Use of Text Messaging and Facebook Groups to Support the Healthy Children, Strong Families 2 Healthy Lifestyle Intervention for American Indian Families

Emily J Tomayko,[1] Eliza J Webber,[1] Kate A Cronin,[2] Ronald J Prince,[3] and Alexandra K Adams[1]

[1]Center for American Indian and Rural Health Equity, Montana State University, Bozeman, MT, USA; [2]Department of Surgery, School of Medicine and Public Health, University of Wisconsin, Madison, WI, USA; and [3]Department of Population Health, School of Medicine and Public Health, University of Wisconsin, Madison, WI, USA

ABSTRACT

Background: Few obesity interventions have been developed for American Indian (AI) families despite the disproportionate risk of obesity experienced within AI communities. The emergence of mobile technologies to enhance intervention delivery could particularly benefit AI communities, many of which are hard to reach and underserved.

Objectives: This study aimed to assess the use and perceptions of text messaging and Facebook to support delivery of the Healthy Children, Strong Families 2 (HCSF2) mailed healthy lifestyle/obesity prevention intervention and discuss lessons learned regarding intervention support via these platforms among AI participants.

Methods: From among AI families with young children (ages 2–5 y), 450 adult-child dyads were recruited from 5 rural and urban communities for a year-long intervention. Intervention content was delivered by mail and supported by text messaging and optional Facebook groups. Participants provided feedback on text message and Facebook components post-intervention, and Facebook analytic data were tracked.

Results: Self-report feedback indicated high satisfaction with both text messaging and Facebook, with tangible content (e.g., recipes, physical activity ideas) cited as most useful. Overall, participants reported higher satisfaction with and perceived efficacy of Facebook content compared with text messaging. Analytic data indicate the optional HCSF2 Facebook groups were joined by 67.8% of adult participants. Among those who joined, 78.4% viewed, 50.8% "liked," and 22.6% commented on ≥1 post. Engagement levels differed by urban-rural status, with more urban participants "liking" ($P = 0.01$) and commenting on posts ($P = 0.01$). Of note, nearly one-third of participants reported changing phone numbers during the intervention.

Conclusions: This study demonstrates high satisfaction regarding mobile delivery of HCSF2 intervention support components. Best practices and challenges in utilizing different mobile technologies to promote wellness among AI families are discussed, with particular focus on urban-rural differences. Future mobile-based interventions should consider the context of unstable technology maintenance, especially in low-resource communities. This work is part of the HCSF2 trial, which is registered at clinicaltrials.gov (NCT01776255). *Curr Dev Nutr* 2021;5:nzaa110.

Introduction

American Indian (AI) families experience a disproportionately high prevalence of obesity compared with the general US population (1). Although estimates vary, recent studies suggest nearly 30% of AI children

and 37% of adults have obesity (2, 3). By age 2–5 y, AI children already have a 50% higher overweight and obesity prevalence than non-AI US children of the same age (2, 4). Such high overweight and obesity rates can be attributed to an array of complex reasons, including poverty, stress, historic trauma, and limited access to healthy foods and physical

activity opportunities. However, few obesity interventions have been developed to target AI families (5), and many AI communities remain underserved. The emergence of mobile technologies, such as phones, tablets, and laptops, offers new and promising opportunities to enhance the delivery of health information and health promotion programs, especially in hard-to-reach and underserved communities. Given the limited health services and high burden of disease faced by many AI communities, delivery of programming via mobile technologies could be of particular benefit.

Text messaging is the most frequently used method for communicating among Americans ages <50 y (6), and public health interventionists are increasingly adapting this form of communication as a strategy to improve health outcomes. A recent systematic review found most published text messaging interventions were effective when addressing health outcomes such as diabetes management, weight loss, physical activity, smoking cessation, and medication adherence (7). Although text messaging can be an effective health promotion communication tool among the general population, less is known regarding the use of text messaging interventions in AI communities. One recent pilot study found text messaging to be a feasible option for communicating nutrition, physical activity, sleep, and screen time information to AI parents of children ages 3–5 y (8). However, the study duration was short (5 wk) and the sample size was small ($n = 17$), limiting the generalizability of results.

