



Safe sleep crib clinics: Promoting risk reduction strategies for sudden unexpected infant death

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ABSTRACT

Objectives: Safe Sleep Community Baby Showers (CBS) provide group education to reduce risk factors of sudden unexpected infant death (SUID). Based on CBS success, Safe Sleep Crib Clinics were developed to provide individual education. This study assessed Crib Clinic outcomes and differences in Crib Clinics compared to CBSs. **Methods:** Certified Safe Sleep Instructors facilitated CBSs and/or Crib Clinics in their communities and collected participant data related to safe sleep, tobacco avoidance and breastfeeding. Crib Clinic data was compared pre- to post-test; post-test results were compared between Crib Clinics and CBSs.

Results: Crib Clinic attendees exhibited significant increases in intention to have infant follow safe sleep recommendations, avoid secondhand smoke and breastfeed (all $p < 0.001$). Significant differences between Crib Clinic and CBS participants related to marital status, language, tobacco, education and insurance (all $p < 0.01$). CBS and Crib Clinic participants differed on items related to sleep environment, breastfeeding and tobacco (all $p = 0.05$).

Conclusions: Overall Crib Clinics appear to be effective in increasing knowledge, intentions and confidence related to safe sleep, tobacco avoidance and breastfeeding. Crib Clinics may offer flexibility (e.g., time, format) that increases accessibility to safe sleep education for families.

Innovation: Results suggest the ability to shift education delivery method based on group size was important in both rural and urban settings.

1. Introduction

Infant mortality is considered an indicator of overall population health [1], and rural areas have significantly higher rates compared to urban areas [2-4]. Differences in rates by population density appear to be driven by county-level socioeconomic disadvantages and post-neonatal deaths (28 days to 1 year) [2]. The leading cause of post-neonatal death is sudden unexpected infant death (SUID), or the death of a child less than one year of age where the cause of death is not apparent prior to investigation [5,6]; SUID accounts for as many as 42 % of rural infant deaths [4].

Since the early 1990's the American Academy of Pediatrics (AAP) has provided evidence-based recommendations to reduce external risk factors of SUID [7]. Examples include placing an infant alone, on the back, in a clutter-free crib, in a tobacco-free environment. Despite these risk

reduction strategies, the SUID rate in Kansas, a predominantly rural state, is higher than the national average (120 infant deaths per 100,000 live births compared to 92 infant deaths; 2016–2020 data) [5]. SUID accounts for over 20 % of Kansas infant deaths [8], nearly all of which (98 %) have external risk factors present [9].

The Kansas Infant Death and SIDS (KIDS) Network promotes the AAP Safe Sleep Recommendations across the state through their Safe Sleep Instructor (SSI) program [10-12]; C.R. Ahlers-Schmidt, unpublished manuscript, 2024]. After the training, SSIs are certified to educate professionals, families, and community members on the AAP Safe Sleep recommendations. In addition, SSIs are trained on how to facilitate a Safe Sleep Community Baby Shower (CBS) [13-17].

CBSs are community-based group events, based on cultural traditions and celebration, to promote infant safe sleep practices [13-17]. SSIs bring together community partners (e.g., healthcare, insurance,

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maternal child health programs) to educate pregnant and postpartum persons and families on the importance of safe sleep practices. CBSs address the six constructs of the Health Belief Model [18,19]: severity, susceptibility, benefits, barriers, cues to action and self-efficacy. For example, to address susceptibility participants from populations with high rates of SUID are prioritized for attendance and participants learn about risks of suffocation from loose bedding and soft material [13]. One way barriers are addressed is by providing safe sleep tools (e.g., portable crib, wearable blanket); some of these items also act as cues to action with safe sleep messaging on them (e.g., Alone, Back, Crib) [13]. Attendees spend about an hour receiving group education from one or more experts on safe sleep, tobacco avoidance and breastfeeding and attending presentations or “booths” about community programs.

Kansas has over 35,000 births per year, yet over a quarter of those births (27 %) are in rural areas [20]. Following certification, rural SSIs reported barriers to hosting community-based group educational events. Challenges included few pregnant persons (e.g., Greeley County had 14 births in 2022) [20], few or no maternal/infant programs to engage at events, and few resources to provide safe sleep tools. To address these issues, the KIDS Network developed a modified educational opportunity to provide standardized individual safe sleep education for pregnant and recently delivered persons, called Safe Sleep Crib Clinics.

