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Interpersonal Communication About Cigarette Warning Labels Among U.S. Smokers: Differences Between Latinos And Whites

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INTERPERSONAL COMMUNICATION ABOUT CIGARETTE WARNING LABELS AMONG U.S. SMOKERS:
DIFFERENCES BETWEEN LATINOS AND WHITES

by

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Abstract

Pictorial health warning labels (HWLs) on cigarette packs are used worldwide to curb cigarette smoking, the leading preventable cause of death in the United States While individual-level mediators of HWLs' effects on cessation have been thoroughly studied, interpersonal communication about HWLs has received less attention in HWL research. However, results from one study demonstrated the importance of interpersonal communication, finding that conversations about HWLs predicted quit attempts in Australia, Canada, and Mexico. That study also found that smokers in Mexico, where most smokers are Latino, reported more conversations than smokers in Australia and Canada, where most smokers are non-Latino White. This thesis extended research on HWL conversations to the United States, where HWLs are text-only. The study aims were to compare the frequency of HWL conversations between U.S. Latino and White smokers and to assess the association of these conversations with subsequent quit attempts.

The current study used data from an online panel of U.S. Latino and White adult smokers. From January 2013 to September 2014, approximately 1,300 respondents were surveyed every four months (total individuals: N= 4,628). HWL conversations, quit attempts in the prior four months, smoking behaviors, and socio-demographic variables were measured at each wave. Poisson generalized estimating equation (GEE) models

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regressed HWL conversation on study variables, and logistic GEE models regressed quit attempts at one wave on predictor variables from the prior wave, including interactions between ethnicity and HWL conversations. Results indicated that HWL conversations were most prevalent among Spanish-speaking Latinos (85%), followed by English-speaking Latinos (59%), and non-Latino Whites (35%), and the statistical significance of these between-group differences was confirmed in adjusted models. Frequency of HWL conversations predicted subsequent quit attempts ($AIRR_{low\ v\ none}$=1.17, 95% CI=1.02,1.33; $AIRR_{high\ v\ none}$=1.27, 95% CI=1.12, 1.43), although ethnicity/language preference did not mediate this effect. Latinos appear to talk more often about HWLs than non-Latino Whites, yet HWL conversations are associated with quit attempts across ethnic groups. Future research should explore reasons for ethnic difference in HWL communication as well as other characteristics of message recipients that might influence conversations. Cessation campaigns should attempt to promote interpersonal communication to increase cessation.

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Chapter 1

Introduction

Overview of the Introduction

Smoking is the leading preventable cause of death in the United States (Jamal et al., 2018), and pictorial health warning labels (HWLs) on cigarette packs are a tobacco control strategy used by numerous countries (Canadian Cancer Society, 2016) and recommended by the WHO (World Health Organization (WHO), 2008) to promote smoking cessation. While much of the research on HWLs has focused on individual-level emotional and cognitive mediators of their effects on cessation (Borland, Yong, et al., 2009; Evans et al., 2015; Yong et al., 2014), an emerging area of HWL research is exploring the role of interpersonal conversations about HWLs. Only one study has assessed the relationship between HWL conversations and subsequent quit attempts. This study was conducted among smokers in Mexico, Canada, and Australia and found that conversations predicted quit attempts and that smokers in Mexico reported more frequent conversations than smokers in the two other countries, where smokers are primarily White (Thrasher et al., 2016).

While the prior research on HWL conversations suggests that Latino smokers might have more conversations than other smokers (Thrasher et al., 2016), it is unclear if HWL conversations occurred more frequently among Mexican smokers due to

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country-level differences. Exploring this question with smokers in the U.S. will help determine if Latino smokers are more likely to have conversations about HWLs and will also address the dearth of research on effective smoking interventions for U.S. Latinos (Castro, 2016; Cox, Okuyemi, Choi, & Ahluwalia, 2011; Webb, Rodríguez-Esquivel, & Baker, 2010). It is also still unclear from current HWL research if the relationship between conversations and quit attempts is generalizable to the U.S. context, where the HWLs are text-only and have not been updated since 1984. Answering this question will extend the domain of HWL research and help to determine whether potential differences in the frequency of conversations between U.S. Latinos and Whites is worth attention. This thesis will further the research around HWL conversations by assessing the frequency of conversations and the possible association between these conversations and subsequent quit attempts among a cohort of Latino and White smokers living in the U.S.

Context for Thesis

As the leading cause of avoidable death worldwide, tobacco use kills 6.3 million people every year (Eriksen, Mackay, Schluger, Islami, & Drope, 2015), including over 480,000 deaths from cigarette smoking in the United States (United States Department of Health and Human Services, 2014). Smoking cigarettes increases the risk of many serious illnesses and conditions, such as cancer, heart disease, and lung diseases (Eriksen et al., 2015; United States Department of Health and Human Services, 2014). Smoking also financially burdens individuals and the nation as a whole. Annually in the

United States, $170 billion is spent on smoking-related medical care (Xu, Bishop, Kennedy, Simpson, & Pechacek, 2015), and an estimated $156 billion is lost in workforce productivity because of smoking-related mortality (United States Department of Health and Human Services, 2014).

Pictorial health warning labels (HWLs) on cigarette packs are a tobacco control strategy used by over 100 countries and jurisdictions (Canadian Cancer Society, 2016) and recommended by the WHO (World Health Organization (WHO), 2008) to promote smoking cessation. A review of HWL studies suggests that HWLs can increase knowledge and perceptions of smoking risks, encourage cessation-related behaviors when smokers attend to the HWLs, and increase smoker utilization of cessation telephone quitlines (Hammond, 2011). However, there is considerable evidence that pictorial HWL –those with images warning of the dangers of smoking–are more effective than HWLs with text only. Both observational and experimental research has found that, compared to text-only HWLs, pictorial HWLs draw more attention to warnings, produce stronger cognitive responses (e.g., thinking about quitting) and emotional arousal, and better promote cessation-related outcomes (e.g., quit intentions, quit attempts, short-term cessation) (Brewer et al., 2016; Hammond, 2011; Noar, Francis, et al., 2016; Noar, Hall, et al., 2016). Despite evidence of the benefits of pictorial HWLs over text-only HWLs, the United States still only requires the text-only HWLs that were first implemented on U.S. packs in 1984 (Comprehensive Smoking Education Act of 1984). While text-only HWLs are less effective than pictorial HWLs, they continue to provide important information

on the established health risks of smoking and may be an important source of information for smokers (Hammond, Fong, McNeill, Borland, & Cummings, 2006).

To better understand the processes through which HWLs influence cessation, much of the HWL research has explored individual-level mediators of their effects on cessation. For example, studies have found that cognitive responses (e.g., thinking about the risks of smoking) and negative emotional reactions (e.g., fear, disgust, worry) to HWLs predict increased quitting intentions and attempts (Borland, Yong, et al., 2009; Cho et al., 2018; Evans et al., 2015; Yong et al., 2014). An understudied domain of HWL research that is gaining attention is interpersonal conversations about HWLs. This area of research is preceded by literature on interpersonal communication about media campaigns, which has found that conversations about campaign messages can enhance or mediate campaign goals (Southwell & Yzer, 2007), including smoking cessation (Durkin & Wakefield, 2006; Hafstad & Aaro, 1997; Jeong, Tan, Brennan, Gibson, & Hornik, 2015; van den Putte, Yzer, Southwell, de Bruijn, & Willemsen, 2011). Research on HWLs has explored the content and context of conversations about pictorial HWLs (Hall et al., 2015; Morgan et al., 2017) as well as whether text or pictorial HWLs are more likely to inspire conversations (Brewer et al., 2016; Morgan et al., 2017). Only one study, however, has assessed the relationship between HWL conversations and subsequent quit attempts (Thrasher et al., 2016). This study was among a cohort of smokers in Mexico, Canada, and Australia–all countries with pictorial HWLs– and found that smokers that reported conversations at one survey wave were more likely to report quit attempts at subsequent surveys. In addition, smokers in Mexico reported more

conversations about HWLs than smokers in Canada and Australia, where smokers are primarily White (Thrasher et al., 2016).

Research Gaps and Significance

The current evidence on conversations about HWLs, particularly the study by Thrasher and colleagues (Thrasher et al., 2016), pose several question that need addressing. First, although there appears to be a higher prevalence of HWL conversations in Mexico than in Canada and Australia, it is unclear if Latinos in general have more HWL conversation than White smokers. As Thrasher and colleagues point out, country-level differences could have accounted for this variation in the prevalence of conversations (Thrasher et al., 2016). Further research is needed to respond to the methodological limitations of that study and to better understand if cultural patterns of communication might influence more frequent conversations among Latinos. Such research will also contribute to the current knowledge on the effects of interpersonal communication in various contexts, which is something called for by Southwell and Yzer in their chapter on interpersonal communication about campaigns (Southwell & Yzer, 2007).

Research that explores whether the prevalence of HWL conversations in the United States is higher among Latinos compared to Whites would also help to fill to the dearth of cessation research among U.S. Latinos (Castro, 2016; Cox et al., 2011; Webb et al., 2010). This research is sorely needed since there is evidence that the factors generally considered to be determinants of smoking and cessation (e.g., socio-economic status,

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depression, and physical dependence) may function differently or not at all for Latino; however, cultural factors may be important determinants of smoking cessation among Latinos (Castro, 2016). Furthermore, it is particularly important to study the effects of HWLs and conversations among U.S. Latinos because they tend to rely on informal sources (e.g., social network members and media for health information (Cheong, 2007; Clayman, Manganello, Viswanath, Hesse, & Arora, 2010; Livingston, Minushkin, & Cohn, 2008), often underutilize effective cessation resources (Cokkinides, Halpern, Barbeau, Ward, & Thun, 2008; Kaufman, Augustson, Davis, & Finney Rutten, 2010; Trinidad, Pérez-Stable, White, Emery, & Messer, 2011), and have additional barriers to healthcare compared to Whites (Kirby & Kaneda, 2013; United States Department of Health and Human Services, 2016). Therefore, it may be difficult to reach Latino smokers with cessation interventions in clinical settings. In contrast to clinical settings, HWLs on cigarette packs and social network conversations about cessation messages are accessible to all smokers and may therefore be particularly important for Latino smokers. Research is needed to understand the potential effectiveness of HWL conversations among U.S. Latino smokers.

Although a slight caveat from the information presented thus far, discussion of the smoking rates among Latinos is pertinent to explaining the significance of research on the frequency of HWL conversations among Latinos. The smoking prevalence among adult Latinos in the United States is lower than the national average (Latinos=10.7%, Whites=16.6%, Blacks=16.5%), and daily and heavy smoking are less common (Kaplan et al., 2014; Margerison-Zilko & Cubbin, 2013; Pulvers et al., 2015; Siahpush, Singh, Jones,

& Timsina, 2010). Nevertheless, Latinos are an important focus for smoking cessation interventions, both because of the size of the population (18% of the U.S. population in 2017: United States Census Bureau, 2017)) and the significant health outcomes associated with light smoking (Inoue-Choi et al., 2017; Schane, Ling, & Glantz, 2010). Therefore, smoking among Latinos remains a public health concern, and research is needed to determine the most effective cessation interventions for this population.

Another gap in the research on conversations about HWLs is whether conversations about text-only HWLs in the United States inspire quit attempts. While conversations about pictorial HWLs appear to enhance the effect of HWLs on cessation, the limited impact of text-only HWLs compared to pictorial HWLs (Brewer et al., 2016; Hammond, 2011; Noar, Francis, et al., 2016; Noar, Hall, et al., 2016) and the tendency of HWL effects to diminish over time (Borland, Wilson, et al., 2009; Li et al., 2015) might mean that conversations about the 34-year-old U.S. text HWLs have little impact on cessation. Answering this question will help to understand if the results of prior research (e.g., Thrasher et al., 2016) generalize to the U.S. setting. It will also ultimately establish the significance of exploring the question of whether U.S. Latinos talk more about HWLs than Whites, since answering that question would be unimportant unless conversations about U.S. HWLs encourage more cessation-related outcomes.

Response to Research Gaps

The aims of this thesis are (1) **to assess differences between Latino and non-Latino White smokers in the U.S. regarding the frequency of reported conversations**

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about HWLs on cigarette packs and (2) **to assess whether conversations about text-only HWLs influence subsequent quit attempts among Latino and non-Latino White smokers in the U.S.** To address these aims, I analyzed and interpreted survey data from a longitudinal study of U.S. Latino and White smokers. These surveys included questions about recent HWL conversations, recent quit attempts, smoking-related thoughts and behaviors, and HWL responses. Since the dataset was from Latinos and Whites within the same country, this eliminated the threat of potential differences in HWL characteristics and other country-level variables that my have confounded differences found in prior cross-country research. I used regression analyses to determine if the frequency of conversations significantly differed between Latinos and Whites and to assess the statistical association between reported conversations at one wave and quit attempts at the subsequent wave.

