 (3.95)	0.07	0.94
Single	60	4.10 (3.63)	31	7.52 (7.14)	2.50	0.02
Race: white, Non-Latina	26	4.00 (3.97)	17	7.65 (6.02)	2.40	0.02
Race: black, Non-Latina	60	4.42 (3.74)	26	5.92 (7.09)	1.02	0.31
Race: other (Latina, Native American)	18	2.89 (2.27)	7	6.14 (5.24)	1.59	0.16
Rural (Lafourche, Terrebonne, Plaquemines, St. Bernard)	30	4.17 (4.03)	22	7.55 (6.61)	2.13	0.04
Metro (Jefferson & Orleans Parish)	75	4.15 (3.66)	34	5.65 (5.94)	1.36	0.18
Age: < 25	63	4.24 (4.12)	15	8.13 (8.48)	1.73	0.10
Age: 25–30	29	4.07 (3.28)	23	6.39 (5.06)	1.91	0.06
Age: 30–34	6	3.17 (3.43)	8	4.50 (4.28)	0.65	0.53
Age > = 35	7	4.57 (2.51)	8	4.13 (6.58)	−0.18	0.86

Table 2 Predictors of EPDS postpartum (6 weeks and 6 months) from predictors taken during and after pregnancy

Time point	Variables	Dependent variable: EPDS 6 weeks postpartum			Dependent variable: EPDS 6 months postpartum		
		β	p value	Model characteristics	β	p value	Model characteristics
1st trimester	Age (scale)	−0.44	0.50	F value (1.99) Adj. R^2 (0.10)*	−0.64	0.30	F value (1.35) Adj. R^2 (0.04)
	In relationship	−0.62	0.51		−0.20	0.82	
	Positive mood	0.02	0.41		0.02	0.39	
	General health	1.27	0.18		0.52	0.56	
	Psychological distress	−0.11	0.45		−0.14	0.32	
	State-anxiety	−0.09	0.31		−0.06	0.45	
	Trait-anxiety	0.15	0.06		0.15	0.05	
	Under $10 k income	0.96	0.26		0.57	0.49	
	Unplanned pregnancy	−1.63	0.07		−0.42	0.62	
2nd trimester	Age (scale)	−0.87	0.16	F value (4.52) Adj. R^2 (0.29)*	−0.75	0.23	F value (1.70) Adj. R^2 (0.08)
	In Relationship	−0.96	0.28		−0.84	0.35	
	Positive mood	−0.01	0.72		0.00	0.94	
	General health	−0.42	0.69		0.79	0.46	
	Psychological distress	0.44	0.02		−0.11	0.57	
	State-anxiety	0.15	0.02		0.00	0.98	
	Trait-anxiety	−0.04	0.57		0.13	0.09	
	Under $10 k income	1.68	0.05		0.63	0.46	
	Unplanned pregnancy	−1.64	0.06		−0.91	0.31	
3rd trimester	Age (scale)	−0.33	0.63	F value (2.05) Adj. R^2 (0.12)*	−0.46	0.45	F value (1.28) Adj. R^2 (0.03)
	In relationship	−0.96	0.32		−1.20	0.17	
	Positive mood	0.01	0.69		0.00	0.95	
	General health	−0.14	0.88		−1.49	0.10	
	Psychological distress	0.06	0.63		0.02	0.87	
	State-anxiety	0.06	0.45		0.05	0.44	
	Trait-anxiety	0.04	0.63		0.05	0.52	
	Under $10 k income	0.13	0.88		0.00	1.00	
	Unplanned pregnancy	−2.23	0.02		−1.43	0.09	
6 weeks postpartum	Age (scale)	−0.17	0.67	F value (19.65) Adj. R^2 (0.67)*	0.00	0.99	F value (7.19) Adj. R^2 (0.40)*
	In relationship	−0.29	0.60		0.14	0.84	
	Positive mood	0.06	0.00		0.00	0.95	
	General health	−0.22	0.71		−1.88	0.01	
	Psychological distress	0.49	0.00		0.59	0.00	
	State-anxiety	0.01	0.85		−0.01	0.86	
	Trait-anxiety	−0.02	0.72		0.11	0.18	
	Under $10 k income	1.14	0.03		0.96	0.14	
	Unplanned pregnancy	−1.22	0.03		−0.23	0.73	
6 months postpartum	Age (scale)				−0.17	0.72	F value (8.46) Adj. R^2 (0.45)*
	In relationship				−0.48	0.45	
	Positive mood				0.07	0.00	
	General health				0.26	0.69	
	Psychological distress				0.13	0.32	
	State-anxiety				−0.11	0.10	
	Trait-anxiety				0.17	0.01	
	Under $10 k income				0.88	0.16	
	Unplanned pregnancy				−1.13	0.08	