These Crib Clinics allow SSIs to provide the same education and tools one-on-one to an individual or family. Crib Clinics cover the same safe sleep, tobacco avoidance and breastfeeding education as the CBSs, but the SSI provides all the education. No community partners are engaged, but SSIs do refer participants to community programs and resources as needed. Crib Clinics last between 20 min and one hour. The purpose of this cross-sectional study is twofold: 1) to assess the outcomes of the Crib Clinics (individual education); and 2) to identify any difference in outcomes compared to community-based group education events (CBSs).

2. Participants and methods

During the two-day SSI certification conference [10–12; C.R. Ahlers-Schmidt, unpublished manuscript, 2024], participants learned to conduct both a Safe Sleep CBS [13–17] and a Safe Sleep Crib Clinic. Both events include brief education on breastfeeding, tobacco avoidance, substance use, perinatal mental health, and the AAP Safe Sleep Recommendations. Safe sleep is addressed using a standardized Safe Sleep Crib Demonstration developed by the KIDS Network [C.R. Ahlers-Schmidt, unpublished manuscript, 2024]. During the demonstration, a safe sleep environment is displayed using a portable crib, wearable blanket, pacifier and doll. Unsafe items are then discussed in terms of risk factors (but kept out of the sleep environment). This demonstration is based on learning theory from the FrameWorks Institute [21] and differs from other safe sleep education strategies which often show families unsafe sleep environments.

Conference attendees were also educated on how to identify priority populations based on local infant mortality data, grant writing to fund cribs and materials, and strategies for hosting education in person and virtually.

Once certified, SSIs were tasked with facilitating at least one CBS or ten individual Crib Clinics with pregnant persons or those with infants less than one year of age (birthing persons) in their local communities. SSIs collected pre- and post-test data on knowledge, intentions and confidence from birthing persons who attend either event; support persons were also invited to attend, but no data was collected from this group. The same pre- and post-test were administered for CBS and Crib Clinics and included items on safe sleep, tobacco avoidance and breastfeeding. Safe sleep items included questions specific to the AAP Recommendations on position, surface, and items. Tobacco avoidance was assessed using questions on secondhand exposure and knowledge of local resources. Breastfeeding intention was measured using a question on duration of breastfeeding (coded as do not plan to breastfeed/plan to breastfeed) and knowledge of local resources. Six additional items

regarding confidence in following the AAP Recommendations were included on the post-test to further assess self-efficacy; response options were ‘less confident’, ‘no change’, and ‘more confident’. Event satisfaction was measured via a Likert scale (1-Very Satisfied to 5-Very Dissatisfied) on the post-test. Most participants were able to complete the forms in 10 min or less.

Deidentified data was entered by the SSIs into Research Electronic Data Capture (REDCap), a secure, web-based data capture application hosted at the University of Kansas Medical Center [22,23]. Event type (CBS or Crib Clinic), descriptive statistics, confidence items and satisfaction were 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. The Mann-Whitney Wilcoxon Test for independent samples was used for comparison between CBS and Crib Clinic participants. Alpha was set a priori at 0.05. Statistical analyses were performed using SPSS for Windows, Version 26.0 (Armonk, NY, USA). This project involved secondary analysis of deidentified program data and was reviewed by the University of Kansas Medical Human Subjects Committee who determined it not human subject research.

3. Results

3.1. Event characteristics

Between 5/1/2019 and 10/31/2023, 480 Safe Sleep education events were held by certified SSIs (319 Crib Clinics; 161 CBS). Crib Clinics were significantly more likely to be held in urban areas than rural areas ($p < 0.001$) and more likely to be virtual in format ($p < 0.001$). Crib Clinics had a median attendance of 1 (range 1–15; $p < 0.001$) and CBSs had a median attendance of 31 birthing persons (range 1–208) ($p < 0.001$).

Across these events 4906 birthing persons were served (592 Crib Clinics; 4314 CBS). Of those, 3475 completed pre- and post-surveys and after accounting for missing data, 3172 (504 Crib Clinics; 2668 CBS) were included in analysis. Birthing persons who attended a CBS were significantly more likely to have a support person (age 18 years or more) with them than those attending a Crib Clinic (CBS median = 1, range 0–9; Crib Clinic median 0; range 0–8).

