Mobile Phone Text Messaging for Tobacco Risk Communication among Young Adult Community College Students: Protocol and Baseline Overview for a Randomized Trial

Alexander V. Prokhorov¹, Georges E. Khalil¹, Karen S. Calabro¹, Tamara C. Machado¹, Sophia C. Russel¹, Katarzyna W. Czerniak¹, Gabrielle C. Botello¹, Minxing Chen¹, Adriana Pérez², Damon J. Vidrine², Cheryl L. Perry²

¹Department of Behavioral Science, The University of Texas MD Anderson Cancer Center, Houston, Texas
²University of Texas Health Science Center at Houston (UTHealth), School of Public Health in Austin, Austin, Texas
³Department of Family and Preventive Medicine, The University of Oklahoma Health Sciences Center, Oklahoma City, Oklahoma.

Corresponding Author:
Alexander V. Prokhorov, MD, PhD
Professor
Department of Behavioral Science
The University of Texas M. D. Anderson Cancer Center
1155 Pressler St. Unit 1330
Houston, TX 77030
Phone: 1-713-563-2605
Fax: 1-713-745-4286
E-mail: aprokhor@mdanderson.org
Abstract

Background: Young adults in community college represent an underserved population susceptible to tobacco use. The use of mobile health (mHealth) text messaging may be an effective strategy for tobacco risk communication with diverse young adults. However, the message structure that is most capable of increasing perceived tobacco risk is still not known.

Objective: The current research protocol outlines the rationale and design of Project Debunk, a randomized trial comparing the effects of different structures of text messages.

Methods: The study is being conducted as a 6-month long randomized trial comparing eight arms, based on the combination of the three message structures delivered to young adults in a 2x2x2 study design: framing (gain-framed or loss-framed), depth (simple or complex), and appeal (emotional or rational). Participants were invited to participate from three community colleges in Houston from September 2016 through July 2017. Participants are randomized to one arm, and receive text messages in two separate campaigns. Each campaign consists of two text messages per day for 30 days (i.e., 60 messages). In addition to baseline assessment, perceived risk is assessed two months after the first campaign, and two months after the second campaign. We assessed perceived risk of using conventional products (e.g., combustible cigarettes) and new and emerging products (e.g., electronic cigarettes).

Results: We completed data collection for the baseline survey on a rolling basis during this time, and assessed validity of the message structure after one week of messages. For the entire sample (n=636), the average age was 20.92 years (SD=2.52); about two-thirds were female, and most were black/African American (n=266/636; 41.2%) or white/Caucasian (n=239/636; 37.0%). After one week of receiving messages: (1) loss-framed messages were more likely to be perceived as presenting a loss than gain-framed messages (F=13.21, P<0.001), (2) complex messages were perceived to be more complex than simple messages (F=2.03, P=0.049), and (3) emotional messages were perceived to be more emotionally involving than rational messages (F=6.35, P<0.001).

Conclusions: This study confirms that the recruitment, randomization methods, and message structures, have been successfully implemented for this randomized trial. The findings will be able to identify specific types of message combinations that are more effective than others in increasing perceived risk of tobacco use. If our results suggest that any of the eight specific text message structures is more effective for helping young adults understand tobacco risk, this would provide evidence to include such messages as part of larger technology-based campaigns such as smartphone applications, entertainment-based campaigns, and social media.

Trial Registration: This trial was registered at the Clinical Trials registry, NCT03457480; https://clinicaltrials.gov/ct2/show/NCT03457480?term=NCT03457480&rank=1 (Archived by WebCite at http://www.webcitation.org/6ykd4IIap).

Keywords: tobacco use; risk communication; text messaging; message framing; regulatory science
Introduction

Background
Almost 38% of young adults are current users of tobacco products and more than one-third use multiple tobacco products, including conventional and new and emerging tobacco products (NETP) [1]. Young adults perceive NETPs such as electronic cigarettes (e-cigarettes) and hookah (i.e., waterpipes) as safer ways to enjoy nicotine than conventional products [2-4]. Reduced risk perception has led to uninformed choices among young adults [5], including experimentation with multiple tobacco products, alcohol, and other substances [6-8]. Indicators of socioeconomic disadvantage such as low educational attainment and income status are predictors of tobacco use [9]. In particular, young adults in community college represent an underserved population more susceptible to tobacco use than young adults attending universities or 4-year colleges [10-12].

Following bans on traditional advertising for tobacco, pro-tobacco marketing began to make effective use of modern advertising through social and mobile media channels to reduce risk perception and promote misinformation about tobacco among young adults [13, 14]. Currently, tobacco companies make effective expenditures for product discounts, point-of-sale advertising, direct mail advertising, e-marketing, and social media [15-20]. Additionally, with 96% of young adults owning a smartphone, tobacco companies depend on mobile strategies for marketing [21]. Tobacco product demonstrations are featured on industry-sponsored websites, and invitations to join online social interactions are encouraged [22-25]. More than 49 pro-tobacco smartphone applications have been identified in application stores under “kids” and “games” categories [26]. As a result, there is a clear need for efforts to respond to pro-tobacco marketing by communicating about tobacco risk to young adults, as delineated by the educational mission and research priorities of the U.S. Food and Drug Administration [27, 28].

The use of mobile health (mHealth) text messaging for the delivery of health messages may be an effective strategy for tobacco risk communication to young adults. In the United States, 95% of mobile phones are capable of receiving texts, and 96% of young adults own mobile phones, indicating this is a highly feasible method for transmitting information to this population [21, 29]. Although text messaging programs have been implemented for preventive behavioral interventions, including smoking cessation, no published accounts have applied text messaging to communicate about tobacco risk to young adults, as delineated by the educational mission and research priorities of the U.S. Food and Drug Administration [27, 28].

