

# Using Community Health Workers to Improve Health Outcomes in a Sample of Hispanic Women and Their Infants: Findings from a Randomized Controlled Trial

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## Abstract

**Introduction:** The Maternal Infant Health Outreach Worker (MIHOW) program, an early childhood home visiting program, uses community health workers (CHWs) to improve health outcomes in underserved communities. **Methods:** This randomized clinical trial evaluated the impact of MIHOW's use of CHWs on selected maternal/infant outcomes up to 15 months postpartum. We hypothesized outcomes would be better among Hispanic women receiving MIHOW compared to a similar group of women eligible for MIHOW who received only a minimal education intervention (MEI). The study also expanded earlier research testing MIHOW's efficacy among Hispanic families using criteria set forth by federal guidelines. Women living in middle Tennessee enrolled during pregnancy ( $\leq 26$  weeks gestation) and continued through 15 months postpartum. **Results:** Enrolled women ( $N = 132$ ) were randomly assigned, with 110 women completing the study ( $MEI = 53$ ;  $MIHOW = 57$ ). Positive and statistically significant ( $p < .01$ ) effects of MIHOW were observed on breastfeeding duration, safe sleep practices, stress levels, depressive symptoms, emotional support, referral follow through, parental confidence, and infant stimulation in the home. **Conclusions:** Findings provided strong evidence of the effectiveness of MIHOW for improving health outcomes in this sample. Using trained CHWs makes programs such as MIHOW a viable option for providing services to immigrant and underserved families.

## Keywords

MIHOW, depressive symptoms, breastfeeding, maternal/child, parental stress, community health workers

## Background

Hispanics, the largest minority population in the United States (Aguayo-Mazzucato et al., 2019) experience many health disparities and inequities. Hispanics have disproportionately higher rates of unintentional injuries, obesity, and diabetes (Velasco-Mondragon et al., 2016), have more difficulty gaining access to preventive care, and have the highest uninsured rate for any ethnic group (Aguayo-Mazzucato et al., 2019; Barnett & Berchick, 2017). Hispanic adults are less likely than their non-Hispanic white or black counterparts to receive mental health treatment (Terlizzi & Zablotsky, 2020). Immigration or socioeconomic status, low education, limited English proficiency, or other social determinants of health may influence lack of access to health care (Aguayo-Mazzucato et al., 2019; Velasco-Mondragon et al., 2016). Health risks are compounded by a lack of culturally competent and linguistically proficient providers and interpreters, lack of insurance and difficulty in accessing health care (Barnett & Berchick, 2017; Velasco-Mondragon et al., 2016).

The inequities begin early. Hispanic families with children younger than 18 years disproportionately live in poverty

(23% vs. 10% of white non-Hispanics) (The Annie E. Casey Foundation, KIDS COUNT Data Center, 2020). Young Hispanic children have lower levels of school readiness (Peterson et al., 2018) and much higher prevalence of childhood obesity (Ismaeel et al., 2018; Taverno Ross et al., 2018). With higher rates of obesity, Hispanic children are more likely to develop high cholesterol, high blood pressure, and diabetes later in life (Ismaeel et al., 2018). Maternal health behaviors can attenuate some of those risks but despite some healthy practices, Hispanic women may not achieve personal health goals for themselves, their infants, or their families. One example is breastfeeding (BF). Even with high BF initiation rates, Hispanic mothers have not been able to achieve either

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HP2020 or HP2030 objectives for BF at 6 months and 1 year of age or exclusive BF at 3 or 6 months of age (Healthy People 2020 – Maternal, Infant and Child Health Objectives, 2021; Healthy People 2030 – Infants Objectives, n.d.). They supplement breastmilk with formula within the first two days of life at a higher rate (23.2%) than most other ethnic groups (12.7%–22.4%), with only Native Hawaiian or other Pacific Islanders being higher (28.2%) (Harris-Luna & Badr, 2018; Healthy People 2020 – Maternal, Infant and Child Health Objectives, 2021). Hispanic mothers also tend to introduce sugar-sweetened beverages and solid foods before 6 months of age (Cheney et al., 2019; Ismael et al., 2018).

With the importance of the first 2 years of a child's life in establishing life-long health behaviors and potentially decreasing short and long-term health risks, targeting early maternal practices are central to combating childhood obesity and risk factors (Cheney et al., 2019; Ismael et al., 2018). While few published studies are specific to Hispanic families, results from a randomized trial testing the impact of the Minding the Baby home visiting parenting program in 158 mostly Hispanic families (68%) provide compelling evidence. Results indicated that the children of Hispanic mothers receiving home visits from a social worker/pediatric nurse team were less likely to be either overweight or obese at 2 years of age as compared to those in the control group (Ordway et al., 2018). Those results suggest potential for positive effects of prevention-focused, relationship-based home interventions on reducing risk for childhood obesity. Furthermore, peer counseling approaches with Hispanic women demonstrate some success in increasing BF rates and delaying introduction of solid foods (Harris-Luna & Badr, 2018; Jones et al., 2015). However, evidence of the effectiveness of interventions to improve those and other health behaviors in Hispanics is very limited and methodological rigor varies widely (Segura-Pérez et al., 2021).

Since 2010, the Maternal, Infant, and Early Childhood Home Visiting (MIECHV) Program, a department of the U.S. Health Resources and Services Administration, has funded evidence-based home visiting for pregnant women and families with young children to promote optimal maternal and child health outcomes (Fitzgerald Lewis et al., 2020; Health Resources & Services Administration [HRSA], 2021). Home visiting programs, most often, focus on low-income families who may experience significant barriers to achieving health. Although approximately 30% of families receiving home visiting services identify as Hispanic, many home visitors do not share their background or language (Fitzgerald Lewis et al., 2020; Lee et al., 2019; Lewy, 2021). While some home visiting models attempt to address diversity by providing cultural competency training to staff, the Center for Health Care Strategies recommends creating a more diverse workforce to help families achieve positive health outcomes and access needed resources (Lewy, 2021).