Social media platforms are also popular forms of communication, with 72% of Americans reporting current use of ≥1 social media platform and 69% using Facebook, specifically (9). However, a review of previously published systematic reviews on interactive social media interventions to promote health equity found mixed effects on health outcomes (10). The reviewers concluded that more research is needed on the effects of utilizing established social media platforms (e.g., Facebook) on health outcomes among disadvantaged populations (10). Another recent systematic review of mobile health promotion among underserved and minority groups described a small number of studies in which mobile platforms were used successfully to deliver health messaging or recruit participants for health promotion studies. However, these studies were predominantly in urban settings, and AI populations were not represented in any of the included studies (11).

Use of mobile platforms like texting and social media to successfully promote health outcomes can be affected by the surrounding environment, particularly when considering differences in rural and urban environments (12, 13). Rural environments are often underresourced with limited healthcare facilities. Rural residents experience poorer health outcomes compared with urban residents, and therefore can be especially in need of mobile health interventions (14, 15). At the same time, limited cell reception and slow internet speeds in rural areas can limit the feasibility and acceptance of these technology platforms.

Healthy Children, Strong Families 2 (HCSF2) was a research-based healthy lifestyle/obesity prevention intervention for AI families with preschool-age children, nationally tested in 5 urban and rural communities (16). The mailed intervention expanded upon the initial Healthy Children Strong Families study design (17), which targeted fruit/vegetable intake, sugar intake, physical activity, and screen time, to include additional study targets of stress and sleep and to enhance delivery of the mailed intervention materials via text messaging and Facebook groups. The overall objective of the HCSF2 intervention was to improve weight status and obesity-related health behaviors of adult and child participants. The objective of this current study was to assess the use and perceptions of text messaging and Facebook groups to enhance delivery of the HCSF2 mailed intervention, compare differences in the perceptions and use of these platforms between urban and rural participants, and to discuss lessons learned regarding intervention support via these platforms among AI participants. The comparison of urban and rural participants was of particular interest because we previously demonstrated sociodemographic and behavioral differences among these groups within the HCSF2 study population (18, 19).

Methods

Participants
The methods and intervention results for the HCSF2 randomized controlled trial have been previously described (16, 17, 20). Briefly, 450 adult-child dyads were recruited from among AI families with young children (2–5 y old) living in 5 rural and urban communities. The study communities ranged in population density from 3.5 to 32 people per square mile for the 4 rural sites ($n = 240$ dyads) and ∼3000 people per square mile for the urban site ($n = 210$ dyads), corresponding to total populations of ∼8000–19,000 for the rural sites and ∼560,000 for the urban site. Participants were randomly allocated to either the intervention group (Wellness Journey) or a child-safety focused control group (Safety Journey) after stratifying by child weight status. Inclusion criteria included a working cell phone; of the 502 interested families who were screened for the study, only 4 were excluded for not having a cell phone or text plan (<1.0%). Data suggest ∼80% of the broader AI/AN (American Indian/Alaska Native) community had regular access to cell phones around the time of study initiation (21).

Intervention delivery
For 1 y, participants in the intervention group received monthly mailed packages containing printed parent-focused wellness lessons, activities, and support materials (e.g., measuring cups, jump ropes, exercise DVD, apple corer, recipe book), and children's materials, including toys, games, and a book addressing 1 of the 6 intervention targets: increase fruit/vegetable consumption, decrease added sugar intake, increase physical activity, decrease screen time, manage stress, and improve sleep habits. The mailed materials were intended for use among the entire family.

Text messaging and Facebook group support
As a supplement to the mailed intervention delivery, a social support component of the intervention was delivered through text messages and optional Facebook groups intended for the adult participants. Text messages were sent twice weekly throughout the intervention and addressed the intervention targets. Text message content was timed to align with each monthly lesson. Participants enrolled in the study on a rolling basis and started with Lesson 1 and the corresponding Lesson 1 text messages. Of the 12 monthly lessons, 5 focused on diet, 2 on physical activity, 1 on screen time, 1 on stress, 1 on sleep, and 2 were mixed focus. Text messages were limited in length to 170 characters, including identification of the text as coming from the HCSF2 intervention. Text message content was developed in collaboration with community partners, and the

TABLE 1 Sample text messages and Facebook posts delivered in support of the Healthy Children, Strong Families 2 intervention

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Sample text messages

  Tasty Tip! When you make quick breads or muffins—freeze the extra loaf or extra muffins. When you're having a crazy week—just pull them out and breakfast or snacks are D-O-N-E.