model for 6 months EPDS scores. While models were predictive of 6 week EPDS score, the predictive power was moderate (2nd trimester $R^2 = 0.29$, $F = 4.52$), and no independent variable was predictive in each model. Risk factors collected at 6 weeks postpartum produced a strongly predictive model for EPDS scores at 6 months postpartum ($R^2 = 0.40$, $F = 7.19$), with general health and psychological distress being the only two significant predictors in the model.

The index score of PPD risk factors at prenatal time points had low, non-significant, correlations with EPDS (Table 3). However, a moderate, significant relationship was found between the index score at postpartum time points and EPDS scores (Spearman's rho = 0.373 at 6 weeks postpartum, and 0.375 at 6 months postpartum) indicating a potential relationship after delivery between the number of PPD risk factors exhibited and EPDS score.

Finally, improvement in PPD from 6 weeks postpartum to 6 months postpartum (measuring the change in EPDS scores) were explored. 47.9% of the eligible participants in Project 3 reported decreased PPD risk (decreased EPDS scores) from 6 weeks to 6 months postpartum. Delivery-related issues were most associated with improvements. Women who reported having delivery complications (e.g. problems with the placenta, severe bleeding, nausea, etc.) were 3.10 (1.26–7.61) more likely to experience a drop in EPDS score. While the women who's baby spent any time in the neonatal intensive care unit (NICU) were 4.96 (1.29–19.16) more likely to experience a drop in EPDS score (Table 4).

Discussion

Our results demonstrated a moderate, statistically significant difference in 6 month postpartum depressive symptoms between women enrolled in a perinatal CHW intervention, and women who were not. Further, we found the effect between groups was greatest for single women. Additionally, the participants' assessment of their CHW relationship was moderately associated with their postpartum depressive scores. Finally, very little difference in EPDS between the control group and the participants who recorded relatively low ratings of their relationship with their CHW. Taken together, our findings suggest that the intervention likely was most successful among women who (a) were single at study baseline and (b) were able to develop an at least adequate relationship with the CHW.

Outreach focusing on antenatal support programs have shown an impact on maternal depression (Thomas et al. 2014). While greater social support is likely to be inversely associated with PPD symptoms (Banker and LaCoursiere 2014), how support can best be provided is more of an open question. We presented specific information about a particular type of social support that can be used to help an at-risk population. Our findings suggest that social support

Table 3 Correlation between risk factors collected at each time point and EPDS scores

Number of risk factors at time point[a]	Spearman correlation with EPDS at 6 weeks-postpartum	Spearman correlation with EPDS at 6 months-postpartum
1st trimester	0.06	0.18
2nd trimester	0.22	0.18
3rd trimester	0.21	0.15
6 weeks postpartum	0.37*	0.38*
6 months postpartum	~	0.38*

[a]Number of risk factors were calculated through an index score of pregnancy wontedness, income, relationship status, psychosocial distress, general health, anxiety, and positive mood

*$p < 0.05$

Table 4 Relationship between delivery-related issues and changes in EPDS from 6 weeks postpartum to 6 months postpartum

		EPDS score dropped (n = 45)	EPDS score did not drop (n = 49)	Odds ratio (CI)
Any delivery/related complications	Yes (n = 61)	35	26	3.10 (1.26–7.61)
	No (n = 33)	10	23	
Child spent time in the neonatal intensive care unit after birth	Yes (n = 14)	11	3	4.96 (1.29–19.16)
	No (n = 80)	34	46	
Unplanned pregnancy	Yes (n = 47)	26	21	0.45 (0.19–1.08)
	No (n = 39)	14	25	

intervention can be advanced through the use of non-mental health professionals. Paraprofessionals have been shown to have an impact on women through peer support networks, (Milani et al. 2015) and home-based CHW outreach (le Roux et al. 2013). This study is one of the first to indicate the effectiveness of a CHW program that uses a mixed approach of mobile technology and home visits.

