

Cover Page

Project RESIST: Evaluating the Effects of Anti-smoking Inoculation Messages Among Young Adult Sexual Minority Women

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PROTOCOL TITLE: Project RESIST: Evaluating the Effects of Anti-smoking Inoculation Messages Among Young Adult Sexual Minority Women

Brief Background

This study is the second of two randomized controlled experiments within Project Resist. The first randomized controlled experiment evaluated the effects of LGBTQ-tailoring (using a campaign logo with LGBTQ+ Pride colors and a slogan indicating the campaign's focus is LGBTQ+ health) vs. a control condition (yellow campaign logo and a slogan indicating the campaign's focus is on health in general) on intentions to quit smoking (among current smokers only), intentions to purchase cigarettes, marketing receptivity, industry beliefs, and industry attitudes (both current and non-current smokers). The messages used highlighted anti-tobacco industry arguments (e.g., how the tobacco industry targets children) and health impacts of cigarette smoking (e.g., risks of smoking related illnesses). Results from this experiment have been reported ([NCT04812795](#) and [publication](#)).

In this experiment, we conducted a national online survey experiment among young adult cisgender and transgender SMW smokers and non-smokers to evaluate the effects of exposure to anti-tobacco-industry inoculation health messages that are tailored for LGBTQ+ audiences. We varied the dose (3 messages vs. single message vs. no message), latency (immediate vs. 1-week delay and 1-month delay), and boosters (3 weekly boosters vs. a single dose) of anti-smoking messages on smoking and quitting intentions. Participants were randomized to one of 9 experimental arms using a fractional factorial design. All messages used LGBTQ+ tailored messages and highlighted anti-tobacco industry arguments. Six of the 12 messages used were identical to those used in the first experiment described above and six messages were new messages that were created.

Study Hypotheses

We hypothesize that multiple exposures (3 vs. single), delayed exposure (1-week or 1-month vs. immediate), and booster exposures (3 boosters vs. none) of anti-tobacco industry inoculation health messages will be associated with increased resistance to marketing, reduced smoking susceptibility, reduced intention to purchase cigarettes, and increased quitting intention.

