Distribution Agreement

In presenting this thesis or dissertation as a partial fulfillment of the requirements for an advanced degree from Emory University, I hereby grant to Emory University and its agents the non-exclusive license to archive, make accessible, and display my thesis or dissertation in whole or in part in all forms of media, now or hereafter known, including display on the world wide web. I understand that I may select some access restrictions as part of the online submission of this thesis or dissertation. I retain all ownership rights to the copyright of the thesis or dissertation. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

Signature:

_____ _____

Cailyn A. Lingwall

A Study of Gruesome and Benign Pictorial Health Warning Labels Among Georgian Adults: For Whom Are They Effective?

By

Cailyn A. Lingwall

MPH
Behavioral Sciences and Health Education

_____

Dr. Carla J. Berg, PhD, MBA, LP
Committee Chair

_____

Dr. Eric Nehl, PhD
Committee Member

_____

Dr. Colleen McBride, PhD
Department Chair

A Study of Gruesome and Benign Pictorial Health Warning Labels Among Georgian Adults: For Whom Are They Effective?

By

Cailyn A. Lingwall

B.A. Global Health Studies
Allegheny College
2015

Thesis Committee Chair: Dr. Carla J. Berg, PhD, MBA, LP

An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Behavioral Sciences and Health Education
2018

Abstract
A Study of Gruesome and Benign Pictorial Health Warning Labels Among Georgian Adults: For Whom Are They Effective?

By Cailyn A. Lingwall

BACKGROUND: Research has documented the effectiveness of pictorial health warning labels (HWLs) for reducing population level cigarette smoking, and may be particularly effective in low-and middle-income countries (LMICs). Additional research is needed on LMICs disproportionately impacted by tobacco-related diseases and death to examine who may find different messages to aid in smoking prevention or cessation. Thus, we 1.) compared perceived effectiveness of pictorial vs. text-only HWLs; 2.) examined themes emerging from pictorial HWLs; and 3.) examined correlates of perceived effectiveness of different pictorial HWL themes among adults in the Republic of Georgia.

METHODS: We analyzed a cross-sectional national household survey of Georgian adults conducted in 2014 (n=1,163). Participants were randomized to evaluate the perceived effectiveness (on a 9-point scale) of either Set A or Set B HWLs, with each set containing half of the HWLs presented pictorially and half with text-only. Bivariate analyses compared the perceived effectiveness of pictorial vs. text-only HWLs. We then conducted factor analyses to determine themes of pictorial HWLs, identifying gruesome and benign themes. Finally, regressions were conducted to identify sociodemographic and tobacco use related correlates of perceived effectiveness of the pictorial HWL themes.

RESULTS: Factor analyses identified one factor among Set A HWLs, labeled “benign”; Set B yielded two factors – “benign” and “gruesome.” All gruesome HWLs were perceived as more effective than text only; however, 2 of the 9 benign HWLs were perceived as no more effective than text only. Among Set A HWLs, correlates of greater perceived effectiveness for all participants included: being female ($p<.001$), living in a rural setting ($p=.001$), not having children in the home ($p=.038$), and being a nonsmoker ($p=.005$); for non-smokers, being female ($p=.016$), and living in a rural setting ($p=.017$); and for current smokers, being female ($p=.014$), not married/living with a partner ($p=.045$), having more close friends who smoke ($p=.013$), and rating quitting smoking as more important ($p=.009$). Among Set B HWLs, 43.8% rated gruesome HWLs more effective, 43.4% rated gruesome and benign equally effective, and 12.9% rated benign more effective. Correlates of benign HWL effectiveness included having fewer friends who smoked ($p=.019$), and a higher household income ($p=.031$); and for smokers, fewer friends who smoked ($p=.013$) and perceiving quitting smoking to be important ($p=.006$). Finally, a lower household income ($p=.003$) predicted gruesome HWLs effectiveness.

CONCLUSIONS: While pictorial HWLs are largely perceived as more effective, gruesome and only some benign HWLs outperform text-only. Some benign HWLs are perceived as equally effective, and a minority found them more effective than gruesome HWLs. Some benign HWLs may be more effective for smokers rating quitting as important. Social factors are critical in understanding the effectiveness and impact of pictorial HWLs.

A Study of Gruesome and Benign Pictorial Health Warning Labels Among Georgian Adults: For Whom Are They Effective?

By

Cailyn A. Lingwall

B.A. Global Health Studies
Allegheny College
2015

Thesis Committee Chair: Dr. Carla J. Berg, PhD

A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Behavioral Sciences and Health Education
2018

ACKNOWLEDGEMENTS

First, I would like to thank the Behavioral Sciences and Health Education Department at the Rollins School of Public Health for affording me the opportunity to contribute my research to the field of tobacco prevention and control. I would like to extend my appreciation to my thesis advisor, Dr. Carla Berg, for her guidance and enthusiasm throughout this study. I would also like to acknowledge my committee member, Dr. Eric Nehl, for his valuable insights and expertise in the application of theory. It is my hope that this research will positively influence future tobacco health warning label research and regulatory policy.

Table of Contents

INTRODUCTION

Cigarette smoking is a major global public health issue, with roughly 31.1% of men and 6.2% of women being daily smokers (Ng et al., 2014; World Health Organization, 2017a). World Health Organization's Framework Convention on Tobacco Control (WHO FCTC) is an evidence-based treaty which reaffirms the highest standards of health for all people and is a motivation for other countries to develop tobacco regulatory policies, particularly in low-and middle-income countries (LMICs), where a significant portion of the world's population lives (World Health Organization, 2003, 2017a).

The health warning label (HWL) policy included in the WHO FCTC is one promising area for population-level tobacco control. The guidelines intend to ensure that tobacco product packages clearly communicate the health risks of smoking to all populations and prevent misleading information (World Health Organization, 2008). According to the WHO FCTC Article 11 guidelines, HWLs "should" cover at least 50% of the package but not less than 30% (World Health Organization, 2008). These guidelines are based on evidence from several countries indicating that all populations easily understand pictorial HWLs, demonstrate population-level impact on smoking initiation and cessation, and are cost-effective, particularly in LMICs (World Health Organization, 2017b). However, evidence suggests that smokers perceive various pictorial HWL messaging strategies differently (Chun et al., 2017; Ilhame Sabbane, Lowrey, And, & Chebat, 2009; Schuz, Eid, Schuz, & Ferguson, 2016). Given that smoking prevalence in various countries often differs by sociodemographic characteristics (Ng et al., 2014; Wang, Shen, Sotero, Li, & Hou, 2018), many of the

correlates of smoking (e.g., age, sex, setting of residence, education level, social influences) are also associated with reactions to pictorial HWLs.

Former Soviet Union countries face some of the highest smoking rates in the world (Mir, Roberts, Richardson, Chow, & McKee, 2013). However, the Republic of Georgia (Georgia) is particularly vulnerable to tobacco-related morbidity and mortality, which is one factor contributing to the decreasing population (Bakhturidze, Ross, & What, 2008). The WHO report on the Global Tobacco Epidemic-Country Profiles indicated that as of 2016, 57% of adult males and 7% of adult females in Georgia currently smoke (World Health Organization, 2017c). Despite the high smoking prevalence in the region, Georgia is lagging behind other countries in adequate tobacco control regulations (World Health Organization, 2015). According to Article 11 guidelines, Georgia lacks adequate HWL policy until legislation goes into effect in May 2018 (Tobacco Control Laws, 2017). Georgia currently has text-only HWLs in comparison to the best-practice standard of pictorial HWLs (World Health Organization, 2015). Specifically, Georgia's text HWLs cover only 30% of cigarette packs, meeting only WHO's minimum guideline (World Health Organization, 2015). Given the high smoking prevalence and the distinct risk factors for smoking within the Georgian population including sex, setting of residence, and social factors, it is important for research to consider how implementing pictorial HWLs with differing messaging strategies might influence Georgia's tobacco use rates.

The Elaboration Likelihood Model (ELM) will inform the current research on perceived effectiveness of HWLs among Georgian adults. ELM posits that messages are processed using the central or peripheral route, which will determine attitude change and

future application of the message (Rucker & Petty, 2006). ELM is specifically effective for developing persuasive risk communication for highly addictive behaviors, because the goal of messaging is to change attitudes and, ultimately, behavior (Rucker & Petty, 2006). Additionally, the framework considers the complexities associated with influencing attitudes about highly addictive behaviors (Rucker & Petty, 2006).

