



# Text Delivered Interventions

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# Disclosure

◇Dr. Abrams/GWU has licensed Text2Quit/Quit4baby to Voxiva Inc.

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# Aims of Talk

- I. Can mobile technology promote smoking cessation?
- II. What mechanisms are involved?
- III. How can it promote reach?



# Technology Use

- 92% of US adults own a mobile phone  
-88% text with their phone
  - 68% have smartphones
    - 75% have used their phone to look up health information
- (Pew 2015; Pew 2014; CTIA 2014)

# Common Across All Major Groups

## Race/ethnicity

White	91
Black	94
Hispanic	92

## Age group

18-29	98
30-49	96
50-64	90
65+	78

## Household income

<\$30K	86
\$30K-\$49,999	94
\$50K-\$74,999	91
\$75K+	98

## Educational attainment

Less than high school	86
High school	90
Some college	93
College+	95

Few Research, 2015



# Rationale for Text Messaging

1. Reach: Help anywhere and anytime
2. Proactive messages interrupt you
3. Interactive help
4. Personalized help
5. Increase contact over time
6. Unobtrusive and confidential
7. Opportunities for tracking of behavior
8. Goes with smoking



**Abroms LC**, Padmanabhan N, and Evans WD. 2012, "Using Mobile Phones for Health Promotion." In S.M. Noar & N.G. Harrington (Eds.), *eHealth Applications: Promising Strategies for Behavior Change*. New York: Routledge, 147-166.

# Drawbacks of Text Messaging

- ◇ Technological challenges to deliver
- ◇ Technological challenges to receive (e.g. charged)
- ◇ Financial challenges to have service and receive messages; “On and off the grid” (e.g service, data)
- ◇ Privacy: SMS are not secure

# Study of Text2Quit



- ◇ Automated, interactive, personalized text messages for quitting smoking
- ◇ Messages are timed around quit date
- ◇ Advice on quitting, peer ex-smoker messages, medication msgs, games, and relapse messages.
- ◇ On-Demand: need additional motivation, having a craving, relapse.
- ◇ 2-3 messages/day following quitdate
- ◇ Developed in 2011

**Abroms LC**, Boal AL, Simmens SJ, Mendel JA, Windsor RA. A randomized trial of Text2Quit: a text messaging program for smoking cessation. *Am J Prev Med.* 2014 Sep;47(3):242-50.





Advice on  
Quitting

Text2Quit. Tomorrow's  
the big day! Throw out  
all your cigs before  
bed. Plan to keep busy  
& avoid smokers. Text  
CRAVE to fight  
cravings.

Erika/Text2Quit. 4  
more days to go.  
Don't talk yourself out  
of it. Think of why  
you're quitting and  
stay committed. You'll  
love being smokefree!



Medication msg

MEDS/Text2Quit. Be  
sure to have your  
NRT Patch on hand.  
Open the pack & read  
the instructions so  
that you're ready to  
use it tomorrow in the  
morning.

On demand  
games & tips

Text2Quit. Reply  
GAME to play trivia  
and earn Text2Quit  
points.

Check-ins

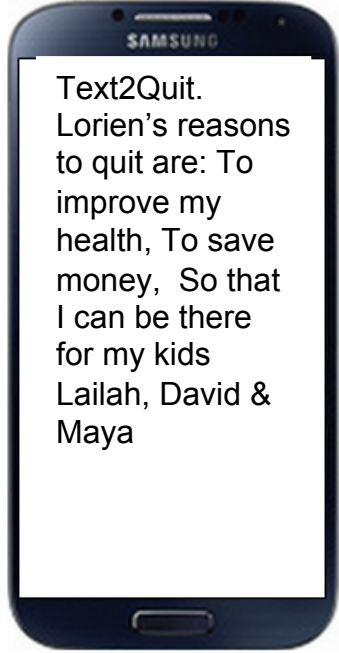
Text2Quit. Did you  
quit smoking today?  
Reply YES or NO.



# Personalization

- Reasons for quitting
- Triggers
- Gender
- Use of pharmacotherapy
- Stats on money saved and health benefits accrued

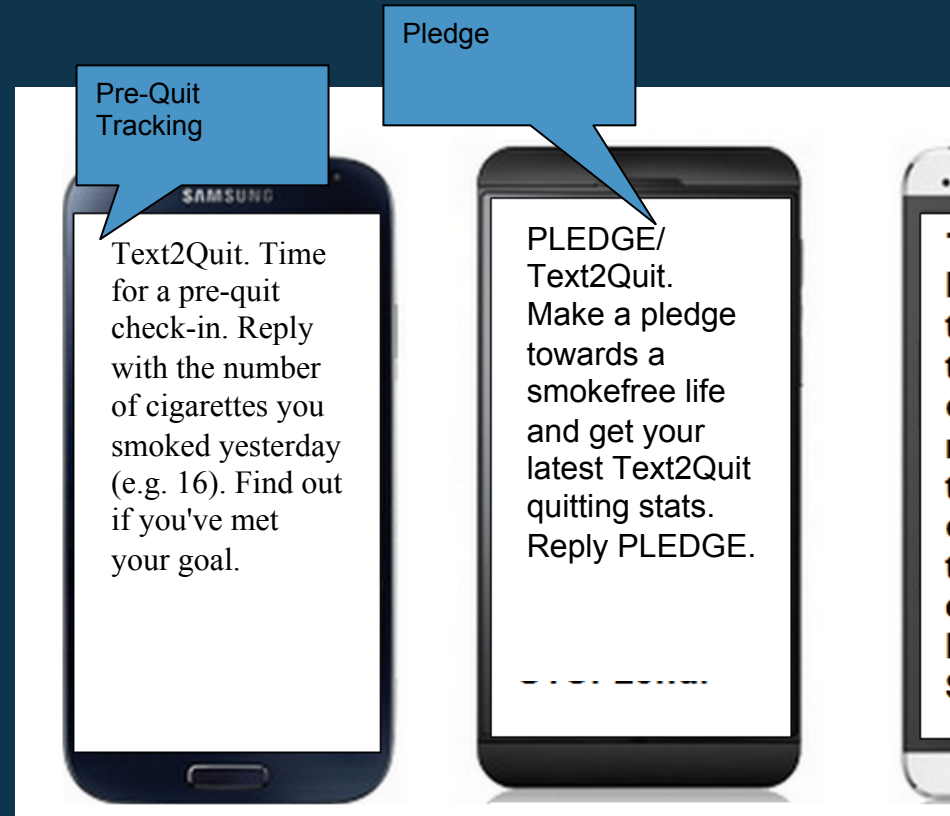
Reasons



Text2Quit.  
Lorien's reasons  
to quit are: To  
improve my  
health, To save  
money, So that  
I can be there  
for my kids  
Lailah, David &  
Maya

# Interaction:

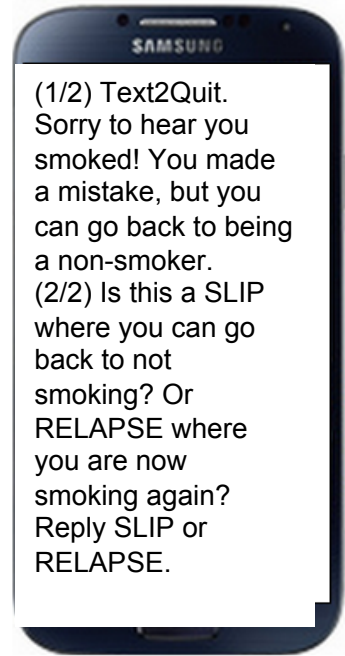
- Track cigarettes smoked
- Track how day went (urges and smoking)
- Weekly smokefree pledge
- Surveys: “Are you ready?”
- “Did you Quit?”