  Snack Attack! Peel a banana and dip in yogurt. Roll in crushed cereal and freeze. Make these the night before and they'll be perfect for after school snacking! Don't forget to check Facebook for new snack recipes.

  Walk tall as the trees. Live strong as the mountains. Be gentle as the spring winds. Keep the warmth of the summer sun in your heart, and the great spirit will always be with you.

  Piles of fun! Leaves are falling. Have your kids help rake them into big piles, then jump into them. Mom and Dad can get into the fun, too!

  Turn house cleaning into a race—assign each kid one chore and see who can finish first.

  Grab the kids and turn up the volume on the radio. Jump up and down, touch your toes, boogie 'til the cows come home!

  Active kids are happy kids! Being active gives kids a chance to socialize, will help them feel good, and kids who are physically active every day will sleep better, too!

Sample Facebook posts (text only provided here, photos often were included)

  Does it take you forever to fall asleep because you're rehashing a bad day or worrying about all the things on your to-do list for tomorrow? Try doing a challenging mental task that completely forces you to concentrate, like counting backward by threes from 535. If you try this, let us know how it goes (after you wake up, that is!)

  Did you know that if you give your kids caffeinated drinks, especially in the evening, that this can reduce the quality of their sleep and then they can be drowsy during the day? Caffeine can be found in soda, bottled and brewed teas, even some drinks you make from powder, like some types of Crystal Light. Best bets? Milk or water.

  Can't beat this snack recipe—cheap, easy and healthy! If you've never tried chickpeas this will get you hooked! Chickpeas are also used to make hummus and are great in soups and on salads. Crunchy Taco Chickpeas (recipe was included)

  Are you going to be on the go this summer? Here's an idea for your next road trip. Reuse an old plastic peanut butter jar and fill partway with low fat peanut butter, lite ranch dip, or another favorite dip, then stick in carrots and celery sticks. Or try $\frac{1}{2}$ cup low fat plain yogurt or $\frac{1}{4}$ cup peanut butter and a tablespoon of honey with some apple slices. Make sure you've got room in the cooler and you're good to go. Happy trails!

  Instead of doing nothing because I am overwhelmed, today I will do something even if it is small because it will be one step closer to my goal. Progress is progress. Let us know how you're doing with your family goal this month! We love to hear from you.

  Since this is a leap year, we get an extra day in February. Celebrate by playing "Leap the Creek"! Lay two sticks or pieces of rope parallel to each other to form a gap for your child to jump over. Have your kids "leap the creek." Keep making the creek wider, a little at a time, to see how far your child can jump before "falling in." Mom and Dad can get in on the fun, too!

  Interested in yet another FREE event? Come participate in the Just Move It Series at [Community A]! Registration begins at 5:30 PM and the walk/run starts at 6 PM. You can choose to walk or run and your distance of 1.5 miles or 3 miles. Team Healthy Children Strong Families! Let me know if you have any questions. See you there! (posted by local site coordinator)

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timed delivery was managed by the mobile research and communications technology company TargetMobi.

Adult participants also were invited to join private/closed, site-specific Facebook groups. Prior focus groups conducted by our group cited fighting and bullying through Facebook as common practices in the study communities, which are primarily small, rural, reservation-based communities (20). Given our awareness of this issue, the Facebook component of the intervention was optional, and the HCSF2 pages were monitored by the central study coordinator and local site coordinators to mitigate any potential misuse. Only those invited to join the private groups were able to view the posts. In addition to protecting participant privacy, we did not allow sharing of content as a measure to prevent cross-contamination of the control group within each community. During the initial in-person study/data collection visit, participants were asked if they were interested in joining the Facebook group. If so, they were added to the group at that time by the local site coordinator so that both the participant and coordinator could verify the request to join was successful. Site coordinators also were continually available to provide assistance, if needed.

The central coordinator posted intervention-supporting information to the Facebook groups that applied broadly to all participating communities (e.g., healthy recipes, sleep tips), whereas local site coordinators posted community-specific information (e.g., announcements of local wellness events, community gatherings, local resources). The content posted to each site's Facebook group was almost entirely identical, with local posts constituting ~5% of all content posted. One exception was recipes using traditional ingredients that were specific to that tribe or location; these recipes were submitted by the local site coordinators at the beginning of the intervention and slotted into the delivery schedule.

