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**HEALTH ACTIVISM: INVESTIGATING THE ROLE OF HOPE AND  
NEIGHBORHOOD-RELATED PERCEPTIONS IN SOLVING  
NEIGHBORHOOD HEALTH ISSUES**

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by

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## ABSTRACT

The general goal of this dissertation was to understand how messages about social health issues can motivate health activism (i.e., communication with neighbors to address shared health concerns) by increasing hope and collective efficacy. I offered a novel model of health activism by engaging research rooted in persuasion and civic engagement, and investigated aspects of the model in three studies. Study 1 (presented in Chapter 2) examined the intended effects of three message features on hope and possible unintended message effects on other discrete emotions. Study 2 (presented in Chapter 3) explored how participants' emotions change over time as a response to different message features (i.e., proximity cue and/or a combination of imagination prompt and recommended-actions information). Study 3 (presented in Chapter 4) tested the model of health activism in the context of lead-exposure risks in Pennsylvania.

There are three critical findings across the three studies. First, people can feel hope about social problems. Second, exposure to the imagination prompt and recommended-actions information and perceptions of collective efficacy result in feeling more hopeful about social health issues. This finding suggests a new direction for hope appeals: messages that enhance efficacy perceptions increase hope because efficacy is an antecedent to hope. Third, more connections to a neighborhood's storytelling network, stronger collective efficacy, and greater hope lead to stronger health activism. An overall reflection on the implications of these findings for theory and practice is presented in Chapter 5.

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## CHAPTER ONE: LITERATURE REVIEW

Traditionally, theories and research in health communication aim to motivate individuals to change unhealthy behaviors and adopt healthy lifestyles. A number of health interventions, accordingly, use persuasive messages that target psychological processes to change individuals' health behaviors (e.g., Fishbein & Cappella, 2006; F. Shen, Sheer, & Li, 2015). Relatively recent research on the structural influences on health has shown the need to challenge existing norms, social structures, policies, and power relationships that impede individuals' health behaviors (C. Campbell & Murray, 2004; Diez-Roux, 2001; Duncan & Kwachi, 2018; Kreps & Maibach, 2008). As Wilkin (2013) puts it, "health communication efforts do not take place in a vacuum" (p. 188). Yet, health communication efforts often fail to address the structural influences that may limit individuals' ability to execute health behaviors (Dutta-Bergman, 2005; Guttman & Ressler, 2001; Laverack, 2012; Moran et al., 2016). If many key determinants of individual health are social, the goal of health communication efforts should be that of changing not only individual behaviors but also the community and social contexts that shape individuals' behaviors.

Health activism is one form of communication that empowers individuals to gain broader control over the decisions and actions that affect their health by "chang[ing] the status quo, including targets such as social norms, embedded practices, policies, or dominance of certain social groups" (Zoller, 2005, p. 344). Derived from the idea of social activism, or "persuasive communication behaviors of a collective that are intended to serve the common interest" (Brasher, Hass, Klinge, & Neidig, 2000, p. 375), health activism involves multiple communication processes (Laverack, 2012; Zoller, 2005). Specific communication processes include developing a sense of common identity among a group of people, identifying the cause of an illness, constructing solutions, and appealing to the public

(Zoller, 2005). Although 15 years have passed since Zoller (2005) proposed the potential of health communication studies to contribute to research and practice in health activism, little is known about what motivates community members to engage in communication behaviors that lead to changes in an existing social system, and how they mobilize their social networks to seek a better future.

A health problem could be perceived as a stable condition of ordinary life, especially when it has been intertwined with individuals' lives for extended periods of time. In order to facilitate health activism, the health problem needs to be perceived as changeable or malleable, allowing people to imagine a better future (Bettencourt, Charlton, Dorr, & Hume, 2001; Cohen-Chen, Halperin, Crisp, & Gross, 2014; Mummendey, Kessler, Klink, & Mielke, 1999). Perceiving the potential for a positive change is closely related to the emotion of hope (Averill, Catlin, & Chon, 1990; Cohen-Chen, Crisp, & Halperin, 2015; Lazarus, 1991), and feeling hope motivates human behaviors and social progress (Braithwaite, 2004; Lazarus, 1999; Harré, Madden, Brooks, & Goodman, 2017; McGeer, 2004; Thomas, McGarty, & Mavor, 2009). At the same time, communities vary in their capacity to make changes. Localized communication resources and networks enhance health communication outreach and mobilization (Wilkin, 2013; Wilkin & Ball-Rokeach, 2006, 2011).

As a step toward understanding health activism, this dissertation investigates why and how hope leads people to capitalize on a community's opportunity to change things for the better. Ultimately, I propose a novel model that integrates the theory of persuasive hope (TPH; Chadwick, 2015) and the communication infrastructure theory (CIT; Kim & Ball-Rokeach, 2006a) to advance understanding of how message-evoked hope and neighborhood-related perceptions lead to health activism. The rest of this chapter is organized in the following way. First, I review the assumptions and claims of the two selected theories: Theory of persuasive

hope and communication infrastructure theory. Second, I examine opportunities to integrate the two theories, followed by challenges created by integrating them. Third, I propose a new model of health activism. Fourth, I present the case in which the model will be instantiated and tested: health activism against the risks of lead exposure in Pennsylvania.

### **Theory of Persuasive Hope**

Hope is a future-oriented emotion that motivates people to engage in behaviors to achieve a goal (Lazarus, 1991). In the past decade, scholars have shown increasing interest in understanding how to harness the potential motivating power of hope in persuasive communication (e.g., Chadwick, 2015; Nabi & Myrick, 2018; Prestin, 2013). The theory of persuasive hope (TPH, Chadwick, 2015, 2017) is an attempt to explain message features that can make people feel hope. In brief, the TPH (Chadwick, 2015, 2017) predicts that specific message contents induce a set of cognitive appraisals that evoke a subjective feeling of hope, which in turn, motivates behavior.

**Meta-theoretical assumptions of TPH.** The TPH is grounded in the meta-theoretical assumptions of the discrete-emotions perspective (Chadwick, 2015). The discrete-emotions perspective assumes that individual emotions (e.g., hope, fear, etc.) are distinct subjective experiences (Izard, 2009; Lazarus, 1991; Roseman, 2001, 2013). The discrete-emotions perspective stands in contrast to other ways of viewing emotions, such as the dimensional approach, which considers emotions based on dimensions like arousal and valence (Thayer, 1989; Watson, Wiese, Vaidya, & Tellegen, 1999). Defining hope as a discrete emotion also differs from approaches that conceptualize hope as a personality trait (i.e., enduring motivation which entails an overall perception that one's goals can be met; Snyder et al., 1991) or temporal cognitive state (i.e., a snapshot of current goal-directed thinking that reflects particular times and proximal events; Snyder et al., 1996).

The discrete-emotions perspective is grounded in an evolutionary perspective (Darwin 1982/1965), which considers emotions as mechanisms designed to solve adaptive issues (Keltner & Gross, 1999). The evolutionary perspective assumes that people monitor their environment and appraise its implications for their well-being (Plutchik, 1980, 2001). The fundamental claim is that specific cognitive appraisals, or subjective evaluations of potential harm or benefit in an encounter with the environment for personal well-being, cause people to experience a discrete emotion (Lazarus, 1991; Roseman, 2013). For example, as people appraise the current situation as threatening or undesired, but yearn for a better future, they will feel hope (Lazarus, 1991; Roseman, Wiest, & Swartz, 1994). Specifically, for a person to experience hope, the future outcome needs to be appraised as important, helpful to achieve one's goals, better than the current situation, and possible to be achieved (Chadwick, 2015; Lazarus, 1991).

Each discrete emotion is considered to be an emergent, subjective state associated with the physiological responses and motor expressions triggered by its relevant cognitive appraisals (Scherer, 2001). For instance, a discrete emotion of hope is expected to have physiological arousals like an increase in heart rate and skin conductance response (Chadwick, 2017; Scherer, Schorr, & Johnstone, 2001; C. A. Smith, 1989). Hope is also expected to involve motor expressions like alert body posture and facial expressions that reflect focused attention (Chadwick, 2017). Altogether, a feeling of hope is a pleasant experience that is associated with eagerness and anticipation (Chadwick, 2015, 2017; Lazarus, 1991).

The discrete-emotions perspective considers emotions as mechanisms that cause people to act in a manner that effectively addresses the appraised situation, referred to as an action tendency (Lazarus, 1991). Action tendency of hope, for example, is proposed as

“moving toward rather than away from an idea or image of a desired outcome” (Lazarus, 1991, p. 285). This is rather vague compared to action tendency of other discrete emotions such as fear (i.e., “get away from the obvious danger,” Lazarus, 1991, p. 238) or anger (i.e., “*attack* on the agent held to be blameworthy for the offense” [emphasis in original], Lazarus, 1991, p. 226). Yet, the action tendency to approach toward a desired outcome has still been proposed as the reason why hope causes people to focus on their goals (Lazarus, 1999). When feeling hopeful, people yearn for something positive, which is not present in their lives, to be materialized (Lazarus, 1999). Hopeful individuals, thus, tend not to give up on pursuing a better future despite the current negative circumstances, but to rather remain vigilant, mobilized, and committed (Lazarus, 1991, 1999).

To summarize, the TPH (Chadwick, 2015, 2017) is grounded in a discrete-emotions perspective, which assumes that emotions have unique (a) cognitive triggers, (b) physiological responses, (c) motor expressions, (d) subjective feeling states, and (e) action tendencies (Plutchik, 1980; Izard, 2009; Nabi, 2002). Furthermore, the TPH (Chadwick, 2015, 2017) assumes that persuasive messages are one type of environmental stimuli (Ortony, Clore, & Collins, 1988) that can evoke the cognitive appraisals that cause people to feel hope.

**Central theoretical claims of TPH.** The central claim of TPH (Chadwick, 2015) is that exposure to a “hope appeal” (p. 598) allows people to make the cognitive appraisals that cause them to experience a subjective feeling of hope.

In TPH, Chadwick (2015) proposed that a hope appeal should include two message components, labeled as (a) “hope evocation” (p. 601) and (b) “recommended actions” (p. 601) components. Drawing from the discrete-emotions scholarship, the TPH theorizes that the hope evocation component needs to include message features (e.g., arguments and images) that trigger specific cognitive appraisals, which combine to evoke hope. Given the “approach

action tendency of hope” (Chadwick, 2015, p. 600), feeling hope is expected to motivate individuals to take actions to bring about a desired future outcome. The recommended-actions component (seen as a supplement to support the action tendency of hope) needs to include information about behaviors that can take advantage of the opportunity, which is expected to increase efficacy beliefs (Chadwick, 2015, 2017). When a message evokes hope by presenting an opportunity for a better future (i.e., hope evocation component), and increases efficacy perceptions by presenting effective and viable behaviors (i.e., recommended-actions component), people should engage in actions that are expected to bring about a desired future outcome (Chadwick, 2015, 2017).

As an initial step toward developing hope appeals, Chadwick (2015) focused only on the hope evocation component and argued that messages can be written in ways that lead one to appraise a future outcome as (a) important, (b) congruent with one’s goals, (c) better than the current state of affairs, and (d) uncertain but possible to achieve. More specifically, *importance* is an appraisal of whether the future outcome is relevant to oneself. *Goal congruence* is an appraisal of whether the future outcome is favorable to achieving one’s personal goals. *Better future expectation* is an appraisal of whether the future will be better or worse than it is now if the outcome occurs. *Possibility* is an appraisal of whether the likelihood of achieving the desired future outcome is uncertain but still possible. In studies of the TPH (Chadwick, 2015; Chadwick, Zoccola, Figueroa, & Rabideau, 2016), the hope-evoking content was, essentially, an expression of the cognitive appraisals. For example, in a message about climate change (Chadwick, 2010), importance was varied by a sentence that said either “Protecting the climate is very important for your well-being” (high-importance, p. 445), or “Protecting the climate is not very important for your well-being” (low-importance, p. 447).

The TPH (Chadwick, 2015) provides an opportunity to consider how to construct messages that cause people to experience hope, so they will be motivated to engage in recommended pro-future behaviors. The next section reviews the meta-theoretical assumptions and central claims of communication infrastructure theory (Kim & Ball-Rokeach, 2006a), which I have selected to frame the predictions about social issues and civic engagement. The review of the two theories, then, serves as a stepping stone to gain insights into understanding why hopeful people engage in civic participation.

### **Communication Infrastructure Theory**

Communication infrastructure refers to a communication opportunity structure that can promote local storytelling and thus, build community (Kim & Ball-Rokeach, 2006a). Even though we live in a time when space is no longer a totalizing force, communication infrastructure associated with space still plays an important role in building and sustaining civil society. The communication infrastructure theory (CIT; Kim & Ball-Rokeach, 2006a, 2006b) is an attempt to understand how a community's communication infrastructures and residents' access to them shape residents' civic engagement. In brief, CIT (Kim & Ball-Rokeach, 2006a, 2006b) predicts that integration into a neighborhood storytelling network increases civic participation because integration allows residents to internalize and activate local stories in their everyday lives.

**Meta-theoretical assumptions of CIT.** The CIT is grounded in the meta-theoretical assumptions of the ecological perspective (Broad et al., 2013; Kim & Ball-Rokeach, 2006a). The ecological perspective emphasizes how organisms interact with their environment; in this perspective, communication is understood as a social process that takes place at and across multiple levels of interactions (Matsaganis, 2015). The ecological perspective to understand neighborhood effects stands in contrast to other research that considers the influence of place-

level (e.g., poverty and crime rates) factors on residents' of the area (e.g., Cummins, Curtis, Diez-Rouz, Macintyre, 2007; Sampson, Raudenbush, & Earls, 1997), rather than the process by which people utilize and contribute to space-based resources.

It is important to note that CIT, drawn from the ecological perspective, explicitly acknowledges individual residents' agency in the processes of community building and civic engagement (Kim & Ball-Rokeach, 2006a). "People are social animals who do not suffer asocial conditions passively; rather, they adapt by using communication tools to reconstitute a social world in which the "I" and "we" can survive" (Ball-Rokeach, Kim, & Matei, 2001, p. 393). The assumption of active residents' role in story construction (Kim & Ball-Rokeach, 2006a) makes CIT distinct from models such as the two-step flow model of media effects (Katz & Lazarsfeld, 1955) and the diffusion of innovation theory (E.M. Rogers, 2003), which consider ordinary residents as passive recipients of stories disseminated mostly by opinion leaders.

Although previous CIT studies (e.g., Kim & Ball-Rokeach, 2006b, Wilkin, Moran, Ball-Rokeach, Gonzalez, & Kim, 2010) have used the terms neighborhoods and communities interchangeably, the concepts differ. A neighborhood is a geographically bounded residential area whereas a community is a social group that may or may not be contained within specific geographic locations (C. Campbell & Murray, 2004; Chaskin, 1997). In this dissertation, I focus on neighborhoods to illuminate how places and their physical and social characteristics contribute to neighborhood problem-solving processes. This aligns with a general understanding of neighborhoods in CIT studies—a place where people experience and make sense of everyday life (Kim & Ball-Rokeach, 2006a, 2006b).

According to CIT (Ball-Rokeach et al., 2001; Kim & Ball-Rokeach, 2006b), each neighborhood has a storytelling network comprised of macro-, meso-, and micro-level

storytellers that is embedded in a communication action context. Neighborhood storytelling is defined as any type of communicative action (e.g., oral, written, or mediated) that focuses on residents, their local neighborhoods, and their lives in those neighborhoods (Ball-Rokeach et al., 2001). Neighborhood storytellers can include macro-level agents (e.g., mainstream media who tell stories primarily about the whole city), meso-level agents (e.g., geo-ethnic or local media and community organizations), and micro-level agents (e.g., residents; Ball-Rokeach et al., 2001). Neighborhood storytelling network operates in a communication action context, which consists of elements of the residential areas that facilitate the creation and sustenance of an integrated storytelling network (Kim & Ball-Rokeach, 2006b). Contextual components such as greater resident stability, more formal and informal places for gathering, and better transportation systems make it easier for neighbors to have a strong integrated storytelling network (Kim & Ball-Rokeach, 2006a; Villanueva, Broad, Gonzalez, Ball-Rokeach, & Murphy, 2016).

**Central theoretical claims of CIT.** The central claim of CIT (Kim & Ball-Rokeach, 2006a) is that residents who perceive themselves as integrated into a neighborhood storytelling network to a greater extent have stronger perceptions of neighborhood belonging and collective efficacy, which in turn, cause them to engage in more civic participation.

The extent to which neighborhood storytellers are integrated into residents' everyday lives provides residents with opportunities to create and disseminate stories about community identity, issues, and action strategies (Kim & Ball-Rokeach, 2006a). The more residents feel integrated into a neighborhood storytelling network, the more they internalize the neighborhood storytelling network, through neighborhood belonging and collective efficacy (Kim & Ball-Rokeach, 2006a, 2006b). Neighborhood belonging is defined as a resident's attachment to the neighborhood, and it is represented by "what individuals do with their

neighbors (e.g., helping each other out) and how they feel about their neighbors (e.g., ease of becoming friends)” (Kim & Ball-Rokeach, 2006a, p. 187). Collective efficacy is defined as “residents’ confidence in their neighbors’ willingness to participate in neighborhood problem-solving processes” (Kim & Ball-Rokeach, 2006b, p. 421).

When community issues arise, neighborhood belonging and collective efficacy lead to civic participation, or investment of valuable resources (e.g., time, money, knowledge, or experiences) in the neighborhood problem-solving process (Kim & Ball-Rokeach, 2006a, 2006b). Examples of civic participation include attending city council meetings, meeting elected officials, sending a letter to the editor, participating in a protest, and informal conversations with neighbors about how to improve the neighborhood’s state of affairs (E. L. Cohen, Ball-Rokeach, Jung, & Kim 2002; Kim & Ball-Rokeach, 2006a).

