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Responses to Graphic Warning Labels among Low-income Smokers

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Abstract

Objective: Graphic warning labels (GWLs) are effective in communicating tobacco-related harms.

Methods: In this mixed-methods study, we used purposive sampling to recruit 100 low-income smokers in the San Francisco Bay Area between October 2017 and February 2018 to participate in an intervention promoting smoke-free homes. We presented the 2009 Food and Drug Administration-proposed GWLs and explored perceptions of affect, efficacy, and appeal using questionnaires at baseline, 3- and 6-months follow-up. Because of participants' interest in this topic, we subsequently conducted a qualitative sub-study among 20 participants exploring perceived efficacy of GWLs on smoking cessation.

Results: In all, 87.3% and 59.2% agreed that GWLs were useful and would motivate cessation behaviors, respectively, at baseline. We found that the most common responses were shock (61.8%) and disgust (55.3%), whereas anger (29.0%) and annoyance (19.7%) were less common. Participants also reported that GWLs unequivocally illustrating smoking's harmful effects were more appealing than non-specific images, as were images that depicted positive cessation-related effects.

Conclusions: GWLs appear to be an important health communication among low-income smokers. Future studies on GWLs should examine the association of negative affect and cessation among this population.

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Human Subjects Approval Statement
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Conflict of Interest Disclosure Statement
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Keywords

beliefs; graphic warning labels; low-income smokers; smoking cessation; tobacco control

Tobacco use is the leading cause of preventable death in the United States (US).[1] Certain populations, including low- and very low-income populations, bear a disproportionate burden of tobacco use.[2,3] Although the prevalence of smoking in the general US population has reached a new low of 13.7%, the prevalence among populations experiencing homelessness has remained high at 70% to 80%.[4,5] Tobacco-related cancers and cardiovascular diseases are the leading causes of death among homeless adults 45 years and older.[6] For those younger than 45 years, the incidence of tobacco-related chronic diseases is 3 to 5 times higher than age-matched individuals in the general population.[7] The increased tobacco-related burden for this population underscores an urgent need for effective tobacco control policies and interventions.

Whereas most smokers understand harms related to cigarette smoking, they underestimate their own risk compared to other smokers.[8] Knowledge of smoking-related harms may be low among low-income (ie, those living at or below the federal poverty line) and low-literacy populations because of limited access to information on the hazards of smoking.[9] Health warnings on cigarette packages may be an effective way to increase awareness of smoking-related harms because of their low cost and high reach among smokers. Smokers can be exposed to health messages on cigarette packs more than 7000 times per year.[10] According to the US Surgeon General, “health warnings on cigarettes packages are a direct, cost-effective means of communicating information on health risks to consumers.”[11]

Health communication theories, such as the extended parallel process model,[12] suggest that pictorial or text-based warnings that combine information about health threats (eg, smoking causes cancer) with a health behavior to counter those threats (eg, quitting smoking decreases cancer risk) are effective.[13] This model has been applied to the study of graphic warning labels (GWLs) for smoking behaviors. GWLs that include a pictorial representation of tobacco-related hazards with text-based messages that describe the negative effects of tobacco are more effective than the current text-only warnings that are on cigarette packages.[14–16] GWLs can be high- or low-emotion-based on the reactions that they elicit. GWLs can elicit high (eg, anger or disgust) or low emotions (eg, indifferent), and these emotions can be positive (eg, hopefulness) or negative (eg, anger). Relative to text-only warnings, high-emotion GWLs can be associated with increased appraisal of risk whereas low-emotion GWLs tend to elicit lower appraisal of risk and less consideration for the warning.[15] GWLs that are high-emotion, more so than GWLs that are low-emotion or text-only messages, evoke stronger negative emotions and foster enduring beliefs about the harms of smoking,[17] which can decrease appeal of cigarettes to smokers.[16] For instance, pictorial representation of smoking-caused harms (eg, pictures of diseased organs) are perceived to be more effective in increasing quit intentions and cessation behavior than labels featuring symbolic images or testimonial warnings, perhaps because the latter elicit less negative emotion.[15] GWLs also may motivate smokers to access cessation services and help prevent relapse to smoking.[18,19]

Although much of the literature on GWLs focuses on the general population, a growing literature suggests that GWLs can be particularly helpful to low-income smokers with low health literacy because the visual representations of tobacco-related hazards can assist in comprehension and recall abilities that may motivate cessation behaviors.[20–25] Studies suggest that GWLs can enhance risk perception of smoking and may trigger cessation behaviors among urban, low-income smokers reporting low levels of formal education and high smoking prevalence.[24–26] For instance, graphic images that elicit high-emotion are more likely to be recognized and retained than low-emotion warnings among low literacy groups.[22] However, it has been shown that high-emotion GWLs do not equally influence motivation to quit smoking among low-income groups.[27] For example, positively framed warning labels may be more appealing than negatively framed messages among older long-term smokers, particularly those representing urban racial/ethnic minorities with extensive exposure to cessation messages.[28] One study involving urban, low-income smokers representing racial/ethnic minorities showed that GWLs that cued smokers to appraise their own vulnerability to tobacco-caused illnesses was associated with increased motivation to quit smoking.[24,25] In another study of 7000 low-literacy smokers,[26] smokers were more apt to recall GWLs that focused on reasons to quit rather than those that promoted skills to quit, suggesting that messages promoting the benefits of quitting smoking are important.

However, there is mixed evidence on the effects of GWLs on negative affect over time.[29,30] Whereas there may be an attrition in emotional responses with repeated exposure to GWLs, there also may be an increased appraisal of risk over time.[17] These findings highlight the importance of assessing both cognitive and affective responses over time among smokers, particularly among marginalized populations.

