Matern Child Health J (2014) 18:223–232
DOI 10.1007/s10995-013-1258-1

Text4baby Program: An Opportunity to Reach Underserved Pregnant and Postpartum Women?

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Published online: 15 March 2013

Abstract Text4baby was launched in 2010 to promote healthy pregnancies and babies by the use of text messaging. The primary objective of this study was to assess factors related to the enrollment process and reception of text4baby. A prospective cohort study was conducted in two Women, Infant and Children clinics in Atlanta (April 2010–July 2011). Randomly selected pregnant and postpartum women (n = 468) were queried on cell phone use and instructed on text4baby enrollment. Self-enrollment issues were assessed at one-week follow-up (n = 351, 75.0 %), and message reception and reading patterns at two-month follow-up (n = 209, 44.7 %). Forty-two percent of the women had some college education and 82 % had household income <=$20,000. About half attempted text4baby self-enrollment (162/351), with enrollment success more likely among women with more education (80 % with some college vs. 62 % with less education), with household income above $10,000 (61 % < $10,000 vs. 83 % $10,001-$20,000 and 76 % > $20,000), and among women living in smaller households (77 % 1–3 members vs. 58 % > 3 members) (all $p < 0.001$). Among the 209 participants in the final follow-up contact, >90 % reported uninterrupted reception and regular reading of messages, and 88 % planned to continue using text4baby. Results also suggested that respondents who were younger (<26 year), less educated and had lower health literacy skills were more likely to have interrupted messages. Despite substantial interest in the text4baby program in an underserved population, innovative ways to help women with significant disadvantages enroll and receive uninterrupted messages are needed.

Keywords Maternal and child health education · Health education · Text messaging · Underserved populations

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Introduction

Each year in the United States, more than 500,000 babies are born prematurely and an estimated 28,000 children die before their first birthday [1], with higher rates among minority women or women with lower socio economic status [2, 3]. The nationwide text4baby program was launched in February 2010 to help address this public health crisis by providing a free mobile information service to pregnant and postpartum women promoting healthy birth outcomes and infant growth. Pregnant women and new mothers receive targeted, developmentally appropriate, weekly Short Message Service (SMS) text messages about key prenatal and postpartum health services and behaviors. For example, a message may be: "worried about keeping baby warm at night? Infant pajamas & infant sleep sacks are safe for baby to wear to sleep. But no loose blankets in the crib." Text4baby aims to demonstrate the potential for mobile technology to impact the health knowledge of women across the United States.

The potential impact of such a program can be significant considering that, on average, mobile-cellular subscriptions

have reached 105.9 per 100 inhabitants in the Americas in 2011 [4]. In particular, text messages can deliver the information instantly and at a relatively low cost, and are a powerful tool for communication. In the United States, 85 % of Americans own cell phones [5], and more than two trillion SMS text messages were sent last year alone [6].

Because of its wide usage and ease of reaching people, text messaging represents an enormous opportunity for delivering health-related information to individuals with a goal of improving health both domestically and internationally. In the United States, various study methods including surveys, in-person interviews, and focus group discussions employed among populations such as people living with HIV/AIDS [7], African American adolescents [8], pregnant women [9], and others [9–13] have found health-related text messaging acceptable and interesting to most participants. The use of text messaging has been evaluated by intervention trials (typically randomized controlled trials) to examine whether it could play an important role for the general population to adopt health-related behaviors, for patients to better manage their diseases, and for health care providers to regulate services more efficiently [10–14]. In particular, text messaging programs have succeeded in the promotion of health-related behaviors, such as use of oral contraceptives [15–17], physical activity [18, 19], and smoking cessation [20–22]. Twelve randomized controlled trials and quasi-experimental studies of behavioral change interventions delivered via text messaging were evaluated in a 2010 literature review [22]. The literature revealed predominately programs with short-term intervention periods, and demonstrated varied frequencies of messaging. Out of nine studies with sufficient power, eight supported the role of text messaging in behavior change in disease prevention and/or management. The review also described several limitations of text message use in behavior change, including the interruption of mobile phone services and the exclusion of underserved populations that may not have access to cell phones or who are not comfortable with SMS (especially individuals who have low literacy and low SES).

