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Persistent barriers to smoking cessation among urban, underserved women: A feasibility study of tailored barriers text messages

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Abstract

Objectives: Despite health risks for themselves and their children, urban underserved women smoke at high rates postpartum. The postpartum period is a stressful transition time that presents unique barriers to sustained cessation. There is limited extant evidence of efficacious psychosocial programs to maintain postpartum smoking cessation.

Methods: Guided by the Cognitive-Social Health Information Processing model, we explored the feasibility of TxT2Commit, a text-messaging intervention designed to prevent postpartum smoking relapse. Participants (n=43) received supportive cessation-focused text messages for one month postpartum. Using a convergent mixed method design, surveys and interviews assessed changes in psychosocial factors and smoking status through a three month follow-up.

Results: Participants reported satisfaction with TxT2Commit, rating text messages as helpful, understandable, supportive, and not bothersome. However, a majority of women (n=28, 65.1%) relapsed by three months. Participants who stayed smoke free (i.e., non-relapsers) reported significantly less temptation to smoke at one and three months postpartum compared to relapsers (*ps*<.01). While relapsers had significantly less temptation at one month compared to baseline, temptation increased by three months (*p*<.01). Consistent with the quantitative results, qualitative interviews identified informational and coping needs, with continued temptation throughout the three months. Non-relapsers were able to manage temptation and reported greater support.

Conclusions for Practice: TxT2Commit demonstrates preliminary feasibility and acceptability among urban, underserved postpartum women. However, most participants relapsed by three

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months postpartum. Additional research is needed to identify targeted messaging to best help women avoid temptation and bolster support to stay smoke free in this uniquely stressful period.

Keywords

tobacco use cessation; postpartum period; text messaging; vulnerable populations

Smoking during and after pregnancy increases negative maternal and child health risks (Banderali et al., 2015). However, despite overall decreases in prenatal and postpartum smoking rates, low-income women continue to smoke at greater rates than higher income women. For example, postpartum relapse occurs at greater rates for women with Medicaid compared to women with private insurance (Kia, Tosun, Carlson, & Allen, 2018). While the use of cognitive-based interventions has been shown to increase cessation rates, existing interventions have traditionally targeted cessation during pregnancy (Chamberlain et al., 2017). These interventions miss a window of opportunity to address the postpartum period, a stressful time of transition when unique stressors experienced by low-income women may become paramount and negatively impact cessation efforts (Goyal, Gay, & Lee, 2010).

During the postpartum period, women are not saliently faced with concerns for fetal health, social stigma, and physical demands that are associated with smoking cessation during pregnancy. Instead, they are more likely to face psychosocial and practical barriers to continued abstinence (e.g., stress of caring for a newborn, increased financial difficulties). Therefore, interventions that successfully increase cessation in the prenatal period are not well-suited to sustain smoking abstinence during postpartum. The few interventions that have evaluated postpartum relapse prevention have used motivational interviewing (Hayes et al., 2013; Jones, Lewis, Parrott, & Coleman, 2015; Parker et al., 2007) and tobacco cessation counseling from nurses (Feeney & Britton, 2016; Ferketich et al., 2012; Lee et al., 2015), as well as mailed self-help booklets (Brandon et al., 2012). However, these approaches have not consistently demonstrated clinically significant outcomes in continued abstinence after delivery (Feeney & Britton, 2016; Ferketich et al., 2012; Hayes et al., 2013; Jones et al., 2015; Jones, Lewis, Parrott, Wormall, & Coleman, 2016; Lee et al., 2015; Reitzel et al., 2010), perhaps because they are not specifically tailored for postpartum women or are delivered via methods not feasible for this stressful period (e.g., in-person counseling, telephone calls).