Overview of the Remainder of the Thesis

The second chapter of this thesis will include a review of literature related to interpersonal communication about HWLs and other smoking cessation campaigns, cultural and ethnic differences that may help explain differences in communication styles as they relate communicate about risk information, and theories related to interpersonal communication about campaign messages and its effects on campaign goals. Research hypotheses based on this literature will then be presented. The third chapter will describe in detail the methodology used to test the study hypotheses. Next, the fourth chapter will include a manuscript on the results of the major thesis work that

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is formatted and prepared to submit to the journal of Health Education and Behavior. The fifth and final chapter of this thesis will conclude with a summary of the research results, discussion of these results in the context of prior literature, and recommendations for future research and public health practice based on the thesis findings.

Chapter 2

Literature Review

This chapter will review the scientific literature that informed the development of the specific aims and hypotheses for this thesis. It will begin by describing the evidence that interpersonal communication is a mediator of the effect of health messages on behaviors, followed by a discussion of the extant literature on interpersonal communication about health warning labels (HWLs). It will then explore research on Latino cultural scripts, communication patterns, and healthcare access that may plausibly influence conversations about cessation messages. The review will conclude with an overview of behavioral and communication theories relevant to research on interpersonal communication about health messages.

Health Campaigns Spark Interpersonal Conversation

Health communication campaigns have been shown to elicit conversations about both the campaigns and their targeted health topics, which, in turn, lead to changes in attitudes, intentions, and behavior (Dunlop, Kashima, & Wakefield, 2010; Geary et al., 2007; Morton & Duck, 2006; Southwell & Yzer, 2007). There is considerable evidence that conversations spurred by anti-smoking media campaigns lead to quit attempts (Durkin & Wakefield, 2006; Hafstad & Aaro, 1997; van den Putte et al., 2011). One example of this is a longitudinal study by van den Putte, et al. (2011), which found that

interpersonal communication about the campaign led to conversations about cessation, which predicted increased quit intentions and subsequent quit attempts (van den Putte et al., 2011). Jeong et al. (2015) also found that interpersonal communication about a cessation media campaign led to conversations about quitting smoking and that conversations about quitting smoking led to quit attempts and seeking support for quitting. Cross-sectional data showed, and longitudinal data partially confirmed, that talking about the campaign and quitting mediated the pathways between campaign exposure and both seeking help and quit attempts (Jeong et al., 2015). These two studies establish interpersonal communication as a mediator in the relationship between cessation messages and cessation-related behaviors.

Interpersonal Conversations and Health Warnings on Cigarette Packs

Observational studies of the effects of HWLs have illustrated that, similar to smoking cessation campaigns, HWLs inspire conversations. For example, Nagelhout et al. (2015) found that conversations about HWLs in Australia significantly increased during a period in which Australia's HWLs were updated, standardized cigarette packaging was introduced, and a national anti-smoking media campaign was aired. The introduction of novel HWL content appeared to inspire more conversations since this effect was independent of the media campaign (Nagelhout et al., 2015).

Thrasher, et al. (2016) also used longitudinal data to assess the frequency of interpersonal communication about HWLs and its association with subsequent quit attempts. In Australia, Canada, and Mexico, conversations about pictorial HWLs were positively associated with subsequent quit attempts (Thrasher et al., 2016). The

relationship between interpersonal communication and quit attempts was independent of knowledge of smoking-related diseases, smoking dependence, risk perceptions, and cognitive responses to HWLs (Thrasher et al., 2016). These findings suggest that interpersonal communication has an effect on cessation that is distinct from the effects found in prior research that has focused on cognitive pathways (e.g., risk perceptions), which justifies the need for further research on this effect. It is unclear, however, if the relationship between conversations about HWLs and quit attempts exists for smokers in the United States, where–unlike in the countries assessed in Thrasher et al. (2016)– the HWLs are text-only and do not contain any information about cessation resources.

Some research has examined the HWL conversations in the United States in controlled settings. Since the HWLs in the US are text-only, researchers can newly expose smokers to pictorial HWLs and ask them about their conversations soon after. Hall et al. (2015) conducted two studies in the United States to describe people involved in communication and the topics discussed after pictorial HWLs were placed on smokers' cigarette packs. The majority of smokers in that study spoke to friends and family members about HWLs while only a few talked to medical professionals. Smokers spoke with both other smokers and nonsmokers about smoking, cessation, and HWLs. The most popular conversation theme reported by study participants was the efficacy of HWLs to influence cessation. Smokers also frequently discussed the acceptability of placing pictorial HWLs on cigarette packs. In addition, only a small percentage of smokers (13%) reported making fun of the HWLs, which was lower than the findings reported in a later observational study in which over one-fourth of smokers in Australia,

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Canada, Mexico, and the U.S. reported making fun of HWLs (Osman, Thrasher, Yong, Arillo-Santillan, & Hammond, 2017). In addition, while Hall et al. (2015) reported that most of the conversations included negative characterizations of HWLs, most also included discussion of their usefulness (Hall et al., 2015).

Brewer et al. (2016) further examined the effects of pictorial versus text-only HWLs on cessation-related behaviors, including conversations about HWLs, smoking risks, and quitting smoking. Using an experimental study design, U.S. smokers were assigned to receive either pictorial or text-only HWLs on their cigarette packs. Smokers exposed to pictorial HWLs were more likely to have conversations about the HWL messages, the health risks of smoking, and quitting than smokers assigned to receive text-only HWLs. In addition, participants given pictorial HWLs were more likely have a quit attempt during the study than participants given text-only HWLs (Brewer et al., 2016).

Using the sample data from the same study as used in Brewer et al. (2016), Morgan et al. (2017) analyzed the context and content of the study participants' conversations. They found that smokers who received pictorial HWLs reported more conversations about the HWLs and were more likely to deliberately show them to other people. A small portion of the sample also reported posting about the HWLs on social media, but there were no differences in the frequency of these posts by HWL type. Corroborating findings from Hall et al. (2015), Morgan et al. (2017) found that popular conversational topics included whether the HWLs made participants want to quit, smoking's effects on health, whether the HWLs would make people other than participants want to quit, opinions on the acceptability of placing the pictorial HWLs on U.S. cigarette packs, and

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whether the HWLs would deter smoking initiation (Morgan et al., 2017). All of these topics were discussed significantly more frequently among participants exposed to pictorial HWLs than participants exposed to text-only HWLs. Participants in this study were also asked to report the adjectives used to describe the HWLs in their conversations. Both text-only and pictorial HWLs were frequently described as informative and useful. The adjectives "gross," "scary," and "depressing" were more often used to describe pictorial than text-only HWLs, but the text-only HWLs were more frequently characterized as "stupid or pointless" than pictorial HWLs (Morgan et al., 2017).

The studies by Hall et al. (2015) , Brewer et al. (2016), and Morgan et al. (2017) provide some insight into the context and content of HWL conversations, but they do not examine whether demographic characteristics, such as ethnicity, influence the frequency or content of conversations. They also do not explore whether conversations about U.S. text-only HWLs inspire U.S. smokers to quit smoking.

Cultural differences in HWL conversations

Thrasher and colleagues (2016) also indirectly explored the potential role of ethnicity in HWL conversations. They compared self-reported conversations about HWLs among smokers in Australia, Canada, and Mexico and found that Mexican smokers consistently reported much higher levels of talking about HWLs than smokers in the other countries. The authors proposed that possible reasons for between-country variations in the frequency of talk were differences in HWL characteristics and packing regulations, as well as changes in HWL features that occurred during the study period.

The frequency of HWL conversations in each of the three countries appeared to coincide with the implementation of new HWL characteristics in each respective country (Thrasher et al., 2016). Further, Mexico updates its HWLs more frequently than the other countries (e.g., every 6 months), which could explain why the prevalence of conversations was greatest among Mexican smokers throughout the study period. It is also possible, however, that differences in cultural and communication norms that influence the way individuals communicate about health risk information drove these between-country variations in the frequency HWL conversations.

Latino Cultural Scripts

There are several traits associated with Latino culture that may drive communication patterns among Latinos, including familism, *simpatía*, and *personalismo*. These cultural scripts could influence more frequent conversations about HWLs and enhance the role of such conversations among Latino smokers.

Familism is a cultural value that has been associated with Latino populations throughout behavioral, social, and cultural literature (Calzada, Tamis-LeMonda, & Yoshikawa, 2013; Lugo Steidel & Contreras, 2003; Sabogal, Marín, Otero-Sabogal, Marín, & Perez-Stable, 1987). This value is comprised of familial closeness and obligation, reciprocity among family members, and high levels of perceived familial support, and it is reflected in both attitudes and behaviors (Calzada et al., 2013; Comeau, 2012; Lugo Steidel & Contreras, 2003; Sabogal et al., 1987). Some research suggests that familism contributes to stronger bonds with family and significant others (Campos, Perez, & Guardino, 2016; Sabogal et al., 1987) and that familism may extend from nuclear family

members to extended family members and even to friends (Keefe, 1984; Rothman, Gant, & Hnat, 1985).

Simpatía is another Latino-associated cultural script that might influence more HWL conversations among Latino smokers compared to smokers of other ethnicities. *Simpatía* has been observed in studies of Latino relationships and is defined as exhibiting "certain levels of conformity, an ability to share in others' feelings, [behaving] with respect toward others, and [striving] for harmony in interpersonal relations" (Triandis, Marín, Lisansky, & Betancourt, 1984). Latinos' high regard for the well-being of personal relationships might cause them to be more sensitive to how their behaviors, including smoking, impact their family and friends. Furthermore, since one aspect of *simpatía* is empathy for others (Triandis et al., 1984), heightened concern for the others' well-being might make non-smoking Latinos particularly concerned about the health of smokers in their social networks and, therefore, more likely to initiate conversations about cessation, including about the health risks listed on HWLs.

There is evidence that Latino relational values are relevant to smoking cessation. Pérez-Stable, Marín, & Posner (1998) found that, compared to non-Latino White smokers, Latino smokers were more likely to report familial motivations for quitting smoking (i.e, familism), such as criticism and pressure from family and protecting the health of and setting a good example for their children. Latino smokers were also more likely to cite as reasons for quitting non-health effects of smoking that could offend or displease other people (i.e., *simpatía*), such as bad breath, and burned clothing. More

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acculturated Latinos were less likely to cite these reasons than less acculturated Latinos (Pérez-Stable et al., 1998).

Since Latino culture is familism-oriented and collectivist, a higher valuing of relationships in this population may result in more frequent conversations about HWLs and, thus, a higher likelihood of quit attempts for Latino smokers compared to Whites smokers. Similarly, conversations about HWLs may be more effective at bringing about subsequent quit attempts for Latinos, since relationally oriented Latino cultural scripts may invoke a stronger commitment to quit as a result of conversations with others. Because acculturation is negatively associated with some dimensions of familism (Lugo Steidel & Contreras, 2003; Sabogal et al., 1987), Latino smokers more acculturated to the predominant (i.e., White) American cultural might be more similar to White smokers in regard to the frequency and effectiveness of conversations about HWLs. If so, more acculturated Latinos may have fewer conversations about HWLs, less quit attempts, and experience a weaker association between conversations and quit attempts compared to less acculturated Latinos.

While not a perfect approximation of acculturation, language use has been used as a proxy for acculturation among Latinos when acculturation or cultural traits have not been directly assessed (Thomson & Hoffman-Goetz, 2009). Also, while the ability of current instruments to measure acculturation may be limited (Thomson & Hoffman-Goetz, 2009), language use and preference have been shown to account for much of the variability across acculturation instruments (Coronado, Thompson, McLerran, Schwartz, & Koepsell, 2005; Cuellar, Arnold, & Maldonado, 1995; Cuellar, Harris, & Jasso, 1980).

Therefore, Latinos who respond to a survey in Spanish may have more conversations about HWLs, greater likelihood of quit attempts, and experience a stronger relationship between conversations about HWLs and subsequent quit attempts compared to Latinos who choose to respond to the same survey in English.

Ethnicity, Health Information Seeking, and Healthcare Disparities

There are well-documented disparities in access to healthcare between Latinos and Whites, which may also influence how and where Latinos obtain health information and patterns of social network conversations about health messages. Compared to Whites, Latinos are more likely to be uninsured and spend more time uninsured (Kirby & Kaneda, 2013; United States Department of Health and Human Services, 2016). Latinos are also less likely to have a regular source of medical care (United States Department of Health and Human Services, 2016) and tend to receive lower quality medical care, including poorer communication with physicians (United States Department of Health and Human Services, 2016). Healthcare disparities also appear within the Latino population based on acculturation since, among Latinos, being uncomfortable speaking English (Clayman et al., 2010) and being a first-generation immigrant (Cheong, 2007) are both associated with begin unisured.

Latinos also experience disparities in access to health information, which may lead to differences in social network conversations about health messages. Latinos tend to engage less frequently in health information seeking than non-Latino Whites (Rooks, Wiltshire, Elder, BeLue, & Gary, 2012; Vanderpool, Kornfeld, Finney Rutten, & Squiers, 2009). Furthermore, one study found that Latinos, particularly those who preferred

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responding in Spanish, have more difficulty obtaining and understanding cancer information compared to Whites, although these differences were not statistically significant after adjusting for gender, age, education, income, location of birth, comfort speaking English, and number of years in the U.S. (Vanderpool et al., 2009).