3.2. Crib clinic participants

The greatest proportion of Crib Clinic participants reported being non-Hispanic white (50 %), single (43 %), with a high school education (or equivalent) (43 %) and Medicaid coverage (57 %). The majority reported no tobacco use (83 %); however, of those currently using, 83 % reported daily use. Additional demographics can be found in Table 1.

3.3. Crib clinic outcomes

In terms of safe sleep intentions, Crib Clinic attendees exhibited statistically significant increases in the number of respondents planning to have their infant sleep on the back only (pre = 76 % vs post = 99 %; $p < 0.001$), on a safe surface only (crib, portable crib, bassinet; pre = 79 % vs post = 97 %; $p < 0.001$), and with no unsafe items in the sleep space (pre = 58 % vs post = 95 %; $p < 0.001$) (Table 2). On the post-test, nearly all participants planned to discuss safe sleep with others (pre = 55 % vs post = 99 %; $p < 0.001$) and could identify at least one person who would support safe sleep (98 %).

Addressing tobacco avoidance, Crib Clinic attendees showed statistically significant increases in intentions to avoid secondhand smoke exposure in home and vehicle (pre = 89 % vs post = 93 %; $p = 0.004$), knowledge of three or more ways to avoid secondhand smoke exposure (pre = 63 % vs post = 96 %; $p < 0.001$), and knowledge of at least three local resources for tobacco dependence (pre = 11 % vs post = 38 %; $p <$

Table 1
Participant Characteristics.

	Total	Crib Clinic	Community Baby Shower	P
	n (%)	n (%)	n (%)	
	3172	504 (16)	2668 (84)	
Primary Language				<0.001
English	2876 (91)	413 (82)	2463 (92)	
Spanish	296 (1)	91 (18)	205 (8)	
Race/Ethnicity				0.091
Non-Hispanic White	1863 (59)	248 (50)	1615 (61)	
Hispanic	688 (22)	148 (30)	540 (20)	
Non-Hispanic Black	354 (11)	69 (14)	285 (11)	
Multiracial	152 (5)	21 (4)	131 (5)	
Other	84 (3)	12 (2)	72 (3)	
Marital Status				0.001
Single	1047 (34)	211 (43)	836 (32)	
Married	1427 (46)	181 (37)	1246 (47)	
Partnered	579 (19)	80 (16)	499 (19)	
Other*	77 (3)	22 (5)	55 (2)	
Partner Race/Ethnicity				0.008
Non-Hispanic White	1588 (52)	205 (42)	1383 (54)	
Hispanic	629 (21)	129 (26)	500 (19)	
Non-Hispanic Black	368 (12)	67 (14)	301 (12)	
Multiracial	101 (3)	13 (3)	88 (3)	
Other	38 (13)	76 (16)	308 (12)	
Education				<0.001
Some High School	474 (15)	120 (24)	354 (13)	
High School Graduate or GED	1375 (44)	214 (43)	1161 (44)	
2-Year Community College Graduate	410 (13)	60 (12)	350 (13)	
4-year College Graduate	469 (15)	46 (9)	423 (16)	
Graduate School	275 (9)	27 (5)	248 (9)	
Other	141 (5)	33 (7)	108 (4)	
Insurance				<0.001
KanCare/Medicaid	1633 (52)	284 (57)	1349 (51)	
Private Insurance	927 (30)	104 (21)	823 (31)	
Self-Pay	290 (9)	87 (18)	203 (8)	
Military	142 (5)	6 (1)	136 (5)	
Other**	138 (4)	17 (3)	121 (5)	
Prenatal Care Provider				0.691
Private Provider's Office	1289 (41)	187 (38)	1102 (42)	
Hospital Clinic	1046 (34)	136 (27)	910 (35)	
Community Health Clinic	400 (13)	79 (16)	321 (12)	
County Health Department	179 (6)	69 (14)	110 (4)	
Other	94 (3)	5 (1)	89 (3)	
Clinic at Work or School	32 (1)	4 (1)	28 (1)	
No Prenatal Care	62 (2)	13 (3)	49 (2)	
Provider				0.003*
Used Tobacco in previous 6 months				
No	2716 (87)	415 (83)	2301 (88)	
Yes	407 (13)	86 (17)	312 (12)	

Note: *p*-value <0.05 indicates statistically significant differences between pre- and post-survey responses.