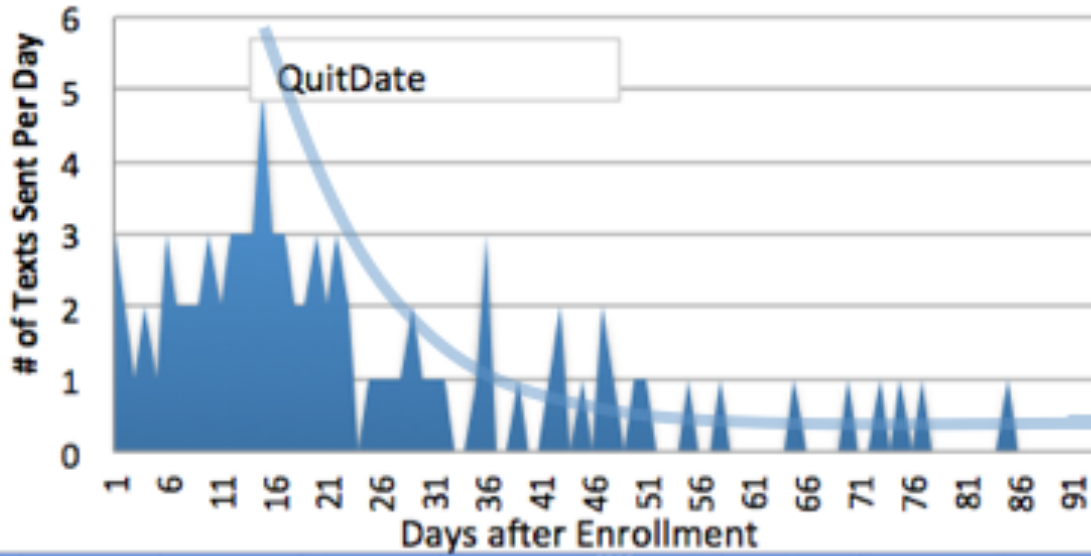


# 24-7 Help

- CRAVE
- SMOKED
- STATS



## Timing and Frequency of Texts in Text2Quit

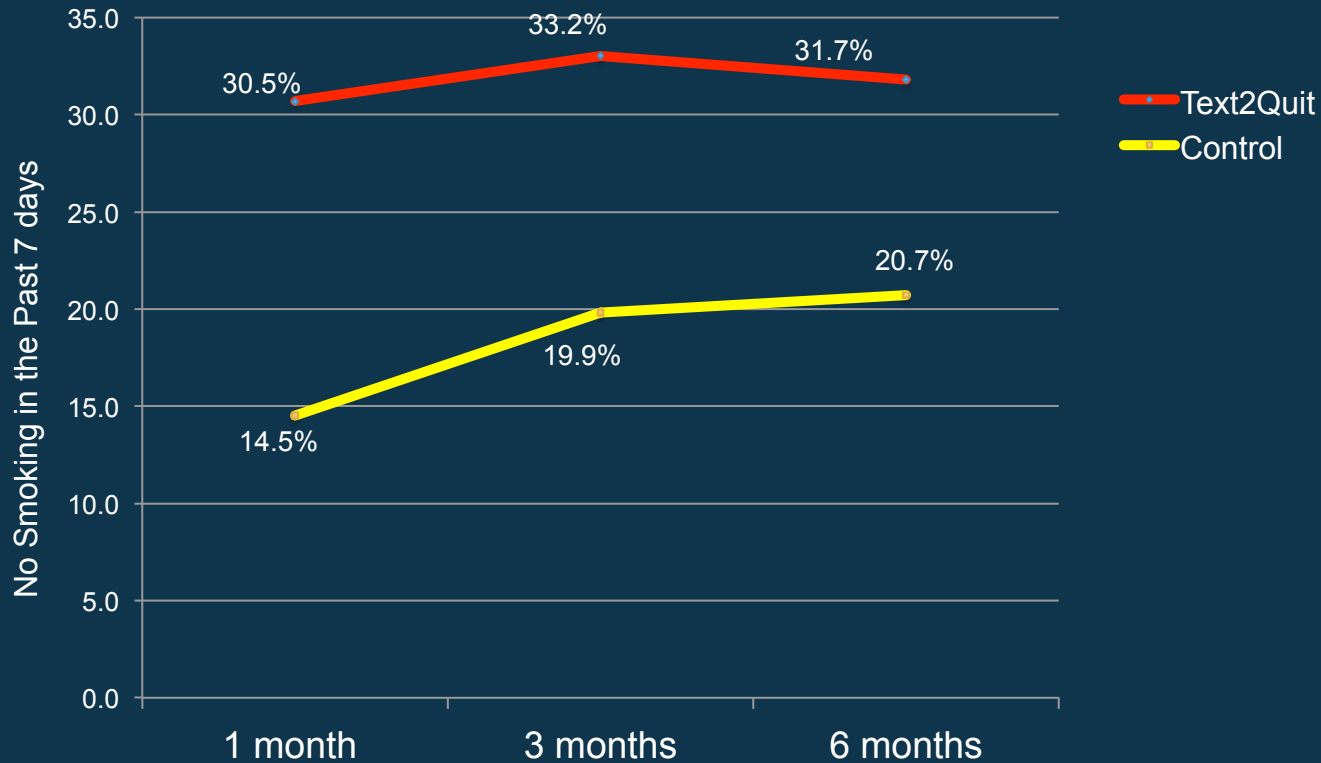


# Randomized Trial of Text2Quit

- Participants recruited on the Internet with Google ad words
- Randomized to receive Text2Quit or a self-help material (Smokefree.gov; *Clearing the Air*).
- Surveyed at baseline, 1, 3, and 6 months post-enrollment to assess smoking status.
- Saliva collected from self-reported quitters at 6 months
- Those lost to follow up were categorized as smokers.

