

# mHealth tools for smoking cessation

## Jacobs Center - CCWD 2018 Workshop

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# Acknowledgments

## **Study Team:**

- ▶ Justin S. White, PhD, University of California, San Francisco
- ▶ Johannes Thrul, PhD, Johns Hopkins University
- ▶ Lee Westmaas, PhD, American Cancer Society
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- ▶ Lorien Abroms, ScD, George Washington University

## **(Some) Study Partners:**

- ▶ Erik Augustson, National Cancer Institute
- ▶ Sydney Sattell, Wellpass (previously Sense Health), Inc

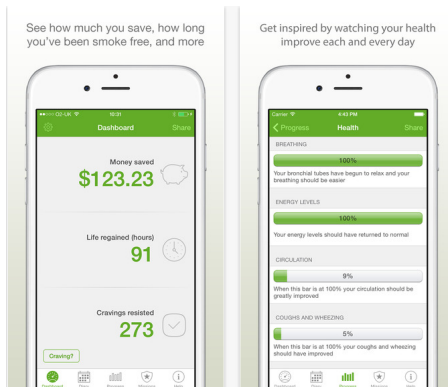
Funding: American Cancer Society

# Motivation

- ▶ Over last two decades, widespread efforts to expand access to smoking cessation aids.
- ▶ Yet, 2/3 of quit attempts still occur without treatment.
- ▶ Barriers: restricted access, high costs, inconvenience.
- ▶ mHealth technologies can reach large population at low cost.
- ▶ Smokers are increasingly using their smartphone for cessation support:
  - ▶ 1.2 million Android app downloads per month (Abrams 2013)

# Motivation

- ▶ Typical app (Smoke Free):



- ▶ Rarely evaluated, poor concordance with medical guidelines.
- ▶ Support often less targeted and less personal.

# What we propose

Our long-term goal is to design a custom smartphone app with 2 innovative features:

## 1. Peer mentoring

- ▶ Users supported through messages by peer mentor.
- ▶ *Peer* mentor = former smoker who quit successfully.

Status: Results from first RCT presented today.

# What we propose

Our long-term goal is to design a custom smartphone app with 2 innovative features:

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Status: Results from first RCT presented today.

## 2. Game-based environment

- ▶ Users enroll in 7-day quit challenges.
- ▶ Mentor and users accumulate points for engaging with the app.
- ▶ Points translate into non-monetary rewards.

Status: Ongoing (design stage)

## Why interesting? (1)

- ▶ Widespread adoption of peer mentoring for health promotion.
  - ▶ AA, Weight Watchers
- ▶ Lack of rigorous evaluation and existing evidence is mixed (Webel et al. 2010)
  - ▶ Westmaas (2010) points to ceiling effects, different definitions of social support, mechanisms not examined
- ▶ Yet, reasons to believe in efficacy (Gale 2018):
  1. Informational channel
  2. Emotional pathway
  3. Social pressure and accountability
- ▶ More so if strong connection between mentor and mentee:  
⇒ study how similarity affects engagement and likelihood of quitting.

## Why interesting? (2)

- ▶ Incentive-based behavioral interventions can promote cessation.
  - ▶ Volpp et al. (2009), White et al. (2013), Halpern et al. (2015)
  - ▶ Leverage behavioral science concepts such as loss aversion or present bias.
- ▶ Gamification for health behavior change still fairly uncommon.
  - ▶ SuperBetter (.5M users), Kwit
  - ▶ But lack of rigorous evaluation.
- ▶ Two distinguishing features of our incentive scheme:
  1. Incentives with surprise elements: keeping novelty up
  2. Focus on identity and image concerns: keeping esteem high



# Outline

1. Results from RCT focused on peer mentoring
2. Discussion of next steps involving gamification

# Peer mentoring via text messages

- ▶ We conducted an RCT to test the effectiveness of peer mentoring for smoking cessation delivered via text messages.
- ▶ We study (i) preferences for peer mentors; (ii) whether success depends on the similarity between mentor and mentee.

## 1. Preference for similarity:

- ▶ Do smokers have a preference for a mentor more similar to themselves? If so, what dimensions of similarity matter?

