Educating Families on Urgent Maternal Warning Signs: Learning From a Pilot to Improve Training and Tools for Maternal and Child Home Visiting Programs

Elizabeth K. Stierman, PhD, MPH[1]
Thomasina Watts, MSPH[1]
Shari M. Lawson, MD, MBA[1]
Teneele M. Bruce, MBS, CBS[2]
Maxine Reed-Vance, PhD, MS, RN[2]
Kelly M. Bower, PhD, MSN/MPH, RN[1]
Andreea A. Creanga, MD, PhD[1]
Jennifer A. Callaghan-Koru, PhD, MHS[3]

Early recognition of the warning signs of pregnancy-related complications and provision of timely, quality care could prevent many maternal deaths. We piloted a maternal warning signs education intervention with five Maryland-based maternal, infant, and early childhood home visiting programs serving populations disproportionately affected by adverse maternal outcomes. The intervention included a 1.5-hr online training for home visitors, monthly collaborative calls with program managers, and a client education toolkit with a 3-min video, illustrated handout of 15 urgent maternal warning signs, magnet with the same, and discussion guide for home visitor–client interactions. A mixed-methods formative evaluation assessed the acceptability, feasibility, and utilization of different components of the intervention. Home visiting program staff reported that the materials were highly acceptable and easily understood by diverse client populations. They valued the illustrations, simple language, and translation of materials in multiple languages. Program managers found implementation a relatively simple process, feasible for in-person and remote visits. Despite positive reception, not all components of the toolkit were used consistently. Program

Health Promotion Practice
Month XXXX Vol. XX, No. (X) 1–13
DOI: 10.1177/15248399241256691
Article reuse guidelines: sagepub.com/journals-permissions

[1]*Johns Hopkins University, Baltimore, MD, USA*
[2]*Baltimore Healthy Start, Baltimore, MD, USA*
[3]*University of Arkansas for Medical Sciences, Little Rock, AR, USA*

Authors' Note: *The authors thank the American College of Obstetricians and Gynecologists (ACOG) and the Alliance for Innovation on Maternal Health (AIM) for permission to use their urgent maternal warning signs materials and associated images. The authors thank Nicole Warren, PhD, MSN, MPH, RN, for her contribution to developing educational materials and facilitating training for home visitors. The authors also thank Carla Bossano, MD, for her contribution in recording the Spanish-language patient education video on urgent maternal warning signs. The authors recognize the Hatcher group for their support with the design and production of multimedia patient education materials and training videos for home visiting professionals. Finally, the authors' sincere appreciation goes to the participants in the home visiting programs in this pilot and whose valuable input helped to improve training and tools for educating clients; special thanks to Healthy Families Mid-Shore, Healthy Families Southern Maryland, Prince George's Child Resource Connect, The Family Tree, and Washington County Family Center. This study was funded by award U7AMC33717 from the Health Resources and Services Administration (HRSA). The contents are those of the authors and do not necessarily represent the official views of, nor an endorsement by, HRSA, U.S. Department of Health and Human Services (HHS), or the U.S. government.* *Address correspondence to Elizabeth K. Stierman, Johns Hopkins Bloomberg School of Public Health, 615 N. Wolfe Street, Baltimore, MD 21205, USA; e-mail: estierm1@jhu.edu.*

managers and staff also identified the need for more guidance and tools to help clients communicate with health care providers and advocate for their health care needs. Feedback from pilot sites was used to adapt the training and tools, including adding content on patient self-advocacy. Home visiting programs have a unique ability to engage families during pregnancy and the postpartum period. This pilot offers lessons learned on strategies and tools that home visiting programs can use to improve early recognition and care-seeking for urgent maternal warning signs.

Keywords: maternal health; health education; health promotion; home visiting; health disparities; urgent maternal warning signs

Maternal mortality and severe maternal morbidity continue to exceed rates in other high-income countries, and outcomes have worsened in recent years (Centers for Disease Control and Prevention (CDC), 2021, 2022; Gunja et al., 2022). This is especially tragic, because most pregnancy-related deaths are preventable (Trost et al., 2022). Striking disparities exist in maternal health outcomes, and Black women are three times more likely to die of pregnancy-related causes than White women (Petersen, Davis, Goodman, Cox, Syverson, et al., 2019). A contributing factor to maternal deaths is delayed recognition of the signs of maternal complications by both patients and providers (Petersen, Davis, Goodman, Cox, Mayes, et al., 2019).

Maternal mortality review committees have recommended that maternity patients receive education about the signs of potentially life-threatening maternal complications and when to seek care (Petersen, Davis, Goodman, Cox, Mayes, et al., 2019). Consistent with these recommendations, several organizations have developed materials for increasing patient and family knowledge and awareness. In 2016, the Association for Women's Health, Obstetric, and Neonatal Nursing (AWHONN) created standardized teaching tools on "POST-BIRTH Warning Signs" designed for nurses to use during postpartum discharge education (Suplee et al., 2016). In 2020, the Alliance for Innovation on Maternal Health (AIM) introduced an illustrated handout and a website describing "Urgent Maternal Warning Signs" that can occur during pregnancy and in the year after delivery (Killion, 2020). Also in 2020, the CDC launched a national communication campaign called "Hear Her" to raise awareness of urgent maternal warning signs and improve communication between patients and their health care providers (Behm et al., 2022). The Hear Her campaign features compelling personal stories about pregnancy-related complications and uses the AIM content to communicate urgent maternal warning signs.

Since their introduction, numerous health care professionals have adopted these materials for patient education, particularly around the time of discharge from the hospital after birth. However, less attention has been given to education on warning signs during pregnancy and the year following delivery. This is a critical time for such education. Recent data (2017–2019) from maternal mortality review committees in 36 states indicate that nearly 22% of maternal deaths occur during pregnancy and 53% occur between 7 days and 1 year postpartum (Trost et al., 2022). Moreover, patients may find it difficult to retain information provided during their delivery hospitalization due to pain, stress, or mental overload after birth (Bowman, 2005).

Community-based organizations and local health departments providing maternal, infant, and early childhood home visiting services have a unique opportunity to reach families with important education to improve early identification and care-seeking for complications (Administration for Children and Families [ACF], 2023; Health Resources and Services Administration, 2023). By building trusting relationships and maintaining regular contact with families throughout pregnancy and the postpartum period, home visitors can deliver education in a safe and emotionally supportive environment (Kanda et al., 2022) in which clients feel comfortable to share concerns and ask questions. These programs are also well positioned to address disparities in maternal health as they serve low-income populations, communities of color, and others who are disproportionately affected by adverse pregnancy outcomes.