**Abroms LC**, Boal AL, Simmens SJ, Mendel JA, Windsor RA. A randomized trial of Text2Quit: a text messaging program for smoking cessation. *Am J Prev Med*. 2014 Sep;47(3):242-50.

# Be Free Study (N=503)



Abroms LC et al, *Am J Prev Med.*  
2014

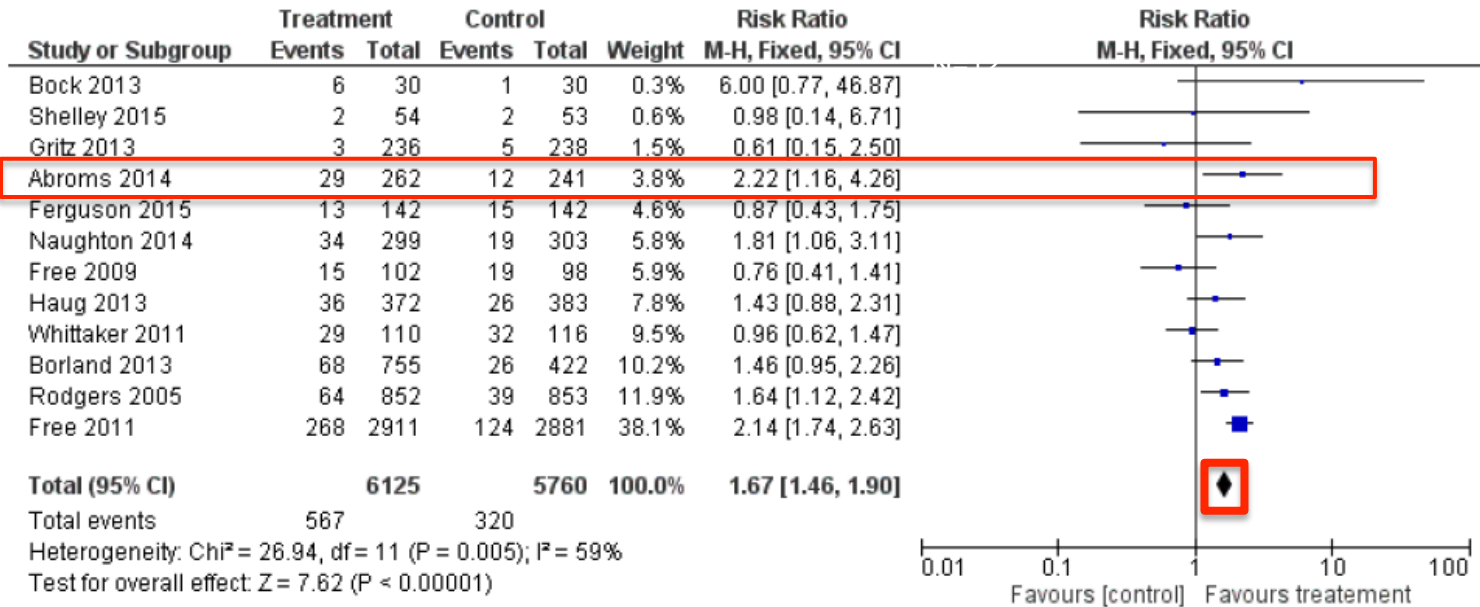
Table 2. Relative risk for smoking outcomes <sup>a</sup> (n = 503)		Intervention (SE) (n = 262)	Control (SE) (n = 241)	Relative risk (95% CI)	
	Follow-up Survey	Measure			
Primary outcome		Biochemically confirmed RPP abstinence	11.1% (.02)	5.0% (.01)	2.22 (1.16 – 4.26)*
		Self-reported RPP abstinence <sup>b</sup>	19.9% (.02)	10.0% (.02)	1.99 (1.27 – 3.13)**
Secondary outcomes	6 Months	Biochemically confirmed abstinence	15.7% (.02)	11.2% (.02)	1.40 (.89 – 2.20)
		Not smoked in the past 7 days (%)	31.7% (.03)	20.8% (.03)	1.53(1.13 – 2.07)**
		Not smoked in the past 30 days (%)	24.8% (.03)	15.8% (.02)	1.57 (1.10 – 2.26)*
	3 Months	Not smoked in the past 7 days (%)	33.2% (.03)	19.9% (.03)	1.67 (1.23 – 2.26)**
		Not smoked in the past 30 days (%)	27.5% (.03)	16.2% (.02)	1.70 (1.20 – 2.41)**
	1 Month	Not smoked in the past 7 days (%)	30.5% (.03)	14.5% (.02)	2.10 (1.47 – 3.00)***
Not smoked in the past 30 days (%)		11.8% (.02)	7.5% (.02)	1.58 (.91 -2.76)	

Abroms LC et al, *Am J Prev Med.*  
2014



# Cochrane Review

Figure 2. Forest plot of comparison: I Mobile phone intervention v ersus control, outcome: I.I 26-week cessation outcomes all studies.



## Tobacco

+ [Reducing Tobacco Use Initiation](#)

- [Increasing Tobacco Use Cessation](#)

[Summary of Findings](#)

[Increasing the Unit Price](#)

[Internet-Based Interventions](#)

[Mass Media Campaigns](#)

[Mass Media: Cessation Series](#)

[Mass Media: Cessation Contests](#)

[Mobile Phone-Based](#)

# Increasing Tobacco Use Cessation: Mobile Phone-Based Interventions

Mobile phone-based cessation interventions use interactive features to deliver evidence-based information, strategies, and behavioral support directly to tobacco users interested in quitting. Typically, participants receive text messages that support their quit attempt, and the message content changes over the course of the intervention.

Content may be developed or adapted for specific populations and communities. Messages may be tailored for individuals based on computer algorithms that match messages to information provided by the participant. Programs may be automated, and they may include text responses provided on demand to participants encountering urges to smoke.

Mobile phone-based interventions may be coordinated with additional interventions, such as Internet-based cessation services or provision of medications.

## Summary of Task Force Recommendations & Findings

The [Community Preventive Services Task Force recommends](#) mobile phone-based interventions for tobacco cessation based on sufficient evidence of effectiveness in increasing tobacco use abstinence among people interested in quitting. Evidence was considered sufficient based on findings from six studies in which mobile phone-based interventions were implemented alone or in combination with Internet-based interventions.

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[Submit](#)

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## Mobile text messaging for health: a systematic review of reviews.

Hall AK<sup>1</sup>, Cole-Lewis H, Bernhardt JM.