In the current proposal, we 1.) compared perceived effectiveness of pictorial vs. text-only HWLs; 2.) examined themes emerging from various pictorial HWLs recommended by the European Union; and 3.) examined correlates of perceived effectiveness of different pictorial HWL themes among adults in the Republic of Georgia. In relation to the latter, individual correlates of perceived effectiveness of HWL themes included sociodemographic variables, social influences, smoking status, and smoking-related factors (e.g., reports of importance of and confidence in quitting).

LITERATURE REVIEW

Global Tobacco Use and Regulation

Cigarette smoking is a major global public health issue, with roughly 31.1% of men and 6.2% of women being daily smokers (Ng et al., 2014). While smoking rates among adults in the United States are falling (Centers for Disease Control and Prevention, 2016), low-and middle-income countries (LMICs) are disproportionately impacted by tobacco-related deaths (World Health Organization, 2017b). Nearly half of smoking-related deaths occur in the developing world (Lopez, Mathers, Ezzati, Jamison, & Murray, 2006).

For more than a decade, World Health Organization's Framework Convention on Tobacco Control (WHO FCTC) has provided a major impetus for all countries to adopt comprehensive policies to counter the global tobacco epidemic (World Health Organization, 2003). The WHO FCTC is an evidence-based treaty that reaffirms the right of all people to the highest standard of health and represents a paradigm shift in developing a regulatory strategy to address tobacco use (World Health Organization, 2003). The core demand reduction provisions in the WHO FCTC are contained in articles 6-14 and address pricing and taxation, secondhand smoke exposure, product regulation, and particularly relevant to the current study, packaging and labeling (World Health Organization, 2003). Nearly 80% of the world's population lives in the 181 countries that have ratified the WHO FCTC, underscoring the importance and potential impact of implementing these evidence-based strategies (World Health Organization, 2017a).

FCTC Article 11: Health Warning Label Policy

The health warning label (HWL) policy included in the WHO FCTC is one promising area for tobacco control. According to the WHO FCTC Article 11 guidelines, HWLs "should" cover at least 50% of the package but not less than 30% (World Health Organization, 2008). These recommendations are based on evidence across several countries and settings indicating that HWLs are easily understood, have broad reach, have population impact on smoking uptake and cessation, and are cost-effective (World Health Organization, 2009, 2017b).

To elaborate on the evidence base underscoring the importance and utility of pictorial HWLs, evidence suggests that both confidence in and importance of quitting are predictors of smoking cessation, as well as factors influencing self-efficacy (Bolman et al., 2018; Gwaltney, Metrik, Kahler, & Shiffman, 2009; Williams, Gagne, Ryan, & Deci, 2002). Research suggests that pictorial HWLs using graphic imagery do not directly increase both smokers' and non-smokers' self-efficacy related to quitting smoking or preventing initiation (Chun et al., 2017; Schuz et al., 2016). Thus, pictorial HWLs may be effective in motivating smokers to quit who already have high self-efficacy in quitting (Chun et al., 2017). Pictorial HWLs may also increase non-smokers' intentions to avoid initiation, particularly among those who already have high self-efficacy in refusing tobacco (Chun et al., 2017). Pictorial HWLs alone, however, may not be effective among smokers who lack confidence to quit if the HWL does not address smokers' self-efficacy relative to quitting (Chun et al., 2017). To increase self-efficacy among this population, future HWLs should include concrete actions promoting smokers to consider quitting

such as including a quit line phone number (Chun et al., 2017; Ilhame Sabbane et al., 2009).

Health Warning Label Messaging Strategies

Gruesome Messaging Strategies

When faced with graphic warning labels vividly depicting the threat of tobacco-related illness, smokers may have an optimistic bias, unrealistically believing they are not susceptible to illness (Mead, Cohen, Kennedy, Gallo, & Latkin, 2015). Specifically, highly addicted smokers may not view gruesome images as relevant, such as those depicting increased risk of heart attack (Mead et al., 2015). Other evidence also suggests that graphic images displaying pathology of illness are more effective than abstract images (Mansour & Bakhsh, 2017).

Benign Messaging Strategies

In addition, benign pictorial warnings that do not provoke emotional reaction including images depicting a skull or burned fingertips were less effective than text-only labels (Mansour & Bakhsh, 2017). However, images of rotten teeth, wrinkled skin, or skin discoloration that deglamorize smoking may be impactful for some populations (Hammond, 2011). Thus, these images are impactful because they display visible health consequences to those who may not value the long-term health consequences (Hammond, 2011).

Text-only Messaging Strategies

Smokers and non-smokers generally agree that the current text-only messaging is too small in size and ineffective (Sychareun, Hansana, Phengsavanh, Chaleunvong, & Tomson, 2015). For example, messages such as “Smoking is dangerous to your health”

(p. 6) may be too general to motivate smokers to quit (Sychareun et al., 2015). Ineffective images instead actually reduce risk perceptions and quit intentions compared to text-only labels. Ultimately, text-only labels may be more effective compared to ineffective graphic HWLs that do not increase emotional reaction (Evans et al., 2017).

Reactions to Pictorial Health Warning Labels by Sociodemographic Factors

Given that smoking prevalence often differs by sociodemographic factors in various countries (Ng et al., 2014; Wang et al., 2018), many of the correlates of smoking (e.g., age, sex, setting of residence, education level, social influences) are also associated with reactions to pictorial HWLs. In terms of age, research shows that HWL content does not have to target youth or adults to have an emotional impact (Hammond, 2011). Younger populations, however, may believe that they can quit smoking before facing illness and perceive that HWLs showing long-term health issues are not relevant (Devlin, Anderson, Hastings, & MacFadyen, 2005). Other evidence suggests that younger people may perceive that HWLs are effective in depicting the cosmetic consequences of smoking including rotten teeth, premature skin aging, or wrinkled skin (Hammond, 2011).

Males and females may perceive some HWLs differently. Compared to men, female smokers were more likely to consider quitting after looking at a pictorial HWL (Koval, Aubut, Pederson, O'Hegarty, & Chan, 2005). Limited evidence among young adults found that the image and messaging might contribute to this difference (Alaouie, Afifi, Haddad, Mahfoud, & Nakkash, 2015). For example, female non-smokers were more likely to perceive that pictorial HWLs displaying addiction, economic impact of smoking, stroke, lungs, tooth decay, and risks to unborn children increased their

susceptibility to smoking risks (Alaouie et al., 2015). In addition, compared to men, women of reproductive age are more responsive to pictorial HWLs about pregnancy (Kollath-Cattano, Osman, & Thrasher, 2016; Mansour & Bakhsh, 2017). In summary, the available evidence is inconclusive, as gender did not play a significant role in the perception of other pictorial HWLs (Mansour & Bakhsh, 2017).

In addition, setting of residence may influence general awareness of all forms of tobacco information, including HWLs (Almeida et al., 2012). Specifically, rural dwellers were less likely to notice HWLs on cigarette packages compared to urban dwellers (Almeida et al., 2012).

In terms of educational status and literacy, pictorial HWLs may be an educational tool in communicating risks to low-literacy populations who may not understand text-based HWLs (Hammond, Fong, McNeill, Borland, & Cummings, 2006). While there were no differences in perceived effectiveness and relevance of text versus pictorial HWLs between U.S. smokers with low health literacy and higher literacy, smokers with low health literacy rated pictorial HWLs as more credible compared to smokers with higher literacy (Thrasher et al., 2012). Limited research among low-income smokers in the U.S. found that this population was most responsive to pictorial HWLs explicitly portraying the negative health impacts of smoking (Mead et al., 2015). In particular, HWLs increasing susceptibility to disease and perceived severity motivated this demographic (Mead et al., 2015). However, a portion of low-SES smokers expressed "fatalistic" attitudes about HWLs, perceiving that smoking is lower-risk compared to other, immediate concerns (Mead et al., 2015). Future research should examine the

impact of SES on messaging persuasiveness as well as other external factors motivating this demographic with fatalistic attitudes about smoking (Mead et al., 2015).

One interpersonal factor that is important in terms of reactions to pictorial HWLs is social influences. Given the vast literature indicating influences from peers, a partner, and family are predictors of smoking (Berg, Aslanikashvili, & Djibuti, 2014), social influences may impact reactions to pictorial HWLs. Indeed, pictorial HWLs may be a means of instigating social discussion, specifically among low-income populations (Ramanadhan, Nagler, McCloud, Kohler, & Viswanath, 2017). Specifically, one study found that pictorial HWLs prompted negative conversations about the images on HWLs among 70% of individuals with a social network (Ramanadhan et al., 2017). HWLs are also a source of information for non-smokers as they can use the HWL to educate family or friends who smoke (Li et al., 2017). Finally, limited evidence suggests that pictorial HWLs may also lead non-smokers to help friends and family quit smoking (Li et al., 2017).