Sample Enrollment

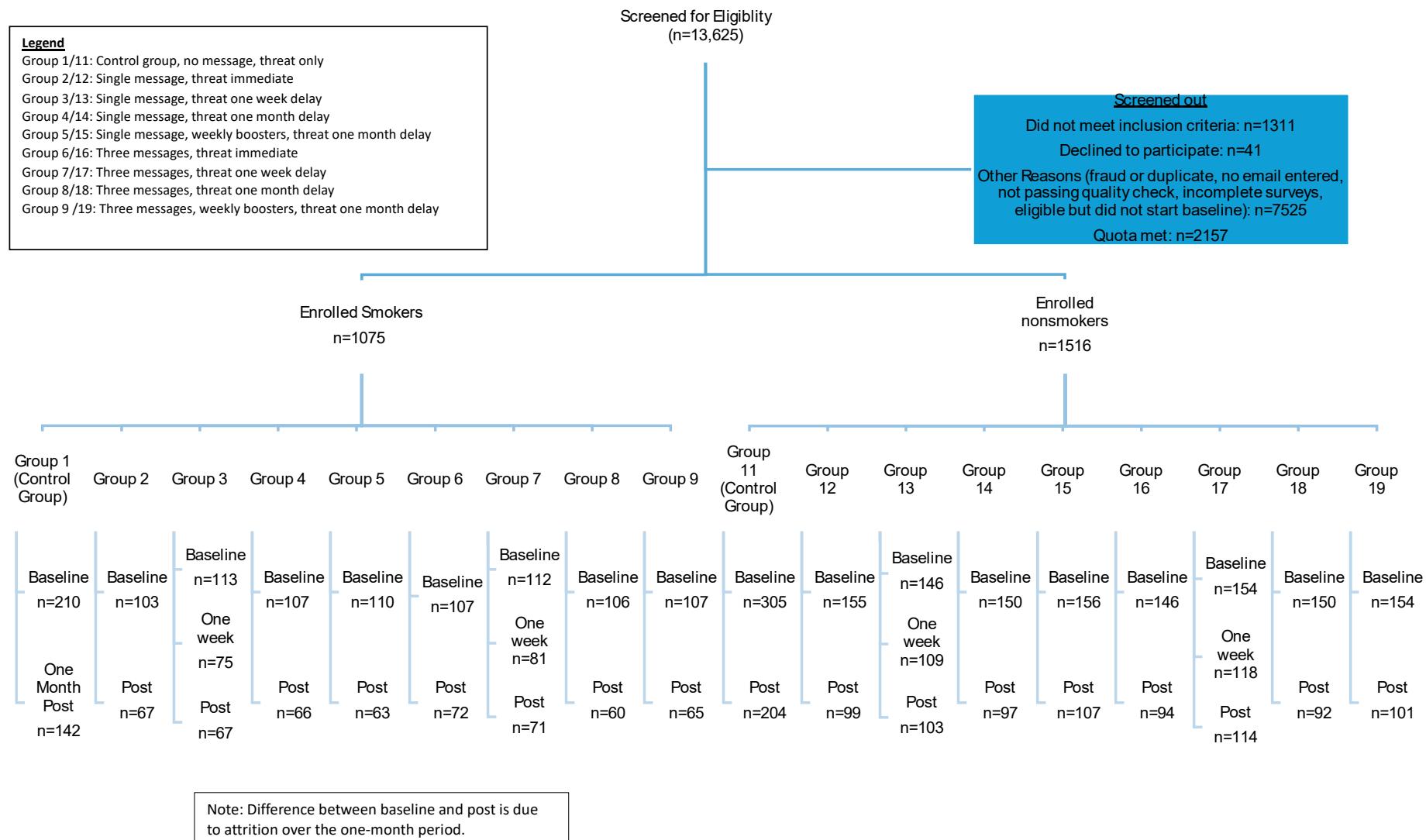
This study recruited young adult sexual minority women (SMW), ages 18-30 years, those who current smoke ($n = 1075$) and those who did not smoke ($n = 1516$). Participants were recruited through a combination of the Prolific online panel (~62% of the sample), The Population Research in Identity and Disparities for Equality (PRIDE) Study (~13%), social media advertising (paid Instagram ads and posting through LGBTQ+-serving community organizations' social media accounts) (~14%), and a dating app (HER) (~11%). Participants were asked to complete a baseline survey and then randomized to one of the 9 message conditions (see Experimental conditions table below). **Figure 1** summarizes the CONSORT flow diagram.

Our planned targeted enrollment was to recruit 1500 participants who currently smoke and 1500 who did not currently smoke (total $n=3000$). We used GPower (ver. 3) to estimate the effect sizes in the outcome variables as a function of message condition, assuming two-tailed tests, with 80% power and $\alpha=0.05$, and factored in 20% attrition among participants to arrive at the sample size of 3000.

However, we experienced difficulty in recruiting participants who currently smoke. Recruitment began in September 2022 and concluded in July 2023. In order to address slow recruitment for current smokers, we expanded the recruitment timeline, reached out to over 30 LGBT organizations to canvass over Pride month, flyering ads locally, advertised on social media and on the HER dating app. We further re-opened

the recruitment on the Prolific panel (having enrolled there ~6 months prior) and only received a handful of eligible cases so we ultimately decided to close out the recruitment to focus on the analysis for the remainder of the study.

Figure 1. CONSORT Flow Diagram



Study Protocol

Participants completed the study using the Qualtrics online survey platform. Participants were first screened for eligibility (ages 18-30, identify as sexual minority, and identify as women). We included all individuals who identified as women (cisgender and transgender), as we anticipated that all SMW would be the intended audience of future iterations of ads from this work. Transfeminine populations are currently and traditionally underrepresented in health research, and we did not wish to further marginalize this group by excluding them from participating in this study. Eligible participants completed questions on their baseline outcome measures and characteristics prior to randomization. They were randomly assigned using the Qualtrics built-in randomizer function to one of the nine experimental conditions. **Table 1** provides details of each experimental condition including the sequence of viewing inoculation messages, threat message, and outcomes assessment. We used block randomization to achieve balance across the two conditions based on sexual orientation and race/ethnicity. One month after the baseline survey, participants were invited to complete a follow-up survey to measure the study outcomes and additional questions on participants' characteristics. Depending on the source of enrollment, participants received up to \$12-15 in rewards or gift cards if they completed all phases of the study. The University of Pennsylvania's Institutional Review Board reviewed this study and considered it exempt.