The use of text messaging among underserved populations is of particular interest, since individuals with limited social and economic resources often lack access to health information [22]. Several studies have shown that text messaging interventions are generally well accepted among African-Americans [23, 24], and when compared to Caucasians, African Americans have expressed greater interest in receive messaging interventions and found the interventions more helpful [25, 26]. One study of staff and students from a University population indicated that they would be willing to pay a fee if they found the text messaging useful, but would not use a text messaging service if it was not useful, even if free of charge [27]. Nevertheless, for underserved populations, free text messaging (or covered by insurance) would still be more preferable than messages for a fee [28]. Research shows that cultural differences should also be addressed when developing messages for underserved populations [29]. and that text messages should be examined more carefully, taking various cultural and social-economic factors into consideration.

Although the effects of texting on various health outcomes have been covered among different populations, only a few, limited studies have focused on the outcomes of birth-related events for pregnant women and postpartum mothers. In focus group discussions, pregnant women showed interest in receiving educational text messages regarding influenza [9]. One randomized controlled trial (RCT) of prenatal texting in Thailand reported that the satisfaction levels towards prenatal care among the women who received prenatal support in SMS messages were significantly higher than women who did not receive the messages [30]. Another study showed that a messaging intervention among postpartum women resulted in increased frequency of physical activity [31]. These few studies demonstrate the interest in receiving health messages and perhaps potential for improving health knowledge and behavior through texting for pregnant women and postpartum mothers.

To date, only one randomized controlled trial study has been conducted to evaluate the national text4baby program. The study, based in two clinics in Fairfax County, Virginia examined the impact of pre-natal text messages on behavior change and knowledge acquisition among low-income pregnant women. Following the study, women who received text4baby messages were nearly three times more likely to have beliefs that they were prepared for motherhood when compared to the mothers who did not receive text messaging exposure [32].

Despite evidence of health messaging having a positive impact, little information is available on the characteristics associated with enrollment and usage. Our project focused on assessing factors related to the text4baby enrollment process and program reception among recipients of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) in two WIC clinics in Georgia. Information from this study is particularly critical given the need for research in an underserved population.

Methods

Setting

The text4baby evaluation was conducted in two WIC clinics in Metro Atlanta (referred to as clinic A and clinic B). Nutrition education is a vital component of the

Federally Funded WIC program and WIC regulations require that at least two nutrition classes are available for WIC recipients every six-month certification period; Atlanta WIC clinics mandate attendance in one nutrition class in this period. Thus, we were able to use these classes as our sample frame. Taught by registered dietitians, the classes emphasize the importance of nutrition and physical activity, and focus on the nutritional needs of pregnant, breastfeeding, and postpartum women, and children under five-years-old. Recruitment was targeted at participants in the nutrition classes instead of the general waiting area to capture all women that needed WIC vouchers in the six-month period, to protect confidentiality, and avoid recruiting women who were receiving other services and would not fit the initial requirements.

The Atlanta clinics each provided several classes each week. At clinic A, approximately five nutrition classes were available to women receiving WIC services every Wednesday. Clinic B, being much larger, offered nutrition classes every Wednesday and Thursday, totaling to about 12 classes per week.

Recruitment

The evaluation team gained permission for recruitment from supervisors at each clinic. Women in the mandatory nutrition class received a numbered slip of paper when entering the classroom. As class ended, the dietitian introduced the study interviewer and allowed her to explain the study. The interviewer, based on having assessed how many of the women she had time to interview, made a pre-determined random selection of the women using the numbered slips of paper. If the class was small, the interviewer approached all participants in the room. Selected women, if agreeable, were screened for study eligibility based on the following characteristics: (1) were the biological mother of a child less than 10 months old or were currently pregnant; (2) had a working cell phone; (3) could receive text messages; (4) had not been previously enrolled in text4baby; (5) spoke English; and (6) at least 18 years old. Women who were eligible and interested in the study completed the Emory consent and HIPPA agreement forms. All documents were read out loud to participants to ensure comprehension. The Emory Institutional Review Board (IRB) provided an expedited approval for this study in November 2010, and each participating WIC clinic accepted this approval from the Emory IRB.