Theoretical Framework
For health promotion and risk communication, researchers have designed different types of messages based on three main structures: framing (gain-framed or loss-framed messages), depth (i.e., simple or complex messages), and appeal (i.e., emotional or rational messages) [35-38]. For framing, gain-framed messages describe the benefits of quitting or avoiding tobacco use, whereas loss-framed messages emphasize the disadvantages of use [39-41]. In the context of message depth, both complex grammatical structures and longer words have been applied to shape message complexity [42-45]. In terms of appeal, researchers have
developed emotional messages by introducing emotional words (e.g., “happy,” “angry”) [46-48], paralinguistic cues such as vocal spelling (e.g., “weeeell,” “soooo”), and emotional icons (e.g., “:-)” for happy face) [49].

The effectiveness of different message characteristics in driving risk communication outcomes stems from the elaboration likelihood model (ELM) [50, 51]. The ELM explains individuals’ motivation to engage in information processing. Individuals expending more mental or cognitive effort processing messages tend to formulate stronger attitudes toward an issue and deeper understanding—a desirable attribute for conveying tobacco risk information to the public. One of the basic constructs in the model concerns the degree of cognitive efforts expended and involvement that people use to engage with message content. The ELM posits that individuals can engage in central or peripheral processing of health information. Central processing involves attention to message content (e.g., complex, rational messages) [52], whereas peripheral processing involves attention to more peripheral cues such as affect or emotions in developing attitudes toward the message [53].

Research Objectives
The primary objective of the current research will be to conduct exploratory analyses to identify the most effective types of messages that inform about the harms of tobacco use among young adults in community college. This research protocol outlines the rationale and design of Project Debunk, a community-based randomized trial (peer-reviewed and funded; Multimedia Appendix 1). Project Debunk compares the effects of different structures of text messages delivered to young adults in community college, with the overarching goal of setting the stage for a larger mobile phone text messaging campaign in the future. The protocol presents baseline data from the trial and assesses validity of the message structures after one week of message exposure.

Methods
Project Debunk Overview
Project Debunk has gathered data in two phases: (a) qualitative research for message design and (b) a randomized trial with main data collection at baseline, 2 months after a first campaign of text messages, and 2 months after a second campaign of text messages. The current research protocol briefly describes the methods used for the message-design phase and outlines detailed information about the trial phase.

Text Messages
From January 2014 to August 2015, our research team from the Tobacco Center of Regulatory Science on Youth and Young Adults (TX TCORS) developed a library of text messages, taking into account previous scientific literature, developments in social media related to tobacco use, and common terminology. Collectively, the research team has extensive experience in tobacco cessation and prevention, public health, health communication, psychology, and creative writing. Message design also involved focus group discussions conducted among community college students [54].
Ultimately, our team generated 976 messages that communicate risks of tobacco use to college students, both users and non-users. The messages were developed according to a combination of the three structures described above (framing, depth, and appeal), resulting in the following eight categories of text messages:

- Complex/gain-framed/emotional (CGE)
- Complex/gain-framed/rational (CGR)
- Complex/loss-framed/emotional (CLE)
- Complex/loss-framed/rational (CLR)
- Simple/gain-framed/emotional (SGE)
- Simple/gain-framed/rational (SGR)
- Simple/loss-framed/emotional (SLE)
- Simple/loss-framed/rational (SLR)

Also, for each category, messages were developed to communicate about the harm of conventional tobacco products and NETPs. Messages describing conventional products included information about combustible cigarettes, variants of cigars, cigarillos, and pipes. Messages about NETP included information about e-cigarettes (including other vaping devices), snus, and hookah. Examples of messages are presented in Multimedia Appendix 2. Experts and students reviewed and rated each message. For validation of message categories, agreement needed to be ≥70% between experts and students for all three message structures. Further validation of message categories was conducted using a linguistic inquiry and word counting library designed to count words under specific themes (e.g., emotional words) [55].

Population
Eligibility criteria for the trial included the following: aged 18 through 25 years, enrolled in community college, using phone text-messaging features on a regular basis, willing to provide their phone number, capable of receiving text messages from the study’s text messaging system, able to read and speak English, and providing a signature on a written informed consent form. Three community college campuses from the Houston Community College (HCC) system were targeted for recruitment. The racial/ethnic profile for students attending the HCC system is as follows: 30.2% African American, 14.6% Asian American, 14.2% white, 36.9% Hispanic, and 4.2% other [56]. All methods and procedures used in the project have been approved by the Institutional Review Board of ethics of the University of Texas MD Anderson Cancer Center (2014-0474), as well as the HCC system Institutional Review Board.

Recruitment and Enrollment
Recruitment took place at each of the participating HCC campuses from September 2016 through July 2017. We set up recruitment stations or booths equipped with a highly visible logo of the research institution. Printed materials (e.g., posters and fliers) announcing the study were displayed in common areas, such as student lounges. During participant recruitment at each campus, the research staff explained the purpose of the study to students and answered their questions. Students interested in the trial were screened for
eligibility. Then, eligible students provided informed consent to participate in the trial. Following consent, participants completed a 20-minute self-administered baseline survey on their personal phones. This method of enrollment has yielded relatively high recruitment rates (80.1%) during our previous research activities with community college students [57]. Recruitment continued until a sample size of 636 participants was reached. Nine participants were not eligible for the study (over the age of 25), so they are dropped, reaching a sample of 636 participants. Up to six follow-up reminders are sent via phone and email to remind participants to complete follow-up surveys in order to progress through the study.

Attrition and Compliance
To the best of our knowledge, no study examining the delivery of text messages to young adults is currently available. On the basis of the results of a study with community college students by Prokhorov and colleagues [57], we expect an acceptable retention rate (between 60% and 70%) and high compliance (i.e., accurate self-reporting about paying attention to and reading most and/or all of the texts).