Table 1. Experimental Conditions

No Intervention: No Message Condition

Participants will receive no anti-smoking messages. They will receive the threat message during the baseline survey. Outcomes will be measured before and immediately after seeing the threat message, and at 1 month.

Experimental: Single Message Immediate

Participants will receive a single anti-smoking message followed by the threat message during the baseline survey. Outcomes will be measured before seeing the anti-smoking message and threat message, immediately after seeing the threat message, and at 1 month.

Experimental: Single Message 1 Week Delay

Participants will receive a single anti-smoking message during the baseline survey, followed by the threat message one week later in a separate survey. Outcomes will be measured before seeing the anti-smoking message at baseline, immediately after seeing the threat message at 1 week, and at 1 month.

Experimental: Single Message 1 Month Delay

Participants will receive a single anti-smoking message during the baseline survey, followed by the threat message one month later in a separate survey. Outcomes will be measured before seeing the anti-smoking message at baseline, and immediately after seeing the threat message at 1 month.

Experimental: Single Message 1 Month Delay, Repeated Exposure

Participants will receive a single anti-smoking message during the baseline survey, followed by the threat message one month later. Participants will also receive repeated exposures of a single anti-smoking message at 1, 2, and 3 weeks in separate surveys. Outcomes will be measured before seeing the anti-smoking message at baseline and immediately after seeing the threat message at 1 month.

Experimental: Three Messages Immediate

Participants will receive three anti-smoking messages, followed by the threat message during the baseline survey. Outcomes will be measured before seeing the anti-smoking messages and threat message, immediately after seeing the threat message, and at 1 month.

Experimental: Three Messages 1 Week Delay

Participants will receive three anti-smoking messages during the baseline survey, followed by the threat message one week later in a separate survey. Outcomes will be measured before seeing the anti-smoking messages at baseline, immediately after seeing the threat message at 1 week, and at 1 month.

Experimental: Three Messages 1 Month Delay

Participants will receive three anti-smoking messages during the baseline survey, followed by the threat message one month later in a separate survey. Outcomes will be measured before seeing the anti-smoking messages at baseline, and immediately after seeing the threat message at 1 month.

Experimental: Three Messages 1 Month Delay Repeat Exposure

Participants will receive three anti-smoking messages during the baseline survey, followed by the threat message one month later. Participants will also receive repeated exposures of three anti-smoking messages at 1, 2, and 3 weeks in separate surveys. Outcomes will be measured before seeing the anti-smoking messages at baseline and immediately after seeing the threat message at 1 month.

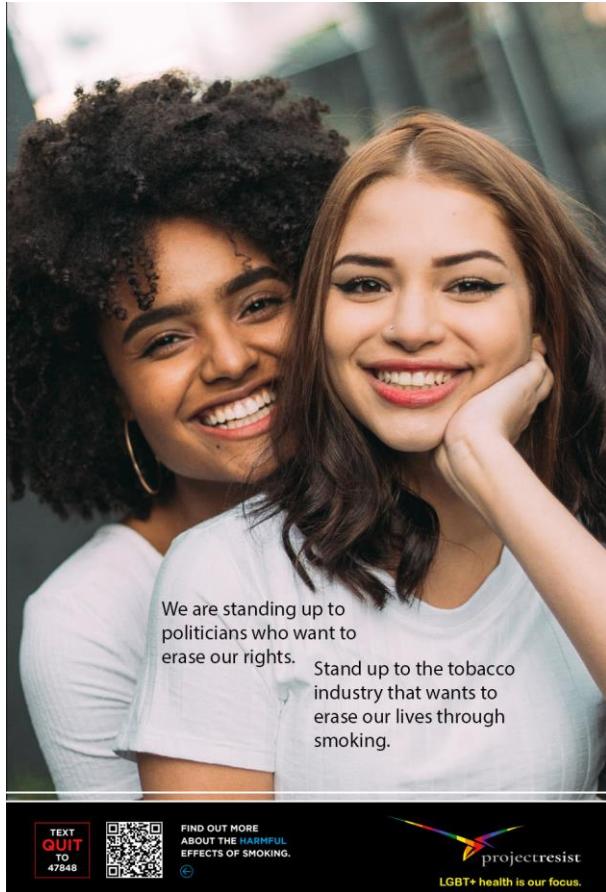
Anti-smoking ads and pro-smoking ads used.