Tobacco Use and HWLs in the Republic of Georgia

Smoking rates in former Soviet Union Countries are among the highest in the world (Mir et al., 2013). Georgia, a former Soviet Union country and LMIC (World Bank, 2007), has shown a record decrease in population over recent years, which is primarily attributed to premature mortality and migration (Bakhturidze et al., 2008). The tobacco-related death toll is one factor contributing to the decrease in population, with an estimated 11,000 deaths per year (Bakhturidze et al., 2008). Georgia also faces higher poverty rates compared to other former Soviet Union countries, with 21.3% of Georgians living in poverty (World Bank, 2016). The WHO report on the Global Tobacco

Epidemic-Country Profiles, Georgia, indicated that as of 2016, 57% of adult males and 7% of adult females currently smoke (World Health Organization, 2017c). Additionally, smoking prevalence in Georgia is higher among men living in rural areas who have lower SES. While smoking prevalence among Georgian women is less than other LMICs (World Lung Foundation, 2015), the tobacco epidemic appears to be growing among this population in large, wealthy cities (Bakhturidze et al., 2008). The inadequate tobacco control policies is one factor exacerbating the growing tobacco use epidemic, high tobacco-related morbidity and mortality in Georgia, as well as social norms encouraging smoking initiation (Berg et al., 2014; World Lung Foundation, 2015).

Historically, Georgia, as well as many other LMICs, has lagged in tobacco policy regulations. Specifically, until legislation goes into effect in May, 2018, Georgia lacks adequate HWL policy according to the Article 11 guidelines (Tobacco Control Laws, 2017). Georgia currently has text-only HWLs in comparison to the best-practice standard of pictorial HWLs (World Health Organization, 2015). Specifically, the text-only HWLs cover only 30% of cigarette packs, barely meeting WHO's guideline (World Health Organization, 2015). Given the high smoking prevalence in Georgia and the distinct risk factors for smoking within the Georgian population, it is important to consider how implementing pictorial HWLs might impact their population tobacco use rates. The shift in the tobacco epidemic from HICs (High-Income Countries) to LMIC's poses additional tobacco control considerations for disadvantaged populations (Pampel, 2006; Pampel, Denney, & Krueger, 2011). Specifically, the rising national income and accessibility of cigarettes contribute to the epidemic among the least educated, particularly males, although females are also expected to follow this trend (Pampel, 2006; Pampel et al.,

2011). Literature suggests that education, income, and employment therefore, are associated with smoking status (Wang et al., 2018).

Theoretical Framework

The Elaboration Likelihood Model (ELM) will inform the current research on perceived effectiveness of HWLs. ELM is effective for developing persuasive risk communication, such as anti-tobacco advertising, because the goal of the messaging is to change attitudes and, ultimately, behavior (Rucker & Petty, 2006). Individuals are exposed to large amounts of health information, and perceive that they are knowledgeable because of sheer exposure to information (Flynn, Worden, Bunn, Connolly, & Dorwaldt, 2011; Rucker & Petty, 2006). However, it is impossible for individuals to process every message in exactly the same way, which means that how people process that information is a much greater indicator of knowledge and eventual attitude change (Flynn et al., 2011). Therefore, personal relevance and involvement with the message are the most influential factors in how one processes a message (Petty & Cacioppo, 1986).

ELM posits that there are two routes to attitude change: the central or peripheral route, which varies according to how much one considers the content of the message (Petty & Cacioppo, 1986). ELM suggests that when individuals with prior motivation to process a particular message encounter another message containing similar arguments, they are likely to invest cognitive energy in "central processing" (Flynn et al., 2011). Within the context of anti-smoking messages, those who are personally motivated to remain tobacco-free are more likely to perceive that the source of an anti-smoking message is highly credible, regardless of the argument quality (Flynn et al., 2011).

Attitudes formed through the central route are more likely to be more resistant to change and are a better predictor of future behavior (Petty & Cacioppo, 1986). In contrast, if someone with less motivation to process a particular message encounters a message with similar arguments, they are more likely to rely on "peripheral cues" to assess that message (Flynn et al., 2011). Peripheral cues may include social cues, or the perceived expertise and credibility of the source (Petty & Cacioppo, 1986). The perceived credibility of the message source, however, only appears to play a role by serving as a peripheral cue for individuals with low motivation or involvement and does not appear to influence those with high motivation (Lein, 2001). Finally, attitudes formed through peripheral processing following exposure to a message are less likely to be stable compared to those from central processing (Flynn et al., 2011).

Gaps in the Literature and Significance

Current research on tobacco control policies in LMICs is inadequate, and further evidence is necessary to inform future prevention programs (Baris et al., 2000). As of 2013, almost half of the LMICs with a population over 500,000 have not fully implemented the Article 11 guidelines for pictorial warning labels (Hiilamo & Glantz, 2015). Enforcement of the current minimal HWL policy in former Soviet Union countries is particularly lacking, demonstrating the need for greater discussion of tobacco control measures in this region (Mir et al., 2013). Specifically, further research should examine factors associated with smoking and quit attempts among adults in Georgia (Berg, Aslanikashvili, & Djibuti, 2015), which, given their association with smoking status, may also influence perceived effectiveness ratings of HWLs. Finally, the Elaboration Likelihood Model is justified as a novel framework to show the variations in how

Georgian adults process the content of various HWL messages, as ELM lends itself well to analyzing the complexities of influencing attitudes about a highly addictive behavior (Rucker & Petty, 2006).

Research Aim

This study of individuals living in the Republic of Georgia aims to use the Elaboration Likelihood Model to assess how individual characteristics are associated with perceived effectiveness of various HWL messaging strategies. In the current proposal, we address the following aims: 1.) Compare perceived effectiveness of pictorial vs. text-only HWLs; 2.) Examine themes emerging from various pictorial HWLs recommended by the European Union; and 3.) Examine correlates of perceived effectiveness of different pictorial HWL themes among adults in the Republic of Georgia. In relation to the latter, potential individual correlates of perceived effectiveness of HWL messaging strategies included sociodemographic variables, social influences, smoking status, and smoking-related factors (e.g., importance of quitting and confidence in quitting).

METHODS

Study Protocol and Participants

The current study is an analysis of a cross-sectional national household survey of Georgian adults conducted from February to May 2014. The study was approved by Emory University IRB and National Centers for Disease Control and Public Health in the Republic of Georgia. This population-based survey included adults aged 18-64 who lived in the Republic of Georgia and were able to read Georgian or English. Participants were compensated ten Lari for completing the survey. The survey was administered in ten regions as well as the capital. The sampling frame was selected using the 2002 census data, the most recent data available. A multi-stage cluster sampling design was used to identify participants. Stratification was performed by region, with each region divided into urban and rural strata and yielding 22 total strata. Among the 22 strata, 122 clusters were formed to provide at least nine interviews per cluster. Sample size was calculated proportionately by the number of households in the regions (Berg et al., 2016).

The "random walk" method was used to select clusters in the household. The "KISH method" used in the WHO's STEPS surveys was then used to select eligible households within the cluster (World Health Organization, 2018). According to the KISH method, all eligible participants from the household were first ranked by age in decreasing order, with males followed by females. Next, participants were selected using the KISH table, which identified the last digit of the household as well as number of eligible participants (World Health Organization, 2018). Out of the 1,539 visits performed, 1,295 total households consisted of eligible adults for the survey. A total of

1,163 adults participated in the survey, yielding an 89.8% response rate (Berg et al., 2016).

Measures

The survey assessed information on sociodemographic factors, tobacco use history and influences, and perceptions of multiple tobacco policies. The current analyses focused on perceptions of HWLs. Below, we highlight each of the measures included in the analyses.

Predictors

Sociodemographic variables. Participants were asked to report sociodemographic factors, which included their age in years, sex (male or female), setting of residence (urban or rural), education (years spent in school), total monthly household income in Lari, employment status (employed part-time, employed full-time, unemployed, student, homemaker, retired, unable to work or disabled, other), their relationship status (married, living with a partner, single/never married, divorced, widowed), and the number of children in the home. Due to the distribution of the sample and similarities in response to outcome measured, we collapsed categorizations for the variables of relationship status (married/living with a partner vs. other) and employment status (employed full-or part-time vs. other). To assess social influences regarding tobacco, all participants were asked to report the number of friends out of their five closest who smoked.

Tobacco use. All participants were asked if they currently smoke tobacco on a daily basis, less than daily, or not at all. For analysis, those who reported daily smoking and less than daily were classified as “current smokers” (Centers for Disease Control and Prevention, 2013). Current smokers were asked to report the number of days smoked in

the past 30, as well as the number of cigarettes smoked per day (Centers for Disease Control and Prevention, 2013). Current smokers were also asked to report how important quitting smoking was to them and how confident they were that they could quit smoking, respectively, on a ten-point scale (0=not at all to 10=extremely) (Biener & Abrams, 1991).