Study Design
The study is being conducted as a 6-month long randomized trial comparing eight arms, based on the combination of the three message structures: framing, depth, and appeal (Figure 1). Participants are randomly-assigned to one of eight arms. They are receiving text messages in two separate waves, or campaigns. Each campaign consists of two text messages per day for 30 days (i.e., 60 messages). The two campaigns were two months and one week apart. Allowing for a crossover design, participants within each of the eight arms are randomly divided into two groups: group 1 is receiving messages about conventional tobacco products during campaign 1 and then about NETP during campaign 2. Group 2 receiving messages about NETP during campaign 1 and then about conventional tobacco during campaign 2. This crossover design was advised by the TX TCORS Scientific Steering Committee, as it will allow us to explore potential differences between the two categories of products within and between participants, with respect to their perceived risk of tobacco use.

**Figure 1.** Study randomization flowchart. Conventional indicates conventional tobacco products including cigarettes, cigars, smokeless; NETP indicates new and emerging tobacco products.
products, including snus, hookah, and e-cigarettes. GSE: gain-framed, simple emotional; GCE: gain-framed, complex, emotional; GSR: gain-framed, simple, rational; GCR: gain-framed, complex, rational; LSE: loss-framed, simple, emotional; LCE: loss-framed, complex, emotional; LSR, loss-framed, simple, rational; LCR: loss-framed, complex, rational; PC1: post-campaign 1; PC2: post-campaign 2. In this study design, there is a break of one week between PC1 survey and campaign 2.

Randomization and Blinding
The study is double-blinded. Following screening and consent, members of our research staff provided participants with a study identification number and a link to the baseline survey to each participant’s mobile phone. This procedure confirmed that the participant’s device fully met the needs of the study. Following the baseline survey, participants were assigned to one of the eight arms following a computer-generated randomization list using a resource called assessment, intervention and measurement (AIM). AIM is a centralized repository at the MD Anderson Cancer Center, managed by a team of experts in the science of collecting and managing participant-reported outcomes. The allocation sequence was generated by the AIM system and automatically sent text messages on the basis of allocation, ensuring that our research team is blind to the allocation of each participant. The allocation sequence is password-protected and accessible only to non-research staff responsible for the AIM system.

Data Collection
Figure 2 depicts how data are collected for the study. Data collection took place at baseline and will continue at the end of each week throughout campaign 1 and campaign 2 of message dissemination, as well as 7 days after campaign 1, 7 days after campaign 2, 2 months after campaign 1, and 2 months after campaign 2. Participants will provide data through online surveys received through mobile phones.

We developed the surveys with skip patterns to minimize burden on participants. Using mobile phones from different brands and data carriers, the research team pre-tested the delivery of surveys and text messages with the assistance of experts in the AIM system (a team of computer scientists and bioinformaticians). This pre-testing allowed us to ensure that the surveys and text messages are reachable and readable regardless of the mobile phone or data carrier.

Data collection from the baseline survey ended in July 2017. At the end of each week throughout message exposure in campaign 1 and campaign 2, participants will complete a manipulation check survey. This weekly manipulation check will ensure that the eight arms of the study differ with respect to unique features such as perceived emotion level, complexity of the messages, and framing type. Data collection from the manipulation check survey for the first week of campaign 1 ended in October 2017. Seven days after the end of campaign 1 and 7 days after the end of campaign 2, participants will receive a survey regarding their immediate experience with the messages. Finally, 2 months after the end of campaign 1 and 2 months after the end of campaign 2, participants will receive a follow-up survey that includes tobacco-related outcome measures.
Survey Measures
All survey measures have been previously tested and validated, with some adaptations (further outlined below). All measures are assessed through web-based closed surveys. We adhered to the Checklist for Reporting Results of Internet E-Surveys (CHERRIES; Multimedia Appendix 3). This checklist will be reported once the study is completed, with the main outcomes of the trial. The current paper presents data from the baseline survey and the first weekly manipulation check survey. A detailed description of the main measures and Cronbach alpha values for available data are reported in Multimedia Appendix 4.

Baseline survey. The baseline survey data for the trial have been collected. With 97 items, baseline information included sociodemographic data such as age, gender, ethnicity, educational attainment, and income [58]. In addition, the baseline survey included questions about factors that may predict perceived risk and tobacco use: mental health status [59], marijuana and alcohol use [60], receptivity to receiving text messages [61], tendency to seek information about tobacco [62], number of friends using tobacco [63], secondhand smoke at home [58], mental health [64], prevention-focus level [65], sensation-seeking level [66], and numeracy ability [67].

Follow-up surveys. Follow-up surveys for the trial are ongoing. Weekly manipulation check surveys will assess participant perceptions about messages received in the previous week. The perceived message characteristics to be assessed include loss framing [68], message complexity level [69], emotional level of messages [70], credibility [71], message enjoyment [72, 73], relevance [74], and message readability.

Surveys completed by participants seven days after each of the two campaigns will assess self-reported attention to the messages [75], emotional involvement [75], thought provocation [76], motivation to discuss the messages with others [77, 78], and recall of actual discussions with others about the messages and tobacco [78].

Two months after campaign 1 and 2 months after campaign 2, we will measure perceived risk of using each tobacco product as the main outcome [79]. As secondary outcomes, we will also measure status and frequency of tobacco use [80], nonusers’ susceptibility to use tobacco products (i.e., likelihood to initiate use at some point in the future) [81], perceived addictiveness of products [4], perceived popularity of tobacco use [4], and perceived benefits of tobacco use [82].
Compensation
Participants who complete all survey assessments will be compensated a total of US$135. They received a $25 gift card for completing the baseline survey, and will receive a $25 gift card for completing each of the surveys administered at 2 months after the campaigns. They also receive a $10 gift card for completing each of the surveys administered seven days after the campaigns, and a $5 gift card for each of the eight weekly manipulation check surveys throughout the two campaigns.