### ⊕ Author information

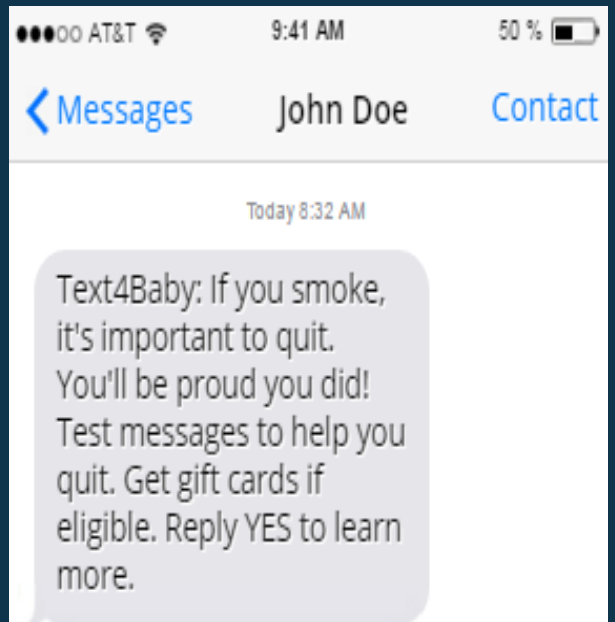
#### Abstract

The aim of this systematic review of reviews is to identify mobile text-messaging interventions designed for health improvement and behavior change and to derive recommendations for practice. We have compiled and reviewed existing systematic research reviews and meta-analyses to organize and summarize the text-messaging intervention evidence base, identify best-practice recommendations based on findings from multiple reviews, and explore implications for future research. Our review found that the majority of published text-messaging interventions were effective when addressing diabetes self-management, weight loss, physical activity, smoking cessation, and medication adherence for antiretroviral therapy. However, we found limited evidence across the population of studies and reviews to inform recommended intervention characteristics. Although strong evidence supports the value of integrating text-messaging interventions into public health practice, additional research is needed to establish longer-term intervention effects, identify recommended intervention characteristics, and explore issues of cost-effectiveness.

# Text4Baby

1 million + subscribers since launch (2011)

Send free text-messages to pregnant users (3x/week), timed around due date on a variety of health topics



## If mothers know best, why don't I know what comes next?



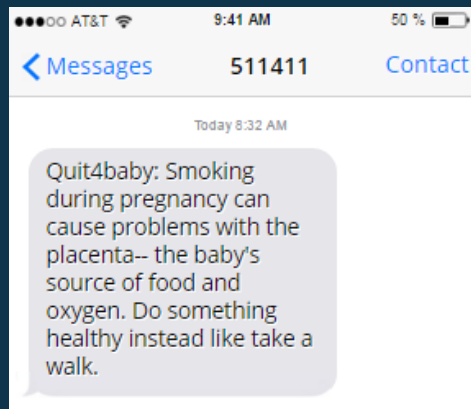
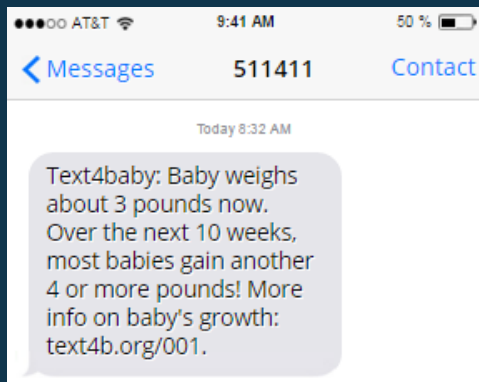
Feeling confused? Now, there's help delivered straight to your cell phone.

Just **text BABY to 511411** today, and start getting **FREE** messages with information to help you through your pregnancy. They're the most important texts you'll get for the next 9 months.



**text4baby**

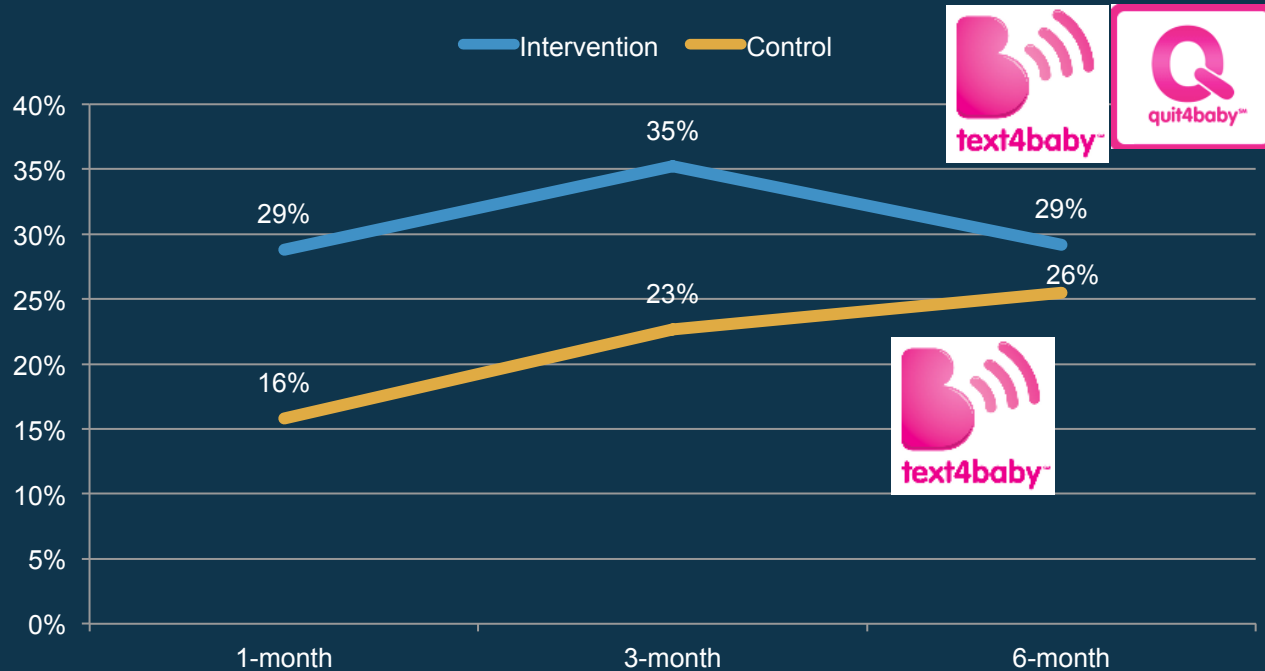
For more information, visit [www.text4baby.com](http://www.text4baby.com)



# Quit4baby

- ◇ Automated, interactive, personalized text messages for quitting smoking
- ◇ Messages are timed around quit date **and baby's due date**
- ◇ Advice on quitting related to **benefits to mom and baby, facts on harms of smoking to mom and baby**, peer ex-smoker messages, and relapse prevention messages.
- ◇ Surveys and On-Demand keywords
- ◇ 5+ messages/day following quitdate