The Cognitive Social Health Information Processing model (C-SHIP; Miller & Diefenbach, 1998) identifies five main psychosocial relapse risk factors as optimal targets of smoking cessation intervention including (1) knowledge, (2) self-efficacy to avoid smoking temptations, (3) distress, (4) decisional balance towards smoking or cessation, and (5) self-regulatory strategies to maintain cessation efforts. First, women of lower socioeconomic status have significantly less knowledge of smoking-related problems (Hiscock, Bauld, Amos, Fidler, & Munafò, 2012). Specifically, during the postpartum period, women may not be aware of the risks associated with environmental tobacco smoke for the newborn. Second, lower quitting self-efficacy has been associated with smoking relapse (Bauld et al., 2017). Third, the ability to quit smoking is negatively influenced by emotional distress (Bauld et al., 2017). Fourth, studies have shown that individuals who report fewer pros of quitting (e.g.,

"quitting will improve the health of my baby") and greater cons of quitting (e.g., "I like the image of a smoker") have lower readiness to quit smoking (Orton, Coleman, Coleman-Haynes, & Ussher, 2018). Finally, lack of strategies to cope with the physiological and psychological components of quitting smoking can undermine individuals' ability to achieve and maintain abstinence (Chamberlain et al., 2017; Nohlert, Ohrvik, & Helgason, 2018; Pollak et al., 2015). The C-SHIP model has guided a smoking cessation intervention for pregnant and postpartum women (Lee et al., 2015), as well as individuals undergoing lung cancer screening (Ferketich et al., 2012) using cognitive-behavioral counseling. However, their limited success in cessation rates may be due to a small pilot study sample size (N=18; Ferketich et al., 2012) or high attrition due to the chosen delivery channel (in-person and telephone call) for pregnant and postpartum women (Lee et al., 2015).

Text messaging appears to be an optimal channel to address these psychosocial factors as it is well-suited delivery channel for low-income underserved populations and have successfully doubled abstinence rates among other populations (Anderson-Lewis, Darville, Mercado, Howell, & Di Maggio, 2018; Whittaker et al., 2012). Text messaging is popular among low-income racial/ethnic minority groups (Duggan, 2013) and offers a number of advantages including: customizability; low-cost, time-efficient implementation; low participant burden; and ease of dissemination into the current healthcare infrastructure. As counseling interventions are time consuming and require scheduling a call or visit at a time without interruptions—which can be difficult for mothers caring for a newborn—text messaging would better facilitate multiple contacts and reduce participant burden.

Accordingly, the purpose of this study was to assess the feasibility of a text messaging intervention (TxT2Commit) for urban, underserved women as they transition from pregnancy to the postpartum period through a convergent mixed methods design. The TxT2Commit program is guided by the C-SHIP model and designed to target five psychosocial relapse risk factors: knowledge, beliefs, distress, decisional balance, and self-regulatory strategies (Wen et al., 2014). Text messages were tailored to the needs of low-income postpartum women who had made a quit attempt during their pregnancy. We assessed the acceptability of TxT2Commit among urban, underserved postpartum women. We evaluated changes in the five psychosocial relapse risk factors over a three-month period post-delivery. We hypothesized that women who had not relapsed at three months postpartum would report more positive outcomes for the five risk factors compared to those who relapsed over the three-month period. Finally, we explored the risk factors in greater depth through qualitative interviews that examined the specific barriers and facilitators to smoking cessation perceived by postpartum women.

Methods

Study population and recruitment.

Low-income women were recruited through 15 local Women, Infants, and Children (WIC) clinics in Philadelphia, Pennsylvania between June 2011 and October 2012. Women were eligible if they were (a) able to communicate in English, (b) at least eighteen years of age, (c) in their third trimester or within ten days postpartum, and (d) a current smoker who made at least one quit attempt within one year of their current pregnancy or former smoker (quit

within past year). Participants were recruited via flyers posted in the WIC clinics and screened for eligibility by research staff via phone or in-person at the clinic. A total of 992 eligible women were identified (mean of 66 women per WIC clinic) with 104 women enrolling in the study. Interested eligible participants provided informed consent and completed a baseline survey. Participants received a cell phone with texting capability and instructions for using the phone. Participants received a $15 gift card at the time of enrollment, a $20 gift card after completion of the one month survey, and a $30 gift card after completion of the three month survey. The study was approved by the [institution name omitted for review] Institutional Review Board.