Sample Size Determination
For sample size determination, we conducted a power calculation using the outcome of change in perceived risk of cigarette smoking from baseline to two months after each of the campaigns. The eight study arms define a 2×2×2 analysis of variance (ANOVA) factorial design. Assuming a balanced design in each of the eight study arms for the change in perceived risk, with n = 70 per arm, we have at least 80% power to detect an effect size of 0.12 in a fixed-effects ANOVA. A total of 560 participants are needed to provide 70 participants per study arm at two months after campaign 2, with complete measurements at baseline. We assume 11% attrition between the assessment at seven days after the program and two months after the program, and 1.5% attrition between baseline and the assessment at two months after campaign 2 (i.e., a total of 12.5% attrition). This assumes 640 participants randomized to eight study arms. This sample size was calculated using PASS 2005.

Current Data Analysis
For the currently available baseline data, we used descriptive statistics to summarize sociodemographic characteristics (e.g., age, gender, and race), tobacco-related characteristics (tobacco use and number of friends who use tobacco), and primary psychosocial health outcomes (i.e., perceived risk of using each tobacco product). ANOVA and chi-square tests were used to identify any differences between the study arms with respect to such characteristics.

Using the currently available data from the first weekly manipulation check survey, we checked to make sure that the message structures were perceived by participants as intended. Using one-way ANOVA, we examined study arm differences in perceived message loss framing, complexity level, emotional level, credibility, message enjoyment, perceived message relevance, and perceived message readability. STATA version 14 statistical software was used for data analysis.

Planned Data Analysis
Once the trial is complete, we plan to conduct an exploratory analysis to identify which combination of message characteristics (i.e., depth, framing, and appeal) most increases perceived risk of using each type of tobacco product. This analysis is exploratory because to date no theoretical framework or empirical evidence has been presented that demonstrates the importance of one message structure over another in the context of tobacco risk communication. We will first conduct, a series of eight repeated-measures mixed-effects models for each type of tobacco product with the interaction effect [group (one combination versus all other combinations) × time (baseline, two months after campaign 1,
and two months after campaign 2) to predict perceived risk of using the product. These models will control for past 30-day use of the product at baseline and the crossover group assignment. For all data analysis, $P < 0.05$ is considered statistically significant. We will use STATA version 14 software for all analyses.

**Ethics and Participant Safety**

Project Debunk has received full approval from the Research Ethics Board of The University of Texas MD Anderson Cancer Center in Houston, Texas, and it has undergone a local institutional scientific review. To the best of our knowledge, Project Debunk does not pose any significant risks to the physical and psychological safety of participants. Participants’ identities have been coded and only the research team has access to a master list that links names and study codes. This list is kept in a locked file cabinet. Demographic data and assessments of text messages will be stored on secure servers within the institution. Only aggregate data will be reported. We have obtained a Certificate of Confidentiality from the federal government, which will help to protect the privacy of research participants. The Certificate protects against the involuntary release of information about participants collected during the course of covered studies.

**Results**

Data collection is currently underway. Data analysis of change in the main outcomes and manuscript writing are expected to be completed in the summer of 2018. We highlight below some of the main baseline findings regarding the study population and measures.

**Sociodemographic Characteristics**

Table 1 presents respondents’ sociodemographic characteristics. For the entire sample (n=636), the average age was 20.78 years (SD=2.18), about two-thirds (n=430/636; 67.5%) were male, and most were black/African American (n=259/636; 40.7%) or white/Caucasian (n=237/636; 37.2%). With respect to ethnicity, 36.4% (232/636) of participants were Hispanic/Latino. The study arms did not differ in terms of sociodemographic characteristics or mental health status, economic status, planned education level, numeracy ability, prevention-focus level, receptivity to receiving text messages, or sensation-seeking level (Table 1).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total</th>
<th>CGE</th>
<th>CGR</th>
<th>CLE</th>
<th>CLR</th>
<th>SGE</th>
<th>SGR</th>
<th>SLE</th>
<th>SLR</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender at birth (men)</td>
<td>430 (67.5)</td>
<td>54 (66.7)</td>
<td>53 (68.8)</td>
<td>54 (74.0)</td>
<td>60 (74.1)</td>
<td>57 (65.5)</td>
<td>56 (60.9)</td>
<td>41 (53.2)</td>
<td>55 (67.1)</td>
<td>0.148</td>
</tr>
<tr>
<td>Hispanic/Latino ethnicity</td>
<td>232 (36.4)</td>
<td>31 (38.3)</td>
<td>29 (37.7)</td>
<td>24 (32.9)</td>
<td>28 (34.6)</td>
<td>31 (35.6)</td>
<td>34 (40.3)</td>
<td>22 (28.6)</td>
<td>33 (40.2)</td>
<td>0.688</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>99 (15.5)</td>
<td>12 (14.8)</td>
<td>12 (19.5)</td>
<td>13 (17.8)</td>
<td>14 (16.1)</td>
<td>9 (11.1)</td>
<td>14 (7.9)</td>
<td>16 (20.8)</td>
<td>13 (15.9)</td>
<td>0.587</td>
</tr>
<tr>
<td>Black/African American</td>
<td>259 (40.7)</td>
<td>34 (42.0)</td>
<td>28 (36.4)</td>
<td>32 (45.2)</td>
<td>33 (48.1)</td>
<td>33 (37.9)</td>
<td>30 (38.0)</td>
<td>31 (40.3)</td>
<td>31 (37.8)</td>
<td></td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>237 (37.2)</td>
<td>31 (38.3)</td>
<td>29 (37.7)</td>
<td>21 (28.8)</td>
<td>23 (35.8)</td>
<td>37 (42.5)</td>
<td>31 (39.2)</td>
<td>24 (31.2)</td>
<td>35 (42.7)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>42 (6.6)</td>
<td>4 (5.0)</td>
<td>5 (6.5)</td>
<td>7 (8.2)</td>
<td>4 (4.9)</td>
<td>3 (3.4)</td>
<td>11 (13.9)</td>
<td>6 (7.8)</td>
<td>3 (3.6)</td>
<td></td>
</tr>
</tbody>
</table>