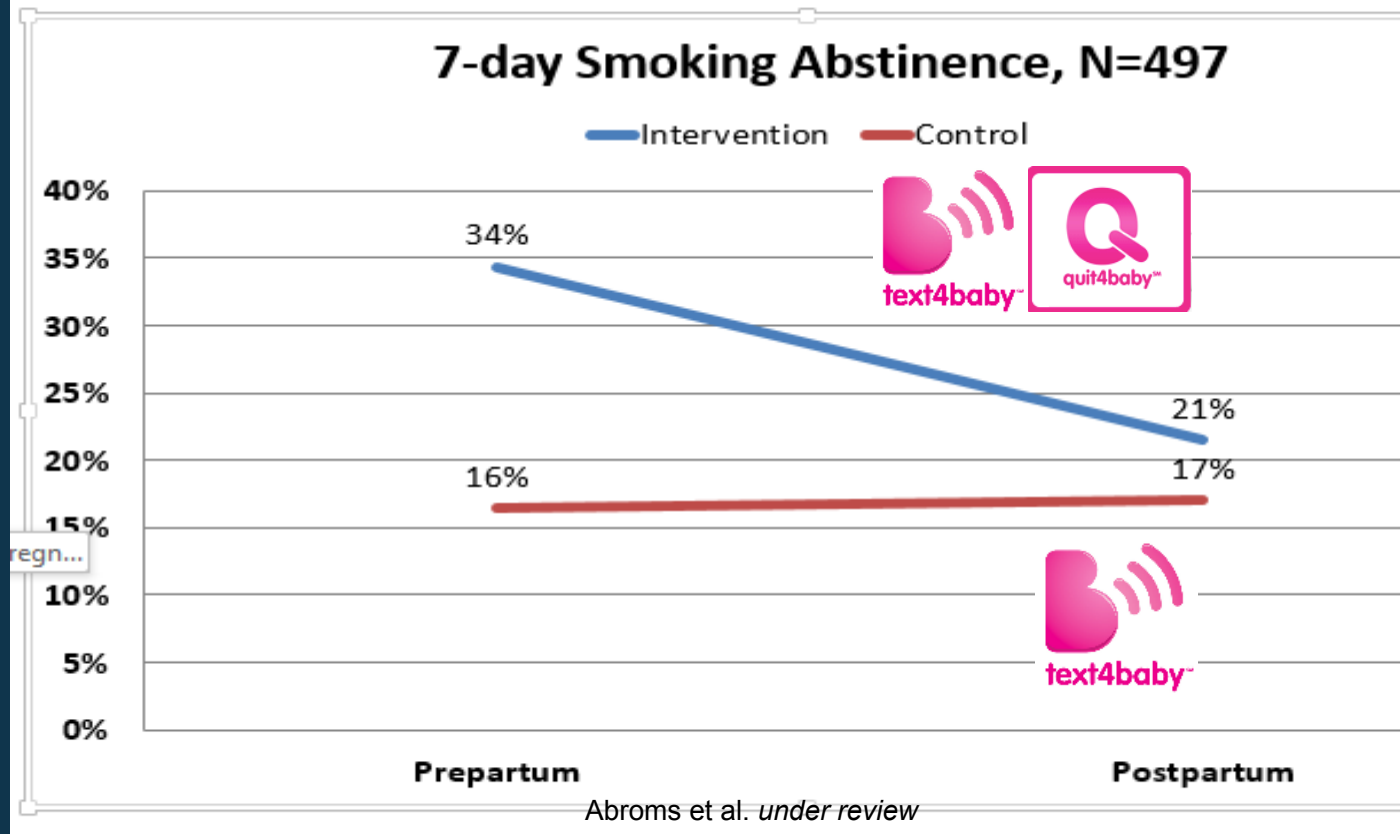
# 7-day Smoking Abstinence N=497



Abroms et al. under review

**Abroms LC**, Johnson P, Leavitt LE, Cleary SD, Chiang SC, Brandon TH, Bushar J. A Randomized Trial of a Text-Messaging Program to Promote Smoking Cessation in Pregnant Women. *Under review*

# Participant Quit Rate by Pregnancy Status





# Quit4baby Summary

- Significant difference in self-reported past 7 day smoking at 1,3 months
- Prepartum effects but not postpartum effects
- Encouraging findings for mCessation in low income pregnant women

# Aims of Talk

- I. Can mobile technology promote smoking cessation?
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# Logic Model

## mHealth inputs (SMS)

Advice on quitting

Peer ex-smoker  
messages

Tracking & feedback

Tools if craving/slip

Pledge

## Intermediate outcomes (Psychosocial)

Social support

Self-efficacy

Behavioral  
capability

## Proximal outcomes (Extra-treatment)

Call quitline

Use NRT /  
medications


Talk to doctor

Online community

## Health outcome

Quit smoking

Hoepfner B., et al. *Addiction*. 2016.



# Psychosocial or Extra-Treatment?

(N=409)

- Same rates of extra-treatment seeking at 1 mo (e.g NRT, quitline, counseling, 1-on1 , self-help materials, online community)
- Text2Quit had greater increases in psychosocial (self-efficacy) compared to control ( $p < .01$ )
- Self-efficacy significant mediator of effect.
- Accounts for 51.1% of the effect of Text2Quit on Cessation at 6 months
- Only variable with a complete mediational path
- → Text messaging programs may be appropriate in low/ middle income countries

# Can you max out on program effects?

Natural experiment in commercial quitline setting with rollout of Text2quit

- Propensity score matching on intake covariates
- ✓ Control Group: 4-call Phone Counseling, NRT, WebCoach (N=4363)
- ✓ Enhanced group: control +Text2Quit (N=4363)
  
- Result: Similar rates of 7-day abstinence at 7 mo (25.3%/25.5%)
- Text2Quit more satisfied
- →Text2Quit not confer benefit for quitting in tandem with quitline services



Boal, A, **Abroms LC**, Graham A. Simmons S. Combined Quitline Counseling and Text Messaging for Smoking Cessation: A Quasi-Experimental Evaluation. *Nicotine & Tobacco Research*. Oct 31, 2015.