Research has also found differences in use of specific sources of health information across ethnicity and language preference groups, indicating that Latinos rely more on social network and media sources of health information. One study found that non-Latino Whites more frequently used the Internet and newspapers than Latinos and that Latinos more comfortable speaking English reported more frequent use of various media channels (e.g., TV, radio, Internet, and newspaper) than Latinos not comfortable speaking English (Clayman et al., 2010). This may suggest that Latinos, particularly those uncomfortable speaking English, do not have equal access to media sources. However, other research among Latinos found that they often relied on media and informal interpersonal sources (e.g., family, friends, churches, community groups) as much or more than on medical professionals to acquire health information (Cheong, 2007; Livingston et al., 2008). One study assessed differences among Latinos, finding that the uninsured were more likely to use television and less likely to use the Internet for obtaining health information and that recent immigrants relied more on family and friends for health information (Cheong, 2007).

Prior research has also highlighted differences between Whites, Latinos comfortable speaking English, and Latinos less comfortable speaking English in their

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trust of sources of health information. Latinos in general reported less trust in physicians (Clayman et al., 2010; Richardson, Allen, Xiao, & Vallone, 2012) than Whites and Latinos more comfortable speaking English reported higher trust in the Internet (Clayman et al., 2010). These studies also found that Latinos comfortable speaking English reported higher trust in newspapers and magazines compared to Latinos less comfortable with English, but this was insignificant after adjusting for socio-demographic variables (e.g., age, gender, education, income, employment and occupational status), insurance status, and media use (Clayman et al., 2010; Richardson et al., 2012). Interestingly, the studies on this topic found no significant difference between Latinos' and Whites' trust for family and friends as sources of health information (Clayman et al., 2010; Richardson et al., 2012).

Disparities in access to health care and differences in health information seeking across ethnicity and language preference may influence how Latinos communicate about health information within their social networks. Because Latinos have less access to and trust in formal medical sources of health information and support compared to Whites, Latinos may turn to other sources for health information and support that are more accessible and perceived as more trustworthy. The evidence that Latinos rely on social network sources and media for health information indicates that Latinos may be using these sources instead of physicians. However, it is unclear from current research if Latinos actually use social network sources more frequently than Whites for obtaining health information. Latinos less assimilated to predominant American culture (e.g., those less comfortable speaking English) experience particular barriers to healthcare

and health information and report lower trust in media sources. Therefore, these Latinos might be particularly likely to rely on social network sources for health information. Relatedly, given all the barriers to other sources of information and support, social network sources may be more effective at changing health behavior for Latinos, especially less assimilated Latinos. In contrast, since Whites have higher access to and trust in physicians and a variety of other sources from which they can acquire information and support (e.g., media), social network sources might be less meaningful or effective for improving health behaviors among Whites.

Use of Cessation Resources Among Latinos

In addition to relying on different health information resources, Latinos and Whites also differ in their use of and access to cessation resources. For example, studies have found that Latinos less frequently use formal cessation aids, such as nicotine replacement therapy, cessation medication, behavioral counseling, and cessation quitlines compared to Whites (Cokkinides et al., 2008; Kaufman et al., 2010; Trinidad et al., 2011). These differences may be due to Latinos' lower awareness of these resources (Kaufman et al., 2010), because Latinos are less likely to be screened for tobacco use and advised to quit from their healthcare providers (Cokkinides et al., 2008; Trinidad et al., 2011), or due to Latinos' lower levels of cigarette consumption (Trinidad et al., 2011). Regardless of the reasons, since Latino smokers have lower use of and access to formal cessation methods, effective smoking cessation resources for Latinos may be more likely to work through informal channels that are more accessible to them such as conversations with others in their social networks.

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Taken together, prior research on health information seeking, health care barriers, and smoking cessation resource use among Latinos suggests that, while Latinos have fewer options for health and cessation support compared to Whites, interpersonal channels may be important resources for Latinos. Therefore, Latino smokers may engage in conversations about cessation messages on cigarette packs more frequently than White smokers. White smokers, who have more access to a variety of cessation options, may be less likely to seek information or support from social network sources.

Relatedly, in the absence of the variety of formal cessation methods available to most smokers, conversations about cessation may prove more effective for influencing cessation among Latinos compared to Whites. Because they can access numerous resources, White smokers who engage in conversations may do so less deliberately, not intending to use them as a source of cessation information and support. Therefore, White smokers may find conversations about cessation less effective at inspiring cessation. In contrast, Latino smokers could derive particular benefit from social network communication about cessation because it may be one of only a few accessible and trustworthy sources of support for this population.

Much of the research on health information seeking and healthcare disparities indicates that measures of acculturation, such as preference for speaking English or Spanish, are associated with more barriers to healthcare (Clayman et al., 2010; Livingston et al., 2008), lower trust in and use of various media channels (Clayman et al., 2010), and greater difficulty obtaining health information (Vanderpool et al., 2009). Therefore, Latino smokers who choose to communicate in Spanish rather than English

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may engage in even more conversations about cessation messages and derive even greater cessation-related benefits from these conversations compared to Latinos who choose to communicate in English.

Theoretical Framework

Although there is no single theory that explains how interpersonal communication about messages influences behaviors, Southwell and Yzer (2007) provided a review of relevant theories from various fields as well as empirical evidence that may help explain how conversations about campaigns impact behaviors. They outlined a framework to describe the processes through which exposure to a media campaign may inspire conversations as well as two possible functions of conversations in media campaign effects.

Drawing from Fishbein and Yzer's (2003) integrated model of behavioral prediction, Southwell and Yzer (2007) suggested that normative, efficacy, and attitudinal beliefs about discussing a topic addressed in a campaign might mediate a campaign's effects on conversations about the campaign topic. In other words, a campaign may increase an individual's perception that talking about the topic is socially acceptable and valued (i.e., normative beliefs), confidence in her or his ability to discuss the topic (i.e., efficacy beliefs), and expectations of more positive than negative outcomes from discussing the topic (i.e., attitudinal beliefs).

Southwell and Yzer (2007) also discussed two plausible roles of interpersonal communication in the effects of media campaign exposure on campaign outcomes. Southwell and Yzer (2007) initially described interpersonal communication as a potential

mediator of campaign effects. They cited Hornik and Ynovitzky (2003), who proposed that conversations about campaign topics can influence campaign goals (e.g., behavior change) in at least two ways. First, conversations can facilitate the reach and frequency of message exposure in a social network such that campaign messages are spread by individuals exposed to the campaign to individuals not exposed to the campaign. This concept was derived from foundational theories of communication (e.g., Two-Step Flow: Katz & Lazarsfeld, 1955) and diffusion (e.g., Diffusion Innovations: Rogers, 1962). Increased reach then allows more individuals to be exposed to campaign messages, thereby facilitating the well-establish mediators of campaign outcomes (e.g., knowledge, attitudes, beliefs) among more individuals. Hornik and Ynovitzky (2003) also suggested that conversations inspired by campaigns can change norms around campaign-related behaviors. Through conversations about campaign topics, individuals may realize that important others approve of and value the behaviors promoted by a campaign, which may encourage uptake of those behaviors. Southwell and Yzer (2007) noted that, while there is evidence that exposure to campaigns is associated with improvements in norms over time, it is unclear that conversations actually mediate this association.

Lastly, Southwell and Yzer (2007) proposed that, rather than mediating, interpersonal communication might moderate the effects of media campaigns. They suggested that, when individuals exposed to a campaign engage in conversations about campaign topics, this may facilitate increased memory and processing campaign information, including information not even discussed in those conversations. Southwell

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and Yzer (2007) also pointed to evidence from research on political communication (Scheufele, 2001, 2002) to theorize that conversations sparked by campaigns might directly moderate the effect of campaign exposure on campaign-related behaviors. However, it is unclear from current evidence whether conversations directly moderate campaign-related behavior or if they instead enhance other mediators of behavior change, such as elaborative encoding of campaign information (Southwell & Yzer, 2007).

Summary of Literature and Connection to Current Study

As evidenced in the empirical research and theoretical work described above, interpersonal communication appears to play an important role in the effect of cessation messages on cessation-related attitudes and behaviors. A longitudinal study supports the potential importance of this relationship in understanding how HWLs work, as smokers who have conversations about cigarette pictorial HWLs are more likely to subsequently quit smoking (Thrasher et al., 2016). Prior research also suggests that ethnicity could moderate the effects of HWL exposure and conversations, since Mexican smokers reported more frequent HWL conversations compared to Australian and Canadian smokers (Thrasher et al., 2016). This thesis will assess whether conversations about text-only HWLs in the U.S. similarly influence quit attempts. By using data from one country, this thesis will also be able to more directly compare the amount of conversations by Latinos and Whites.

This thesis is guided by the framework conceptualized by Southwell and Yzer (2007); however, it is beyond the scope of this thesis to analyze many of the relationships and variables they proposed. Specifically, since all smokers are presumably exposed to

HWLs, it is difficult to examine the role of interpersonal communication as a mediator versus a moderator of HWL effects. Therefore, this study will focus on the association between conversations about HWLs and subsequent quit attempts. In addition, the current study will not explore many plausible mediators of the relationship between conversations and quit attempts (e.g., memory of campaign information, message reach, social norms). Instead, this study will expand the frameworks proposed by Southwell and Yzer (2007) and further previous HWL research by considering the effects of ethnicity on HWL conversations and their effects.

Research Aims and Hypotheses

Based on a review of relevant literature, the research aims and hypotheses are as follows: **Aim 1: To assess differences between Latino and non-Latino White smokers in the U.S. regarding the frequency of reported conversations about HWLs on cigarette packs.**

- Hypothesis 1: The frequency of interpersonal communication about HWLs will vary across smoker ethnicity/language groups, with non-Latino Whites having the least conversations, Latinos who prefer to respond in English having more conversations than Whites, and Latinos who prefer to respond in Spanish having the most conversations.

Aim 2: To assess whether conversations about text-only HWLs influence subsequent quit attempts among both Latino and non-Latino White smokers in the U.S.

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- Hypothesis 2: Interpersonal communication about HWLs will be positively associated with subsequent quit attempts among non-Latino Whites, Latinos who prefer to respond in English, and Latinos who prefer to respond in Spanish.

- Hypothesis 3: The association between interpersonal communication about HWLs and quit attempts will vary across smoker ethnicity/language groups, with non-Latino Whites experiencing the weakest association, Latinos who prefer to respond in English experiencing a stronger association than Whites, and Latinos who prefer to respond in Spanish experiencing the strongest association.

The conceptual model at the end of this chapter (Figure 2.1) outlines the proposed effect pathway that will be analyzed in this thesis. As described in the study hypotheses, interpersonal communication about HWLs on cigarette packs should lead to subsequent quit attempts. Ethnicity and language preference should influence both the frequency of interpersonal communication as well as moderate its relationship with quit attempts.
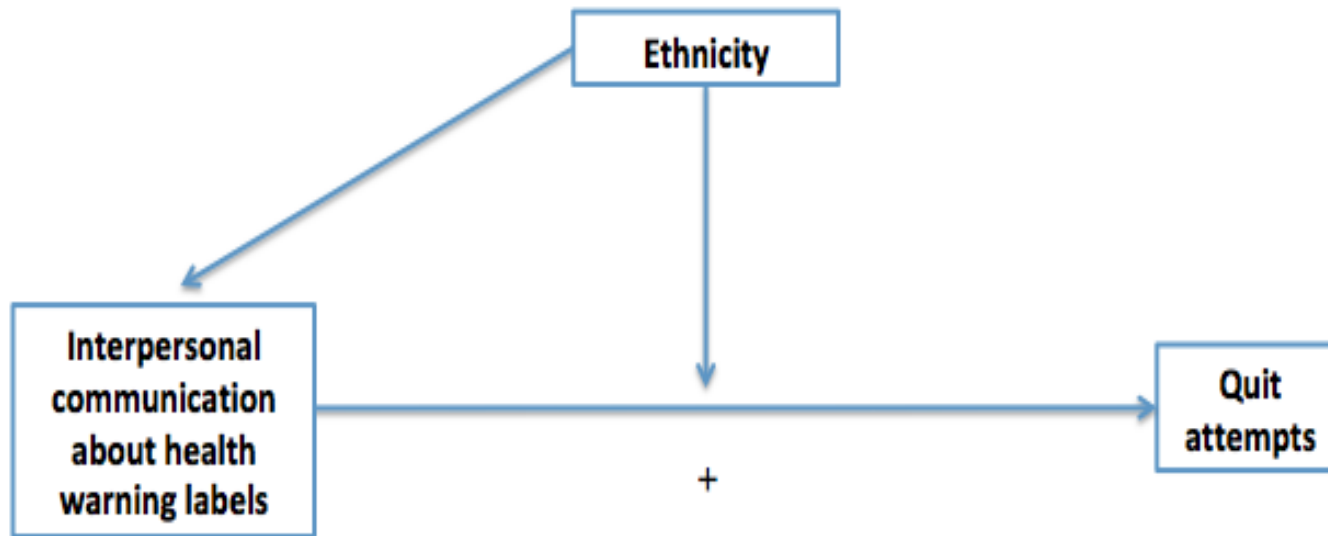
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Figure 2.1 Conceptual model

Chapter 3

Methodology

The previous chapter reviewed literature on interpersonal communication about health campaigns and HWLs, cultural factors and health care and information barriers that might influence how Latinos and Whites communicate about cessation messages, and a theoretical framework that conceptualizes the possible effects of interpersonal communication on campaign goals. From this literature, study aims and hypotheses were outlined. The current chapter will describe in detail the procedures used to address the study hypotheses, including the sampling and data collection protocol, variables used in the data analysis, and statistical tests used to analyze the data.