---

Table 1: Baseline sociodemographic characteristics for the total sample and by treatment arms
<table>
<thead>
<tr>
<th>Have children</th>
<th>Age</th>
<th>Mental health status</th>
<th>Economic status</th>
<th>Planned education</th>
<th>Numeracy ability</th>
<th>Prevention-focus level</th>
<th>Receptivity to receiving text messages</th>
<th>Sensation-seeking level</th>
</tr>
</thead>
<tbody>
<tr>
<td>65 (9.3)</td>
<td>20.78 (2.18)</td>
<td>16.81 (4.81)</td>
<td>2.77 (0.92)</td>
<td>3.68 (1.15)</td>
<td>7.40 (1.87)</td>
<td>2.41 (.69)</td>
<td>0.92 (0.15)</td>
<td>3.5 (0.83)</td>
</tr>
<tr>
<td>7 (8.6)</td>
<td>20.53 (2.21)</td>
<td>16.95 (4.50)</td>
<td>2.67 (0.96)</td>
<td>3.77 (1.10)</td>
<td>5.01 (1.78)</td>
<td>2.33 (.71)</td>
<td>0.94 (0.12)</td>
<td>3.5 (0.73)</td>
</tr>
<tr>
<td>8 (10.4)</td>
<td>21.03 (3.10)</td>
<td>16.21 (4.70)</td>
<td>2.79 (0.96)</td>
<td>3.75 (1.05)</td>
<td>5.06 (1.92)</td>
<td>2.5 (.73)</td>
<td>0.9 (0.22)</td>
<td>3.47 (0.85)</td>
</tr>
<tr>
<td>8 (11.0)</td>
<td>20.75 (2.10)</td>
<td>17.03 (1.28)</td>
<td>2.74 (0.93)</td>
<td>3.53 (1.28)</td>
<td>4.84 (1.99)</td>
<td>2.46 (.71)</td>
<td>0.9 (0.22)</td>
<td>3.34 (0.91)</td>
</tr>
<tr>
<td>5 (6.2)</td>
<td>20.89 (2.30)</td>
<td>17.16 (1.16)</td>
<td>2.68 (0.93)</td>
<td>3.81 (1.16)</td>
<td>4.56 (2.13)</td>
<td>2.37 (.72)</td>
<td>0.9 (0.18)</td>
<td>3.45 (0.86)</td>
</tr>
<tr>
<td>6 (6.9)</td>
<td>20.57 (2.07)</td>
<td>17.36 (1.06)</td>
<td>2.84 (0.89)</td>
<td>3.68 (1.06)</td>
<td>4.89 (1.86)</td>
<td>2.38 (.72)</td>
<td>0.92 (0.13)</td>
<td>3.55 (0.84)</td>
</tr>
<tr>
<td>9 (11.4)</td>
<td>20.97 (2.25)</td>
<td>16.75 (1.09)</td>
<td>2.96 (0.81)</td>
<td>3.72 (1.09)</td>
<td>4.48 (1.72)</td>
<td>2.4 (.64)</td>
<td>0.95 (0.10)</td>
<td>3.60 (0.85)</td>
</tr>
<tr>
<td>9 (11.7)</td>
<td>21.86 (2.22)</td>
<td>17.08 (1.25)</td>
<td>2.77 (0.87)</td>
<td>3.52 (1.25)</td>
<td>4.81 (1.89)</td>
<td>2.39 (.68)</td>
<td>0.93 (0.14)</td>
<td>3.51 (0.81)</td>
</tr>
<tr>
<td>7 (8.5)</td>
<td>20.63 (2.21)</td>
<td>16.79 (1.24)</td>
<td>2.71 (0.90)</td>
<td>3.61 (1.24)</td>
<td>4.29 (1.61)</td>
<td>2.42 (.68)</td>
<td>0.9 (0.14)</td>
<td>3.55 (0.81)</td>
</tr>
</tbody>
</table>

Missing values are not presented in this table.

Participants were randomized into one of eight treatment arms, describing the type of messages: complex, gain-framed, emotional (CGE); complex, gain-framed, rational (CGR); complex, loss-framed, emotional (CLE); complex, loss-framed, rational (CLR); simple, gain-framed, emotional (SGE); simple, gain-framed, rational (SGR); simple, loss-framed, emotional (SLE); simple, loss-framed, rational (SLR).

Proportions in subsample and percentage are presented for categorical variables, and the mean with standard deviation (SD) are presented for continuous variables.

Significance testing with chi-square test for the categorical variables (i.e., gender, ethnicity, race, having children) and analysis of variance for the continuous variables.

### Tobacco-related Characteristics

Respondents' tobacco-related characteristics are presented in Table 2. Of the entire sample, at least once in their lifetime, 45.10% (287/636) have ever used cigarettes, 32.30% (206/636) have used cigars, 55.60% (354/636) have used hookah, and 26.80% (171/636) have used e-cigarettes. Also, 25.30% (161/636) have used marijuana, 47.10% (300/636) have used more than one tobacco product, and 43.2% (275/636) have used both marijuana and tobacco products.

Among nonusers, 13.40% (47/351) were found to be susceptible to smoking cigarettes, 24.30% (109/449) were susceptible to smoking cigars, 30.40% (86/283) were susceptible to using hookah, and 24.10% (106/440) were susceptible to using e-cigarettes. At baseline, no significant differences between the eight groups were found with respect to all such tobacco-related characteristics (Table 2).
Table 2: Tobacco-related characteristics for the total sample and by group at baseline