To support the widespread implementation of these labels, the 2009 Family Smoking Prevention and Tobacco Control Act (TCA) required the US Food and Drug Administration (FDA) to create 9 cigarette GWLs for placement on cigarette packages. However, the Court of Appeals for the Washington, DC Circuit ruled against the labels in 2012, stating that the images were designed “to evoke an emotional response,” that some of the images “could be misinterpreted by consumers,” and that some images did “not convey any warning information at all.”[31] At that time, the FDA chose not to appeal the Court of Appeals ruling, deciding instead to gather more evidence to support the Tobacco Control Act’s warning label requirement.[32] However in August 2019, the FDA proposed a new rule to establish 12 textual warning labels and 13 accompanying GWLs.[33]

We had a unique opportunity to explore responses to GWLs among low-income smokers in the San Francisco Bay Area. Between October 2017 and February 2018, we conducted an intervention to increase voluntary adoption or smoke-free homes among 100 formerly homeless adults residing in permanent supportive housing (PSH) in the San Francisco Bay Area.[34] During the one-hour intervention visit, study staff presented and discussed the 9 FDA-proposed GWLs. We asked participants to report their affective and cognitive responses to these labels at baseline, and at 3-month and 6-month follow-up. During the study duration, participants expressed interest in discussing these labels further, which prompted a subsequent qualitative sub-study (September 2018 and February 2019) to explore the perceived efficacy of the GWLs on smoking cessation behavior. The current

manuscript uses mixed methods to triangulate quantitative and qualitative responses to GWLs among the participants who were enrolled in the smoke-free home intervention study.

METHODS

Setting and Participants

We partnered with 6 San Francisco Bay Area PSH programs that housed over 4000 formerly homeless individuals.[35,36] Study procedures for the smoke-free home intervention are described in detail elsewhere,[34] but herein we offer a brief description. We contacted directors of each of the agencies to identify PSH sites within their housing portfolio that would benefit from tobacco control interventions because of high smoking rates with their clientele. Through this process, we identified 15 PSH sites where we conducted the smoke-free home intervention study. PSH residents who were aged 18 years or older, current smokers (defined as having smoked 100 cigarettes in their lifetime and having smoked in the past 7 days), able to provide verbal informed consent, and who anticipated living at the PSH property for at least 9 months were eligible for the study.

Study procedures.—Using purposive sampling based on interest in participating, we recruited 100 PSH residents in the smoke-free home intervention between October 2017 and February 2018 (retention rates at 3- and 6-month follow-up were 85% and 83%, respectively).[34] At baseline, study staff provided a one-hour, one-on-one counseling session to each PSH resident that included a step-by-step guide on how to adopt a SFH and a presentation of the 9 FDA proposed GWLs.[34] We gave participants a hardcopy of each of the 9 GWLs (Figure 1) and encouraged them to view each image during the study. We evaluated affective and cognitive responses to the GWLs using questionnaires at baseline, and at 3- and 6-month follow-up.

During the follow-up visits, participants expressed further interest in discussing their responses to the GWLs, which promoted a subsequent qualitative sub-study on the perceived efficacy of GWLs on motivating cessation behaviors. We asked participants who were returning for their 6-month follow-up interview whether they would be interested in participating in a sub-study on responses to GWLs, and those who agreed were invited to complete an in-depth, semi-structured interview. We recruited 20 participants and stopped recruiting when we reached thematic saturation in interviews. Study staff conducted all in-depth, semi-structured interviews at the PSH sites between September 2018 and February 2019.

Participants received $25 for completing the baseline questionnaire and $10 for each follow-up questionnaire. Participants in the qualitative substudy were reimbursed $ 15 for participating in the interview.

Theoretical Context

The SFH intervention study was theoretically founded in the social cognitive theory, where the intervention addressed personal, behavioral, and environmental factors that influenced adoption of a smoke-free home and smoking cessation behaviors among formerly homeless adults in permanent supportive housing.[37] For example, social norms around smoking,

smoke-free policies, and access to cessation resources were environmental level factors. Personal factors included stress, mental health or substance use disorders, or lack of knowledge about tobacco use or cessation. Behavioral factors included incentive motivations, self-efficacy, or practices to change behavior. Using our prior formative work,[8,17] we mapped out intervention content to the following constructs in the social cognitive theory: behavioral capability (imparting knowledge/skills), reinforcements (internal/external reinforcements, incentivization), expectations (goal settings), and self-efficacy (materials to increase self-efficacy such as graphic warning labels). We further used the extended parallel process model[12] as the theoretical foundation for the part of the intervention that included GWLs. The model posits that fear-inducing stimuli, such as GWLs, can motivate a change in smoking behavior.

Quantitative Measures

Demographic and cigarette smoking behaviors at baseline.—Participants self-reported their age, sex (female, male, transgender), race/ethnicity (Hispanic/Latinx, non-Hispanic White, non-Hispanic Black, Native Hawaiian/Pacific Islander, other/2 races or more), education (less than high school, high school or equivalent, some college, college or professional training), and yearly income (disability, interests, salary, SSI, pensions, public assistance). We asked participants whether they were daily or non-daily smokers. Participants reported whether they had smoked cigarettes in the past 7 days, the number of days smoked in the past 7 days, and the number of cigarettes smoked on each smoking day. We used this information to calculate average daily cigarette consumption. Participants reported the time to first cigarette after waking (within 5 minutes, 6-30 minutes, 31-60 minutes, > 60 minutes). We reported nicotine dependence using the heaviness of smoking index (HSI) and categorized participants as having low addiction (0-2), moderate addiction (3-4), or high addiction (5-6).[38] We asked residents to describe their intention to quit smoking as ‘Never expect to quit’, ‘May quit in the next 6-months’, ‘Will quit in the next 6-months’, and ‘Will quit in the next month’. We asked whether they had made a quit attempt in the past year and the length of the last quit attempt.