In this experiment (Aim 3 of Project Resist), we conducted a national online survey experiment among young adult cisgender and transgender SMW who smoke and who did not smoke to evaluate the effects of exposure to anti-tobacco-industry inoculation health messages that are tailored for LGBTQ+ audiences. We varied the dose (3 messages vs. single message vs. no message), latency (immediate vs. 1-week delay and 1-month delay), and boosters (3 weekly boosters vs. a single dose) of anti-smoking messages on smoking and quitting intentions. Participants were randomized to one of 9 experimental arms using a fractional factorial design. All messages used LGBTQ+ tailored messages and highlighted anti-tobacco industry health messages (e.g., Let's come together as a community and say no to big tobacco. They've targeted us enough.)

We only used LGBTQ+ tailored messages because we did not design this study to compare effects between culturally tailored versus non-tailored messages that were also used in the experiment in Aim 2 of Project Resist. Similarly, we focused on anti-industry messages and did not use messages that described health effects of smoking which were included in Aim 2 of Project Resist, as we did not design this study to compare the effects between anti-tobacco industry versus health effects messages. Prior inoculation health campaigns and studies have also utilized anti-tobacco industry health messages as experimental message stimuli. Six of the 12 messages used in this experiment were identical to those used in the first experiment (Aim 2 of Project Resist) and six messages were new messages that were created to include an anti-tobacco industry health message and a matching picture.

For those who currently smoke, the bottom of each message included the study project logo (Project Resist), a campaign slogan (e.g., LGBT+ health is our focus), a box stating “Text QUIT to 47848”, a QR code that is linked to the SmokefreeTXT website, and text stating “Find out more about the harmful effects of smoking”. For those who did not smoke, the bottom of each message included the study project logo (Project Resist), a campaign slogan (e.g., LGBT+ health is our focus), a QR code that is linked to the CDC’s website on harmful health effects of smoking, and text stating “Find out more about the harmful effects of smoking”. **Figure 2** shows examples of the anti-smoking messages used for those who smoke and those who did not smoke.

Figure 2 Anti-Smoking Ads



A. For those who currently smoke



B. For those who did not currently smoke

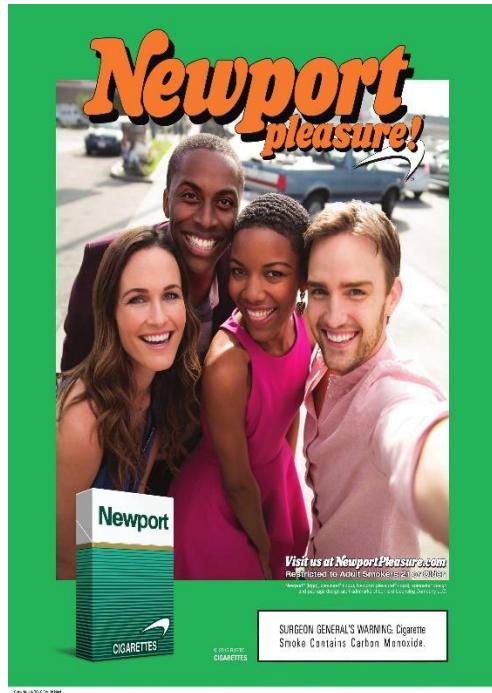
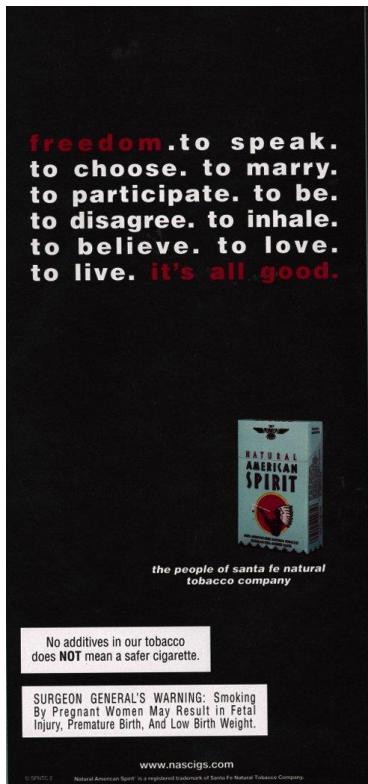
The 12 anti-smoking messages were randomly grouped into 4 blocks of 3 messages. The rationale for grouping into 4 blocks of messages is to ensure that the two experimental conditions that will receive the repeated exposures (either 1 message per week or 3 messages per week) would receive unique messages each week without any repetition of messages.