Following the consent process, study participants were given the text4baby program's "how to enroll" tear off sheets that is in use nationwide. Women had the option of enrolling for the text messages via texting "baby" at the 511411 number or enrolling online (text4baby website). For both enrollment options, women entered their pregnancy due-date, or child's date of birth, and their zip code. Additionally, women who signed up on-line provided their phone number. Enrolled women would then receive three weekly messages targeted to the weeks along in pregnancy or the age (in weeks) of their child.

Data Collection

In-person Baseline Interview

A pregnant or postpartum version of the survey was orally administered to participants, taking ten to fifteen minutes to complete. Women provided up to two phone numbers for follow-up contact. Women were then given the tear sheet explaining how to sign up for the text4baby text messages, and were asked to sign themselves up in their free time.

Enrollment Assessment Call

With a target time frame of one week after completing the baseline survey, women were contacted by phone to assess text4baby self-enrollment issues. Women were asked if they had attempted to enroll in text4baby. If the women answered that they had not signed up for messages, the interviewer enrolled them if they were still interested in receiving text4baby messages.

Reception Assessment Call

The final survey was conducted by phone with a two month target time frame from the known date of text4baby registration. Similar to the baseline survey, the two-month survey had both pregnant and postpartum versions and took approximately fifteen to twenty minutes to complete. Contact attempts were started on the date indicating the woman had been receiving messages for two months. If contact was not made on the first attempt, additional calls were made to the participant, with a maximum set at fifteen attempts.

Follow-up Contact Time Frame

Due to difficulty in making contact with the participants by phone, the actual time frame for follow-up phone calls for the one week survey ranged from one to twenty-two weeks since completing the baseline survey (median 1.6 weeks). Similarly, the two month survey was completed anywhere from two to nine months after enrollment in text4baby (median 4.5 months).

Incentives

Women were given a $7 gift card upon completing the baseline survey. Upon completing the final survey, women were mailed a $10 gift card.

Data Collection Instruments

Baseline Survey

The baseline survey included demographic questions covering race/ethnicity, marital status, education level, employment and income, and number of children. To assess enrollment barriers, we asked women if they shared a phone, the number of text messages they received a day, and how many cell phone numbers they had in the past six months. The final portion of the baseline survey assessed health literacy with the Newest Vital Signs instrument [33].

Enrollment Assessment Survey

The one week survey asked women if they had attempted to enroll in the text messaging program via text messaging or website. The women were also asked if that had any concerns enrolling in text4baby, and, if they had not enrolled, whether they would like the interviewer to enroll them in the study.

Reception Assessment Survey

The two month follow-up survey asked women questions regarding cell phone service interruption, the number of text4baby messages they read a week on average, the pattern of reading messages over the course of the study (all since the beginning, more at the beginning but less with time, less at the beginning but more with time, did not read them regularly), and whether they planned to continue using text4baby.

Statistical Analysis

Descriptive statistics such as frequencies, proportions, and 95 % confidence intervals were calculated. Responses were weighted to adjust for the proportion of women selected in each nutrition class (the venue where we approached the women) and the nonresponse rate in those classes (i.e., the proportion of women approached who declined to participate in the study). SAS software's Proc Surveyfreq [34] was used for all analyses, specifying the stratified sample design and sample weights so that estimates reflect the WIC clinic population from which the sample was selected and variances are correctly calculated. Bivariate relationships were tested for statistical significance using the Rao-Scott Chi square test. Using a family-wise type I error rate of 5 % due to the multiplicity of tests, significant relationships are noted if $p < 0.001$.

Results

Table 1 describes the demographic characteristics of the study sample at baseline, one-week, and two-month follow-up. A total of 468 participants completed the baseline survey, of whom 351 completed the one-week survey, and 209 completed the two month survey. The distribution of most characteristics remained approximately constant across the three time points, although smokers tended to be more likely to drop out of the study at two months (change from 15 % to 10 %). About one-fourth of the participants were pregnant women, while three-fourths were postpartum mothers. About 54 % of the participants at baseline were under 25 years old, and 26 % were 30 years or older. At baseline, 36 % were first time mothers, 91 % were Black/African American, 62 % were single/never married, 42 % had at least some college education, 44 % were employed at least part-time, 82 % had a household income below $20,000, 38 % lived in households with 4 or more members, 85 % were non-smokers, and 74 % reported not drinking alcohol in the past month. Overall, 22 % had low health literacy skills [score 0–1 on NVS], 50 % had limited health literacy skills [score 2–3 on NVS] and 28 % had adequate health literacy skills [score 4–6 on NVS].