### **Integrating Theories of Hope and Civic Participation**

The goal of this dissertation is to understand how to construct messages that lead to health activism by evoking hope and collective capacity for change. The TPH (Chadwick, 2015) and the CIT (Kim & Ball-Rokeach, 2006a) both provide insights. The TPH (Chadwick, 2015) explains why certain messages make people feel hope. The CIT (Kim & Ball-Rokeach, 2006a) provides an explanation for why some residents living in neighborhoods with different capacities engage in a varying degree of civic participation. In the next sections, I describe the places of common ground and opportunities for integration between these two theories. Then, I discuss the challenges that need to be resolved in order to create a model of how hope about neighborhood issues and collective capacity can motivate health activism.

**Opportunities for integration: Appraisals and outcomes.** There exist two sites of common ground between the two theories: (a) the central role of cognitive appraisals and (b) the complementary processes that lead to efforts to make a better future. The following

section illustrates how and why these two sites provide an opportunity to integrate the TPH (Chadwick, 2015) and CIT (Kim & Ball-Rokeach, 2006a).

***Central role of cognitive appraisals.*** Both theories include cognitive appraisals as the central, mediating processes in their logic models. In the TPH (Chadwick, 2015), cognitive appraisals of the person-environment relationship mediate the relationship between exposure to hope-evoking messages and a feeling of hope. In the CIT (Kim & Ball-Rokeach, 2006a), cognitive appraisals of social relationships—neighborhood belonging and collective efficacy—mediate the relationship between an integration into the neighborhood storytelling network and civic participation. I propose that the cognitive processes in the two theories are interlocking such that cognitive appraisals of the person-environment relationship and social relationships occur in an appraisal phase, promoting subsequent feelings and actions.

***Complementary processes.*** The processes discussed in TPH and CIT complement each other and align with my goal of understanding how neighbors overcome social structural barriers and mobilize resources to pursue a better future together. In the TPH (Chadwick, 2015), hope should result in actions that capitalize on opportunities to achieve a desired future outcome. In the CIT (Kim & Ball-Rokeach, 2006a, 2006b), neighborhood belonging and collective efficacy should motivate residents to invest in their neighborhood's problem-solving processes. When combined, the two theories can illuminate the process that motivates residents to pursue a better future for their neighborhood. I propose that residents who feel hope and internalize the neighborhood storytelling network will seek out ways to make a better future because they are oriented toward a desired future outcome and feel confident in their ability to actualize it. Whereas the CIT (Kim & Ball-Rokeach, 2006a) proposes both neighborhood belonging and collective efficacy as mediating factors whereby residents internalize and activate local stories, I focus on collective efficacy in this dissertation.

**Challenges for integration.** The preceding section highlights the opportunities for integrating the two theories, but there exist challenges as well. In this section, I describe five challenges and my plans to address them. Here is a brief preview. First, TPH defines hope-evoking messages based on their effects rather than intrinsic message features; I discuss the implications of such an approach and argued for the need to identify intrinsic message features that evoke hope. Second, TPH addresses personal appraisals (e.g., personal goals) whereas CIT addresses neighborhood appraisals (e.g., neighborhood goals); I argue that the logic using personal appraisals can be extended to neighborhood appraisals. Third, the two theories conceptualize efficacy differently; I revisit the concept of collective efficacy and propose a message cue that can evoke collective efficacy as it is defined in this study. Fourth, the TPH and CIT focus on different constructs—hope and collective efficacy respectively—that motivate people; I include both constructs in the proposed model to discuss complementary processes that lead to health activism. The fifth challenge relates to the outcome variable of interest for this dissertation: health activism (Zoller, 2005). Although both theories define their outcomes in ways that fit with this behavior, little is known about this communication process, which I explore at the end of this section.

***Designing a hope appeal.*** When the goal of a study is to understand the persuasion processes and effects prompted by a persuasive message, defining a message variable based on intrinsic message features rather than message effects is recommended (O’Keefe, 2003). Following O’Keefe’s (2003) recommendation, Chadwick (2015) stated that “a hope appeal is a hope appeal because it contains elements designed to create the appraisals of hope and a perception of opportunity, not merely because a receiver feels hopeful after reading the message” (p. 601). In studies of the TPH (Chadwick, 2015; Chadwick et al., 2016), messages to evoke hope were created by including verbal expressions of the four cognitive appraisals

(i.e., importance, goal congruence, positive future expectation, and possibility). This approach assumes that exposure to such contents will trigger the intended appraisals. Although Chadwick (2010, 2015) avoided defining a hope-evoking message based on whether it arouses hope, the assumption that including contents about an appraisal would trigger the intended appraisal still leads to defining a message content based on its effects. Chadwick (2010, 2015) was correct in attempting to use communication to promote cognitive (re)appraisals of the future outcome, but identifying intrinsic message features can provide better guidance for designing effective messages. In this dissertation, I propose three message features, proximity cue, imagination prompt, and recommended-actions information, and argue as to why they should evoke hope.

*Extending personal appraisals to neighborhood appraisals.* In the TPH, Chadwick (2015) assumes that a person appraises the person-environment relationship as an independent individual. The four cognitive appraisals causing the discrete emotion of hope are about the person, and the person alone. If four appraisals in the TPH (Chadwick, 2015) were extended to a neighborhood context, people would need to appraise a future outcome for the “neighborhood” as important, goal congruent, better than the current situation, and possible to be achieved. I believe that the four individual-based appraisals can be extended to neighborhood-based appraisals.

According to intergroup emotions theory (Mackie, Maitner, & E. R. Smith, 2009), people can experience emotions even when they have a social group as a reference point to appraise the consequences of an event. In other words, people experience emotions from an event that does not directly affect them, if the event benefits or harms the group or fellow ingroup members. One mechanism that facilitates this process is the extent to which individuals identify with a social group (Mackie, Silver, & E. R. Smith, 2004). High

identifiers (vs. low identifiers) are more likely to think about themselves in terms of group membership and adopt the beliefs, attitudes, and behaviors representative of the group (E. R. Smith, Seger, & Mackie, 2007; Tajfel, 1981). In this dissertation, I focus on a neighborhood as one specific group with which people identify. Drawing from intergroup emotions theory (Mackie et al., 2009), I presume that neighborhood issues will be perceived as relevant, thus important, for residents as long as they identify with the neighborhood.

Identification has implications for goal congruence, future expectations, and possibility appraisals as well. When people identify with a group, they “tend to respond to goals that advance that group as a whole” (Wegge & Alexander Haslam, 2003, p. 52). Thus, for residents who identify with their neighborhood, goal congruence of the future outcome can be appraised as to whether the future outcome facilitates the neighborhood’s goals. Likewise, future expectation, or whether the expected future outcome is “becoming more or less goal congruent” (Lazarus, 1991, p. 150), can be appraised based on the congruence between the potential future and the neighborhood’s goals. People can have a positive future expectation when the future is expected to be better for the neighborhood. Possibility concerns whether the future is predetermined or not, and both personal and neighborhood outcomes can be perceived as uncertain but possible. I expect that residents can feel hope about their neighborhood through the four appraisals associated with hope, just with a social orientation to those appraisals.

*(Re-) Examining efficacy.* Both TPH (Chadwick, 2015) and CIT (Kim & Ball-Rokeach, 2006a) include efficacy beliefs as resources for promotive actions, but the conceptualizations of efficacy differ between the two theories. Developed in the context of individual behavior change, TPH (Chadwick, 2015) focuses on confidence in one’s own capability to perform a behavior (i.e., self-efficacy). Developed in the context of civic

engagement, CIT (Kim & Ball-Rokeach, 2006a), on the other hand, addresses confidence in the collective's capability to mobilize neighborhood problem-solving act (i.e., collective efficacy). Integrating the two theories requires replacing self-efficacy proposed in TPH with collective efficacy to address the situation in which a desired future outcome is achieved through many individuals' efforts.

Health communication often targets health goals that individuals can complete through personal behavior change (e.g., Fishbein & Ajzen, 1975). When a desired future outcome is specific to personal goal achievement and therefore, expected to be achieved through personal efforts, self-efficacy—the perception of whether and how one can manage the situation—is relevant. Preventing skin cancer by wearing sunscreen (Nabi & Myrick, 2018) or keeping one's body in shape through regular exercise (Kim, Chung, & So, 2019) are examples of personal goals achieved through individual behavior change. Following this general trend, the TPH (Chadwick, 2015) suggests that hope appeals have their greatest potential for motivating action to achieve a personal goal when people perceive a high level of self-efficacy because efficacy encourages people to move more assertively on their hope-motivated action tendencies.

Yet, in many cases, achieving the desired future outcome is not entirely up to an individual (Laverack, 2012; Wilkin, 2013). For example, neighborhood effects on health have been well documented (Diez-Roux, 2001; Kawachi & Berkman, 2003). Numerous studies especially in the fields of geography, spatial demography, and epidemiology have attested to how features of geographical units, such as poverty or crime rate, or ethnic heterogeneity in census tracts, influence residents of the area (e.g., Browning & Cagney, 2002; Sampson, Morenoff, & Earls, 1999). These studies have emphasized the importance of collective efforts (e.g., getting vaccinated for herd immunity; R. M. Anderson & May, 1985, or promoting

healthy lifestyles for local communities through community gardens; Teig et al., 2009) to improve health for residents who live in the same neighborhood. When the future outcome people seek is “achievable only through interdependent efforts” (Bandura, 2006, p. 316), such as the case of improving neighborhood health conditions, people should consider the capacity of the collective.

One problem of posing collective efficacy as one of the main variables in the model is that there exist two different lineages in conceptualizing this construct: (a) confidence in the collective’s capability to achieve a particular goal (Bandura, 1986, 2000) and (b) perceived willingness of others’ in intervening for the common good that grounds in social cohesion and trust (Sampson et al., 1997). On the one hand, Bandura (1986) defines collective efficacy as beliefs that the collective “can solve their problems and improve their lives through concerted effort” (p. 449). Collective efficacy, in this sense, involves judgments about the “group’s capabilities to make decisions, to enlist supporters and resources, to devise and carry out appropriate strategies, and to withstand failures and reprisals” (Bandura, 1986, p. 451). Bandura (1986, 2000) and researchers who employed this definition are interested in efficacy beliefs that are specific to a particular task. Accordingly, scholars following this tradition measure collective efficacy beliefs by asking participants to rate how certain they are that their group can attain a specific goal (Bandura, 2006). In the TPH, Chadwick’s (2015) conceptualization of self-efficacy as the confidence to perform a specific behavior aligns with this line of work but just with a different agent (i.e., the self vs. the collective).

On the other hand, in Sampson et al.’s (1997) seminal article, collective efficacy was defined as the informal social control used by individuals to control group-level processes and visible signs of social disorder. Specifically, collective efficacy in this tradition is understood as a combination of the “willingness of local residents to intervene for the

common good,” (i.e., informal social control; Sampson et al., 1997, p. 919) and “social cohesion and trust” (p. 920). Researchers who employed this conceptualization have been inconsistent in treating the two constructs (i.e., *informal social control*, and *social cohesion and trust*) in empirical studies. For instance, Sampson et al. (1997) combined the two constructs into a summary measure because (a) informal social control was expected to be enhanced under conditions of solidarity and mutual trust and (b) the two constructs (i.e., informal social control and social cohesion and trust) were, in fact, closely associated ( $r = 0.80$ ). In the CIT, Kim and Ball-Rokeach (2006a) employed Sampson et al.’s (1997) definition of collective efficacy. That said, empirical studies of CIT have adopted different approaches, including measuring only the dimension of informal social control (e.g., Kim & Ball-Rokeach, 2006b; Matsaganis & Wilkin, 2015), and considering informal social control and social cohesion and trust as two distinct dimensions of collective efficacy (e.g., Kim & Shin, 2016; Kim, Shin, et al., 2019).

In this dissertation, I investigate the situation in which a desired future outcome is achieved through neighbors’ efforts, and thus, focus on the role of collective efficacy rather than self-efficacy. In doing so, I follow Bandura’s (2000) conceptualization of collective efficacy, which emphasizes the collective’s capability to bring about a desired outcome.

***Examining the role of hope and collective efficacy.*** The role of hope and collective efficacy can be a challenging issue to address in integrating the two theories. While being the primary construct in the TPH (Chadwick, 2015), hope is not included in the CIT (Kim & Ball-Rokeach, 2006a). Efficacy beliefs are discussed as resources for promotive actions in both theories, but efficacy is not central to theoretical predictions or empirical testing of the TPH (Chadwick, 2015). These challenges, of course, are mainly because the goals of the two theories were not the same as the model of health activism proposed in this study. My

resolution is to locate both hope and collective efficacy as main predictors in the model and explain the complementary processes of the two constructs in the neighborhood problem-solving processes.

In the model of health activism, I include both hope and collective efficacy as independent predictors of health activism. According to discrete emotions theorists (e.g., Frijda, 1986; Lazarus, 1991), action tendency of discrete emotions would lead to behaviors independent of one's efficacy perceptions. This is in line with the theorization of hope appeals that message-evoked hope alone should motivate behaviors that can take advantage of opportunities to achieve a desired outcome (Chadwick, 2015). In the context of collective action, several studies have similarly suggested that hope and collective efficacy are two closely related, but distinct constructs (e.g., Cohen-Chen & van Zomeren, 2018; Hart & Feldman, 2016; van Zomeren, Pauls, & Cohen-Chen, 2019; Wlodarczyk, Basabe, Páez, Zumeta, 2017). Wlodarczyk et al. (2017) propounded one helpful way to explain the relationship as well as difference between collective efficacy and hope. Whereas hope relates to the belief that the goals "will" be achieved in the future, collective efficacy focuses on the belief that certain goals "can" be achieved, (Wlodarczyk et al., 2017, p. 206). In light of the theorization that posits hope and collective efficacy as two distinct constructs, I propose that hope and collective efficacy can motivate people to pursue a better future outcome by respectively leading people to imagine a better future and believe that they have the capacity to make it happen.

***Health activism as an outcome variable.*** Both TPH and CIT define their outcome variables in ways that fit with the outcome of interest in this dissertation: health activism (i.e., a form of health communication that aims to challenge the existing order such as norms, social structures, and policies that impede health promotion; Zoller, 2005). Although the term

activists may indicate only the individuals with high commitment who “demonstrate relentless dedication, and contribute a sustained effort” (Bobel, 2007, p. 147), I adopt a broad and inclusive definition of activists. Thus, any resident who cares enough about a neighborhood issue and is willing and able to exert “small-scale, individual-level efforts, such as spreading a message by word of mouth” (Bobel, 2007, p. 155), can be an agent of health activism.

Health activism can be a means to pursue a better future, which is tied to the action tendency of hope. By discussing goals, barriers, and prospects to achieve a desired outcome for the neighborhood with other residents, people can “capitalize on the opportunity and achieve the desired future outcome” (Chadwick, 2015, p. 600). Health activism is also a type of civic participation as defined in CIT (E. L. Cohen et al., 2002; Kim & Ball-Rokeach, 2006a; Matsaganis, 2015) because it is a way for residents to invest in the neighborhood problem-solving processes. Communication can be a process by which communities collectively develop adaptive capacities (Buzzanell, 2010; Houston, 2018) and positive community attributes (e.g., community resilience and social capital; Matsaganis, 2015; Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008; Spialek, Czapinski, & Houston, 2016). In this sense, the two theories have the potential to serve as useful frameworks for answering the inquiry of what motivates health activism.

To contextualize this discussion, consider the example of eliminating the risks of lead exposure in the neighborhood. Individual residents can contribute to achieving this goal by carrying out actions such as properly disposing of harmful materials (e.g., lead-containing paint, toys, and jewelry) so that they do not end up contaminating groundwater. Residents can also urge politicians to implement stricter regulations for lead exposure. Some residents may take these actions without necessarily questioning the effectiveness of personal contribution.

They may do so for different reasons including strong environmental ethics (e.g., van Zomeren, Postmes, & Spears, 2012), habitual behaviors (Ajzen, 2002; Lavelle, Rau, & Fahy, 2015), or a sense of urge that any change needs to start from an individual action (e.g., van Zomeren, Saguy, & Schellhaas, 2013). Other residents, however, may want to seek ways that they can mobilize their neighbors' efforts, which could eventually bring about more substantial outcomes. In case a resident wants other neighbors to join neighborhood problem-solving processes, she would need to communicate such desire to them. Yet, we know little about this communication behavior that can mobilize collective actions and resources of the community.

These communication efforts, or health activism, may take various forms ranging from disseminating useful information, sharing hopeful feelings, and persuading other people to engage in action. For instance, residents may attempt to initiate conversations to make other neighbors think about the neighborhood problems and ways to address the problem. They may encourage others to perceive greater confidence in their neighbors' collective capacity, to appraise the situation positively, or to feel hopeful about solving the problem. Given that conversations among neighbors increasingly entail community-oriented social media platforms such as a private Facebook page or neighborhood-based apps like Nextdoor (Afzalan & Evans-Cowley, 2015; Johnson & Haleboua, 2014), online health activism might also facilitate critical aspects of problem-solving. Specifically, people can utilize community-oriented social media to gauge their neighbors' interests in a health issue, seek and share information about common health concerns, and mobilize resources to address those concerns (Johnson & Haleboua, 2014; Vicari & Cappi, 2016).