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# Connecting the digital dots

EHRs



Digital Registries



Apps/texting programs



Mobile Phones

**Reason for Visit**

- Smoking related
  - Smoking
- Other
  - Migraine headache
  - Congestive heart failure
  - Hypertension
  - Myocardial infarction
  - Diabetes mellitus type 2
  - Diet modification
  - Type 2 diabetes
  - Melanoma
- Medications
  - Aspirin
  - Habitat
  - Social History
  - Review of Systems
  - Vital Signs
  - Physical Exam
  - Lab Tests

SEARCH	VIEW	PATIENTS	PATIENT NAME	MRN	PATIENT ID	CAGE	CHD	DM	HF	HTN	HD	PHYS
SEARCH	VIEW	PATIENTS	John, Robert	1000000001	1000000001	✓	✓	✓	✓	✓	✓	✓
SEARCH	VIEW	PATIENTS	Smith, John	1000000002	1000000002	✓	✓	✓	✓	✓	✓	✓
SEARCH	VIEW	PATIENTS	Johnson, Mary	1000000003	1000000003	✓	✓	✓	✓	✓	✓	✓
SEARCH	VIEW	PATIENTS	Davis, Jane	1000000004	1000000004	✓	✓	✓	✓	✓	✓	✓
SEARCH	VIEW	PATIENTS	Wilson, Tom	1000000005	1000000005	✓	✓	✓	✓	✓	✓	✓
SEARCH	VIEW	PATIENTS	Anderson, Lisa	1000000006	1000000006	✓	✓	✓	✓	✓	✓	✓
SEARCH	VIEW	PATIENTS	Thomas, Mike	1000000007	1000000007	✓	✓	✓	✓	✓	✓	✓
SEARCH	VIEW	PATIENTS	White, Emily	1000000008	1000000008	✓	✓	✓	✓	✓	✓	✓
SEARCH	VIEW	PATIENTS	Green, David	1000000009	1000000009	✓	✓	✓	✓	✓	✓	✓
SEARCH	VIEW	PATIENTS	Miller, Anna	1000000010	1000000010	✓	✓	✓	✓	✓	✓	✓

**All iPhone Apps**

- Quit Smoking: Cold Turkey (Lite) - Healthcare & Fitness
- Quit Smoking: Cold Turkey (Full) - Healthcare & Fitness
- Quit Smoking: Stop Smoking - Healthcare & Fitness
- Quit Smoking: My Quit Coach - Healthcare & Fitness
- Quit Smoking: My Quit Coach - Healthcare & Fitness
- Quit Smoking: My Quit Coach - Healthcare & Fitness
- Quit Smoking: My Quit Coach - Healthcare & Fitness
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# Types of Reach

Reactive: Build it and they will come

Proactive: Use SMS for outreach and service.



It doesn't matter where you start. Just start.

Search 

**smokefree.gov**

Ready to Quit


Smoking Affects You

Manage Your Mood

Get Active

Eat Healthier

Tools & Tips



N=800 approx subscribers

**Get Quit Help: SmokefreeMOM Texts**

• • • • ▶ ||

**smokefreeTXT**  
Quit with text messages, sign-up today

N=~120,000 users

**Quit Plan**  
Quitting is easier with a plan

**quitSTART App**  
Get support from your phone

**Join us on facebook**  
Tell us where you are on your quit journey



Depression 101



Get Health Tips by Text Message



Tips for Eating



Find a Quit Method That Works For You



Prepare to Quit



18 Ways Smoking Affects Your Health



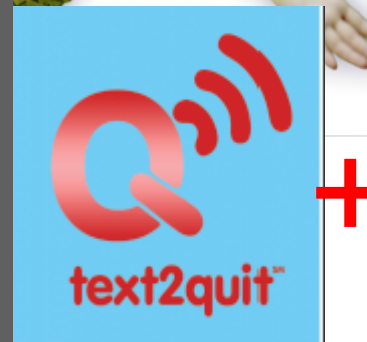


## Quit For Life® Program

The nation's leading tobacco cessation counseling program.

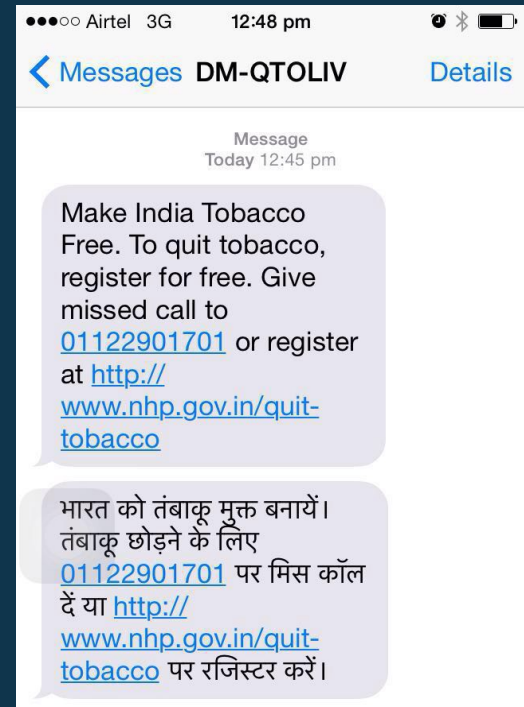


- Covers 27 States, 675 employers/health plans
- Participants receive:
  - 1) multiple outbound coaching calls,
  - 2) Web Coach®
  - 3) Text2Quit<sup>SM</sup>
- Over 300,000 callers enrolled in Text2Quit



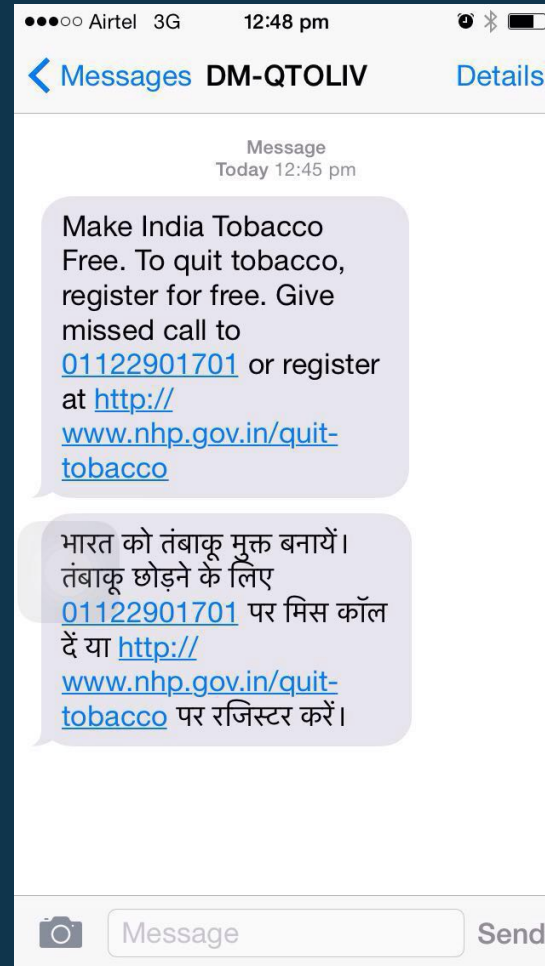
# Proactive: SMS Outreach for SMS program

- Text4baby list
- India government list
- GW MFA: smoker patient list
- Medicaid lists