Intervention.

Guided by the Cognitive-Social Health Information-Processing (C-SHIP) model (Miller & Diefenbach, 1998), a text-messaging intervention was iteratively developed through (1) needs assessment interviews with WIC participants (N=30), (2) text message content development guided by the C-SHIP model and needs assessment responses, (3) health literacy evaluation, (4) cognitive response interviews (N=30), (5) a panel of community members and scientific experts (N=7), and (6) 1 week usability testing (N=10; Wen et al., 2014). Over two hundred messages were created to address the five psychosocial relapse factors: (a) knowledge: increase knowledge of smoking's harmful effects; (b) beliefs: self-efficacy to avoid temptation; (c) distress: decrease the distress of new motherhood; (d) decisional balance: increase the pros and decrease the cons of quitting smoking; and (e) self-regulation: promote self-regulation strategies (e.g., avoiding smokers, nicotine patch). Approximately 60 additional text messages were developed to provide targeted support during times of a smoking lapse or craving. Upon giving birth, participants received three system-initiated randomly selected texts per day for one month.

Study design.

The intervention was assessed in a single-arm feasibility study to demonstrate the acceptability of a text-messaging smoking cessation program among newly postpartum women in underserved communities. A convergent mixed methods design (Creswell & Plano Clark, 2011) was used with concurrent data collection of quantitative self-report surveys and qualitative structured interviews. Both quantitative and qualitative data collection strands had equal weight and were converged during interpretation (QUAN + QUAL).

Data collection and Measures.

Quantitative Surveys.—Three surveys were administered to participants over the course of the study. A baseline survey was completed in-person upon enrollment and two follow-up surveys were completed at one month and three months via phone.

Background Variables.—Demographic information (e.g., age, marital status, income) and previous pregnancy experience (i.e., planned pregnancy, number of previous live births) were collected. Participant smoking history was also assessed.

Intervention Satisfaction.—Satisfaction with TXT2Connect was assessed using five author-constructed items at one month follow-up when the text message intervention ended. All items had 5-point Likert-type response options. One item asked for overall satisfaction with the program, while four items asked if the text messages were helpful, understandable, supportive, and/or bothering with a total score ranging from 0 to 4 (0=not at all to 4=extremely) for all items.

Assessment of C-SHIP Psychosocial Relapse Factors.—Knowledge was assessed by an author-developed measure of ten true/false questions about the risks of smoking during pregnancy and postpartum. Beliefs about one's ability to remain smoke-free were assessed using the 9-item Self-Efficacy/Temptations Scale (Velicer, Diclemente, Rossi, & Prochaska, 1990). Distress was measured using the 12-item List of Threatening Events (i.e., distressing events; (Brugha, Bebbington, Tennant, & Hurry, 1985). Decisional Balance was assessed using the Pros and Cons of Quitting (Velicer, DiClemente, Prochaska, & Brandenburg, 1985). A 20-item scale containing an equal amount of statements that either favor or oppose smoking abstinence. Lastly, self-regulation was measured using the Ways of Quitting questionnaire (Myers, MacPherson, Jones, & Aarons, 2007). All measures of C-SHIP relapse factors were assessed at baseline, one month, and three months with greater total scores indicating more positive C-SHIP outcomes.

Smoking Status.—Smoking status was assessed at each time point and participants were asked if they smoked every day, some days, or not at all. Participants were considered to have relapsed if they selected "every day" or "some days." Those who did not respond to the item were considered relapsers (N=3).

Qualitative Structured Interviews.—Participants (N=41) completed structured phone interviews at one week, one month, and three months after giving birth. The one week interview had seven items that asked about their experience during the remainder of their pregnancy, delivery experience, current health, baby's health, current smoking status, additional concerns or stressors, and their overall thoughts on TxT2Connect. The one and three month interviews had eight items that asked about specific stressors experienced following delivery, any cravings and identified triggers, specific coping or quitting strategies used, sources of support, additional professional quitting support, baby's health, and overall thoughts on TxT2Connect.