Three factors were considered that might impact text4baby enrollment or reception, including currently receiving more than eight text messages per day (70 %), sharing a cellphone with others (7 %), and having more than one cell phone number in the past six months (25 %) (Table 2) per day (81 % [18–25 year] vs. 64 % [26–29 year] vs. 51 % [30 year and older], $p < 0.0001$). Also, women who had not attended college were somewhat more likely to share phones (10 % vs. 4 %; $p = 0.0008$) or have changed cell phone numbers in the previous six months (32 % vs. 16 %; $p = 0.0015$). Maternal status, race, marital status, employment status, household income, and household size were not significantly related to any of the three factors.

Overall, 51 % of women given text4baby enrollment instructions attempted self-enrollment (Table 3). The proportion of enrollment attempts did not differ significantly by demographic factors. We note, however, that among the 39 participants without a high school diploma, 31 % attempted to enroll compared to over 50 % among educated women (NS, data not shown). Of participants who attempted self-enrollment, 69 % reported that they successfully enrolled. Success was more likely among women who had higher education (80 % vs. 62 %; $p < 0.0001$), household income above $10,000 (61 % < $10,000 vs. 83 % $10,001-$20,000 and 76 % > $20,000; $p < 0.0001$), and living in households of 1–3 people (77 % vs. 58 % > 3 people; $p = 0.0002$). Age, maternal status, race, marital status, and employment status were not significantly related to enrollment attempts or success. Only 10 women reported enrolling online, with the remainder using the texting method.

Very few (1 %) participants expressed having concerns about enrolling in the text4baby service. During the

Table 1 Characteristics of participants at baseline, enrollment assessment follow-up, and reception assessment follow-up

	Baseline		Enrollment assessment		Reception assessment	
	n	Wtd % (95 % CI)	n	Wtd % (95 % CI)	n	Wtd % (95 % CI)
Overall	468	100 %	351	100 %	209	100 %
Age (years)						
18–25	238	54 % (51,56)	166	50 % (48,52)	91	46 % (42,49)
26–29	101	20 % (18,22)	80	21 % (19,23)	51	24 % (21,26)
≥30	122	26 % (24,28)	101	29 % (27,31)	64	31 % (28,34)
Maternal status						
Pregnant	122	27 % (25,29)	88	26 % (24,28)	50	27 % (24,30)
Postpartum	346	73 % (71,75)	263	74 % (72,76)	159	73 % (70,76)
First child[a]	173	36 % (34,38)	126	36 % (34,38)	78	36 % (33,39)
Race/ethnicity						
Black/African-American[b]	425	91 % (89,93)	314	90 % (88,92)	190	91 % (88,93)
Other	39	9 % (7,11)	33	10 % (8,12)	19	9 % (7,12)
Marital status						
Single/never married	282	62 % (60,65)	204	59 % (56,62)	125	60 % (56,65)
Married/living with a partner	155	30 % (28,32)	119	32 % (30,34)	68	30 % (27,34)
Other separated/Divorced/Widowed	28	7 % (6,9)	25	9 % (7,11)	16	9 % (6,13)
Education						
Less than college	264	58 % (55,60)	196	57 % (55,60)	115	57 % (54,61)
College and above	201	42 % (40,45)	152	43 % (40,45)	94	43 % (39,46)
Employment status						
Employed	203	44 % (42,47)	151	44 % (41,46)	91	42 % (38,46)
Unemployed/student	261	56 % (53,58)	196	56 % (54,59)	118	58 % (54,62)
Household income						
Less than $10,000	244	56 % (54,59)	181	56 % (54,58)	104	54 % (50,57)
$10,001 to $20,000	114	25 % (23,28)	83	25 % (24,27)	55	28 % (25,32)
More than $20,000	83	18 % (17,20)	61	19 % (17,20)	35	18 % (15,20)
Number of people in household supported by this income						
1–3 people	284	62 % (59,65)	206	60 % (57,62)	126	63 % (59,66)
More than 3 people	181	38 % (35,41)	142	40 % (38,43)	83	37 % (34,41)
Not current smoking	403	85 % (84,87)	305	87 % (86,89)	187	90 % (89,92)
No alcohol in the past month	339	74 % (72,77)	257	75 % (73,77)	160	78 % (75,80)
Health literacy skills						
Low	93	22 % (20,24)	67	21 % (18,24)	41	22 % (18,26)
Medium	226	50 % (47,52)	165	48 % (46,50)	99	46 % (43,50)
Adequate	126	28 % (26,31)	103	31 % (28,34)	62	31 % (28,35)