Attitudes toward GWLs at baseline, and at 3- and 6-month follow-up.—We asked participants to indicate their level of agreement with statements that addressed the appeal and credibility and efficacy of GWLs. We characterized high-emotion GWLs as labels that elicited anger, annoyance, disgust, hope, indifference, manipulation, or shock and horror. We dichotomized responses as ‘agree/strongly agree’ versus ‘disagree/strongly disagree/neutral’. We asked participants the extent to which the GWLs elicited feelings about their own tobacco-caused risk. We asked participants the extent to which they would reduce consumption if the image appeared on the cigarette or tobacco brand they normally purchased. Responses ranged from ‘not at all’ to ‘very often’.

Qualitative Measures

In-depth, semi-structured interview guides were developed by the principal investigator (MV) and informed by prior research involving smokers experiencing current or prior homelessness.[35,39,40] Questions were pilot-tested with participants representative of the target population. During in-depth, semi-structured interviews, we explored broadly the

social context of cigarette smoking (ie, triggers to smoking, use of alternative tobacco products, effects from cigarette smoking) and general attitudes toward smoking cessation (ie, intention to quit smoking, prior quit attempts, and use of smoking cessation aids). We presented a hard-copy of the 9 GWLs and cigarette packs with labels affixed on one side of the pack. We explored emotional responses and the potential impact that emotions may have on risk perceptions and smoking cessation behaviors. We asked about potential action-oriented steps that participants would be willing to take in response to the labels.

Data Analysis

Quantitative data.—We calculated descriptive statistics using medians and interquartile ranges (IQRs) for continuous variables and proportions for categorical variables. We report the unadjusted proportion of participants who agreed to statements on appeal, credibility, and affective responses at each time point. To account for repeated measures, we clustered by participant and presented robust standard errors. To examine whether the change in affective and cognitive responses over study duration was statistically significant, we used generalized estimation equations for binary outcomes, accounting for repeated measurements, and report p-values obtained from these models. We performed all analyses using STATA 14.2 (College Station, TX).

Qualitative data.—The audio-recorded in-depth, semi-structured interviews were transcribed verbatim by a contracted professional transcription service, and transcribed texts were redacted of any personal identification data. We used Atlas.ti.8 qualitative data analysis software to facilitate efficient coding, and analyzed transcripts using directed, content analysis approach.[41] The 2 interviewers (TK and MH) coded each other's transcripts and the PI (MV) assisted with reconciling the codes. After independently coding the first 4 transcripts, the research team met to develop the first iteration of the codebook. We used the initial codebook to code subsequent transcripts and met regularly during the coding process to refine the codebook by adding new codes and resolving disagreements in assignment or description of codes. We further refined and reduced the number of overall codes by grouping them into a short list of inclusive categories and themes. Whereas some of the themes were determined *a priori* based on the interview guide, several were emerging themes. We selected exemplar quotes to reflect each theme we identified.

Triangulating qualitative and quantitative findings.—We used the process of triangulation, and specifically the convergence model, where we collected qualitative and quantitative data separately to obtain complementary data on the topic.[42] During the process of triangulation, we compared results from the quantitative data with those of the qualitative data, and summarized areas of convergence and divergence in response to the GWLs as well as areas where qualitative data embellished findings from the quantitative data.

RESULTS

Sample Characteristics and Attitudes toward GWLs

The median age of the 100 participants in the smoke-free home intervention study was 58.5 years (IQR 51.5-65.0), 70.0% were racial/ethnic minorities, and 34.0% were women (Table

1). The majority (78.0%) were daily smokers and the median daily cigarette consumption was 9 cigarettes (IQR: 4.0-12.5). Most participants reported that GWLs helped in appraising their own health risks, and about half reported that the labels would encourage a reduction in smoking cigarettes (Table 1).

Most participants agreed that the GWLs provided useful information (baseline 87.3% ±SE 4.0; 3-months 87.3% ± SE 4.0; 6-months 83.1% ± SE 4.5) or that they had learned new facts about smoking (baseline 63.4% ± SE 5.8; 3-months 70.4% ± SE 5.5; 6-months 71.8% ± SE 5.4, $p < .05$). Few believed that the health effects were overestimated About half the participants believed that the GWLs would help with quitting smoking (baseline 55.3% ± SE 5.7; 3-months 43.4% ± SE 5.7; 6-months 56.6% ± SE 4.7) or encouraging action to quit (baseline 59.2% ± SE 5.7; 3-months 48.7% ± SE 5.8; 6-months 63.2% ± SE 5.6, $p = .01$) (Figure 3). About half of the participants reported feeling shocked and horrified or disgusted when viewing the images, but fewer participants reported indifference, anger, or annoyance (Figure 4).

Qualitative Findings

Among the 20 participants, we identified the following 4 themes: (1) social context of tobacco use and cessation, (2) general attitudes toward GWLs, (3) affective and cognitive responses toward GWLs, and (4) perceived efficacy of the GWLs in motivating cessation behaviors (Table 2).

Social context of tobacco use and cessation.—Family influences factored into participants' narratives on initiating smoking at a young age. When asked about her triggers to smoking, a 36-year-old woman said: "I grew up in a house of smokers. My parents both smoked. It was just normal to me." Two participants initiated smoking during their time in the military; others started smoking while working at blue-collar jobs where smoking was normalized.