Outcome

Perceived effectiveness of HWLs. Other European Union Countries have implemented the HWLs included in the survey, validating the use of the specific messaging strategies measured (Tobacco Labelling Resource Centre, 2013). Perceived effectiveness was assessed by asking: "On a scale of 1-9, where 1 is 'not at all' and 9 is 'extremely,' please indicate how effective this message might be in motivating smokers to quit smoking or preventing people from starting smoking." Participants were randomized to receive either Set A HWLs or Set B HWLs, which included half pictorial images and half text-only messages. Table 2 depicts which pictorial and text-only HWLs were included in each of the two sets.

Data Analyses

We conducted descriptive statistics of the study sample (sociodemographic variables and tobacco use variables). Bivariate analyses (i.e., t-tests, ANOVAS, Chi-squared tests, and correlations) were then used to examine differences in sociodemographic characteristics as well as tobacco use in participants who completed Set A versus Set B. Bivariate analyses were used to determine if there are any differences in the samples randomized to the two sets. To address our first study aim, we conducted

bivariate analyses examining average perceived effectiveness ratings of pictorial vs. text-only health warning labels.

To address our second study aim, factor analyses were conducted on the various HWL messaging strategies to identify factors or "themes" that might emerge. We conducted a factor analysis using Promax rotation for Set A and for Set B, respectively. We used eigenvalues of greater than 1 as the criteria for number of factors. Then, we examined the content and internal consistency of the factors. Findings for Set A indicated one factor. Findings for Set B indicated two factors. After examining the content across Set A and Set B, all HWLs in Set A were labeled "benign" and half of the HWLs in Set B were also labeled "benign; the remaining three HWLs in Set B were labeled "gruesome." (These findings are described more fully below in the Results section).

To examine our third study aim, we conducted regression analyses. Given the different factor structures for Set A vs. Set B, we approached subsequent analyses of these two sets differently. For Set A which involved only one factor ("benign"), we conducted linear regression to identify correlates of perceived effectiveness of the HWLs. For Set B, which included two factors ("benign" and "gruesome"), we first examined the proportion that perceived gruesome HWLs as more effective than benign , that perceived gruesome and benign HWLs as equally effective, and that perceived the benign as more effective than gruesome. Based on these findings, we conducted multinomial logistic regression analyses examining differences among participants who, on average, rated gruesome as more effective or benign as more effective relative to no difference. Our inclusion of potential predictors was based on the aforementioned literature regarding well-documented sociodemographic and tobacco-use factors related to reactions to

HWLs. Thus, for each set of analyses, we developed models among all participants in each set, among nonsmokers in each set, and among smokers in each set, respectively. We forced the sociodemographic factors and current smoking status for analyses among all participants; sociodemographic factors for analyses among nonsmokers; and sociodemographic factors and tobacco use-related factors for analyses among smokers.

All statistical modeling was conducted using SPSS 23.0 (IBM, Armonk, NY), with significance set at $p<.05$.

RESULTS

Study Participants

Table 1 shows that our sample was on average 42.48 years old (SD=13.56), 50.1% male (n=548), 57.7% rural (n=629), and 39.2% were employed full time or part time (n=426). They had an average of 12.75 years of education (SD=2.85), reported an average monthly household income of 573.6 Lari (SD=630.01), 65.9% were married or living with a partner (n=720), and 46.5% had children in the home (n=458). Current tobacco use prevalence among participants was 30.7% (n=336). Among smokers, participants reported smoking an average of 20.64 days out of the past 30 (SD=13.54), and smoked an average of 20.28 cigarettes on the days that they smoke (SD=9.54). On average, participants rated their importance of quitting as a 5.87 out of 10 (SD=3.47), and rated their confidence in quitting as a 4.59 out of 10 (SD=3.23).

In terms of differences between Sample A versus Sample B, only employment status was statistically different, such that Sample A had a larger proportion who were unemployed ($p<.001$). No other differences were found.

Aim 1. Perceived Effectiveness of Pictorial versus Text-only HWLs

Table 2 shows that all pictorial HWLs were rated as more effective than text-only HWLs ($p's<.001$), with the exceptions of the HWLs with the messaging: "Smoking can cause a slow and painful death" ($p=.129$) and "Smoking is highly addictive -- don't start" ($p=.271$).

Aim 2: Factor Analysis Examining Themes Emerging from Pictorial HWLs

Factor analysis of Set A HWLs identified one factor ("benign"), which accounted for 79.4% of the variance. Cronbach's alphas for this factor was .95. Factor analysis of

Set B HWLs identified two factors (see Table 2): "gruesome" and "benign." These two factors accounted for 88.1% of the variance. Cronbach's alphas for each factor were .91 and .94, respectively. Table 2 indicates that, while all gruesome pictorial HWLs were perceived as more effective than text-only HWLs, the two pictorial HWLs that were not perceived to be more effective than text-only HWLs were categorized as benign.

Aim 3: Correlates of Perceived Effectiveness of Benign HWLs (Set A)

Table 3 shows linear regression results examining correlates of perceived effectiveness of Set A benign HWLs. Among all *participants,* correlates with greater perceived effectiveness of benign HWLs included being female ($p<.001$), living in a rural setting ($p=.001$), not having children in the home ($p=.038$), and being a nonsmoker ($p=.005$; Adjusted R-Square=.104). Among *nonsmokers,* correlates with greater perceived effectiveness of benign HWLs included being female ($p=.016$) and living in a rural setting ($p=.017$; Adjusted R-Square=.043). Among *current smokers,* correlates with greater perceived effectiveness of benign HWLs included being female ($p=.014$), not being married/living with a partner ($p=.045$), having more close friends who smoke ($p=.013$), and rating quitting smoking as more important ($p=.009$; Adjusted R-Square=.107).

Aim 3: Correlates of Perceived Effectiveness of Gruesome Versus Benign HWLs (Set B)

For Set B labels, we examined the proportion that perceived gruesome HWLs as more effective than benign. While 43.8% (n=238) rated gruesome images more effective on average, 43.4% (n=236) rated gruesome and benign images equally effective (no difference), and 12.9% (n=70) rated benign images as more effective.

Table 4 shows results of the multinomial logistic regression examining correlates of perceiving either gruesome or benign HWLs as more effective on average compared to those reporting no difference (referent group). *Among all participants,* participants rating benign HWLs as more effective had fewer friends who smoked (p=.019) and had a higher monthly household income (p=.031). No significant predictors of rating gruesome HWLs as more effective were identified (Nagelkerke R-squared=.067). Among *nonsmokers*, there were no significant predictors of perceiving gruesome or benign HWLs as more effective, relative to rating no difference in their effectiveness (Nagelkerek R-squared=.042). Among *current smokers*, compared to those rating the HWLs as equally effective, those reporting benign HWLs as more effective had fewer friends who smoked (p=.013) and rated quitting smoking to be more important (p=.006). Finally, compared to those rating the HWLs as equally effective, those reporting gruesome HWLs as more effective had a lower household income per month (p=.003; Nagelkerke R-Square=.497).

In summary, all gruesome HWLs and only some benign HWLs outperform text-only labels. Compared to gruesome HWLs, some participants perceived benign labels were equally effective, and a minority perceived they were more effective. Finally, social influences, as well as importance of quitting were significant predictors of rating benign or gruesome HWLs as more effective.

DISCUSSION

The current study of Georgian adults examined how individual characteristics, including sociodemographic variables, social influences, smoking status, and smoking-related factors, relate to perceived effectiveness of various cigarette HWL messaging strategies. Findings indicate the broader public health policy significance of how individual predictors of smoking status influence Georgian adults' perceptions of different HWL messaging strategies. Key results indicated that gruesome labels were rated as more effective than text-only labels. Not all pictorial messaging strategies are equally effective, however, because only some benign HWLs were rated as more effective than text-only HWLs. The more novel finding was that gruesome HWLs are not an effective messaging strategy for all. Specifically, a portion of participants perceived no difference in effectiveness between gruesome and benign HWLs, and a smaller portion rated benign HWLs more effective on average. Therefore, the pictorial messaging strategies tested in this study are not effective for all people.

