Promoting Safe Sleep, Tobacco Cessation and Breastfeeding to Rural Women during the COVID-19 Pandemic

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Abstract

Background: Safe Sleep Community Baby Showers address strategies to prevent sleep-related infant deaths. Due to the COVID-19 pandemic, these events transitioned from in-person to virtual.

Objective: This study seeks to describe the outcomes of transitioning Safe Sleep Community Baby Showers to a virtual format and comparing outcomes to previous in-person events.

Methods: Participants from four rural Kansas counties were emailed the pre-survey, provided educational materials (videos, live-stream or digital documents), and completed a post-survey. Those who completed both surveys received a portable crib and wearable blanket. Within group comparisons were assessed between pre- and post-surveys; between group comparisons (virtual vs in-person) were assessed by post-surveys.

Results: Based on data from 74 virtual and 143 in-person participants, virtual participants were more likely to be married (p<.001), have private insurance (p<.001), and less likely to report tobacco use (p<.001). Both event formats significantly increased knowledge and intentions regarding safe sleep and avoidance of second-hand smoke (all p?.001). Breastfeeding intentions did not change. Differences were observed between virtual and in-person participants regarding confidence in ability to avoid second-hand smoke (72% vs 84%; p=.031), intention to breastfeed ?6 months (79% vs 62%; p=.008) and confidence in ability to breastfeed ?6 months (64% vs 47%; p=.02).

Conclusions: While both event formats demonstrated increase knowledge/intentions to follow safe sleep recommendations, virtual events may further marginalize groups who are high risk for poor birth outcomes. Strategies to increase technology access, recruit priority populations and ensure disparities are not enhanced will be critical for implementation of future virtual events.

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Results: Based on data from 143 in-person and 74 virtual participants, virtual participants were more likely to be married (p<.001), have private insurance (p<.001), and less likely to report tobacco use (p<.001). Both event formats significantly increased knowledge and intentions regarding safe sleep and avoidance of second-hand smoke (all p≤.001). Breastfeeding intentions did not change. Differences were observed between in-person and virtual regarding confidence in ability to avoid second-hand smoke (in-person, 84% vs virtual, 72%; p=.031), intention to breastfeed ≥6 months (in-person, 62% vs virtual, 79%; p=.008) and confidence in ability to breastfeed ≥6 months (in-person, 47% vs virtual, 64%; p=.02).
Conclusions: While both event formats demonstrated increased knowledge/intentions to follow safe sleep recommendations, virtual events may further marginalize groups who are high-risk for poor birth outcomes. Strategies to increase technology access, recruit priority populations and ensure disparities are not exacerbated will be critical for implementation of future virtual events.

Keywords: SIDS; safe sleep; tobacco cessation; breastfeeding; virtual education

Introduction

The impact of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) on maternal and perinatal outcomes appears to be less severe than initially thought, though infection is still a cause for concern [1,2-4]. However, impacts appear to go beyond the physiologic reactions to direct infection [1]. Pregnant and postpartum women have reported changes in employment and financial status, mental health, social support, and for some, even access to care [5]. Women also reported changes in infant care practices, such as breastfeeding and infant sleep strategies specifically attributed to the pandemic, though changes did not always reach statistical significance [5].

While empirical data are not yet available, personal communication with emergency and support services indicate there may be an increase of sleep-related infant deaths during the pandemic. Sleep-related infant deaths, including sudden infant death syndrome (SIDS), accidental suffocation or strangulation in bed (ASSB), and other undetermined deaths, are the primary cause of death for infants from 28 days to one year of life despite risk reduction strategies promoted by the American Academy of Pediatrics (AAP) (e.g., supine position) [6]. Programs such as Safe Sleep Community Baby Showers [7-9] are a recognized strategy to promote infant safe sleep [10] where women and their support persons are brought together at a community venue to celebrate their pregnancy and receive education. Topics address risk reduction strategies to prevent sleep-related infant deaths, including safe sleep position and surface, breastfeeding and tobacco-free environments. Tools needed to create a safe sleep environment (e.g., portable crib, wearable blanket) are often provided to attendees [7-9].