- For participants in the single-message and repeated exposure condition, the 4 blocks of messages were randomly ordered for each week and 1 message from each block was randomly selected, with no repetition, to be shown to the participants each week. These participants saw 4 unique messages over the 1-month period.
- For participants in the 3-message and repeated exposure condition, the 4 blocks of messages were randomly ordered for each week and all 3 messages from each block were shown in random order to the participants each week. These participants saw 12 unique messages over the 1-month period.
- For participants in the other single-message conditions with no repeated exposure, 1 block of messages was randomly selected and 1 message from this block was randomly selected and shown to the participants. These participants viewed only 1 message at baseline.
- For participants in the other 3-message conditions with no repeated exposure and viewed 3 message at baseline, 1 block of messages was randomly selected and 3 messages within this block were shown in random order to the participants. These participants viewed 3 unique messages at baseline.

Two pro-smoking ads were selected from the repository, *Trinkets and Trash*, including a Newport menthol cigarette ad that had been shown in LGBTQ+ magazines and a Natural American Spirit ad that used terms such as “freedom to love” and “freedom to marry” to target LGBTQ+ audiences. One ad was randomly selected to be shown to participants as the threat stimulus. **Figure 3** shows the two pro-smoking ads used in this study.

- For participants in the no-message condition, they did not view any anti-smoking message at baseline. They were shown 1 pro-smoking ad and the post-exposure outcome measures were collected immediately.
- For participants in the single-message and 3-messages immediate conditions, they viewed the anti-smoking messages, followed by the pro-smoking ads, and the post-exposure outcome measures were collected immediately.
- For participants in the single-message and 3-messages and 1-week delay conditions, they viewed the anti-smoking messages at baseline. They received the pro-smoking ad 1 week later, and the post-exposure outcome measures were collected at 1 week.
- For participants in the single-message and 3-messages and 1-month delay conditions, they viewed the anti-smoking messages at baseline. They received the pro-smoking ad 1 month later, and the post-exposure outcome measures were collected at 1 month.

Figure 3. Pro-smoking Ads



Primary Outcome Measures

1. Intention to quit smoking (among people who currently smoke)

We used a 4-item scale on intention to quit smoking at baseline and at follow-up (immediate, one-week and one-month) among current smokers only using four items:

- a. I will make an effort to quit smoking in the next 30 days;
- b. I intend to quit smoking in the next 30 days;
- c. I expect to quit smoking in the next 30 days;
- d. How likely is it that you will quit smoking in the next 30 days. Responses ranged on 7-point Likert-like scales.

Responses were summed to create a scale for intention to quit (range from 4-28), higher scores indicate higher intention to quit.

Note: Intent to quit smoking was not collected after exposure to the pro-tobacco message in the no-message, 1-message, and 3-message immediate conditions among people who currently smoked.

2. Intention to purchase cigarettes

The Juster scale was used to measure intention to purchase cigarettes at baseline and at one-month follow-up. Participants were asked, "How likely are you to purchase cigarettes in the next 6 months?" Responses ranged from 0=No chance, almost no chance (1 in 100) to 10=Certain, practically certain (99 in 100). Higher values reflect higher intention to purchase.