Sample and Data Collection Procedures

From January 2013 to January 2015, survey data were collected every four months from adult smokers in the U.S. who participated in online consumer panels provided by Lightspeed GMI (http://www.lightspeedresearch.com) for marketing research. These panels were similar to the U.S. population in key socio-demographic features (GMI, 2017). Individuals were eligible for initial enrollment if they resided in the U.S., smoked at least 100 cigarettes in their lifetimes, smoked at least once in the prior 30 days, and were between 18-64 years of age. Data from smokers who identified as both non-Latino and non-White were excluded because the number of respondents from these groups was very small.

Seven surveys waves were conducted, with approximately 1,300 participants at each wave, including an oversample of 400 additional Latinos surveyed at each wave. To maintain sample size, new participants were recruited at each wave to replace the participants lost to follow-up. Throughout the study waves, response rates ranged from 1%-4%, and follow up rates ranged from 60%-85%. In order to analyze both correlates of HWL conversations and predictors of quit attempts between consecutive waves, two analytic samples were created. Analytic Sample 1 included all observations (Individuals: n= 4,628; Observations: n=7,668) and was used in models to assess correlates of HWL conversations. Analytic Sample 2 only included observations from respondents who completed two consecutive survey waves (Individuals: n=1,552; Observations: n=3,646) so that data from one wave could be used to predict quit attempts by the subsequent wave (i.e., t + 1). This study obtained approval from the Institutional Review Board at the University of South Carolina.

Measures

Interpersonal communication. HWL conversations were assessed with three items used in previous studies (Nagelhout et al., 2015; Thrasher et al., 2016): "In the last month, how often have you talked to others about the warning labels on cigarette packs?"; "In the last month, how often have your family members spoken with you about the warning labels on cigarette packs?"; and "In the last month, how often have other people besides your family spoken with you about the warning labels on cigarette packs?" Response options were on a 5-point scale (1="not at all"; 2="once"; 3="a few times"; 4="often"; 5="very often"). These items had high internal consistency (α= 0.91).

Because responses to these questions were skewed, they were recoded (i.e., never=0; once=1; a few times or more=2) and all three items summed (range=0-6) to create a variable used when interpersonal communication was a dependent variable in analyses. Because responses to the items were skewed, it would have been inappropriate to treat their sum as a continuous predictor variable. Therefore, when interpersonal communication was used an independent variable, the original scores of the three questions were summed (range=3-15) and three cut points were established (i.e., never=3; less frequent=4-6; more frequent=7-15).

   Quit attempts. At all follow-up observations, participants were asked if they had made a quit attempt in the past four months, the time interval between survey waves (1= "yes"; 0= "no" or **"**don't know"). Participants were considered to have made a quit attempt if they answered that they had quit smoking altogether or had made a quit attempt in the past four months. A variable was created to indicate a quit attempt at the subsequent wave (i.e., t+1) (0=no quit attempt; 1=quit attempt; "Don't know" answers were treated as no quit attempt and coded as 0).

   Ethnicity & language preference. Respondents were asked to identify which racial or ethnic groups best described them. This study only includes individuals who identified as "White" or "Hispanic or Latino." At the beginning of the survey, respondents were asked if they preferred to complete the survey in English or Spanish.

   Control variables. Several smoking-related variables were measured because of their associations with quit attempts and interpersonal communication about HWLs in previous studies (Borland, Yong, O'Connor, Hyland, & Thompson, 2010; Hyland et al.,

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2006; Thrasher et al., 2016). To assess *negative emotional responses to HWLs*, participants were shown the four text-only HWLs currently on packs in the U.S. For each HWL, fear ("How much does this warning make you feel afraid?"), disgust ("How disgusting is this warning label?"), and worry ("How much does this warning make you feel worried about the health risks of smoking") were assessed. Response options ranged from 1 ("not at all") to 9 ("extremely"). The responses for each item were averaged for each HWL. The three items had high reliability (Cronbach's α = 0.93) and were averaged to create an overall negative emotions scale.

A scale for *cognitive responses to HWLs* was created from three questions. While the questions used for this scale are similar to items used in perceived effectiveness scales (Bigsby, Cappella, & Seitz, 2013; Brennan, Durkin, Wakefield, & Kashima, 2016; K. C. Davis, Nonnemaker, Duke, & Farrelly, 2013), previous HWL research has also conceptualized them as cognitive HWL responses and found that they are associated with quitting behavior (Borland, Yong, et al., 2009; Thrasher et al., 2016). The three items included: "To what extent do the warning labels make you think about the health risks of smoking?"; "To what extent do the warning labels on cigarette packs make you more likely to quit smoking?"; and "How much do the warning labels make you feel like you would be better off without smoking?" Response options ranged from 1 ("not at all") to 9 ("extremely"), with verbal anchors used at alternate response intervals. The three items had high internal consistency (α=0.92). The responses were summed and tertiles created to assist interpretation (i.e. low, medium, high).

Because the Center for Disease Control and Prevention's national Tips campaign occurred concurrently with the current study, exposure to its messages was assessed with a single aided recall item: "In the last month, have you seen any anti-smoking ads on television or the Internet, where former smokers talk about living with the diseases caused by smoking?" (1= "Yes"; 0 = "No"; 0= "Don't know"). There is some evidence for the validity of this item (Huang et al., 2015).

Smoking related risk beliefs were measured with an index used in prior research (Swayampakala et al., 2015; Thrasher et al., 2016). This portion of the survey stated, "Below is a list of diseases that may or may not be caused by smoking cigarettes. To the best of your knowledge, indicate which illnesses, if any, are caused by smoking cigarettes" (1= "Yes"; 0 = "No" or "Don't know"). The list of diseases was randomly ordered for each participant and included emphysema, heart attacks, bladder cancer, blindness, and gangrene.

Heaviness of Smoking Index (HSI: Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989) included two questions about the number of cigarettes smoked per day and the time to first cigarette after waking (Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989). Recent quit attempts were considered having made a quit attempt in the past four months (1= "Yes"; 0= "No"; 0= "don't know"). Participants were also asked about their intentions to quit smoking. Responses were dichotomized to indicate intention to quit within the next six months (yes= 1; no=0). Intending to quit is a consistent predictor of quit attempts. A systematic review of prospective cohort studies

with adult smoker found that intending to quit soon is predictive of future quit attempts (Vangeli, Stapleton, Smit, Borland, & West, 2011).

Participants were also asked if there were children currently living in their house under the age of 18 (1 = "yes"; 0 = "no" or "don't know"). Socio-demographic variables measured were age (18-24, 25-34, 35-44, 45-54, 55-64), sex, education (high school or less; some college or university; completed college or university), and household income ($29,999 or less; $30,000-$59,999; $60,000 or more). Survey wave and the total number of surveys completed prior to any particular survey were also considered in adjusted models.

Data analysis

Analyses were performed using Stata, version 14. Chi square tests and t-tests were conducted to assess differences between the two analytic sample as well as between respondents who participated in multiple waves versus those lost to follow-up in each of the ethnicity and language preference groups. Two sensitivity analyses were conducted for interpersonal communication about HWLs. A Pearson's Chi-Square test was used as a sensitivity analysis to confirm that the responses to each of the interpersonal communication items differed between ethnicity/language preference groups. One-way analysis of variance (ANOVA) was used to assess overall differences in the negative emotions scale across ethnic/language preference groups, followed by Tukey's post hoc test to identify group differences.

Aim 1 of this thesis was to assess differences between Latino and non-Latino White smokers in the U.S. regarding the frequency of reported conversations about HWLs on

cigarette packs. To address this aim, the prevalence of talking about HWLs at each wave was calculated for each of the ethnicity/language preference groups. Poisson generalized estimating equation (GEE) models were also used to assess bivariate and adjusted correlates of frequency of talking about HWLs for analytic Sample 1. The survey conducted at wave 7 did not include items on interpersonal communication. Therefore, analyses around Aim 1 only included data from wave 1 through wave 6.

Aim 2 of this thesis was to assess whether conversations about text-only HWLs influence subsequent quit attempts between Latino and non-Latino White smokers in the U.S. To address this aim, logistic GEE models regressed quit attempts at one wave on study variables from the prior survey wave, including interactions between ethnicity and HWL conversations. Both bivariate and adjusted models were conducted. A sensitivity analyses were also conducted to determine if the person initiating the conversations influenced the relationship between talking and quit attempts. For these analyses, separate models were estimated, each including only one of the three interpersonal communication items, recoded with three cut points (i.e., none, once, and more than once).

Chapter 4

Conversations About Cigarette Health Warnings Labels and Quit Attempts Among

Latinos and Whites[1]

Abstract

Background: Prior research has demonstrated that interpersonal communication about pictorial cigarette health warning labels (HWLs) predicts subsequent quit attempts and that smokers in a Latin American country reported more HWL conversations than smokers in two majority White countries. However, it is unknown whether Latinos in general engage in more HWL conversations than Whites and whether conversations about U.S. text-only HWLs influence cessation.

Aims: To compare Latinos and non-Latino Whites regarding the frequency of interpersonal communication about HWLs and its relationship with cessation attempts.

Methods: From January 2013 to September 2014, approximately 1,300 U.S. Latino and non-Latino White adult smokers were surveyed every four months (total individuals: N= 4,628). Interpersonal communication, quit attempts in the prior four months, smoking behaviors, and socio-demographic variables were measured at each wave. Poisson generalized estimating equation (GEE) models regressed HWL conversation on study variables, and logistic GEE models regressed quit attempts at follow-up on predictor variables from the prior wave, including interactions between ethnicity and HWL talk.

Results: HWL conversations were most frequently reported among Spanish-speaking Latinos (85%), followed by English-speaking Latinos (59%), and non-Latino Whites (35%), and the statistical significance of these between-group differences was confirmed in adjusted models for predictors of the frequency of HWL conversations. Frequency of conversations about HWLs predicted subsequent quit attempts (AIRR$_{low\ v\ none}$=1.17, 95%

CI=1.02,1.33; AIRR$_{high\ v\ none}$=1.27, 95% CI=1.12, 1.43), although ethnicity/language preference did not moderate this effect.

Conclusions: Latinos appear to have more conversations about HWLs than non-Latino Whites, yet the strength of the association between the frequency of HWL conversations and smoking cessation attempts were similar across ethnic groups. Cessation campaigns may consider using messages that encourage interpersonal communication to increase cessation.

Introduction

Pictorial health warning labels (HWLs) on cigarette packs are a tobacco control strategy used by over 100 countries and jurisdictions (Canadian Cancer Society, 2016) and recommended by the World Health Organization (World Health Organization (WHO), 2008) to promote smoking cessation. Much research has focused on individual-level, psychological responses to HWLs, such as cognitive responses (e.g., thinking about the risks of smoking) and negative emotional reactions (e.g., fear, disgust, worry), finding that these responses mediate the effects of HWLs on quit intentions and attempts (Borland, Yong, et al., 2009; Cho et al., 2018; Evans et al., 2015; Yong et al., 2014). However, research on interpersonal communication about cessation media campaigns, suggests that conversations about HWLs might also enhance their effects on cessation (Durkin & Wakefield, 2006; Hafstad & Aaro, 1997; Jeong et al., 2015; van den Putte et al., 2011). One study has assessed the relationship between conversations about pictorial HWLs and subsequent quit attempts among a cohort of smokers three countries, finding that smokers in Mexico reported more conversations than smokers in

Canada and Australia (Thrasher et al., 2016). Nevertheless, conversations predicted future quit attempts across all three countries (Thrasher et al., 2016).

The cross-country study by Thrasher at colleagues (2016) suggests that Latinos might have more HWL conversations than Whites, and multiple factors might explain this difference between ethnic groups. Since Latinos interact often with their family members and rely on them for social support (Comeau, 2012; Keefe, 1984; Keefe, Padilla, & Carlos, 1979), Latinos might have more opportunities for HWL conversations. Also, because Latino culture has been described as expressing high concern for relational harmony (Triandis et al., 1984), they may feel a stronger commitment to quit as a result of conversations with family members and other important network members. U.S. Latinos also experience additional barriers to obtaining healthcare (Kirby & Kaneda, 2013; Richardson et al., 2012; Sentell & Braun, 2012; United States Department of Health and Human Services, 2016) and health information (Cheong, 2007; Livingston et al., 2008) compared to Whites, which may drive Latino smokers to seek more support from informal sources, such as social network members. Furthermore, acculturation is negatively associated with various dimensions of familism (Lugo Steidel & Contreras, 2003; Sabogal et al., 1987) and preference for speaking Spanish is associated with more healthcare and health information barriers (Clayman et al., 2010; Livingston et al., 2008; Vanderpool et al., 2009). Therefore, compared to Latinos who prefer to speak Spanish, the patterns of HWL communication among Latinos who prefer to speak English may be more similar to communication patterns exhibited by Whites.