Community health workers (CHWs) are trusted community members who serve as links between health/social services and a community to improve access to health services and quality of

service delivery (Barnett et al., 2018.). Called by many titles, including peer mentors, CHWs strive to improve health outcomes in countries throughout the world (Barnett et al., 2018). CHWs are well accepted among Hispanic groups, likely driven by a long history of *promotoras* working to address a variety of health issues. Findings from a recent pilot study (Taverno Ross et al., 2018) suggested the effectiveness of a CHW led home-based intervention to promote healthy eating and physical activity for Latino families with preschoolers. Similarly, results from a pragmatic trial indicated that phone support offered by *promotoras* was a positive predictor for exclusive BF duration (Harris-Luna & Badr, 2018). Although some studies support CHW models as an effective strategy to improve health outcomes in Hispanic families, evidence remains inconclusive (Spencer et al., 2018; Taverno Ross et al., 2018).

### *Maternal Infant Health Outreach Worker Program*

For almost four decades, the Maternal Infant Health Outreach Worker (MIHOW) program has worked to improve health outcomes and address inequities in underserved communities. MIHOW provides services to families considered at risk for poor health outcomes due to low income or education, limited support, physical isolation, limited English, or public assistance eligibility (Elkins et al., 2013). Services typically begin in pregnancy and continue until the child's third birthday. Similar to a *promotora* model, MIHOW utilizes CHWs from the target community to educate and support participants. The focus is on relationships beginning in pregnancy, providing monthly home visits and offering periodic group gatherings. Its theoretical foundation is strength-based, training CHWs to focus on the strengths, abilities, and potential of program participants rather than problems or deficits when helping participants progress toward goals (Stuart, 2012). Seven principles (see Table 1) from the strength-based perspective guided the development of the program and curriculum.

MIHOW was first implemented in Appalachia in rural areas with few healthcare providers. Agencies and clinics with strong reputations and long-standing community partnerships employed and trained successful mothers from the target community to mentor pregnant women in their communities, a strategy that built on the tradition of interdependence and support often seen in rural communities. Minority communities, rural or urban, often show similar interdependence and have difficulty finding healthcare providers who reflect their communities.

To be a MIHOW home visitor, women must: be from the target community, be of the same culture and/or language group of families served, have strong problem solving and communication skills, have a respect for children and enjoyment of parenting their own child(ren), have completed all MIHOW training, and use the MIHOW curriculum (Elkins et al., 2013). There is no educational requirement for employment; however, visitors must be able to read/understand curriculum and write notes regarding each visit. For more information on MIHOW, visit [www.mihow.org](http://www.mihow.org).

**Table 1.** Seven Principles of a Strength-Based Perspective.

1. People are recognized as having many strengths and the capacity to continue to learn, grow, and change.
2. The focus of intervention is on the strengths and aspirations of the people we work with.
3. Communities and social environments are seen as being full of resources.
4. Service providers collaborate with the people they work with.
5. Interventions are based on self-determination.
6. There is a commitment to empowerment.
7. Problems are seen as the result of interactions between individuals, organizations, or structures rather than deficits within individuals, organizations, or structures.

Source: Stuart (2012).

Criteria defined in the Social Security Act, Title V, § 511 [42 U.S.C. § 711] determines which programs are evidence-based and eligible for federal funding through the MIECHV program. MIHOW, considered by MIECHV as a promising approach, needs further evidence based upon rigorous evaluations to meet the criteria for evidence-based MIECHV programs, including evidence that outcomes persist at least 12 months after program enrollment. MIHOW program evaluations using a randomized clinical trial (RCT) design have demonstrated beneficial effects for Hispanic mothers and their infants (Clinton, 1992; Lutenbacher et al., 2018). Mothers in those studies who received MIHOW reported higher levels of BF self-efficacy and exclusivity, lower levels of depressive symptoms and parental stress, and more safe sleep practices and infant stimulation in the home than mothers who received a minimal education intervention (MEI). This prior work provided rigorous evidence supporting implementation in similar Hispanic communities; however, the postpartum follow up of participants has been limited to 6 months.

## Purpose

The purpose of the study described in this report was to evaluate the impact of MIHOW on selected maternal and infant health outcomes up to 15 months postpartum in a sample of Hispanic women and their children living in middle Tennessee. The study further evaluated the effectiveness of the MIHOW model using the criteria set forth by federal guidelines, with an ultimate goal of offering a home visiting model ideally suited for rural and underserved communities, which incorporates diversity into the home visitation workforce. Due to the availability of funding, we were able to follow mothers up to 15 months postpartum.

We hypothesized that women randomly assigned to receive the MIHOW intervention would have better health outcomes than a comparison group receiving an MEI. Specifically, women in the MIHOW group would: breastfeed longer; put their babies to sleep on their backs; report lower depressive symptoms and maternal stress; receive more referrals and access more resources; report a higher sense of parenting

competence; read and sing more to their infants; and have a more stimulating home environment for their infant.

## Methods

The Institutional Review Board (IRB) of Vanderbilt University Medical Center in the Southeastern United States (IRB #171929, #172100) approved this single site RCT. Data collection occurred between May 2018 and October 2020.

### Study Sample and Sample Size Justification

The sample consisted of 132 pregnant Hispanic women living in middle Tennessee. The proposed sample size of 100 for this study was derived from effect statistics reported in previous research (Lutenbacher et al., 2018). Groups of 50 women each would be sufficient to detect common Cohen's *d* effect sizes in the range of 0.5–0.6 dependent on the extent of the correlation between the baseline values and the respective value of change for a given measure (80% statistical power, two-tailed alpha = 0.05). Ultimately, 110 women (57 intervention and 53 comparison) completed the study (Figure 1).

### Recruitment

Trained staff visited community businesses, agencies, and clinics with high levels of Spanish-speaking patrons and talked to management about the study, leaving flyers when allowed. After the first wave of recruitment, staff received most referrals through word of mouth from other study participants. Trained study staff screened all women interested in participating in the study to determine eligibility and, if eligible, completed the informed consent process. Study staff encountered challenges to recruitment and retention, primarily due to fear around Immigration and Customs Enforcement (ICE) raids and immigration policies implemented during the study period. Nevertheless, staff were able to over recruit ( $n = 132$ ) versus the target sample ( $n = 100$ ).

### Study Eligibility

To be eligible for study participation, women self-identified as Hispanic, were  $\leq 26$  weeks pregnant, resided in one of six identified counties, were eligible to receive MIHOW services, and were willing to be randomized into one of two study groups. Women considered eligible for MIHOW services were those at-risk for poor birth outcomes due to any economic or social factor such as receiving government assistance, reporting low income, having little/no support system, low education, isolation, or other social stressors. Women were excluded from the study if they had previously received MIHOW services, suffered from a severe mental or physical disability, or were under 18 years of age and did not have parental consent.