Facebook posts were made every Monday, Wednesday, and Friday throughout the intervention. Facebook posts addressed the same intervention targets but were delivered in a more random fashion, as people joined the Facebook groups on a rolling basis. Although the length of posts varied, the majority were short (50–100 words) and contained a picture. Among the postings to the 5 site group pages throughout the intervention, the postings were categorized as follows: 45.3% were diet/recipes, 16.2% were physical activity related, 15.8% were miscellaneous, 9.5% addressed stress, 6.0% addressed sleep, 3.1% were TV/screen time related, 2.9% focused on goal-setting, and 1.2% were poll questions. Sample text messages and Facebook posts are listed in Table 1. The content of text messages and Facebook posts was reviewed by local site coordinators to ensure cultural sensitivity and appropriateness.

All protocols were approved by the University of Wisconsin Institutional Review Board and applicable tribal review boards; conduct of the study followed the approved protocols. All participants provided written consent for themselves and the participating child. Moreover, all aspects of the study were overseen by a formal data safety monitoring committee.

Data collection

Two types of data were collected: *1*) a post-intervention exit survey on experiences with both text messaging and Facebook groups during HCSF2; and *2*) analytic data on all Facebook activity. For the exit survey, participants were invited to provide feedback at the end of the year-long intervention. The exit survey contained 25 Likert scale and open response questions soliciting participants' feedback on the overall HCSF2 program, including 12 questions on participants' experiences with the text messaging and HCSF2 Facebook group. These 12 questions addressed overall satisfaction with the text messages and Facebook posts, thoughts on the frequency and helpfulness of the texts and posts, and self-reported level of engagement with each. For the analytic data, all Facebook group activity was tracked throughout the intervention to record dates and content of each post along with corresponding views, "likes," and comments.

Statistical analysis

Descriptive statistics were prepared as numbers and percentages for the following categorical outcome variables: *1*) variables from self-reported data, including satisfaction with text messages, helpfulness of text messages, frequency of text messages, most helpful text message content, change of cell phone number, viewed Facebook posts, reasons for not viewing Facebook posts, Facebook group engagement, devices used to view Facebook, satisfaction with Facebook posts, helpfulness of Facebook posts, frequency of Facebook posts, most useful Facebook post content; and *2*) variables from Facebook analytic data, including viewed posts, liked posts, commented on posts, and posted content.

Dichotomous "dummy" variables (coded as 1, 0, or missing) were created for each categorical response level. Differences between urban and rural subgroups were examined for each discrete outcome using Pearson χ^2 test statistic, with Fisher exact test for cell counts <5. Missing values were not included in the analysis.

Descriptive statistics were prepared as means and SDs for the following count variables: number of Facebook posts viewed, number of likes, number of comments, and number of Facebook posts initiated. All count variables were derived from analytic tracking data. Negative binomial regression with Wald χ^2 test statistic was used to assess urban-rural differences in the mean rates of count outcomes. All analyses were conducted using SAS 9.4 (SAS Institute Inc.) with a 2-tailed significance level of 0.05.

Results

Postintervention exit survey

Among the 450 adult HCSF2 participants, 369 completed the exit survey after the year-long intervention regarding participant experience with both text messaging and Facebook groups. Among these respondents, 329 (89.2%) were mothers, 11 (3.0%) were fathers, 22 (6.0%) were grandmothers, 2 (0.5%) were grandfathers, 3 (0.8%) were guardians, and 2 (0.5%) were listed as other caretakers. Adult participant ages ranged from 18 to 65 y, with a mean age of 31.5 ± 8.3 y.

Texting.
Overall, the majority of respondents were either satisfied or very satisfied with the text messages they received (**Table 2**). Most found them

helpful or very helpful in making healthier lifestyle choices. The vast majority thought the frequency of texts was just right, and the most helpful types of messages were cited as those including tips/health information (66.7%) and recipe or activity ideas (58.3%). Text messaging feedback differed by rural/urban status. Respondents living in urban locations were more likely to be very satisfied with the text messages compared with respondents located in rural areas, although this difference was nonsignificant. Urban respondents also were more likely than rural respondents to find the text messages very helpful ($P < 0.01$).