Note: Intent to purchase cigarettes was not collected after exposure to the pro-tobacco message in the no-message, 1-message, and 3-message immediate conditions among people who currently smoked and people who did not smoke.

3. Susceptibility to Smoke Cigarettes (among people who currently do not smoke)

Susceptibility to smoke cigarettes was measured among people who do not currently smoke using four-items:

- a. Have you ever been curious about smoking a cigarette?
- b. Do you think you will smoke a cigarette in the next year?
- c. Do you think that you will try a cigarette soon?
- d. If one of your best friends were to offer you a cigarette, would you smoke it? Responses ranged on 4-point Likert-like scales.

Responses were summed to create a scale for susceptibility to smoke cigarettes (range from 0-12). Higher scores indicate increased susceptibility to smoke cigarettes.

Secondary Outcome Measures

1. Receptivity to marketing

Receptivity to tobacco marketing was measured using 2 items:

- a. Tobacco companies should have the same rights to advertise as other companies.
- b. Are you open to using or wearing something with a tobacco company logo or picture on it? Response options range from 1 (strongly agree) to 5 (strongly disagree)

The scale is a sum of the responses to these items, the scale ranges from 2 to 10, with lower scores indicating greater receptivity to marketing.

2. Tobacco industry attitudes

Attitudes toward the tobacco industry were measured using 3 items:

1. I would like to see cigarette companies go out of business.
2. I would not work for a cigarette company.

3. How much do you like cigarette companies.

Response options for items 1 and 2 were from 1 (Strongly agree) to 5 (Strongly disagree). Response options for item 3 were from 1 (Dislike strongly) to 5 (Like strongly). Response options were summed across these 3 items to create the tobacco industry attitudes scale. Values range from 3 to 15, with lower scores indicating stronger anti-industry sentiment.

3. Tobacco industry beliefs

Beliefs about the tobacco industry were measured using 4 items:

1. Cigarette companies lie.
2. Cigarette companies target teens to replace smokers who die.
3. Cigarette companies deny that cigarettes cause cancer and other harmful diseases.
4. Cigarette companies deny that cigarettes are addictive.

Response options were from 1 (Strongly agree) to 5 (Strongly disagree). Responses were summed across these 4 items to create the tobacco industry beliefs scale. Values ranges from 4 to 20, with lower scores indicating stronger anti-industry sentiment.

Statistical Analyses:

Data analysis plan. We will compare covariate distributions across conditions to evaluate the extent to which randomization was successful. Our main analytic strategy is to fit linear regression models to predict the primary and secondary outcomes immediately after exposure to the pro-tobacco message by experimental condition, stratified by smoking status. This regression-based approach allows us to adjust the effect of message condition for factors that may not have been well balanced by randomization (including baseline values of the outcomes), as well as to explore potential interactions between experimental condition and baseline covariates, which can further inform message development. Let Y_i be the outcome (e.g. intention to quit among smokers) for subject i , x_i be the assigned message condition, and c_i be a vector of individual, meso-, and macro-level covariates. We will fit linear regression models of the form

$$\mathbb{E}(Y_i|x_i, c_i) = \alpha + \beta'x_i + \gamma'c_i$$

where β is a vector of coefficients associated with each treatment condition and γ vector of coefficients associated with the covariates. Each $\hat{\beta}$ is interpretable as the average difference in the outcome immediately after exposure to the pro-tobacco message for that treatment condition, vs. the control condition, adjusting for baseline covariates. All planned comparisons will be tested using two-tailed tests at a Bonferroni-corrected $P<0.05$ cutoff.

To account for differential loss to follow-up by treatment arm, we will apply inverse probability of censoring weighting as follows. For each experimental condition, we will estimate the probability of loss to follow-up at the time of the outcome measurement conditional on covariates using logistic regression. Based on these models, we will generate inverse probability of censoring weights and fit weighted models for the primary and secondary outcomes using a generalized estimating equations (GEE) approach. Under the assumption of Missingness At Random (MAR), these models will yield unbiased and consistent estimates of the treatment effects of interest.