**Comparison Condition.** All study participants received the MEI, which consisted of distribution of printed educational materials about health and child development (in preferred language), at

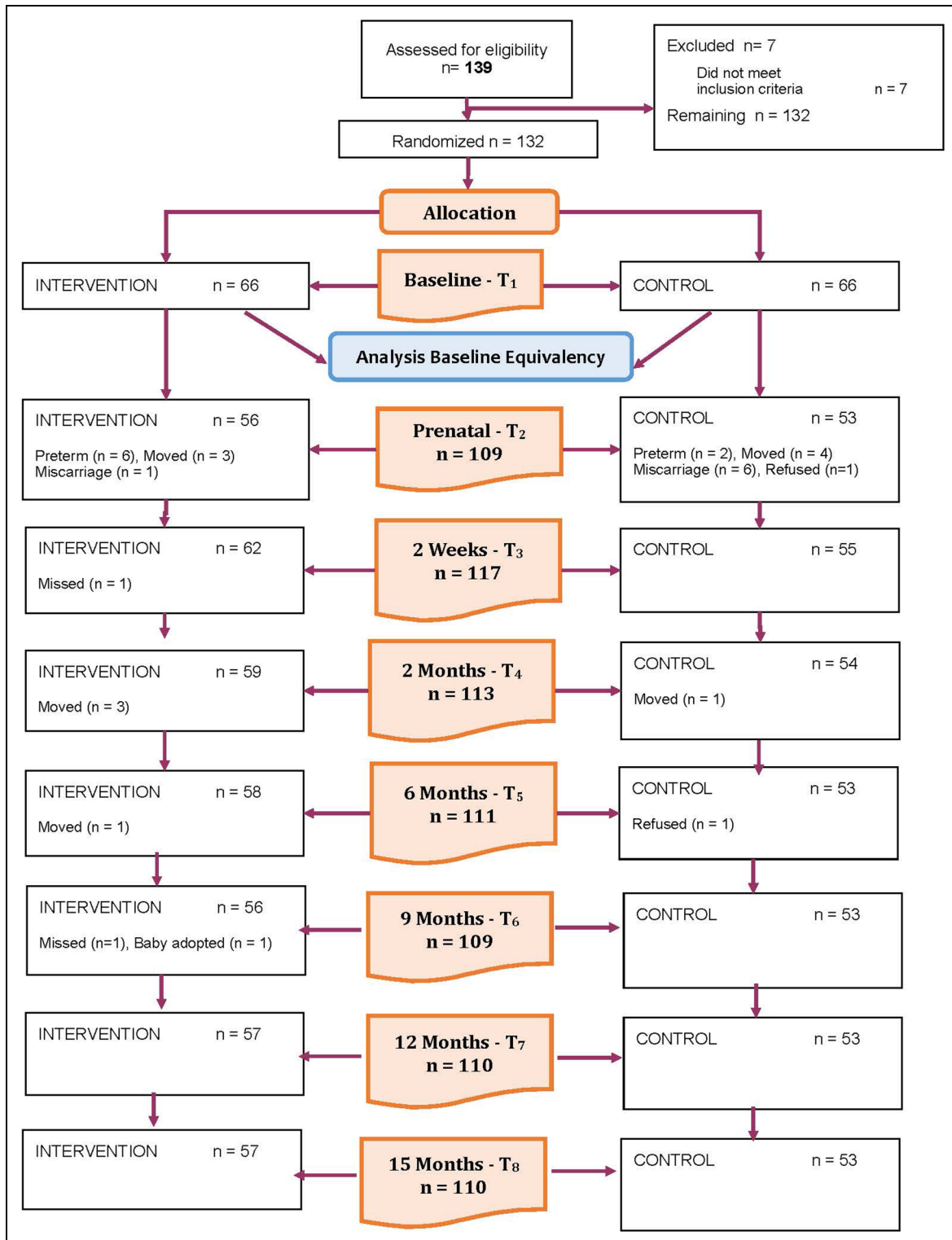


Figure 1. CONSORT flow diagram.

the end of each data collection interview. Study data collectors (and thus also distributors of the MEI) were blinded to group assignment. The comparison group included participants only receiving the MEI.

**Intervention Condition.** In addition to the MEI, the intervention group received standard MIHOW services delivered by trained CHWs. The intervention group not only received MIHOW monthly home visits, they also were invited to periodic group

gatherings. Those gatherings were optional and included opportunities for socialization, education, and resource information. Sixteen MIHOW group meetings occurred over the course of the study. Only the number of participants in each session was recorded.

### Procedures

The partnering agency employed the CHWs as hourly workers with health benefits. All CHWs were from the local Hispanic community. They completed 40 h of initial training on the MIHOW model with no adaptations made to MIHOW content, level of intensity, or training requirements.

Data collectors were also from the community; all were native Spanish speakers yet also fluent in English. They completed extensive training related to the conduct of an RCT and to project protocols. They were “blind” to group assignment. Data collectors used an interview guide at eight data points: enrollment ( $\leq 26$  weeks pregnant), 35 weeks pregnant, and 2 weeks, 2 months, 6 months, 9 months, 12 months, and 15 months postpartum (PP). Data collectors read all items aloud to participants and recorded data in paper format.

Data collectors were trained to detect signs of mental health and child abuse. Specifically, they alerted the program coordinator to any scores greater than 13 on the Edinburgh Postnatal Depression Scale (EPDS) or if the question regarding suicidal ideation was marked, “Yes.” They also were to report any suspected child abuse in the home to the program coordinator. There were very few occurrences of high depressive scores and no incidences of suicidal ideation or reported suspicions of child abuse. The program coordinator called the family to make a referral to appropriate resources when notified by the data collector.

All women agreeing to participate in the study completed a written informed consent process with a trained research assistant. Once consented, participants completed an enrollment interview and after completion of that interview were informed whether they would receive MIHOW home visits (intervention group) plus a MEI or receive only the MEI (comparison group). A computer-generated program directed participant randomization.