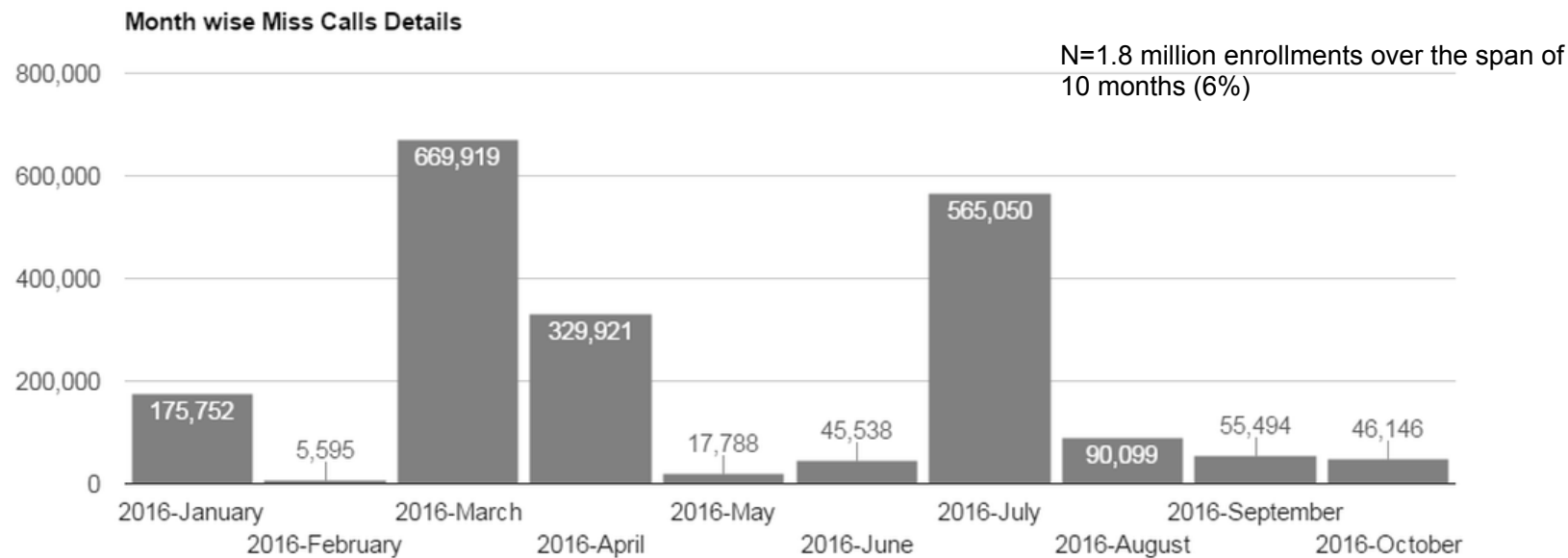




30 million  
Promotional SMS  
sent via gov  
directories



## Month wise Miss Calls Details



Whittaker R, Abroms, L & Murthy P. WHO Presentation. 2016

# Types of Reach

## Reactive:

- Make available & they will come
- Some success, especially for general smoking cessation text messaging (but not pregnancy) (Heminger et al. 2016)

## Proactive SMS Outreach for SMS program

- Found success both in India and Quit4baby
- Open question whether will work from a health system.

# Aims of Talk

- I. Can mobile technology promote smoking cessation?
- II. What mechanisms are involved?
- III. Can technology promote reach?



# Scientific Take Home Points

- I. Can mobile technology promote smoking cessation?

Yes, multiple RCT indicate that 70% increase in likelihood of quitting. Emerging evidence with pregnant.

- II. What mechanisms are involved?

Psychosocial changes

- III. Can technology promote reach? Yes, both reactive and proactive methods





Impact=Reach X Efficacy



# The future of population health with technology...

## Reach:

- Smokers search for apps and digital programs and find ones proven to work
- Patient are screened in EHR as smoker and leave clinical visit with digital program
- Smokers receive outreach by SMS for SMS program



# Efficacy

- Proven programs are refined and optimized over time
- Integrated with sensors that connect to smartphone (Smokerlyzer, Smokebeat)
- Integrated with smartphone capabilities --- GPS, calendar...
- Integrated with counselors –real or automated--who are activated in high need situations

# Automated text messaging programs are easy to develop

JMIR MHEALTH AND UHEALTH

Abroms et al

Original Paper

## Recommended Steps for Developing and Pretesting a Text Messaging Program for Behavior Change

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- B Hoepfner, Harvard
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- R. Whittaker, U of Auckland
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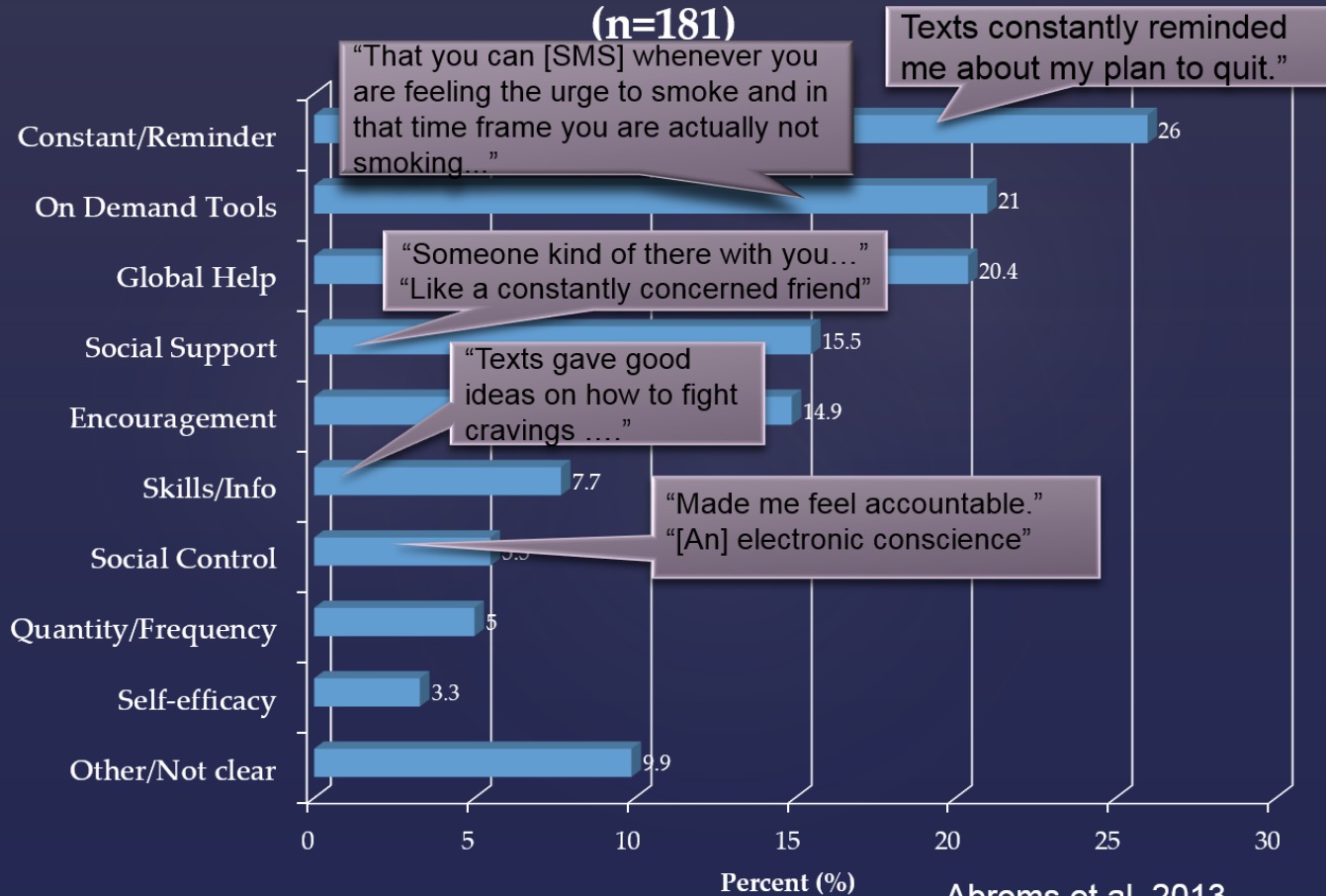
## Students and Staff