Recognizing this potential, we developed and piloted a maternal health education intervention with five maternal, infant, and early childhood home visiting programs in Maryland. This intervention provided home visiting programs with training and tools to educate families on warning signs of maternal complications during pregnancy and the year after delivery.

Intervention Design

Home visiting programs in Maryland participated in an earlier formative research study that guided design of the education intervention and toolkit (Callaghan-Koru et al., 2022). Based on these findings, we developed a pilot intervention that included a 1.5-hr online training for home visiting staff, monthly collaborative calls with program managers, and a client education toolkit with a 3-min video, illustrated handout of 15 urgent maternal warning signs, magnet with the same, and a discussion guide for home visitor–client interactions (Table 1). Formative research participants' input led to the

TABLE 1
Urgent Maternal Warning Signs Toolkit: Original Tools and Revisions Based on Pilot Sites' Feedback

Name	*Description of original tool*	*Revisions based on pilot sites' feedback*
Handout	Illustrated handout of 15 urgent maternal warning signs published by the Alliance for Innovation on Maternal Health (AIM). The QR code links to the AIM webpage for more information.	Translated handout into additional languages. It is now available in 14 languages: English, Spanish, Amharic, Arabic, Chinese, Dari, Farsi, French, Haitian Creole, Kinyarwanda, Korean, Pashto, Uzbek, and Vietnamese.
Discussion guide	Laminated guide for home visitors to use when providing education on warning signs to clients. It includes steps for each part of the conversation, techniques for each step, and potential conversation starters.	1. Reoriented the discussion guide to face the client. The guide is now printed on the backside of the illustrated handout, so the client can keep a copy. 2. Added a conversation guide from the CDC Hear Her campaign to help clients share their concerns with their health care provider.
Video	3-min video in English, Spanish, and French that describes the 15 urgent maternal warning signs. Available at https://maternalwarningsigns.org/ and https://www.youtube.com/@mdmomprogram5758	Added a QR code that links to the video on the redesigned, double-sided version of the handout. This enables the client to view the video on demand.
Magnet	Magnet for placement on the refrigerator. It lists the 15 urgent maternal warning signs and includes space to write the contact information for the client's maternity care provider and the nearest emergency room.	No change.
Training for home visiting staff	1.5-hr training for home visitors, with four modules. The first module summarizes trends and causes of maternal mortality. The second covers urgent maternal warning signs. The third discusses communication strategies for teaching warning signs. The last module covers implementation steps.	1. Added a module on the benefits of patient self-advocacy and how home visitors can support clients to advocate for health care that meets their preferences and needs. 2. Developed an online, self-paced version of the training that staff can access on demand. This enables learners to revisit content for refreshers, and it allows new hires to complete the training as part of their onboarding. Available at https://courseplus.jhu.edu/core/index.cfm/go/course.home/coid/18543/
Implementation guidance for home visiting programs	Planning tool that lists implementation steps, action items for each step, and a target date for implementation.	In addition to the planning tool, an implementation manual was developed that describes implementation steps and offers guidance based on best practices and learning from the pilot. This step-by-step approach starts with guidance on assigning leadership, deciding how to integrate the education into existing services, and gaining staff buy-in; it then proceeds to coordinating training, initiating client education, and monitoring progress, and it ends with sustainability considerations.

Note. QR code = quick-response code.

selection of AIM's urgent maternal warning signs content and illustrations as the basis for the toolkit. Intervention design was informed by the "COM-B" model of behavior change—capability, opportunity, and motivation (Damschroder et al., 2022; Michie et al., 2011; West & Michie, 2020). Drawing from a U.S. consensus meeting of behavioral theorists and a long-standing legal principle for establishing preconditions for volitional behavior, the COM-B model identifies three necessary conditions for a given behavior to occur. An individual must have the *capability* (e.g., knowledge, skills) and *motivation* (e.g., desire, plan) to perform a behavior and external factors must allow *opportunity* for the behavior to occur. Our intervention sought to strengthen clients' capabilities and motivation by providing education to increase knowledge and understanding of urgent maternal warning signs and by using motivational interviewing techniques to build confidence and skills for seeking health care. It also sought to reduce barriers to care (i.e., improve opportunity) by helping clients identify social supports and resources.

PURPOSE

We evaluated the acceptability, feasibility, and utilization of different components of a maternal warning signs education intervention delivered by maternal, infant, and early childhood home visiting programs. Findings from this pilot program will be used to refine implementation strategies and tools prior to scale-up of the intervention across the state of Maryland, and provide lessons learned for other states interested in implementing similar education interventions.

METHOD

Setting and Participants

We identified early childhood home visiting programs for those who were interested in participating in the pilot through a baseline survey (Callaghan-Koru et al., 2022). For the volunteers, we purposively selected five programs that operated in different regions of the state (Capital, Central, Southern, and Eastern Shore) and served either rural (n = 3) or urban/suburban (n = 2) communities. Participating programs also varied in size. At the start of the pilot, the number of clients enrolled in each program ranged from 26 to 62, and the number of staff members directly serving clients ranged from 3 to 12. Programs followed evidence-based service delivery models: Healthy Families America (n = 4) and Parents as Teachers (n = 1; ACF, 2019, 2020). In these models, home visits are conducted by family support specialists or parent educators. These positions require a minimum of a high school diploma and prior experience of working with children and families; they do not require training in medicine or nursing. The pilot was conducted between March and August 2021; during this time, most home visits were conducted remotely due to the COVID-19 pandemic.

Study Design

This mixed-methods study applied qualitative and quantitative methods to evaluate acceptability, feasibility, and utilization of a maternal warning signs education intervention (Creamer, 2018). Conceptually, these measures are considered salient during early stage implementation for the purpose of learning and early adaptation of strategies and tools to ensure implementation success (Proctor et al., 2011; Stetler et al., 2006). The study was reviewed by the institutional review board (IRB) of the University of Maryland, Baltimore County (protocol no. 523) and deemed exempt from IRB review. An incentive of US$30 per participant was offered to individual participants, when allowed by agency policy, or to the agency. All participants provided informed consent.

Data Collection and Analysis

The staff surveys were self-administered during March–April 2021 (post-training survey) and September 2021 (endline survey), using an online survey platform (Qualtrics, 2021). The staff rated acceptability, feasibility, and utilization for different components of the education intervention, using Likert-type scales. Survey data were cleaned by removing duplicate entries, dropping respondents who completed less than 50% of the survey, and excluding survey items with less than 95% response rate. After cleaning, we explored descriptive statistics for survey items, calculating means and percentages based on all nonmissing values for each item. Statistical analyses were conducted using Stata, Version 15 (StataCorp, 2017). Program managers also submitted monthly monitoring reports documenting the intervention's reach, measured by the number of prenatal and postnatal visits during which home visitors delivered warning signs education.