## 2. Importance of similarity for success:

- ▶ How does similarity impact engagement and likelihood of quitting?

# Sample and design

- ▶ Recruit 200 U.S. adult smokers who
  - ▶ want to quit within 30 days
  - ▶ do not use NRT or e-cigs
  - ▶ agree to take a salivary cotinine test
- ▶ **Control group:** receives automated text messages used in SmokefreeTXT (developed by National Cancer Institute)
  - ▶ 1-5 messages per day for up to 8 weeks
  - ▶ Messages include encouragement, advice, and tips for quitting
- ▶ **Treatment group:** receives similar automated messages + personalized messages from a peer mentor.
- ▶ Follow-up at 3 months (self-report + saliva test)

## Text messaging intervention

Feature	SmokefreeTXT (Control)	Mentor group
Conversation starters	"Write down your top 3 [smoking triggers] ..."	"What are your top 3 smoking triggers?"
Personalized msg.	"Think of healthy ways to deal with stress & boredom instead of smoking. Go to the gym, take a jog, or walk the dog."	"Think of healthy ways to deal with stress & boredom instead of smoking. For instance, I went for a walk, took a bubble bath, or went someplace I couldn't smoke."
Customized msg.	Not applicable	Add or remove msg. from script; send spontaneous msg. anytime

## Our peer mentors

- ▶ *Peer* mentor: former smoker who quit successfully at least 6 months ago.
- ▶ Good diversity in terms of socio-demographic characteristics.
- ▶ 36 mentors assigned 3 smokers each. Assignment is random.
- ▶ Had to complete a 2-hour online training and create a profile page.
- ▶ Incentives: \$50 for training, \$150 for mentoring + entry in \$1,000 lottery drawing (additional entries if mentees quit)

## Your mentor

Name [REDACTED]

Profile Picture:



Gender: female

Age: 48

Hometown: [REDACTED]

Profession: Healthcare

Those I love the most: Family

Hobbies: Scrapbooking, crafts, casino, pro coaching

**Fun fact about me:** I'm a new mommy to a 12-week old puppy and it's been crazy!! We had a dog for 16 years and had to put her down 1 year ago, and we decided to start this all over again. YIKES!!!!

**About me as a former smoker:** I smoked a pack a day for approximately 15 years. After watching my dad receive treatment for lung cancer, I quit smoking. I never wanted my family to go through what I was going through watching my dad suffer from the effects of cigarette smoking.

**Smokefree since:** 01/01/2002

**Years as a smoker:** 16

**Average cigarettes per day before quitting:** 20

**My main reason for quitting:** My family & to stay healthier!

**Methods used to quit smoking:** Zyban

**Reason for becoming a mentor:** To help others realize....that YES it's very difficult to quit and probably one of the hardest things you'll ever have to do, but you can do it!

## Preferences for peer mentors

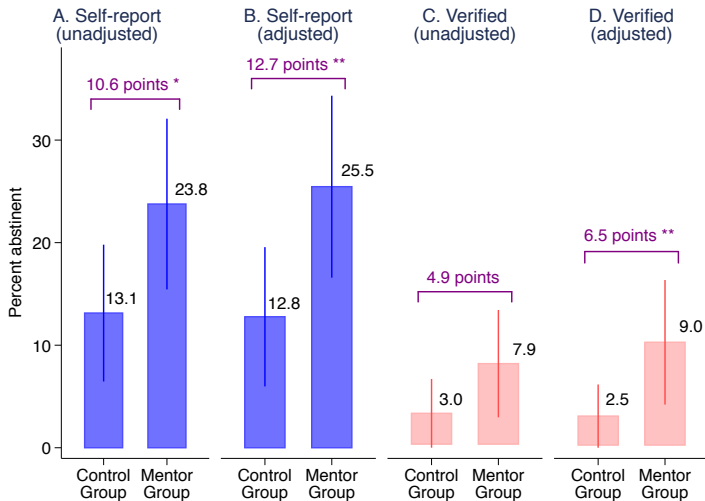
- ▶ Before assignment to treatment, smokers complete a baseline survey gathering data on their preferences for a peer mentor.
- ▶ 7 characteristics considered:
  1. **Demographic variables:** gender, age, race/ethnicity
  2. **Smoking-related variables:** heavy/light smoker, reason for smoking, reason for quitting, method used to quit
- ▶ Smokers asked to rank 7 dimensions in order of importance.
- ▶ For each dimension, also asked to express a preference.
  - ▶ choice from a list of categories
  - ▶ option “no preference” available