Each data collection interview took approximately one hour. At the end of each interview, participants received a \$25 merchandise card and the MEI. Staff entered data from paper into a Research Electronic Data Capture (REDCap) database, hosted at Vanderbilt University (Harris et al., 2009, 2019). REDCap is a secure, web-based software platform designed to support data capture for research studies. The project coordinator and/or research assistants conducted monthly data fidelity checks of a random selection of data forms.

### Procedure Modifications due to COVID-19

Due to COVID-19 restrictions, between late March 2020 through October 2020, all home and data collection visits occurred virtually and all participants received mailed educational materials. Depending on the preference of each

participant, visits were conducted via either Zoom or Face Time. By late March 2020, all participants had been in the study for at least 1 year. Subsequently, over 80% of all study participants ( $n = 91$ ;  $MEI = 44$ ,  $MIHOW = 47$ ) received at least a portion of their home and/or data collection visits virtually. Over 90% of the 12- and 15-month visits were conducted virtually (12-month:  $MEI = 29$ ,  $MIHOW = 28$ ; 15-month:  $MEI = 44$ ,  $MIHOW = 47$ ).

Nine in-person group meetings for women assigned to the MIHOW group occurred before March 2020 and seven ZOOM meetings occurred after COVID closures in March 2020. In-person meetings had an average attendance of nine women. Once meetings changed to ZOOM, attendance ranged from 15 to 46 attendees with an average of 27 women participating in each meeting. Other than specific adaptation for using the Home Observation for Measurement of the Environment—the Infant-Toddler version (HOME-IT) measure described below, all other MIHOW program and RCT study procedures remained the same as pre-COVID-19.

### Measures

Primary outcomes were assessed with standardized measures and established questions from national sources (e.g., National Survey of Children’s Health). Descriptions of the key standardized measures are summarized below. Details for each of the study measures are in Supplemental Table 1.

### Outcome Measures

*Breastfeeding Self-Efficacy Scale – Short Form (BSES)* (Dennis, 2003). This 14-item tool assesses a mother’s confidence in her ability to breastfeed her new infant and has been successfully translated and psychometrically tested among women from diverse cultures with adequate reliability and validity (Dennis, 2003; Oliver-Roig et al., 2012). Cronbach’s alphas in the current study ranged from 0.96 to 0.99.

*EPDS* (Cox et al., 1987). This 10-item scale assesses women at risk of perinatal depression. There are four possible responses on an ordinal response scale (0 to 3). Total scores range between 0 and 30. Scores  $\geq 10$  may indicate minor depressive symptomatology with scores  $> 13$  indicating a likely depressive illness (Cox et al., 1987; Lara-Cinisomo et al., 2017). Cronbach’s alphas of the scores in the current study ranged from 0.78 to 0.87.

*Parenting Stress Index-Short Form (PSI-SF)* (Abidin, 2012). This 36-item scale measures the level of stress in the parent-child system and includes three domains (parental distress, parent-child dysfunctional interaction, and difficult child) which combine to form a Total Stress scale. Available in Spanish, prior reports suggest strong reliability coefficients (Barroso et al., 2016). Reliability coefficients of the scores in the current study ranged from 0.94 to 0.98.

*IT-HOME* (Caldwell & Bradley, 1984). Used worldwide, the 45-item IT-HOME Inventory measures the quality and quantity of stimulation and support available to a child (birth

to age three) in the home environment. Items include direct questions and observations by a trained observer during a home visit. Higher scores suggest a more enriched home environment. Scores in the lower quartile may indicate a home environment that poses a risk to the child's development (Totsika & Sylva, 2004). Observation and conversation guided the completion of the *HOME* measure.

Furthermore, due to the nature of the IT-HOME, minor modifications were required for collection of data from that measure during the COVID-19 restrictions period (late March 2020 through October 2020). Data collectors used strategies that allowed them to observe parent and child interactions and the environment almost as well via video as in-person. For example, they had the woman show particular aspects of the home that the data collector typically observed during pre-virtual visits and/or had the participant set the camera in such a way to observe parent and child interactions. The study team also developed a parallel question to use when observation was not possible via video for HOME items typically using observation.

*Parenting Sense of Competence (PSOC)* (Johnston & Mash, 1989). The 16-item scale measures parental competence on two dimensions: Satisfaction and Efficacy. The PSOC is a widely tested instrument with evidence of strong reliability and validity (Johnston & Mash, 1989). The Spanish translation has demonstrated good reliability and construct validity as well as cultural validity among Spanish-speaking, Latino parents (Haack et al., 2011). Cronbach's alphas for the current sample ranged from 0.67 to 0.85.

### Sample Characteristics Measures

*The Brief Acculturation Scale for Hispanics (BASH)* (Norris et al., 1996). Designed to assess level of acculturation in Hispanics, this four-item measure is highly correlated with generation, length of time in the United States, country of birth, and language chosen for an interview. A total score was developed by averaging the responses to the four items and dichotomized into groups indicating low ( $\leq 3.0$ ) and high acculturation ( $> 3.0$ ). Reports confirm the BASH as a reliable and valid measure of acculturation among Hispanic Americans (Mills et al., 2014; Lutembacher et al., 2018). The reliability coefficient for the current study was 0.92.

*Short Assessment of Health Literacy-Spanish (SAHL-S)*. It is an 18-item instrument to test health literacy. For each term, the data collector reads a key word with a related meaning and a distractor word unrelated in meaning to the test term to test the participant's comprehension, as well as pronunciation (decoding) of health-related terms. The administration of the test takes 2–3 min. The assessment has good reliability and validity (e.g., is highly correlated with years of schooling) in both English and Spanish (Agency for Healthcare Research and Quality, 2019).

### Statistical Analysis

Descriptive statistical summaries and figures were generated to summarize and inspect the distributions of demographic and

study measures at each time of assessment. Change in the measures assessed more than once over the course of the study were also generated and summarized. Information from those descriptive and graphical evaluations was used to determine the most appropriate test distribution to specify within the mixed-effects generalized linear models used for testing study hypotheses (e.g., normal, log with a Tweedie, etc.) using intention-to-treat principles. Within those models, the interaction effect of study group and time of assessment (controlling for baseline values) provided the critical test of differences between the study groups in the amount of change in each respective outcome measure. Cohen's *d* effect sizes were generated for all study group comparisons. Statistical significance tests maintained maximum type I error rates of .05 ( $p < .05$ ). IBM SPSS Statistics 27 software was used to conduct all study analyses.

