Using Smartphones to Collect Information about Health Behaviors: A Formative and Process Evaluation

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Disclaimer

The findings and conclusions of this study are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention or ICF International.

Overview

- Background
- Study Phase I: Focus Group
- Study Phase II: Smartphone Survey
- Conclusion
- Next Step: Outcome Evaluation

Background

- In June 2011, CDC's Office on Smoking and Health convened an expert panel to address rapid response surveillance for tobacco prevention and control.
- Rapid response surveillance is a system designed to provide accurate and reliable information on an emerging tobacco control-related issue in a quick, cost-efficient manner.

Background (continued)

- **Smartphones were identified as a promising mode to conduct surveys and collect data expeditiously**
  - Over 50 percent of American adult cell phone users now own a smartphone or a phone that operated on a smartphone platform.[1] Since 88% of US adults are now cell phone owners, that means that a total of 46% of *all* American adults are smartphone users.
  - Serve as an electronic method for data collection, merging processes of data collection and data entry.
  - Smartphone survey applications offer additional data collection features: instant location data, multimedia (camera/video) communication tools such as push notifications, e-mail, short message service (SMS).

[1] http://www.pewinternet.org/2012/03/01/nearly-half-of-american-adults-are-smartphone-owners/

Applying Smartphones in Rapid Response Data Collection

- **We conducted a feasibility study to evaluate the potential to collect health and behavioral data rapidly using smartphones to meet the enhanced surveillance needs of CDC's Office of Smoking and Health:**
  - To follow tobacco users over time
  - To obtain experiential and behavioral data in real-time
  - To target specific populations
  - To assess tobacco industry influences
    - Point of sales/retail environment
    - Product pricing

Applying Smartphones in Rapid Response Data Collection: Phase 1, Focus Groups

- **Conducted focus groups in April 2012 to assess the willingness of individuals to participate in surveys conducted on their smartphones**
  - 12 focus group participants recruited via random digit dial of cell phone numbers
  - Eligible participants were smartphone owners between the ages of 18 and 65
  - Included both cigarette smokers and non-smokers
  - Two focus groups of 4 were held, with participants divided by age (18-34, 35-65)
  - Participants received an honorarium of $50

Focus Group Composition

Focus Group 1 Ages 18-34

Participant	Race	Smoker (Y/N)	Sex
1	Asian	N	M
2	White	N	M
3	White	N	M
4	White	Y	M

Focus Group 2 Ages 35-65

Participant	Race	Smoker (Y/N)	Sex
1	Asian	N	F
2	White	N	M
3	White	Y	F
4	White	Y	M

Moderator Guide Questions

- Would you be likely to participate in the survey? Why, why not?
- How many text messages would you be willing to respond to in a day?
- Would you have difficulty completing the survey at work/school? Thinking of your work/school schedule, would there be times that you would be likely to miss the surveys?
- Would you prefer to receive a text message with a web address that would link to the survey versus taking the survey directly on your phone?
- Would you be more likely/less likely to participate if this was a traditional computer/mail/phone survey?
- Do you have any concerns about your answers being kept confidential?
- How easy/difficult is it for you to type in one or two sentences on a smartphone?
- How much would you need to be paid to participate? How do feel about receiving online payments through ZashPay?

Focus Group Results

- **Information obtained from focus group participants was organized into the following categories:**
  - Security concerns
  - Usability concerns
  - Perceived burden
  - Perceived social benefit
  - Use of Incentives

Security Concerns

- **Privacy of information transmitted on smartphones: *"You download an app and then they have all your info."***
- **Risks posed by viruses and spam when sending and receiving surveys over e-mail**
- **Concern that data collected would be stored on the smartphone: *"Smart phones are easy to get stolen, and then they have all your information."***

Usability Concerns: Screen Size and Formatting

- **iPhone is much easier to use than a Blackberry or Droid; these devices would pose a barrier to participating. Comments about non-iPhone smartphones:**
  - *"The screen size on the iPhone is better than the Blackberry and more 'magical.'"*
  - *"I find it difficult to scroll, and the screen size is difficult."*
  - *"I have a less fancy smartphone, so when there is a page that doesn't format correctly…like it puts all the pictures up front…it is annoying for me."*
  - *"Types of sites can be different, and formatting looks different on different phones."*