Stress was one of the primary triggers for smoking, with stress from homelessness and/or living in sub-optimal housing being the most common trigger. Boredom and the lack of meaningful employment were other triggers. Participants who had mental illness described using smoking to allay symptoms from depression or post-traumatic stress disorder. Although some participants described the synergistic effects of cigarette smoking with other substances, others substituted cigarettes for illicit substances that they were once dependent upon. Almost all participants described prior and/or current experience with using cannabis; many smoked cigarettes and cannabis concurrently.

Most participants described an interest in smoking cessation but faced barriers. Participants living in PSH buildings that had a policy restricting smoking but where the policy was not enforced reported challenges with quitting smoking in an environment where "there's temptations all around." Lack of culturally appropriate treatment and apathy toward a one-size-fits-all approach were other barriers to cessation. A 61-year-old woman described the cost of smoking as a motivator for smoking cessation, stating: "You're paying $10 to kill yourself. A cigarette takes 7 minutes of your life. So, I'm paying $10 to kill myself. And

that's almost $4800 a year. And that's gonna minus 5 years off my life. It's really a wake-up call."

General attitudes toward GWLs.—Within this context of triggers to smoking and barriers to cessation, participants described their views on how GWLs could motivate smoking cessation behaviors. The general consensus was that GWLs could be more influential than the current text-only Surgeon General's warning messages. Some participants reported that if the GWLs were readily accessible, not only as a fixture on their cigarette packs, but also on billboards or as commercials on television, it would force them to contend with the harms of tobacco use. This appraisal of their own risk could prime cessation behaviors.

Participants responded favorably to the high-emotion GWLs that depicted the negative effects of smoking on one's body and had more of a shock value compared to the less explicit images or images where the link to tobacco use was less direct (Figure 1). For instance, the images of the damaged lungs or tracheostomy were described as some of the most effective GWLs because of their visual appeal. A 36-ycar-old woman reported: "Everybody hears that smoking causes heart disease and stroke and lung cancer. But, if you can see the image of that – the image of the lungs versus just explaining it, I think that sends a lot stronger message." In contrast, for example, a 60-year-old man considered the image of the rotting teeth to be less impactful because the source of the ailment was ambiguous: "I never seen anybody lose teeth behind cigarettes. Maybe behind meth. But not no cigarettes." Some participants felt similar skepticism about the image of the man with the oxygen tank and the cadaver. A few participants believed that the images were "scare tactics" and not meaningful public health tools to motivate cessation behaviors.

Most participants responded favorably to the GWLs that described the effects of secondhand smoke (SHS) on children and nonsmokers. The fear that "you're really harming somebody else besides yourself" was one that was raised by a few participants. I he image with the child also was seen as effective because of the cognitive response that it evoked including the potential for smoking to cause "birth defects, premature births, or low birth weights."

The image of the individual who had stopped smoking evoked positive responses from some participants because it provided a sense of hope that quitting was possible. For example, a 35-year-old woman said: "It would make other people probably happy for me that I quit, and it might motivate them to quit also."

Affective and cognitive response to GWLs.—The most commonly described affective responses were shock and disgust, with the majority of participants stating that exposure to the GWLs would evoke an emotional response, irrespective of whether or not they wanted to quit. Some participants reported disgust when viewing images of smoking's effects on the body (ie, lungs), stating that the images were "gross" and that "they would be turned off." A minority of participants reported feeling annoyed, angry, or indifferent toward the labels, with one 52-year-old man stating that the images were "overkill" because he "already knew that cigarettes are bad."

Several participants reported that they would be embarrassed to smoke from packs of cigarettes that had GWLs. Some believed that smoking from cigarette packs with GWLs affixed on them would make them feel "really bad about their choice to smoke" or that they would be an "eye-opener," forcing them to contend with their smoking behavior. A 70-year-old man reported that he would avoid seeing the images when pulling cigarettes out of the packs: "If this picture was on my cigarettes, I would never see it. It's too negative for me. I wouldn't even look at it." In general, participants refuted the idea that repeated exposure to the images would result in attention fatigue, and that attention fatigue related to the labels could be minimized if images were rotated.

Perceived efficacy of the GWLs in motivating cessation behaviors.—Some participants reported that if the GWLs were affixed on their cigarette packs, they would trigger negative affective reaction such as remorse from smoking, which could motivate smoking reduction or cessation. For example, a 50-year-old man reported "feeling sad after seeing the picture of the cadaver" and was "glad that he quit the 3 packs a day." A 53-year-old woman reported that the GWLs reduced her urge to smoke, stating that she had used the Internet to view the label displaying the image of decaying lungs. She stated: "When I catch myself smoking too much, I'll [look at the images], just to remind myself what my lungs could look like." Participants reported that labels that resonated with their personal experience were more impactful than ones that were generic. For example, a 55-year old woman was moved by the image of a child's exposure to SHS, sharing that she quit smoking during her pregnancy: "It makes me feel bad. I'm glad I didn't smoke with mine." Yet, other participants reported that the GWLs would not trigger cessation behaviors because the decision to quit was self-guided, and that external motivators such as labels, while informative, would not trigger behavior change.

Triangulating quantitative and qualitative responses.—Quantitative and qualitative results were complimentary to each other. Whereas the quantitative data summarized the negative affective responses to these labels, the qualitative data supported these responses and expanded upon them by describing how the affective responses could motivate cessation behaviors. In particular, participants were able to describe qualitatively the potential positive impact on cessation behaviors if they smoked from cigarette packs that had GWLs affixed on them. Over 80% of participants in the smoke-free home intervention study reported that they had found the information from the GWLs to be useful, a response that resonated with participants in the qualitative sub-study. The most commonly reported affective responses among participants were shock and disgust. These findings were corroborated in qualitative interviews, where participants favored high-emotion GWLs that elicited negative affect more so than those that elicited a tepid response. A minority of participants reported apathy or indifference to the GWLs, which were reactions that were infrequently raised in the qualitative interviews. Furthermore, the interviews highlighted the potential benefits of positively depicted images, such as the benefits of smoking cessation, more clearly than did the quantitative data.