## Results

### Sample Characteristics

The average age at enrollment was 29.5 years ( $SD = 5.7$ ), almost half (45.4%) married, and most (65.9%) had not received a high school diploma. As detailed in Figure 2, almost half (49.2%) of the women were from Mexico originally. BASH scores for all participants indicated a low level of acculturation (median = 1; 1–1). Most women (72.7%) were unemployed and 89.5% reported incomes  $\leq$  \$25,000 per year. A majority (78.8%) reported having health care coverage; most did not receive TANF (99.2%) or food stamps (75.8%) and almost half (46.2%) received WIC. Participants indicated being in the United States and the current area about 4 years (median = 48.0; 24–120 months; median = 48.0; 17–96 months; respectively). No statistically significant differences between the characteristics of the groups at baseline were observed ( $p > .05$ ). See Supplemental Table 2 for detailed demographic descriptions and comparisons.

### Primary Outcomes

*Outcomes in Child Health.* Within the subsample of women in this study reporting a prior live birth ( $N = 96$ ), 67.7% reported prior BF (*MIHOW* = 73.1%, *MEI* = 62.4%). Within the entire sample, BF initiation rates were not statistically different between groups (*MIHOW* = 96.6% vs. *MEI* only = 88.9%,  $p = .110$ ). At the 9- and 12-month times of assessment, a statistically significantly higher percentage of women in the *MIHOW* group than in the *MEI* group reported BF their infant (Cohen's  $d = 0.46$  and 0.74 respectively, Table 2). No statistical differences in BF self-efficacy scores were noted across the two groups ( $p > .15$ , Cohen's  $d \leq 0.13$ ). Most women (99.1%) were feeding their infants some solids by 6-months of age. Detailed summaries and comparisons of the child health outcomes are in Supplemental Table 3.

As summarized in Table 3, generally a higher percentage of mothers in the *MIHOW* group placed their babies on their backs

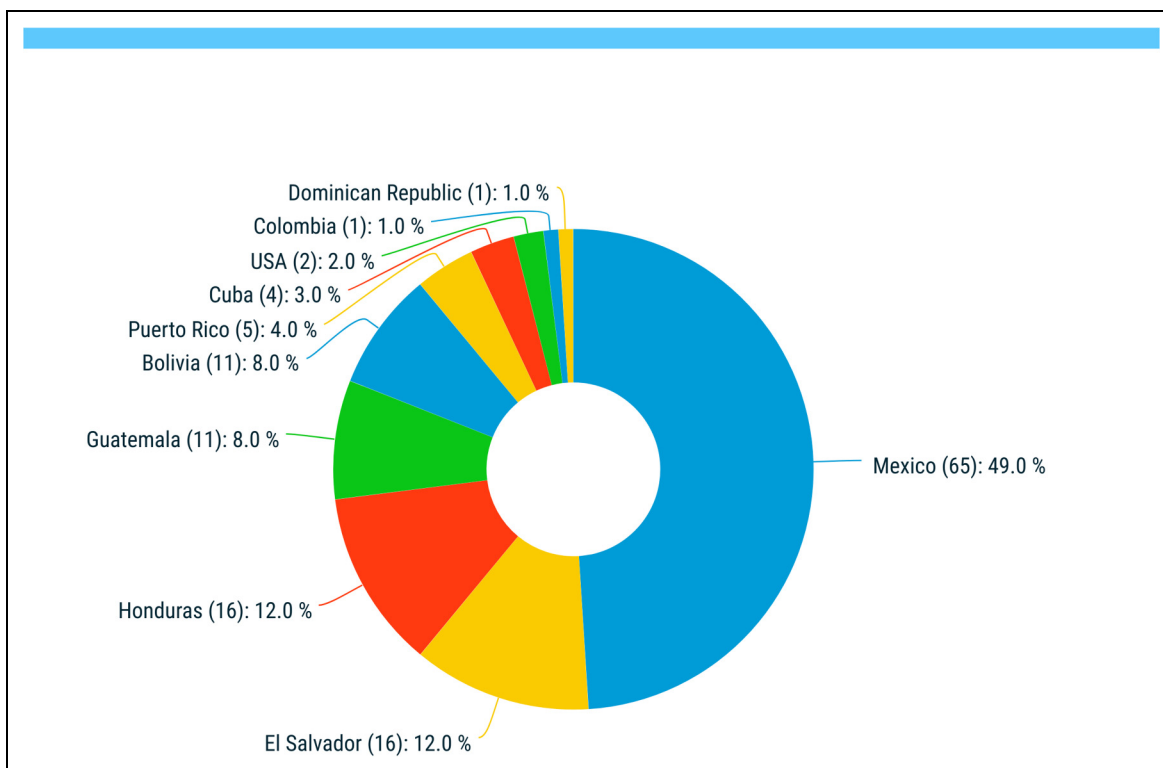


Figure 2. Distribution of participants country of origin.

Table 2. Breastfeeding by Study Group.

	Overall	MEI only n (%) (sample N)	MIHOW	p-value <sup>a</sup>	Cohen's d
Currently breastfeeding					
2 weeks PP	88 (83.0) 106	40 (81.6) 49	48 (84.2) 57	.725	0.10
2 months PP	75 (66.4) 113	33 (61.1) 54	42 (71.2) 59	.257	0.25
6 months PP	48 (43.4) 111	18 (34.0) 53	30 (51.7) 58	.058	0.40
9 months PP	37 (33.9) 109	13 (24.5) 53	24 (42.9) 56	.042	0.46
12 months PP	28 (25.5) 110	7 (13.2) 53	21 (36.8) 57	.004	0.74
15 months PP	7 (6.4) 110	1 (1.9) 53	6 (10.5) 57	.050	—

Note. MEI = minimal education intervention; MIHOW = Maternal Infant Health Outreach Worker; PP = postpartum.

<sup>a</sup>Likelihood ratio test.

to sleep at every time of assessment with the greatest difference being at 2-months PP (Cohen's  $d=1.27$ ). At 9 months PP, MIHOW mothers still reported safe sleep practices more often than mothers in the MEI group (80.4% vs. 60.4%;  $p=.021$ , Cohen's  $d=0.54$ ) (Table 3).