Through these conversations, neighbors can have a more accurate understanding of the problem, which helps them to set a clear, specific goal. Another promising outcome of

such communication efforts is making others reappraise the future outcome (Burleson & Goldsmith, 1998) by embracing a positive perspective (Gross, 2015; Zaki & Williams, 2013) and imagining a better future (Barge, 2003). Moreover, these conversations can make others hopeful (Rimé, 2007) and be motivated to engage in recommended behaviors (Kam & Merolla, 2018; Lazarus, 1999; Merolla & Kam, 2018).

Before discussing predictors of health activism, I now turn to review the previous studies that attempted to create hope through communication. Acknowledging the insights previous studies provide, but at the same time recognizing that most of them were not attentive to the distinctive features and implications neighborhood (vs. personal) issues might have, I discuss why and how previous knowledge can be extended to design a message that evokes hope about a neighborhood issue.

### **Creating Hope about a Neighborhood Issue through Communication**

Following the discrete-emotions perspective (Lazarus, 1991), TPH contends that messages to evoke hope should contain contents that can induce appraisals about the relevance of the issue, positive expectations about the future, and the possibility of achieving a desired future outcome (Chadwick, 2015). Although little attention has been paid to communicatively inducing cognitive appraisals that constitute hope, the idea that people can make others feel hope through communication is not new. Indeed, given that communication can prompt and facilitate cognitive (re)appraisals (Burleson & Goldsmith, 1998; Jones & Wirtz, 2006; Kam & Merolla, 2018), it is reasonable to expect that hope-evoking cognitive appraisals can be triggered through communication. For instance, several studies have looked at how hope-inducing interventions in the clinical settings adopted communication-based strategies. Hope-inducing interventions often employed a discussion group format where participants were encouraged to talk about the possibility of a better future (Rustøen &

Hanestad, 1998), articulate a concrete future goal (Tollett & Thomas, 1995), discuss possible ways to achieve a future goal (Retnowati, Ramadiyanti, Suciati, Sokang, & Viola, 2015), and develop action plans to achieve the goal (Tollett & Thomas, 1995). In other clinical studies that focused on caregivers' communication with a person living with a disease, emphasizing positive aspects (Herth, 1993), instilling fighting spirit (Clayton, Butow, Arnold, & Tattersall, 2005), and providing inspirational messages (Wilson et al., 2010) were proposed as ways to create and sustain feelings of hope. As participants in clinical studies were exposed to multiple hope-inducing messages over extended periods of time, examining the influence of specific message features in these studies remains challenging. Additionally, most of the clinical studies assessed patients' hope with measures that are developed for use in clinical settings such as Herth Hope Index (Herth, 1992) and Miller Hope Scale (Miller & Powers, 1988), which do not entirely correspond with a discrete emotion of hope.

Qualitative case studies have illustrated how communication strategies created feelings of hope in a particular context. For example, Tracy and Huffman (2016) examined how communication can generate hope when someone is resistant and violent, such as the case of a would-be school shooter. The analysis of the real-time conversation between the persuader and a would-be school shooter (i.e., sufferer) revealed that validating the sufferer's point of view that the current situation could be perceived as negative is an important first step. The persuader then highlighted the sufferer's ability to overcome the adversity and followed up with an alternative hopeful future. Throughout the conversation, the persuader employed positive intensity in the language (i.e., pitch changes or use of words that show affiliation or positive emotion; Tracy & Huffman, 2016), which helped evoke hope.

Communication could create hope in a larger context, such as in community-building efforts (Barge, 2003; Browne, 2002). Analyses of a community-building organization, Imagine

Chicago's projects suggest that the central practice to generate hope is to develop "positive communication frameworks" (Barge, 2003, p.63). Some of the major ways community builders can create positive communication frameworks include highlighting the strength of the community, imparting a vision toward a better shared future, inspiring community members' imaginative abilities, and emphasizing practical actions community members can take to make the community better (Barge, 2003; Browne, 2002). Although the goal of qualitative case studies is an in-depth understanding of a particular situation, common findings from these studies indicate that helping people imagine the possibility of a better future enables them to embrace more positive perspectives about the current situation and the future, which allow them to experience hope.

In a separate line of research into persuasive messages, researchers (Chadwick, 2015, 2017; Feldman & Hart, 2016; Nabi & Myrick 2018; Prestin, 2013) have attempted to elicit hopeful feelings through messages that reflect the appraisals associated with hope (Lazarus, 1991, 1999). For example, Chadwick (2015) investigated whether exposure to verbalization of relevant cognitive appraisals—appraising a future as important, favorable to achieve one's goals, positive than now, and uncertain but possible to attain-- caused people to experience hope. In a study that tested a hope appeal in the context of climate protection, Chadwick (2015) examined the effect of each appraisal component on hope; message components of goal congruence,  $r(243) = .20, p < .01$ , and possibility,  $r(243) = .17, p < .01$ , had significant medium-sized effects on hope; however, message components of importance  $r(243) = .14, p = .07$ , and future expectation  $r(243) = .10, p < .08$ , did not achieve statistical significance. In Chadwick et al. (2016), a hope appeal that emphasized four appraisals (i.e., importance, goal congruence, future expectation, and possibility) about a successful future job interview induced significantly higher hope than the control messages,  $r(125) = .49, p < .001$ .

Underdog narrative is another message feature that can evoke hope (Prestin, 2013). In Prestin (2013), messages with an underdog narrative that (a) included likeable main character, (b) presented struggles of the main character to achieve their goals against unfavorable circumstances, and (c) resulted in the successful goal achievement through persistent efforts was proposed as eliciting hopeful feelings. Underdog narrative generated significantly higher hope,  $r(246) = .62, p < .001$ , than messages that intended to generate other positive emotions (i.e., amusement and calmness) and no message exposure. Findings from the persuasion literature demonstrate that messages that closely reflect the core relational theme of hope (i.e., yearning for a positive outcome against the odds; Lazarus, 1991) have a unique effect on hope.

In several other studies, efficacy information has been suggested as evoking hope (e.g., Nabi, 2002, Nabi & Myrick, 2019; Feldman & Hart, 2016). Nabi and Myrick (2018), for instance, found that both self-efficacy (i.e., beliefs in one's ability to carry out behaviors;  $r(336) = .11, p < .05$ , in Study 1 and  $r(366) = .21, p < .001$ , in Study 2) and response efficacy (i.e., beliefs in the effectiveness of a proposed behavior to achieve a goal;  $r(336) = .13, p < .05$ , assessed only in Study 1) positively correlated with hope, suggesting that messages with these components may create hope. In an experimental study, Feldman and Hart (2016a) demonstrated that messages with different types of efficacy information that ranges from self-efficacy in the political sphere to elected officials' efficacy to respond to public opinion and response efficacy of the public policy all induced significantly higher hope,  $r(423) = .24, p < .001$ , than the message with no efficacy information. Although messages without efficacy information have successfully induced hope in some studies (e.g., Chadwick, 2015; Chadwick et al., 2016; Prestin, 2013), presenting efficacy information that is relevant to the context may be a critical way to boost hope for a better future.

In summary, messages that evoke hope need to contain contents that address the relevance of the issue, positive expectation about the future, and possibility of achieving a desired future outcome. To extend these predictions into evoking hope about a neighborhood issue, three main characteristics of a neighborhood issue should be considered. First, a neighborhood issue affects multiple residents in the neighborhood, but does not affect everyone equally. To elicit hope for a better neighborhood future, a message should thus lead a person to perceive an issue as relevant even if its influence on oneself is negligible. Second, the causes of a neighborhood issue are beyond a single individual's controllability and likely rooted in social structures like public infrastructures. Accordingly, a message that evokes hope about a neighborhood issue should help individuals envision a future with improved social structures and status quo for a given group, such as a society, community, or neighborhood. The last feature of a neighborhood issue is that it requires more than a single individual's efforts to be resolved. A message that helps people experience hope about a better future of the neighborhood should assure that neighbors, as a collective, are capable of improving the current state of affairs. In light of the challenges to evoke hope about a neighborhood issue, I propose three message features, proximity cue, imagination prompt, and recommended-actions information, and argue as to why they should evoke hope. To contextualize this discussion, I now turn to provide an overview of the issue of focus in this dissertation.

### **Problem Statement: Lead Contamination**

Lead is a metal that occurs naturally in the earth's crust, but human activity has caused it to become more widespread (EPA, 2019a). As a cumulative toxicant, even small amounts of lead can cause serious health problems (EPA, 2019a). Young children are particularly vulnerable to toxic effects of lead, which could result in damage to the brain and

nervous system (CDC, 2005, 2019). Adults may also suffer from long-term harmful effects of lead such as the increased risk of high blood pressure and damage to the brain and kidneys, which may lead to death (CDC, 2019). Because lead accumulates in the body and there is no known level of lead exposure that is considered safe, it is recommended that all sources of lead be controlled or eliminated to prevent lead poisoning (CDC, 2005, 2019; WHO, 2018).

Lead can be found in all parts of the environment. Lead-based paint and lead-contaminated dust are the most widespread sources of lead exposure in the United States (CDC, 2019). As lead-based paint was banned for residential use in 1978, homes built in the U.S. before 1978 are likely to have lead-based paint (CDC, 2019). Deposits from leaded gasoline use and industrial sources may contaminate soil. People can be exposed to lead when they breathe lead-contaminated soil particles or consume fruits and vegetables grown in or near lead-contaminated soil (CDC, 2019; Mielke & Reagan, 1998). Lead enters into drinking water when service lines, pipes in a house, and other plumbing fixtures or solder that contain lead corrode (CDC, 2013; Triantafyllidou & Edwards, 2012). Unlike many other drinking water contaminants, lead is usually not present in the drinking water source, but rather results from the distribution system or on-site plumbing itself. Lead can also get into the air from many factors including leaded gasoline or lead aviation fuel, metals processing, and waste incinerators (EPA, 2017). Furthermore, consumer products imported from other countries or produced in the U.S. before the ban may contain lead. These products range from plastic toys, jewelry, cosmetics, medicines, and even food such as certain spices and candies (Gorospe & Gerstenberger, 2008).

Public concern toward the dangers of lead exposure has rapidly increased since the lead poisoning crisis of 2014 in Flint, Michigan. Briefly, due to insufficient water treatment after the change of water source of the town, lead leached from water pipes into the drinking

water, exposing over 140,000 residents to elevated lead levels (Hanna-Attisha, LaChance, Sadler, & Champney Schnepf, 2016; Ruckart et al., 2019). Even after five years since the crisis, the city is in the process of rectifying the issue, replacing the water supply infrastructure (Ruckart et al., 2019). Indeed, lead contamination is still a public health threat in many other areas of the United States. Pennsylvania is certainly one of the states with alarming lead levels, with eighteen PA cities tested higher than Flint for elevated blood lead levels; growing evidence indicates a possible broader statewide lead problem (Clean Water Acton, 2019; Jarret & Sepp, 2017). The Pennsylvania Department of Health (2014) reported that the primary source for lead exposure in Pennsylvania is aging, deteriorating lead-based paint chips and dust. Pennsylvania ranks third in the nation for having the most housing units identified as having been built before 1950 when lead was more prevalent (U.S. Census Bureau, 2010), and fourth in the nation for housing units identified as having been built before 1978 (Pennsylvania Department of Health, 2014).

I test the theorized model with the issue of lead exposure risks in Pennsylvania because it meets the three criteria of a neighborhood issue as defined in this study. First, a neighborhood issue affects multiple members of society, but it may not affect every resident in the same manner. Even though the sources of lead exposure are related to the environmental factors (e.g., water, soil, and air) that neighbors inevitably share with one another, the potential impacts of lead exposure on individual residents vary. Residents who live in a high-risk neighborhood could be just fine if they live in a brand new house whereas residents living in a low-risk neighborhood could still be exposed to alarming levels of lead due to specific issues with water service lines that connect their homes with the water main. Second, the causes of a neighborhood issue are beyond a single individual's controllability and likely rooted in the social system. Neighborhoods' risk of lead exposure meets this

second criterion because it is based on the shared infrastructure such as water supply systems in the area and lead-contamination at public places like parks, playgrounds, and libraries. Third, fundamental solutions to a neighborhood issue involve changes to the social structure and policy-level interventions, which require civic engagement. A fundamental solution to eliminating lead in drinking water is not to encourage individuals to drink bottled water but to establish and maintain water supply infrastructures that are safe from lead (EPA, 2019b; Ruckart et al., 2019). Likewise, while individuals can avoid bringing lead-contaminated soil particles to their homes by taking off shoes at the door, more fundamental solutions relate to enforcing regulations that strengthen the standards against lead hazards (EPA, 2019c; Ettinger, Leonard, Mason, 2019). At the very least, individuals need to support infrastructure construction for the sake of a better neighborhood future, despite the possible personal inconvenience. Oftentimes, policy changes are achieved when individuals mobilize collective efforts and appeal to the policymakers as a group. The fact that addressing the root causes of lead exposure entails social structural changes and civic engagement renders this neighborhood issue a suitable target to tackle with health activism.

Moreover, lead exposure risks in Pennsylvania fit with the assumptions and exist within the boundary conditions of the two central theories of this dissertation. Based on the TPH (Chadwick, 2015), the issue needs to present a certain level of possibility to be solved, but not with certainty so that people can feel hope about the future. If eliminating lead exposure in the neighborhood is perceived as impossible, a feeling of hope is not likely. If, however, the desired future outcome is expected to be achieved with certainty, people are more likely to feel relief and happiness, rather than hope (Chadwick, 2015; Lazarus, 1991). The state of Pennsylvania is expected to have place-based neighborhoods with varied

communication infrastructure, and thus could be an ideal region to test the predictions in the CIT (Kim & Ball-Rokeach, 2006a).

### **Proposed Model of Health Activism**

In this section, I describe the proposed model of health activism (see Figure 1), which includes how cognitive responses to a health message and neighborhood communication features result in feelings of hope and the internalization of a neighborhood's storytelling network, which in turn, motivate residents' health activism. Before I explain the predictions included in the model, I first explicate message features that are expected to evoke hope in the context of eliminating the risk of lead exposure in Pennsylvania. I then provide a detailed discussion on the model of health activism with its testable hypotheses in this study context.

**Message cues to evoke hope.** Considering the challenges presented by unique aspects of a neighborhood issue, I propose three message features (i.e., proximity cue, imagination prompt, and recommended-actions information) to evoke hope in the context of eliminating lead exposure risks in neighborhoods.

**Proximity cue.** The first message choice is a proximity cue. Although proximity is a multifaceted concept that includes several dimensions such as time and social closeness, this study confines a proximity cue to the extent to which an issue is geographically proximate to one's neighborhood. Studies have shown that geographical proximity to the threat of infectious diseases (e.g., Diggory, 1956; Shih, Wijaya, & Brossard, 2008), hazardous substance (e.g., Severtson & Burt, 2012), and areas with frequent natural disasters (e.g., Lujala, Lein, & Rød, 2015; Spence, Poortinga, & Pidgeon, 2012) leads people to perceive the threat as highly relevant to them. As with these cases, the risk of lead exposure is a place-based health issue and provides an opportunity for including information about the comparative geographical proximity to the risk.

In previous studies, a message that addressed personal health issues emphasized the issue relevance by highlighting the possible impact of the issue on ones' own health and well-being (Chadwick, 2015; Nabi & Myrick, 2018). One example is a message that aims to prompt perceived susceptibility to the risk by presenting information about individuals' own chances of experiencing the threat (Nabi & Myrick, 2018; Witte, 1992). A message content to increase perceived proximity is distinct from that increases susceptibility because it provides information about the relevance of lead exposure in one's neighborhood instead of one's own chances of experiencing the threat. Unlike risks that individuals with similar proximity to the issue are likely to have similar susceptibility to the risk (e.g., infectious disease and natural hazards), susceptibility to lead exposure can vary to a great extent even to residents within the same neighborhood. A person who lives in a neighborhood with high risks of lead exposure could be almost entirely safe from lead poisoning exposure if she has taken preventive measures, such as living in a house that did not use lead-based paint, drinking only filtered water, and frequently washing hands (CDC, 2019b). The proximity cue, thus, aims to inform individuals of the relevance of lead exposure in one's neighborhood, rather than making them perceive their own chances of experiencing exposure as high. In other words, even if a person believes that she is not likely to suffer from lead exposure, a proximity cue can still prompt her to think about the implications of lead exposure for the neighborhood.

In the experimental message, I included a map of Pennsylvania that shows the number and percentage of children aged 0-71 months with confirmed elevated blood lead level (EBLL) by county (see Appendix D for details). Although one's sense of neighborhood might not perfectly match with the scope of the county (E. Campbell, Henly, Elliott, & Irwin, 2009; Weiss, Ompad, Galea, & Vlahov, 2007), the number and percentage of children with EBLL in one's county can facilitate an appraisal that lead contamination is a relevant issue to one's

neighborhood. Thus, the following hypothesis is posed

H1: When proximity to the issue is higher, appraisals of importance will be higher.

*Imagination prompt.* Second message content is an instruction to imagine the occurrence of a desired future outcome. Imagining can make people feel more hopeful about a future by increasing the perceived likelihood of experiencing a positive future outcome. Researchers have explained the effects of imagination with availability heuristic (Tversky & Kahneman, 1973). When imagining a specific future outcome, it could form a mental image of that outcome, allowing the same image to be reconstructed more easily. At the same time, once a future is conceived in one way through imagination, a mental image of a particular future outcome limits the ability to picture the future in alternative ways (Bruner & Potter, 1964; Gregory, Cialdini, & Carpenter, 1982). Regarding the neighborhood's risks of lead exposure, imagining a better future for the neighborhood can make the desired future cognitively available, and thus be perceived as more likely to happen (Carroll, 1978; Sherman, Cialdini, Schwartzman, & Reynolds, 1985; Tversky & Kahneman, 1973).