Focus group discussions (FGDs) and in-depth interviews with home visiting staff were conducted in July and August 2021. Sessions were facilitated by a trained research team member using a semi-structured guide and attended by a notetaker. The semi-structured guide included questions exploring the acceptability of client education tools, how tools were used during visits, and the ease of incorporating structured discussions on

maternal warning signs into routine visits. Qualitative data analysis used a framework approach, a matrix-based method for sorting and synthesizing data (Ritchie & Lewis, 2003). The research team members read transcripts and developed an initial coding index, including deductive codes informed by the COM-B framework and inductive codes reflecting concepts emerging from interviews. In the second stage, the team applied these codes to subsequent transcripts through an iterative team-based process, adapting and expanding the coding index as new concepts emerged. In the last stage, codes were reapplied to all transcripts using ATLAS.ti (2021) web, Version 9.1.6. Data were synthesized and displayed in thematic matrices. Our mixed-methods approach gave equal priority to quantitative and qualitative data when interpreting results and drawing conclusions.

RESULTS

Pilot sites delivered maternal warning signs education during 150 prenatal visits and 291 postpartum visits between March and August 2021. Some clients received education once during either a prenatal or postpartum visit, and some received education more than once (usually first during a prenatal visit with a refresher during a postpartum visit). The staff reported spending a median of 10 to 14 min providing this education during visits. The home visiting staff (n = 37) shared their perspectives of the intervention during FGDs and interviews. The staff also completed post-training satisfaction surveys (n = 36) and endline surveys (n = 34), with a response rate of 90% and 85%, respectively. The characteristics of the research participants are displayed in Table 2. Most participants engaged in both qualitative (interview or FGD) and quantitative (survey) research activities; a few participated in only the interview/FGD or, alternatively, the survey.

TABLE 2
Characteristics of Study Participants

Characteristics self-reported in endline staff survey[a] (N = 34)	N	%
Current position		
Home visitor[b]	24	70.6
Home visiting supervisor	6	17.6
Director/program manager	4	11.8
Gender		
Female	34	100
Race/ethnicity[c]		
Non-Hispanic Black	13	38.2
Non-Hispanic White	11	32.4
Hispanic	9	26.5
Prefer not to answer	1	2.9
Age		
Below 25 years	1	2.9
25–30 years	7	20.6
31–40 years	10	29.4
41–50 years	7	20.6
51–60 years	6	17.6
Above 60 years	3	8.8
Highest level of education		
High school/GED	0	0.0
Some college or associate's degree	8	23.5
Bachelor's degree	18	52.9
Master's degree or higher	8	23.5
Nursing degree		
Yes	1	2.9
No	33	97.1
Years of experience in home visiting		
5 or fewer years	19	55.9
6–10 years	5	14.7
11–20	5	14.7
21 or more years	5	14.7

Note. GED = General Educational Development.
[a]Most home visiting staff participated in both the post-training and endline surveys; participant characteristics were similar for both surveys. [b]Includes home visitors, family support specialists, nurses, case managers, and those in similar positions who directly interact with clients. [c]Mutually exclusive categories: persons with Hispanic ethnicity are grouped as Hispanic, regardless of race.

Acceptability

Most (94%) survey respondents agreed or strongly agreed that home visitors should educate clients about the signs of maternal complications, and nearly all home visitors (96%) agreed or strongly agreed that clients were interested in the maternal warning signs education (Figure 1). Qualitative participants also perceived the intervention as beneficial in helping clients recognize and act on urgent maternal warning signs (Table 3). Most home visiting staff liked the handout (97% agreed or strongly agreed) and video (88% agreed or strongly agreed), and most home visitors reported that the tools were useful for educating clients. Qualitative participants shared their appreciation of the colorful illustrations, simple language, and translations of materials in multiple languages.

The virtual training for home visiting staff was also rated highly. In the post-training survey, home visiting