During the COVID-19 pandemic, many programs which support maternal and infant health, including education on the AAP safe sleep recommendations, had to redirect resources and reduce or even halt support services. New delivery strategies were needed to accommodate stay-at-home orders and gathering size restrictions when services were available. One such strategy was virtual education; however, the impact of transitioning Safe Sleep Community Baby Showers from in-person to virtual is unknown. As such, the purpose of this study is to describe the outcomes of virtual Safe Sleep Community Baby Showers and compare the results to previous in-person events.

Methods

The Kansas Infant Death and SIDS (KIDS) Network has created a statewide infrastructure of certified Safe Sleep Instructors (SSIs) [8,11] who facilitate in-person Safe Sleep Community Baby Showers. With the support of the KIDS Network, SSIs in four rural counties (Geary, Cloud, Harvey and Shawnee) held virtual Safe Sleep Community Baby Showers in 2020. Outcomes from these events were compared to previous in-person Safe Sleep Community Baby Showers held in 2019.

Participants

Participants were pregnant or postpartum women. For in-person events participants were recruited via social media, radio ads, fliers and through healthcare providers and maternal and child health programs. Pre-surveys were completed on paper at the event prior to the education. Post-surveys were completed immediately following the education. Participants for virtual events were recruited through local outreach including social media and referral by partner programs and events. Potential participants were emailed a link and instructions to complete the pre-survey. Once completed, educational materials and links were distributed. The post-survey link with instructions was emailed following completion of the education. Participants at all events who completed both pre- and post-surveys received a portable crib and wearable blanket.

Instruments

A 22-item pre-survey, including demographics, knowledge, intention and practice questions on safe sleep, tobacco use/avoidance and breastfeeding, was completed by participants prior to receiving education. Due to skip logic not all participants completed all items. At the end of the event, 13 of the same knowledge and intention items from the pre-survey and an additional 9 items related to confidence and satisfaction with the event were collected. Deidentified survey data were collected and managed using Research Electronic Data Capture (REDCap), a secure, web-based data capture application hosted at the University of Kansas Medical Center [12,13].

Education

Safe sleep, breastfeeding and tobacco cessation/avoidance education was provided to participants regardless of education format. In-person events were interactive by nature, utilizing presentation and demonstration, but also included video components. For virtual events, Geary and Cloud Counties chose to provide educational videos and pre-recorded presentations to participants (passive). Harvey and Shawnee Counties held real-time, interactive education over a virtual platform (interactive).

Statistical Analysis

Descriptive statistics, confidence items and satisfaction are summarized using frequencies (percentages). Comparisons between pre- and post-surveys were made using McNemar’s test for paired dichotomous variables (safe vs. unsafe responses), Friedman’s Test and Chi Squared Likelihood-Ratio Test. Data from previous in-person Safe Sleep Community Baby Showers for three of the four counties were used to assess potential differences in post-intervention outcomes. One was omitted due to utilizing a previous version of the survey. The Mann-Whitney Wilcoxon Test for independent samples was used for comparison between virtual and in-person events. Due to different education formats (interactive and passive) for virtual Safe Sleep Community Baby Showers a secondary data analysis was completed. Alpha was set a priori at 0.05. Statistical analyses were performed using SPSS for Windows, Version 23.0 (Armonk, NY, USA). This project involved secondary analysis of deidentified program data and was reviewed by the University of Kansas Medical Center Human Subjects Committee who determined it not human subject research.

Results

Between August 2020 and November 2020, four virtual Safe Sleep Community Baby Showers were

held in rural Kansas counties: Harvey, Geary, Cloud and Shawnee. Ninety-seven individuals engaged in the virtual events; 22 completed only the pre-survey and one completed only the post-survey. Therefore, 74 participants were included in analysis. Due to similarity in results between events, data is reported in aggregate on the tables. In 2019, one in-person Safe Sleep Community Baby Showers was held in each of the following counties Geary, Cloud and Shawnee Counties with a total of 145 attendees across all events. All completed both pre- and post-surveys.

Demographics

Full demographics are in Table 1. Differences in marital status and insurance status were observed between virtual and in-person participants. Virtual participants were significantly more likely to be married (p<.001) and have private insurance (p<.001).