Imagination prompt is similar with a message that addresses both the positive future expectation (e.g., "Protecting the climate will make the future much better," Chadwick, 2010, p. 445) and possibility (e.g., "It is very likely that we can make the climate better," Chadwick, 2010, p. 445) in that these message choices are expected to help people form a mental image about a desired future. Yet, the imagination prompt explicitly asks individuals to imagine a better future. Although a simple instruction to imagine a future outcome has shown to increase the perceived likelihood of that event (Carroll, 1978; Fanning, 1994; Peale, 1982), providing vivid descriptions of "what can be better" makes it even easier for people to visualize a future (Taylor, Pham, Rivkin, & Armor, 1998). Hence, I presented the following instruction that asks people to visualize a concrete future of the neighborhood that is

completely free from lead exposure: “Imagine a better future where your neighborhood is completely free from the risks of lead exposure. Imagine that all residents become healthier, more kids play in the neighborhood, and water anywhere from your neighborhood becomes safe to drink. Think about how the daily lives of residents in your neighborhood will be changed and try to visualize a better future in your mind.”

When a person becomes capable of turning a vague future expectation into a more concrete future scenario of how eliminating risks of lead exposure can affect one’s neighborhood, the future can be perceived as more relevant. In a similar sense, active imagination of a desired future outcome can make it easier for a person to appraise whether or not the future will help them achieve the goals of the neighborhood, which in this case are improved neighborhood health condition, safe environment for kids, and better quality drinking water. With the instruction for imagination that includes vivid descriptions of what exactly would be better when the risks of lead exposure are eliminated, positive expectation toward the future is likely to be increased as well. Interestingly, previous studies have demonstrated that imagining a future event can enhance the perceived likelihood of the event as well by making the imagined outcome more cognitively available (e.g., Carroll, 1978; Gregory et al., 1982; Sherman et al., 1985). Considering the influence of imagination on cognitive appraisals, the following hypothesis is posed:

H2: When an instruction for imagining a desired future is presented (vs. absent) in the message, appraisals for (a) importance, (b) goal congruence, (c) positive future expectation, and (d) possibility of achieving a desired future outcome will be stronger.

The four cognitive appraisals (i.e., importance, goal congruence, positive future expectation, and possibility) are expected to evoke a feeling of hope (Chadwick, 2015; Lazarus, 1991). When someone appraises a future where the risk of lead exposure is

eliminated as important for one's neighborhood, helps achieve goals of the neighborhood, better than the neighborhood's current circumstances, and possible to be achieved with a degree of uncertainty, s/he would feel hope about a better neighborhood future.

H3: Higher appraisals of (a) importance, (b) goal congruence, (c) positive future expectation, and (d) possibility will predict a stronger subjective feeling of hope.

***Recommended-actions information.*** A third message content to evoke hope is information about recommended actions to address the issue. Presenting the recommended actions that are viable and effective to address the issue has been widely used as a way to induce relevant efficacy perceptions (e.g., Nabi & Myrick, 2018; Turner, Rimaly, Morrison, & Kim, 2006). Efficacy perceptions, then, allow a person to perceive that there are things that can be done to improve the current situation (Nabi & Myrick, 2018). This very perception that a better future is possible is what characterizes hope (Lazarus, 1991, 1999). Related to these lines of thought, several studies have shown the positive relationships between efficacy perceptions and hope (e.g., Feldman & Hart, 2016; Nabi & Myrick, 2018; Włodarczyk et al., 2017).

In this study, I extend the idea that efficacy information can generate hope to make people experience hope about a better neighborhood future. When addressing an issue that needs many individuals' efforts to be resolved, people should consider collective efficacy (i.e., confidence in the collective's power to produce desired results; Bandura, 2000).

Because eliminating lead exposure risks in the neighborhood requires many of the residents' engagement in collective efforts, individuals will consider neighbors' capability to estimate the likelihood of achieving this goal. Messages, then, need to include information about what neighbors can do to effectively eliminate lead exposure risks to increase hope about a better future for the neighborhood.

In the experimental message, I first highlighted that neighbors have the capability to make a better future for all (e.g., “Keep in mind that collective efforts can bring about a better future for the neighborhood!). I then presented information about the behaviors that are recommended as ways to eliminate the risks of lead exposure in the neighborhood. Specifically, two different behaviors are suggested as something neighbors can do to eliminate the risk of lead exposure in the area: (a) “As neighbors, we can run the water for a few minutes before using it for drinking or cooking to effectively avoid lead in drinking water” and (b) “As neighbors, we can contact the elected officials in our area to request a test for lead in tap water of public facilities in the neighborhood such as schools, libraries, and community gyms, and funding for lead abatement activities as well as replacement of the water service lines in the neighborhood.” I propose that recommended-actions information prompts cognitive appraisals of collective efficacy, which in turn, would lead to a stronger subjective feeling of hope.

H4: When information about recommended actions is presented (vs. absent), collective efficacy will be stronger.

H5: Collective efficacy will predict a stronger subjective feeling of hope.

**Internalizing neighborhood stories.** A neighborhood storytelling network plays a central role in motivating civic participation (Kim & Ball-Rokeach, 2006a). Neighborhood storytelling includes “discourses about who the community members are—their identities, desires, and shared lived experiences, what their most important opportunities, obstacles, and issues are, and what/how they should do to address them” (Kim & Ball-Rokeach, 2006a, p. 177). By connecting to a neighborhood storytelling network, residents can internalize local stories in their lives. Residents who are more attuned to neighborhood stories, thus, are likely to have a higher sense of collective efficacy. In other words, the imagination of what we can

do (i.e., collective efficacy) could be a form of positive internalization of neighborhood stories (Kim & Ball-Rokeach, 2006a). In line with the CIT's predictions, I propose that engaging in everyday neighborhood storytelling will be positively related to collective efficacy.

H6: Greater perceived integration with the neighborhood storytelling network is associated with stronger perceptions of collective efficacy.

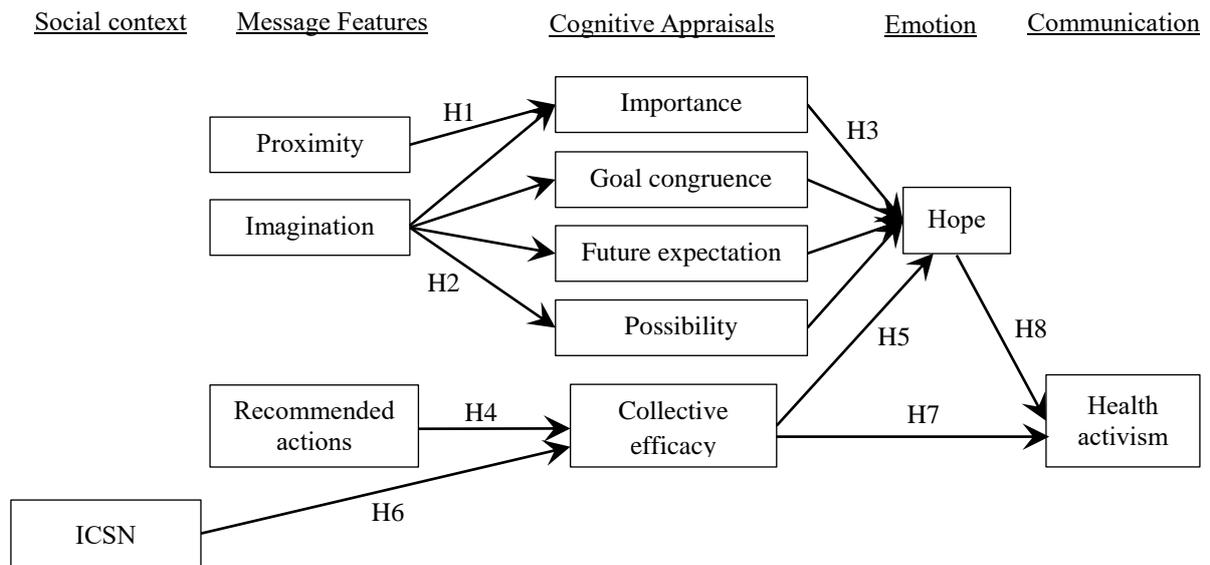
**Predicting health activism.** Drawn from well-established theories (e.g., Fishbein & Ajzen, 1975, 2010) on the relationship between one's cognitive beliefs and behaviors, the CIT proposes the direct effect of collective efficacy on civic participation (Kim & Ball-Rokeach, 2006a). Indeed, a considerable body of research has revealed that collective efficacy is a positive predictor for individuals' motivation to engage in civic participation (e.g., Cohen-Chen & van Zomeren, 2018; van Zomeren, Leach, & Spears, 2012). A meta-analysis (van Zomeren et al., 2008) also demonstrated collective efficacy to be a medium-sized predictor of collective action intentions ( $r = .36$ ) and behavior ( $r = .25$ ). In the context of this study, when being confident in neighbors' ability to collectively solve the problem, residents are likely to be motivated to participate in a neighborhood problem-solving process. As one way to address the issue, residents are expected to engage in health activism, or communication with their neighbors about the problem, plans to solve it, and expectations toward the future. Thus, I propose that residents who are confident in their neighbors' collective efficacy would exhibit high engagement intention for health activism.

H7: Stronger perceptions of collective efficacy result in greater intentions to engage in health activism.

A wide range of studies has addressed the capacity of hope for generating change. As Lazarus (1991) describes, a feeling of hope is "a wishing or yearning for a relief from a

negative situation, or from the realization of a positive outcome when the odds do not greatly favor it” (p. 282). But hope is more than a mere desire for a particular outcome; it is a desire that entails agency (McGeer, 2004). For example, hope has been described as important coping resources against despair (Good, Good, Schaffer, & Lind, 1990; Lazarus, 1999), positive motivational state that drives individuals to work toward important goals (Nabi & Myrick, 2018; Prestin, 2013), and an emotion embedded in an account of revolution and utopia (Bloch, 1986). In this sense, hope can motivate people to “galvanize efforts to seek improvement of an unsatisfactory situation” (Lazarus, 1999, p. 666) and strive to create a new and better future (Braithwaite, 2004; Webb, 2013). In addressing an unsatisfactory situation that requires collaborative efforts to be improved, hope could be a motivating force to galvanize the collective’s efforts. Specifically, in the context of addressing the neighborhood’s risks of lead exposure, a resident who feels hope can mobilize the efforts of other neighbors by engaging in health activism.

H8: Stronger feelings of hope result in greater intentions to engage in health activism.



*Figure 1.* Model of health activism

*Note.* ICSN refers to an integrated connectedness to a neighborhood storytelling network.

## CHAPTER TWO: MESSAGE EFFECTS

Study 1 was conducted to examine the direct effects of three message features—proximity cue, imagination prompt, and recommended-actions information—on hope. Given the central role hope plays in the proposed model of health activism, it is critical to assess whether the three message features evoke hope about a neighborhood issue, as intended.

The discrete-emotions perspective (e.g., Lazarus, 1991) considers emotions as the results of subjective evaluations of the environment's implications on personal well-being. To experience hope, a person needs to appraise a future outcome as important, better than the current state of affairs so that it helps attain one's goals, and uncertain but possible to achieve (Lazarus, 1991). This study investigates three message features to induce specific appraisals that are associated with feeling hope: the perceptions of (a) issue relevance, (b) positive future expectation, and (c) possibility of achieving a desired future outcome. The three message features are designed to induce hope about a neighborhood issue because the overall goal of this dissertation is to illuminate how and why hope leads people to capitalize on neighborhoods' opportunities to make a better shared future (i.e., health activism).

### Message Features

The first message feature, a proximity cue, is information about the state of being proximate in space, time, or relationship. In this study, the proximity cue is instantiated with information about the geographical proximity to the risks of lead exposure. A proximity cue is expected to make the issue seem more relevant (Swienty, Reichenbacher, Reppermund, & Zihl, 2008). For example, the level of lead exposure risk by geographical region can prompt a person to think about the relevance of risks for one's neighborhood.

The second message feature, an imagination prompt, is an instruction that asks people to imagine a better future. In this study, the imagination prompt is instantiated with instructions to imagine a better future for the neighborhood that is free from lead exposure

risk. Assuming that people comply with the instruction, as a desired future outcome becomes more cognitively available through imagination, people will perceive the positive future as being more likely to occur (Tversky & Kahneman, 1973).

The third message feature, recommended-actions information, contains a list of actions that readers can take to avoid experiencing a threat; in this case, their risk of lead exposure. Information about recommended-actions is expected to evoke hope by making people be aware of the things that can be done to improve the current situation (Lazarus, 1999; Nabi & Myrick, 2018). The perception that a better future is possible is what constitutes hope (Lazarus, 1991, 1999).

### **Social Hope**

With the ultimate aim of promoting health activism, the three message features are written to evoke hope about a neighborhood (vs. a personal) issue. If hope about a personal issue helps an individual to focus on and move toward personal goals, hope about a neighborhood issue should help people to engage in behaviors that can help achieve a better future for their neighborhood (Braithwaite, 2004; Jin & Kim, 2018). Previous studies suggest that two other emotions—inspired and encouraged—are strongly related to hope (e.g., Chadwick, 2015; Nabi & Myrick, 2018), and may, in fact, be conceptually indistinct. I thus test the influence of three message features on inspired and encouraged as well as hope.

### **Exploring Unintended Effects**

A message that is designed to evoke a certain emotion may generate other emotions. For example, fear appeals have been found to evoke other emotions such as anger, sadness, and guilt (Dabbs & Leventhal, 1966; Dillard, Plotnick, Godblod, Freimuth, & Edgar, 1996; Pinto & Priest, 1991). More recent studies (e.g., Carrera, Muñoz, & Cabellero, 2010; Nabi & Myrick, 2018) have shown that a message raising awareness of the issue followed by solutions to the issue could evoke both negative (e.g., fear, sadness, etc.) and positive (e.g.,

hope, relief, etc.) emotions. Because my goal is to promote health activism, it would be important to know if hope-inducing messages also trigger other emotions that might either facilitate or dampen civic engagement.

Anger, for instance, is an emotion that is often discussed as motivating civic engagement given its action tendency to fight against injustice (Gamson, 1992; Jasper, 1998, 2011). Moral emotions like pride and compassion may also facilitate civic engagement because such emotions entail a feeling of connection with people around them (Jasper, 2011; Tangney, Stuewig, & Mashek, 2007). Other emotions that might either facilitate or dampen civic engagement include fear, sadness, worry, disgust, and surprise. On the one hand, these emotions could offer an opportunity to mobilize against the current negative situation and change the current state of affairs (Ibrahim, Ye, & Hoffner, 2008; Rimé, Páez, Basabe, & Martínez, 2010). On the other hand, these emotions might dampen civic engagement when people choose to withdraw or stay quiet with the unsatisfactory situation (Lazarus, 1991). Additionally, happiness might dampen civic engagement because people who are happy with the current situation are less likely to exert efforts to change it. For these reasons, I explored the influence of the three message choices—proximity cue, imagination prompt, and recommended-actions information—on nine additional discrete emotions (e.g., pride, compassion, happiness, fear, anger, sadness, worry, disgust, and surprise).

## **Methods**

### **Participants**

Participants were recruited using Amazon's Mechanical Turk (MTurk). Study participation was limited to residents of Pennsylvania based on Turkers' Internal Revenue Service (IRS) records with the Amazon's payment system. Because IRS records may not represent the current residential address, participants were also asked "Are you currently living in Pennsylvania?"; those who said *yes* were invited to fill out the survey. Participants

were compensated \$4 for their time. Most participants (about 95%) completed the survey in less than 30 minutes. An average time to complete the survey was less than 15 minutes ( $M = 14.11$ ,  $SD = 7.51$ ,  $Mdn = 12.18$ ,  $Min = 5.03$ ,  $Max = 45.8$ ). Of a total of 196 participants who completed the survey, responses from three participants who took less than 5 minutes to complete the survey were eliminated from the following analyses. The final sample is  $N = 193$ .

**Demographic information.** Participants on average were 36.74 years old ( $SD = 11.27$ ,  $Mdn = 35$ ,  $Min = 18$ ,  $Max = 71$ ). A total of 101 participants (52.3%) reported that they do not have kid and others ( $n = 92$ ; 47.7%) reported having one (17.6%), two (18.7%), three (4.1%), or four or more (5.7%) children. On average, the age of youngest child was 9.60 years old ( $SD = 8.55$ ,  $Mdn = 7$ ,  $Min = 0$ ,  $Max = 42$ ). A total of 4 participants reported that their children have been identified as having elevated blood lead levels.

**County representation.** Of 67 counties in Pennsylvania, participants were from 49 counties: 28 participants were living in Allegheny County, 20 people were living in Philadelphia County, and 12 people were living in Chester County, and all the other Counties had less than 10 participants. Participants on average were 36.74 years old ( $SD = 11.27$ ,  $Mdn = 35$ ,  $Min = 18$ ,  $Max = 71$ ). Table 2.1 reports detailed demographic information of the participants and compares that with 2018 American Community Survey data for Pennsylvania (American Community Survey, 2018). Demographic characteristics of the participants generally represented those of the entire Pennsylvania residents.