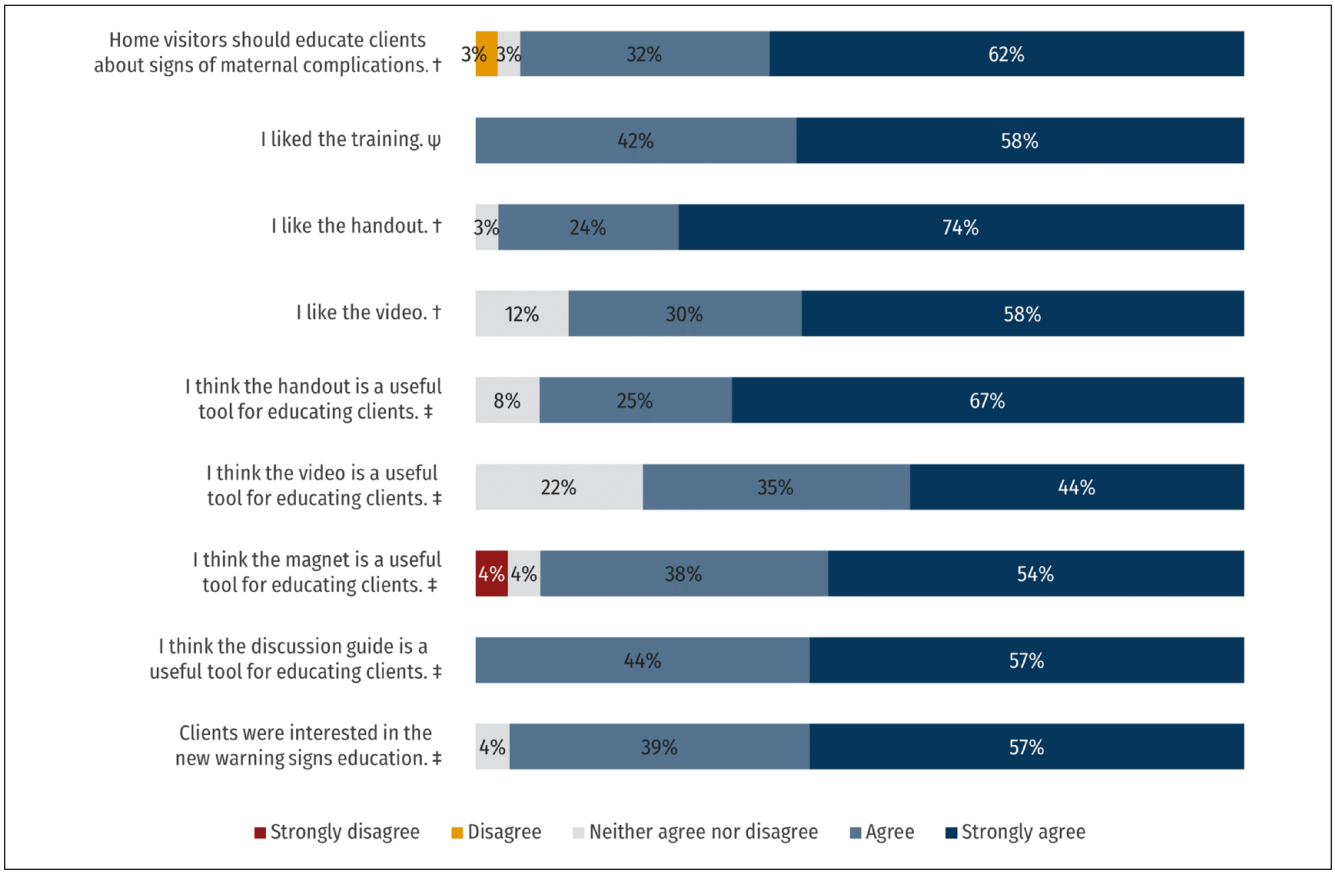

FIGURE 1 Acceptability of Urgent Maternal Warning Signs Education and Tools Reported by Home Visiting Staff
Notes: †Endline survey responses from all home visiting program staff, including home visitors, supervisors, and program managers (n = 34). ‡Endline survey responses from home visitors who interact with clients directly (n = 24). ΨPost-training survey responses (n = 36). Missing values (i.e., non-responses) were omitted from calculation of percentages; non-responses were one or fewer per item.

staff rated their overall satisfaction with training at a mean of 4.6 on a 5-point scale: 72% were very satisfied, 19% satisfied, 6% neutral, 3% dissatisfied, and none were very dissatisfied. Home visiting staff gave similar ratings for the overall usefulness (M = 4.7 of 5 points) and relevance (M = 4.7 of 5 points) of the staff training. Most felt that the right amount of time was spent on the various topics covered during the training; however, one third (36%) wished more time was spent on patient self-advocacy.

Feasibility

Home visiting managers and supervisors found implementation to be a relatively simple process, feasible for in-person and remote visits. Nine of the 10 supervisors, program managers, and directors responding to the endline survey strongly agreed (n = 5) or agreed (n = 4) that implementing the toolkit had been a relatively simple process; one was unsure. Similarly, nine of the 10 strongly agreed (n = 5) or agreed (n = 4) that staff members were able to easily use the toolkit in their home visits; one was unsure.

However, home visitors shared more nuanced perspectives on the intervention's perceived fit with their program model during FGDs and interviews. While some felt the inclusion of this education in their curriculum was a natural fit, a few home visitors perceived a mismatch with their own skills or with their curriculum's focus on child development. For example, one home visiting staff shared that, not being a clinician, it was challenging when clients approached them with questions of a medical nature. Another staff found it difficult to allocate time to conversations centered on the parent's health, given their program's primary focus was the child; nevertheless, they still made time to share this information with parents, believing it was important.

TABLE 3
Qualitative Feedback on Acceptability and Feasibility of Urgent Maternal Warning Signs Intervention, and Other Emerging Issues

Authors' interpretation of themes	*Illustrative participant quotations*
Acceptability	
Home visiting staff reported satisfaction with educational materials. They appreciated the simple language, colorful illustrations, easy placement of reminders, and availability in multiple languages.	"I like the laminated card with the pictures . . . it's helpful to have something they can look at when I'm telling them what the symptoms are so they can see." (Home visitor) "The magnet is a constant reminder that if they feel something that's not right to contact their OB or their primary doctor." (Home visitor)
Home visiting staff believed this information was important to share with their clients. They perceived the intervention as beneficial in helping clients recognize and act on urgent maternal warning signs.	"I had a mom who was experiencing dizziness and headaches. We were able to go over the EMPOWER Moms [urgent maternal warning signs] handout and it encouraged her to go to the doctor." (Home visitor) "I was so glad that I had sent her that information because she was able to identify that that was what she was experiencing based on the picture from the brochure." (Home visitor) "By virtue of the fact that they're sharing this information, it has encouraged moms to just be cognitive and aware of things that are happening in their bodies. And this has helped some moms to be more alert, more aware, and perhaps rather than second guessing themselves, they've made the necessary appointments to go in and visit their OBGYN or go to the emergency room." (Home visitor) "I support them [my clients] in any type of way . . . because it would break my heart if I lost one of my clients to any type of complications like that. It would hurt me deeply." (Home visitor)
Feasibility and perceived fit	
Home visiting staff reported mixed perceptions about the compatibility of the intervention with their program models. Some felt the inclusion of this education in their curriculum was a natural fit and of value for their clients. However, one reported challenges in interpreting medical information as a nonclinician. Another said they had limited time, and their focus needed to be on their program's priority population: the child rather than the expectant parent.	"We didn't intentionally stay away from this information [before the pilot], but I think it was an inclusion into the curriculum that really, kind of, empowered the home visitors to say this really is a concern." (Home visiting program manager) "I can't spend a lot of time giving them [the mom] information. I have to concentrate on my target child because that's what my reports are due on, but I will give them the information just because it's the same house [and] I need to make sure mom's okay." (Home visitor) "I'm not a medical person, they come to me first, because they trust me. But then I have to look for the information, and then I have to be able to interpret it to them so that they can understand it. It's hard." (Home visitor)
Implementation occurred when most visits were conducted remotely due to the COVID-19 pandemic. The ability to share educational materials electronically through text/email was identified by some as an asset. However, this was limited by some clients' inability to reliably access the internet.	"It [the pilot] was all during remote time [during the COVID pandemic], sharing the information about the videos was something that we could do if the parents had the infrastructure to do so." (Home visitor) "I want to be in the house again because I could take my laptop and be like, here! Because my phone has a hot spot. It doesn't matter where I am. They don't have Internet." (Home visitor)

(continued)

TABLE 3 (CONTINUED)

Authors' interpretation of themes	*Illustrative participant quotations*
Extent to which the education met client needs	
Home visitors and clients mentioned that getting the clients' health team to take their concerns seriously and act on them was sometimes difficult and frustrating. They identified the need for more guidance and resources to support clients in advocating for themselves.	"I would like to change is her [the physician] not to just like, you know, sweeping it under the rug. I want her to take more precaution like I am. Because I don't want nothing to happen to me or the baby." (Client) In speaking of interactions with providers during previous birth experiences: "I've been hurt so many times. I can't lie my confidence is still down, but I'm trying to keep it maintained." (Client)
Home visiting staff identified barriers to clients' ability to obtain health care services due to limited/no insurance coverage and transportation challenges. In some cases, clients felt unable to take action when they had concerns about their health due to such barriers. This spoke to the need for care coordination services, alongside the provision of education.	"Everybody's situation is different, but my undocumented clients . . . Their health care sometimes is pushed back because they don't go to the hospital unless they're about to have the baby." (Home visitor) "99% of them don't qualify for insurance except for Emergency Medical, which is delivery at the hospital. So, once they get to the hospital and have the baby, all of that is covered. But before that they must pay for everything. So, finding good prenatal care, especially over here. I'm on the Eastern shore. It's hard. We don't have very many." (Home visitor)