DISCUSSION

This study builds upon the GWL literature globally and in the US by examining affective and cognitive responses to GWLs and perceived efficacy on cessation behaviors in a low-income population. Findings from both quantitative and qualitative data suggest that shock and disgust were the most common affective responses, whereas anger or apathy were less common. Most participants believed that the information provided in the GWLs was credible and could motivate smoking cessation.

The quantitative and qualitative data suggested that participants favored labels that unequivocally described the harms of smoking. Participants in the in-depth interviews described these labels as memorable because of their “shock value” and because they undoubtedly presented the harmful consequences of smoking. Labels that illustrated damaged lungs or the tracheostomy elicited negative affective responses such as fear of smoking. These findings are consistent with a previous study that showed that GWLs that were able to evoke fear or anger in response to graphic imagery may be more effective than text only labels.[21] Participants were skeptical of images that displayed the cadaver or rotten teeth because such effects were not specific to smoking. These findings are consistent with prior research that showed that smokers’ perceptions of credibility of the information presented on GWLs can be an important mediator of tobacco-related risk appraisal, which in turn, may be associated with quit intentions and/or quitting behavior.[17] There were a few smokers who participated in the in-depth interviews who believed that information provided on the labels were “overkill” or exaggerated smoking’s harmful effects. These smokers were less motivated by GWLs to change their smoking behavior.

Consistent with prior studies in the general population, our findings suggest that negative affect elicited by the high-emotion GWLs may be associated with increased appraisal of risk, leading to quit intentions or quitting behaviors.[17,43] Several in-depth interview participants described fear or stigma associated with smoking from packs with GWLs affixed on them, which allowed them to scrutinize their own risk of developing a tobacco-related disease. The increased risk scrutiny also was linked to participants’ perceptions of credibility of the information on the labels, with higher scrutiny being associated with higher perceptions of credibility. Studies suggest that GWLs that increase risk scrutiny are also important mediators of smoking reduction and/or cessation behaviors.[17] Thus, images that arouse negative affect, as opposed to apathy, may be important components of impactful GWLs, where impact is measured as increased risk awareness, risk perception, and quit intentions.[44]

Many participants who completed the in-depth interviews reported being motivated to quit by viewing images that had a positive message. For example, the image of the man who had quit smoking elicited a positive response because it fostered a feeling of accomplishment after smoking cessation. The combination of the image with the message “I quit” served as a motivator, not only for participants’ own quitting behaviors, but also for their potential role in supporting others in the quitting process.

Consistent with prior research,[20,21,26] our findings suggest that graphic representations of tobacco-caused illness can aid in comprehension of risk among low-income groups, and emotionally evocative media can motivate quit intentions. Prior research has suggested that loss-framed or negatively framed GWLs that describe risks associated with smoking may be more effective for smokers with high self-efficacy in quitting, whereas messages that are positively framed such as the one describing quitting success may be more effective for smokers with low-efficacy in quitting.[45] Furthermore, there might be generational differences, with older smokers preferring more positive than negative messages compared to younger smokers.[28] Our study did not explore the association between GWLs and quitting behaviors. However, most participants had some interest in quitting smoking within the next 6 months, and at least half had attempted to quit in the past year. Our findings suggest that a combination of positively and negatively framed GWLs may be an important strategy to reduce tobacco use in very low-income populations.

Despite the fact that we conducted our study prior to the release of the 2019 FDA-proposed GWLs, our findings have implications for how those images might be perceived among low-income populations. The FDA recently issued a final rule to require new GWLs on cigarette packaging and cigarette advertisements that takes effect in June 2021.[46] These labels are broader in content than the labels previously proposed in 2009. The labels now include lesser-known harms related to smoking, such as bladder cancer, peripheral arterial disease, erectile dysfunction, and conditions that cause blindness. Our findings suggest that very low-income populations may be particularly open to viewing these new images to appraise their own risk in developing smoking-related conditions that go beyond lung and heart disease.

Our study had several limitations. First, there is an inherent selection bias as participants recruited for the in-depth interviews were those who had participated in an intervention to increase adoption of smoke-free homes. It is possible that other components of the smoke-free home intervention influenced participants' responses to the GWLs. Secondly, the purposive sampling of participants for both the smoke-free home intervention and the qualitative sub-study limits the generalizability of findings. Attitudes toward GWLs may be different among those not engaged in the smoke-free home intervention study. Lastly, our sample was small and included smokers living in PSH for formerly homeless adults. Thus, these findings may not be generalizable to other low-income populations or smokers currently experiencing homelessness.

Despite these limitations, a strength of our study is that it explores tobacco-related health communication in an understudied population of very low-income smokers from racial/ethnic minority groups. Our study suggests that GWLs can have an enduring effect on thoughts and emotions related to smoking, and that repeated exposure to the labels is acceptable for a marginalized group. These findings have implications for the newly proposed FDA GWLs, and suggest that low-income smokers who have experienced homelessness may respond favorably to messages around the hazards of tobacco use. Policy-based interventions are among the most successful interventions in reducing tobacco use because of their broad reach and cost-effectiveness. However, there is inequitable access to some tobacco control policies such that lower income groups benefit less from them compared to higher income groups. GWLs on cigarette packages have the potential to reach

this population because most individuals obtain cigarettes from packs. GWLs may foster negative affect that might increase risk appraisal, quit intentions, and quitting behaviors among very low-income smokers, lending particular salience to the FDA's newly proposed labels. Our future work will focus on the impact of these labels on cessation outcomes in this population.