Data analysis.

A convergent mixed methods design was completed with quantitative and qualitative data collected and analyzed independently with convergent interpretation in the discussion (Creswell & Plano Clark, 2011). Quantitative data analyses were completed using SPSS Statistics 24 (Armonk, NY). Participants that completed all three quantitative surveys were included in the analyses. Univariate analyses were first completed for all variables. Bivariate analyses were completed to compare demographics, Txt2Connect satisfaction, and C-SHIP constructs between relapsers and non-relapsers. Due to the small sample size and nonnormal distributions, Chi-Square, Fisher's Exact Test, and Mann-Whitney U tests were used for bivariate analyses. Repeated measures analyses were completed using the Friedman test to

assess differences in C-SHIP constructs within groups (i.e., relapsers, non-relapsers) at baseline, one month, and three months. C-SHIP constructs were significant at $p < .01$ after a Bonferroni correction for both within group and between group analyses.

The qualitative structured interviews were first analyzed using open coding performed separately by two research team members. The two open coders then met to assimilate codes into a single codebook where an agreement was reached for all codes. Codes were then independently reviewed by two separate members of the research team to create themes guided by the C-SHIP model. Interrater reliability was completed using the proportion agreement method due to multiple factors that complicate more advanced interrater reliability statistics (e.g., variation in coder expertise, possibility of multiple codes per unit of text; Campbell et al., 2013). An initial acceptable agreement of 72.2% was achieved (Fahy, 2001). The two coders then met to discuss any code disagreements and a final agreed upon code was identified for each discrepancy. Themes were then converged with quantitative findings in the final interpretation of study results. Due to confidentiality concerns by participants and short structure of the interview, audio recording of the interviews was not completed and participant responses were immediately transcribed by research staff during the interview.

Results

Quantitative results.

A total of 104 women enrolled in the study and 43 (40.6%) completed all three surveys (Table 1). There were no significant demographic differences between those that completed all three surveys and those that did not (Supplementary Table 1). A majority of participants (n=28, 65.1%) relapsed by three months. Participants had a mean age of 28.72 (SD=12.25) and were predominantly single or separated (86.0%). All participants had health insurance (100%) and 41.9% lived with their significant other. The majority of participants had an unplanned pregnancy (79.1%). Significantly more participants who self-identified as a race/ethnicity other than Non-Hispanic White or Non-Hispanic Black were non-relapsers than relapsers at three months ($p<.05$). Participants expressed high satisfaction and understandability with TXT2Connect at one month (i.e., termination of intervention) and did not report that the program was bothersome. There were no significant differences between relapsers and non-relapsers in program satisfaction.

Table 2 shows the C-SHIP constructs for relapsers and non-relapsers over time and between-group comparisons at each time point. Temptation was the only significant C-SHIP construct with significant differences between relapsers and non-relapsers. The temptation total scale and subscales (i.e., negative affect, social/positive temptation, habitual/craving temptation) significantly decreased for non-relapsers over time ($ps<.01$). Relapsers saw a temporary decrease of overall temptation from baseline to one month ($p<.01$), however this did not persist at three months. Additionally, both relapsers and non-relapsers saw a decrease in distressing events over time ($ps<.01$) and non-relapsers had an increase in pros to quitting versus cons to quitting ($p<.01$). Neither group had any significant changes in knowledge or ways of quitting ($ps>.01$).

Qualitative results.

A total of 41 participants completed at least one interview (97.6%) with 26 completing all three interviews (61.9%). The total number of interviews analyzed across the three time points was 112. Overall, most participants said they found Txt2Connect helpful and enjoyed the messages (94.9%). One participant said they "actually find it very helpful…and sometimes gets me to think twice about smoking" and another said "I like that the messages don't beat you up when you lapse." Further, one participant said Txt2Connect "was more helpful to deal with stress than for the smoking." However, two participants said the program was not helpful, wishing the "messages were more detailed" and "more in person support would be more beneficial." Finally, while most participants did not report any technical difficulties with TxT2Connect, two participants reported issues related to the cell phone, including lost chargers.