[a] Have only one child/expecting the first child

[b] Black/African-American, Non-Hispanic

receptivity assessment call, women who had self-enrolled were asked if the enrollment process had been easy or difficult; over 95 % reported it had been easy (data not shown).

Ninety-five percent of women reported receiving text4baby messages without interruption, 92 % regularly read all messages throughout the study, and 88 % planned to continue being enrolled in the text4baby program (Table 4). Women who were at least 26 years old were more likely to read messages regularly than younger women, although not significant (95 % [30 year and older] vs. 94 % [26–29 year] vs. 88 % [18–25 year], $p = 0.0031$). Furthermore, women with at least a college education (98 % college vs. 92 % less than college, $p = 0.0023$) and had higher health literacy skills (100 % vs. 92 %; $p < 0.0001$) were significantly more likely to report receiving messages without interruption. No significant differences were noted due to maternal status, education, or parity.

Table 2 Barriers to enrollment into the text4baby program assessed at baseline

	Overall n[a]	Receiving > 8 messages per day Wtd % (95 %CI)	Sharing cellphone with others Wtd % (95 %CI)	Had > 1 cellphone number in 6mo Wtd % (95 %CI)
Overall	468	70 % (67,72)	7 % (6,8)	25 % (23,27)
Age (years)				
18–25	238[b]	81 % (79,83)	4 % (3,5)	29 % (26,32)
26–29	101	64 % (57,71)	8 % (6,11)	27 % (21,34)
≥30	122[b]	51 % (47,55)	11 % (9,14)	15 % (12,18)
		p[c] < 0.0001	$p = 0.01$	$p = 0.07$
Maternal status				
Pregnant	122[b]	67 % (62,73)	4 % (2,6)	22 % (18,26)
Postpartum	346[b]	70 % (68,73)	8 % (7,9)	26 % (24,29)
		$p = 0.62$	$p = 0.15$	$p = 0.46$
Race/ethnicity				
Black/African-American[d]	425	71 % (69,73)	7 % (6,8)	25 % (23,27)
Other	39	55 % (44,65)	10 % (5,16)	22 % (15,29)
		$p = 0.11$	$p = 0.43$	$p = 0.77$
Marital status				
Single/never married	282	74 % (72,77)	5 % (4,5)	24 % (22,27)
Married/living with a partner	155[e]	62 % (59,65)	12 % (10,15)	28 % (25,32)
Other	28	62 % (49,75)	6 % (1,12)	16 % (4,29)
		$p = 0.09$	$p = 0.03$	$p = 0.65$
Education				
Less than college	264	72 % (69,75)	10 % (8,11)	32 % (29,35)
College and above	201[e]	66 % (63,69)	4 % (3,4)	16 % (13,19)
		$p = 0.13$	$p = 0.0008$	$p = 0.0015$
Employment status				
Employed	203	70 % (67,73)	5 % (4,6)	27 % (24,30)
Unemployed/ student	261[e]	69 % (66,62)	9 % (7,10)	24 % (21,26)
		$p = 0.88$	$p = 0.02$	$p = 0.39$
Household income				
Less than $10,000	244[e]	71 % (67,74)	11 % (9,12)	26 % (23,29)
$10,001 to $20,000	114	62 % (57,66)	3 % (2,5)	23 % (17,29)
More than $20,000	83	72 % (68,76)	2 % (0,5)	17 % (14,21)
		$p = 0.20$	$p = 0.04$	$p = 0.46$
Number of people in household supported by this income				
1–3 people	284[e]	71 % (68,74)	5 % (5,6)	24 % (21,27)
More than 3 people	181	67 % (63,71)	10 % (8,12)	27 % (22,31)
		$p = 0.41$	$p = 0.03$	$p = 0.69$