Perceived Effectiveness of Pictorial versus Text-only HWLs

The study found that with the exception of two labels, pictorial HWLs were perceived as more effective than text-only labels. This finding is supported by literature stating that the effectiveness of pictorial HWLs depends on the particular image (Evans et al., 2017). For instance, pictorial HWLs containing images that provoke little emotional reaction are less effective in increasing risk perceptions of smoking compared to text-only labels (Evans et al., 2017). Within the context of the ELM, the effectiveness of an image depends on the motivation of the viewer to consider the type of smoking-related risks depicted on the label, in addition to the messaging cues (central or peripheral) that

the individual finds most salient about that image. For example, central messaging cues for HWL messaging may include connecting the label content to relevant personal experience with smoking-related health impacts or ability to scrutinize the true argument of an image (Lein, 2001). In contrast, peripheral cues may include an emotional reaction generated by the image or perceived expertise of the messaging source (Lein, 2001).

Correlates of Perceived Effectiveness of Benign HWLs (Set A)

Correlates of perceived effectiveness of Benign HWLs were being female; living in a rural setting; having no children in the home; not married or living with a partner; having more close friends who smoke; being a nonsmoker; and rating quitting as more important. ELM may inform why certain individual characteristics influence benign warning label effectiveness. Specifically, those individuals likely relied on central processing cues related to factual arguments of the message such as addiction, the role of a doctor/pharmacist in smoking cessation, or risks to unborn children. In addition, this population had prior motivation to engage with the message because they perceived that quitting smoking is important, representing key determinants of the central processing route.

This study found that women are more likely to rate benign HWLs as effective. This finding is aligned with literature suggesting that women are more likely to consider quitting after viewing labels, be concerned with the cosmetic consequences of smoking, and consider the economic implications of smoking, and risks to children (Alaouie et al., 2015; Koval et al., 2005; Mannocci, Antici, Boccia, & La Torre, 2012). In addition, residing in rural areas was correlated with rating benign HWLs as more effective. While there is sparse literature evidencing this finding, rural dwellers could have perceived that

benign messages are more effective due to their general limited exposure to all types of tobacco information (Almeida et al., 2012). Perhaps females living in rural areas were also more likely to consider quitting and contemplate the messaging strategies of benign labels, as evidenced by their concern of smoking-related consequences.

In addition, those who did not have children in the home and those who did not live with a spouse/partner were likely to perceive that benign images are effective. This finding is partially aligned with literature stating self-reported exposure to anti-smoking campaigns and messaging is associated with greater social dialogue about quitting smoking (Thrasher et al., 2016). Additionally, those living with children in the home are more likely to discuss HWL content compared to those who did not live with children (Thrasher et al., 2016). However, this literature discussing social factors does explain the influence of friends. Perhaps this population of females who perceive that quitting is important were already more likely to perceive that benign images are generally effective, including those displaying risks to others, regardless of social influences. Future HWLs, however, must still consider the label salience by including images of relevant social influences such as children, family, or friends (Institue for Global Tobacco Control, 2013). Within ELM, social factors may be particularly salient in determining whether the message receiver is likely to centrally process the facts displayed on the HWL or judge the credibility of the message from the salience of peripheral cues such as social factors. Finally, it is not surprising that being a non-smoker and rating quitting as more important are correlates of benign image effectiveness, given that they are also significant predictors of overall perception of HWLs, and self-efficacy in quitting (Bolman et al., 2018; Gwaltney et al., 2009; Williams et al., 2002).

Correlates of Perceived Effectiveness of Gruesome Versus Benign HWLs (Set B)

All gruesome HWLs were rated as more effective compared to text-only HWLs. This finding is supported by literature suggesting that gruesome HWLs may increase avoidance of HWLs and fear of smoking, consideration of smoking risks, aid in memorability of health risks, as well as increase intentions to discuss the label with another person (Gibson et al., 2015; Sychareun et al., 2015). Based on the outcomes of viewing gruesome HWLs, the Elaboration Likelihood Model may suggest that gruesome warning label messaging strategies may eventually lead to central processing route cues. For instance, indicators of central processing of gruesome HWLs could include personal relevance of smoking, cognitively engaging with messaging content to consider health risks, or intentions to discuss the content with another person.

The portion of participants perceiving no difference between text and pictorial HWLs evidences the need for future research on which strategies elicit positive and negative reactions as well as which are most persuasive (McQueen et al., 2015), particularly in other former Soviet Union countries. The results suggest this population of Georgian adults are heavily addicted, smoking an average of 20.28 cigarettes per day, uncertain of their confidence of quitting tobacco, and may minimize the severity of health risks associated with smoking (Weinstein, 1998). Similarly, ELM suggests that external factors also influence individuals' general attitude, engagement, and processing of the messaging strategy (Petty & Cacioppo, 1986), meaning that tobacco use characteristics could influence the minimal difference between the two HWL types. The fact that some labels are more persuasive in helping viewers to visualize and process health risks of smoking (McQueen et al., 2015), may have also influenced this finding.

In terms of rating gruesome or benign HWLs as more effective, monthly household income, number of friends who smoke, and importance of quitting, were key predictors. Lower monthly household income was associated with rating gruesome images as more effective, which is consistent with previous literature suggesting that strong pictorial HWLs may be effective in reducing smoking-related disparities and decreasing "communication inequality" about the health risks of smoking (Cantrell et al., 2013; Viswanath et al., 2006). Similarly, this idea is aligned with the finding that those rating benign labels as more effective had a higher monthly household income. In addition, current smokers with fewer social influences who smoke rated benign HWLs as more effective. Previous literature demonstrates the significance of social norms around tobacco use, specifically in Georgia (Berg et al., 2014). Literature also shows that adult smokers are likely to talk about HWL messaging, specifically if the content is novel, and that conversations within social networks about anti-smoking strategies may also aid in quit attempts (Thrasher et al., 2016). Finally, smokers rating quitting as more important were more likely to perceive that benign HWLs are effective. As intention to quit is a crucial predictor of changing addictive behaviors such as smoking (Romer, Peters, Strasser, & Langleben, 2013), prior consideration of smoking risks and HWL messaging content may be a crucial predictor of benign label effectiveness. ELM suggests that people who have previously engaged with an issue and are able to process a message with minimal distractions are more likely to perceive that the message is persuasive over the long-term (Petty & Cacioppo, 1986). Considering the aforementioned predictors of HWL effectiveness, ELM suggests that future messaging strategies should consider

individuals' motivation to consider the message content, as well as the impact of external influences on engagement with that content.

Study Significance

The current study will be the first to use the Elaboration Likelihood Model to inform the perceived impact of health warning label messaging strategies on tobacco products among adults in Georgia. This study is significant because it examines which aspects of pictorial warnings are most effective, and do not lead to defensive outcomes among smokers and non-smokers. This research is crucial given the high smoking prevalence in Georgia, as well as important to inform policy in former Soviet Union countries with similar tobacco control policies and smoking rates. Finally, the study is novel because it uses sociodemographic correlates of smoking status to inform perceived effectiveness of various HWL messaging strategies in Georgia.

Future Implications for Research and Practice

The current study has significant influence on public health practice and research. In terms of practice, this study contributes to the body of evidence supporting Georgia's anticipated tobacco HWL policy, which Parliament is expected to implement in May 2018 (Tobacco Control Laws, 2017). Specifically, the new health warning regulations require labels to cover 65% of the total tobacco package which includes both sides as well as pictorial warnings (European Network for Smoking and Tobacco Prevention, 2017). In addition, the principal warning message should include a contact telephone number, such as a quit line (Tobacco Control Laws, 2017).

Regarding future research implications, longitudinal studies in Georgia should further examine the effectiveness of varying HWL messaging strategies in long-term

smoking prevention and cessation. Given the tobacco epidemic among Georgian males and the emerging epidemic among females, early smoking intervention among adolescents is critical. Future studies should examine various HWL messaging strategies as well as other smoking prevention messaging for this vulnerable population. Finally, all tobacco prevention advertising in Georgia must consider the influence of sociodemographic variables, smoking factors, and social influences on message effectiveness.

Limitations

Study limitations include the potential lack of generalizability, the use of self-report measures, and the cross-sectional nature of this data, limiting our ability to determine the directionality of the relationships documented and the number of correlates examined. Moreover, odds ratios may overestimate the true associations among variables when the prevalence of the condition under study (e.g., current smoking prevalence) is high. In addition, the presentation of Set A and Set B health warning labels had implications for participants' responses. Despite these limitations, these findings are important given the dearth of published research on correlates of receptivity to public smoke-free policies and implementation of voluntary smoke-free policies in individual homes and cars among adults in Georgia and potentially other former Soviet Union countries.