While both relapsers (96.3%) and non-relapsers (100%) said they appreciated TxT2Connect, many relapsers expressed interest in receiving more information (25.9%). Additionally, three relapsers cited attempts to get information from others. One relapser said their "…mother attends smoking cessation classes and shares pamphlets and other info," while another said they "tried [the] quit line, but [the] coach didn't follow up." Two non-relapsers said they sought additional information from the internet or their doctor.

All relapsers (100%) cited sources of temptation for their smoking, compared to 57.1% of non-relapsers. Two relapsers reported triggers for temptation from social/positive smoking sources from "seeing others smoking," including "mom and brother smoking in the home." Additionally, three relapsers cited temptation triggers from habits and cravings. One participant said they smoke out of habit "usually at night to stay awake when [my] son is up" and another said she likes "to smoke after a meal or after eating, this one is the hardest one to give up." Temptation from negative affect was the only type of temptation cited by both relapsers and non-relapsers. Stress, anger, and frustration were the most common triggers for both relapsers ("when…stressed and overwhelmed it leads to smoking"; 81.5%) and non-relapsers ("…when frustrated by [my] kids"; 57.1%). Additionally, two relapsers cited boredom as reasons for smoking, and one participant said "being bored at home leads to chain smoking."

Relapsers cited distressing events in their interviews more often than non-relapsers (66.7% and 35.7%, respectively). Participants said they experienced personal and family health events during the three months of follow-up such as postpartum depression and serious illnesses for their newborn (51.9% relapsers, 14.3% non-relapsers). One participant who relapsed said her "baby has meningitis" and "is in the hospital on antibiotics." Another participant who relapsed said her "daughter has suffered a stroke" resulting in "many appointments and a long hospital stay." Other difficult events reported by participants included being a victim of neighborhood violence, difficulty looking for jobs, deaths in their family, separation from the child's father, and legal difficulties (29.6% relapsers, 21.4% non-relapsers).

While participants often did not speak explicitly about the pros and cons of quitting, three relapsers described their perceived cons to quitting (11.1%). One relapser said they loved

"the taste of menthol, so it is not always stress that triggers it," and others used smoking as a way to avoid problems or concentrate better. Non-relapsers more commonly cited pros to quitting (42.9%), most commonly because of concerns for their family's or own health. One participant said they think of how smoking would affect their child and "it is not hard any more to not smoke."

Both relapsers and non-relapsers mentioned several coping methods to help stay smoke free (18.5% and 42.9%, respectively). One relapser said she was "trying to keep myself as busy as I can," and another said she "doesn't buy packs [of cigarettes] and stays away from other smokers." Another relapser said they were using nicotine patches and trying to "not get stressed, but it's hard." Non-relapsers cited coping methods such as "chewing gum and eating jolly ranchers," "[staying] away from other smokers," and "[thinking] of how it's going to affect…daughter and it makes it easy to stop."

Discussion

The present study aimed to establish the feasibility of a C-SHIP intervention and to assess changes in C-SHIP constructs among non-relapsers and relapsers. To our knowledge, this study is the first to use a text messaging intervention for smoking cessation among urban, underserved postpartum women. The text messaging intervention demonstrated feasibility with high ratings in satisfaction from participants. However, relapse rates were comparable to those reported elsewhere (Merzel, English, & Moon-Howard, 2010). Significant differences between relapsers and non-relapsers highlight key areas to target in future interventions.