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Figure 1.
The 9 Pictorial Warnings Used in Intervention. Images Reproduced with Permission from the United States Food and Drug Administration (2009)

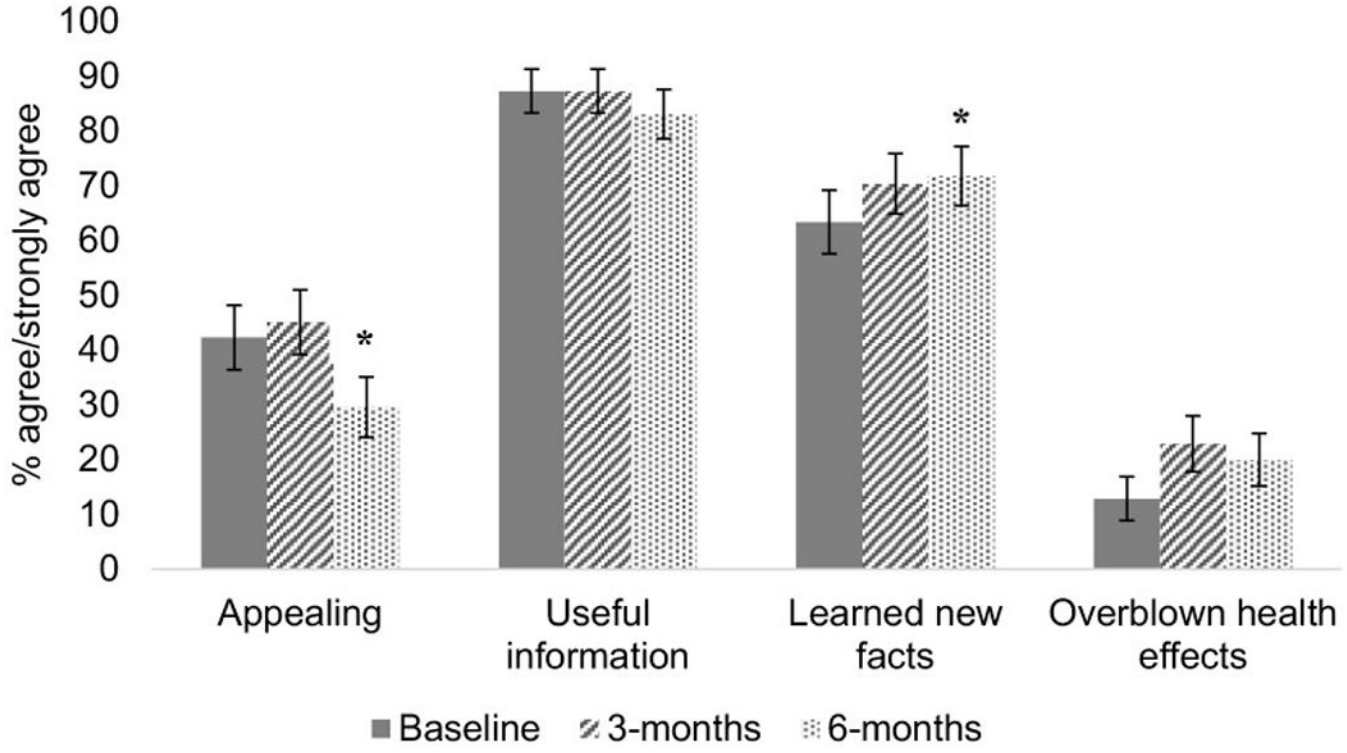

Figure 2.

Appeal and Credibility Response to the GWLs among Permanent Supportive Housing Resident (N = 100): San Franciso Bay Area, October 2017-February 2018

*p < .05 for GWLs appeal and learn new facts responses at 6-month follow-up.

Note.

Error bars represent robust standard erors; clustering at individual leavel.