Missing: CBS- race/ethnicity (*n* = 25), marital status (*n* = 32), partner race/ethnicity (*n* = 88), education (*n* = 24), insurance (*n* = 36), prenatal care provider (*n* = 59), tobacco use (*n* = 55). CC- race/ethnicity (*n* = 6), marital status (*n* = 10), partner race/ethnicity (*n* = 14), education (*n* = 4), insurance (*n* = 6), prenatal care provider (*n* = 11), tobacco use (*n* = 3).

* Marital Status-Other: separated, divorced, and widowed.

** Insurance-Other: includes Managed Care Organization/Marketplace.

0.001). In addition, significantly more birthing persons planned to breastfeed (pre = 82 % vs post = 85 %; *p* = 0.001) and knew at least three local breastfeeding resources (pre = 18 % vs post = 47 %; *p* < 0.001) following the Crib Clinic.

The majority felt more confident in their abilities related to safe sleep (87 %–93 %), breastfeeding (81 %), and tobacco avoidance (86 %) following the Crib Clinic (Table 3). In addition, most participants were satisfied (18 %) or very satisfied (79 %) with the event.

3.4. Crib clinics compared to community baby showers

Significant differences were observed between Crib Clinic and CBS participants related to marital status, primary language spoken, tobacco use, education level and insurance coverage (all *p* < 0.01). In addition, significant differences were observed for partner race/ethnicity as reported by participants (*p* = 0.008).

Crib Clinic outcomes differed from CBS outcomes on several variables. Crib Clinic participants were significantly more likely than CBS attendees to intend to only include safe items in the infant sleep environment (95 % vs 93 %; *p* = 0.028) and to feel more confident in their ability to do so (87 % vs 83 %; *p* = 0.040). For both groups, loose blankets and bumper pads were the most common items still reported on the post-test.

Crib Clinic attendees were less likely to plan to breastfeed (85 % vs 91 %; *p* = 0.001) or know at least three local breastfeeding resources (47 % vs 52 %; *p* = 0.033) and were more likely to intend to have second-hand tobacco exposure (7 % vs 4 %; *p* = 0.007). Crib Clinic participants were less likely to report being very satisfied with the overall event compared to CBS attendees (79 % vs 84 %; *p* = 0.002).

4. Discussion and conclusion

4.1. Discussion

Few community-level interventions have been identified that provide an opportunity to engage in robust discussion regarding the AAP safe sleep recommendations. The KIDS Network Safe Sleep Crib Clinics were developed as an alternative to the group education format of CBSs, especially for rural areas where there are fewer pregnant persons. Surprisingly, results of this study suggest Crib Clinics were more likely held in urban areas than rural. This may be partially explained by the COVID-19 pandemic and restrictions on group gatherings during a portion of the study. It may also reflect a broader need for individualized education formats due to the SSI's employment capacity. For example, home visitors and case managers can easily incorporate Crib Clinics into the existing infrastructure for parent education, whereas community-based group educational events (CBSs) may not be within the organizations' capacities.

Participant characteristics may also have played a role. Birthing persons who attended Crib Clinics were significantly more likely to report demographics associated with increased risk of poor birth outcomes and infant mortality, including tobacco dependence, lower education, unmarried and Medicaid or self-pay [1,24]. Participants with these characteristics may experience barriers to attending CBSs due to transportation issues, inability to take time off work, and childcare challenges. The ability to offer flexible times and virtual options, such as with the Crib Clinics, may increase the likelihood that priority populations engage in safe sleep education.

Table 2
Changes in Outcomes.