Temptation to smoke was the key C-SHIP construct that significantly differentiated between relapsers and non-relapsers. Quantitative findings showed non-relapsers had lower overall temptation to smoke and lower temptation to smoke from negative affect, social/positive, and habitual/craving than relapsers at three months postpartum (*ps*<.01). While the quantitative results found significant decreases in temptation from social/positive and habitual/craving, negative affect was the only subtype cited by both non-relapsers and relapsers in the qualitative interviews. These observations are consistent with current literature which converges on negative affect—namely stress—being a key risk factor for smoking relapse in the postpartum period (Correa, Simmons, Sutton, Meltzer, & Brandon, 2015; Diclemente, 2016; Orton et al., 2018). One potential explanation for non-relapsers' successful maintenance of smoking cessation is that they were better able to manage negative affect and minimize smoking temptation. A lack of healthy coping methods often results in women using smoking as a coping method during postpartum (Diclemente, 2016; Ripley-Moffitt et al., 2008). This is consistent with our interviews with relapsers who frequently reported smoking as a way to calm down and cope with difficult situations. Our findings suggest that helping women cope with negative affect may help them stay smoke free during the postpartum period.

Our quantitative finding suggests a modest increase in knowledge from baseline to one month postpartum for non-relapsers but was not sustained at three months postpartum. There also was no significant difference in knowledge between relapsers and non-relapsers. The

qualitative interviews suggest that non-relapsers and relapsers sought cessation knowledge from outside sources beyond the text messaging intervention; however, the knowledge sources differed between the two groups. Non-relapsers more frequently mentioned having formal information sources (e.g., physician) whereas relapsers expressed interest or attempts to gain more information (e.g. “tried quit line, but coach didn’t follow up”). These findings indicate that women desired more information about quitting. However, while previous research suggests that knowledge about the dangers of smoking can lead to positive health changes among mothers (e.g., less indoor smoking), knowledge is not associated with overall smoking behavior among postpartum women (Levitt, Shaw, Wong, & Kaczorowski, 2007).

While negative life events (e.g., separation from partner, job loss, death in family) have previously been associated with postpartum smoking relapse (Allen et al., 2018; Hauge, Torgersen, & Vollrath, 2012), our findings did not show any significant differences in the amount or type of distressing life events experienced between relapsers and non-relapsers. However, in qualitative interviews, some differences were evident between the two groups. Relapsers more frequently mentioned their newborns’ serious illnesses (e.g., meningitis, whooping cough, stroke, seizures), some of which required hospitalization, and the resulting stress. While non-relapsers did not experience a significantly lower number of negative life events, they may have had better coping mechanisms that helped to prevent relapse.

While non-relapsers saw a significant increase in the pros to quitting ($p<.01$), decisional balance favoring quitting was not significantly different between relapsers and non-relapsers. However, non-relapsers cited more pros to quitting than cons in the qualitative interviews (e.g., their own and their family’s health). Concerns about the harmful effects of smoking to both fetal health and the woman’s own health are known to motivate smoking cessation among pregnant women (McLeod, Pullon, & Cookson, 2003); our qualitative findings suggest that health concerns may continue to motivate cessation maintenance into postpartum. These qualitative findings support existing evidence that relapse is predicted by self-reported inability to manage stress (Nohlert et al., 2018).

Both non-relapsers and relapsers cited using multiple coping strategies in the qualitative interviews, and there were no significant differences between the two groups in the quantitative findings. This suggests that one specific coping method may not be the key for staying smoke free. Rather, non-relapsers may have been more successful at identifying coping strategies that worked for them. Indeed, a recent meta-analysis of ten studies found no difference in various coping strategies in successful quitting among adult smokers (Lindson-Hawley, Aveyard, & Hughes, 2012).

The quantitative and qualitative results suggested high acceptability from participants who completed the three quantitative surveys and at least one qualitative survey. However, 61 participants (58.7%) were excluded from the analysis due to attrition. This suggests that our follow-up methodology (i.e., telephone-based surveys and interviews) may not be suitable for this population for the same rationale of using text message delivery for counseling messages such as low participant burden during the stressful postpartum period. Research suggests low-income populations are receptive to text message-based surveys with open and

closed questions (Rai et al., 2017). This survey methodology may be appropriate for text-based interventions, allowing seamless integration of intervention delivery and follow-up and should be explored in future evaluations of TxT2Connect. Additionally, participants expressed interest in greater interactivity with the program, including one-on-one contact with counselors to discuss their issues and barriers to cessation. While the text message-based intervention may facilitate increased reach, some participants may benefit from supplemental interaction and support and should be considered for next steps in evaluating TxT2Connect and other smoking cessation programs.