Table 2. 1

*Demographics of the Sample (N = 193) and Pennsylvania Residents*

Variable	Study Participants	Pennsylvania Residents
	%	
<b>Sex</b>		
Female	52	51
<b>Ethnicity</b>		
White	82	81
Black or African American	9	11
Asian	6	3
Hispanic, Latino, or Spanish origin	5	7
American Indian or Alaska native	0.5	0.2
Native Hawaiian or Pacific Islander	1	0
<b>Education</b>		
Attended high school	1	10
Graduated high school	25	35
Associate degree	17	24
Bachelors degree	40	19
Graduate or professional degree	17	12
<b>Income</b>		
< \$20,000	9	16
\$20,000 – \$35,000	17	14
\$35,000 – \$50,000	18	13
\$50,000 – \$75,000	19	18
\$75,000 – \$100, 000	22	13
> \$100, 000	16	27

*Note.* The reported percentages add up to more than 100% because participants could select more than one option. The information in the Pennsylvania Residents column came from the American Community Survey (2018).

**Power analysis.** For 2 x 2x 2 ANOVA that examines two levels of the three message conditions, with an  $N = 193$ , power = .90, and alpha = .05, the analysis should detect an effect size of  $f = 0.23$  which, according to J. Cohen (1988), is a medium-sized effect.

**Missing data.** Across items, four participants missed one item. Missing observation for an individual on a given variable was replaced with the mean for non-missing observations for that variable (A. B. Anderson, Bailevsky, & Hum, 1983; Graham, 2009).

### Study Design and Procedures

The study was a 2 (Imagination prompt: present vs. absent) x 2 (Recommended

actions: present vs. absent) between-subjects design, with a varying degree of proximity to elevated lead exposure induced by different county-level risks presented on the map of Pennsylvania. Participants in all conditions were first asked three questions about their neighborhood: (a) the name of the neighborhood, (b) the approximate number of people living in the neighborhood, and (c) the number of neighbors they know by name. They were also asked about how long they have lived in the same neighborhood. These questions were asked to orient participants to read the message and respond to the following questions with their neighborhood in mind.

Next, participants were randomly assigned to four message conditions. This was done by adding a randomizer element to the Qualtrics' survey flow function. This let Qualtrics assign the participants to one of the four conditions through a random number generator. Before reading the message, participants were informed that the health message they were going to read was being considered for dissemination to the public and that they were asked to provide feedback on the message's content. They were also informed that the information in the message was aggregated from several scientific sources including the Centers for Disease Control and Prevention, World Health Organization, and Pennsylvania Department of Health. After reading one of the four experimental messages, participants responded to questions about their emotional responses to the message and their demographic information. At the end of the survey, an open-ended question asked participants to write down any thoughts or inquiries they had about the study.

### **Stimulus**

Participants were randomly assigned to one of four message conditions: (a) proximity cue alone, (b) proximity cue and imagination prompt, (c) proximity cue and recommended-actions information, and (d) proximity cue, imagination prompt, and recommended-actions information.

To begin, every participant saw a map of Pennsylvania that served as the proximity cue. The map presented the number and percentage of children (aged 0-71 months) tested for blood lead level (BLL) by county. The county-level data came from the 2017 childhood lead surveillance annual report published by the Pennsylvania Department of Health. Across the counties, the number of children tested for BLL per 1000 children ranged from .20 to 39.23 ( $M = 8.36$ ,  $SD = 11.68$ ,  $Mdn = 3.20$ ) while the percentage of children tested for BLL ranged from 5.75% to 31.29% ( $M = 16.45$ ,  $SD = 6.46$ ,  $Mdn = 14.12$ ). Proximity to the issue was calculated by averaging the (a) number of children tested with BLL per 1000 children and (b) percentage of children tested for BLL in the county one lives in, given the strong correlation between the two scores,  $r(191) = .89$ ,  $p < .001$ .

Participants who received the *imagination prompt* read the following instruction. “Imagine a better future where your neighborhood is completely free from the risks of lead exposure. Imagine that all residents become healthier, more kids play in the neighborhood, and water anywhere from your neighborhood becomes safe to drink. Think about how the daily lives of residents in your neighborhood will be changed and try to visualize a better future in your mind.”

Participants who received *recommended-actions information* read a description of behaviors that neighbors could take to eliminate lead exposure. The presented behaviors were recommended as ways to eliminate lead exposure by different agencies including the Clean Water Action (2019) and Centers for Disease Control and Prevention (2019b). Specifically, the message first described that neighbors have the capability to make a better future for all (e.g., “Keep in mind that collective efforts can bring about a better future for the neighborhood!). Then, the message presented information about the behaviors that can reduce lead exposure in the neighborhood (e.g., “As neighbors, we can run the water for a few minutes before using it for drinking,” and “As neighbors, we can contact the elected officials

in our area to request a test for lead in tap water of public facilities”).

The Flesch reading ease of the message that included all three message features (proximity cue, imagination prompt, and recommended-actions information) scored 43.7, and its Flesch-Kincaid grade level was 13, suggesting that the message should be easily understood by those who completed the high school education. As the imagination prompt contained 63 words and recommended-actions information had 91 words, the message with both imagination prompt and recommended-actions information had a total of 154 more words than the message that presented neither of them. There was no significant difference in the readability between the imagination prompt (Score: 52.6, grade level: 11) and recommended-actions information (Score: 49.9, grade level: 11).

## Measurement

**Emotional responses.** Participants were asked to report how the message made them feel on a 5-point Likert-type scale (1 = *none of this emotion*, 2 = *a little bit*, 3 = *somewhat*, 4 = *moderate*, 5 = *a great deal of this emotion*). A total of 12 emotions were measured with a single item for each emotion: hope ( $M = 1.87$ ,  $SD = 1.10$ ), inspired ( $M = 1.79$ ,  $SD = 1.17$ ), encouraged ( $M = 1.82$ ,  $SD = 1.08$ ), pride ( $M = 1.45$ ,  $SD = 1.02$ ), compassion ( $M = 2.52$ ,  $SD = 1.35$ ), happy ( $M = 1.44$ ,  $SD = 1.00$ ), fear ( $M = 2.64$ ,  $SD = 1.23$ ), angry ( $M = 2.50$ ,  $SD = 1.29$ ), sad ( $M = 2.69$ ,  $SD = 1.23$ ), worried ( $M = 3.11$ ,  $SD = 1.25$ ), disgust ( $M = 2.52$ ,  $SD = 1.29$ ), and surprise ( $M = 2.89$ ,  $SD = 1.20$ ).

**Induction checks for the proximity map.** After viewing the map, participants answered three items that were included to check whether the map of elevated lead exposure successfully induced variance in the perceived risk of lead exposure. The items included: “The risk of lead contamination in [the name of the county one lives in] is,” “The number of children with elevated blood lead levels in [the name of the county one lives in] is,” and “The percentage of children with elevated blood lead levels in [the name of the county one lives in]

is.” Responses were marked on a 5-point Likert-type scale, with the verbal labels later coded as 1 = *very low*, 2 = *low*, 3 = *average*, 4 = *high*, and 5 = *very high*. Responses were averaged into a composite score, with higher scores indicating greater risk perceptions ( $\alpha = .93$ ).

**Induction check for message quality.** Participants’ judgments of message quality were measured to confirm there is no unintended difference in perceived message quality between the message conditions. Five items adapted from Cacioppo, Petty, and Morris (1983) asked participants to evaluate whether the message was *persuasive*, *effective*, *credible*, *accurate*, and *clear*. Responses were marked on a 5-point Likert-type scale (1 = *strongly disagree*, 2 = *disagree*, 3 = *neither disagree nor agree*, 4 = *agree*, and 5 = *strongly agree*). Responses were averaged into a composite score, with higher scores indicating stronger message quality ( $\alpha = .80$ ).

**Demographic variables.** Participants’ age, ethnicity, sex, education, income, number, and age of children, and whether any of their children has been identified as having an elevated blood lead level were assessed at the end of the survey.

## Results

### Proximity Map: Induction Check

Although one’s sense of neighborhood might not perfectly match with the scope of the county (E. Campbell et al., 2009; Weiss et al., 2007), the number and percentage of children tested for blood lead level in one’s county should make individuals perceive lead contamination as an issue relevant to one’s neighborhood. If the map worked as intended, then participants living in counties with elevated lead exposure should report that the risk of lead exposure is higher in their county. This intention was tested with a correlation. The findings showed that participants living in counties with a higher number of children tested for blood lead levels reported higher lead exposure risk,  $r(191) = .31, p < .01$ . In addition, participants living in counties with a higher percentage of children tested with blood lead

levels reported higher lead exposure risk,  $r(191) = .34, p < .01$ . The map successfully induced intended perceptions such that the higher the number and the percentage of children tested with blood lead level in one's county, the higher lead exposure risks participants reported for their county.

### **Message Quality: Experimental Check**

On average, participants perceived the message as persuasive ( $M = 4.09, SD = .75$ ), effective ( $M = 4.27, SD = .68$ ), credible ( $M = 4.28, SD = .65$ ), accurate ( $M = 4.15, SD = .69$ ), and clear ( $M = 4.23, SD = .76$ ). To confirm that there was no unintended difference in perceived message quality between the experimental conditions, an ANOVA was conducted with perceived message quality (e.g., persuasiveness, effectiveness, credibility, accuracy, and clarity) as the dependent variable and the message condition (the four alternatives) as the independent variable. The results showed that perceived message quality did not vary by message condition,  $F(3, 189) = 1.92, p = .13, \eta^2 = .03$ . In addition, the confidence intervals for the message conditions overlapped: proximity cue alone ( $M = 4.18, SD = .52, 95\% \text{ CI } [4.03, 4.33]$ ), proximity cue and imagination prompt ( $M = 4.15, SD = .59, 95\% \text{ CI } [4.01, 4.30]$ ), proximity cue and recommended-actions information ( $M = 4.12, SD = .53, 95\% \text{ CI } [3.97, 4.27]$ ), and proximity cue, imagination prompt, and recommended-actions information ( $M = 4.35, SD = .44, 95\% \text{ CI } [4.21, 4.50]$ ). The overlapping confidence intervals indicated that differences between conditions were not statistically significant.

### **Direct Message Effects**

Three message features were investigated: proximity cue, imagination prompt, and recommended-actions information. In all three cases, more of the cue (vs. less of it or none of it) was predicted to increase hope.

Table 2. 2

*Descriptive Statistics and Correlations between Hope and Message Features (N = 193)*

Variable	<i>M</i>	<i>SD</i>	1	2	3
1. Hope	1.87	1.10			
2. Proximity cue	12.41	8.84	.01		
3. Imagination prompt	-0.01	1.00	.09	.04	
4. Recommended Actions	0.02	1.00	.17*	-.02	-.02

*Notes.* The variable for proximity cue was created by calculating the mean score for the (a) number of children tested for BLL per 1000 children and (b) percentage of children tested for BLL by county. The variables for Imagination prompt and Recommended-actions information were recoded such that 1 = presence of the message feature, -1 = absence of the message feature.

\* $p < .05$ .

The mean level of hope (see Table 2.2) did not represent a hopeful state. Measured on a 5-point scale, the mean level of hope is below 2, which indicates that participants felt “a little bit” of hope. Correlations between hope and message features appear in Table 2.2. The correlation between proximity cue and hope was very small and statistically not significant,  $r(191) = .01, p = .88$ . An independent-samples  $t$ -test revealed that a subjective feeling of hope was not significantly different between those who received ( $M = 1.97, SD = 1.15$ ) and did not receive ( $M = 1.76, SD = 1.07$ ) imagination prompt,  $t(191) = -1.29, p = .20, r = .09$ . An independent-samples  $t$ -test revealed that a subjective feeling of hope was significantly higher for those who received ( $M = 2.05, SD = 1.14$ ) than those who did not receive ( $M = 1.67, SD = 1.05$ ) the recommended-actions information,  $t(191) = -2.39, p < .05, r = .17$ . The findings suggest that proximity cue and imagination prompt did not increase hope whereas recommended-actions information did.

### **Main and Interaction Effects of Message Conditions**

To explore the main and interaction effects of message conditions, a series of 2 (low vs. high proximity cue to the issue) x 2 (presence vs. absence of imagination prompt) x 2 (presence vs. absence of recommended-actions information) analysis of variance (ANOVA) was conducted. For the analysis, a dichotomized variable for the proximity was created such

that participants were divided into either living in a county with low ( $n = 96$ ) or high ( $n = 97$ ) proximity to lead exposure. The mean level of proximity was 6.79 ( $SD = 1.28$ ) for the low proximity cue condition whereas 17.96 ( $SD = 9.60$ ) for the high proximity cue condition.

The results of ANOVA with means, standard deviations, and the sample sizes for hope by message conditions appear in Table 2.3. The main effects were consistent with the correlation and independent-samples  $t$ -tests reported earlier. None of the interactions was statistically significant at  $p < .05$ . The partial  $\eta^2$ s for the interactions were all less than .008. These findings suggest that none of the effects of message choices depend on other message choices.

Table 2. 3

*Means, Standard Deviations, and Sample Sizes for Hope by Experimental Conditions*

Recommended- actions	Imagination Prompt					
	Present			Absent		
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>
High Proximity ( $n = 97$ )						
Present	2.15	1.06	27	1.68	1.03	25
Absent	1.60	1.16	25	1.65	.93	20
Low Proximity ( $n = 96$ )						
Present	2.24	1.22	21	2.16	1.25	25
Absent	1.91	1.13	22	1.56	.97	27

*Notes.* The overall model was statistically not significant,  $F(7, 185) = 1.59, p = .14, R^2 = .06$ .

### **Influence of Message Features on Other Emotions**

To assess the potential message effects on other emotions, a series of correlations among discrete emotions and message features were examined (see Table 2.4). Hope showed strong positive correlations with inspired,  $r(191) = .66, p < .05$ , and encouraged,  $r(191) = .65, p < .01$ . Hope was also positively correlated with other positive emotions including

pride,  $r(191) = .57, p < .01$ , compassion,  $r(191) = .54, p < .01$ , and happiness,  $r(191) = .60, p < .01$ . Anger,  $r(191) = .17, p < .01$ , sadness  $r(191) = .20, p < .01$ , and surprise  $r(191) = .23, p < .01$ , showed small positive correlations with hope.

Correlations further provided a basic test of the relationship between message features and emotions. The proximity cue did not show statistically significant correlation with any of the measured emotions. The imagination prompt showed small, positive correlations with inspired,  $r(191) = .13, p < .05$ , encouraged,  $r(191) = .16, p < .05$ , pride,  $r(191) = .14, p < .05$ , happiness,  $r(191) = .15, p < .05$ , and surprise,  $r(191) = .16, p < .05$ . Recommended-actions information showed a small, positive correlation with inspired,  $r(191) = .13, p < .05$ , and encouraged,  $r(191) = .16, p < .05$ . In addition, recommended-actions information showed a small negative correlation with anger,  $r(191) = -.13, p < .05$ , sadness,  $r(191) = -.19, p < .05$ , and disgust,  $r(191) = -.27, p < .05$ .

Table 2. 4

*Correlations among the Three Message Features and Twelve Discrete Emotions (N = 193)*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Proximity	--													
2. Imagination	.04	--												
3. RecAction	-.02	-.02	--											
4. Hope	.01	.09	.17**	--										
5. Inspired	.00	.13*	.18**	.66*	--									
6. Encouraged	.05	.16*	.23**	.65**	.68**	--								
7. Pride	-.00	.14*	.04	.57**	.67**	.64**	--							
8. Compassion	.12	.11	.02	.54**	.46**	.42**	.41**	--						
9. Happy	.05	.15*	.07	.60**	.73**	.65**	.80**	.43**	--					
10. Fear	.03	-.04	-.07	.12	.13*	.07	.07	.17**	.11	--				
11. Anger	.11	.05	-.13*	.17**	.12*	.07	.23**	.27**	.19**	.66**	--			
12. Sadness	.09	-.03	-.19*	.20**	.13*	.07	.14*	.37**	.20**	.64**	.66*	--		
13. Worry	-.03	.08	-.09	.11	.13*	.09	.07	.24**	.08	.78**	.57**	.57**	--	
14. Disgust	.01	.08	-.27*	-.02	.02	-.03	.01	.14*	.00	.55**	.64**	.51**	.60**	--
15. Surprise	-.11	.16*	.04	.22**	.26**	.21**	.19**	.18**	.26**	.34**	.21**	.20**	.33**	.22**

*Notes. The variable for proximity cue was created by calculating the mean score for the (a) number of children tested for BLL per 1000 children and (b) percentage of children tested for BLL by county. The variables for Imagination prompt (Imagination) and Recommended-actions information (RecAction) were recoded such that 1 = presence of the message feature, -1 = absence of the message feature.*

*\*p < .05, \*\*p < .01.*

To completely explore possible message effects, separate ANOVAs were conducted with the other 11 discrete emotions (i.e., inspired, encouraged, pride, compassion, happiness, fear, anger, sadness, worry, disgust, and surprise) as dependent variables, and proximity cue (low vs. high), imagination prompt (absent vs. present), and recommended-actions information (absent vs. present) as independent variables. Table 2.5 shows the  $F$  values and effect sizes for each discrete emotion.