Notably, a substantial proportion of respondents (31.7%) reported changing their cellular phone number during the study period, and urban participants were less likely than rural respondents to have their number change during the study period ($P = 0.02$). The research team was made aware of these changes typically via informal conversations between participants and local site coordinators, who often were known by participants. The study team also received periodic reports from TargetMobi regarding undeliverable messages or were promoted to inquire about phone number changes when attempts to reach participants by phone for study visit reminders were unsuccessful.

Facebook.
Overall, 64.2% of respondents self-reported viewing a post, 54.7% "liking" a post, 25.2% commenting on a post, and 8.7% posting a question to the group, which aligns with the analytic data on actual use (**Table 3**). The most common reasons reported for not viewing HCSF2 group posts were not having a Facebook account (33.3%) and not receiving Facebook notifications when content was posted to the group (22.7%), which would depend on the Facebook settings chosen by each participant. Mobile phone was the most commonly cited device used to view Facebook posts, with 40.7% of respondents viewing Facebook exclusively by phone and 18.4% using a combination of phone and computer/tablet to view Facebook posts. The majority of respondents were satisfied or very satisfied with Facebook posts. Most found Facebook posts at least somewhat helpful in making healthier lifestyle choices. Most found the frequency of posting to be just right, with the most useful types of Facebook posts cited as those including recipes/meal ideas (60.7%) and game/physical activity ideas (49.6%). A higher percentage of urban respondents than rural respondents accessed the Facebook group exclusively by phone ($P < 0.01$). Urban residents were slightly more likely to be very satisfied than rural residents with the Facebook posts ($P = 0.08$) and were twice as likely to find them very helpful than rural residents ($P = 0.03$).

Facebook analytics

Facebook analytics from tracking data are shown in **Table 4**. The HCSF2 site-specific Facebook groups were joined by 67.8% of all adult HCSF2 participants (305/450). Among those who joined the groups, 78.4% viewed ≥1 post, with a mean of 91.5 ± 75.8 posts viewed throughout the intervention year out of ~150 posts/y. Approximately half "liked" ≥1 posts. Comments were posted by 22.6% of participants, and original messages were posted to the group by 6.2% of participants. The Facebook groups were joined in similar proportions by urban and rural participants, and similar proportions of urban and rural participants viewed ≥1 post. Engagement levels differed by urban-rural status, with urban participants more likely to like a post ($P = 0.01$), to post comments ($P = 0.01$), and to post a higher average number of comments

TABLE 2 Participant-reported engagement with and perceptions of Healthy Children, Strong Families 2 intervention support components delivered through text messaging compared by urban/rural community status[1]

	Total re-spondents (n = 369)	Rural re-spondents (n = 206)	Urban re-spondents (n = 163)	P value
Satisfaction receiving text messages, n (%)				
Very satisfied	153 (41.5)	73 (35.4)	80 (49.1)	0.33
Satisfied	140 (37.9)	82 (39.8)	58 (35.6)	0.33
Neither satisfied nor dissatisfied	64 (17.3)	43 (20.9)	21 (12.9)	0.04
Dissatisfied	6 (1.6)	3 (1.5)	3 (1.8)	0.79
Very dissatisfied	2 (0.5)	1 (0.5)	1 (0.6)	0.88
Helpfulness of text messages in making healthier lifestyle choices, n (%)				
Very helpful	102 (27.6)	40 (19.4)	62 (38.0)	<0.01
Helpful	140 (37.9)	81 (39.3)	59 (36.2)	0.36
Somewhat helpful	75 (20.3)	53 (25.7)	22 (13.5)	<0.01
Slightly helpful	30 (8.1)	17 (8.3)	13 (8.0)	0.83
Not helpful	14 (3.8)	7 (3.4)	7 (4.3)	0.71
Frequency of text messages, n (%)				
Too frequent	27 (7.3)	16 (7.8)	11 (6.7)	0.62
Just right	310 (84.0)	169 (82.0)	141 (86.5)	0.84
Too infrequent	23 (6.2)	12 (5.8)	11 (6.7)	0.80
Most helpful text messages (>1 response was allowed), n (%)				
Texts including tips/health information	246 (66.7)	122 (59.2)	124 (76.1)	<0.01
Texts including recipe or activity ideas	215 (58.3)	115 (55.8)	100 (61.3)	0.28
Texts including quotes	57 (15.4)	28 (13.6)	29 (17.8)	0.27
Texts including questions that require a response	47 (12.7)	23 (11.2)	24 (14.7)	0.31
Other	22 (6.0)	7 (3.4)	15 (9.2)	0.02
Cell phone number changed during study period, n (%)	117 (31.7)	75 (36.4)	42 (25.8)	0.02