	Crib Clinic (n = 504)			Community Baby Shower (n = 2668)			
	Pre-Survey	Post-Survey	Within Group Differences	Pre-Survey	Post-Survey	Within Group Differences	Between Group Differences
	n (%)	n (%)	p	n (%)	n (%)	p	p
Safe Sleep Practices							
Safe Sleep Position (back only)	371 (76 %)	483 (99 %)	<0.001	2121 (84 %)	2480 (98 %)	<0.001	0.310
Safe Sleep Surface (crib, portable crib, or bassinet only)	392 (79 %)	483 (97 %)	<0.001	2253 (87 %)	2502 (97 %)	<0.001	0.997
Safe crib items (firm mattress, fitted sheet, or wearable blanket)	274 (58 %)	450 (95 %)	<0.001	1648 (69 %)	2230 (93 %)	<0.001	0.028*
Have or plan to discuss safe sleep with others	217 (55 %)	488 (99 %)	<0.001	1722 (68 %)	2510 (99 %)	<0.001	0.941
Know at least one person who will support safe sleep	–	457 (98 %)	–	–	2508 (99 %)	–	0.182
Smoking Exposure and Knowledge of Resources							
Secondhand exposure in home or car			0.004			<0.001	0.007
Yes	56 (11)	34 (7)		254 (10)	106 (4)		
No	431 (89)	453 (93)		2252 (90)	2400 (96)		
Know ≥ 3 ways to avoid secondhand exposure			<0.001			<0.001	0.980
Yes	307 (63)	467 (96)		1840 (74)	2366 (96)		
No	181 (37)	21 (4)		630 (26)	104 (4)		
Know ≥ 3 resources for tobacco cessation			<0.001			<0.001	0.540
Yes	50 (11)	183 (38)		380 (16)	846 (37)		
No	426 (89)	293 (62)		1915 (84)	1449 (63)		
Breastfeeding Intention and Knowledge of Resources							
Intend to breastfeed			0.001			0.010	0.001
Yes	395 (82)	412 (85)		2235 (90)	2256 (91)		
No	87 (18)	70 (15)		252 (10)	231 (9)		
Know ≥ 3 resources for breastfeeding			<0.001			<0.001	0.033
Yes	92 (18)	224 (47)		672 (28)	1262 (52)		
No	386 (24)	254 (53)		1766 (72)	1176 (48)		

Note: p-value <0.05 indicates statistically significant differences between pre- and post-survey responses.

Missing data: CBS- position (n = 129), surface (n = 83), items (n = 263), discuss (n = 134), know one person (n = 126); secondhand exposure (n = 162), avoid secondhand exposure (n = 198), tobacco resources (n = 343), breastfeeding intention (n = 181), breastfeeding resources (n = 230). CC- position (n = 14), surface (n = 5), items (n = 30), discuss (n = 11), know one person (n = 37), secondhand exposure (n = 17), avoid secondhand exposure (n = 16), tobacco resources (n = 28), breastfeeding intention (n = 22), breastfeeding resources (n = 118).

Despite the difference in populations served, both Crib Clinics and CBS significantly increased knowledge, intentions and confidence related to infant safe sleep, breastfeeding and tobacco avoidance between pre- and post-test. However, a few differences in outcomes were identified between groups. While the majority of both groups intended to only include safe items in the sleep environment at post-test, the proportion of Crib Clinic participants was significantly higher (95 % vs 93 %; $p = 0.028$). Crib Clinic participants also were significantly more likely to report being confident in their ability to do so (87 % vs 83 %; $p = 0.040$). These differences may indicate individual education offers better opportunities to address barriers to removing “clutter” from cribs (e.g., loose blankets, bumper pads).

In contrast Crib Clinic participants were less likely to report intention to breastfeed and more likely to intend to have second-hand smoke exposure. In terms of breastfeeding, there is strong evidence that low maternal education and tobacco use are associated with lower odds of breastfeeding initiation and continuation [25]. In addition, there is some evidence second-hand smoke exposure is associated with breastfeeding discontinuation prior to six months [26]. Due to demographic and outcome differences in these areas, enhancing Crib Clinic content around breastfeeding and tobacco avoidance may further improve knowledge and intention outcomes, and ultimately, reduce SUID as both tobacco avoidance and breastfeeding reduce risk [7].

It is important to recognize parent sleep choices and other individual factors are not the only contributors to SUID. Differences in rural/urban infant mortality have been shown by race, but these differences have

been associated with factors including structural racism. Rural inequities between black and white infant mortality appear to be specifically related to education, employment and home ownership [27]. These social determinants of health must also be addressed to truly impact infant mortality. In addition, critical steps in influencing infant sleep decisions include consistent messaging [28,29] and establishing social norms [30]. To address consistent messaging, the SSI program also certifies SSIs to educate professionals (e.g., healthcare workers, childcare workers, first responders [10–12; C.R. Ahlers-Schmidt, unpublished manuscript, 2024] to ensure knowledge and tools to promote the AAP Safe Sleep Recommendations. Individual-level safe sleep education has often been left to physicians and clinicians to incorporate during outpatient clinical appointments or during the very brief period of hospitalization for delivery [7]. However, education from these sources can be incomplete or include inaccuracies [29,31–33], demonstrating the need for continuing education for professionals.