Gaps & Current study

While previous international research suggests that Latino smokers talk more than White smokers, it is unclear if this is true. Prior research on this issue was limited to cross-country comparisons of the prevalence of HWL conversations, and, therefore, the results are potentially confounded by different HWL content across countries (Thrasher et al., 2016). It is also unknown if the relationship between HWL conversations and quit attempts is generalizable to the U.S. context, where HWLs only include text and have not been updated since 1984. Prior research demonstrating this relationship has been conduct only in countries with pictorial HWLs. Thus, the current study aimed to add to research around interpersonal communication about HWLs by assessing its association with quit attempts among U.S. smokers exposed to the same HWLs, comparing smokers who were non-Latino White and Latino, including comparison of Latinos who preferred Spanish with those who preferred English. Based on prior research, we hypothesized that conversations about HWLs would vary across smoker ethnicity/language groups, with non-Latino Whites having the least conversations and Latinos who prefer to respond in Spanish having the most conversations (H1) and would be positively associated with subsequent quit attempts across ethnicity/language groups (H2). We also predicted that ethnicity/language group would moderate the effect of conversations on quit attempts, with non-Latino Whites experiencing the weakest association and Latinos who prefer to respond in Spanish experiencing the strongest association (H3).

Sample

From January 2013 to January 2015, seven waves of survey data were collected from an online cohort of U.S. adult smokers recruited from a consumer panel provided by Lightspeed GMI (http://www.lightspeedresearch.com). GMI panels are similar to the U.S. population in key socio-demographic features (Lightspeed GMI, 2017). Individuals were eligible for initial enrollment if they resided in the U.S., smoked at least 100 cigarettes in their lifetimes, smoked at least once in the prior 30 days, and were between 18-64 years of age. Data from participants other than Whites and Latinos were deleted because of low responses.

Data Collection Procedures

Survey waves occurred every four months, with approximately 1,300 participants at each wave, including an additional oversample of 400 Latinos, surveyed at each wave (to allow comparison with Mexican participants in the parent study). To maintain sample size, replenishment was used at each wave, with new participants replacing dropouts. Two analytic samples were created: (1) Sample 1, which included all data from the first six study waves (Individuals: n= 4,628; Observations: n=7,668); and (2) Sample 2, which only included observations for which there was a follow-up at the subsequent survey wave (Individuals: n=1,552; Observations: n=3,646), so that data from the prior wave could be used to predict quit attempts by the follow-up wave (i.e., t + 1). Throughout the study, response rates ranged from 1%-4%, and follow up rates ranged from 60%-85%. For the current study, data used from final wave (Wave 7)

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included only quit attempts because questions about interpersonal communication were not asked at the final wave. This study obtained institutional review board approval from the University of South Carolina.

Measures

Interpersonal communication. Conversations about HWLs was assessed with three items used in previous studies (Nagelhout et al., 2015; Thrasher et al., 2016): "In the last month, how often have you talked to others about the warning labels on cigarette packs?"; "In the last month, how often have your family members spoken with you about the warning labels on cigarette packs?"; and "In the last month, how often have other people besides your family spoken with you about the warning labels on cigarette packs?" Response options were on a 5-point scale (1="not at all"; 2="once"; 3="a few times"; 4="often"; 5="very often"). These items had high internal consistency (α= 0.84 to 0.93 for all ethnicity/language preference groups). Because responses to these questions were skewed, they were recoded (i.e., never=0; once=1; a few times or more=2) and all three items summed (range=0-6) for use when interpersonal communication was a dependent variable. It would have been inappropriate to treat the sum of the skewed items as a continuous predictor variable. Therefore, when interpersonal communication was used an independent variable, the original scores of the three questions were summed (range=3-15), with participants classified into three groups (i.e., did not talk=3; talked less frequently=4-6; talked more frequent=7-15).

Quit attempts. At all follow-up observations, participants were asked if they continued to smoke and, if so, whether they had made a quit attempt in the past four

months (1=yes; 0= no or don't know). Participants were considered to have made a quit attempt if they had quit smoking altogether or made a quit attempt in inter-survey interval of the past four months. A variable was created to indicate a quit attempt by the subsequent wave (i.e., t+1) (0=no quit attempt; 1=quit attempt' "Don't know" answers were treated as no quit attempt and coded as 0).

Ethnicity and language preference. Respondents were asked to identify which racial or ethnic groups best describe them. This study only includes individuals who identified as "White" or "Hispanic or Latino." At the beginning of the survey, respondents were asked if they preferred to complete the survey in English or Spanish.

Control variables. Several smoking-related variables associated with quit attempts and interpersonal communication about HWLs (Borland et al., 2010) were assessed: a scale for cognitive responses to HWLs (e.g., "To what extent do the warning labels make you think about the health risks of smoking?"; α=0.92) (Borland, Yong, et al., 2009; Thrasher et al., 2016); a scale for negative emotional responses to HWLs (i.e., fear, disgust, worry; α = 0.93)(Cho et al., 2018); smoking-related risk beliefs (Swayampakala et al., 2015); Heaviness of Smoking Index (HSI: Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989); and intention to quit in the next 6 months. Exposure to the concurrent Center for Disease Control and Prevention's national Tips campaign was assessed with a single aided recall item of the campaign (Huang et al., 2015). Socio-demographic variables were age, sex, education, household income, and having children in the home. Survey wave of participation and number of surveys completed by each

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respondent before any particular survey administration were also considered in adjusted models.

Data Analysis

Analyses were performed using Stata, version 14. Chi square tests and t-tests were performed to assess differences between respondents who participated in multiple waves and those lost to follow-up in each of the ethnicity and language preference groups. For each ethnic group, the prevalence of conversations about HWLs from wave 1 through wave 6 was calculated. Poisson generalized estimating equation (GEE) models assessed bivariate and adjusted correlates of frequency of HWL conversations for Sample 1 from wave 1 through wave 6. For Sample 2, logistic GEE models regressed quit attempts at follow-up on study variables from the prior survey for waves 1 through 7. Both bivariate and adjusted models were conducted.   The potential moderating effect of ethnicity was assessed by including an interaction term between ethnicity/language preference and interpersonal communication in the full logistic GEE model.

A sensitivity analysis through Pearson's Chi-square to confirm that the interpersonal communication varied significantly for all three survey items across ethnic/language preference groups. A second sensitivity analysis was conducted to ensure that the each of the three interpersonal communication items significantly predicted quit attempts. For this analysis, separate logistic GEE models were estimated, each including only one of the three interpersonal communication items, recoded with three cut points (i.e., none, once, and more than once).

Results

Sample Characteristics

Overall, the full sample was nearly evenly White (49%) and Latino (32% English-speaking Latino, 19% Spanish-speaking). Around half of the sample had discussed HWLs in the previous month (52%). There were some significant differences among participants who completed multiple surveys and participants lost to follow-up (Table 4.1). Across ethnicity/language preference groups, participants who completed multiple surveys had higher income. Among English-speaking Latinos and Whites, respondents followed up were older, heavier smokers, and less likely to have had a recent quit attempt. Among both groups of Latinos, respondents followed up had higher education. Among Whites only, respondents followed up were more likely male and daily smokers, had lower quit intentions. In addition, while Whites followed up less frequently discussed HWLs, Spanish-speaking Latinos followed up, more frequently discussed HWLs..

Trends and Correlates of Interpersonal Communication About HWLs

There were consistent differences in the prevalence of talking about HWLs between non-Latino Whites, English-speaking Latinos, and Spanish-speaking Latinos throughout the study period (Figure 1). Spanish-speaking Latinos had the highest prevalence of conversations (range = 78.5%—87.2%), followed by English-speaking Latinos (range = 52.6%—68.2%), and non-Latino Whites (range = 23.6%—43.4%).

The statistical significance of these between-group differences was confirmed in adjusted models for predictors of the frequency of HWL conversations (Table 2), with

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English-speaking Latinos talking more than non-Latino Whites (AIRR=1.25, 95% CI = 1.17, 1.33) and Spanish-speaking Latinos talking even more compared to non-Latino Whites (AIRR=1.70, 95% CI = 1.58, 1.81). The sensitivity analysis comparing the frequency of conversations using each of the three items used to create the interpersonal communication scale revealed that the distribution of responses to each of the three items was significantly different across ethnicity groups (Item 1, $\chi2$= 522.7, p-value<0.000; Item 2, $\chi2$= 1.0, p-value<0.000; Item 3, $\chi2$=981.6, p-value<0.000), and the percentage reporting conversations following the expected pattern across ethnicity/language preference across most items. However, for the item that asked about conversations initiated by the smoker, a smaller percentage of Spanish-speaking Latinos answered "very often" to this item compared to English-speaking Latinos. Other adjustment variables were also significantly associated with more frequent HWL conversations (see Table 4.2).

Predictors of Quit Attempts

Interpersonal communication about HWLs was associated with quit attempts at the subsequent wave (Table 4.3), with more frequent conversations increasing the likelihood of attempting to quit (AIRR $_{low\ vs.\ none}$ =1.31, 95% CI = 1.00, 1.72; AIRR $_{high\ vs.\ none}$ =1.74, 95% CI = 1.32, 2.30). A sensitivity analyses confirmed that the direction, magnitude, and significance of effects of conversations on quit attempts were consistent across the three survey items, and the interpretation of results would not change. Therefore, the results of this sensitivity analysis are not presented.

The term that interacted interpersonal communication by ethnicity/language preference was not significant when added to the model; therefore, it was dropped from the model to obtain the correlates of quit attempts. Both English-speaking Latinos (AIRR=1.26, 95% CI = 1.00, 1.57) and Spanish-speaking Latinos (AIRR =1.73, 95% CI = 1.04, 2.86) were more likely to report a quit attempt at follow-up compared to Whites. Various adjustment variables were also associated with quit attempts (See Table 4.3).

Discussion

Hypothesis 1 for this study predicted that Latinos, especially those responding in Spanish, would have more HWL conversations than Whites. This hypothesis was supported since the adjusted analysis found that English-speaking Latinos were more likely to talk more frequently than Whites and Spanish-speaking Latinos were even more likely to talk more frequently than Whites. This is consistent with Thrasher et al.'s (2016) cross-country comparisons, which found that Mexican smokers had a higher prevalence of interpersonal communication about HWLs than Canadian or Australian smokers. Our results suggest that differences in HWL content across countries may not account for the differences in the frequency of HWL conversations between Latinos and Whites in that prior study (Thrasher et al., 2016), since all survey respondents in the current study were exposed to the same HWLs content. Further, it appears that some factors other than socio-demographic and smoking patterns drive conversational differences, since the current study found significant differences between Latinos and Whites while controlling for these things.

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Variations in the frequency of HWL conversations across ethnic and language preference groups may be due in-part to the expression of Latino cultural values among Latino smokers. The Latino cultural value of familism– a reliance on familial support and frequent socializing with family members–may provide more opportunities for Latino smokers to discuss HWLs with and to seek support for cessation from people in their social networks (Comeau, 2012; Keefe, 1984; Keefe, Padilla, & Carlos, 1979; Rothman et al., 1985). Since some dimensions of familism decrease with acculturation (Lugo Steidel & Contreras, 2003; Sabogal et al., 1987), it is not surprising that Latinos who responded to the survey in English reported fewer conversations than those who responded in Spanish. Latinos culture is also characterized by *simpatía* , or a high regard for amicable relationships and sympathy for others (Triandis et al., 1984). This might inspire more conversations related to smoking, as Latinos may be more sensitive to how their behaviors (i.e., smoking) affect their family and friends. Similarly, non-smoking Latinos might be particularly concerned about the health of the smokers in their social networks, which might lead them to initiate conversations about cessation, including around the health risks of smoking stated on HWLs.

The higher likelihood of conversations among Spanish-speaking Latinos in particular might be due to language preference issues, since the US HWL messages are only in English. Our sensitivity analysis found that a smaller percentage of Spanish-speaking Latinos compared to English-speaking Latinos initiated conversations "very often," which may be because the conversations among Spanish speaking Latinos are initiated by others in their network who are more comfortable reading English. While

Spanish speakers might be less likely to initiate conversations about HWLs because of a language barrier, other Latinos who speak English in their networks might be concerned about the health of these smokers and offer to translate the messages for them. Future research should examine whether such phenomena account for conversations, including whether displays of social support or other similar behaviors reflect cultural values of familism and *simpatia*.

Disparities in access to healthcare and health information might also drive more HWL conversations among Latinos compared to Whites. Latinos may rely on their social networks for cessation support because of the multiple barriers they face to obtaining healthcare and health information, such as low trust in physicians (Richardson et al., 2012), lower quality and access to health care (United States Department of Health and Human Services, 2016), and difficulty obtaining health information (Vanderpool et al., 2009). Further, language preference could be indicative of access to healthcare (Woloshin, Schwartz, Katz, & Gilbert Welch, 1997), such as having healthcare insurance (Clayman et al., 2010). These disparities could help explain differences in the frequency of conversations about HWLs between Spanish-speaking and English-speaking Latinos.