Usability Concerns: Text Message vs. Web Link

- **Device preference when answering questions by text messaging or via a link to Web survey**
  - More difficult to complete the survey on a website using an older phone: *"Texts would be more successful than a web survey. It is quicker and easier to text"; "Texting is an easy way to communicate, I will always respond."*
  - Some participants indicated that they would be less likely to complete surveys via text message when being asked to provide sensitive information, whereas others preferred this mode: *"I would prefer the smartphone for sensitive questions. I would not want to talk to someone on the phone about it."; "I wouldn't want to use mail for these questions…what if it fell out of the mailbox and a neighbor picked it up?"*

Usability Concerns: Device Preference

- **Laptop/desktop preferred if survey is long or requires more than minimal typing**
  - *"When I research or look at something from my phone, I will only look at it with a quick glimpse. My attention span is short."*
  - *"On a laptop, I can type as fast as I talk and do longer surveys."*
  - *"Anytime you have to type a lot, you use a laptop. It takes three times as long on a phone. Anything more than five or six sentences and I will use a laptop."*
  - *"No phone is preferable: on a laptop, on my terms."*

Perceived Burden

- **Amount of time required to respond, and flexibility in response time, impact participation**
  - Having to complete a survey at a specific time would be a barrier, in part because participants do not keep their phone on them at all times: *"I don't like being bugged to do anything 'right now,' I would rather set it up so once a day at my convenience I could fill it out."*
  - Participants preferred known parameters around contact times (generally not before 12pm or after 10pm)

Perceived Social Benefit

- **Especially for older participants, a survey's social value is a strong motivator**
  - *"The type of study is important…the social reason."*
  - *"I would participate because it helps people."*
- **Participants felt that frequent smartphone surveys, such as diary studies, could help people keep track of their health behaviors in a positive way**
  - *"As a smoker, I would not have any issue participating. Only recently have I started tracking my smoking, and it's alarming, so that's good."*

Use of Incentives

- **For all focus group participants, incentives to complete smartphone surveys were cited as an important motivator**
- **Contingent incentives based on survey completion would motivate participants to continue with the study**
  - *"Contingent incentives would provide an "instant reward" that would encourage compliance."*
- **Despite their frequent use of the Internet, participants were generally skeptical of receiving online incentives**
- **All participants stated that they would prefer cash**
  - *"I have never heard of ZashPay, but I have heard of PayPal, although I would never use it from my phone."*
  - *"I don't use PayPal on the phone. I question the security."*

Focus Group Conclusions

- Focus group participants were generally accepting of the concept of utilizing smartphones to collect health and behavioral data

- Participants provided useful feedback on ways to increase participation in such studies, including the provision of contingent incentives, limiting the use of open-ended questions, providing flexibility in response time, and emphasizing the survey data's social benefits

- Participants also provided useful insight into potential barriers to participation, including usability issues with certain types of smartphones, and considerations related to those who have work-issued smartphones

Applying Smartphones in Rapid Response Data Collection: Phase 2, Surveys

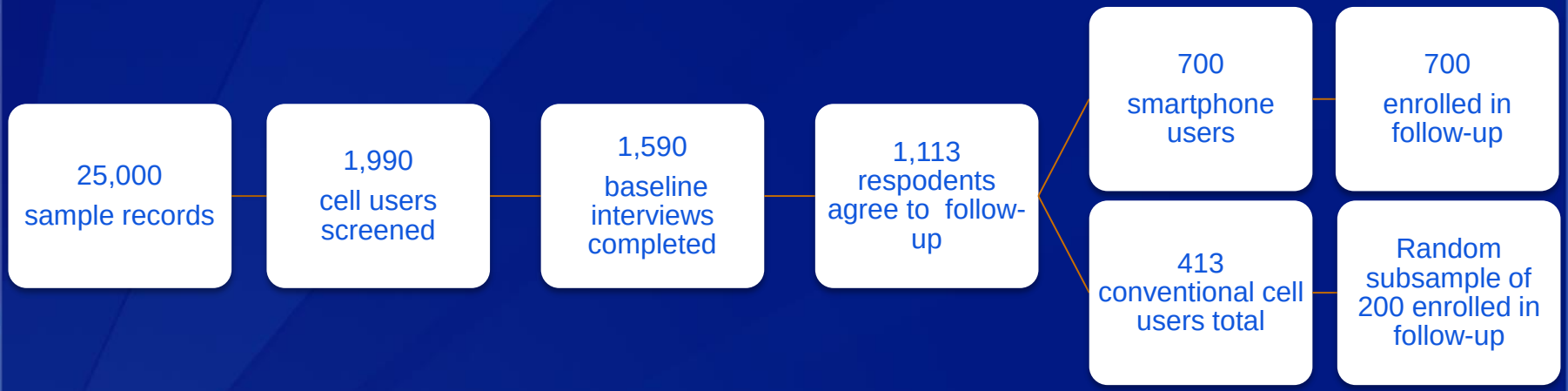
- **Information obtained through the focus groups was applied to the design of the survey phase. Specifically, we:**
  - Used only closed-ended questions with limited response options
  - Kept the surveys brief, so that if completed in one sitting it would require less than 5 minutes
  - Sent invitations and reminders at 5:30pm, in consideration of traditional work schedules
  - Utilized an incentive structure with incentives accruing for every survey completed