Several limitations of the study should be noted. First, the study was a single-arm study that did not have a control or comparison group for analyses. Further, smoking status was assessed by self-report and was not be biochemically verified. Biochemical verification was considered too intrusive for the study population by clinical staff and community advisors. Additionally, several participants mentioned during the qualitative interview that they would have liked greater interactivity with the program. This highlights participants' desire for context-sensitive support. Lastly, the study had high loss to follow-up which may be a result of this difficult time of transition, particularly for underserved women. Future studies need to examine possible solutions to minimize attrition.

Conclusions

In summary, the findings suggest that TxT2Connect may be a feasible and acceptable method to help women stay smoke free during postpartum. Additionally, non-relapsers were more successful at maintaining cessation when they were able to reduce temptation. A randomized controlled trial is needed to further clarify our findings. In particular, future studies should explore the mechanisms that help urban, underserved women stay smoke free during the stressful postpartum period, particularly in managing temptation.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Significance:

While many women quit smoking during pregnancy, most relapse in postpartum—particularly among urban, underserved women. Existing interventions to prevent postpartum relapse in this population are limited in their efficaciousness. This study examined the feasibility of TxT2Commit, a text message-based smoking cessation intervention for urban, underserved postpartum women as well as changes in psychosocial constructs from baseline to three months postpartum. Most women relapsed by three months postpartum and despite their satisfaction with TxT2Commit, women who relapsed had persistent temptation to smoke, especially from stress and lack of support.

Table 1.

Baseline Demographics of All Participants and by Relapse/Non-Relapse at 3 Months Postpartum

Characteristic	All Participants (N=43) n (%) or *M* (SD)	Relapser at 3 months (N=28) n (%) or *M* (SD)	Non-Relapser at 3 months (N=15) n (%) or *M* (SD)	*p* value
Age	28.72 (12.25)	28.57 (14.81)	29.00 (5.18)	.104
Race/Ethnicity				
Non-Hispanic White	5 (12.2)	5 (18.5)	0 (0.00)	**.012**
Non-Hispanic Black	26 (63.4)	19 (70.4)	7 (50.0)	
All other races/ethnicities	10 (24.4)	3 (11.1)	7 (50.0)	
Marital Status				
Single or Separated	37 (86.0)	24 (85.7)	13 (86.7)	.656
Married	6 (14.0)	4 (14.3)	2 (13.3)	
Household Income				
≤ $15,000	29 (67.4)	20 (71.4)	9 (60.0)	.334
≥ $15,001	14 (32.6)	8 (28.6)	6 (40.0)	
Education				
< High school diploma	7 (16.3)	5 (17.9)	2 (13.3)	.425
High school diploma	16 (37.2)	12 (42.9)	4 (26.7)	
Some college	20 (46.5)	11 (39.3)	9 (60.0)	
Has health insurance	43 (100.0)	28 (100.0)	15 (100.0)	–
Lives with significant other	18 (41.9)	12 (42.9)	6 (40.0)	.559
Unplanned pregnancy	34 (79.1)	21 (75.0)	13 (86.7)	.315
# previous live births	1.72 (1.58)	1.41 (1.82)	2.21 (2.01)	.242
Age started smoking	16.08 (3.61)	15.75 (3.91)	16.70 (2.98)	.337
# Cigarettes per day	8.50 (7.69)	7.79 (6.70)	9.83 (9.38)	.305
# Household smokers	0.72 (0.79)	0.72 (0.74)	0.71 (0.91)	.759
# Previous quit attempts	4.12 (5.41)	3.85 (5.78)	4.60 (4.82)	.195
Satisfaction with program[a]	3.50 (0.86)	3.64 (0.81)	3.29 (0.95)	.326
Text messages were…[a]				
Helpful	3.22 (0.88)	3.27 (0.91)	3.14 (0.90)	.695
Understandable	3.50 (0.51)	3.55 (0.52)	3.43 (0.54)	.638