**Outcomes in Maternal Health.** Summaries of the patterns of change in the EPDS scores and total PSI are illustrated in Figures 3 and 4. Two mixed-effects general linear models that controlled for the initial respective maternal scores (baseline or 2 weeks PP) revealed a statistically significant interaction effect of time of assessment PP and study group for each outcome ( $p<.001$ ). The effect of the MIHOW intervention demonstrated increasingly stronger effect of the intervention during the PP period on depressive symptoms (Cohen's  $d=$

0.13 at 2 months to  $-0.67$  at 15 months). A similar pattern was observed for maternal stress. Regardless of the initial time of assessment, scores for the two groups were very similar at that time point (baseline medians  $\sim 85$ , 2-week PP medians  $\sim 76$ ). There was an increasingly stronger effect of the MIHOW intervention during the PP period (Cohen's  $d=0.07$  to  $-0.14$  at 2 to 6 months and increased to  $-1.19$  at 15 months). Mothers assigned to the MIHOW group reported more available social and emotional help at 9, 12, and 15 months postpartum (Cohen's  $d=0.54-1.20$ , Supplemental Tables 4 and 5).

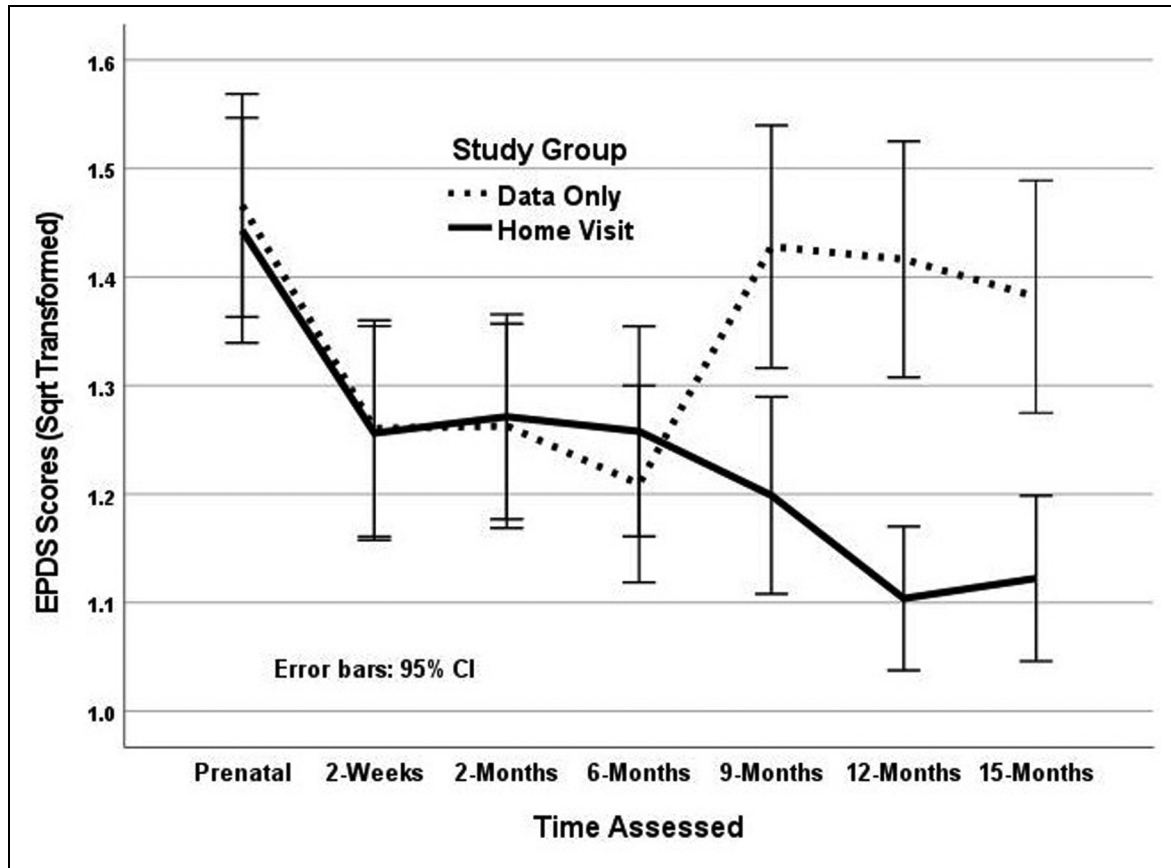
**Outcomes in Referrals and Resource Access.** Statistically significantly higher proportions of the women assigned to the MIHOW group received referrals to resources than did those

**Table 3.** Babies Put on Back to Sleep—Summaries by Group.

On back	Overall	MEI only <i>n</i> (%) (Sample <i>N</i> )	MIHOW	<i>p</i> -value <sup>a</sup>	Cohen's <i>d</i>
2 weeks PP	104 (92.0) 113	49 (92.7) 54	55 (93.2) 59	.627	0.19
2 months PP	104 (92.0) 113	46 (85.2) 54	58 (98.3) 59	.007	1.27
6 months PP	86 (77.5) 111	38 (71.7) 53	48 (82.8) 58	.163	0.35
9 months PP	77 (70.6) 109	32 (60.4) 53	45 (80.4) 56	.021	0.54

Note. MEI = minimal education intervention; MIHOW = Maternal Infant Health Outreach Worker; PP = postpartum.

<sup>a</sup>Likelihood ratio test.



**Figure 3.** Edinburgh postnatal depression scale (EPDS) scores by time of assessment.

in the MEI only group during the prenatal period (69.8% vs. 13.5%;  $p < .001$ ; Cohen's  $d = 1.49$ ). Significantly more women in the MIHOW group completed contact with those resources prenatally (94.6% vs. 28.6%;  $p < .001$ ; Cohen's  $d = 1.42$ ).

**Outcomes in Parenting Practices.** Summaries of the PSOC at each time of assessment are in Table 4. A mixed-effects general linear analysis (controlling for PSOC scores 2 weeks PP) revealed a statistically significant interaction effect of time of assessment and study group ( $p < .001$ ). The effect of the MIHOW intervention demonstrated increasingly stronger effect of the intervention during the PP period (Cohen's  $d = 0.41$  at 2 months to 2.02 at 15 months) (Table 4). Mother

reports of singing songs to their infants were very similar across groups. Increasing and statistically significant effects of MIHOW were apparent for reading to the infant and for the overall HOME score during the first 15 months PP. Compared to the women assigned to the MEI group, women assigned to MIHOW were reading to their infant more often at all time points (Cohen's  $d = 0.53$ –1.75) and beginning with 2 months PP had a higher overall HOME score at each time of assessment (Cohen's  $d = 0.47$ –1.78) (Supplemental Table 6).