Conclusions

Not all people perceive that gruesome or benign HWLs are effective; and it is crucial to understand the effectiveness in different populations. While pictorial HWLs are largely perceived as more persuasive, gruesome and only some benign HWLs outperform

text-only. Some benign HWLs are perceived as equally persuasive, while a minority perceived that they are more effective than gruesome HWLs. In particular, benign HWLs may be more effective for smokers rating that quitting smoking is important. Future research should examine how ELM could be applied as a framework to inform future tobacco prevention messaging strategies, as well as how significant social factors influence the effectiveness of various types of HWL messaging and their effects.

FUNDING

This research was supported by the National Cancer Institute (K07 CA139114; PI: Berg), the Georgia Cancer Coalition (PI: Berg), and the Council for International Exchange of Scholars Fulbright Scholars Program.

COMPETING INTERESTS

The authors declare no conflicts of interest.

ACKNOWLEDGMENTS

We would like to thank the Georgia National Center for Disease Control and Public Health for their scientific input and technical support in conducting this research and Tbilisi State Medical University for hosting Dr. Berg during her tenure as a Fulbright Scholar in Georgia.

Table 1. Participant Characteristics and Bivariate Analyses Examining Differences Between Subgroups of Participants

Table 1. Participant Characteristics and Bivariate Analyses Examining Differences Between Subgroups of Participants, N=1093

Variable	M (SD) or N (%)	Set A N=556	Set B N=537	p-value
Sociodemographics				
Age (SD)	42.48 (13.56)	42.48 (13.45)	42.48 (13.69)	.996
Sex (%)				.090
Male	548 (50.1)	255 (47.5)	293 (52.7)	
Female	545 (49.9)	282 (52.5)	263 (47.3)	
Setting of residence (%)				.902
Urban	462 (42.3)	228 (42.6)	234 (42.1)	
Rural	629 (57.7)	307 (57.4)	322 (57.9)	
Employment status				.001
Employed full or part time	426 (39.2)	207 (38.7)	219 (39.6)	
Unemployed	340 (31.3)	156 (29.2)	184 (33.3)	
Homemaker	198 (18.1)	122 (22.8)	76 (13.7)	
Other	124 (11.3)	50 (9.3)	74 (13.4)	
# of years of education (SD)	12.75 (2.85)	12.86 (2.86)	12.65 (2.84)	.229
Income per month in Lari (SD)	573.6 (630.01)	562 (568.53)	584.43 (682.80)	.577
Relationship status (%)				.702
Married/living with partner	720 (65.9)	357 (66.5)	363 (65.3)	
Other	373 (34.1)	180 (33.5)	193 (34.7)	
Children in home (%)	458 (46.5)	210 (44.0)	248 (48.9)	.126
# of 5 closest friends who smoke (SD)	2.50 (1.89)	2.41 (1.88)	2.58 (1.89)	.135
Tobacco Use				
Current smoker (%)	336 (30.7)	169 (31.5)	167 (30)	.646
# of days smoked, past 30 (SD)	20.64 (13.54)	20.40 (13.61)	20.85 (13.50)	.732
Avg. cigarettes smoked per day (SD)	20.28 (9.54)	20.02 (9.21)	20.52 (9.85)	.633
Importance of quitting (SD)	5.87 (3.47)	6.14 (3.48)	5.62 (3.45)	.166
Confidence in quitting (SD)	4.59 (3.23)	4.49 (3.34)	4.68 (3.13)	.595

Table 2. Comparison of Persuasiveness of Graphic versus Text-based Messages

Table 2. Comparison of Persuasiveness of Graphic versus Text-based Messages

Message	Text M (SD)	Pictorial M (SD)		Message	Text M (SD)	Pictorial M (SD)	
	Set B	Set A	p		Set A	Set B	p
				Gruesome			
	5.00 (2.76)	5.67 (2.75)	<.001		4.62 (2.62)	5.81 (2.78)	<.001
	4.46 (2.65)	5.02 (2.67)	<.001		5.09 (2.63)	6.03 (2.51)	<.001
	4.26 (2.65)	4.75 (2.72)	.003		4.15 (2.63)	5.52 (2.76)	<.001
				Benign			
	3.66 (2.68)	4.39 (2.74)	<.001		4.62 (2.62)	4.86 (2.75)	.129
	4.36 (2.61)	4.81 (2.70)	.004		4.57 (2.68)	4.75 (2.74)	.271
	4.29 (2.66)	4.97 (2.74)	<.001		4.68 (2.66)	5.16 (2.65)	.003

Table 3. Linear Regression Identifying Correlates of Reported Effectiveness of Benign Warning Labels, Set A

Table 3. Linear Regression Identifying Correlates of Reported Effectiveness of Benign Warning Labels, Set A

	All Participants			Nonsmokers			Current Smokers		
Variable	**Beta**	**95% CI**	**p**	**Beta**	**95% CI**	**p**	**Beta**	**95% CI**	**p**
Age	-0.06	-0.16, 0.04	.217	-0.07	-0.19, 0.05	.228	-.063	-0.27, 0.14	.546
Female	5.88	2.60, 9.17	<.001	4.51	0.83, 8.19	.016	11.00	2.26, 19.75	.014
Rural	4.69	2.00, 7.38	.001	4.00	0.73, 7.27	.017	4.39	-0.99, 9.78	.109
Employed full or part time	-2.13	-4.81, 0.54	.118	-2.82	-6.07, 0.43	.089	0.97	-4.11, 6.05	.705
# of years of education	0.21	-0.26, 0.67	.383	0.26	-0.32, 0.85	.374	0.02	-0.80, 0.83	.970
Income per month in Lari	0.00	0.00, 0.00	.089	0.00	-0.00, 0.00	.137	0.00	-0.00, 0.01	.529
Married/living with partner	-2.62	-5.63, 0.39	.088	-1.83	-5.52, 1.86	.330	-5.82	-11.52, -0.13	.045
Children in home	-2.99	-5.80, -0.17	.038	-3.02	-6.48, 0.44	.087	-4.14	-9.23, 0.96	.111
# of 5 friends who smoke	0.10	-0.78, 0.97	.830	-0.44	-1.42, 0.54	.374	2.61	0.56, 4.65	.013
Tobacco Use									
Current Smoker	-4.87	-8.27, -1.47	.005	--	--	--	--	--	--
# of days smoked, past 30	--	--	--	--	--	--	0.12	-0.38, 0.62	.633
Avg. CPD	--	--	--	--	--	--	-0.07	-0.32, 0.19	.612
Importance of quitting	--	--	--	--	--	--	0.95	0.24, 1.66	.009
Confidence in quitting	--	--	--	--	--	--	0.24	-0.58, 1.06	.568
Adjusted R-Squared	.104			.043			.107		

Table 4. Multinomial Logistic Regressions Comparing Those Who Rated Gruesome or Benign as More Effective Relative to No Difference (Referent Group), Set B

Table 4. Multinomial Logistic Regressions Comparing Those Who Rated Gruesome or Benign as More Effective Relative to No Difference (Referent Group), Set B

	All Participants						Nonsmokers						Current Smokers					
	Gruesome More Effective			Benign More Effective			Gruesome More Effective			Benign More Effective			Gruesome More Effective			Benign More Effective		
Variable	OR	CI	p	OR	CI	p	OR	CI	p	OR	CI	p	OR	CI	p	OR	CI	p
Age	0.99	0.98, 1.01	.360	0.99	0.97, 1.02	.455	1.00	0.98, 1.02	.673	1.00	0.97, 1.03	.915	0.95	0.91, 1.00	.055	0.97	0.90, 1.04	.394
Female	0.86	0.50, 1.47	.577	1.87	0.88, 4.00	.104	0.92	0.50, 1.69	.791	1.43	0.62, 3.33	.402	0.25	0.04, 1.41	.115	2.95	0.15, 56.86	.475
Rural	1.01	0.64, 1.58	.984	1.08	0.57, 2.10	.567	0.98	0.57, 1.68	.941	1.20	0.55, 2.58	.650	1.75	0.55, 5.53	.343	2.54	0.38, 17.07	.336
Employed full or part time	1.19	0.75, 1.89	.452	1.45	0.76, 2.78	.258	1.13	0.65, 1.96	.667	1.41	0.65, 3.07	.385	2.73	0.83, 8.99	.098	0.82	0.14, 5.00	.831
# of years of education	0.95	0.88, 1.03	.240	0.91	0.81, 1.02	.119	0.94	0.85, 1.04	.225	0.92	0.80, 1.06	.240	1.03	0.85, 1.26	.752	0.78	0.59, 1.03	.074
Income per month in Lari	1.00	0.99, 1.00	.225	1.00	1.00, 1.00	.031	1.00	1.00, 1.00	.774	1.00	1.00, 1.00	.062	1.00	1.00, 1.00	.003	1.00	1.00- 1.00	.228
Married/living with partner	1.16	0.70, 1.92	.562	1.26	0.61, 2.61	.531	1.24	0.67, 2.27	.494	0.92	0.40, 2.13	.841	0.91	0.26, 3.22	.882	3.41	0.38, 30.32	.271
Children in home	1.01	0.64, 1.60	.954	1.47	0.77, 2.82	.247	1.17	0.67, 2.05	.583	1.33	0.60, 2.95	.488	0.39	0.14, 1.11	.076	2.44	0.50, 11.77	.268
# of 5 friends who smoke	0.97	0.84, 1.12	.651	0.78	0.63, 0.96	.019	1.04	0.88, 1.23	.638	0.92	0.72, 1.18	.511	0.69	0.43, 1.09	.107	0.45	0.24, 0.84	.013
Tobacco Use																		
Current smoker	1.00	0.57, 1.80	.969	0.80	0.35, 1.81	.587	--	--	--	--	--	--	--	--	--	--	--	--
# days smoked, past 30	--	--	--	--	--	--	--	--	--	--	--	--	1.01	0.93, 1.10	.758	1.10	0.92, 1.23	.428
Avg. CPD	--	--	--	--	--	--	--	--	--	--	--	--	0.96	0.90, 1.02	.177	0.97	0.90, 1.05	.415
Importance of quitting	--	--	--	--	--	--	--	--	--	--	--	--	1.02	0.89, 1.18	.745	1.68	1.16, 2.42	.006
Confidence in quitting	--	--	--	--	--	--	--	--	--	--	--	--	0.98	0.84, 1.16	.840	1.08	0.81, 1.43	.602
Nagelkerke R-Squared	.067						.042						.497					