Hypothesis 2 was that HWL conversations would predict quit attempts. This hypothesis was supported by our findings that the frequency of conversations was independently associated with a higher likelihood of attempting to quit smoking by the subsequent survey. This finding is consistent with prior research on interpersonal communication generated by various types of smoking cessation messages (Durkin & Wakefield, 2006; Hafstad & Aaro, 1997; Jeong & Bae, 2018; Jeong et al., 2015; van den

Putte et al., 2011) Jeong . The current study also extends the findings of the only previous study that has considered the relationship between pictorial HWL conversations and quit attempts (Thrasher et al, 2016), indicating that conversations about relatively weak, text-only HWLs promote quit attempts independent of other key mediators of HWL effects, such as cognitive and emotional responses to HWLs (Borland, Yong, et al., 2009; Cho et al., 2018).

Frameworks proposed by Southwell and Yzer (2007) suggest multiple pathways through which HWLs might influence conversations which lead to cessation. HWL messages might encourage conversations by changing attitudinal, normative, or efficacy beliefs about discussing cessation. These conversations might affect campaign-related goals by promoting secondary diffusion of HWL information. Secondary diffusion may be particularly important for Spanish-speaking Latinos in the U.S., who may be less likely than their English-speaking counterparts to attend to or process English language HWL messages. In addition, HWL conversations may influence quitting by revealing social norms against smoking and/or support for smoking cessation or by by increasing the saliency of HWL messages and generating more thoughts about smoking risks (Southwell & Yzer, 2007). The current study supports these frameworks from Southwell and Yzer (2007), yet our results also suggest that this framework could be enhanced. In addition to beliefs about campaign topics, the current study suggests that it is important to consider audience characteristics, such as ethnicity, as factors that explain the extent of communication about campaign messages. Furthermore, Southwell and Yzer (2007) presented different frameworks that separated the pathway between campaign

exposure to conversations from the pathway between conversations to campaign goals. However, a more integrated model might be needed that includes both the factors predicting conversations and those that predict campaign goals (e.g., cognitive and emotional responses to HWLs). Future research should further conceptualize this model and seek to produce empirical evidence for it.

Hypothesis 3 predicted that the relationship between HWL conversations and quit attempts would be stronger for Latinos than Whites, especially for Latinos who preferred Spanish. This hypothesis was not supported by the study results. Given Latino smokers' underuse of formal cessation assistance (Cokkinides et al., 2008; Trinidad et al., 2011) and high motivation to quit (Bock et al., 2005), we hypothesized that interpersonal communication would be especially helpful for Latinos. However, conversations about HWLs may be equally effective among Whites smokers because they are more likely to use other cessation resources, such as telephone quitlines and physician assistance (Cokkinides et al., 2008; Kaufman et al., 2010; Trinidad et al., 2011). Future research should consider how the effects of interpersonal conversations interact with the availability and use of other cessation resources. Nevertheless, the results from the current study demonstrate that conversations were equally helpful across ethnic and language groups, highlighting the importance of interpersonal communication as a meaningful outcome of cessation message exposure messages.

Limitations & Strengths

The results of this study should be interpreted in light of some limitations. The current study did not consider the content of HWL. While HWL research has

demonstrated that smokers discuss a variety of topics when talking about HWLs (Brewer et al., 2016; Hall et al., 2015; Morgan et al., 2017), future studies should connect these topics to cessation-related behaviors in order to better understand if some topics are more motivating than others. Indeed, one recent study suggests that making fun of HWLs increases the likelihood that smokers try to quit, which suggests that conversational content may not matter as long as smokers are discussing HWLs (Osman et al., 2017). The current study also did not distinguish between conversational partners, although a sensitivity analysis found that HWL conversations similarly influenced quit attempts regardless of whether smokers talk with family members or non-family members. Still, some research suggests that the effects of interpersonal conversations about health campaigns varies depending on the conversational partner (Jeong & Bae, 2018). This may be particularly true for Latinos, since strong bonds with in-group family members (Campos et al., 2016; Sabogal et al., 1987) may make conversations with these members more influential compared to conversations with others outside of the family. It is also possible that study respondents more willing to engage in HWL conversations were also more likely to quit for a variety of reasons which would have biased the relationship between conversations and quit attempts. Future studies may consider controlling for willingness to have conversations by using propensity score matching, as suggested by Parks and Kim (2017).

Another potential limitation of the current study is due to its use of language preference as a proxy for acculturation. Future research should consider measurement of culture scripts, as well as acquiescent and extreme response styles, which are

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common among Latino survey respondents (Hui & Triandis, 1989; Marin, Gamba, & Marin, 1992), particularly those who more frequently use Spanish (R. E. Davis, Resnicow, & Couper, 2011). Therefore, differences in HWL communication between ethnicity/language preference groups cannot be attributed to culture or acculturation and may be have been driven by response bias. Future research in this area should include more reliable measures of acculturation, cultural scripts, and response styles. The results of the current study are also subject to attrition bias. The relationship between conversations and quit attempts may either been underestimated or overestimated, given that participants followed up had characteristics that could have made them more likely to quit (e.g., higher income, higher education) or less likely to quit (e.g., less likely to have seen Tips campaign and fewer recent quit attempts among Whites and English-speaking Latino; lower quit intentions among Whites).

The results of the current study are also limited in terms of their generalizability. The study sample was recruited from an online panel of consumers with no known sampling frame, so it is unclear if selection biases account for our findings. In addition, because the sample had access to the internet, it may not have reflected the larger population of U.S. smokers, particularly U.S. Latinos with lower internet access (Brown, Lopez, & Hugo Lopez, n.d.). Furthermore, the study results cannot be generalized to other racial and ethnic groups of smokers or to other modes of communication, such as online communication, an increasingly important source of health information and support (Fox, n.d.; Fox & Duggan, n.d.). Future research should explore the effects of

HWL communication among more diverse groups of smokers and through various communication channels.

In spite of its limitations, the current study also had many strengths. The longitudinal design allowed assessment of the association of HWL conversations and subsequent quit attempts, strengthening causal inference compared to cross-sectional studies or those with shorter follow-up periods. The current study also controlled for country-level confounders and HWL content, which had limited the ability to directly compare Latinos and Whites in a previous study. Lastly, the current study controlled for various factors that are known to mediate HWL effects and influence smoking cessation.

Conclusions

This study contributes to the current body of knowledge on interpersonal communication about health messages and builds on prior research (Thrasher et al., 2016), suggesting that interpersonal communication about HWLs occurs more frequently among Latinos compared to Whites and that HWL-generated conversations are consistently associated with quit attempts across ethnic groups. While cessation interventions should encourage conversations among all groups of smokers, the results of the currents study suggest interventions might consider increasing such conversations among White smokers. However, further research is needed to explore the reasons that Latinos report more conversations as well as the HWL content, contextual and individual-level characteristics that promote HWL conversations that lead to more frequent and sustained quit attempts. Such research could then help to improve HWLs and other cessation messages.

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Table 4.1 Sample Characteristics, respondents followed up vs. lost to follow-up

Ethnicity	Non-Latino White		English-Speaking Latino		Spanish-Speaking Latino	
	Lost to follow-up	Followed up	Lost to follow-up	Followed up	Lost to follow-up	Followed up
Characteristics	n=1,268	n=3,210	n=1,160	n= 957	n=814	n= 216
Age						
18-24	28%	10%***	27%	14%***	13%	11%
25-34	27%	22%	34%	29%	38%	51%
35-44	16%	20%	18%	29%	25%	22%
45-54	14%	24%	13%	17%	13%	11%
54-64	15%	24%	8%	11%	11%	6%
Sex						
Female	57%	47%***	55%	52%	46%	53%
Education						
High school or less	29%	29%	32%	20%***	41%	33%***
Some college or university	41%	38%	38%	38%	27%	11%
Completed college or university	30%	33%	30%	42%	32%	56%
Income						
$29,000 or less	33%	25%***	38%	22%***	39%	18%***
$30,000-$50,000	32%	36%	32%	32%	36%	29%
$60,000 or more	35%	39%	30%	46%	26%	53%

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HSI, [mean (SD)]	2.35 (1.58)	2.59 (1.48)***	1.63 (1.41)	1.82 (1.42)*	1.19 (1.35)	1.14 (1.14)
Daily smoker						
Yes	79%	86%***	59%	64%	45%	46%
Quit intention in next 6 months						
Yes	44%	39%*	48%	49%	54%	52%
Quit attempt in past 4 months						
Yes	43%	35%***	55%	46%*	64%	61%
Campaign exposure						
Yes	68%	57%***	76%	60%***	67%	70%
Children at home						
Yes	42%	40%	55%	62%*	68%	73%
Cognitive HWL Responses						
Low	41%	41%	29%	26%	16%	6%*
Medium	33%	35%	39%	40%	33%	29%
High	25%	24%	32%	34%	51%	65%
Smoking-related risk beliefs (mean)	2.25 (1.21)	2.13 (1.20)*	2.20 (1.35)	2.25 (1.42)	2.10 (1.25)	2.16 (1.41)
Negative HWL emotions scale (mean)	4.51 (2.20)	4.28 (2.17)*	5.15 (2.10)	5.09 (2.15)	5.69 (1.93)	6.24 (1.77)*
Interpersonal communication about HWLs						
None	61%	69%***	42%	46%	16%	10%*

Less frequent	15%	11%	22%	20%	21%	14%
More frequent	24%	20%	36%	34%	62%	76%

Note: Data from are from initial enrollment into the study in wave 1 through wave 6.
Each individual contributed up to 6 observations.
* p < .05; ** p < .01; *** p < .001.

Table 4.2 Correlates of more frequent communication about HWLs in the prior month (n=7,048)

	IRR	SE	AIRR	SE
Age				
18-24	ref		ref	
25-34	1.19***	0.05	0.89***	0.03
35-44	0.91*	0.04	0.76***	0.03
45-54	0.59***	0.03	0.63***	0.03
54-64	0.40***	0.03	0.51***	0.03
Ethnicity				
Non-Hispanic white	ref			
English-preference Latino	1.49***	0.06	1.25***	0.04
Spanish-preference Latino	2.31***	0.09	1.70***	0.06
Sex				
Female	0.75***	0.02	0.83***	0.02
Education				
High school or less	ref			
Some college or university	0.97	0.04	1.02	0.04
Completed college or university	1.58***	0.06	1.25***	0.05
Income				
$29,000 or less	ref		ref	
$30,000-$50,000	1.12**	0.04	1.07*	0.04
$60,000 or more	1.51***	0.06	1.18***	0.04
HSI	0.967***	0.009	1.02*	0.01
Daily smoker				
Yes	0.85***	0.02	0.94*	0.03

Quit intention in next 6 months				
Yes	1.49***	0.04	1.04	0.03
Quit attempt in past 4 months				
Yes	1.59***	0.04	1.18***	0.03
Campaign exposure				
Yes	1.25***	0.03	1.07*	0.03
Children at home				
Yes	1.60***	0.05	1.11***	0.03
Cognitive response scale				
Low	ref		ref	
Medium	2.83***	0.12	2.29***	0.13
High	5.20***	0.22	3.04***	0.18
Smoking-related risk beliefs	1.07***	0.01	1.00	0.01
Negative HWL emotions scale	1.28***	0.01	1.12***	0.01
Study Wave				
1	ref		ref	
2	1.18***	0.04	1.08	0.05
3	1.23***	0.04	1.11*	0.05
4	1.23***	0.04	1.10*	0.05
5	1.36***	0.04	1.17**	0.05
6	1.30***	0.04	1.12*	0.05
Time in sample				
1	ref		ref	
2	0.98	0.02	1.01	0.03
3	0.94*	0.03	0.97	0.04
4	0.92*	0.03	0.91	0.04

	IRR	SE	AIRR	SE
5	0.96	0.03	0.91	0.06
6	1.03	0.05	1.04	0.09

Note: Data in these models are from Analytic Sample 1, wave 1 through wave 6.
IRR: Incidence Rate Ratio, AIRR: Adjusted Incidence Rate Ratio
* p < .05; ** p < .01; *** p < .001

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Table 4.3 Crude and adjusted odds of trying to quit over the follow-up period (n=3,309)

	%	IRR	SE	AIRR	SE
Age					
18-24	52	ref		ref	
25-34	49	0.86	0.13	0.94	0.17
35-44	38	0.55***	0.09	0.78	0.15
45-54	34	0.45***	0.07	0.96	0.18
54-64	34	0.48***	0.08	0.99	0.19
Ethnicity					
Non-Hispanic white	35	ref			
English-preference Latino	49	1.69***	0.18	1.26*	0.14
Spanish-preference Latino	71	3.60***	0.71	1.73*	0.44
Sex					
Female	39	0.89	0.08	1.08	0.10
Education					
High school or less	32	ref		ref	
Some college or university	38	1.24*	0.14	1.05	0.12
Completed college or university	48	1.87***	0.21	0.99	0.13
Income					
$29,000 or less	30	ref		ref	
$30,000-$50,000	39	1.24*	0.14	1.18	0.14
$60,000 or more	46	1.85***	0.20	1.33*	0.17
HSI		0.88***	0.02	0.99	0.04
Daily smoker					
Yes	35	0.54***	0.05	0.78	0.11