<table>
<thead>
<tr>
<th>Substance use</th>
<th>Total</th>
<th>CGE</th>
<th>CGR</th>
<th>CLE</th>
<th>CLR</th>
<th>SGE</th>
<th>SGR</th>
<th>SLE</th>
<th>SLR</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
<td>(%)</td>
<td>(%</td>
<td>(%)</td>
<td>(%)</td>
<td>(%)</td>
<td>(%)</td>
<td>(%)</td>
<td>(%)</td>
<td>(%)</td>
</tr>
<tr>
<td><strong>Cigarettes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever</td>
<td>287(45.1)</td>
<td>37 (45.7)</td>
<td>34 (44.2)</td>
<td>28 (38.4)</td>
<td>35 (43.2)</td>
<td>43 (49.4)</td>
<td>41 (51.9)</td>
<td>35 (45.5)</td>
<td>34 (41.5)</td>
<td>.772</td>
</tr>
<tr>
<td>p30</td>
<td>87 (13.7)</td>
<td>12 (.14.8)</td>
<td>7 (.9.1)</td>
<td>9 (.12.3)</td>
<td>14 (17.3)</td>
<td>11 (12.6)</td>
<td>11 (13.9)</td>
<td>12 (1.65)</td>
<td>11 (13.4)</td>
<td>.903</td>
</tr>
<tr>
<td><strong>Cigars</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever</td>
<td>206 (32.3)</td>
<td>27 (33.3)</td>
<td>29 (37.7)</td>
<td>29 (39.7)</td>
<td>22 (27.2)</td>
<td>20 (23.0)</td>
<td>20 (35.4)</td>
<td>25 (32.5)</td>
<td>26 (31.7)</td>
<td>.361</td>
</tr>
<tr>
<td>p30</td>
<td>61 (9.6)</td>
<td>6 (7.4)</td>
<td>11 (14.3)</td>
<td>4 (5.5)</td>
<td>9 (11.1)</td>
<td>8 (9.2)</td>
<td>10 (12.7)</td>
<td>4 (5.2)</td>
<td>9(11.)</td>
<td>.448</td>
</tr>
<tr>
<td><strong>Smokeless</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever</td>
<td>34 (5.3)</td>
<td>2 (2.5)</td>
<td>1 (1.3)</td>
<td>6 (8.2)</td>
<td>3 (3.7)</td>
<td>3 (3.4)</td>
<td>9 (11.4)</td>
<td>6 (7.8)</td>
<td>4 (4.9)</td>
<td>.079</td>
</tr>
<tr>
<td>p30</td>
<td>6 (.9)</td>
<td>1 (1.2)</td>
<td>1 (1.3)</td>
<td>1 (1.4)</td>
<td>0 (0.1)</td>
<td>1 (2.5)</td>
<td>2 (0.0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>.686</td>
</tr>
<tr>
<td><strong>Hookah</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever</td>
<td>354 (55.6)</td>
<td>42 (51.9)</td>
<td>43 (55.8)</td>
<td>34 (46.6)</td>
<td>46 (56.8)</td>
<td>52 (59.8)</td>
<td>46 (58.2)</td>
<td>44 (57.1)</td>
<td>47 (57.3)</td>
<td>.789</td>
</tr>
<tr>
<td>p30</td>
<td>116 (18.2)</td>
<td>16 (19.8)</td>
<td>15 (19.5)</td>
<td>8 (11.5)</td>
<td>15 (18.5)</td>
<td>18 (20.7)</td>
<td>15 (19.5)</td>
<td>15 (19.5)</td>
<td>14 (17.1)</td>
<td>.852</td>
</tr>
<tr>
<td><strong>e-Cigarettes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever</td>
<td>171 (26.8)</td>
<td>22 (27.2)</td>
<td>19 (24.7)</td>
<td>19 (26.5)</td>
<td>21 (25.9)</td>
<td>18 (29.9)</td>
<td>22 (27.8)</td>
<td>20 (26.8)</td>
<td>22 (26.8)</td>
<td>.998</td>
</tr>
<tr>
<td>p30</td>
<td>57 (8.9)</td>
<td>9 (11.1)</td>
<td>5 (6.5)</td>
<td>7 (9.6)</td>
<td>7 (8.6)</td>
<td>5 (7.2)</td>
<td>5 (6.3)</td>
<td>3 (7.8)</td>
<td>3 (3.7)</td>
<td>.100</td>
</tr>
<tr>
<td><strong>Marijuana</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever</td>
<td>161 (25.3)</td>
<td>21 (25.9)</td>
<td>24 (31.2)</td>
<td>15 (20.5)</td>
<td>21 (25.9)</td>
<td>22 (25.3)</td>
<td>24 (30.4)</td>
<td>17 (22.1)</td>
<td>17 (20.7)</td>
<td>.694</td>
</tr>
<tr>
<td>Poly-tobacco use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever</td>
<td>300 (47.1)</td>
<td>43 (53.1)</td>
<td>34 (44.2)</td>
<td>35 (47.9)</td>
<td>39 (48.1)</td>
<td>40 (46)</td>
<td>42 (53.2)</td>
<td>34 (44.2)</td>
<td>33 (40.2)</td>
<td>.719</td>
</tr>
<tr>
<td>Susceptible to use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever</td>
<td>47 (13.4)</td>
<td>7 (15.9)</td>
<td>2 (4.7)</td>
<td>2 (4.4)</td>
<td>9 (19.6)</td>
<td>8 (18.2)</td>
<td>6 (15.8)</td>
<td>4 (9.5)</td>
<td>9 (18.8)</td>
<td>.164</td>
</tr>
<tr>
<td>Poly-tobacco use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever</td>
<td>275 (43.2)</td>
<td>40 (49.4)</td>
<td>39 (50.6)</td>
<td>26 (35.6)</td>
<td>34 (42)</td>
<td>38 (43.7)</td>
<td>32 (40.5)</td>
<td>31 (40.3)</td>
<td>35 (42.7)</td>
<td>.625</td>
</tr>
<tr>
<td>Secondhand smoke in house</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever</td>
<td>68 (10.7)</td>
<td>10 (12.3)</td>
<td>9 (11.7)</td>
<td>10 (13.7)</td>
<td>7 (8.6)</td>
<td>6 (9.6)</td>
<td>4 (5.1)</td>
<td>12 (15.6)</td>
<td>10 (12.2)</td>
<td>.386</td>
</tr>
</tbody>
</table>
Participant randomization to 8 groups of messages: gain-framed, simple emotional (GSE); gain-framed, simple, rational (GSR); gain-framed, complex, emotional (GCE); gain-framed, complex, rational (GCR); loss-framed, simple, emotional (LSE); loss-framed, complex, emotional (LCE); loss-framed, complex, rational (LCR)

Results that include “Ever” product use (Ever) followed by “Past 30 days” use (p30)

Refers to the concurrent use of multiple tobacco products among participants

Susceptibility to use is measured with non-users only

P-value of difference between the groups with respect to each participant characteristic. P-value is obtained based on qui-square or ANOVA results, depending on the variable.