Table 1. Participant characteristics.[a]

	In-person CBS N=145	Virtual CBS N=74	Between Group Difference
	n (%)	n (%)	p
County of Residence			<.001*
Harvey	0 (0.0)	15 (20.3)	
Geary	54 (37.2)	42 (56.8)	
Cloud	20 (13.8)	11 (14.9)	
Shawnee	71 (49.0)	6 (8.1)	
Race/Ethnicity			.44
Non-Hispanic White	87 (60.4)	51 (68.9)	
Non-Hispanic Black	30 (20.8)	10 (13.5)	
Hispanic	15 (10.4)	9 (12.2)	
Other[b]	12 (8.3)	4 (5.4)	
Marital Status			<.001*
Single	58 (40.3)	8 (10.8)	
Married	59 (41.0)	51 (68.9)	
Other[c]	27 (18.8)	15 (20.3)	
Partner Race/Ethnicity			.64
Non-Hispanic White	74 (51.0)	46 (62.2)	
Non-Hispanic Black	27 (18.6)	11 (14.9)	
Hispanic	17 (11.7)	7 (9.5)	
Other[b]	14 (9.7)	5 (6.8)	
Not applicable/Choose not to answer	13 (9.0)	5 (6.8)	
Mother's Education			.05
Some high school	23 (16.0)	5 (6.8)	
High school graduate or GED	79 (54.9)	32 (43.2)	
2-year community	12 (8.3)	13 (17.6)	

college graduate			
4-year college graduate	15 (10.4)	13 (17.6)	
Graduate school	9 (6.3)	7 (9.5)	
Other	6 (4.2)	4 (5.4)	
Insurance Status			.001*
Private insurance	27 (18.8)	26 (35.1)	
KanCare/Medicaid	84 (58.3)	23 (31.1)	
Military	24 (16.7)	20 (27.0)	
Other[d]	9 (6.3)	5 (6.8)	
Prenatal Care Provider			.11
Private provider's office	54 (37.8)	34 (46.6)	
Hospital clinic	66 (46.2)	30 (40.5)	
Community health clinic	16 (11.2)	4 (5.4)	
Clinic at work or school	0 (0.0)	2 (2.7)	
County health department	2 (1.4)	0 (0.0)	
Other	5 (3.5)	3 (4.1)	

[a] Missing data: In-person - Race/Ethnicity (n=1); Marital Status (n=1); Mother's Education (n=1); Insurance Status (n=1); Prenatal Care Provider (n=2). Virtual - Prenatal Care Provider (n=1);
[b] Race/Ethnicity-Other: multiracial and other.
[c] Marital Status-Other: partnered, separated, divorced.
[d] Insurance Status-Other: self-pay, managed care organization/marketplace, other.
**p-value* <.05 indicates statistically significant difference between pre- and post-survey responses.

Changes in Safe Sleep Knowledge and Intentions

Following the Safe Sleep Community Baby Showers, in-person participants demonstrated a positive increase from pre- to post-survey in intention to follow safe sleep practices related to anticipated sleep position (pre, 89% vs post, 99%, p<.001), anticipated sleep surfaces (pre, 87% vs post, 97%, p=.001), anticipated crib items (pre, 66% vs post, 95%, p<.001) and discussing safe sleep with others (pre, 65% vs post, 96%, p<.001) (Table 2). On the post-survey, the majority (98%) reported knowing at least one person who would support safe sleep. Virtual participants also demonstrated a positive increase from pre- to post-survey in intention to follow safe sleep practices related to only placing their baby on the back to sleep (pre, 85% vs post, 100%; p=.001), safe sleep surfaces (pre, 82% vs post, 97%; p=0.001), inclusion of only safe items in the crib (pre, 80% vs post, 97%; p<.001), and discussing safe sleep with others (pre, 73% vs post, 100%, p<.001). In addition, all virtual participants (100%) reported knowing at least one person who would support safe sleep. No differences in anticipated safe sleep practices were observed between those who attended an in-person event compared to those who attended a virtual event.