# Baseline characteristics

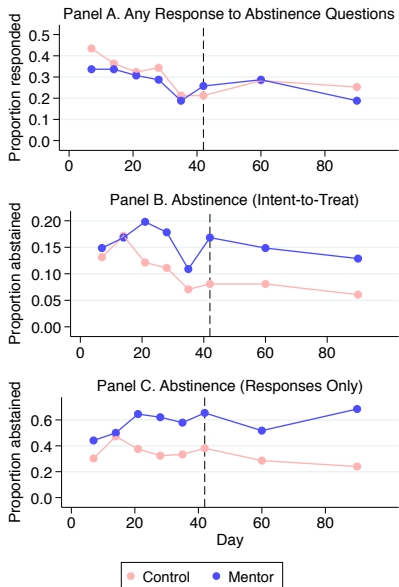
	Participants			Mentors
	Control	Treatment	p-value	
<i>Panel A. Demographics</i>				
Male (%)	20.2	24.8	0.44	27.7
Age (mean $\pm$ SD)	43.3 $\pm$ 12.5	44.3 $\pm$ 12.2	0.57	45.2 $\pm$ 12.7
Income (%)				
Less than \$20,000	38.4	27.7	0.11	3.0
\$20,000 - \$39,999	25.3	24.8	0.94	21.2
\$40,000 - \$74,999	22.2	18.8	0.55	34.3
\$75,000 or more	8.1	15.8	0.09	34.3
Decline to report	6.1	12.9	0.10	5.7
White (%)	75.8	73.3	0.69	91.7
Send text messages daily (%)	73.7	77.2	0.57	84.8
<i>Panel B. Smoking characteristics</i>				
Cigarettes per day (mean $\pm$ SD)	20.9 $\pm$ 20.6	17.8 $\pm$ 16.0	0.24	16.5 $\pm$ 8.8
Years smoking (mean $\pm$ SD)	26.5 $\pm$ 13.1	26.9 $\pm$ 12.5	0.79	29.4 $\pm$ 13.1
Reason to smoke: relieve stress (%)	61.6	53.5	0.25	44.4
Reason to quit: improve health (%)	52.5	54.5	0.79	47.2
Uses other nicotine products (%)	7.1	11.9	0.25	-
Observations	99	101		36