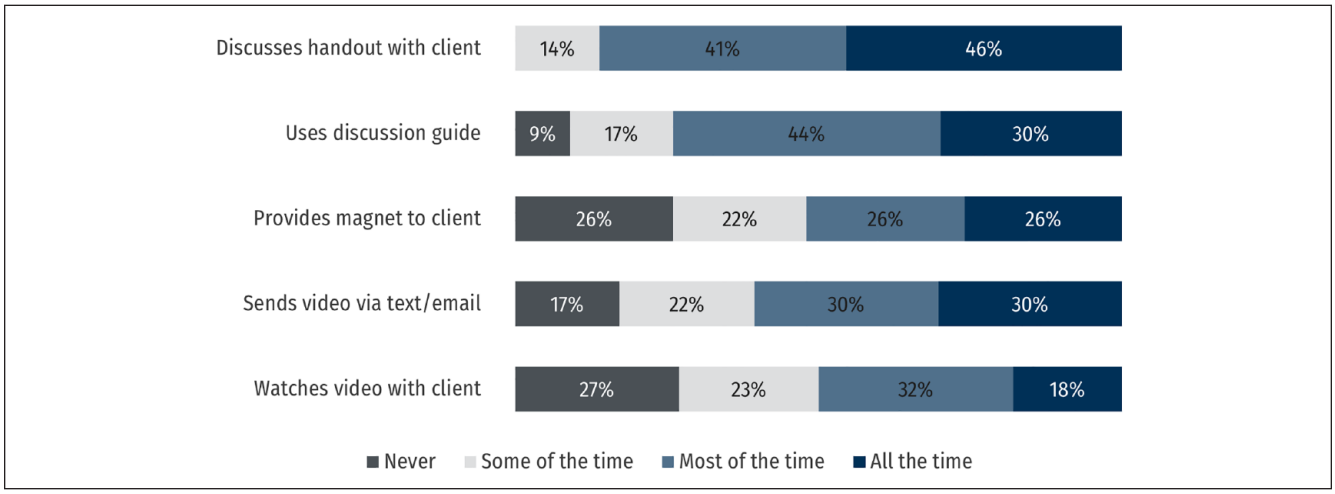

FIGURE 2 Frequency That Home Visitors Report Using Educational Tools
Notes: Endline survey responses capturing self-reported use by home visitors, family support specialists, nurses, and case managers who interact with clients directly (n = 24). Missing values (i.e., non-responses) were omitted from calculation of percentages; non-responses were two or fewer per item.

Utilization

Despite high ratings for acceptability, certain components of the toolkit were utilized less than others (Figure 2). Most home visitors (87%) discussed the illustrated handout with most or all clients. However, only half of the home visitors (50%) watched the 3-min video together with clients most or all the time, and slightly more (60%) shared the video with clients

through text/email most or all the time. Half of the home visitors (52%) provided magnets to most or all clients, but one quarter (27%) never did.

Qualitative data provide context for these survey findings. During FGDs and interviews, home visiting staff spoke of how the COVID-19 pandemic changed how they interacted with clients. Most home visits were remote during the pilot. Home visitors often shared electronic versions of the handout or video with clients, but some reported challenges sharing content with clients who did not have internet access at home. Some programs organized monthly drop-offs to distribute physical materials, such as magnets, to clients, but this practice was not universal.

Extent to Which the Education Met Client Needs

Beyond acceptability, feasibility, and utilization, interview and FGD participants called attention to other important themes related to clients' experiences navigating the health care system and seeking care for maternal complications. They shared stories highlighting the difficulties some clients face in getting health care providers to take their concerns seriously, and identified a need for more guidance and resources to support clients in advocating for themselves (Table 3). Others discussed barriers in clients' ability to access health care services due to limited or lack of insurance coverage and transportation challenges.

DISCUSSION

Much of the published literature on interventions to increase awareness of maternal warning signs focuses on postpartum discharge education in hospital settings. This essential component of maternity care can improve patient knowledge of postpartum complications (de Los Reyes et al., 2022), but it occurs during a narrow window immediately following delivery. Pregnancy-related complications can occur during pregnancy and up to 1 year after delivery, and there is need to reinforce messages throughout this time frame. As such, we developed and piloted a training for home visitors on urgent maternal warning signs and a toolkit of client education materials for delivery to prenatal and postpartum clients engaged in maternal, infant, and early childhood home visiting. Overall, we found this educational intervention was highly acceptable to home visiting staff. They felt educating clients on maternal warning signs was important and believed home visitors should offer this education. They reported that the materials were appreciated and easily understood by diverse client populations, and they valued the colorful illustrations, simple language, and translations of materials in multiple languages. Program managers found implementation a relatively simple process, feasible for in-person and remote visits, although a few home visitors reported challenges, such as time constraints or difficulty, as a nonclinician, in interpreting information of a medical nature. Despite the overall positive reception, not all components of the toolkit were used consistently. In addition, clients and staff desired more content on certain topics. Together, this learning informed revisions to the toolkit (Table 1).

Knowledge of warning signs alone does not determine whether a person seeks and receives prompt care for complications. Access to care, emotional support from family and friends, and the response of health care providers to patient concerns are among the many factors that can affect timely receipt of care (Carter et al., 2017; Petersen, Davis, Goodman, Cox, Mayes, et al., 2019). Unfortunately, patient concerns, particularly those of patients of color, are not always taken seriously and escalated in a timely fashion (Janevic et al., 2020; Kidner & Flanders-Stepans, 2004; Wang et al., 2021). During qualitative interviews, pilot participants touched on many of these external factors that restrict clients' *opportunity* to access and engage in their health care. At the same time, pilot participants desired more guidance and tools to help clients communicate with providers and advocate for their health care needs. While acknowledging that certain factors were outside their control, they hoped communication and advocacy skills would enhance clients' *capability* to navigate these external barriers; the *motivation* was present. Indeed, greater patient engagement in care has been associated with better health outcomes, improved satisfaction with care, and reduced medical costs (Greene et al., 2015; Hibbard & Greene, 2013; Hibbard et al., 2013; James, 2013), underscoring the potential benefits of building self-advocacy skills of pregnant and postpartum people. Based on this feedback, the updated training for home visiting staff includes a new module on the benefits of patient self-advocacy and how home visitors can support clients to build skills and confidence to advocate for health care that meets their needs and preferences. This module introduces a self-advocacy framework that focuses on (1) increasing patient knowledge relevant to health concerns, so they can better engage in decisions about their health care; (2) building assertiveness to initiate conversations with their health care provider about their concerns and care; and (3) practicing mindful nonadherence when provider recommendations are inadequate or do not meet their needs; this might include asking about other diagnostic tests or treatments, or seeking a second opinion (Brashers et al., 1999).