Table 2. Changes in intended safe sleep practices.[a]

	In-person CBS N=145			Virtual CBS N=74			
	Pre-Survey	Post-Survey	Within Group Difference	Pre-Survey	Post-Survey	Within Group Difference	Between Group Differences

	n (%)	n (%)	p	n (%)	n (%)	p	p
Safe sleep position (back only)	128 (88.9)	142 (98.6)	<.001*	63 (85.1)	74 (100)	.001*	.31
Safe sleep surface (crib, portable crib or bassinet only)	126 (86.9)	140 (96.6)	.001*	60 (82.2)	71 (97.3)	.001*	.78
Safe crib items (firm mattress, fitted sheet, or wearable blanket only)	86 (66.2)	123 (94.6)	<.001*	58 (79.5)	71 (97.3)	<.001*	.33
Have or plan to discuss safe sleep with others	90 (65.2)	132 (95.7)	<.001*	53 (72.6)	73 (100)	<.001*	.07

[a] Missing data: In-person - sleep position (n=1); crib items (n=15); talk to others about safe sleep (n=7). Virtual - sleep surface (n=1); crib items (n=1); talk to others about safe sleep (n=1).
**p-value* <.05 indicates statistically significant difference between pre- and post-survey responses.

Changes in Readiness to Quit and Knowledge of Tobacco-Free Environment

The majority of in-person participants (n=100; 69%) and virtual participants (n=72; 97%) reported not using tobacco products in the six months prior to the Safe Sleep Community Baby Showers; however, this number was significantly lower for in-person participants (p<.001). Of in-person participants reporting tobacco use (n=44), the majority (61%) reported daily use, while 5% reported weekly and 34% were not currently using. Of virtual participants who reported using (n=2), one was not currently using and the other reported daily use. No significant changes in readiness to quit were observed between pre- and post-survey for either group.

Positive changes were observed for in-person participants from pre- to post-survey regarding plans to not allow tobacco use in home or car (pre, 87% vs post, 93%; p=.039), knowledge of three ways to avoid secondhand exposure (pre, 76% vs post, 96%; p<.001) and knowledge of at least three local resources for tobacco cessation (pre, 18% vs post, 41%; p<.001) (Table 3). Following the events, virtual participants also reported positive changes from pre- to post-survey in plans to not allow

tobacco use inside their home or car (pre, 91% vs post, 99%; p=.014), knowledge of three ways to avoid secondhand exposure (pre, 70% vs post, 100%; p<.001) and knowledge of at least three local resources for tobacco cessation (pre, 10% vs post, 52%; p<.001). No differences were observed between virtual and in-person participants.

Table 3. Smoking exposure, cessation, resources and intent to quit. [a]

	In-person CBS N=145			Virtual CBS N=74			
	Pre-Survey	Post-Survey	Within Group Difference	Pre-Survey	Post-Survey	Within Group Difference	Between Group Differences
	n (%)	n (%)	p	n (%)	n (%)	p	p
Secondhand exposure in home or car [b]			.039*			.014*	.05
Never	123 (86.6)	132 (93.0)		67 (90.5)	73 (98.6)		
Daily	18 (12.7)	9 (6.3)		5 (6.8)	1 (1.4)		
Weekly	1 (0.7)	1 (0.7)		2 (2.7)	0 (0.0)		
Know ≥3 ways to avoid secondhand exposure			<.001*			<.001*	.10
Yes	107 (76.4)	135 (96.4)		52 (70.3)	74 (100)		
No	33 (23.6)	5 (3.6)		22 (29.7)	0 (0.0)		
Know ≥3 local resources for tobacco cessation			<.001*			<.001*	.12
Yes	24 (18.0)	55 (41.4)		7 (9.6)	38 (52.1)		
No	109 (82.0)	78 (58.6)		66 (90.4)	35 (47.9)		

[a] Missing data: In-person - secondhand exposure in home or car (n=3); know ≥3 ways to avoid secondhand exposure (n=5); know ≥3 local resources (n=12). Virtual - know ≥3 local resources (n=1).

[b] Pre-survey indicates actual behavior; post-survey represents future intention.