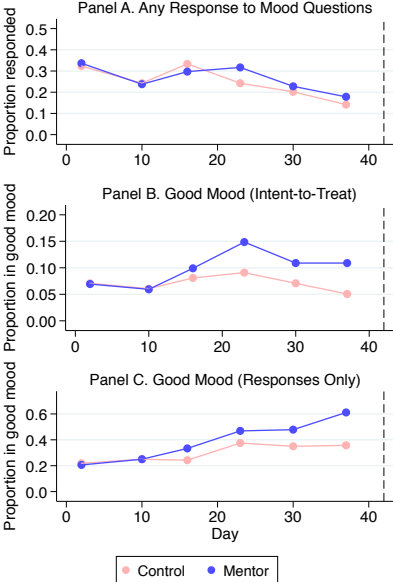
# Intervention effects on abstinence



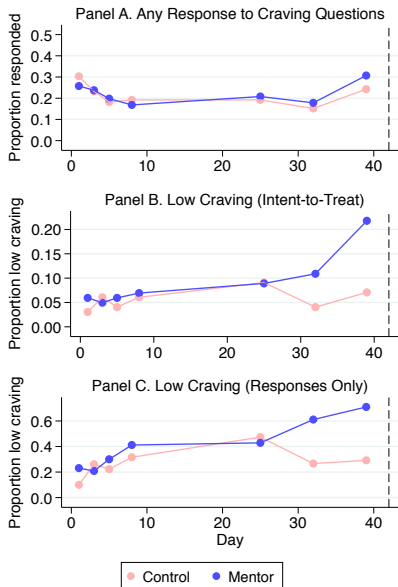
# Abstinence over time



# Mood over time



# Cravings over time

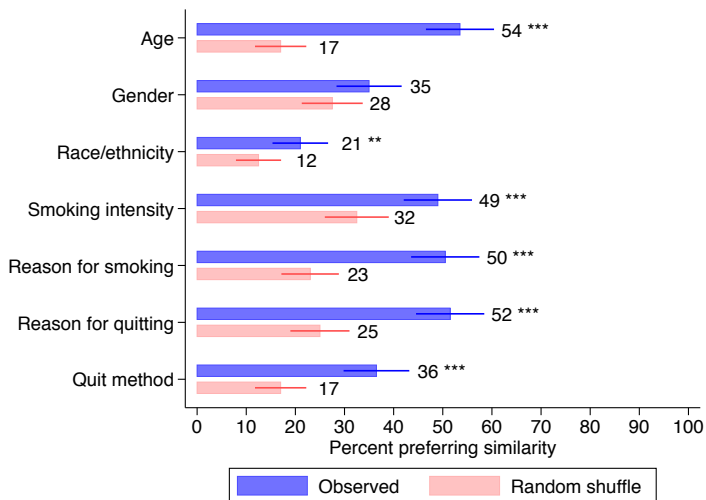


# Engagement

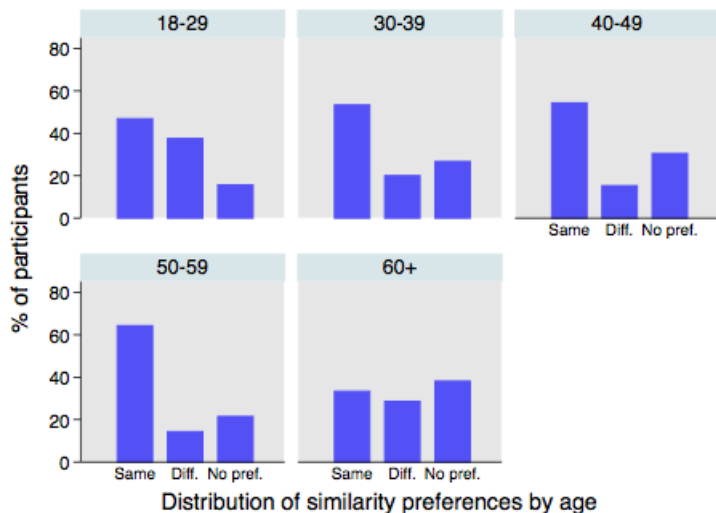
	(1) Control Group	(2) Mentor Group	(3) Difference in Means
Days of engagement (mean $\pm$ SD)	42.1 $\pm$ 16.0	44.9 $\pm$ 18.3	2.7
Unsubscribe (%)	15.2	17.8	2.7
Days to unsubscribing (mean $\pm$ SD)	19.5 $\pm$ 15.4	17.8 $\pm$ 14.4	-1.7
Reset quit date (%)	2.0	11.9	9.9***
Number of words sent by participants (mean $\pm$ SD)	28.2 $\pm$ 61.2	338.3 $\pm$ 888.3	310.1***
Median word count per msg. sent by participants (mean $\pm$ SD)	1.3 $\pm$ 1.4	5.1 $\pm$ 7.1	3.8***
Number of messages sent by participants (mean $\pm$ SD)	11.7 $\pm$ 13.9	34.4 $\pm$ 56.0	22.7***
Number of messages received by participants (mean $\pm$ SD)	104.6 $\pm$ 34.2	123.0 $\pm$ 59.5	18.3***
Number of replies to status assessment questions (mean $\pm$ SD)	6.4 $\pm$ 6.9	6.6 $\pm$ 7.6	0.2