Applying Smartphones in Rapid Response Data Collection: Phase 2, Surveys

- **Cell phone users ages 18-65 were recruited via RDD using a national cell phone frame for a follow-up study consisting of:**
  - A 6-minute baseline CATI survey, with a series of questions about smoking and alcohol consumption
  - 2 brief follow-up surveys over a 2-week period, 19-21 questions each
    - Follow-up participation was by SMS/text message for conventional cell phone users and by web for smartphone users
- **Respondents earned points for each survey they completed:**
  - 4 points for the baseline survey and 3 points for each of the follow up surveys, for up to 10 total points
  - Each point was worth $1. We distributed incentives at the end of the survey period.

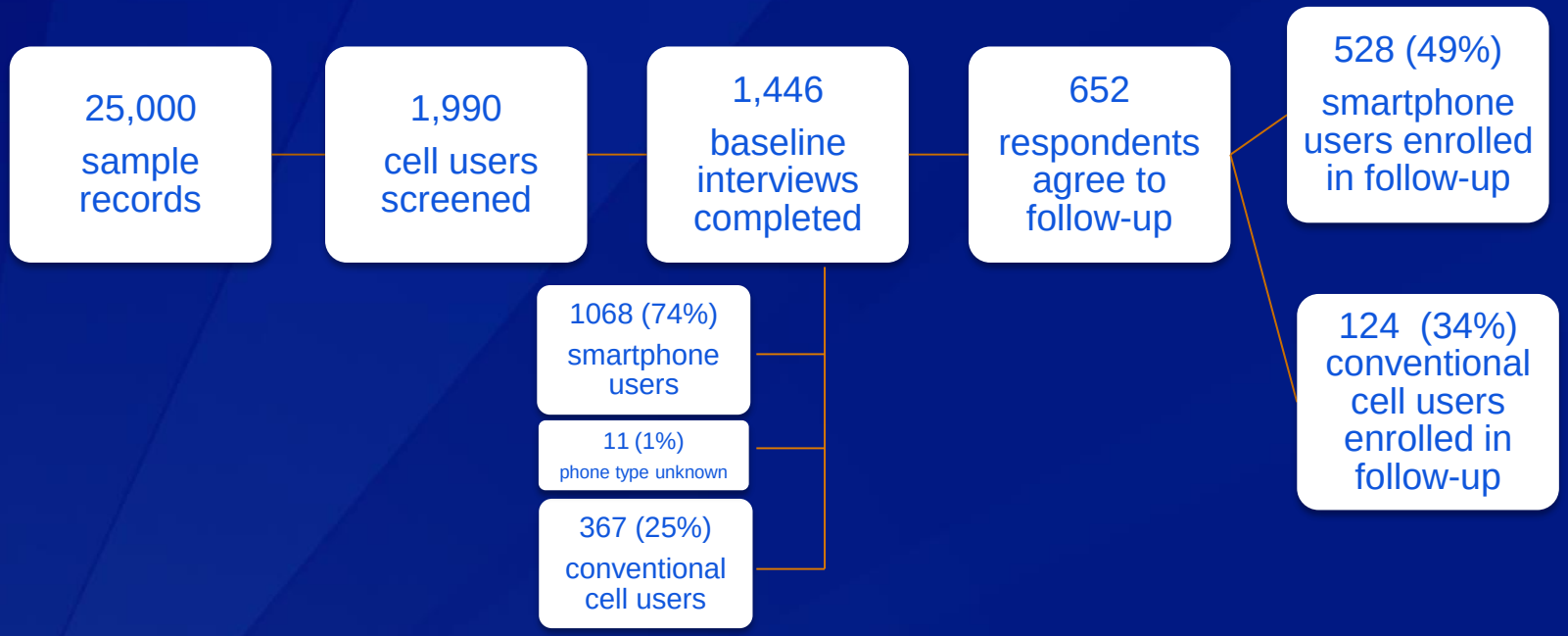
Applying Smartphones in Rapid Response Data Collection: Phase 2, Surveys