Table 2. 5

*F Values and Effect Sizes for each Emotion across Different Experimental Conditions*

		Prox	Imagine	RA	Prox x Im	Prox x RA	RA x Im	Prox x Im x RA
Inspired	$F$	1.40	3.37	5.98*	.42	.27	.01	2.45
	$\eta^2$	.01	.02	.03	.00	.00	.00	.01
Encouraged	$F$	.57	5.68*	11.36**	1.35	.20	.14	.83
	$\eta^2$	.00	.03	.06	.01	.00	.00	.00
Pride	$F$	3.16	3.96*	0.47	.40	.02	.01	.38
	$\eta^2$	.02	.02	.00	.00	.00	.00	.00
Compassion	$F$	.65	1.97	.02	.27	.01	.04	.41
	$\eta^2$	.00	.01	.00	.00	.00	.00	.00
Happiness	$F$	2.34	4.53*	.94	.00	.07	.03	.54
	$\eta^2$	.01	.20	.74	.18	.00	.40	3.79
Fear	$F$	.30	.00	.00	.00	.00	.00	.02
	$\eta^2$	.00	.00	.00	.00	.00	.00	.00
Anger	$F$	1.75	.36	3.43	.01	.40	.39	.01
	$\eta^2$	.01	.00	.02	.00	.00	.00	.00
Sadness	$F$	.40	.29	7.04**	.13	.16	1.11	.07
	$\eta^2$	.00	.00	.04	.00	.00	.01	.00
Worry	$F$	.99	1.16	1.28	.85	.20	.96	5.73*
	$\eta^2$	.01	.01	.01	.01	.00	.01	.03
Disgust	$F$	.19	.91	14.97***	.00	.05	1.53	.73
	$\eta^2$	.00	.01	.08	.00	.00	.01	.00
Surprise	$F$	.37	5.53*	.53	1.32	.66	1.93	1.38
	$\eta^2$	.00	.03	.00	.01	.00	.01	.01

*Note.* Prox refers to Proximity condition (low vs. high). Im refers to Imagination prompt condition (absence vs. presence). RA refers to Recommended-actions condition (absence vs. presence). The overall model for each emotion is as follow. For inspired,  $F(7, 185) = 2.02$ ,  $p = .06$ ,  $R^2 = .07$ . For encouraged,  $F(7, 185) = 2.89$ ,  $p < .01$ ,  $R^2 = .10$ . For pride,  $F(7, 185) = 1.14$ ,  $p = .34$ ,  $R^2 = .04$ . For compassion,  $F(7, 185) = .53$ ,  $p = .81$ ,  $R^2 = .02$ . For happiness,  $F(7, 185) = 1.16$ ,  $p = .33$ ,  $R^2 = .04$ . For fear,  $F(7, 185) = .85$ ,  $p = .55$ ,  $R^2 = .03$ . For anger,  $F(7, 185) = .90$ ,  $p = .51$ ,  $R^2 = .03$ . For sadness,  $F(7, 185) = 1.27$ ,  $p = .27$ ,  $R^2 = .05$ . For worry,

$F(7, 185) = 1.67, p = .12, R^2 = .06$ . For disgust,  $F(7, 185) = 2.61, p < .05, R^2 = .09$ . For surprise,  $F(7, 185) = 1.60, p = .14, R^2 = .06$ .  
 $*p < .05, **p < .01, ***p < .001$ .

The three message features explained the most variance in encouraged ( $R^2 = .10$ ), followed by disgust ( $R^2 = .09$ ) and inspired ( $R^2 = .07$ ). The results of a series of ANOVAs revealed that the omnibus  $F$  test was significant for these three emotions but not for other emotions. The lower (vs. higher) proximity to the issue did not have significant influence on any of the emotions. The message with (vs. without) the imagination prompt had positive influence on encouraged, pride, happiness, and surprise. The message with (vs. without) information about recommended actions had positive influence on inspired and encouraged but negative influence on sadness and disgust. There was no main or interaction effect of message features on compassion, fear, and anger. In the next paragraphs, I provide details about the significant main and interaction effects message features had on the following emotions: inspired, encouraged, pride, happiness, sadness, and worried.

For inspired, there was a main effect for the recommended-actions information. Inspired was higher when recommended actions were included in the message ( $M = 1.99, SE = 0.12, 95\% CI [2.22, 1.76]$ ) rather than absent from it ( $M = 1.58, SE = 0.12, 95\% CI [1.81, 1.34]$ ).

For encouraged, there was a main effect for the imagination prompt and recommended-actions information. Encouraged was higher when imagination prompt was included in the message ( $M = 2.00, SE = 0.11, 95\% CI [2.20, 1.78]$ ) rather than absent from it ( $M = 1.64, SE = 0.11, 95\% CI [1.84, 1.43]$ ) and when recommended actions were included in the message ( $M = 2.07, SE = 0.11, 95\% CI [2.28, 1.86]$ ) rather than absent from it ( $M = 1.56, SE = 0.11, 95\% CI [1.77, 1.35]$ ).

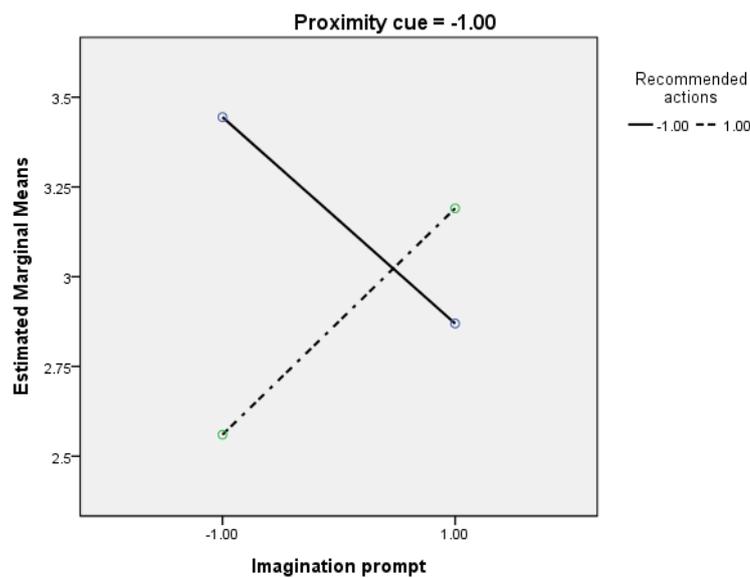
For pride, there was a main effect for the imagination prompt. Pride was higher when imagination prompt was included in the message ( $M = 1.60, SE = 0.10, 95\% CI [1.80, 1.39]$ )

rather than absent from it ( $M = 1.30$ ,  $SE = 0.10$ , 95% CI [1.51, 1.10]).

For happiness, there was a main effect for the imagination prompt. Happiness was higher when imagination prompt was included in the message ( $M = 1.59$ ,  $SE = 0.10$ , 95% CI [1.79, 1.39]) rather than absent from it ( $M = 1.28$ ,  $SE = 0.10$ , 95% CI [1.48, 1.08]).

For sadness, there was a main effect for the recommended-actions information. Sadness was lower when recommended actions were included in the message ( $M = 2.47$ ,  $SE = 0.12$ , 95% CI [2.71, 2.22]) rather than absent from it ( $M = 2.93$ ,  $SE = 0.13$ , 95% CI [3.18, 2.69]).

For worry, there was a proximity cue X imagination prompt X recommended-actions information interaction effect. Interaction effect of imagination prompt X recommended-actions information varied when proximity was low versus high. When proximity was low and imagination prompt was absent, the level of worry was higher if recommended-actions information was absent ( $M = 3.44$ ,  $SE = 0.24$ , 95% CI [3.91, 2.98]) rather than present ( $M = 2.56$ ,  $SE = 0.25$ , 95% CI [3.05, 2.07]). Figure 2.1 shows the means of worry across experimental conditions.



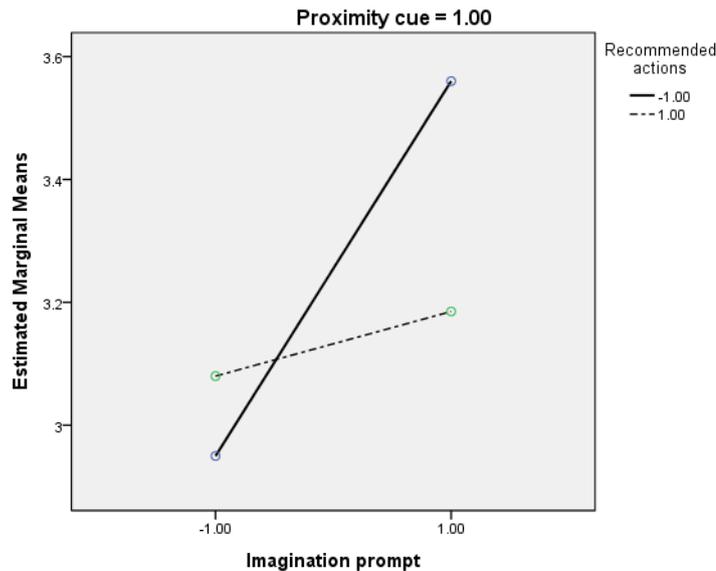


Figure 2. 1. Estimated marginal means of worry across experimental conditions

For disgust, there was a main effect for the recommended-actions information.

Disgust was lower when recommended actions were included in the message ( $M = 2.18$ ,  $SE = 0.13$ , 95% CI [2.43, 1.93]) rather than absent from it ( $M = 2.88$ ,  $SE = 0.13$ , 95% CI [3.14, 2.63]).

For surprise, there was a main effect for the imagination prompt. Surprise was higher when imagination prompt was included in the message ( $M = 3.12$ ,  $SE = 0.14$ , 95% CI [3.40, 2.84]) rather than absent from it ( $M = 2.65$ ,  $SE = 0.14$ , 95% CI [2.93, 2.37]).

## Discussion

The main purpose of Study 1 was to examine the effects of three message features—proximity cue, imagination prompt, and recommended-actions information—on hope. Examining whether these three message features have intended effects is essential to test the proposed model of health activism, which uses messages to motivate people to capitalize on a neighborhood's opportunity to change things for the better by making them feel hopeful. The results showed that two message features, proximity cue and imagination prompt, did not have statistically significant influence on hope. The third message feature was promising: the

presence (vs. absence) of recommended-actions information in the message led to greater hope, but the effect was small ( $r = .17$ ).

The secondary purpose of this study was to reveal the effects three message features have on emotions other than hope. When correlations between hope and other emotions were explored, hope had a strong positive correlation with inspired, encouraged, pride, compassion, and happiness (cf. J. Cohen, 1988). Hope had a small positive correlation with anger, sadness, and surprise (cf. J. Cohen, 1988). The lower versus higher proximity to the issue did not have significant influence on any of the emotions measured. But, the other two message features were found to influence several emotions. The message with (vs. without) the imagination prompt led people to report greater feelings of being encouraged, pride, happiness, and surprise. The message with (vs. without) information about recommended actions led participants to report greater feelings of being inspired and encouraged but lower sadness and disgust.

### **Theoretical and Practical Implications**

Drawn from a discrete-emotions perspective, in TPH, Chadwick (2015) theorized that a message can evoke hope by addressing cognitive appraisals (i.e., importance, goal congruence, positive future expectation, and possibility) that constitute hope. Three message features examined in Study 1 were designed to evoke hope by facilitating appraisals about the relevance of the issue (i.e., proximity cue), positive expectation about the future (i.e., imagination prompt), and possibility of achieving a desired future outcome (i.e., recommended-actions information). The results showed that only recommended-actions information had statistically significant influence on hope. It remains to be examined as to whether message features facilitate certain cognitive appraisals albeit not to an extent that evokes hope. It could be that a certain message feature is only relevant to a specific cognitive appraisal and that cognitive appraisals induced by different message features would

complement one another to eventually evoke hope. In addition, the influence of each appraisal on hope might be relative such that certain appraisals just need to be evoked whereas other appraisals should reach a certain degree (Chadwick, 2015). From a message designing point of view, understanding whether it is the mere presence or magnitude in appraisals that causes a certain emotion and deciding which appraisals to aim with a certain message feature could be critical tasks.

Next, hope turned out to be associated with several other emotions. The strong positive correlations hope had with inspired and encouraged align with findings from previous studies (e.g., Nabi & Myrick, 2018; Prestin, 2013). The finding that hope is positively correlated with pride, compassion, and happiness call for need to explore how multiple positive emotions interact to influence persuasive outcomes. Positive correlations with hope and negative emotions like anger and sadness are notable. In literature on persuasion, hope is often understood as arising in response to diminishing fear; when people perceive that something can be done to address the threat, they experience less fear but more hope (e.g., Nabi & Myrick, 2018). In this sense, negative emotions like anger and sadness could be antecedents to experience hope—these emotions might be more salient than fear in the context of lead exposure risk in the neighborhood.

The results overall indicated that messages written in ways that reflect the core relational theme of a certain discrete emotion have the potential to induce not only the target emotion but also other emotions. Compared to numerous studies that investigated how messages evoke negative emotions that lead to successful persuasion (e.g., Dillard, Plotnick, Godbold, Freimuth, & Edgar, 1996; Witte & Allen, 2000), however, we know little about which message features induce particular positive emotions and what combinations of positive emotions do to a persuasion process. Relatedly, the concept of emotional flow (Nabi, 2015), or changes in emotional experience during exposure to a message, has yet to be

explored with various sequences of emotions in different contexts.

In the context of co-creating a better future for the neighborhood, an emotion of pride, for instance, can increase residents' level of identification with neighbors and motivate them to approach toward neighbors who are in-group members (Harth, Leach, & Kessler, 2013). By shaping moral judgment and action, an emotion of compassion can motivate people to cooperate with neighbors so as to protect those who suffer (Goetz, Keltner, & Simon-Thomas, 2010). As widely known, anger is an emotion that can motivate people to fight against injustice (Jasper, 2011). If these emotions have synergetic effects with hope, a message to motivate health activism can consider ways to induce these emotions in addition to arousing hope. Considerable works need to be done to understand how addressing multiple emotions in a message affects persuasive outcomes.

### **Modifications to the Dissertation Project**

Based on the findings of Study 1, I made several modifications to the dissertation project. First, the results that three message features affected emotions other than hope imply that participants might have experienced multiple emotions and changes in emotions while reading the experimental message. The cross-sectional, single-time post-exposure measures of emotions, however, did not allow the testing for the possible emotional shifts over time. This served as the motivation for designing Study 2 that investigates how emotional responses unfold over time. Before testing the proposed model of health activism, I thus conducted Study 2 that measured emotions multiple times during message processing.

In addition, I made several modifications to the survey before conducting Study 2 and Study 3. First, I modified the information presented as the proximity induction to better convey the information about the county-level risk of lead exposure. In this Study 1, a map of Pennsylvania that presented the number and percentage of children aged 0-71 months *tested for blood lead level (BLL)* by county was used as the proximity induction. Because the blood

lead level testing for children is not mandatory in Pennsylvania and health care providers' lead testing practices vary, the testing of children could be targeted rather than random (General Assembly of the Commonwealth of Pennsylvania, 2019). For Study 2 and Study 3, I replaced the proximity induction with the number and percentage of children *confirmed with elevated blood lead level (EBLL)* by county. The county-level EBLL data was retrieved from the 2017 childhood lead surveillance annual report published by the Pennsylvania Department of Health, which followed CDC's (2019) definition for EBLL. Lead levels in the blood are measured in micrograms per deciliter (mcg/dL) and lead blood levels of 5 mcg/dL are considered as higher than normal (CDC, 2019).

The second change I made relates to the instruction to measure emotions. In the open-ended question that solicited participants' feedback on the survey, one participant reported: "When you asked for feelings about the message, I wasn't sure if you meant the message about how many kids were affected (with the chart), or if you meant the message to imagine a place where lead wasn't a concern. I answered my feelings about the first instance with the charts." This comment suggests that participants might have referred to different parts of the message when answering the question, "How did the message make you feel?" Moreover, with the current instruction, there is a possibility that participants might have provided part of their emotional experience (e.g., peak emotional experience) or the average of overall emotional experience. Hence, I decided to use a more specific instruction to assess emotions for Study 2 and Study 3: "After reading the message, how do you feel *about the future of your neighborhood?*"

When examining the correlations between hope and other discrete emotions, hope had strong positive correlations with inspired and encouraged. Three items—hope, encouraged, and inspired—also showed a high Cronbach's alpha score ( $\alpha = .85$ ). Following other studies' (e.g., Chadwick, 2015; Nabi & Myrick, 2018) approaches, I decided to create a composite

variable of hope when testing the model of health activism. Because I intended to capture the full spectrum of hope, I added more items in Study 3, such as energized, heartened, and anticipated to assess participants' feelings of hope. I added these items based on previous studies that presented various, yet related conceptualizations of hope (e.g., Snyder, 2002).

### **Conclusions**

Study 1 allowed for the examination of message effects on emotions that serves as a useful guide to test the model of health activism. Additionally, the findings of Study 1 provided reasons to examine how different message features lead to an over-time change in emotions. Before testing the model of health activism, Chapter 3 is devoted to Study 2 that examines shifts in emotions during message processing.

### CHAPTER THREE: SHIFTS IN EMOTIONS DURING MESSAGE PROCESSING

Discrete emotions are reactions to environmental stimuli, including persuasive messages (Ortony et al., 1988). After exposure to a message, people appraise the potential harm or benefit of the ideas presented in the message for their personal well-being, which, in turn, results in an emotional experience (Lazarus, 1991). Depending on the appraisals, people experience different discrete emotions; appraising the current situation as an imminent threat to one's well-being induces fear whereas perceiving demeaning offense evokes anger (Lazarus, 1991). The discrete-emotions perspective explains that each emotion has action tendencies, which guide behavior to solve adaptive issues (Keltner & Gross, 1999). Because emotions have different action tendencies, they have different impacts on persuasive outcomes in response to environmental stimuli (Nabi, 2002). For instance, fear in response to a message motivates protective behavior whereas feeling angry motivates retributive action (Lazarus, 1991).