Manipulation Checks

We first checked to ensure that the messages were perceived by participants as intended after the first week of message exposure (Table 3). Compared with gain-framed messages, loss-framed messages were significantly more likely to be perceived as presenting a loss, F=13.13, P<0.001. Groups receiving CLE, CLR, SLE, and SLR messages scored higher on perceived message framing as loss than did groups receiving CGE, CGR, SGE, or SGR messages. Complex messages were perceived to be significantly more complex than simple messages, F=2.04, P=0.048. Groups receiving CLE, CLR, CGE, and CGR messages scored higher on perceived message complexity than did groups receiving SLE, SLR, SGE, or SGR messages. Emotional messages were perceived to be significantly more emotionally involving than rational messages F=6.46, P<0.001. Groups receiving CLE, SLE, CGE, and SGE messages scored higher on perceived emotional level of their messages than did groups receiving CLR, SLR, CGR, or SGR messages (Table 3).

We also checked to make sure that the health messages were consistently perceived as credible (Table 3). As expected, there was no significant difference among the treatment arms with regard to perceived credibility of message content (F=1.70, P=0.105). The total mean score on message credibility was 7.57 (SD=2.01) on an eight-point scale. This confirms that all message interventions were perceived to be credible sources of information related to tobacco. Similarly, as shown in Table 3, the treatment arms did not differ with regard to enjoyment of the messages (F=0.41, P=0.899), perceived message relevance (F=1.04, P=0.399), or perceived message readability (F=0.34, P=0.935).
Perceived general risk of using cigarettes or e-cigarettes and the perceived risk of using hookah or smokeless tobacco were assessed in baseline and week 1 manipulation check outcomes for the total sample and by treatment arm. At baseline, there were no significant differences among the treatment arms with respect to our risk communication variables: perceived risk of using each tobacco product, perceived personal and general benefits of e-cigarettes, perceived addictiveness of products, or perceived popularity of tobacco use (Table 4).

### Table 3: Week 1 manipulation check outcomes for the total sample and by treatment arm

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>M (SD)</th>
<th>P value&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived message-framing as a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>loss</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived complexity level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived emotional level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived credibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enjoyment of messages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived relevance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived readability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived enjoyment of messages</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>Participants were randomized into one of eight treatment arms, describing the type of messages: complex, gain-framed, emotional (CGE); complex, gain-framed, rational (CGR); complex, loss-framed, emotional (CLE); complex, loss-framed, rational (CLR); simple, gain-framed, emotional (SGE); simple, gain-framed, rational (SGR); simple, loss-framed, emotional (SLE); simple, loss-framed, rational (SLR).

<sup>b</sup>Significance testing with analysis of variance.

### Baseline Treatment Arm Differences in Outcome Measures

At baseline, there were no significant differences among the treatment arms with respect to our risk communication variables: perceived risk of using each tobacco product, perceived personal and general benefits of e-cigarettes, perceived addictiveness of products, or perceived popularity of tobacco use (Table 4).

### Table 4: Baseline risk communication outcomes for the entire sample and by treatment arm

<table>
<thead>
<tr>
<th>Outcome</th>
<th>M (SD)</th>
<th>P value&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived risk of using cigarettes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived risk of using cigars</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived risk of using smokeless tobacco</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived risk of using hookah</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived risk of using e-cigarettes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived personal benefits of e-cigarettes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived general benefits of e-cigarettes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived addictiveness of products</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>Participants were randomized into one of eight treatment arms, describing the type of messages: complex, gain-framed, emotional (CGE); complex, gain-framed, rational (CGR); complex, loss-framed, emotional (CLE); complex, loss-framed, rational (CLR); simple, gain-framed, emotional (SGE); simple, gain-framed, rational (SGR); simple, loss-framed, emotional (SLE); simple, loss-framed, rational (SLR).

<sup>b</sup>Significance testing with analysis of variance.
Perceived popularity of tobacco use

<p>| | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.44</td>
<td>2.57</td>
<td>2.5</td>
<td>2.33</td>
<td>2.36</td>
<td>2.47</td>
<td>2.49</td>
<td>2.28</td>
</tr>
<tr>
<td></td>
<td>(1.13)</td>
<td>(1.11)</td>
<td>(1.05)</td>
<td>(1.21)</td>
<td>(1.15)</td>
<td>(1.09)</td>
<td>(1.06)</td>
<td>(1.19)</td>
</tr>
</tbody>
</table>
| Missing values are not presented in this table.

Participants were randomized into one of eight treatment arms, describing the type of messages: complex, gain-framed, emotional (CGE); complex, gain-framed, rational (CGR); complex, loss-framed, emotional (CLE); complex, loss-framed, rational (CLR); simple, gain-framed, emotional (SGE); simple, gain-framed, rational (SGR); simple, loss-framed, emotional (SLE); simple, loss-framed, rational (SLR).

Discussion

The Project Debunk trial will evaluate a comprehensive campaign delivered by phone for increasing tobacco risk perception among a large sample of young adults in community college, including both tobacco users and nonusers. In particular, the trial will identify which structures of text messages, if any, have the strongest effect on increasing the perceived risk of using conventional tobacco products and NETP. The results of this trial will form the basis of an evidence-based resource that future researchers and practitioners could modify for use among their populations of interest.