CBS participants were significantly more likely to report feeling very satisfied with the event (79 % vs 84 %; $p = 0.002$). Several factors may have influenced this difference. CBSs are facilitated with a celebratory focus, including decorations and refreshments, while Crib Clinics do not tend to have the same atmosphere. In addition, CBSs offer an opportunity to socialize with other pregnant persons and to establish social norms through group interactions which may have led to greater satisfaction with this format.

Table 3
Confidence in Ability to Engage in Risk Reduction Strategies.

	Crib Clinic (n = 504)	Community Baby Shower (n = 2668)	Between Group Differences
	n (%)	n (%)	p
Get baby to sleep on his/her back			0.425
Less confident	7 (1)	17 (1)	
No change	46 (9)	293 (11)	
More confident	443 (89)	2263 (88)	
Have baby sleep in my room, but separate crib, portable crib, or bassinet			0.140
Less confident	2 (<1)	18 (1)	
No change	53 (11)	328 (13)	
More confident	443 (89)	2225 (87)	
Keep loose blankets out of crib			0.040
Less confident	15 (3)	75 (3)	
No change	50 (10)	360 (14)	
More confident	433 (87)	2140 (83)	
Avoid secondhand smoke			0.261
Less confident	8 (2)	31 (1)	
No change	63 (13)	390 (15)	
More confident	428 (86)	2156 (84)	
Breastfeed only			0.333
Less confident	7 (1)	16 (1)	
No change	89 (18)	437 (17)	
More confident	399 (81)	2107 (82)	
Follow safe sleep recommendations even when people give different advice			0.165
Less confident	2 (<1)	7 (<1)	
No change	28 (6)	203 (8)	
More confident	431 (93)	2274 (92)	

Missing data: CBS- sleep on back ($n = 95$), location ($n = 97$), loose blankets ($n = 93$), secondhand smoke ($n = 93$), breastfeed ($n = 108$), follow recommendations ($n = 184$). CC- sleep on back ($n = 8$), location ($n = 6$), loose blankets ($n = 6$), secondhand smoke ($n = 5$), breastfeed ($n = 9$), follow recommendations ($n = 43$).

4.1.1. Limitations

This study is not without limitations. First, events took place in Kansas, a Midwestern state, so results may not be generalizable to other regions. All data is self-reported, which may result in response bias, such as, social desirability bias. In addition, completion of individual items was voluntary and resulted in missing data. Some communities offered both Crib Clinics and CBSs, allowing participant choice in the education format while other communities offered only one option; COVID-19 also impacted the frequency and format of these events. No behavioral outcomes were measured related to infant sleep decisions. Follow up studies using surveys, interviews, or optimally, in-home observation are needed to assess behavioral outcomes of participants. Future studies should also include randomized controlled trials to assess intervention effectiveness.

4.2. Innovation

While the intention of this study was to identify a strategy for expanding the CBS content to better meet the needs of birthing persons and families in rural settings, results suggested the ability to shift the content delivery method based on group size was important in both rural and urban settings. The innovation of this project lies in the successful

reformatting of group education focused on disseminating evidence-based practices regarding SUID risk reduction strategies to individual education for persons who are not equitably served by perinatal services and programs (e.g., rural settings, transportation barriers). The education developed for this study is also innovative in that it was delivered at the community level, outside of clinical care environments (e.g., pediatrician's office) where safe sleep education traditionally takes place. Crib Clinics are successful in the dissemination of information to groups who have been economically and socially marginalized by trusted individuals within their own communities.

4.3. Conclusions

Overall Crib Clinics appear to be an effective tool in increasing knowledge, intentions and confidence related to safe sleep, tobacco avoidance and breastfeeding in both urban and rural locations. These individual education events may offer a level of flexibility (e.g., time, format) that increases accessibility to safe sleep education for families. Integration of education on tobacco avoidance and breastfeeding benefits helps promote these behaviors, but additional focus on these areas may be warranted.

Ethics approval

This project involved secondary analysis of deidentified program data and was reviewed by the University of Kansas Medical Human Subjects Committee who determined it not human subject research.