[1]Percentages might not add to 100 due to missing and nonapplicable values.

than rural participants ($P < 0.01$). Facebook engagement also differed by topic, with diet-related topics receiving the highest number of views and likes per post (34.5 ± 27.4 views/post, 2.4 ± 2.6 likes/post), followed by physical activity (19.1 ± 16.3 views/post, 1.2 ± 1.6 likes/post), poll questions (17.3 ± 9.5, 0.9 ± 1.7), stress (16.3 ± 13.0, 1.3 ± 1.6), miscellaneous posts (14.7 ± 15.1, 1.0 ± 1.7), sleep (14.1 ± 10.8, 1.0 ± 1.3), screen time (12.6 ± 10.4, 0.6 ± 1.1), and goal-related posts (11.8 ± 9.7, 0.8 ± 1.3); these data align with self-report feedback suggesting diet- and activity-related posts were most useful to participants.

Discussion

This article highlights key findings regarding the use and experiences of providing obesity prevention intervention support to AI families through text messaging and Facebook groups. Specifically, this study describes how these platforms were used as part of a comprehensive home-based obesity prevention program in both rural and urban AI communities. Although evidence suggests the use of telehealth has increased access to healthcare among AI populations (22, 23), less is known about the use of mobile technologies in health promotion programs among AI communities. This article adds to the scant literature regarding use of mobile platforms to deliver or support delivery of health promotion interventions for AI communities.

Text messages and Facebook posts were well received by AI families participating in the HCSF2 study. Despite the overall high levels of satisfaction and perceived helpfulness of these intervention components, participants needed to have an active phone number and stable internet connection to receive them. Nearly one-third of participants reported changing phone numbers during the study period, suggesting inconsistent cellular plan coverage and other communication barriers. This high turnover in cell phone numbers has been reported in other minority groups; for example, just 38% of male Latino farmworkers maintained the same phone number in 2012 (the same year HCSF2 was initiated) as they had the prior year (24). Another study found that the vast majority of Americans who are homeless own cell phones; however, 55% changed numbers within a 3-mo period (25). Gonzales et al. (26) explain this phenomenon of cell phone instability through the lens of technology maintenance, arguing that preused or lower quality devices and no-contract plans reduce initial cost barriers to mobile technology access yet contribute to instability in cell phone communication due to device malfunction and frequent number changes. As mobile and electronic healthcare services proliferate, ability to maintain access to technology becomes an increasingly critical factor in determining health outcomes. Rural families in our study experienced higher turnover in cell phone numbers and perceived text messaging to be less satisfactory and helpful than urban families. Thus, texting may be a more reliable and, therefore, more positively perceived form of communication among urban but not rural residents. Still, one-quarter of urban participants changed their phone number during the study period, indicating a need for more stable communication pathways, regardless of urban/rural status.

Facebook could represent a more stable pathway, because people are likely to maintain the same account regardless of the device used to access the account (e.g., cell phone, community computer, personal tablet). Overall, participants reported higher satisfaction with and perceived efficacy of the Facebook content compared with the text

TABLE 3 Participant-reported engagement with and perceptions of Healthy Children, Strong Families 2 intervention support components delivered through Facebook groups compared by urban/rural community status[1]