We further revised the toolkit by reorienting the discussion guide to face the client rather than the home visitor. The client now receives a copy of the revised discussion guide printed on the backside of the urgent maternal warning signs handout. Together, the home visitor and client can review the warning signs, discuss any questions or concerns, and plan for what to do in an emergency should they experience any of these signs. This includes a conversation starter from the CDC Hear Her campaign to help clients share their concerns with their health care provider. Clients keep a copy of this handout, so they can refer to it, as needed, and take it with them on medical visits. The handout also includes a QR code linking to the 3-min video, so clients can watch the video on demand and share it with family members. This is intended to increase use of the video in response to the finding that home visitors sometimes forgot or ran out of time to watch the video with clients. In addition, in response to pilot feedback, we developed an online, self-paced version of the training that home visiting staff can access on demand. This enables learners to revisit content for a refresher, and it allows new hires to complete the training as part of their onboarding, thereby facilitating continuity during staff turnover.

STRENGTHS AND LIMITATIONS

Participation in the pilot study was voluntary and, therefore, susceptible to self-selection bias; participants of the programs choosing to participate may have been more likely to find the intervention acceptable and feasible, and more likely to utilize tools than those who chose not to participate. While pilot sites were not likely representative of all home visiting programs in Maryland nor all home visiting service delivery models, they included a range of program sizes, geographic locations, and populations served, allowing us to study the intervention in diverse contexts.

This study benefited from the use of mixed qualitative and quantitative research methods to measure and understand implementation outcomes, facilitating more nuanced learning that allowed for adaptation and improvements to the training and toolkit prior to scaling up the intervention statewide. However, we recognize this study focuses on a select set of implementation outcomes (acceptability, feasibility, and usability) related to the intervention itself. These are important, but there are many other contextual factors that influence whether an intervention is ultimately successful in the real world, such as institutional support, leadership, and ongoing coaching (Fixsen et al., 2005); these were not explicitly evaluated in this study. In addition, we acknowledge that the study reflects the perspectives of home visiting staff; COVID-19 precautions and organizational policies related to client privacy limited our ability to recruit clients for interviews. Client perspectives are a focus of our ongoing research, which aims to understand the intervention's effect on clients' ability to recognize the signs of maternal complications and advocate for health care that addresses their concerns.

IMPLICATIONS FOR PRACTICE

Already, many states and tribal authorities are implementing new approaches to increase recognition and timely action on maternal warning signs. Several of them have launched communication campaigns, often modeled after the national Hear Her campaign, that use storytelling to raise awareness of maternal complications and provide resources to help patients and providers better engage in lifesaving conversations. Other states, including Arizona, Illinois, Maryland, and Ohio, are training home visitors and staff at WIC sites to educate clients on urgent maternal warning signs as a routine part of their services (Callaghan-Koru et al., 2021). Maternal, infant, and early childhood home visiting programs have a unique ability to reach populations at risk during pregnancy and the postpartum period. We recommend state and local health departments consider partnering with home visiting programs to expand the reach of these campaigns. In addition, home visiting programs interested in initiating or strengthening education on maternal warning signs, as part of their standard curriculum, can consider existing training and tools freely available from AIM, Hear Her, and statewide initiatives such as ours.

We also encourage programs to optimize tools and strategies for hybrid delivery of educational interventions. While home visiting programs have largely resumed in-person visits following the end of the COVID-19 public health emergency, interest continues in hybrid home visiting models that offer increased flexibility to meet families' diverse needs and preferences. However, as seen in our pilot, not all households have reliable internet access; a Pew Research Center (2021) survey found 30% of U.S. adults often or sometimes have problems connecting to the internet at home. Low-income households are more likely to rely solely on a cell phone provider for connecting to the internet through a smartphone, instead of a more reliable broadband internet connection (U.S. Census Bureau, 2021). Home visiting programs may find mobile-friendly strategies and tools (e.g., QR codes) more accessible to clients than solutions requiring high-speed internet or designed for a computer—and, for some, printed tools and in-person modalities will remain the preferred option.

Consistent with the National Standards for Culturally and Linguistically Appropriate Services (CLAS), we encourage programs to consider multilevel actions to advance equity, from the provision of communication materials to workforce strategies (Office of Minority Health, U.S. Department of Health & Human Services, n.d.). This was an important consideration in developing and refining the toolkit—which uses illustrations and simple language to communicate health topics to audiences with varying literacy levels, and which now includes translations in 14 languages. Beyond the materials themselves, we recognize that successful implementation depends on effective interpersonal communication. The home visitor's ability to engage clients in conversation on topics, from recognizing health complications to navigating the health care system, depends on their rapport with clients and an ability to adapt communication to the individual. For example, understanding that clients may have different levels of familiarity with the U.S. health care system, or different past experiences interacting with health care professionals, can be helpful in guiding how home visitors approach conversations on maternal warning signs. Recruiting home visiting staff who reflect the diversity of backgrounds, languages, and experiences of the clients they serve can likewise help build rapport and understanding of clients' context and culture (Crowne et al., 2021).

Finally, we recommend that health campaigns, including efforts to increase care-seeking for urgent maternal warning signs, move beyond knowledge to more holistically address motivation, capability, and opportunity. At the patient level, this can include teaching self-advocacy skills; at the provider level, this can include building skills to improve communication and address bias in care; and at the institutional level, it can include changes in culture, policies, and practices. To address the desire for self-advocacy materials, we revised our toolkit for home visiting programs to include tools from CDC's Hear Her campaign alongside AIM's materials on urgent maternal warning signs. We also developed new training content for home visitors on self-advocacy. At the same time, we recognize the need for interventions that target health care providers and build their skills to better listen and act on patients' concerns, in addition to patient-level interventions. For these efforts to succeed, it is critical to acknowledge how health care professionals' implicit biases can affect patient care and contribute to racial disparities in health outcomes (FitzGerald & Hurst, 2017; Hall et al., 2015; Maina et al., 2018). AIM recommends educating maternal health care professionals on implicit bias and its implications for clinical practice (Howell et al., 2018). In Maryland, implicit bias training is now mandatory for health care professionals, and statewide programs, such as the Maryland Maternal Health Innovation Program (2023) and Breaking Inequality Reimagining Transformative Healthcare (B.I.R.T.H.) Equity Maryland (2023), are providing education and tools to help obstetric and nonobstetric providers recognize and mitigate biases in the care of pregnant and postpartum people. Together, these patient- and provider-level interventions are elevating patient voices to improve maternal health outcomes and reduce disparities.