### Discussion

Our findings add to the empiric evidence related to home visitation in underserved Hispanic families. Study results extend prior work



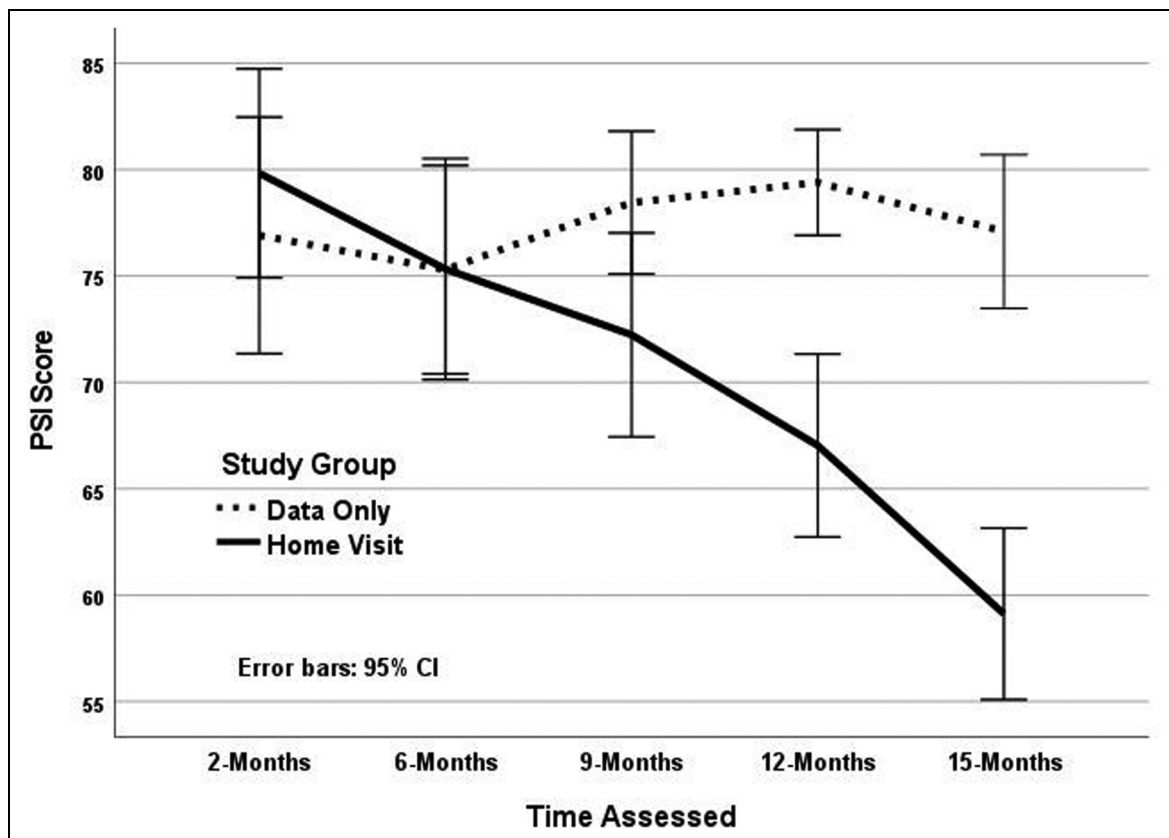
(e.g., Lutenbacher et al., 2018) and offer new evidence of the impact of MIHOW on selected child and maternal health outcomes through 15 months postpartum. Using an intent to treat approach, support for many of our hypotheses provided evidence of the effectiveness of MIHOW in this sample of Hispanic women and their infants. Overall, women assigned to the MIHOW group breastfed longer, used safe sleep practices at critical time points, reported fewer depressive symptoms and less parenting stress, reported more parenting competence and satisfaction, and had higher quality home environments for their infants.

Current literature is clear that BF can significantly affect short and long-term health outcomes for both the BF woman and their infant (Centers for Disease Control and Prevention [CDC], 2021; Victora et al., 2016). Women who breastfeed are less likely to develop breast and ovarian cancer, shed pregnancy weight gain more rapidly, decrease post pregnancy uterine bleeding, and decrease risk of osteoporosis, developing type 2 diabetes, and cardiovascular disorders (CDC, 2021; Victora et al., 2016). Their breastfed infants are less likely to be obese, overweight, or develop diabetes (CDC, 2021). Consistent with national trends for Hispanic women, BF initiation across our study participants exceeded the Healthy People 2020 goal that 81.9% of babies would be breastfed at least once (Healthy People 2020 – Maternal, Infant and Child Health Objectives, 2021). Only women in the MIHOW group, however, met and exceeded the 2020 target for increasing the

proportion of infants who were breastfed at 1 year (34.1%) with 36.8% of those women still BF. While this achievement is important for those women, efforts to strengthen support to those and other BF women is critical to reach the newer HP 2030 goal of 54.1% of mothers still BF at 1 year. Similar to findings from systematic reviews (e.g., Segura-Pérez et al., 2021) and recent works (e.g., Lutenbacher et al., 2018; Rhodes et al., 2021), peer counseling interventions such as those delivered by trained MIHOW CHWs can be especially helpful to aid Hispanic mothers in achieving BF goals and gaining the benefits of BF for themselves and their infants (Rhodes et al., 2021). In part, this success may be due to CHWs taking more time and having less social distance with the mothers than medical providers (Jones et al., 2015).

Safe sleep practices reduce the risk of preventable sleep-related deaths as well as deaths from SIDS, which happen primarily between 2 and 4 months of age (American Academy of Pediatrics [AAP], 2019). Similar to prior reports in Hispanic samples (Lutenbacher et al., 2018; Provini et al., 2017), most mothers in this study exceeded national rates (i.e., 65%) of putting babies on their back to sleep. This was especially evident in the MIHOW group, with more of those study participants putting their infants to sleep on their backs at 2 months, a very critical time to prevent SIDS (AAP, 2019).