Planned Enrollment



Applying Smartphones in Rapid Response Data Collection: Phase 2, Surveys

Actual Enrollment



Whereas we had hoped to enroll a total of 900 respondents for the follow-up study, the rate of consent at baseline was lower than expected (45% vs. 57%). Due to budgetary constraints we stopped recruitment with a total of 652 respondents enrolled for the follow-up study.

SMS Follow-up Surveys for Conventional Cell Users

- **Follow-up surveys were programmed to meet the 160 character limit per question**

- **First "opt-in" SMS sent to all 124 respondents at the same time. Subsequent schedule was individualized:**

    1. Send opt-in message
    2. If no response in 24 hours, send opt-in message again
    3. If no response to 2nd message within 24 hours, send opt-in message final time. If no response within 24 hours, further communication to this cell # ceased.
    4. After the respondent confirmed participation, the first survey question was immediately sent.
    5. Steps 2 & 3 were repeated for each survey question sent.

- **Respondents were instructed to send the SMS "STOP" to end participation at any point during the study.**

SMS Follow-up Surveys for Conventional Cell Users

- The follow-up survey for conventional cell phone users consisted of up to 21 outgoing texts, 1 survey question per text. 3 questions were conditional based on responses to previous survey questions.

- An automated program checked survey responses (e.g., “YES”, ”yes”, etc.). Responses were also visually reviewed at the end of each day to determine whether respondents sent a compliant response that was not recognized by the automated system (e.g., “y”, “n”).

- After the final survey question for each follow-up survey, respondents were sent a text notifying them that they had earned 3 points, as well as providing the total points earned to date.

Schedule for SMS Follow-up Surveys

Date	Time	Survey #1 Event
Day 1	5:30pm	Sent first text invitation to Survey #1 to 124 cell phones
Day 5	5:30pm	Sent Reminder invitation to 68 incompletes
Day 12		Closed Survey #1; 56 completes.

Date	Time	Survey #2 Event
Day 1	5:30pm	Sent text invitation for Survey #2 to 102 cell phones (removed 22 opt-outs)
Day 5	5:30pm	Sent reminder invitation to 66 incompletes.
Day 7		Closed Survey #2; 52 completes

Response Outcomes for SMS Follow-up Surveys

- **89% (survey #1) and 85% (survey #2) of respondents completed the entire survey within the first 48 hours of sending the first invitation**
- **A reminder was sent to incomplete responders on Day 5 (survey #1) and Day 4 (survey #2) to boost participation; after the reminder, response rates increased by 5% (survey #1) and 8% (survey #2)**
- **To better understand respondent behavior around text surveys, we sent Survey #2 invitations to all respondents who had not actively opted out, regardless of whether the respondent had completed Survey #1**
  - 6 people who did not complete Survey #1 completed Survey #2

Final Response Status for SMS Follow-up Surveys

Final Status	N
Survey 1:	
Invited	124
Opted out	22
Incomplete	46
Complete	56
Survey 2	
Invited	102
Opted out	11
Incomplete	39
Complete	52

- Survey #1 Response Rate: 45%
- Survey #2 Response Rate:
  - 51% for respondents who received invitation to survey #2 (N=102)
  - 42% of eligible respondents (N=124)

Web Follow-up Surveys for Smartphone Users

- **For each follow-up survey, smartphone users were sent a text message with an embedded URL that included a unique survey link for the follow-up survey. Unique ID numbers were used to track individual participation.**
  - Survey #1 text: You recently agreed to do a brief CDC survey online. You already have 4 points! For 3 more points, complete the survey now at www.cdcpoll.net/1XXX.
  - Survey #2 text: You recently agreed to do a brief CDC survey online. You already have 7 points! For 3 more points, complete the survey now at www.cdcpoll2.net/1XXX.