	Total respondents (n = 369)	Rural respondents (n = 206)	Urban respondents (n = 163)	P value
Did you look at the postings in our HCSF Facebook group?				
Yes	237 (64.2)	119 (57.8)	118 (72.4)	<0.01
No	132 (35.8)	87 (42.2)	45 (27.6)	<0.01
Of those who answered "No," reasons for not looking at postings:				
I am not on Facebook	44 (33.3)	30 (34.5)	14 (31.1)	0.08
I was added to the group, but did not receive notifications when anything was posted	30 (22.7)	19 (21.8)	11 (24.4)	0.39
I was not added to the group	13 (9.8)	11 (12.6)	2 (4.4)	0.05
I did not want to have to be in a group with other people	11 (8.3)	8 (9.2)	3 (6.7)	0.26
I was not interested in the type of content that was posted	9 (6.8)	8 (9.2)	1 (2.2)	0.08
Other	25 (18.9)	11 (12.6)	14 (31.1)	0.07
Self-reported Facebook group engagement				
Posted a question	32 (8.7)	12 (5.8)	20 (12.3)	0.11
Commented on a post	93 (25.2)	42 (20.4)	51 (31.3)	0.16
"Liked" a post	202 (54.7)	94 (45.6)	108 (66.3)	<0.01
Device(s) used to view Facebook				
Phone	150 (40.7)	68 (33.0)	82 (50.3)	<0.01
Computer/tablet	23 (6.2)	13 (6.3)	10 (6.1)	0.95
Both phone and computer/tablet	68 (18.4)	40 (19.4)	28 (17.2)	0.59
Satisfaction with Facebook group posts				
Very satisfied	141 (38.2)	69 (33.5)	72 (44.2)	0.08
Satisfied	124 (33.6)	73 (35.4)	51 (31.3)	0.25
Neither satisfied nor dissatisfied	87 (23.6)	52 (25.2)	35 (21.5)	0.28
Dissatisfied	7 (1.9)	3 (1.5)	4 (2.5)	0.53
Very dissatisfied	1 (0.3)	0 (0.0)	1 (0.6)	0.96
Helpfulness of Facebook posts in making healthier lifestyle choices				
Very helpful	56 (15.2)	21 (10.2)	35 (21.5)	0.03
Helpful	105 (28.5)	57 (27.7)	48 (29.4)	0.32
Somewhat helpful	58 (15.7)	32 (15.5)	26 (16.0)	0.43
Slightly helpful	18 (4.9)	10 (4.9)	8 (4.9)	0.66
Not helpful	2 (0.5)	1 (0.5)	1 (0.6)	0.99
Frequency of Facebook postings				
Too frequent	5 (1.4)	2 (1.0)	3 (1.8)	0.65
Just right	215 (58.3)	109 (52.9)	106 (65.0)	0.64
Too infrequent	17 (4.6)	8 (3.9)	9 (5.5)	0.79
Most useful Facebook posts (>1 response was allowed)				
Recipes/meal ideas	224 (60.7)	111 (53.9)	113 (69.3)	<0.01
Games/activity ideas	183 (49.6)	94 (45.6)	89 (54.6)	0.09
Posts with information	141 (38.2)	65 (31.6)	76 (46.6)	<0.01
Links to healthy lifestyle information	67 (18.2)	24 (11.7)	43 (26.4)	<0.01
Invitations to events	59 (16.0)	37 (18.0)	22 (13.5)	0.25
Being able to connect with other parents	24 (6.5)	11 (5.3)	13 (8.0)	0.31
Polls/surveys	9 (2.4)	5 (2.4)	4 (2.5)	0.98
Documents you had to open	6 (1.6)	2 (1.0)	4 (2.5)	0.28
Other	6 (1.6)	3 (1.5)	3 (1.8)	0.77

[1]Values are n (%). Percentages may not add to 100 due to missing and nonapplicable values. HCSF, Healthy Children, Strong Families.

messaging component. Engagement with Facebook content also differed by urban/rural status, with urban participants more likely to view, "like," comment, and leave questions on posts. Because Facebook access is potentially more stable than text messaging, other factors could have contributed to the urban/rural differences observed here. For example, participants living in rural locations might have been less engaged due to the lack of anonymity because many community members are known to each other. Although the closed Facebook site was monitored by both the central and local site coordinators, the risk of being bullied offline or outside the HCSF2 Facebook page remained. Participants living in

urban areas were recruited from a large urban health center serving AI patients and were significantly less likely to know each other. Higher urban engagement also could have been attributed to higher internet and social media access among urban compared with rural participants. Many rural areas still lack access to high-speed internet and might be slower to adapt to certain technology advancements (27).