**p-value* <.05 indicates statistically significant difference between pre- and post-survey responses.

Changes in Breastfeeding Intentions

In-person participants planned to breastfeed their baby with no change observed from pre- to post-survey (pre, 94% vs post, 96%; p=.53; Table 4). Differences were also not observed in intention to

breastfeed longer than six months (pre, 60% vs post, 62%; p=.63). However, following the events, more in-person participants reported being confident in their ability to breastfeed for longer than six months (pre, 41% vs post, 47%; p=.008) and knowledge of at least three local breastfeeding resources (pre, 33% vs post, 59%; p<.001). Virtual participants planned to breastfeed their baby with no change observed pre- to post-survey (pre, 93% vs post, 93%; p=.56). No differences were reported in intention to breastfeed longer than six months (pre, 79% vs post, 79%; p=1.00) or confidence in ability to breastfeed longer than six months (pre, 59% vs post, 64%, p=.38). A statistically significant difference was observed in knowledge of at least three local breastfeeding resources (pre, 18% vs post, 55%; p<.001) following the virtual events. Differences were observed between in-person and virtual participants in their intention to breastfeed longer than six months (62% vs 79%; p=.008) and confidence in ability to breastfeed for longer than six months (47% vs 64%; p=.02).

Table 4. Breastfeeding intent, confidence and knowledge of resources. [a]

	In-person CBS N=145			Virtual CBS N=74			
	Pre-Survey	Post-Survey	Within Group Difference	Pre-Survey	Post-Survey	Within Group Difference	Between Group Differences
	n (%)	n (%)	p				p
Likelihood of breastfeeding			.53			.56	.80
Don't plan to breastfeed	4 (2.9)	5 (3.6)		5 (6.8)	5 (6.8)		
Not likely	4 (2.9)	1 (0.07)		0 (0.0)	0 (0.0)		
Somewhat likely	25 (18.1)	24 (17.4)		10 (13.5)	11 (14.9)		
Very likely	105 (76.1)	108 (78.3)		59 (79.7)	58 (78.4)		
Intend to breastfeed >6 months			.63			1.00	.008*
Yes	77 (60.2)	79 (61.7)		52 (78.8)	52 (78.8)		
No	51 (39.8)	49 (3.3)		14 (21.2)	14 (21.2)		
Confident in ability to breastfeeding for >6 months			.008*			.38	.02*
Yes	50	58		41	44		

	(40.7)	(47.2)		(59.4)	(63.8)		
No	73 (59.3)	65 (52.8)		28 (40.6)	25 (36.2)		
Knowledge of ≥3 local breastfeeding resources			<.001*			<.001*	.65
Yes	45 (32.6)	81 (58.7)		13 (17.6)	41 (55.4)		
No	93 (67.4)	57 (41.3)		61 (82.4)	33 (44.6)		

[a] Missing data: In-person - likelihood (n=7); duration (n=6); confidence (n=11); knowledge of local resources (n=7). Virtual - duration (n=8); confidence (n=5).
**p-value* <.05 indicates statistically significant difference between pre- and post-survey responses.

Confidence Change

On the post-survey, participants were asked to rate their confidence based on education received (Table 5). Significant differences were only observed between the two groups in confidence to avoid secondhand smoke (p=.03).

Table 5. Confidence in ability to engage in risk reduction strategies following Safe Sleep Community Baby Showers.[a]

	In-person CBS N=145	Virtual CBS N=74	Between Group Difference
	n (%)	n (%)	p
Get baby to sleep on his/her back			.22
Less Confident	1 (0.7)	0 (0.0)	
No Change	24 (16.6)	18 (24.3)	
More Confident	120 (82.8)	56 (75.7)	
Have baby sleep in my room, but separate crib, portable crib or bassinet			.18
Less Confident	1 (0.7)	0 (0.0)	
No Change	23 (15.9)	18 (24.3)	
More Confident	121 (83.4)	56 (75.7)	
Keep loose blankets out of the crib			.60
Less Confident	3 (2.1)	0 (0.0)	
No Change	25 (17.4)	17 (23.0)	
More Confident	116 (80.6)	57 (77.0)	
Follow safe sleep recommendations even when people give different			.50

advice			
No Change	17 (15.2)	14 (18.9)	
More Confident	95 (84.8)	60 (81.1)	
Avoid secondhand smoke			.03*
No Change	23 (16.0)	21 (28.4)	
More Confident	121 (84.0)	53 (71.6)	
Breastfeed			.14
No Change	36 (25.5)	26 (35.1)	
More Confident	105 (74.5)	48 (64.9)	

[a] Missing data: In-person - loose blankets (n=1); follow recommendations (n=33); secondhand smoke (n=1); breastfeeding (n=4).
**p-value* <.05 indicates statistically significant difference between pre- and post-survey responses.