[a] Only people without missing responses for the row variable are included in this column

[b] 1–3 people had missing responses for all three questions: whether they have been receiving > 8 messages per day, sharing cellphone with others, and having multiple cellphone numbers

[c] P values are based on Rao-Scott Chi Square statistics

[d] Black/African-American, Non-Hispanic

[e] One person missing response for the question about multiple cellphone numbers

Discussion

The evaluation of the text4baby program in an underserved, limited literacy population found that when women were given information about text4baby and enrollment instruction, half attempted enrollment regardless of demographic characteristics. However, within this underserved population, women who had higher education, higher household income, or lived in smaller households were more likely to successfully enroll themselves in the text4baby program. This important finding demonstrates that despite substantial interest in the program in an underserved population, innovative ways to help women enroll in the text4baby program are needed.

Table 3 Associations between demographic factors and self-enrollment process, at enrollment assessment follow-up

	Overall	Enrollment attempted	Successfully enrolled if attempted	
	n[a]	Wtd % (95 %CI)	n[b]	Wtd % (95 %CI)
Overall	331	51 % (49,54)	162	69 % (66,72)
Age (years)				
18–25	157	54 % (49,59)	80	69 % (64,74)
26–29	76	48 % (44,52)	39	80 % (77,82)
≥30	95	46 % (42,51)	41	63 % (59,68)
		p[c] = 0.37		$p = 0.03$
Maternal status				
Pregnant	83	50 % (43,56)	41	73 % (68,77)
Postpartum	248	51 % (48,55)	121	68 % (64,72)
		$p = 0.79$		$p = 0.45$
Race/ethnicity				
Black/African-American[d]	297	52 % (49,55)	148	69 % (65,72)
Other	30	42 % (30,53)	13	–[e]
		$p = 0.38$		$p = 0.17$
Marital status				
Single/never married	195	53 % (49,57)	94	71 % (66,75)
Living with a partner/Married	109	49 % (45,53)	55	62 % (58,66)
Other	24	50 % (37,63)	13	–[e]
		$p = 0.87$		$p = 0.01$
Education				
Less than college	188	51 % (47,55)	93	62 % (58,65)
College and above	140	52 % (48,57)	69	80 % (77,82)
		$p = 0.04$		$p < 0.0001$
Employment status				
Employed	140	56 % (52,60)	78	72 % (68,76)
Unemployed/student	187	48 % (45,52)	84	67 % (62,71)
		$p = 0.85$		$p = 0.36$
Household income				
Less than $10,000	171	50 % (46,53)	82	61 % (55,66)
$10,001 to $20,000	76	61 % (54,67)	44	83 % (79,86)
More than $20,000	58	46 % (42,50)	27	76 % (74,78)
		$p = 0.11$		$p < 0.0001$
Number of people in household supported by this income				
1–3 people	194	53 % (49,57)	99	77 % (75,78)
More than 3 people	134	49 % (45,53)	63	58 % (52,65)
		$p = 0.50$		$p = 0.0002$

[a] Number of women who were asked whether they attempted to enroll. A weighted percent of this n is reported as attempting enrollment

[b] Number of women who attempted self-enrollment. A weighted percent of this n is reported as successfully enrolled

[c] P values are based on Rao-Scott Chi Square statistics

[d] Black/African-American, Non-Hispanic

[e] Values not provided since n < 20

When asked about the enrollment process, however, most women indicated they did not have any concerns. Those women who had not yet enrolled in the program at the enrollment assessment survey often confided that they lost the paper with the enrollment instructions or had just forgotten to sign up. This feedback is not surprising, as the WIC clinics are hectic and women attending the clinics often face the burden of keeping several children behaved. This finding suggests that the promotion of text4baby in clinics may be more successful if individuals are encouraged to sign up on the spot. In fact, the national text4baby program is now suggesting for their new partner sites to have women sign up "on site".

Nearly all women reported uninterrupted message reception, and 9 out of 10 read all the messages and plan to continue using text4baby. Although women reported very high rates of receiving and reading messages, many also reported frequent interruption of cell service, making these findings hard to interpret. These issues were particularly of concern among respondents who were younger, less educated and with low health literacy skills.