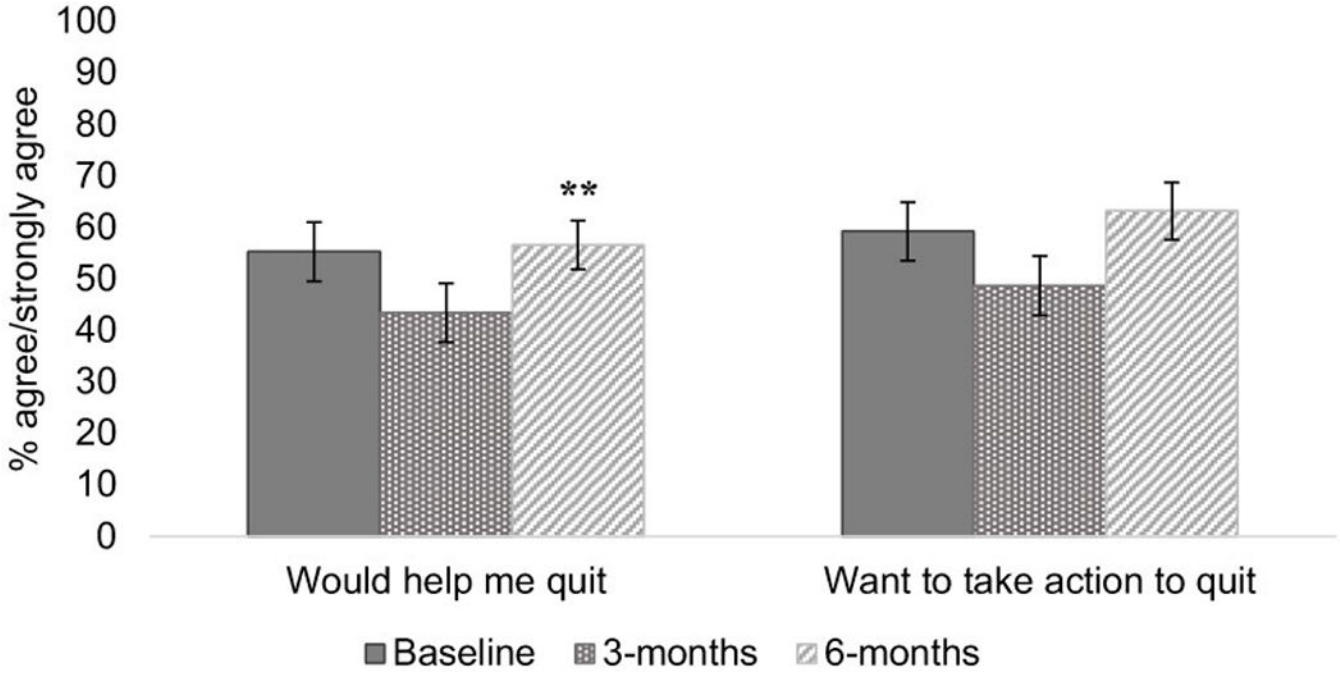

Figure 3.

Efficacy Response to the GWLs among Permanent Supportive Housing Residents (N = 100): San Francisco Bay Area, October 2017-February 2018

**p = .01 for GWLs efficacy to help quit smoking at 6-month follow-up.

Note.

Error bars represent robust standard errors; clustering at individual leavel.

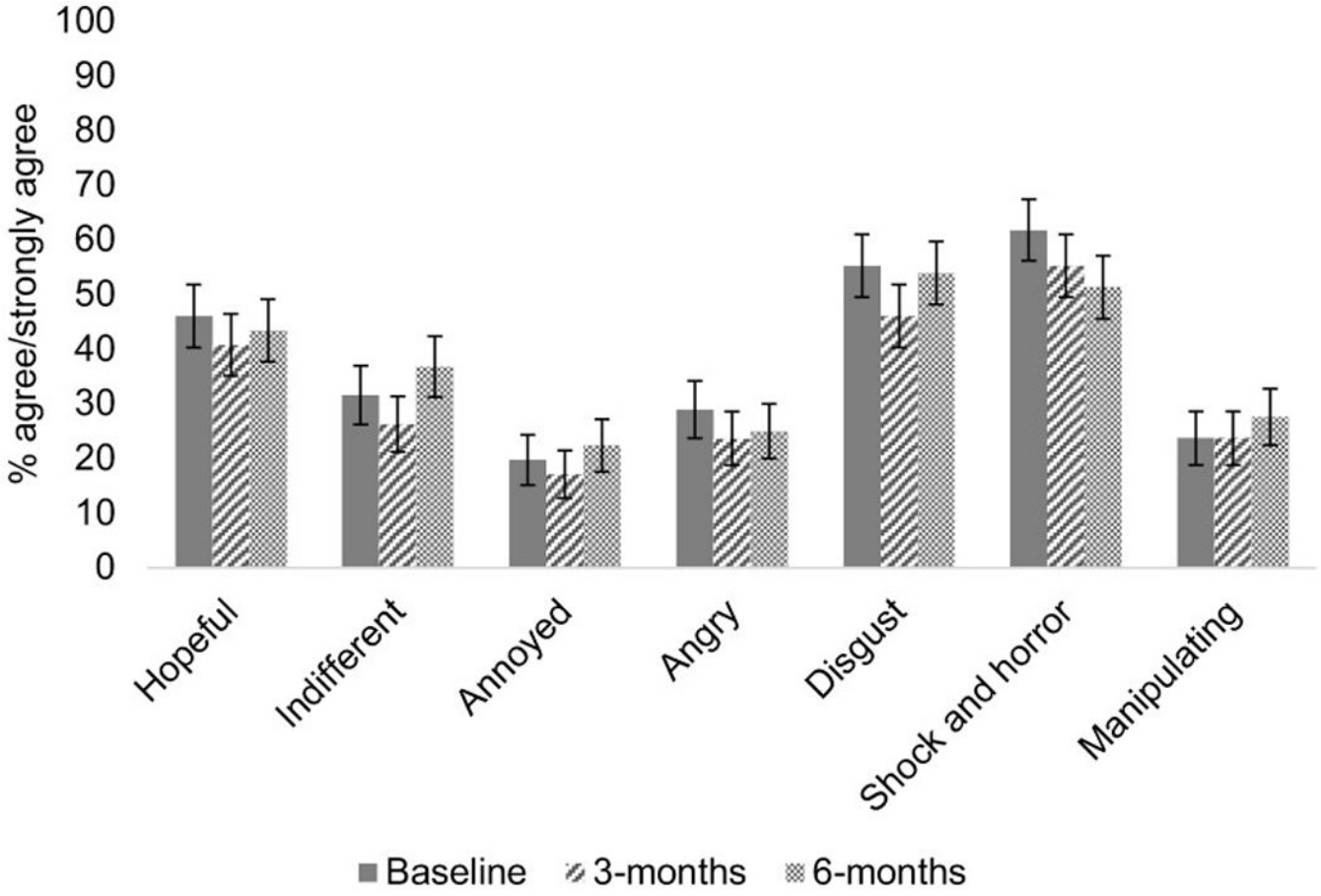

Figure 4.

Emotional Response to the GWLs among Permanent Supportive Housing Residents (N = 100): San Francisco Bay Area, October 2017-February 2018

Note.

Error bars represent robust standard errors; clustering at individual level.