Characteristic	All Participants (N=43) n (%) or *M* (SD)	Relapser at 3 months (N=28) n (%) or *M* (SD)	Non-Relapser at 3 months (N=15) n (%) or *M* (SD)	*p* value
Supportive	3.22 (0.81)	3.18 (0.87)	3.29 (0.76)	.881
Bothering (invasive)	0.33 (0.69)	0.45 (0.82)	0.14 (0.38)	.455

[a] 5 point Likert-type rating 0=Not at all to 4=Extremely

Table 2.

Cognitive Health Social Information Processing (C-SHIP) Outcomes among Relapsers and Non-Relapsers at 3 months

		Relapser at 3 months	Non-Relapser at 3 months		
C-SHIP Outcome	**Time Point**	***M* (SD)**	***M* (SD)**	**Mann-Whitney U**	***p* value**
Knowledge	Baseline	7.11 (2.15)	8.07 (1.28)	160.00	.195
	1 month	7.57 (2.28)	9.13 (1.41)	114.00	.011
	3 month	7.86 (2.34)	8.73 (2.02)	152.50	.124
	X^2	7.97	5.55		
	p value	.019	.062		
Temptation Self-efficacy	Baseline	3.10 (0.71)	2.87 (0.78)	175.00	.371
	1 month	2.67 (0.83)	1.90 (0.83)	106.50	**.008**
	3 month	2.90 (0.75)	1.69 (0.71)	49.50	**< .001**
	X^2	8.89	15.53		
	p value	**.012**	**< .001**		
Negative Affect	Baseline	4.39 (0.80)	4.02 (1.17)	172.50	.319
	1 month	3.88 (1.25)	2.78 (1.59)	125.00	.028
	3 month	4.14 (1.04)	2.49 (1.43)	79.00	**.001**
	X^2	6.72	5.16		
	p value	.035	.076		
Social/Positive	Baseline	2.50 (0.89)	2.33 (0.88)	174.50	.360
	1 month	2.20 (0.92)	1.51 (0.55)	117.50	.017
	3 month	2.35 (1.02)	1.22 (0.47)	67.00	**< .001**
	X^2	2.50	15.96		
	p value	.287	**< .001**		
Habitual/Craving	Baseline	2.39 (0.99)	2.24 (0.98)	194.50	.690
	1 month	1.93 (0.94)	1.40 (0.61)	133.50	.042
	3 month	2.22 (0.81)	1.36 (0.56)	76.00	**.001**
	X^2	6.74	12.46		
	p value	.034	**.002**		
Distressing Events	Baseline	2.71 (2.24)	1.73 (1.16)	165.50	.248
	1 month	1.43 (1.62)	0.80 (0.78)	175.50	.357
	3 month	1.25 (1.40)	0.80 (1.32)	164.00	.212
	X^2	10.69	9.96		
	p value	**.005**	**.007**		
Decisional Balance	Baseline	11.11 (9.45)	13.80 (8.45)	181.50	.467
	1 month	14.75 (9.37)	15.00 (8.27)	204.50	.888
	3 month	14.11 (9.33)	16.67 (10.81)	182.50	.599
	X^2	3.65	10.39		
	p value	.161	**.006**		
Ways of Quitting	Baseline	1.22 (0.67)	1.45 (0.79)	166.50	.268

C-SHIP Outcome	Time Point	Relapser at 3 months *M* (SD)	Non-Relapser at 3 months *M* (SD)	Mann-Whitney U	*p* value
	1 month	1.37 (0.67)	1.48 (0.85)	187.00	.558
	3 month	1.44 (0.69)	1.45 (0.93)	200.50	.958
	X^2	1.64	0.05		
	p value	.441	.978		

Note: p-value significant below .01 after Bonferroni correction