Participant Satisfaction

Satisfaction with events was high. In-person participants were very satisfied (n=120; 83%), satisfied (n=22; 15%) or neutral (n=2; 1%). The majority of virtual participants reported being very satisfied (n=57; 77%). The remainder were satisfied (n=16; 22%) or neutral (n=1; 1%). Several comments specifically addressed the virtual nature of the training. One woman stated, “Thank you for the opportunity to participate in the community baby shower over zoom! It's a great way to keep promoting safe sleep for babies while keeping up with the strange times we are living in today.” No significant differences in event satisfaction were observed between in-person and virtual participants (p=.27).

Secondary Analysis of Virtual Education Formats

Two different education formats were utilized at the virtual Safe Sleep Community Baby Showers. Fifty-three (71.6%) participants received passive education and 21 (28.4%) attended an interactive virtual event. Participants who attended passive virtual events were significantly more likely to have received a high school diploma or GED (p=.01) and have military insurance (p=.01). Whereas participants who attended interactive events were more likely to receive prenatal care at a private provider’s office (p=.01). No differences in anticipated safe sleep practices, smoking exposure or cessation, breastfeeding intention or confidence, or confidence on engagement in risk reduction strategies were observed between those who attended passive virtual event compared to those who attended an interactive virtual event. Differences between the two groups were observed regarding knowledge of resources following the events. Specifically, participants who attended interactive events were more likely to know three or more local resources for tobacco cessation (p<.001) and three or more local breastfeeding resources (p<.001).

Discussion

Safe Sleep Community Baby Showers held as virtual events in rural counties due to the COVID-19 pandemic had significantly more participants who reported being married and on private insurance than in-person events. These characteristics are frequently associated with positive perinatal outcomes (e.g., [14,15]). In addition, though it did not cross the threshold for significance, virtual attendees were less likely to report low education levels (50% high school diploma/GED or less) than in-person attendees (70.9%).

Women of higher socioeconomic status may have been more likely to participate in Safe Sleep Community Baby Showers for a variety of reasons. Rural communities are highly susceptible to

COVID-19 due vulnerable populations, fewer physicians, and lack of related services [16]. However, impacts may be especially dire for socially vulnerable populations [16] and concerns for immediate needs (e.g., food, housing, employment) impacted by the pandemic may have resulted in lower participation in educational events by low-income women. Further, during the pandemic many health departments and health care providers had to modify or suspend services, such a prenatal home visits, which may have promoted Safe Sleep Community Baby Showers to hard-to-reach families.

Differences in participants between the two event formats may also highlight access disparities that are exacerbated with the use of technology [17]. To reduce unintended negative impacts, future events could utilize Crawford and Serhal's digital health equity framework [18], an expansion of Dover's theories of health equity [19]. Dover's model suggests that the interplay of social determinants of health and health system utilization impact health equity. Within the model, impacts of socioeconomic, cultural and political context and their influence on social stratification process, health policy context, environment, health-related behaviors and health beliefs, and social circumstances are explored [19]. Crawford and Serhal expand this framework by considering the impacts of digital health resources and digital health literacy in enhancing health equity. For example, an individual's use of technology, and capacity to access and interpret digital content, is shaped by their social, cultural and economic position which should be considered in the development of health care and education and, even more importantly, in the development of policy [18].

As COVID-19 transmission risks are reduced through increased vaccine availability, it may be important to consider ways to safely hold in-person event as data suggests these events serve individuals reporting more socio-demographic and behavioral risk factors associated with infant mortality [20]. If COVID-19 risks persist, identifying outreach strategies and partnerships to increase access to technology may be critical to ensure high-risk families have access to virtual events and to prevent further marginalizing disparate groups. Event dissemination and recruitment strategies may also need to be shifted to better promote virtual events to disadvantaged groups, such as through health care providers, other maternal child health programs or trusted community members.