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CRedit authorship contribution statement

Carolyn R. Ahlers-Schmidt: Writing – review & editing, Writing – original draft, Visualization, Methodology, Funding acquisition, Conceptualization. **Christy Schunn:** Writing – review & editing, Supervision, Methodology, Funding acquisition, Conceptualization. **Ashley M. Hervey:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis, Data curation, Conceptualization. **Maria Torres:** Writing – review & editing, Resources, Project administration, Methodology, Investigation, Conceptualization.

Declaration of competing interest

None.

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References

- [1] Ely DM, Driscoll AK. Infant mortality by selected maternal characteristics and race and Hispanic origin in the United States, 2019-2021. *Natl Vital Stat Rep* 2024;73(3):1-9.
- [2] Ehrental DB, Kuo HD, Kirby RS. Infant mortality in rural and nonrural counties in the United States. *Pediatrics* 2020;146(5):e20200464. <https://doi.org/10.1542/peds.2020-0464>.
- [3] Mohamoud YA, Kirby RS, Ehrental DB. Poverty, urban-rural classification and term infant mortality: a population-based multilevel analysis. *BMC Pregnancy Childbirth* 2019;19(1):40. <https://doi.org/10.1186/s12884-019-2190-1>.
- [4] Womack LS, Rossen LM, Hirai AH. Urban-rural infant mortality disparities by race and ethnicity and cause of death. *Am J Prev Med* 2020;58(2):254-60. <https://doi.org/10.1016/j.amepre.2019.09.010>.
- [5] Centers for Disease Control and Prevention. Sudden unexpected death and sudden infant death syndrome. <https://www.cdc.gov/sids/index.htm>; 2023 [accessed 4 April 2024].
- [6] Shapiro-Mendoza CK, Palucci VJ, Hoffman B, et al. Half century since SIDS: a reappraisal of terminology. *Pediatrics* 2021;148(4):e2021053746. <https://doi.org/10.1542/peds.2021-053746>.
- [7] Moon RY, Carlin RF, Hand I. Task force on sudden infant death syndrome and the committee on fetus and newborn. Evidence base for 2022 updated recommendations for a safe infant sleeping environment to reduce the risk of sleep-related infant deaths. *Pediatrics* 2022;150(1):e2022057991. <https://doi.org/10.1542/peds.2022-057991>.
- [8] Kansas Department of Health and Environment. Bureau of Epidemiology and Public Health Informatics, Division of Public Health. Kansas Infant Mortality and Stillbirth Report, 2021. <https://www.kdhe.ks.gov/DocumentCenter/View/29631/Infant-Mortality-Report-2021-PDF>; 2023 [accessed 11 April 2024].
- [9] Kobach KW. Kansas Child Death Review Board Report 2023. https://www.ag.ks.gov/docs/default-source/reports/scdrb/2023-scdrb-annual-report-final.pdf?sfvrsn=e98abf1a_4;_2023.
- [10] 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):296-9. <https://doi.org/10.1016/j.sleh.2017.05.010>.
- [11] 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):185-91. <https://doi.org/10.1007/s10900-018-0571-4>.
- [12] Ahlers-Schmidt CR, Schunn C, Hervey AM, et al. Infant safe sleep promotion: increasing capacity of child protective services employees. *Int J Environ Res Public Health* 2021;18(8):4227. <https://doi.org/10.3390/ijerph18084227>.
- [13] Ahlers-Schmidt CR, Schunn C, Hervey AM, Dempsey M, Blackmon S, Davis B, et al. Redesigned community baby showers to promote infant safe sleep. *Health Educ J* 2020;79(8):888-900. <https://doi.org/10.1177/0017896920935918>.
- [14] Ahlers-Schmidt CR, Schunn C, Dempsey M, Blackmon S. Evaluation of community baby showers to promote safe sleep. *Kans J Med* 2014;7(1):1-5. <https://journals.ku.edu/kjm/article/view/11476/10883>.
- [15] Ahlers-Schmidt CR, Schunn C, Lopeze V, Kraus S, Blackmon S, Dempsey M, et al. A comparison of community and clinic baby showers to promote safe sleep for populations at high risk for infant mortality. *Glob Pediatr Health* 2016;3. <https://doi.org/10.1177/2333794X15622305>. 2333794X15622305.