Table 4 Text4baby message reception, frequency of reading messages, and attitude to continued use of text4baby, at reception assessment follow-up

	Overall n[a,b]	Messages received w/o interruption Wtd % (95 %CI)	Read all messages regularly Wtd % (95 %CI)	Plan to continue using T4B Wtd % (95 %CI)
Overall	209	95 % (94,95)	92 % (90,93)	88 % (86,91)
Maternal status				
Pregnant	50	96 % (96,97)	95 % (91,100)	88 % (87,90)
Postpartum	159	94 % (93,95)	90 % (89,91)	88 % (86,91)
		$p^c = 0.01$	$p = 0.40$	$p = 0.97$
Age (years)				
18–25	91	94 % (91,97)	88 % (85,90)	88 % (85,92)
26–29	51	94 % (88,100)	94 % (94,95)	87 % (83,91)
≥30	64	96 % (93,98)	95 % (93,97)	89 % (86,92)
		$p = 0.95$	$p = 0.0031$	$p = 0.96$
Education				
Less than college	115	92 % (91,93)	91 % (89,93)	91 % (87,94)
College and above	94	98 % (97,99)	93 % (92,93)	85 % (83,87)
		$p = 0.0023$	$p = 0.43$	$p = 0.22$
Health literacy				
Low	41	92 % (90,93)	90 % (85,95)	91 % (87,96)
Medium	99	92 % (91,93)	92 % (92,93)	86 % (82,90)
Adequate	62	100 % (100,100)	90 % (89,92)	89 % (86,92)
		$p < 0.0001$[d]	$p = 0.81$	$p = 0.70$
First child				
Yes	78	94 % (93,94)	91 % (90,92)	88 % (84,93)
No	131	95 % (94,96)	92 % (90,94)	88 % (86,90)
		$p = 0.38$	$p = 0.76$	$p = 0.98$

[a] Only people without missing responses for the row variable are included in this column

[b] 0–3 people had missing responses for all three questions: whether they received messages without interruption, read all messages regularly, and plan to continue using Text4baby

[c] P values are based on Rao-Scott Chi Square statistics

[d] An approximate Rao-Scott p value was calculated based on adding 1 observation to each cell in the cross-tabulation (necessitated by a cell with zero observations)

Overall, our results indicate that the text4baby SMS program is widely accepted by this target population of low income underserved pregnant women and new mothers, and has the potential to prompt change in health behavior. Our study provides additional insight into the enrollment process for primarily African American women attending WIC clinics in Atlanta, Georgia.

Despite the contributions of this study, at least two limitations have been identified. First, although the baseline survey was conducted in-person in the WIC clinic, the two follow-up surveys needed to be administered by telephone. This follow-up method proved to be a barrier to retaining women in the study as much of the population did not have reliable cell phone service. Over 60 % of the women who completed the baseline survey had a no-contract month-to-month cell phone plan in which temporary disconnection-reconnection is common. Not only did this issue reduce our follow-up response rate, it indicates that women may be underestimating difficulties in message reception. Second, our urban, low-income, primarily African-American study population only represents one facet of the demographic population targeted by text4baby and results may not be representative. Sampling was limited to an English speaking population, and further studies of the enrollment process for Spanish speaking women in text4baby are needed.

Preliminary results from similar text4baby evaluations like the one completed by researchers at the National Latino Research Center (NLRC) at California State University San Marcos and University of California San Diego, complement the results found in our study. Results found that the women surveyed had a high satisfaction of the text4baby service, however this study did not specifically examine the enrollment process [35]. In addition,

Evans et. al demonstrated that text4baby pre-natal messages accomplished a fundamental aim in the text4baby program, by preparing women for motherhood. They call for further insight into the role of health literacy in the use of text4baby and additional randomized controlled trials on behavior change over time [32].

Future research should rigorously examine the impact of text4baby on changing behaviors, particularly behaviors that can influence pregnancy and child health outcomes. Additional research is needed to determine how to ensure that this type of intervention program can impact health outcomes for underserved populations.

Acknowledgments Grant funding support was provided by the de Beaumont Foundation. The authors would like to thank the ongoing support by Judy Meehan and E. Lauren Sogor with the National Healthy Mothers, Healthy Babies Coalition; project support by William Oswald and Lydia Odenat; and the staff and participants at the Adamsville and College Park WIC clinics.

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