Despite demographic differences in attendees, both event formats were successful at promoting the AAP Safe Sleep Recommendations, with participants showing significant increases regarding intentions to use safe sleep practices following the Baby Showers. Post-event rates reflected those from previously published studies [7-9]. Similarly, positive improvements were observed within events for tobacco cessation/avoidance items, though self-reported tobacco use was significantly higher for in-person participants. This could further reflect in-person participation by a higher risk group or may suggest a higher likelihood to truthfully report tobacco use in-person. Fewer improvements were observed for breastfeeding intention and duration, though knowledge of breastfeeding support resources increased. In addtion, only the in-person events increased participant confidence in ability to breastfeed for greater than 6 months, which has been linked to benefits for both mother and infant, including reduced infant mortality [21].

To further assess impacts of the virtual education, secondary analysis was performed to compare passive versus active education strategies. Participants differed in terms of demographic variables, such as insurance type, but this is likely a reflection of the community at large and not the educational format. For example, Geary County, which utilized a passive education format, had high rates of military insurance, but is the home of a military base. In terms of knowledge outcomes, the most prominent difference appeared in recognition of tobacco cessation and breastfeeding support resources. This may have resulted from additional discussion by participants and presenters in the interactive format. If passive format will be used in the future, special care should be taken to

provide additional information on resources available to support desired behaviors.

Limitations

This study is limited as events took place in rural counties in a Midwest state and may not be generalizable to urban areas or other regions. These rural communities had been engaged in safe sleep promotion through the Safe Sleep Instructor [8,11] project over a number of years, which may have impacted baseline data and openness to safe sleep education. Proportions of participants by county differed between in-person and virtual formats, which may have contributed to demographic differences. However, poverty rates for the counties were comparable: Harvey 9.6%, Cloud 11.4%, Shawnee 11.4% and Geary 13%; state range 3.3% to 22.4% [22]. Data were self-report, which could result in social desirability response bias. In addition, behavioral data following the event could not be collected as it was outside the scope of this project. Future studies should assess parent behaviors related to infant safe sleep following educational events. Authors would like to note there was fewer missing data with the virtual trainings. This may indicate a benefit of allowing participants to complete data forms at their leisure prior to the event. Future research should assess attitudes and comfort around completing surveys online compared to in-person.

Conclusions

While both event formats demonstrated the ability to increase knowledge/intentions in most areas measured, virtual events may further marginalize groups who are high-risk for poor birth outcomes. These findings have implications beyond safe sleep promotion, especially as the COVID-19 pandemic continues to accelerate the use of telemedicine and virtual platforms for public health education. Strategies to increase technology access, recruit priority populations and ensure disparities are not enhanced will be critical for implementation of future virtual events.

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Conflicts of Interest

None declared.

Abbreviations

AAP: American Academy of Pediatrics
ASSB: accidental suffocation or strangulation in bed
COVID-19: Coronavirus Disease 2019
GED: Graduate Equivalency Degree or General Education Diploma
Safe Sleep Instructor (SSI)
SARS-CoV-2: Severe acute respiratory syndrome coronavirus 2
SIDS: sudden infant death syndrome

References

1. Kotlar B, Gerson E, Petrillo S, Langer A, Tiemeier H. The impact of the COVID-19 pandemic on maternal and perinatal health: a scoping review. Reprod Health 2021;18(1):10. PMID: 33461593
2. Elshafeey F, Magdi R, Hindi N, et al. A systematic scoping review of COVID-19 during