Quit intention in next 6 months					
Yes	64	3.25***	0.27	2.13***	0.21
Quit attempt in past 4 months					
Yes	73	7.37***	0.67	3.95***	0.41
Campaign exposure					
Yes	45	1.34***	0.10	1.17	0.11
Children at home					
Yes	46	1.59***	0.14	1.05	0.11
Cognitive response scale					
Low	27	ref		ref	
Medium	38	1.43***	0.11	1.19	0.14
High	63	2.73***	0.26	1.56**	0.25
Smoking-related risk beliefs		1.07***	0.03	0.99	0.03
Interpersonal communication					
None	27	ref		ref	
Low	43	1.62***	0.18	1.31*	0.18
High	66	3.36***	0.35	1.74***	0.25
Negative emotions scale		1.26***	0.02	1.05	0.03
Study Wave					
1	35	ref		ref	
2	39	1.14	0.10	1.00	0.17
3	41	1.17	0.11	1.05	0.18
4	39	1.12	0.11	1.08	0.19
5	42	1.29***	0.13	1.25	0.20
6	41	1.30***	0.14	1.23	0.21
Time in sample					

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1	42	ref		ref	
2	41	1.01	0.06	0.92	0.11
3	36	0.92	0.07	0.78	0.11
4	35	1.02	0.10	0.79	0.14
5	37	1.15	0.14	0.83	0.16
6	30	1.05	0.14	0.52**	0.13

Note: Data in these models are from Analytic Sample 2, wave 1 through wave 7.
IRR: Incidence Rate Ratio, AIRR: Adjusted IRR
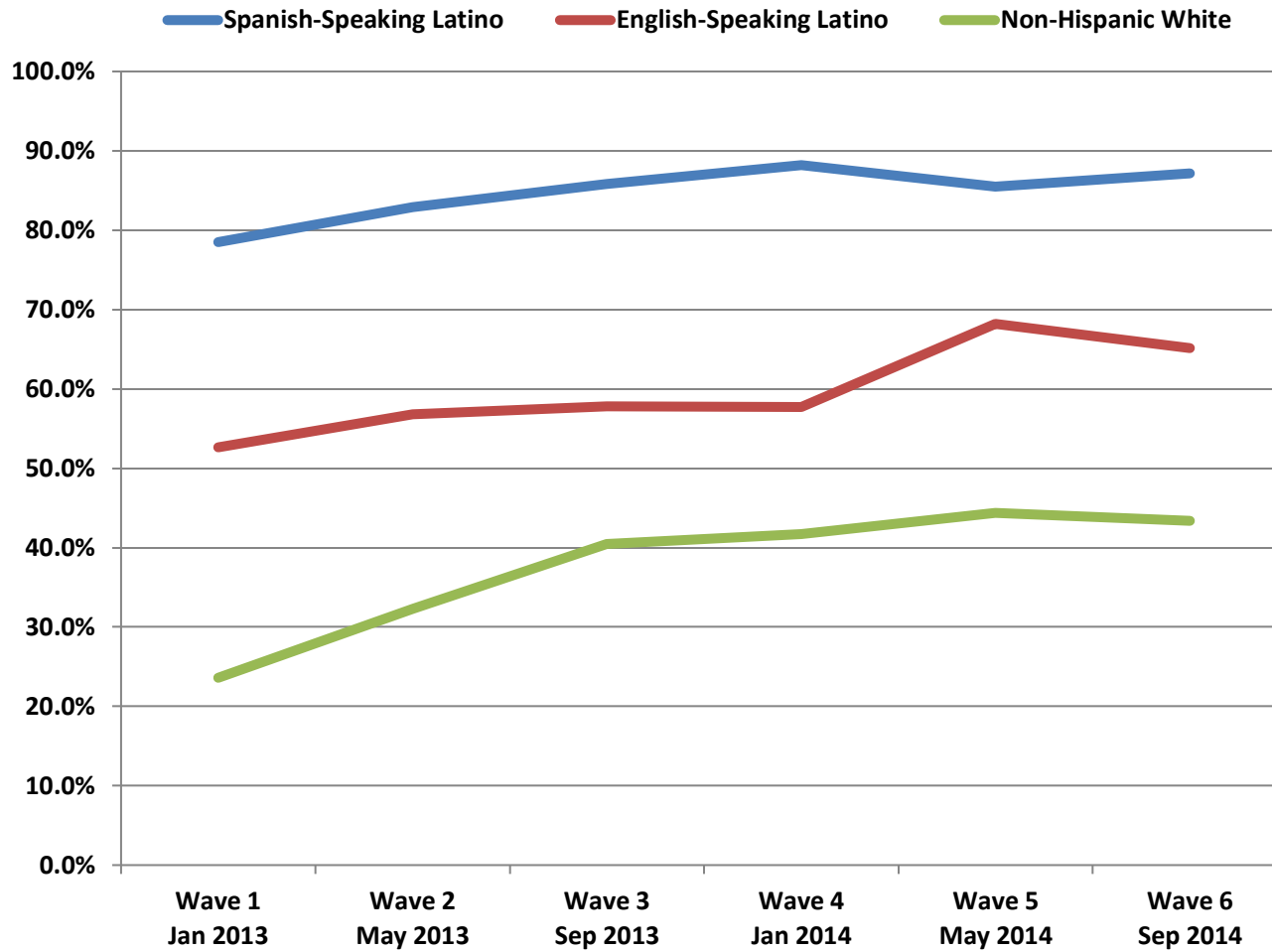* p < .05; ** p < .01; *** p < .001

Figure 4.1 Interpersonal communication about cigarette HWLs, January 2013-September 2014

Chapter 5

Discussion, Implications, and Recommendations

This thesis explored differences in the frequency of HWL conversations across ethnicity groups and the relationship between these conversations and quit attempts among a cohort of U.S. smokers. The previous chapter presented the results of a variety of statistical analyses used to assess the study aims and hypotheses. The current chapter will discuss how the study results relate to previous research on HWLs and interpersonal communication about media campaigns. It will also include implications for public health practice and recommendations for future research.

Aim 1 of this thesis was to assess differences in the frequency of conversations about HWLs between Latino and non-Latino White smokers. Hypothesis 1 predicted that the amount of HWL conversations would vary by ethnicity/language preference groups, with Whites reporting the least conversations and Spanish-speaking Latinos reporting the most conversations. This hypothesis was supported by the results of the current study, corroborating Thrasher et al.'s (2016) finding that Mexican smokers had a higher prevalence of interpersonal communication about HWLs than smokers in Canada and Australia, where most smokers are White. Thrasher et al. (2016) did not directly compare the frequency of conversations between Latinos and Whites, since smokers in those three countries had different HWL content, which was updated with varying regularity. The current analyses from this thesis, however, eliminated differences in

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HWL content and other potential country-level differences since all the respondents were within a single country and exposed to the same HWLs. Furthermore, the current study controlled for demographic variables, such as education, income, and smoking-related variables. Therefore, the significant effect of ethnicity on the frequency of conversations suggests that these control variables were not driving differences between ethnic groups.

While culture was not directly assessed in this thesis, Latino-associated cultural scripts and network characteristics (between family and friends) suggests that cultural factors may partially explain differences in the frequency of HWL conversations between Whites, English-speaking Latinos, and Spanish-speaking Latinos. One cultural script that has been evidenced among Latinos is familism. Perceived familial support is considered a primary component of familism and persists even among more acculturated Latinos in the United States (Lugo Steidel & Contreras, 2003; Sabogal et al., 1987). Keefe and colleagues (1979) found that Mexican Americans tend to rely on their extended families as the primary source of support (Keefe, Padilla, & Carlos, 1979). Keefe later described Mexican Americans' social networks as large social networks comprised of nearby family members (Keefe, 1984) and said that, compared to White Americans, Mexican Americans more strongly value in-person meetings with family members and generally socialize more often with their network members (1984). These characteristics indicate that Latinos may communicate with family members often and have strong family network ties. For Latinos living close to family members, this may provide more opportunities for Latino smokers to discuss HWLs with and seek cessation

support social network members (Comeau, 2012; Keefe, 1984; Keefe et al., 1979; Rothman et al., 1985). Since some dimensions of familism decrease with acculturation (Lugo Steidel & Contreras, 2003; Sabogal et al., 1987) and language preference is associated with acculturation (Coronado et al., 2005; Cuellar et al., 1995, 1980), it is not surprising that Latinos in the current study who responded to the survey in Spanish reported more conversations than those who responded in English.

The Latino cultural script of *simpatía* may similarly explain why culture values might inspire more HWL conversations among Latinos. *Simpatía* is expressed through conformity, empathy, respect for others, and seeking harmony in relationships (Triandis et al., 1984). This cultural value of amicable relationships and sympathy for others could encourage more conversations related to smoking, as Latinos may be more sensitive to how their smoking affects their family and friends. Similarly, non-smoking Latinos might be particularly concerned about the health of smokers in their social networks, which could plausibly lead them to initiate conversations about cessation, including about the HWLs that highlight the health risks of smoking.

The higher likelihood of conversations among Spanish-speaking Latinos in particular might be due to the need for translation since the messages are only in English. The sensitivity analysis comparing differences in responses to all three interpersonal communication items across ethnic/language preference groups found that a smaller percentage of Spanish-speaking Latinos compared to English-speaking Latinos initiated HWL conversations "very often." Therefore, it seems that the higher overall prevalence of conversations among Latinos less comfortable speaking English is

driven by conversations initiated by others. While Spanish-speaking Latinos might be less likely to initiate conversations about HWLs because of a language barrier, other English-speaking Latinos in their networks might be concerned about the health of these smokers and offer to translate the messages for them. While more research is needed to determine the reasons for conversations, such a display of social support would reflect cultural values of familism and *simpatia*.

In addition to Latino cultural scripts and large, tight-knit social networks, the higher frequency of HWL conversations among Latinos compared to Whites may be a byproduct of their access to sources of information. Since, compared to Whites, Latinos have low trust in health care professionals (Richardson et al., 2012), lower quality and access to health care (United States Department of Health and Human Services, 2016), and additional barriers to obtaining health information (Vanderpool et al., 2009), they may rely more on informal sources (e.g., friends and family) for health information and support. This might be especially true for Spanish-speaking Latinos living in the U.S., since language and cultural barriers may make it more difficult for them to search for health information (Vanderpool et al., 2009), and a higher likelihood of being uninsured poses a large barrier to obtaining health care (Clayman et al., 2010). Since the data for this thesis were from an online panel, the sample of Latinos in this study had access to the Internet, which may indicate that they had more access to the Internet than other Latino populations. While this is a limitation to the generalizability of the results, it reduces the likelihood that limited access to online information was driving differences in communication patterns between Latinos and Whites. However, given the evidence

from prior research, it is still likely that Latinos in this study–especially those who responded in Spanish–had less access to formal sources of health information and support, such as a healthcare provider, compared to Whites.

The findings from this thesis that ethnicity and language preference moderated the relationship between HWL exposure and HWL conversations add to Southwell and Yzer (2007) frameworks on interpersonal communication about media messages. Southwell and Yzer (2007) proposed possible explanations for the relationship between media campaign exposure and conversations about campaign topics. According to their framework, HWLs might encourage conversations about HWL messages and smoking cessation by changing attitudinal, normative, and efficacy beliefs around discussing cessation. The results of this thesis, however, imply that, in addition to the mediating effect of conversational beliefs, the Southwell and Yzer framework should consider audience characteristics (e.g., ethnicity and acculturation) as factors that influence conversations about HWL messages. Audience characteristics might inspire HWL conversations by influencing the beliefs about discussing cessation as well as perceptions about cessation itself.

This second aim of this thesis was to analyze the relationship between conversations about text-only HWL and quit attempts among U.S. Latino and non-Latino White smokers. Hypothesis 2 predicted that conversations about HWLs at one study wave would be associated with future quit attempts at the next study wave. This hypothesis was supported by the findings of the current study, which is consistent with prior research that has found that interpersonal communication generated by various

types of smoking cessation messages is associated with cessation-related beliefs, intentions, and behaviors (Dunlop, 2011; Dunlop, Cotter, & Perez, 2014; Dunlop, Wakefield, & Kashima, 2008; Durkin & Wakefield, 2006; Hafstad & Aaro, 1997; Hwang, 2012; Jeong et al., 2015; van den Putte et al., 2011). This finding is also an important extension of the only other study that analyzed and found a relationship between pictorial HWL conversations and subsequent quit attempts (Thrasher et al., 2016). The current study demonstrates that this relationship also applies to conversations about text-only HWLs.

The relationship between conversations and subsequent quit attempts was significant even when controlling for cognitive and emotional responses to HWLs, both of which prior studies have identified as mediators of HWLs' impact on quit attempts (Borland, Yong, et al., 2009; Cho et al., 2018). This suggests that interpersonal communication has a distinct role in the effect of HWL exposure on quitting, which justifies further exploration of this pathway.