Table 1

Baseline Demographic and Smoking Characteristics of Permanent Supportive Housing Residents (N = 100): San Francisco Bay Area, October 2017-February 2018

Characteristic	N (%)
Age, years - median (IQR)	58.5 (51.5-65.0)
Sex	
Female	34 (34.0)
Male	65 (65.0)
Transgender	1 (1.0)
Race/ethnicity	
Hispanic	13 (12.9)
NH White	30 (30.0)
NH Black	49 (49.0)
NH Pacific Islander	3 (3.0)
Other/2 races or more	5 (5.0)
Education[a]	
Less than High School	23 (23.2)
High School or Equivalent (GED)	32 (32.3)
Some College	28 (28.2)
College, Professional Training	16 (16.2)
Yearly income[b]	
< $15,000	77 (78.6)
$15,000-$30,000	14 (15.2)
> $30,000	7 (7.1)
Cigarette use	

Characteristic	N (%)
Frequency of Smoking	
Daily	78 (78.0)
Less than daily	22 (22.0)
Daily Cigarette Consumption – median (IQR)	9.0 (4.0–12.5)
Heaviness of Smoking Index (HSI)	
Low dependence (0-2)	63 (63.0)
Moderate dependence (3-4)	35 (35.0)
High dependence (5-6)	2 (2.0)
Smoking cessation intention and attempts	
Quit Intentions	
Never expect to quit	17 (17.2)
May quit in next 6 months	56 (56.6)
Will quit in next 6 months	17 (17.2)
Will quit in the next month	9 (9.1)
Proportion Attempting to Quit in Past Year	55 (55.0)
Longest quit attempt in past year (Days) – median (IQR)	9 (4.0-18.0)
Extent to which GWLs would prompt participants to think about their own health risk	
Not at all/Rarely	25 (25.0)
Sometime/Occasionally	16 (16.0)
Often/Very often	59 (59.0)
Extent to which GWLs would prompt participants to reduce their consumption	
Not at all/Rarely	34 (34.0)
Sometime/Occasionally	24 (24.0)
Often/Very often	42 (42.0)

Note.

[a] One participant refused to report education.

[b] Two participants refused to report income.

Table 2

Exemplar Quotes Related to Themes Identified in the Qualitative Analysis among Permanent Supportive Housing Residents (N = 20): San Francisco Bay Area, October 2017-February 2018

1.Social context of tobacco use and cessation

"It was just normal to me; I didn't know anything else. So for me, seeing my parents smoking, that was just normal. I didn't really associate it with, oh, smoking is bad, 'cause my parents were doing it so it didn't really… 'cause if it was really bad, why would my parents do it, kind of thing." (Female, 36 years old)

"Everybody in there smoked cigarettes, and if you didn't smoke, you smoked, and if you didn't drink, you drank. And plus, the pressure of the unknown, when you're in the military, especially during wartime, you don't know where you're goin', so – you smoke a little bit more." (Male, 60 years old)

2. General attitudes towards GWLs

"It has to be more graphic – like the teeth, the cancer thing… For me, personally, the one with the hole – and the baby smoking – those ones will -- ooh, god, that's horrible – more yellow fingernails and rotten teeth and – yeah, the lung thing and the baby smoking, that will work for them, too, but I don't think the oxygen thing – not that graphic." (Female, 53 years old)

"They're trying to use a scare tactic with people. They don't seem to understand that – you're speaking with adults who choose to have a cigarette." (Male, 52 years old)

In relation to the smoker's lungs

"That's pretty impactful. That kind of puts it in your face of what you're doing to your lungs and what your lungs look like, – that would be a good warning label." (Female, 36 years old)

In relation to the cadaver

I: It's saying how smoking can kill you.

P: We don't even know if he died from smoking though, [from looking at the cadaver] (Male, 36 years old)

In relation to the tracheostomy

"That commercial really hit home. I think that would be a great billboard… I mean, it grabs you. And that's what you want. You want to be shocked." (Female, 61 years old)

In relation to "I Quit"

"That's a good thing to let everyone know that you quit. So maybe that would stop people from trying to offer cigarettes. " (Male, 53 years old)

3.Affective and cognitive responses to the GWLs

"Interviewer (I): Do you think that seeing these images, would they shock you every time you opened up your cigarette pack?

Participant (P): "They just throw it out there for 3 months, 6 months, and then take 'em away, throw 'em out there again like 6 months later…oh, my god, did you see that pack of cigarettes? So it keeps it in people's minds fresh, and not just continuously – because you become anesthetized, you don't even see that after a while" (Female, 53 years old)

"I: If some of these labels were on your cigarette packs and you were using these cigarette packs in public, would you feel a sort of social pressure or embarrassment using these in public?"

P: "I mean, I wouldn't say an embarrassment, but I would feel like – 'cause I'm kind of a self-conscious person – and if I was like – holding this, smoking a cigarette with my kid sitting next to me, I'd feel like kind of an idiot…it would be kind of embarrassing, just kind of – uncomfortable." (Female, 36 years old)

4.Perceived efficacy of the GWLs in motivating cessation behaviors

"I think they would make me feel really bad about my choice to smoke, and that would make me want to quit more. I think it would eventually help me stop smoking. Possibly reduce smoking, but it would make me really want to quit." (Female, 36 years old)

"Yes. It'd be hard to hide from 'em. Hard to forget about – this time – sittin' in my apartment pullin' out my cigarette pack and I saw that, pretty soon you get tired of lookin' at stuff, like to think Yeah, I think that would greatly influence." (Female. 60 years old)

"P: Probably make me more aware of what the cigarettes are doin'to your body.

I: And do you think people would consider stopping?

P: If they don't consider it, they may think about stopping. It may plant a seed in their head. To stop smoking." (Male, 60 years old)