Most previous studies on the persuasive influence of discrete emotions have primarily focused on single emotions, with the most attention focused on fear (Boster & Mongeau, 1984; Nabi, 2002; Witte & Allen, 2000). It is not until recently researchers started to consider how the *flow*, or change, of the emotional experience may influence persuasive outcomes (e.g., Carrera et al., 2010; Nabi, 2015). The concept of *emotional flow* encompasses various types of shifts in emotional experience, such as from negative to positive, from positive to negative, from one negative or positive emotional state to another of a similar valence, or from high/low intensity within one particular emotional state to vice versa (Nabi, 2015). The idea is that because emotions constantly change in light of reappraisals of one's environment, the emotion people experience over the course of message exposure is likely to change as the content of the message unfolds. One example that produces emotional flow is a standard fear appeal structure, which evokes fear in response to threat information followed by hope

induced in response to efficacy information (Nabi, Gustafson, & Jensen, 2018; Nabi & Myrick, 2018).

Testing an overtime change of emotional states in response to different parts of a message requires measuring emotions at multiple points in time. Given the relatively recent introduction to the literature, only a few empirical studies have tested the concept of emotional flow. In the context of fear appeals, studies have found that the intensity of fear changes in response to different components of a standard fear appeal, which includes threat information followed by efficacy information (e.g., Dillard, Ruobing, Meczkowski, Yang, & L. Shen, 2017; Rossiter & Thornton, 2004; L. Shen & Dillard, 2014). In general, fear peaked in response to threat information and diminished following efficacy information (e.g., Dillard et al., 2017; Meczkowski, Dillard, & L. Shen, 2016).

Moreover, other studies (e.g., Dillard et al., 1996; Nabi et al., 2018; Nabi & Myrick, 2018) demonstrated that the standard fear appeal structure evokes multiple emotions, including fear, anger, sadness, and hope. Across two studies, Nabi and Myrick (2018) showed that a fear appeal with threat and efficacy information in it evoked hope as well as fear. Because Nabi and Myrick utilized a cross-sectional design and measured emotions only after exposure to the entire fear appeal, whether fear was evoked in response to threatening information while hope was evoked in response to efficacy information remains unanswered. Still, Nabi and Myrick's work is noteworthy because it explicitly tested the conceptual link between efficacy information and hope and provided a basis for integrating hope into fear appeal theorizing. Findings that message-evoked hope had comparable to stronger effects on behavioral intention than fear also allude to the importance of considering emotional flow from fear to hope, as opposed to focusing only on fear (Nabi & Myrick, 2018).

Study 2 was designed to investigate changes in emotions in response to the message features introduced in Study 1 (i.e., proximity cue, imagination prompt, and recommended-

actions information). The proximity cue that presents varying levels of lead-exposure risks in counties of Pennsylvania contains threatening information. Imagination prompt and recommended-actions information include what people can do to effectively bring about a better future for their neighborhoods, which in large part corresponds to efficacy information as defined in fear appeal literature. In testing message effects in Study 2, I combined the imagination prompt and recommended-actions information to minimize participants' burden of responding to emotion measures repeatedly.

A cross-sectional design that measures emotions only at the end of the message exposure, such as in Study 1, only informs of how the message in its entirety affects emotions and does not allow the testing for the influence of each message feature on emotions. Additionally, when over-time changes in emotions in response to different message features are not measured, the concept of emotional flow cannot be explored. Thus, Study 2 measured emotions at multiple points in time and explored how four other emotions (fear, anger, pride, and sadness) as well as the target emotion of hope change over time. Because this study was an attempt to explore the possible change in emotions after exposure to novel messages, I explored the following research question:

RQ1: How do emotions of hope, fear, anger, sadness, and pride change in response to the proximity cue and/or a combination of imagination prompt and recommended-actions information?

Furthermore, I was particularly interested in the relationship between patterns of change in two emotions, fear and hope. The proximity cue, with threat information in it, may generate perceptions of susceptibility to a severe threat. Without having certainty about their ability to cope with it, those who perceive that their well-being is threatened by the risk are expected to experience fear (Lazarus, 1991). In comparison, a combination of imagination prompt and recommended-actions information is expected to make people feel confident in

their ability to effectively address the threat. When people assess that they can cope with the threat, fear will be alleviated (Lazarus, 1991; Witte, 1992). In this sense, the expected pattern of change in fear during the course of message exposure is an inverted U-pattern. People would experience the highest level of fear in response to the proximity cue, which would be reduced after exposure to the imagination prompt and recommended-actions information. Such a prediction is in line with findings of the studies that tested over-time change in fear in response to a fear appeal that contains threat information followed by efficacy information (e.g., Dillard et al., 2017; Meczkowski et al., 2016).

The expected change in hope in response to the proximity cue is not straightforward. The original goal of proximity cue in this study was to make the issue of lead exposure risk salient. By offering people an opportunity to reappraise the future outcome, the proximity cue is expected to evoke hope. In contrast to this general prediction of the dissertation, in Study 1, the proximity cue did not have significant influence on hope and only worked to evoke risk perceptions. If the effect of proximity cue is mostly to evoke risk perceptions as indicated from Study 1, it may diminish expectations about a better future. Perceiving less opportunity for a better future, then, could result in a decrease in hope (Chadwick, 2015; Lazarus, 1991). Imagination prompt and recommended-actions information are designed to help people become aware of what they can do to address the threat to increase their expectations about a better future. As the perceived likelihood of achieving a better future increases in response to such efficacy information, people are likely to experience greater hope (Nabi, 2002, Feldman & Hart, 2016). Indeed, studies have demonstrated that part of a fear appeal, the efficacy component, that alleviates fear also increases hope (e.g., Nabi et al., 2018). From above, the competing possibilities exist regarding the influence of proximity cue on hope whereas a combination of imagination prompt and recommended-actions information is expected to increase hope.

In sum, for fear, the prediction is an inverted-U pattern—starting low, peaking after the proximity cue, and decreasing after the imagination prompt and recommended-actions information. For hope, if both the proximity cue and a combination of imagination prompt and recommended-actions information increase hope, it will show a linear increase. Alternatively, if the proximity cue reduces hope while a combination of imagination prompt and recommended-actions information that increases hope, the change in hope will show a U-pattern. In this case, we should see a mirrored pattern of fear and hope by measuring both emotions over time in response to different message features. If the same message component increases fear while decreasing hope and vice versa, an over-time change in the two emotions is expected to imitate each other, but reversed in the direction perpendicular to the mirror surface. As an initial step to understanding the simultaneous flows of multiple emotions, I explored whether the change in fear and hope show a mirroring pattern after exposure to the proximity cue and after exposure to a combination of imagination prompt and recommended-actions information.

RQ2: Do fear and hope show a mirrored pattern over time such that fear increases while hope decreases in response to the proximity cue and that fear decreases while hope increases in response to a combination of imagination prompt and recommended-actions information?

## **Method**

### **Participants**

Undergraduate students were recruited from introductory communication courses at the Pennsylvania State University. Students received 2% course credit for participation in the study. Alternative assignments were available for students who did not want to participate in the study. Because study participation was limited to residents of Pennsylvania, students were first asked, “Are you currently living in Pennsylvania? (If you are living in State College or

nearby towns as you go to the Penn State, your answer to this question should be YES)”; only those who said *yes* were invited to fill out the survey.

A total of 124 participants completed the survey before COVID-19 shut down in-person studies. The average time to complete the survey was about 10 minutes ( $M = 10.71$ ,  $SD = 3.28$ ,  $Mdn = 10.27$ ,  $Min = 4.13$ ,  $Max = 22.87$ ). Responses from two participants who took less than 5 minutes to complete the survey were eliminated from the dataset. The final sample is  $N = 122$ . Participants (49% female, 51% male) on average were 20.08 years old ( $SD = 1.49$ ,  $Mdn = 20$ ,  $Min = 18$ ,  $Max = 27$ ). They identified their race as White (69.4%), Hispanic, Latino, or Spanish origin (1.6%), Black or African American (4.9%), Asian (21.3%), and other (2.5%).

### Study Design and Procedures

The study was a 2 (Proximity cue: present vs. absent) x 2 (Imagination prompt and recommended-actions information: present vs. absent) factorial design. The repeated-measurement design for emotions varied by condition. The first condition measured emotions three times: at the baseline ( $t_0$ ), after presenting the proximity cue ( $t_1$ ), and after presenting both imagination prompt and recommended-actions information ( $t_2$ ). The second condition measured emotions two times: at baseline ( $t_0$ ), and after presenting the proximity cue ( $t_1$ ). The third condition measured emotions two times: at baseline ( $t_0$ ) and after presenting both imagination prompt and recommended-actions information ( $t_1$ ). The fourth condition measured emotions once: after presenting all message features (i.e., the proximity cue, imagination prompt, and recommended-actions information) ( $t_2$ ). The fifth condition measured emotions once: at baseline ( $t_0$ ).

Table 3. 1

#### *Summary of Study Conditions*

<i>n</i>	Emotion	Message	Emotion	Message	Emotion
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		measure (t <sub>0</sub> )	exposure	measure (t <sub>1</sub> )	exposure	measure (t <sub>2</sub> )
Condition 1	25	O	Proximity cue	O	Imagine and Rec Actions	O
Condition 2	23	O	Proximity cue	O	-	-
Condition 3	26	O	Imagine and Rec Actions	O	-	-
Condition 4	23	-	Proximity cue	-	Imagine and Rec Actions	O
Condition 5	25	O	Proximity cue	-	Imagine and Rec Actions	-

*Note.* O indicates emotion was measured.

Participants signed up for time slots online prior to the experiment. When participants arrived at the computer lab, a researcher instructed them to sit in front of any of the computers. To minimize disruption, the researcher waited until the appointed time and sent out the survey link to participants' email. Participants were informed that they can leave the lab quietly once they complete the survey.

First, participants responded to an online questionnaire that asked information about their neighborhood: (a) the name of the neighborhood, (b) the approximate number of people living in the neighborhood, and (c) the number of neighbors they know by name. They were also asked about how long they have lived in the same neighborhood. These questions were asked to orient participants to read the message and respond to the following questions with their neighborhood in mind.

Then, participants were randomly assigned to one of five conditions. This was done by adding a randomizer element to the Qualtrics' survey flow function. This let Qualtrics assign the participants to one of the four conditions through a random number generator. Before reading the message, participants were informed that the health message they were going to read was being considered for dissemination to the public and that they were asked to provide feedback on the message's content. They were also informed that the information in the message was aggregated from several scientific sources including the Centers for

Disease Control and Prevention, World Health Organization, and Pennsylvania Department of Health. After participating in one of the five experimental conditions, participants responded to questions about their demographic information. At the end of the survey, an open-ended question asked participants to write down any thoughts or inquiries they had about the study.

### **Stimulus**

Participants who received the *proximity cue* were presented with a map of Pennsylvania that presented the number and percentage of children aged 0-71 months confirmed with elevated blood lead level (EBLL) by county. Lead levels in the blood are measured in micrograms per deciliter (mcg/dL) and lead blood levels of 5 mcg/dL are considered as higher than normal (CDC, 2019). The county-level data came from the 2017 childhood lead surveillance annual report published by the Pennsylvania Department of Health.

Participants who received the *imagination prompt* and *recommended-actions information* first read the following instruction. “Imagine a better future where your neighborhood is completely free from the risks of lead exposure. Imagine that all residents become healthier, more kids play in the neighborhood, and water anywhere from your neighborhood becomes safe to drink. Think about how the daily lives of residents in your neighborhood will be changed and try to visualize a better future in your mind.” Then, they read a description of behaviors that neighbors could take to eliminate lead exposure. The presented behaviors were recommended as ways to eliminate lead exposure by different agencies including the Clean Water Action (2019) and Centers for Disease Control and Prevention (2019b). Specifically, the message described that neighbors have the capability to make a better future for all (e.g., “Keep in mind that collective efforts can bring about a better future for the neighborhood!). The message also presented information about the behaviors that can reduce lead exposure in the neighborhood (e.g., “As neighbors, we can run the water

for a few minutes before using it for drinking,” and “As neighbors, we can contact the elected officials in our area to request a test for lead in tap water of public facilities”).

The Flesch reading ease of the message that included all three message features (proximity cue, imagination prompt, and recommended-actions information) scored 43.7, and its Flesch-Kincaid grade level was 13, suggesting that the message should be easily understood by those who completed the high school education. As the imagination prompt contained 63 words and recommended-actions information had 91 words, the message with both imagination prompt and recommended-actions information had a total of 154 more words than the message that presented neither of them.

## Measurement

**Emotional responses.** To assess the baseline emotions, participants were asked, “How much of this emotion are you feeling about the future of your neighborhood?” To assess emotions after exposure to message features, participants were asked, “After reading the message, how do you feel about the future of your neighborhood?” Responses were marked on a 5-point Likert-type scale (1 = *none of this emotion*, 2 = *a little bit*, 3 = *somewhat*, 4 = *moderate*, 5 = *a great deal of this emotion*). A total of five emotions—hope, fear, anger, sadness, and pride—were measured with a single item for each emotion at different time points (See Table 3.1).

**Demographic variables.** Participants’ age, ethnicity, sex, education, income, number, and age of children, and whether any of their children has been identified as having elevated blood lead levels were assessed at the end of the survey.

## Analysis Plan

Before analyzing the data to answer research questions, I evaluated the efficacy of the random assignment process by assessing whether baseline emotions ( $t_0$ ) in conditions 1, 2, 3, and 5 were within the sampling error. I also considered a possible testing effect (i.e., the

potential that measurements adopted earlier in the research influence responses on measures later in the research). I compared whether the emotions assessed after the exposure to imagination prompt and recommended-actions information ( $t_2$ ) were statistically different between conditions 1 and 4. Condition 1 measured emotions at three different points ( $t_0$ ,  $t_1$ , and  $t_2$ ) while condition 4 only measured emotions after the exposure to all message features ( $t_2$ ). Next, I examined whether different message features produce a significant difference in emotional responses. To this end, I compared conditions 1, 2, and 3, which respectively exposed participants to either proximity cue (conditions 1 and 2) or the combination of imagination prompt and recommended-actions information (condition 3).

RQ1 asked how does each of five emotions (i.e., hope, fear, anger, sadness, and pride) change over time, and RQ2 asked whether the change in fear and hope show a mirrored pattern over time. To answer RQ1, I respectively examined the initial change in emotions after being exposed to the proximity cue and the secondary change in emotions after being exposed to imagination prompt and recommended-actions information. For the initial change, I focused on conditions 1 and 2, which provide information about the change in emotions from baseline ( $t_0$ ) to time 1 ( $t_1$ ). I calculated the change score for emotions ( $t_1 - t_0$ ) and ran a single-sample *t*-test to examine whether the change score is significantly different from a score of 0. For the secondary change, I focused on condition 1, which provides information about the change in emotions from time 1 ( $t_1$ ) to time 2 ( $t_2$ ). I calculated the change score for emotions ( $t_2 - t_1$ ) and ran a single-sample *t*-test to examine whether the change score is significantly different from a score of 0.

To answer RQ2, I focused only on condition 1 of which measured emotions at all three time points ( $t_0$ ,  $t_1$ ,  $t_2$ ). I examined correlations between the initial changes in hope and fear and between the secondary changes in hope and fear. Additionally, I looked to see if whether the mirroring pattern is unique to hope and fear, or whether it appears between hope

and other emotions as well.

## Results

### Preliminary Analyses for Hope

**Baseline test.** Table 3.2 shows the means and standard deviations for hope by message condition. The baseline score was used to assess the efficacy of random assignment. An ANOVA was conducted with the message condition as the independent variable and baseline hope measured in conditions 1, 2, 3, and 5 as the dependent variable,  $F(3, 95) = 2.13, p = .10, R^2 = .03$ . The omnibus test was not statistically significant. Pairwise comparisons indicated that the random assignment generally worked although there was a small difference in baseline hope between conditions 2 and 3.

Table 3. 2

#### *Comparing Levels of Hope Between Conditions*

	<i>n</i>	Emotion measure ( <i>t</i> <sub>0</sub> )	Message exposure	Emotion measure ( <i>t</i> <sub>1</sub> )	Message exposure	Emotion measure ( <i>t</i> <sub>2</sub> )
Condition 1	25	2.60 <sub>ab</sub> (1.19)	Proximity cue	2.24 <sub>c</sub> (1.20)	Imagine and Rec Actions	3.24 <sub>e</sub> (1.39)
Condition 2	23	2.09 <sub>a</sub> (1.13)	Proximity cue	1.95 <sub>c</sub> (1.13)	-	-
Condition 3	26	2.92 <sub>ab</sub> (1.20)	Imagine and Rec Actions	3.20 <sub>d</sub> (1.08)	-	-
Condition 4	23	-	Proximity cue	-	Imagine and Rec Actions	3.09 <sub>e</sub> (1.20)
Condition 5	25	2.32 <sub>b</sub> (1.38)	Proximity cue	-	Imagine and Rec Actions	-

*Note.* Average scores were compared between conditions at the same time point; means with no subscript in common differ at  $p < .05$ .

**Testing effects.** To examine possible testing effects, the levels of hope at *t*<sub>2</sub> between conditions 1 and 4 were compared using an independent samples *t*-test. The levels of hope at *t*<sub>2</sub> were not significantly different between condition 1 ( $M = 3.24, SD = 1.39$ ) and condition 4 ( $M = 3.09, SD = 1.20$ ),  $t(46) = .41, p = .69, r = 0.06$ . This result indicated that testing effects of emotion measures did not pose a substantial threat to the internal validity of the study.