L Leavitt, Consultant  
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J Schindler-Ruwisch, GWU  
J. Mendel, GWU  
J Bontemps-Jones, ACS  
Allison Goldstein, WHO

Participants in trials:  
Text2Quit  
Quit4baby

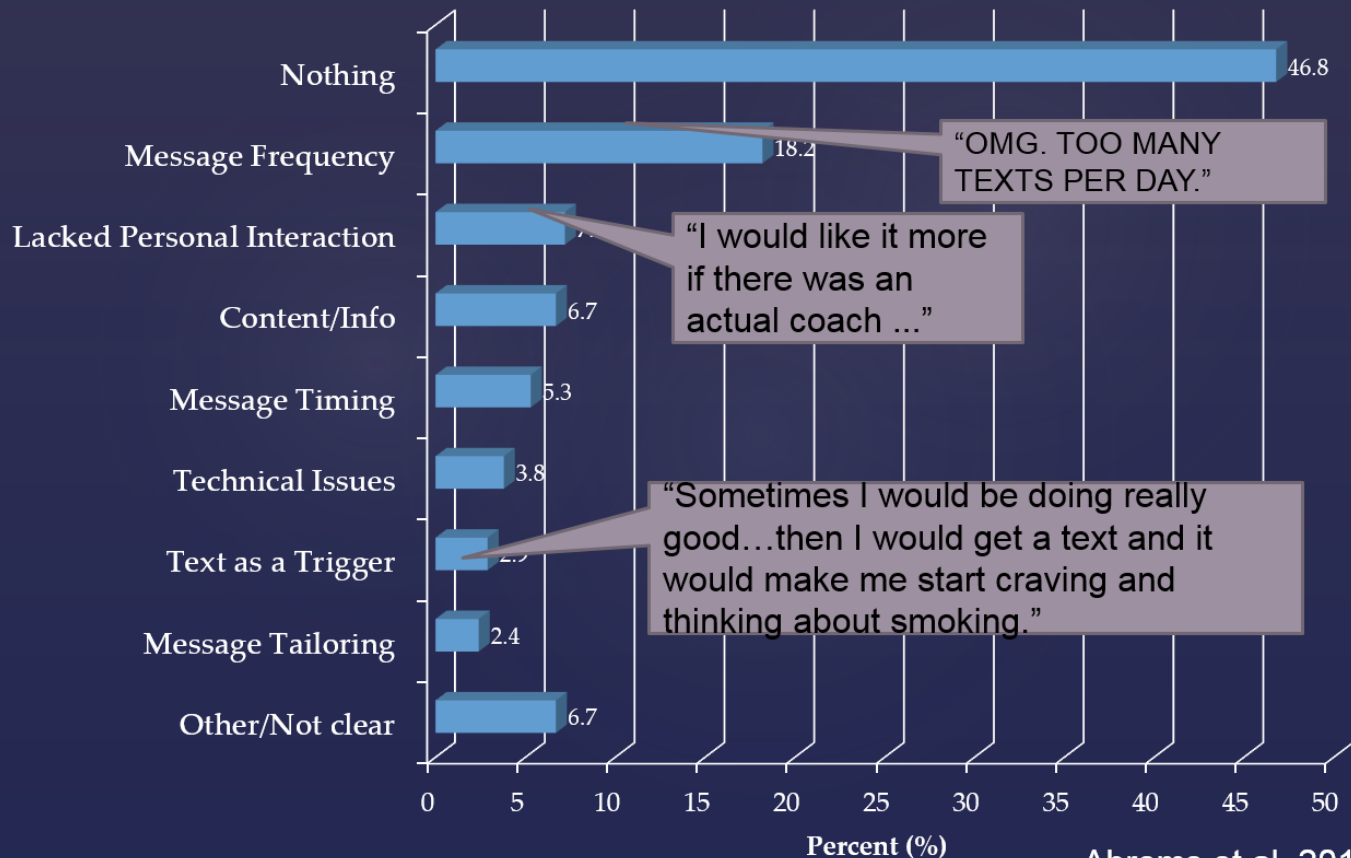
# What Did You Like About Text2Quit? (1 Month)

(n=181)



# What Did You Dislike About Text2Quit? (1 Month)

(n=173)



# Mobile phone SMS messages can enhance healthy behaviour: a meta-analysis of randomised controlled trials.

[Orr JA1](#), [King RJ1](#).

## Author information

### Abstract

Healthy behaviour, such as smoking cessation and adherence to prescribed medications, mitigates illness risk factors but health behaviour change can be challenging. Mobile phone short-message service (SMS) messages are increasingly used to deliver interventions designed to enhance healthy behaviour. This meta-analysis used a random-effects model to synthesise 38 randomised controlled trials that investigated the efficacy of SMS messages to enhance healthy behaviour. Participants (N = 19,641) lived in developed and developing countries and were diverse with respect to age, ethnicity, socioeconomic background and health behaviours targeted for change. SMS messages had a small, positive, significant effect ( $g = 0.291$ ) on a broad range of healthy behaviour. This effect was maximised when multiple SMS messages per day were used ( $g = 0.395$ ) compared to using lower frequencies (daily, multiple per week and once-off) ( $g = 0.244$ ). The low heterogeneity in this meta-analysis ( $I^2 = 38.619$ ) supports reporting a summary effect size and implies that the effect of SMS messaging is robust, regardless of population characteristics or healthy behaviour targeted. SMS messaging is a simple, cost-effective intervention that can be automated and can reach any mobile phone owner. While the effect size is small, potential health benefits are well worth achieving.

Multiple messages a day  
Across a wide range of health behaviors ranging from  
appointment reminders to ART medication adherence.