Within the intervention group, mood, anxiety, psychological distress, perceptions of the pregnancy, and income were each predictive of EPDS scores. However, none of the measurements were consistently predictive over the course of the pregnancy. Previous studies have argued for more intensive and earlier efforts targeting at-risk women (Patton et al. 2015); our results suggest that no specific prenatal time period was especially poised for prevention efforts, at least with this population. A conservative conclusion may be to start screening early in pregnancy and to screen often throughout pregnancy. Further, given their association with EPDS scores, broadening screening to include mood, anxiety, pregnancy planning, and income variables may be prudent if casting a wider net for prevention efforts is a goal.

Previous studies have found unwanted pregnancy and postpartum complications can challenge a woman's mental health (Abdollahi et al. 2014). Additionally, stressful life events closely before or after delivery have been shown to be positively associated with postpartum depression (Da Costa et al. 2000). However, our findings add to the literature by indicating the PPD effects of delivery-related issues may have more of a short-term effect. Women who experienced NICU involvement or delivery-related complications were more likely to exhibit lower EPDS scores from 6 weeks to 6 months.

Overall, results support the continued growth of individually-based perinatal outreach efforts. Our findings indicate that services provided by CHWs may be particularly effective with low-income populations who are single, have less of an existing support network, or who experienced NICU admission. While individual, prenatal psychosocial health measures were significantly associated with postpartum EPDS scores, no collection of measures taken at any prenatal time point produced a strongly predictive model of EPDS scores. Regardless, screening for key socio-demographic factors (income, marital status), perception of pregnancy (planned/unplanned), and psychosocial variables (anxiety and moods) may be effective in reaching women most at risk. Finally, the results related to the STAR survey show that perinatal outreach efforts need to be attentive to the relationship between CHW and perinatal woman. Specifically, outreach efforts are most successful when they are accompanied by is an effective, longitudinal relationship between the CHW and the woman prenatally. The concept of a therapeutic alliance has been established and researched in related fields of community psychiatry (Mcguire-Snieckus et al. 2007; Wittorf et al. 2010); however limited research exists in researching the same principle to community health workers (Lichtveld et al. 2016). The STAR model was recently used in this same CHW population to find an association between the quality of interaction (as measured by the STAR scale) and study adherence (Mundorf et al. 2017), yet this is the first study to apply this measurement tool to health outcomes of CHW interventions.

Our study had limitations pertaining to participants, measures, and methods. First, findings comparing EPDS scores in an intervention and a comparison population were both focused on pregnant women eligible for WIC-perinatal support, and may not be valid to a wider general audience. Second, the comparison population in this study was not fully matched with the intervention population. Women in the intervention study were required to be pregnant with what would be their first child, while women in the comparison population ranged in terms of parity. We attempted to correct for the potential confounding effect of WIC programming, by comparing mean EPDS scores with just the control population who was also enrolled in WIC. The study's findings are also limited due to the lack of EPDS scores for both populations at baseline. While the two populations were demographically similar, the intervention group may have had better psychosocial health at the start of the study. Finally, further conclusions based on the STAR rating should be cautioned due to the potential for reverse causality. Participants who had relatively worse psychosocial health at the end of the survey were just as likely to have a negative attitude of their CHW, rather than the other way around. A previous study using the STAR survey tested this hypothesis (i.e., that STAR ratings were the results of the participant's general predisposition towards forming good relationship); however, they found no evidence of association with either the social network size or the number of confiding relationships (Catty et al. 2012). Additional research using the STAR rating will be helpful to untangling the possible causal direction of the CHW relationship. Finally, while we found a strong relationships between CHWs and clients during the year-long intervention; a short-term intervention may not produce the relationship necessary to positively impact postpartum health. Selecting and training CHWs with attention to enhancing a collaborative alliance may be especially useful in promoting positive treatment outcomes.

Despite limitations, our study was able to show that WIC-eligible women enrolled in a CHW-led intervention focused on providing social support and health information had significantly lower postpartum depression scores 6 months after delivery than a similar population of postpartum women. Future research can build on these findings by designing a study with a true control population, or randomized enrollment into an intervention/control wing. Additionally, better evaluation of the CHW, the participant, and their relationship

can help tease out how CHWs may be building relationship, and how those relationships help participants.

Our findings further strengthen the argument that intervening in the antenatal period may improve outcomes for pregnant women. The CHW relationship—through building social support and health navigation—may be beneficial and thus warrants further research. Findings of this article can contribute to the field of Maternal and Child health by focusing on depression as a mental health issue, the importance of community health workers in providing support for low-income women in a racial minority population.

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