REFERENCES

Alaouie, H., Afifi, R. A., Haddad, P., Mahfoud, Z., & Nakkash, R. (2015). Effectiveness of pictorial health warnings on cigarette packs among Lebanese school and university students. *Tob Control, 24*(e1), e72.

Almeida, L., Szklo, A., Sampaio, M., Souza, M., Martins, L. F., Szklo, M., . . . Caixeta, R. (2012). Global Adult Tobacco Survey data as a tool to monitor the WHO Framework Convention on Tobacco Control (WHO FCTC) implementation: the Brazilian case. *Int J Environ Res Public Health, 9*(7), 2520-2536. doi:10.3390/ijerph9072520

Bakhturidze, G., Ross, H., & What, J. (2008). Population survey on tobacco economy and policy in Georgia. *FCTC Implementation and Monitoring Center in Georgia*, 4-22.

Baris, E., Brigden, L. W., Prindiville, J., da Costa e Silva, V. L., Chitanondh, H., & Chandiwana, S. (2000). Research priorities for tobacco control in developing countries: a regional approach to a global consultative process. *Tob Control, 9*(2), 217-223.

Berg, C. J., Aslanikashvili, A., & Djibuti, M. (2014). A Cross-Sectional Study Examining Youth Smoking Rates and Correlates in Tbilisi, Georgia. *BioMed Research International, 2014*, 10. doi:10.1155/2014/476438

Berg, C. J., Aslanikashvili, A., & Djibuti, M. (2015). A Cross-Sectional Study Examining Adult Smoking Rates and Recent Quit Attempts in the Republic of Georgia. . *Tobacco Control and Public Health in Eastern Europe., 5*.

Berg, C. J., Topuridze, M., Maglakelidze, N., Starua, L., Shishniashvili, M., & Kegler, M. C. (2016). Reactions to smoke-free public policies and smoke-free home policies in the Republic of Georgia: results from a 2014 national survey. *Int J Public Health, 61*(4), 409-416. doi:10.1007/s00038-016-0793-0

Biener, L., & Abrams, D. B. (1991). The Contemplation Ladder: validation of a measure of readiness to consider smoking cessation. *Health Psychol, 10*(5), 360-365.

Bolman, C., Verboon, P., Thewissen, V., Boonen, V., Soons, K., & Jacobs, N. (2018). Predicting Smoking Lapses in the First Week of Quitting: An Ecological Momentary Assessment Study. *J Addict Med, 12*(1), 65-71. doi:10.1097/adm.0000000000000365

Cantrell, J., Vallone, D. M., Thrasher, J. F., Nagler, R. H., Feirman, S. P., Muenz, L. R., . . . Viswanath, K. (2013). Impact of Tobacco-Related Health Warning Labels across Socioeconomic, Race and Ethnic Groups: Results from a Randomized Web-Based Experiment. *PLOS ONE, 8*(1), e52206. doi:10.1371/journal.pone.0052206

Centers for Disease Control and Prevention. (2013). Behavioral Risk Factor Surveillance System Prevalence and Trends Data. Retrieved from https://www.cdc.gov/brfss/annual_data/annual_2013.html

Centers for Disease Control and Prevention. (2016). Current Cigarette Smoking Among Adults in the United States. *Smoking & Tobacco Use.* Retrieved from https://www.cdc.gov/tobacco/data_statistics/fact_sheets/adult_data/cig_smoking/

Chun, S., Park, J. W., Heflick, N., Lee, S. M., Kim, D., & Kwon, K. (2017). The Moderating Effects of Self-Esteem and Self-Efficacy on Responses to Graphic Health Warnings on Cigarette Packages: A Comparison of Smokers and Nonsmokers. *Health Communication*, 1-7. doi:10.1080/10410236.2017.1331186

Devlin, E., Anderson, S., Hastings, G., & MacFadyen, L. (2005). Targeting smokers via tobacco product labelling: opportunities and challenges for Pan European health promotion. *Health Promotion International*, *20*(1), 41-49.

European Network for Smoking and Tobacco Prevention. (2017). New Tobacco Control legislation in Georgia came into force on 30 May. Retrieved from http://ensp.org/2017/06/08/new-tobacco-control-legislation-in-georgia-came-into-force-on-30-may/

Evans, A. T., Peters, E., Shoben, A. B., Meilleur, L. R., Klein, E. G., Tompkins, M. K., . . . Tusler, M. (2017). Cigarette Graphic Warning Labels Are Not Created Equal: They Can Increase or Decrease Smokers' Quit Intentions Relative to Text-Only Warnings. *Nicotine Tob Res*, *19*(10), 1155-1162. doi:10.1093/ntr/ntw389

Flynn, B. S., Worden, J. K., Bunn, J. Y., Connolly, S. W., & Dorwaldt, A. L. (2011). Evaluation of smoking prevention television messages based on the elaboration likelihood model. *Health Education Research*, *26*(6), 976-987. doi:10.1093/her/cyr082

Gibson, L., Brennan, E., Momjian, A., Shapiro-Luft, D., Seitz, H., & Cappella, J. N. (2015). Assessing the Consequences of Implementing Graphic Warning Labels on Cigarette Packs for Tobacco-Related Health Disparities. *Nicotine Tob Res, 17*(8), 898-907. doi:10.1093/ntr/ntv082

Gwaltney, C. J., Metrik, J., Kahler, C. W., & Shiffman, S. (2009). Self-Efficacy and Smoking Cessation: A Meta-Analysis. *Psychology of addictive behaviors : journal of the Society of Psychologists in Addictive Behaviors*, *23*(1), 10.1037/a0013529. doi:10.1037/a0013529

Hammond, D. (2011). Health warning messages on tobacco products: a review. *Tob Control*, *20*(5), 327-337. doi:10.1136/tc.2010.037630

Hammond, D., Fong, G. T., McNeill, A., Borland, R., & Cummings, K. M. (2006). Effectiveness of cigarette warning labels in informing smokers about the risks of smoking: findings from the International Tobacco Control (ITC) Four Country Survey. *Tob Control, 15*(Suppl 3), iii19-iii25. doi:10.1136/tc.2005.012294

Hiilamo, H., & Glantz, S. A. (2015). Implementation of effective cigarette health warning labels among low and middle income countries: state capacity, path-dependency and tobacco industry activity. *Soc Sci Med, 124*, 241-245. doi:10.1016/j.socscimed.2014.11.054

Ilhame Sabbane, L., Lowrey, T., And, J.-C., & Chebat, J.-C. (2009). The Effectiveness of CigaretteWarning Label Threats on Non-Smoking Adolescents. *Journal of Consumer Affairs, 43*(2). doi:10.1111/j.1745-6606.2009.01142.x

Institue for Global Tobacco Control. (2013). *State of Evidence Review: Health Warning Labels on Tobacco Products* Retrieved from Baltimore, MD: https://www.globaltobaccocontrol.org/sites/default/files/HealthWarnings_state_of_evidence_final_11_18_2013_web_0.pdf

Kollath-Cattano, C., Osman, A., & Thrasher, J. (2016). *Evaluating the perceived effectiveness of pregnancy-related cigarette package health warning labels among different gender/age groups* (Vol. 66).