CONCLUSION

Home visiting programs have a unique ability to engage families during pregnancy and the postpartum period. This pilot demonstrates how home visiting programs can incorporate tools and strategies to improve early recognition and care-seeking for urgent maternal warning signs. Home visitors and clients who participated in this pilot considered such education useful and feasible to incorporate into routine visits, and they expressed a desire for additional tools to help clients build skills in navigating the health care system and advocating for their health care needs. Improving maternal health outcomes requires a comprehensive approach that engages patients, families, health care providers, and broader policy and social systems. Home visiting programs can be an important partner in this work by elevating the voices of families and empowering them with the knowledge and skills to meaningfully engage in decisions about their health.

ORCID iD

Elizabeth K. Stierman https://orcid.org/0000-0002-3866-3542

REFERENCES

Administration for Children and Families. (2019). Implementing parents as teachers (PAT). Department of Health and Human Services. https://homvee.acf.hhs.gov/implementation/Parents%20as%20Teachers%20(PAT)%C2%AE/Model%20Overview

Administration for Children and Families. (2020). *Implementing healthy families America (HFA)*. Department of Health and Human Services. https://homvee.acf.hhs.gov/implementation/Healthy%20Families%20America%20(HFA)%C2%AE/Model%20Overview

Administration for Children and Families. (2023). *What is home visiting evidence of effectiveness?* Department of Health and Human Services. https://homvee.acf.hhs.gov/

ATLAS.ti. (2021). Scientific Software Development GmbH [ATLAS.ti Web, Version 9.1.6]. Available at https://atlasti.com

Behm, B., Tevendale, H., Carrigan, S., Stone, C., Morris, K., & Rosenthal, J. (2022). A National communication effort addressing maternal mortality in the United States: Implementation of the hear

her campaign. *Journal of Women's Health (Larchmt)*, *31*(12), 1677–1685. https://doi.org/10.1089/jwh.2022.0428

B.I.R.T.H. Equity Maryland. (2023). *Breaking inequality reimagining transformative healthcare*. Maryland Patient Safety Center. https://marylandpatientsafety.org/birthequitymd/

Bowman, K. G. (2005). Postpartum learning needs. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, *34*(4), 438–443. https://doi.org/10.1177/0884217505276054

Brashers, D. E., Haas, S. M., & Neidig, J. L. (1999). The patient self-advocacy scale: Measuring patient involvement in health care decision-making interactions. *Health Communication*, *11*(2), 97–121. https://doi.org/10.1207/s15327027hc1102_1

Callaghan-Koru, J., Glassgow, E., Oza Frank, R., & Christensen, H. (2021, August 30–31). Improving the quality and expanding the delivery of warning signs education for patients and families. *National Maternal Health Innovation Symposium*. https://youtu.be/3AjgJdylpiU?list=PLNLYSeVxW69zs6-o1w8CkALJ_VjdUdqWU

Callaghan-Koru, J. A., Wahid, I., Lawson, S. M., Bower, K. M., Wilburn, C. S., & Creanga, A. A. (2022). Maternal warning signs education during home visiting: Results from a formative evaluation in Maryland. *Women's Health Report (New Rochelle)*, *3*(1), 633–642. https://doi.org/10.1089/whr.2022.0027

Carter, W., Bick, D., Mackintosh, N., & Sandall, J. (2017). A narrative synthesis of factors that affect women speaking up about early warning signs and symptoms of pre-eclampsia and responses of healthcare staff. *BMC Pregnancy Childbirth*, *17*(1), 63. https://doi.org/10.1186/s12884-017-1245-4

Centers for Disease Control and Prevention. (2021). *Severe maternal morbidity in the United States*. https://www.cdc.gov/reproductivehealth/maternalinfanthealth/severematernalmorbidity.html

Centers for Disease Control and Prevention. (2022, June). *Pregnancy mortality surveillance system*. https://www.cdc.gov/reproductivehealth/maternal-mortality/pregnancy-mortality-surveillance-system.htm

Creamer, E. G. (2018). *An introduction to fully integrated mixed methods research*. SAGE.

Crowne, S., Rosinsky, K., Goldberg, J., Sparr, M., Ulmen, K., & Huz, I. (2021). *A conceptual framework for implementation quality in home visiting*. Health Resources and Services Administration, U.S. Department of Health and Human Services.

Damschroder, L. J., Reardon, C. M., & Widerquist, M. A. O. (2022). The updated consolidated framework for implementation research based on user feedback. *Implementation Science*, *17*, 75. https://doi.org/10.1186/s13012-022-01245-0

de Los Reyes, S., Al-Khaled, D., Brito, K., Kholmatov, M., Farley, B., Kuriloff, M., & Plunkett, B. (2022). AWHONN postpartum discharge education: Patient knowledge and sustainability. *BMJ Open Quality*, *11*(4), 1528. https://doi.org/10.1136/bmjoq-2021-001528

FitzGerald, C., & Hurst, S. (2017). Implicit bias in healthcare professionals: A systematic review. *BMC Medical Ethics*, *18*(1), 19. https://doi.org/10.1186/s12910-017-0179-8

Fixsen, D. L., Naoom, S. F., Blase, K. A., Friedman, R. M., & Wallace, F. (2005). *Implementation research: A synthesis of the literature*. The National Implementation Research Network.