- [16] Ahlers-Schmidt CR, Schunn C, Hervey AM, Torres M, Cordoba AP. Safe sleep community baby showers to reduce infant mortality risk factors for women who speak Spanish. *Sleep Health* 2021;7(5):603-9. <https://doi.org/10.1016/j.sleh.2021.07.002>.
- [17] Ahlers-Schmidt CR, Schunn C, Hervey AM, Torres M, Nelson JEV. Promoting safe sleep, tobacco cessation, and breastfeeding to rural women during the COVID-19 pandemic: quasi-experimental study. *JMIR Pediatr Parent* 2021;4(4):e31908. <https://doi.org/10.2196/31908>.
- [18] Becker MH. The health belief model and personal health behavior. *Health Educ Monogr* 1974;2:324-508.
- [19] Janz NK, Becker MH. The health belief model: a decade later. *Health Educ Q* 1984;11(1):1-47.
- [20] Kansas Department of Health and Environment. Bureau of Epidemiology and Public Health Informatics, Division of Public Health. Preliminary Birth Report Kansas, 2022. <https://www.kdhe.ks.gov/DocumentCenter/View/29633/Preliminary-Birth-Report-2022-PDF>; 2023 [accessed 11 April 2024].
- [21] FrameWorks Institute. Framing essentials: beware of mythbusting. <https://frameworxuk.org/resources/beware-of-mythbusting/>; 2022 [accessed 11 April 2024].
- [22] 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):377-81. <https://doi.org/10.1016/j.jbi.2008.08.010>.
- [23] 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. <https://doi.org/10.1016/j.jbi.2019.103208>.
- [24] Elder TE, Goddeeris JH, Haider SJ. Racial and ethnic infant mortality gaps and the role of socio-economic status. *Labour Econ* 2016;43:42-54. <https://doi.org/10.1016/j.labeco.2016.04.001>.
- [25] Cohen SS, Alexander DD, Krebs NF, et al. Factors associated with breastfeeding initiation and continuation: a Meta-analysis. *J Pediatr* 2018;203:190-196.e21. <https://doi.org/10.1016/j.jpeds.2018.08.008>.
- [26] Suzuki D, Wariki WMV, Suto M, et al. Secondhand smoke exposure during pregnancy and Mothers' subsequent breastfeeding outcomes: a systematic review and Meta-analysis. *Sci Rep* 2019;9(1):8535. <https://doi.org/10.1038/s41598-019-44786-z>.
- [27] Owens-Young J, Bell CN. Structural racial inequities in socioeconomic status, urban-rural classification, and infant mortality in US counties. *Ethn Dis* 2020;30(3):389-98. <https://doi.org/10.18865/ed.30.3.389>.
- [28] Oden RP, Joyner BL, Ajao TI, Moon RY. Factors influencing African American mothers' decisions about sleep position: a qualitative study. *J Natl Med Assoc* 2010;102(10):870-80. [https://doi.org/10.1016/s0027-9684\(15\)30705-7](https://doi.org/10.1016/s0027-9684(15)30705-7).
- [29] Von Kohorn I, Corwin MJ, Rybin DV, Heeren TC, Lister G, Colson ER. Influence of prior advice and beliefs of mothers on infant sleep position. *Arch Pediatr Adolesc Med* 2010;164(4):363-9. <https://doi.org/10.1001/archpediatrics.2010.26>.
- [30] Moon RY, Carlin RF, Cornwell B, et al. Implications of Mothers' social networks for risky infant sleep practices. *J Pediatr* 2019;212:151-158.e2. <https://doi.org/10.1016/j.jpeds.2019.05.027>.
- [31] Colson ER, McCabe LK, Fox K, et al. Barriers to following the care-to-sleep recommendations: insights from focus groups with inner-city caregivers. *Ambul Pediatr* 2005;5(6):349-54. <https://doi.org/10.1367/A04-220R1.1>.
- [32] Colson ER, Levenson S, Rybin D, et al. Barriers to following the supine sleep recommendation among mothers at four centers for the women, infants, and children program. *Pediatrics* 2006;118(2):e243-50. <https://doi.org/10.1542/peds.2005-2517>.
- [33] Pease A, Ingram J, Blair PS, Fleming PJ. Factors influencing maternal decision-making for the infant sleep environment in families at higher risk of SIDS: a qualitative study. *BMJ Paediatr Open* 2017;1(1):e000133. <https://doi.org/10.1136/bmjpo-2017-000133>.