Koval, J. J., Aubut, J.-A. L., Pederson, L. L., O'Hegarty, M., & Chan, S. S. H. (2005). The Potential Effectiveness of Warning Labels on Cigarette Packages: The Perceptions of Young Adult Canadians. *Canadian Journal of Public Health, 96*(5), 353-356.

Lein, N.-H. (2001). *Elaboration Likelihood Model in Consumer Research: A Review*: Proc. Natl. Sci. Counc.

Li, Z., Marshall, T. E., Fong, G. T., Quah, A. C. K., Feng, G., Jiang, Y., & Hitchman, S. C. (2017). Noticing cigarette health warnings and support for new health warnings among non-smokers in China: findings from the International Tobacco Control project (ITC) China survey. *BMC Public Health, 17*, 476. doi:10.1186/s12889-017-4397-2

Lopez, A. D., Mathers, C. D., Ezzati, M., Jamison, D. T., & Murray, C. J. (2006). Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. *Lancet, 367*(9524), 1747-1757. doi:10.1016/s0140-6736(06)68770-9

Mannocci, A., Antici, D., Boccia, A., & La Torre, G. (2012). Impact of cigarette packages warning labels in relation to tobacco-smoking dependence and motivation to quit. *Epidemiol Prev, 36*(2), 100-107.

Mansour, A., Y. , & Bakhsh, Z. (2017). Factors Affecting the Perceived Effectiveness of Pictorial Health Warnings on Cigarette Packages in Gulf Countries: A Cross-sectional Study. *Tob Use Insights, 10*, 1179173X17698462. doi:10.1177/1179173X17698462

McQueen, A., Kreuter, M. W., Boyum, S., Thompson, V. S., Caburnay, C. A., Waters, E. A., . . . Fu, Q. (2015). Reactions to FDA-Proposed Graphic Warning Labels Affixed to U.S. Smokers' Cigarette Packs. *Nicotine & Tobacco Research, 17*(7), 784-795. doi:10.1093/ntr/ntu339

Mead, E. L., Cohen, J. E., Kennedy, C. E., Gallo, J., & Latkin, C. A. (2015). The role of theory-driven graphic warning labels in motivation to quit: a qualitative study on perceptions from low-income, urban smokers. *BMC Public Health, 15*(1), 92. doi:10.1186/s12889-015-1438-6

Mir, H., Roberts, B., Richardson, E., Chow, C., & McKee, M. (2013). Analysing compliance of cigarette packaging with the FCTC and national legislation in eight former Soviet countries. *Tob Control, 22*(4), 231.

Ng, M., Freeman, M. K., Fleming, T. D., Robinson, M., Dwyer-Lindgren, L., Thomson, B., . . . Gakidou, E. (2014). Smoking prevalence and cigarette consumption in 187 countries, 1980-2012. *Jama, 311*(2), 183-192. doi:10.1001/jama.2013.284692

Pampel, F. C. (2006). Global Patterns and Determinants of Sex Differences in Smoking. *International journal of comparative sociology, 47*(6), 466-487. doi:10.1177/0020715206070267

Pampel, F. C., Denney, J. T., & Krueger, P. M. (2011). CROSS-NATIONAL SOURCES OF HEALTH INEQUALITY: EDUCATION AND TOBACCO USE IN THE WORLD HEALTH SURVEY. *Demography, 48*(2), 653-674. doi:10.1007/s13524-011-0027-2

Petty, R., & Cacioppo, J. (1986). *The Elaboration Likelihood Model of Persuasion* (Vol. 19).

Ramanadhan, S., Nagler, R. H., McCloud, R., Kohler, R., & Viswanath, K. (2017). Graphic health warnings as activators of social networks: A field experiment among individuals of low socioeconomic position. *Soc Sci Med, 175*, 219-227. doi:10.1016/j.socscimed.2016.12.044

Romer, D., Peters, E., Strasser, A. A., & Langleben, D. (2013). Desire versus Efficacy in Smokers' Paradoxical Reactions to Pictorial Health Warnings for Cigarettes. *PLOS ONE, 8*(1), e54937. doi:10.1371/journal.pone.0054937

Rucker, D., & Petty, R. (2006). Increasing the Effectiveness of Communications to Consumers: Recommendations Based on Elaboration Likelihood and Attitude Certainty Perspectives. *Journal of Public Policy & Marketing, 25*, 39-52. doi:10.1509/jppm.25.1.39

Schuz, N., Eid, M., Schuz, B., & Ferguson, S. G. (2016). Immediate effects of plain packaging health warnings on quitting intention and potential mediators: Results from two ecological momentary assessment studies. *Psychol Addict Behav, 30*(2), 220-228. doi:10.1037/adb0000146

Sychareun, V., Hansana, V., Phengsavanh, A., Chaleunvong, K., & Tomson, T. (2015). Perceptions and acceptability of pictorial health warning labels vs text only - a cross-sectional study in Lao PDR. *BMC Public Health, 15*, 1094. doi:10.1186/s12889-015-2415-9

Thrasher, J. F., Abad-Vivero, E. N., Huang, L., O'Connor, R. J., Hammond, D., Bansal-Travers, M., . . . Hardin, J. (2016). Interpersonal communication about pictorial health warnings on cigarette packages: Policy-related influences and relationships with smoking cessation attempts. *Social Science & Medicine, 164*, 141-149. doi:https://doi.org/10.1016/j.socscimed.2015.05.042

Thrasher, J. F., Carpenter, M. J., Andrews, J. O., Gray, K. M., Alberg, A. J., Navarro, A., . . . Cummings, K. M. (2012). Cigarette Warning Label Policy Alternatives and Smoking-Related Health Disparities. *American journal of preventive medicine, 43*(6), 590-600. doi:10.1016/j.amepre.2012.08.025

Tobacco Control Laws. (2017). Law of Georgia on Tobacco Control

Viswanath, K., Breen, N., Meissner, H., Moser, R. P., Hesse, B., Steele, W. R., & Rakowski, W. (2006). Cancer knowledge and disparities in the information age. *J Health Commun, 11 Suppl 1*, 1-17. doi:10.1080/10810730600977517

Wang, Q., Shen, J. J., Sotero, M., Li, C. A., & Hou, Z. (2018). Income, occupation and education: Are they related to smoking behaviors in China? *PLOS ONE, 13*(2), e0192571. doi:10.1371/journal.pone.0192571

Weinstein, N. D. (1998). Accuracy of smokers' risk perceptions. *Ann Behav Med, 20*(2), 135-140.

Williams, G. C., Gagne, M., Ryan, R. M., & Deci, E. L. (2002). Facilitating autonomous motivation for smoking cessation. *Health Psychol, 21*(1), 40-50.

World Bank. (2007). Data: World Bank Country and Lending Groups. Retrieved from https://datahelpdesk.worldbank.org/knowledgebase/articles/906519

World Bank. (2016). Poverty headcount ratio at national poverty lines. Retrieved from https://data.worldbank.org/indicator/SI.POV.NAHC?locations=BR

World Health Organization. (2003). Framework Convention on Tobacco Control. Retrieved from http://www.who.int/tobacco/framework/WHO_FCTC_english.pdf

World Health Organization. (2008). *Guidelines for implementation of Article 11*. Retrieved from Geneva, Switzerland http://www.who.int/fctc/treaty_instruments/adopted/Guidelines_Article_11_English.pdf?ua=1

World Health Organization. (2009). *The impact of pictures on the effectiveness of tobacco warnings* (8). Retrieved from Geneva, Switzerland

World Health Organization. (2015). Health warning labels on cigarette packages: Data by country. Retrieved from http://apps.who.int/gho/data/view.main.TOB31600

World Health Organization. (2017a). Parties to the WHO Framework Convention on Tobacco Control. Retrieved from http://www.who.int/fctc/signatories_parties/en/.

World Health Organization. (2017b). Tobacco. Retrieved from http://www.who.int/mediacentre/factsheets/fs339/en/

World Health Organization. (2017c). WHO report on the global tobacco epidemic, 2017 Country profile: Georgia Retrieved from http://www.who.int/tobacco/surveillance/policy/country_profile/geo.pdf?ua=1

World Health Organization. (2018). STEPwise approach to surveillance (STEPS). Retrieved from http://www.who.int/ncds/surveillance/steps/en/

World Lung Foundation. (2015). Country Fact Sheet. *The Tobacco Atlas. Country Fact Sheet: Georgia.* Retrieved from http://www.tobaccoatlas.org/country-data/georgia/