Greene, J., Hibbard, J. H., Sacks, R., Overton, V., & Parrotta, C. D. (2015). When patient activation levels change, health outcomes and costs change, too. *Health Affairs (Millwood)*, *34*(3), 431–437. https://doi.org/10.1377/hlthaff.2014.0452

Gunja, M. Z., Gumas, E. D., & Williams, R. D. I. (2022, December 1). The U.S. maternal mortality crisis continues to worsen: An international comparison. *To the Point (Blog)*. https://doi.org/10.26099/8vem-fc65

Hall, W. J., Chapman, M. V., Lee, K. M., Merino, Y. M., Thomas, T. W., Payne, B. K., & Coyne-Beasley, T. (2015). Implicit racial/ethnic bias among health care professionals and its influence on health care outcomes: A systematic review. *American Journal of Public Health*, *105*(12), e60–e76. https://doi.org/10.2105/AJPH.2015.302903

Health Resources and Services Administration. (2023). *Maternal, Infant, and Early Childhood Home Visiting (MIECHV) Program*. https://mchb.hrsa.gov/programs-impact/programs/home-visiting/maternal-infant-early-childhood-home-visiting-miechv-program

Hibbard, J. H., & Greene, J. (2013). What the evidence shows about patient activation: Better health outcomes and care experiences; fewer data on costs. *Health Affairs (Millwood)*, *32*(2), 207–214. https://doi.org/10.1377/hlthaff.2012.1061

Hibbard, J. H., Greene, J., & Overton, V. (2013). Patients with lower activation associated with higher costs; delivery systems should know their patients "scores." *Health Affairs (Millwood)*, *32*(2), 216–222. https://doi.org/10.1377/hlthaff.2012.1064

Howell, E. A., Brown, H., Brumley, J., Bryant, A. S., Caughey, A. B., Cornell, A. M., & Grobman, W. A. (2018). Reduction of peripartum racial and ethnic disparities: A conceptual framework and maternal safety consensus bundle. *Obstetrics & Gynecology*, *131*(5), 770–782. https://doi.org/10.1097/AOG.0000000000002475

James, J. (2013). Patient engagement. *Health Affairs Health Policy Brief*. https://www.healthaffairs.org/content/forefront/health-policy-brief-patient-engagement

Janevic, T., Piverger, N., Afzal, O., & Howell, E. A. (2020). "Just because you have ears doesn't mean you can hear"-perception of racial-ethnic discrimination during childbirth. *Ethnicity and Disease*, *30*(4), 533–542. https://doi.org/10.18865/ed.30.4.533

Kanda, K., Blythe, S., Grace, R., & Kemp, L. (2022). Parent satisfaction with sustained home visiting care for mothers and children: An integrative review. *BMC Health Services Research*, *22*(1), 295. https://doi.org/10.1186/s12913-022-07666-3

Kidner, M. C., & Flanders-Stepans, M. B. (2004). A model for the HELLP syndrome: The maternal experience. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, *33*(1), 44–53. https://doi.org/10.1177/0884217503261131

Killion, M. M. (2020). Empowering women to recognize maternal warning signs. *MCN: The American Journal of Maternal/Child Nursing*, *45*(6), 372. https://doi.org/10.1097/NMC.0000000000000670

Maina, I. W., Belton, T. D., Ginzberg, S., Singh, A., & Johnson, T. J. (2018). A decade of studying implicit racial/ethnic bias in healthcare providers using the implicit association test. *Social Science Medicine*, *199*, 219–229. https://doi.org/10.1016/j.socscimed.2017.05.009

Maryland Maternal Health Innovation Program. (2023). *MDMOM hospital equity initiative*. https://mdmom.org/hospital-initiative

Michie, S., van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, *6*, 42. https://doi.org/10.1186/1748-5908-6-42

Office of Minority Health, U.S. Department of Health & Human Services. (n.d.). *National Standards for Culturally and Linguistically Appropriate Services (CLAS) in Health and Health Care*. Department of Health and Human Services. https://thinkculturalhealth.hhs.gov/clas/standards

Petersen, E. E., Davis, N. L., Goodman, D., Cox, S., Mayes, N., Johnston, E., Syverson, C., Seed, K., Shapiro-Mendoza, C. K., Callaghan, W. M., & Barfield, W. (2019). Vital signs: Pregnancy-related deaths, United States, 2011-2015, and strategies for prevention, 13 States, 2013-2017. *Morbidity and Mortality Weekly Report*, *68*(18), 423–429. https://doi.org/10.15585/mmwr.mm6818e1

Petersen, E. E., Davis, N. L., Goodman, D., Cox, S., Syverson, C., Seed, K., Shapiro-Mendoza, C., Callaghan, W. M., & Barfield, W. (2019). Racial/ethnic disparities in pregnancy—related deaths—United States, 2007-2016. *Morbidity and Mortality Weekly Report*, *68*(35), 762–765. https://doi.org/10.15585/mmwr.mm6835a3

Pew Research Center. (2021). *Mobile technology and home broadband 2021*. https://www.pewresearch.org/internet/2021/06/03/mobile-technology-and-home-broadband-2021/

Proctor, E., Silmere, H., Raghavan, R., Hovmand, P., Aarons, G., Bunger, A., Griffey, R., & Hensley, M. (2011). Outcomes for implementation research: Conceptual distinctions, measurement challenges, and research agenda. *Administration and Policy in Mental Health*, *38*(2), 65–76. https://doi.org/10.1007/s10488-010-0319-7

Qualtrics. (2021). *Qualtrics software, March 2021*. https://qualtrics.com

Ritchie, J., & Lewis, J. E. (2003). *Qualitative research practice: A guide for social science students and researchers*. SAGE.

StataCorp. (2017). *Stata Statistical Software: Release 15*.

Stetler, C. B., Legro, M. W., Wallace, C. M., Bowman, C., Guihan, M., Hagedorn, H., Kimmel, B., Sharp, N. D., & Smith, J. L. (2006). The role of formative evaluation in implementation research and the QUERI experience. *Journal of General Internal Medicine*, *21*(Suppl. 2), S1–S8. https://doi.org/10.1111/j.1525-1497.2006.00355.x

Suplee, P. D., Kleppel, L., & Bingham, D. (2016). Discharge education on maternal morbidity and mortality provided by nurses to women in the postpartum period. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, *45*(6), 894–904. https://doi.org/10.1016/j.jogn.2016.07.006

Trost, S. L., Beauregard, J., Chandra, G., Njie, F., Berry, J., Harvey, A., & Goodman, D. A. (2022). *Pregnancy-related deaths: Data from maternal mortality review committees in 36 US States, 2017-2019*. Centers for Disease Control and Prevention, US Department of Health and Human Services.

U.S. Census Bureau. (2021, April). *Computer and internet use in the United States*: *2018* [Press Release Number CB21-TPS.38]. https://www.census.gov/newsroom/press-releases/2021/computer-internet-use.html

Wang, E., Glazer, K. B., Sofaer, S., Balbierz, A., & Howell, E. A. (2021). Racial and ethnic disparities in severe maternal morbidity: A qualitative study of women's experiences of peripartum care. *Women's Health Issues*, *31*(1), 75–81. https://doi.org/10.1016/j.whi.2020.09.002

West, R., & Michie, S. (2020). A brief introduction to the COM-B model of behaviour and the PRIME theory of motivation. *Qeios*. https://www.qeios.com/read/WW04E6