The finding that HWL conversations predicted quit attempts supports the conceptual frameworks proposed by Southwell and Yzer (2007),which offer several pathways through which campaign messages can inspire conversations that influence campaign goals. As suggested by the Southwell and Yzer (2007) frameworks, conversations sparked by HWLs may encourage quit attempts by disseminating health information to smokers who are not exposed to the original messages. While all smokers are presumably exposed to HWLs on cigarette packs, many smokers may not read the HWLs. This may be especially true in the U.S. where the HWLs are text-only and

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have not been updated in 34 years. Indeed, one study found that U.S. smokers are less likely to notice and read HWLs than in other countries where HWLs are pictorial and updated more frequently (Borland, Wilson, et al., 2009; Hammond et al., 2007). Therefore, when other people in smokers' social networks (smokers or non-smokers) bring up the HWL messages in discussion, this may act secondary message diffusion of those messages by drawing smokers' attention to them. This increased message exposure through conversation would then presumably generate the known effects of HWL messages, such as increased knowledge and risk perception (Hammond, 2011). Such conversations would cause more smokers to be aware of the information on HWLs. While most smokers are already aware of the effects of smoking featured on U.S. HWLs (Hammond et al., 2006; Oncken, McKee, Krishnan-Sarin, O'Malley, & Mazure, 2005; Rutten, Augustson, Moser, Beckjord, & Hesse, 2008), this pathway of HWL message dissemination through conversations might be particularly important for Spanish-speaking Latinos in the United States. For Latinos who cannot read the English text on U.S. HWLs, conversations in which others translate the messages may be their only means of exposure HWL messages. The sensitivity analysis results from this thesis mentioned earlier, which suggest that HWL conversations initiated by others drives more frequent conversations among Spanish-speaking Latinos, seem to support this idea.

In addition to spreading information, conversations about HWLs may also influence cessation by either mediating or enhancing other effects of message exposure. Southwell and Yzer proposed that conversations inspired by media campaigns could

change smokers' normative beliefs about smoking. Depending on the content of HWL conversation, these conversations may cause smokers to realize that others in their social network disapprove of smoking and/or want them to quit (Southwell & Yzer, 2007). These changes in normative beliefs may then lead to stronger intentions to quit (Hornik & Yanovitzky, 2003), which is predictive of quit attempts (Vangeli et al., 2011). Southwell and Yzer also proposed that discussing campaign messages might aid memory and cognitive processing of message information. This is plausible, since two studies have found that popular topics in HWL conversations include that HWLs made smokers want to quit and smoking's effects on health (Hall et al., 2015; Morgan et al., 2017). Therefore, although smokers are generally aware of the risks of smoking, conversations might make HWL content more salient and stimulate thoughts about the risks of smoking and quitting, which may lead to increased quit intentions and quit attempts (Borland, Yong, et al., 2009; Cho et al., 2018; Evans et al., 2015; Yong et al., 2014).

While not a hypothesis or research question of this thesis, this current study also found that the frequency of HWL conversations rose steadily during each subsequent study wave. This was the case for both Latinos and Whites. Since the prevalence of conversations was adjusted for the number of waves in which respondents had previously participated, it is unlikely that participation in the surveys inspired an increase in conversations. However, one possible explanation for the increasing trend is the Tips campaign, a national anti-smoking campaign that occurred concurrently with the waves of the surveys analyzed in the current study (Neff et al., 2016). The Tips

campaign highlighted smoking-related risks similar to those on U.S. HWLs, and it could have increased attention to and discussion of HWLs over the study period.

Finally, hypothesis 3 stated that the relationship between HWL conversations and quit attempts would be weakest among non-Latino Whites, stronger among Latinos who prefer to respond in English, and strongest among Latinos who prefer to respond in Spanish. Contrary to this prediction, ethnicity and language preference did not moderate the relationship between interpersonal communication and subsequent quit attempts. This outcome is surprising since English-speaking Latinos had more conversations than Whites and Spanish-speaking Latinos had more conversations than English-speaking Latinos. I hypothesized that interpersonal communication about HWLs would be more effective for Latino smokers because, compared to Whites, they are less likely to have access to and use formal cessation resources (Cokkinides et al., 2008; Trinidad et al., 2011). However, it could be that conversations were equally effective among White and Latino smokers because Whites' conversations were used in combination with other cessation resources, such as telephone quitlines and physician assistance (Cokkinides et al., 2008; Kaufman et al., 2010; Trinidad et al., 2011). Future research should consider how the effects of interpersonal conversations interact with the availability and use of other cessation resources. Nevertheless, the finding that conversations appear equally helpful across ethnic and language groups, highlights the importance of interpersonal communication as a meaningful mediator of the effects of HWLs and other cessation messages.

Limitations

The results of this thesis should be interpreted in light of its limitations. One limitation of the current study is that it did not consider the content of conversations, which could matter for influencing quit attempts. For example, a prior study on antismoking television campaigns illustrated that conversations with positive message appraisals were positively associated with perceived message effectiveness, while the opposite was true for negative message appraisals (Brennan et al., 2016). While prior research on HWLs has demonstrated a diversity of conversational content about HWLs (Brewer et al., 2016; Hall et al., 2015; Morgan et al., 2017), no studies have determined whether conversational content actually matters for influencing cessation. However, one study found that disparagement of HWLs by smokers did not discourage cessation and, in some countries, increased the likelihood of future quit attempts (Osman et al., 2017). Therefore, it could be that simply having conversations about HWLs is more important than the content of these conversations.

In addition, the current study did not distinguish between conversational partners. This may be important since, in a meta-analysis of studies assessing the effect of interpersonal communication about health campaigns on campaign-targeted goals, Jeong & Bae (2017) found that the effect was larger when spouses or significant others were the conversational partners. While a sensitivity analysis used in the current study found that, across the entire sample, conversations about HWLs had a similar effect on quit attempts regardless of who participated in the conversation, conversational partners may have a different influence on cessation for Latinos than for Whites. Since

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the Latino cultural script of familism implies that Latinos have strong bonds with in-group family members (Campos et al., 2016; Sabogal et al., 1987), Latino smokers' conversations with these family members may be especially influential compared to conversations with others outside of the family. Future research should explore this possibility.

Other unmeasured factors could have inflated reports of interpersonal communication and its association with quit attempts. For example, individual respondents' willingness to engage in conversations could have spuriously influenced the association between interpersonal communication and quit attempts. In other words, individuals who were more willing or predisposed to have conversations about cessation messages for a variety of reasons may have also been more likely to quit. Parks & Kim (2017) used a propensity score matching technique to address this potential confounder. They first estimated individuals' propensity to engage in interpersonal communication and then matched respondents who engaged in interpersonal communication to respondents with similar propensity scores who did not engage in interpersonal communication. Even when controlling for propensity to engage in conversations about cessation messages, they found an independent effect of interpersonal communication on cessation-related behaviors (Parks & Kim, 2017). Nevertheless, propensity score matching can be used in future studies on interpersonal communication to ensure unbiased results as a result of propensity to engage in conversations.

Several issues could have affected the validity of the current study results for Latinos in particular. For one thing, the use of language preference as a proxy for acculturation is limited for multiple reasons. While language use and proficiency are commonly used and account for much of the variability in acculturation instruments (Thomson & Hoffman-Goetz, 2009), scholars criticize this type of measure because it misses all of the other elements of acculturation (e.g. adopting values, beliefs, and customs of a new culture) and fails to consider biculturalism (i.e., embracing some values and behaviors of a new culture while maintaining aspects of the old culture) (Abraído-Lanza, Armbrister, Flórez, & Aguirre, 2006; Thomson & Hoffman-Goetz, 2009). Furthermore, the effects of language preference may be confounded by healthcare disparities, as language preference among Latinos might be associated with access to health services and quality of interaction with health care providers (Thomson & Hoffman-Goetz, 2009). In light of the limitations of using language preference as a proxy for acculturation, and because the current study did not measure cultural scripts (e.g., familism and *simpatia*), the differences in the frequency of HWL conversations observed between Spanish-speaking and English-speaking Latinos cannot be attributed to acculturation. Future research should further explore the influence of culture and acculturation on interpersonal conversations about media messages. The current study's findings for Latinos are further limited because it did not account for acquiescent and extreme response styles, which previous research has demonstrated to be prevalent among Latinos when participating in surveys (Hui & Triandis, 1989; Marin et al., 1992). Since the current study did not account for these response styles, the results

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cannot be disentangled from them; however, future research in this area should measure and control for these response styles.

A final threat to the internal validity of study outcomes, particularly results of the relationship between conversations and quit attempts, is that they may have been subject to attrition bias. Compare to respondents who dropped out of the study after one wave, the respondents in the follow-up sample had higher income and education (among Latinos), which could have made them more likely to quit and resulted in an overestimation of the effect of HWL conversations on quit attempts. However, respondents followed up also had characteristics that may have made them less likely to quit, such as fewer recent quit attempts (among Whites and English-speaking Latinos), lower intentions to quit (among Whites), and lower likelihood of seeing the Tips campaign (among Whites and English-speaking Latinos). Because respondents followed up had characteristics that could have made them more or less likely to quit compared to drop-outs, it is unclear whether the association between conversations and quit attempts would have been underestimated or over estimated. In addition, while White respondents followed-up had less frequent conversations, Spanish-speaking Latinos followed up had more frequent conversations compared to Spanish-speaking Latinos lost to follow-up. This could have underestimated the effect of conversations for Whites while overestimating the effect for Spanish-speaking Latinos. However, it is unlikely that this occurred, since there was no moderating effect of ethnicity/language preference on the relationship between conversations and quit attempts.

The results of this thesis are also potentially restricted by threats to external validity. The study sample was derived from no known sampling frame, so it is unclear if selection effects were present. In addition, the online panel of respondents was not necessarily reflective of the larger population of U.S. smokers, especially for a hard to reach minority population such as Latinos. Since the Latinos in this study had access to the Internet, it is likely that they had higher education and income than the general population of U.S. Latinos (Brown et al., n.d.). In addition, the results of this thesis are limited to comparisons of Latino smokers and non-Latino White smokers since other racial groups, such as African Americas, were excluded from the analysis. Therefore, the results cannot be applied to other racial and ethnic groups, and more research is needed to determine whether different relationships exist between interpersonal communication and smoking cessation for these groups.

Implications for practice

There is ample evidence that HWLs encourage cessation-related behaviors (Hammond, 2011), and this thesis' findings suggest that text-only HWLs are more effective when they inspire conversations with other people. Future anti-smoking campaigns should consider using messages that encourage conversations. Since they have a broad reach, HWLs are a promising intervention for reducing heath disparities for Latinos as well as other groups with limited health resources. HWLs can be easily formatted to encourage Latinos– and other smokers who have limited access to cessation resources– to use free cessation aids (e.g., by including a telephone number or website for a cessation quitline). HWLs could also facilitate even more conversations

and informal cessation support by using topics that might influence conversations with others, such as the second-hand effects of smoking. Given that the prevalence of HWL conversations was lowest among non-Latino Whites, the results of this study also suggest that HWLs and other cessation messages may also particularly aim to increase cessation conversations among White smokers.

Implications for research

In order to design messages that capitalize on the positive effects of interpersonal communication, it will be necessary to identify HWL message content that encourages conversations as well as the characteristics and contextual factors of interpersonal communication that lead to more frequent and sustained quit attempts among different smoker groups. Future qualitative research among Latinos should also seek to understand why Latino smokers are more likely to report interpersonal communication about HWLs than non-Latino White smokers. This insight could help determine whether the apparent differences in how Latinos socialize risk information could be used to design health interventions that reduce health disparities for this population.

Future research should also expand the findings of the current study to other communication modalities across ethnic groups. Specifically, since the Internet is becoming increasingly important for obtaining health information and support (Fox, n.d.; Fox & Duggan, n.d.), future studies should determine if the relationship between online communication about cessation messages influences cessation-related outcomes and whether the frequency of online communication varies by smoker ethnicity.

Lastly, future research should seek to update the frameworks proposed by Southwell and Yzer (2007). These scholars present three different frameworks– one in which communication is the ultimate outcome and two in which campaign goals are the outcomes that are either mediated or moderated by communication about campaigns. While this thesis was not able to do this, future studies should aim consolidate these frameworks in a way that considers both the predictors of communication about campaign messages as well as the pathways from communication to campaign-related behaviors. In developing such an expanded model, future research should also determine whether the characteristics of individual message recipients (e.g., ethnicity) influence perceptions of communication about the campaign and perceptions of the campaign-related behavior itself in a way that influences the extent of communication.

Conclusion

This thesis contributes to the current body of knowledge on interpersonal communication about health messages and builds on prior research suggesting that the amount of HWL conversations varies across ethnic groups (Thrasher et al., 2016). The findings of this thesis suggest that Latinos talk more frequently about HWLs than non-Latino Whites and that conversations about U.S. HWLs are consistently associated with quit attempts across ethnic groups. Further research should explore the reasons that Latinos report more conversations, which could contribute to improved cessation interventions for Latino smokers, as well as the contextual and individual-level characteristics that promote HWL conversations that lead to more frequent and sustained quit attempts. Anti-smoking campaigns should also consider developing

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messages that encourage interpersonal communication in order to increase smoking

cessation

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