To the best of our knowledge, this is the first published mHealth protocol for a trial that assesses the effect of a comprehensive and evidence-based mobile phone text messaging campaign for tobacco risk communication. The current protocol summarizes the design and describes the planned evaluation of Project Debunk. Going beyond a simple presentation of our future study procedures, the protocol also presents results from our baseline data. In particular, baseline information confirms that a substantial proportion of young adults at community colleges continue to smoke cigarettes, in addition to using NETP such as e-cigarettes and hookah. There were no differences among the treatment arms with respect to sociodemographic or tobacco-related characteristics. In addition, the treatment arms did not differ at baseline with respect to perceived risk of using any tobacco product.

Preliminary results also show that we have successfully manipulated the eight message structure combinations with our study sample. This is evident from treatment arm differences with respect to perceived message loss framing, emotional level, and complexity. All eight message structure combinations were found to be enjoyable, easy to read, and credible.

Anticipated Results

On the basis of previous pilot data collected by our team [54], we anticipate adequate feasibility and satisfaction among participants. In a previous study that we conducted with young adult college students [57], the recruitment rate was high (80.1%) and participants reported positive changes in their perceived risk of tobacco use. We anticipate similar results in Project Debunk, for all groups. We project that all message structure combinations will result in an increase in perceived risk of using tobacco products. As suggested by recent reports [4, 83], we expect higher levels of perceived risk of using combustible cigarettes compared with NETP such as e-cigarettes and hookah. Also, change over time in perceived risk is expected to be lower for combustible cigarettes, compared with e-cigarettes and hookah. We cannot predict or anticipate specific results with respect to which message structure is most effective in improving tobacco risk perception. This
study will be the first to provide empirical evidence that highlights the importance of one message structure over another in the context of tobacco risk communication.

Strengths and Limitations
We will address anticipated difficulties described in previous studies of mobile text messaging in young-adult populations [84–86], such as participant retention, in several ways: regular communication with participants and continuous reminders via phone, and compensation (gift cards) at project completion.

Conclusions
It is evident that young-adult tobacco users and nonusers are interested in mHealth programs that help them learn about tobacco risks [54]. Moreover, as a mass media strategy, mHealth programs offer the potential to greatly increase the reach of young adults. If our results suggest that a specific mobile phone text message structure is most effective for helping young adults accurately perceive tobacco risk, this would provide evidence to include such messages as part of larger technology-based campaigns such as smartphone applications, entertainment-based campaigns, and social media. These findings would also provide a deeper understanding of the factors that drive change in perceived risk of using tobacco and improve the design of our text messages. Considering the wide variety of tobacco products studied in the trial, the results will highlight any potential differences between the products. With the use of mHealth text messaging, the results of the current study will reveal the best strategies to efficiently and widely communicate risk to young adults and ultimately prevent tobacco use in this age demographic.

Acknowledgements
We are grateful to campus leadership at Houston Community College for supporting our research activities and recognizing its importance to the health and safety of students. We appreciate students who volunteered to participate in this study. We would also like to acknowledge the members of the TX TCORS scientific steering committee for their constructive support and valuable recommendations throughout this study. The committee includes Jerome Williams (Prudential Chair in Business, at the Rutgers Business School), Cornelia (Connie) Pechmann (Professor at the Paul Merage School of Business, University of California, Irvine), John Pierce (Professor at the Cancer Prevention Program, Moores Cancer Center, University of California, San Diego, La Jolla, California and the Department of Family Medicine and Public Health, University of California, San Diego), Lisa Hendrickson (Senior Research Scientist at the Stanford Prevention Research Center), and Lois Biener (Senior Research Fellow at the University of Massachusetts Boston).

Funding
This study was funded by the Tobacco Center of Regulatory Science on Youth and Young Adults (5P50CA180906-02).

Authors’ Contributions
A.V.P. and K.S.C. conceptualized the initial study with numerous valuable contributions by G.E.K. T.C.M., S.C.R., K.W.C., and G.C.B. managed recruitment and will manage follow-up assessments. G.E.K. wrote the preliminary manuscript. G.E.K. and M.C. conducted the
statistical analysis. A.V.P., C.L.P., D.J.V., K.S.C., T.C.M., and A.P. contributed to drafts of the manuscript. A.V.P. approved the final manuscript.

Conflicts of Interest
There are no conflicts of interest for this study.

Data Access and Responsibility
Authors G.E.K. and M.C. had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Abbreviations
mHealth: Mobile health
TX TCORS: Tobacco center of regulatory science on youth and young adults
ELM: Elaboration likelihood model
CGE: Complex/gain-framed/emotional
CGR: Complex/gain-framed/rational
CLE: Complex/loss-framed/emotional
CLR: Complex/loss-framed/rational
SGE: Simple/gain-framed/emotional
SGR: Simple/gain-framed/rational
SLE: Simple/loss-framed/emotional
SLR: Simple/loss-framed/rational
PC1: Post-campaign 1
PC2: Post-campaign 2
ANOVA: Analysis of variance

Multimedia Appendix Captions
Multimedia Appendix 1. Peer-review report
Multimedia Appendix 2. Examples of text messages
Multimedia Appendix 3. Checklist for reporting results of Internet e-surveys (CHERRIES)
Multimedia Appendix 4. Description of the main measures

References
2. Pokhrel P, Lam TH, Pagano I, Kawamoto CT, Herzog TA. Young adult e-cigarette use outcome expectancies: Validity of a revised scale and a short scale. Addict Behav. 2018;78:193-9. PMID: 29195147
5. Kozlowski LT, Sweanor DT. Young or adult users of multiple tobacco/nicotine products urgently need to be informed of meaningful differences in product risks. Addict Behav. 2017 Jan 25;76:376-381. PMID: 28148394


26. BinDhim NF, Freeman B, Trevena L. Pro-smoking apps: where, how and who are most at risk. Tob Control. 2013;24(2):159-61. PMID: 24046212