Schedule for Web Follow-up Surveys

Date	Time	Survey #1 Event
Day 1	5:30pm	Sent invitation to Survey #1 via text message to 528 respondents
Day 3	12:00pm	Sent reminder invitation to 351 non-responders
Day 5	5:30pm	Sent reminder invitation to 292 non-responders
Day 12		Closed out web survey #1. 296 started survey, 277 completed; 20 opted out

Date	Time	Survey #2 Event
Day 1	5:30pm	Sent invitation to Survey #2 sent via text message to 511 participants (removed 17 opt-outs)
Day 4	12:00pm	Sent reminder invitation to 317 non-responders
Day 6	5:30pm	Sent reminder invitation to 251 non-responders
Day 7		Closed Web Survey #2. 291 started survey, 279 completed

Response Outcomes for Web Follow-up Surveys

- 64% (survey #1) and 70% (survey #2) of respondents completed the entire survey within the first 48 hours of sending the first invitation
- Reminders to survey #1 were sent to incomplete responders on Days 3 and 5 to boost participation; after sending the reminders, response rates increased by 11% (first reminder) and 7% (second reminder)
- Reminders to survey #2 were sent to incomplete responders on Days 4 and 6 to boost participation; after sending the reminders, response rates increased by 13% (first reminder) and 4% (second reminder)
- 27 respondents completed only web survey #2

Final Response Status for Web Follow-up Surveys

Final Status	N
Survey 1:	
Invited	528
Opted out	20
Incomplete	231
Complete	277
Survey 2:	
Invited	511
Opted out	0
Incomplete	232
Complete	279

- Survey #1 Response Rate: 52%
- Survey #2 Response Rate:
  - 55% for respondents who received invitation to survey #2 (N=508)
  - 53% of eligible respondents (N=528)

Conclusions

- **Baseline CATI survey**
  - Although smartphone users represent about 50% of all cell phone users, of cell users responding to the baseline survey, 75% were smartphone users and only 25% were conventional cell users
  - The percent of respondents who completed the baseline interview and agreed to participate in the follow up study (45%) was lower than expected
  - There was a differential rate of agreeing to follow-up between conventional cell users and smartphone users (34% vs. 49%); this may be a function of age, comfort with technology, interest in surveys in general or this survey topic specifically, or a combination of factors

Conclusions

- **Follow-up SMS and web surveys**
  - For both the SMS and web follow-up surveys, the majority of respondents completed the survey within 48 hours of the initial invitation being sent. The reminders generated an additional 5% - 13% response, depending on the survey and mode.
  - 6 respondents completed only SMS Survey #2 and 27 respondents completed only web Survey #2.
  - The response rates for the SMS follow-up surveys were lower than the response rates for the web follow-up surveys, but response rates for both are comparable to those obtained in other follow-up studies on similar topics but conducted by telephone.

Conclusions

- **Follow-up SMS and web surveys**
  - The response to the follow-up surveys indicates that SMS and web surveys are a feasible method for rapid response data collection. Smartphone users in particular were willing to participate in this data collection effort: about 50% of those completing baseline agreed to participate in the follow-up study
  - These preliminary results indicate that respondents may be amenable to completing multiple data collection points without the risk of substantial attrition

Next Steps: Outcome Evaluation

- **Evaluate quality of sample (unit non-response) by comparing initial CATI responses for:**
  1. Baseline responders who opt-in to the follow-up study and those who do not
  2. Smartphone users and conventional cell phone users
  3. Baseline responses for responders who complete the follow-up surveys and those who do not
- **Evaluate quality of data by comparing item non-response in the initial CATI survey, follow up web surveys, and follow-up text message surveys.**

Next Steps: Outcome Evaluation

- Examine the relationship between survey modes and demographic characteristics of respondents through pairwise contingency tables
- Examine the bivariate relationship between survey approaches and tobacco and alcohol risk behavior measures. Logistic models will be developed for each of the risk behavior measures to examine whether survey approach affected responses after adjusting for the impact of demographic characteristics such as age, gender, education level, marital status, and employment status
- Use a logistic regression model to compare mode effect and accuracy of data estimates when benchmarked against National Adult Tobacco Survey, Behavioral Risk Factor Surveillance System, and National Health Interview Survey data.

Thank you!
For more information please contact:

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