\*\*\*  $p < 0.01$  \*\*  $p < 0.05$  \*  $p < 0.10$

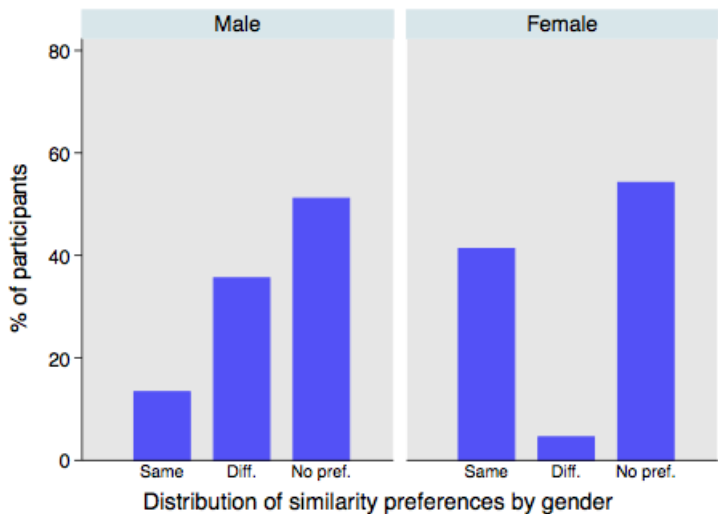
# Preference for similarity with peer mentor



## Heterogeneity in preferences: age



## Heterogeneity in preferences: gender





# Summary (1)

1. It is feasible to train former smokers to act as peer mentors
2. Peer mentoring improves smoking abstinence at 3 months relative to automated texting
  - ▶ Verified abstinence: ↑ 5-7 points over 3% base
  - ▶ Self-reported abstinence: ↑ 10-13 points over 13% base.
3. Smokers display a strong preference for mentors who are similar to themselves.
  - ▶ Though we find heterogeneity in preferences, e.g., by gender.
  - ▶ “Smart” matching algorithms may help attract and retain users of dyadic programs.

## Summary (2)

- ▶ Similarity of own vs. mentor attributes did not strongly predict abstinence or engagement.
- ▶ However, the study findings need to be replicated in a larger, more diverse sample.
- ▶ The social interactions may not have been intense enough for effects to appear.
  - ▶ Mentees did not remember their mentor's attributes very well when quizzed in endline survey.
- ▶ A wider range of attributes also merit attention.
- ▶ Currently analyzing content of conversations to gain more insights.

## Next steps

- ▶ Develop a prototype for a gamified app
- ▶ Game based on “quit challenges”
  - ▶ Commitment for short duration of 7 days
  - ▶ Focus on early stage, small steps: “foot in the door”
- ▶ Engaging with the app unlocks rewards:
  - ▶ Points for completing various “missions”
  - ▶ Missions emphasize both processes and outcomes
- ▶ Integration with a carbon monoxide sensor connected to phone allowing for personal monitoring.

# CO sensor



# Virtual rewards

Points from missions completed allow to:

1. Unlock new territories and play new “mystery” games
  - ▶ Curiosity, preference for non-instrumental information
2. Make digital pet grow:
  - ▶ Identity: symbol of transformation
  - ▶ Increases sense of accountability (good for teenagers?)

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# Surprise and curiosity



The screenshot shows the Travel Anywhr website interface. The background is a red-tinted image of a mountain range. The logo "anywhr" is in the top left. The navigation menu includes "ABOUT US", "HOW IT WORKS", "TRIP THEMES", "REVIEWS", "FAQ", and "CONTACT US". The main heading is "Travel Anywhr |" followed by the tagline "The catch? The destination is a surprise." Below this is a search form with three dropdown menus: "Where are you flying from?" (set to "Changi International Airport (SIN)"), "Theme" (set to "Adventure"), and "No. Of Pax" (set to "1"). A blue "Explore" button is on the right. At the bottom right, there are navigation icons for back, forward, and search.

# Combining peer mentoring and gamification

- ▶ Importance of building self-esteem capital both for users and mentors.
- ▶ For mentors:
  - ▶ Of course, social preferences - stronger for mentees who feel “closer”
  - ▶ Commitment value of being a role model: “keep being awesome”
  - ▶ Status concerns: leaderboard with list of top mentors





# Discussion

- ▶ Game play as substitute for smoking?
  - ▶ “Temptation bundling”
  - ▶ Substituting one addiction for another?
- ▶ Building confidence through game play
  - ▶ Transfer from virtual to real world?
- ▶ Monitoring
  - ▶ Necessary? Detrimental?
  - ▶ Importance of feedback, but danger of reminders