Prenatal and postpartum depression continue to be a focal area for perinatal care and home visiting interventions (HRSA, 2021; Tandon et al., 2020). Similar to other CHW and home visiting



**Figure 4.** Parenting stress Index – Short Form (PSI) scores by time of assessment.

**Table 4.** Parenting Sense of Competence and Practices Summaries by Group.

PSOC	Overall	MEI Only Mean (SD) N	MIHOW	p-value	Cohen's <i>d</i>
2 weeks PP	65.3 (5.6) 108	65.0 (6.3) 52	65.6 (4.8) 56	.551 <sup>a</sup>	
2 months PP	66.0 (5.6) 107	64.7 (5.3) 52	67.1 (5.7) 55		0.41
6 months PP	67.3 (6.4) 107	65.8 (6.5) 52	68.8 (5.9) 55		0.47
9 months PP	69.4 (8.7) 107	65.3 (8.1) 52	73.2 (7.5) 55		0.98
12 months PP	69.5 (9.0) 108	63.8 (7.0) 52	74.8 (7.3) 56		1.51
15 months PP	70.4 (9.2) 108	63.4 (6.7) 52	77.0 (5.7) 56	<.001 <sup>b</sup>	2.02

Note. MEI = minimal education intervention; MIHOW = Maternal Infant Health Outreach Worker; PP = postpartum.

<sup>a</sup>Independent *t*-test.

<sup>b</sup>Interaction effect test in mixed-effects general linear model controlling for initial 2-weeks PP score.

programs caring for underserved populations, women receiving the MIHOW intervention reported fewer depressive symptoms and lower parental stress (Barnett et al., 2018). Consistently assessing women for depressive symptoms, making referrals and providing needed support can facilitate a greater capacity for them to nurture their children and minimize risk of their children developing mental health difficulties of their own (Hattangadi et al., 2020; Nelson, 2016).

As one might expect, women in the MIHOW group reported more referrals and receipt of services during the prenatal period. Similarly, at 15 months postpartum, almost all of the women in the MIHOW group (95%) reported receiving referral to resources, while only 25% of the comparison mothers reported referral. Overall, mothers from both groups reported linking to the resources after referral. Anecdotally, the partnering agency reported that COVID-19 may have influenced the results due to high need of families and a specific COVID-19 relief program. In any case, it underscores that the perinatal period is an especially promising time to connect engaged Hispanic families with needed resources and promoting healthy behavior change.

Women receiving MIHOW visits indicated more social and emotional help from 9 to 15 months and a higher sense of parenting satisfaction and efficacy at 15 months postpartum than women in the comparison group. These factors are often associated with higher parental responsiveness and higher quality of parent-child interactions (Albanese et al., 2019; Morris et al., 2017). While mothers in both groups sang songs to their children, mothers in the MIHOW group consistently read to their children more days per week. Similar to other home visitation programs (e.g., LeCroy & Lopez, 2018), mothers assigned to MIHOW also scored higher on the HOME, suggesting a more enriched home environment. Evidence from other early childhood home visiting programs in the United States suggests that strengthening social support for low-income parents can positively impact stress levels and responsivity to their children, culminating in more nurturing parenting practices (Morris et al., 2017; Ordway et al., 2018).

Overall, the women assigned to the MIHOW group practiced healthier behaviors at home, fared better emotionally, and reported better mental health and parenting satisfaction. Introducing trained CHWs who share the same culture as participant families is a key strategy of the MIHOW program.

Engaging young families at critical junctures, reinforcing healthy messaging outside of health surveillance visits and helping families integrate health behaviors into daily life has great potential to impact physical and mental health outcomes for parents and their infants (HRSA, 2021; Lee et al., 2019).

## Limitations

Although considered a gold standard study design, an RCT may not be the best approach to evaluate focused behavioral interventions. These types of interventions tend to have varying effects across participants and may interact with other variables. Randomization in an RCT ensures equal opportunity to the study conditions but not equivalence of key (potentially confounding) characteristics of participants assigned to each group. Although our two groups had no significant differences in key study variables or characteristics at baseline, the baseline value of the respective outcome variables were controlled where possible in the mixed-effects analyses. Data was primarily self-report, thus bringing the advantages and disadvantages of using this type of data. Study strengths included our conduct of regular data fidelity checks, a fluent bilingual staff and low study attrition. Generalizability of findings may be limited to other similar samples of women but helpful in future implementation and evaluations of MIHOW in other ethnic minorities or marginalized populations. Due to sample size, we were not able to measure between groups from different nations of origin.

## Impact of COVID-19

Midway through the last year (year 3) of the study, the COVID-19 pandemic provided challenges and opportunities. With extremely limited information available on conducting home visits virtually (Bock et al., 2021), the team quickly converted in-person MIHOW and data collection visits to a virtual format. At the time of conversion, study enrollment was complete and most participants had received several study contacts. The change to virtual visits affected intervention and comparison groups almost equally. Having engaged participants prior to COVID strengthened the team's ability to retain participants and complete virtual home and data collection visits. Anecdotally, study staff reported it was easier organizing

visits virtually than in-person visits and participants liked the delivery mode. Similar to other home visiting programs impacted during COVID-19 (e.g., Bock et al., 2021), the opportunity suggests that virtual visits are feasible for delivery of MIHOW and should be considered in future efforts. In addition, when the group meetings for women assigned to the MIHOW group converted to a virtual format, attendance more than doubled. Again, this suggests that virtual group meetings may be a strategy to engage similar groups of women.

## Conclusion

The national interest in expanding evidence-based home visitation programs to vulnerable populations is ongoing but it can be difficult to recruit and retain home visitors (HRSA, 2021; Lewy, 2021). Some home visiting models require staff to have a bachelor's degree, years of experience with young children, or specific credentials (e.g., CDA or RN) that can hinder recruitment, especially in rural areas and among disadvantaged groups (Fitzgerald Lewis et al., 2020). Our study highlights the potential of positively influencing the health outcomes of pregnant Hispanic women and their infants when trained CHWs from the target community conduct home visits guided by a structured curriculum, such as MIHOW. Study results significantly contribute to the limited evidence and evaluations of programs that use CHWs, few of which include perinatal Hispanic women, and often focus on very limited outcomes (Barnett et al., 2018; Spencer et al., 2018). More longitudinal research is needed to evaluate the impact of the full dose of MIHOW (i.e., until the child's third birthday) and other similar interventions and their impact on multiple maternal and infant health outcomes.

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## Supplemental Material

Supplemental material for this article is available online.

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