Participants found tangible content, such as recipe/meal or physical activity ideas, to be most useful, regardless of messaging platform or urban/rural status. Poll questions were less well received. This finding is in contrast to Edney et al. (28), who described that Facebook posts

TABLE 4 Facebook analytic data on actual participant engagement with Facebook intervention content compared by urban/rural community status

Variables	Total (*n* = 305)	Rural (*n* = 157)	Urban (*n* = 148)	*P* value
Number of participants who…, *n* (%)				
Viewed posts	239 (78.4)	119 (75.8)	120 (81.1)	0.26
"Liked" posts	155 (50.8)	69 (44.0)	86 (58.1)	0.01
Commented on posts	69 (22.6)	26 (16.6)	43 (29.1)	0.01
Posted content	19 (6.2)	7 (4.5)	12 (8.1)	0.19
Mean (±SD) number of…				
Posts viewed	91.5 ± 75.8	88.9 ± 75.6	94.2 ± 176.2	0.76
"Likes"	6.2 ± 15.2	3.9 ± 9.3	8.6 ± 19.3	<0.01
Comments made	0.8 ± 3.0	0.5 ± 1.6	1.2 ± 3.9	<0.01
Posts initiated	0.1 ± 0.7	0.1 ± 0.3	0.2 ± 0.9	0.02

with simple poll questions generated the highest engagement in a physical activity intervention. Lack of anonymity (e.g., the high proportion of participants who knew each other in any given community) could partially explain why Facebook posts containing polls/surveys were less well received in our study. In addition, the ability to connect with other parents was rarely cited as a most useful aspect of the Facebook group. Social media platforms are, by definition, platforms created to facilitate and enhance interpersonal connections. As such, this finding was unexpected, but might be attributed to the personally identifiable nature of Facebook and tendency for bullying among AI communities, as described above. These differences in the perceived efficacy of Facebook compared with text messaging could assist other groups in decision-making regarding how best to allocate resources for program delivery efforts in similar communities (e.g., the choice between a text messaging or social media campaign or both).

Participants in this study were required to have a mobile phone capable of receiving text messages prior to enrolling in the study. However, access to these messages was disrupted due to the high turnover in phone numbers, especially among rural families. Study coordinators adapted to this limitation by utilizing Facebook Messenger as a backup form of communication when arranging visits and other study logistics with participants. This was found to be a more reliable communication pathway, because most study participants retained their Facebook user name throughout various phone number changes (16). A study of Facebook use for a healthy lifestyle program among first-time parents also reported the utility of Facebook for administrative purposes (e.g., study reminders) and reported similar levels of engagement and perceived usefulness of Facebook for program delivery (29).

Future studies might consider using other mobile platforms, such as a dynamic study webpage where participants can choose what name is displayed, or messaging platforms beyond short message service (SMS) texts, such as WhatsApp or Facebook Messenger, which are not linked to a particular phone number or cellular service plan. It is worth noting newer applications, such as WhatsApp, were not available during HCSF2 study administration, which highlights the rapidly changing landscape of social media and messaging technology and trends.

Strengths and limitations

A previous survey of 115 AI patients with diabetes demonstrated patients were very receptive to receiving health education via mobile platforms, regardless of sociodemographic factors (e.g., age, education, sex) (22). Another small study reported on the feasibility of and high engagement with a 5-wk text messaging campaign to support healthy behavior change for AI parents with young children (8). The present study adds to this literature with the longest, largest trial describing text messaging and Facebook support of a healthy lifestyle intervention for AI families, which was delivered over the course of 1 y to 450 families. We also describe differences between urban and rural families, which is noteworthy because the vast majority of AI research focuses on rural, reservation-based communities. This study was limited by collecting feedback on these components at the end of the trial only, which did not allow for text messaging and Facebook content to be tailored mid-intervention. In addition, there could have been response bias, because the site coordinators were often known to participants. However, the analytic data collected via Facebook provided an objective measure of Facebook engagement in addition to the self-report participant feedback survey.

Conclusions

This article demonstrates the experiences regarding support of a mailed healthy lifestyle/obesity prevention intervention using text messaging and Facebook groups to promote wellness in urban and rural AI families. The emergence of mobile- and internet-based health promotion platforms offers new and innovative ways to address health disparities. At the same time, socioeconomic-based differences in disruption-free access to mobile technology could inadvertently perpetuate existing health disparities, and both initial acquisition and long-term maintenance of technology should be considered when planning mobile health delivery of health promotion programs. Future research also should address the most appropriate and effective methods of communication among small communities where many people are known to each other. Given the high use of text messaging and Facebook, these platforms could serve as important avenues of health promotion delivery among AI communities.

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