pregnancy and childbirth. Int J Gynaecol Obstet 2020;150(1):47-52. PMID: 32330287
3. Juan J, Gil MM, Rong Z, Zhang Y, Yang H, Poon LC. Effect of coronavirus disease 2019 (COVID-19) on maternal, perinatal and neonatal outcome: systematic review. Ultrasound Obstet Gynecol 2020;56(1):15-27. PMID: 32430957
4. Zaigham M, Andersson O. Maternal and perinatal outcomes with COVID-19: A systematic review of 108 pregnancies. Acta Obstet Gynecol Scand 2020;99(7):823-829. PMID: 32259279
5. Ahlers-Schmidt CR, Hervey AM, Neil T, Kuhlmann S, Kuhlmann Z. Concerns of women regarding pregnancy and childbirth during the COVID-19 pandemic [published online ahead of print, 2020 Sep 24]. Patient Educ Couns 2020;103(12):2578-2582. PMID: 33010997
6. Moon RY; TASK FORCE ON SUDDEN INFANT DEATH SYNDROME. SIDS and Other Sleep-Related Infant Deaths: Evidence Base for 2016 Updated Recommendations for a Safe Infant Sleeping Environment. Pediatrics 2016;138(5):e20162940. PMID: 27940805
7. Ahlers-Schmidt CR, Schunn C, Lopez V, et al. A Comparison of Community and Clinic Baby Showers to Promote Safe Sleep for Populations at High Risk for Infant Mortality [published correction appears in Glob Pediatr Health 2016;3:2333794X16651787]. Glob Pediatr Health 2016;3:2333794X15622305. Published 2016 Mar 16. PMID: 27335991
8. Ahlers-Schmidt CR, Schunn C, Engel M, Dowling J, Neufeld K, Kuhlmann S. Implementation of a Statewide Program to Promote Safe Sleep, Breastfeeding and Tobacco Cessation to High Risk Pregnant Women. J Community Health 2019;44(1):185-191. PMID: 30187364
9. Ahlers-Schmidt CR, Schunn C, Hervey AM, et al. Redesigned Community Baby Showers to Promote Infant Safe Sleep. Health Edu J 2020;79(8):888-900 doi.org/10.1177/0017896920935918
10. Moon RY, Hauck FR, Colson ER. Safe Infant Sleep Interventions: What is the Evidence for Successful Behavior Change? Curr Pediatr Rev 2016;12(1):67-75. PMID: 26496723
11. Ahlers-Schmidt CR, Schunn C, Kuhlmann S, Kuhlmann Z, Engel M. Developing a state-wide infrastructure for safe sleep promotion. Sleep Health 2017;3(4):296-299. PMID: 28709518
12. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform. 2009;42(2):377-381. PMID: 18929686
13. Harris PA, Taylor R, Minor BL, et al. The REDCap consortium: Building an international community of software platform partners. J Biomed Inform 2019;95:103208. PMID: 31078660
14. Kim HJ, Min KB, Jung YJ, Min JY. Disparities in infant mortality by payment source for delivery in the United States. Prev Med 2021;145:106361. PMID: 33309872
15. Shah PS, Zao J, Ali S; Knowledge Synthesis Group of Determinants of preterm/LBW births. Maternal marital status and birth outcomes: a systematic review and meta-analyses. Matern Child Health J 2011;15(7):1097-1109. PMID: 20690038
16. Peters DJ. Community Susceptibility and Resiliency to COVID-19 Across the Rural-Urban Continuum in the United States. J Rural Health 2020;36(3):446-456. PMID: 32543751
17. Madubuonwu J, Mehta P. How Telehealth Can be Used to Improve Maternal and Child Health Outcomes: A Population Approach. Clin Obstet Gynecol 2021;64(2):398-406. PMID: 33904845
18. Crawford A, Serhal E. Digital Health Equity and COVID-19: The Innovation Curve Cannot Reinforce the Social Gradient of Health. J Med Internet Res 2020;22(6):e19361. PMID: 32452816
19. Dover DC, Belon AP. The health equity measurement framework: a comprehensive model to

measure social inequities in health [published correction appears in Int J Equity Health 2019 Apr 23;18(1):58]. Int J Equity Health 2019;18(1):36. Published 2019 Feb 19. PMID: 30782161

20. Lorenz JM, Ananth CV, Polin RA, D'Alton ME. Infant mortality in the United States. J Perinatol 2016;36(10):797-801. PMID: 27101388
21. Duijts L, Jaddoe VW, Hofman A, Moll HA. Prolonged and exclusive breastfeeding reduces the risk of infectious diseases in infancy. Pediatrics 2010;126(1):e18-e25. PMID: 20566605
22. Kansas Health Matters. People Living Below Poverty Level. https://www.kansashealthmatters.org/indicators/index/view?indicatorId=347&localeTypeId=2&periodId=4523. Accessed August 18, 2021.