**Message effects.** Conditions 1 and 2 included a pre-test/post-test design ( $t_0$  and  $t_1$ ) with exposure to the proximity cue. Hope at the second measurement should be the same for both conditions. To compare the levels of hope at  $t_1$  between conditions 1 and 2, an independent samples  $t$ -test was conducted. The levels of hope after exposure to proximity cue were not significantly different between condition 1 ( $M = 2.24$ ,  $SD = 1.20$ ) and condition 2 ( $M = 1.95$ ,  $SD = 1.13$ ),  $t(45) = .84$ ,  $p = .41$ ,  $r = 0.12$ . Based on this result, I decided to combine conditions 1 and 2 for the subsequent analyses.

Condition 3 also had a pre-test/post-test design, but the exposure was to the imagination prompt and recommended-actions information. The question is whether hope at  $t_1$  differed based on exposure to the proximity cue (conditions 1 and 2) or the imagination prompt and recommended-actions information (condition 3). The result of an independent samples  $t$ -test showed that levels of hope at  $t_1$  were significantly lower when participants were exposed to the proximity cue ( $M = 2.11$ ,  $SD = 1.17$ ) than to the imagination prompt and recommended-actions information ( $M = 3.20$ ,  $SD = 1.08$ ),  $t(70) = -3.89$ ,  $p < .001$ ,  $r = 0.44$ . In addition, I compared the initial change in hope ( $t_1 - t_0$ ) in conditions 1 and 2 with that from condition 3 to examine whether *changes* in hope differed between message features. On average, participants experienced less hope after exposure to the proximity cue ( $M_{change} = -0.26$ ,  $SD = 1.09$ ), but more hope after exposure to the imagination prompt and recommended-actions information ( $M_{change} = 0.36$ ,  $SD = 0.99$ ), and the difference was statistically significant,  $t(70) = -2.34$ ,  $p < .05$ ,  $r = 0.29$ .

The results overall showed that the imagination prompt and recommended-actions information produced greater hope than the proximity cue. Whereas participants who received the proximity cue remained feeling “a little bit” of hope, those who received the imagination prompt and recommended-actions information felt “somewhat” hopeful. Examining changes in hope revealed that the proximity cue decreased hope while the

imagination prompt and recommended-actions information increased hope.

### Preliminary Analyses for Fear

**Baseline test.** Table 3.3 shows the means and standard deviations for fear by message condition. The baseline score was used to assess the efficacy of random assignment. An ANOVA was conducted with a message condition as the independent variable and baseline hope measured in conditions 1, 2, 3, and 5 as the dependent variable,  $F(3, 95) = 1.49, p = .22, R^2 = .05$ . The omnibus test was not statistically significant. Pairwise comparisons between conditions indicated that the random assignment generally worked although there was a small difference in baseline fear between conditions 2 and 5.

Table 3.3

#### *Comparing Levels of Fear Between Conditions*

	<i>n</i>	Emotion measure ( $t_0$ )	Message exposure	Emotion measure ( $t_1$ )	Message exposure	Emotion measure ( $t_2$ )
Condition 1	25	1.24 <sub>ab</sub> (0.72)	Proximity cue	2.00 <sub>c</sub> (1.08)	Imagine and Rec Actions	1.40 <sub>e</sub> (0.82)
Condition 2	23	1.04 <sub>a</sub> (0.21)	Proximity cue	1.57 <sub>cd</sub> (0.95)	-	-
Condition 3	26	1.15 <sub>ab</sub> (0.37)	Imagine and Rec Actions	1.58 <sub>d</sub> (0.81)	-	-
Condition 4	23	-	Proximity cue	-	Imagine and Rec Actions	1.78 <sub>e</sub> (1.04)
Condition 5	25	1.40 <sub>ab</sub> (0.87)	Proximity cue	-	Imagine and Rec Actions	-

*Note.* Average scores were compared between conditions at the same time point; means with no subscript in common differ at  $p < .05$ .

**Testing effects.** To examine possible testing effects, the levels of fear at  $t_2$  between conditions 1 and 4 were compared using an independent samples  $t$ -test. The levels of fear at  $t_2$  were not significantly different between condition 1 ( $M = 1.40, SD = 0.82$ ) and condition 4 ( $M = 1.78, SD = 1.04$ ),  $t(46) = -1.42, p = .16, r = 0.20$ . This result indicated that testing effects of emotion measures did not pose a substantial threat to the internal validity of the study.

**Message effects.** Conditions 1 and 2 included a pre-test/post-test design ( $t_0$  and  $t_1$ ) with exposure to the proximity cue. Fear at the second measurement should be the same for both conditions. To compare the levels of fear at  $t_1$  between conditions 1 and 2, an independent samples  $t$ -test was conducted. The levels of fear after exposure to the proximity cue were not significantly different between condition 1 ( $M = 2.00$ ,  $SD = 1.08$ ) and condition 2 ( $M = 1.57$ ,  $SD = 0.95$ ),  $t(46) = 1.48$ ,  $p = .15$ ,  $r = 0.21$ . Based on this result, I decided to combine conditions 1 and 2 for the subsequent analyses.

Condition 3 also had a pre-test/post-test design, but the exposure was to the imagination prompt and recommendation-actions information. The question is whether fear at  $t_1$  differed based on exposure to the proximity cue (conditions 1 and 2) or the imagination prompt and recommended-actions information (condition 3). The result of an independent samples  $t$ -test showed that levels of fear at  $t_1$  were higher when exposed to the proximity cue ( $M = 1.79$ ,  $SD = 1.03$ ) than when exposed to the imagination prompt and recommended-actions information ( $M = 1.58$ ,  $SD = 0.81$ ), but the difference was statistically not significant,  $t(72) = 0.92$ ,  $p = .36$ ,  $r = 0.11$ . In addition, I compared the initial change in fear ( $t_1 - t_0$ ) in conditions 1 and 2 with that from condition 3 to examine whether *changes* in fear differed between message features. On average, participants experienced more fear after exposure to not only the proximity cue ( $M_{change} = 0.65$ ,  $SD = 0.76$ ) but also the imagination prompt and recommendation-actions information ( $M_{change} = 0.42$ ,  $SD = 0.90$ ), and the difference was statistically not significant,  $t(72) = 1.13$ ,  $p = .26$ ,  $r = 0.14$ .

The results overall showed that the proximity cue produced greater fear than the imagination prompt and recommended-actions information (although the difference was not statistically significant). Changes in fear revealed that both message features increased fear, but in both cases, participants remained feeling somewhere between “none” and “a little bit” of fear. There was no significant difference in change in fear in response to two message

features.

### Preliminary Analyses for Anger

**Baseline test.** Table 3.4 shows the means and standard deviations for anger by message condition. The baseline score was used to assess the efficacy of random assignment. An ANOVA was conducted with a message condition as the independent variable and baseline anger measured in conditions 1, 2, 3, and 5 as the dependent variable,  $F(3, 95) = 1.73, p = .17, R^2 = .05$ . The omnibus test was not statistically significant. Pairwise comparisons between conditions showed that random assignment generally worked although there was a small difference in baseline anger between conditions 1 and 2.

Table 3. 4

#### *Comparing Levels of Anger Between Conditions*

	<i>n</i>	Emotion measure ( <i>t</i> <sub>0</sub> )	Message exposure	Emotion measure ( <i>t</i> <sub>1</sub> )	Message exposure	Emotion measure ( <i>t</i> <sub>2</sub> )
Condition 1	25	1.48 <sub>a</sub> (0.92)	Proximity cue	1.48 <sub>c</sub> (0.82)	Imagine and Rec Actions	1.44 <sub>e</sub> (1.00)
Condition 2	23	1.04 <sub>b</sub> (0.21)	Proximity cue	1.52 <sub>cd</sub> (1.04)	-	-
Condition 3	26	1.31 <sub>ab</sub> (0.55)	Imagine and Rec Actions	1.31 <sub>d</sub> (0.68)	-	-
Condition 4	23	-	Proximity cue	-	Imagine and Rec Actions	1.52 <sub>e</sub> (0.79)
Condition 5	25	1.40 <sub>ab</sub> (0.87)	Proximity cue	-	Imagine and Rec Actions	-

*Note.* Average scores were compared between conditions at the same time point; means with no subscript in common differ at  $p < .05$ .

**Testing effects.** To examine possible testing effects, the levels of anger at *t*<sub>2</sub> between conditions 1 and 4 were compared using an independent samples *t*-test. The levels of anger at *t*<sub>2</sub> were not significantly different between condition 1 ( $M = 1.44, SD = 1.00$ ) and condition 4 ( $M = 1.52, SD = 0.79$ ),  $t(46) = -0.31, p = .76, r = 0.04$ . This result indicated that testing effects of emotion measures did not pose a substantial threat to the internal validity of the study.

**Message effects.** Conditions 1 and 2 included a pre-test/post-test design ( $t_0$  and  $t_1$ ) with exposure to the proximity cue. Anger at the second measurement should be the same for both conditions. To compare the levels of anger at  $t_1$  between conditions 1 and 2, an independent samples  $t$ -test was conducted. The levels of anger at  $t_1$  were not significantly different between condition 1 ( $M = 1.48, SD = 0.82$ ) and condition 2 ( $M = 1.52, SD = 1.04$ ),  $t(46) = -.16, p = .88, r = 0.02$ . Based on these results, I decided to combine them for the subsequent analyses.

Condition 3 also had a pre-test/post-test design, but the exposure was to the imagination prompt and recommendation-actions information. The question is whether anger at  $t_1$  differed based on exposure to the proximity cue (conditions 1 and 2) or the imagination prompt and recommended-actions information (condition 3). The result of an independent samples  $t$ -test showed that levels of anger at  $t_1$  were higher when exposed to the proximity cue ( $M = 1.50, SD = 0.92$ ) than when exposed to the imagination prompt and recommended-actions information ( $M = 1.31, SD = 0.68$ ), but the difference was statistically not significant,  $t(72) = 0.93, p = .35, r = 0.12$ . In addition, I compared the initial change in anger ( $t_1 - t_0$ ) in conditions 1 and 2 with that from condition 3 to examine whether *changes* in anger differed between message features. On average, participants experienced more anger after exposure to the proximity cue ( $M_{change} = 0.23, SD = 0.93$ ) and almost no change after exposure to the imagination prompt and recommendation-actions information ( $M_{change} < 0.001, SD = 0.89$ ), but the difference was statistically not significant,  $t(72) = 1.03, p = .31, r = 0.13$ .

The results overall revealed that the proximity cue produced greater anger than the imagination prompt and recommended-actions information (although the difference was not statistically significant). Regardless of receiving any one of two message features, participants remained feeling somewhere between “none” and “a little bit” of anger. Changes in anger indicated that the proximity cue increased anger while the imagination prompt and

recommended-actions information almost did not affect anger at all, but the difference in change in anger in response to two message features was not statistically significant.

### Preliminary Analyses for Sadness

**Baseline test.** Table 3.5 shows the means and standard deviations for sadness by message condition. The baseline score was used to assess the efficacy of random assignment. An ANOVA was conducted with a message condition as the independent variable and baseline sadness measured in conditions 1, 2, 3, and 5 as the dependent variable,  $F(3, 95) = 0.48, p = .70, R^2 = .02$ . The omnibus test was not statistically significant. Pairwise comparisons showed that baseline sadness in all conditions was within the sampling error, suggesting that the random assignment worked well.

Table 3. 5

#### *Comparing Levels of Sadness Between Conditions*

	<i>n</i>	Emotion measure ( <i>t</i> <sub>0</sub> )	Message exposure	Emotion measure ( <i>t</i> <sub>1</sub> )	Message exposure	Emotion measure ( <i>t</i> <sub>2</sub> )
Condition 1	25	1.32 <sub>a</sub> (0.75)	Proximity cue	1.88 <sub>b</sub> (0.93)	Imagine and Rec Actions	1.32 <sub>d</sub> (0.75)
Condition 2	23	1.22 <sub>a</sub> (0.67)	Proximity cue	1.52 <sub>bc</sub> (0.67)	-	-
Condition 3	26	1.15 <sub>a</sub> (0.37)	Imagine and Rec Actions	1.31 <sub>c</sub> (0.55)	-	-
Condition 4	23	-	Proximity cue	-	Imagine and Rec Actions	1.91 <sub>e</sub> (1.08)
Condition 5	25	1.36 <sub>a</sub> (0.86)	Proximity cue	-	Imagine and Rec Actions	-

*Note.* Means with no subscript in common differ at  $p < .05$ .

**Testing effects.** To examine possible testing effects, the levels of sadness at *t*<sub>2</sub> between conditions 1 and 4 were compared using an independent samples *t*-test. The levels of sadness at *t*<sub>2</sub> were significantly different between condition 1 ( $M = 1.32, SD = 0.75$ ) and condition 4 ( $M = 1.91, SD = 1.08$ ),  $t(46) = -2.22, p < .05, r = 0.30$ . This result indicated that the difference in sadness at *t*<sub>2</sub> may be due to testing effects.

**Message effects.** Conditions 1 and 2 included a pre-test/post-test design ( $t_0$  and  $t_1$ ) with exposure to the proximity cue. Sadness at the second measurement should be the same for both conditions. To compare the levels of sadness at  $t_1$  between conditions 1 and 2, an independent samples  $t$ -test was conducted. The levels of sadness at  $t_1$  were not significantly different between condition 1 ( $M = 1.88, SD = 0.93$ ) and condition 2 ( $M = 1.52, SD = 0.67$ ),  $t(46) = 1.53, p = .13, r = 0.22$ . Based on these results, I decided to combine conditions 1 and 2 for the subsequent analyses.

Condition 3 also had a pre-test/post-test design, but the exposure was to the imagination prompt and recommendation-actions information. The question is whether sadness at  $t_1$  differed based on exposure to the proximity cue (conditions 1 and 2) or the imagination prompt and recommended-actions information (condition 3). The result of an independent samples  $t$ -test showed that levels of sadness at  $t_1$  were significantly higher when exposed to the proximity cue ( $M = 1.71, SD = 0.82$ ) than when exposed to the imagination prompt and recommended-actions information ( $M = 1.31, SD = 0.55$ ),  $t(72) = 2.22, p < .05, r = 0.28$ . In addition, I compared the initial change in sadness ( $t_1 - t_0$ ) in conditions 1 and 2 with that from condition 3 to examine whether *changes* in sadness differed between message features. On average, participants experienced more sadness after exposure to not only the proximity cue ( $M_{change} = 0.44, SD = 0.92$ ) but also the imagination prompt and recommended-actions information ( $M_{change} = 0.15, SD = 0.46$ ), and the difference was not statistically significant,  $t(72) = 1.47, p = .15, r = 0.20$ .

The results overall showed that the proximity cue produced greater sadness than the imagination prompt and recommended-actions information. Changes in sadness indicated that both message features increased sadness, but in both cases, participants remained feeling somewhere between “none” and “a little bit” of sadness. There was no difference in change in sadness in response to two message features.

### Preliminary Analyses for Pride

**Baseline test.** Table 3.6 shows the means and standard deviations for pride by message condition. The baseline score was used to assess the efficacy of random assignment. An ANOVA was conducted with a message condition as the independent variable and baseline pride measured in conditions 1, 2, 3, and 5 as the dependent variable,  $F(3, 95) = 0.94, p = .43, R^2 = .03$ . The omnibus test was not statistically significant. Pairwise comparisons indicated that baseline pride in all conditions was within the sampling error, suggesting that the random assignment was successful.

Table 3. 6

#### *Comparing Levels of Pride Between Conditions*

	<i>n</i>	Emotion measure ( <i>t</i> <sub>0</sub> )	Message exposure	Emotion measure ( <i>t</i> <sub>1</sub> )	Message exposure	Emotion measure ( <i>t</i> <sub>2</sub> )
Condition 1	25	2.88 <sub>a</sub> (1.20)	Proximity cue	2.32 <sub>b</sub> (1.31)	Imagine and Rec Actions	2.88 <sub>d</sub> (1.42)
Condition 2	23	2.26 <sub>a</sub> (1.21)	Proximity cue	1.87 <sub>b</sub> (1.22)	-	-
Condition 3	26	2.62 <sub>a</sub> (1.10)	Imagine and Rec Actions	2.54 <sub>b</sub> (1.14)	-	-
Condition 4	23	-	Proximity cue	-	Imagine and Rec Actions	1.96 <sub>e</sub> (1.30)
Condition 5	25	2.64 <sub>a</sub> (1.58)	Proximity cue	-	Imagine and Rec Actions	-

*Note.* Average scores were compared between conditions at the same time point; means with no subscript in common differ at  $p < .05$ .

**Testing effects.** To compare the levels of pride at *t*<sub>2</sub> between conditions 1 and 4, an independent samples *t*-test was conducted. The levels of pride at *t*<sub>2</sub> were significantly different between condition 1 ( $M = 2.88, SD = 1.42$ ) and condition 4 ( $M = 1.96, SD = 1.30$ ),  $t(46) = 2.34, p < .05, r = 0.32$ . This result indicated that the difference in pride at *t*<sub>2</sub> may be due to testing effects.

**Message effects.** To examine possible testing effects, the levels of pride at *t*<sub>2</sub> between conditions 1 and 4 were compared using an independent samples *t*-test. Pride at the second

measurement should be the same for both conditions. To compare the levels of pride at  $t_1$  between conditions 1 and 2, an independent samples  $t$ -test was conducted. The levels of pride at  $t_1$  were not significantly different between condition 1 ( $M = 2.32, SD = 1.31$ ) and condition 2 ( $M = 1.87, SD = 1.22$ ),  $t(46) = 1.23, p = .23, r = 0.18$ . Based on this result, I decided to combine them for the subsequent analyses.

Condition 3 also had a pre-test/post-test design, but the exposure was to the imagination prompt and recommendation-actions information. The question is whether hope at  $t_1$  differed based on exposure to the proximity cue (conditions 1 and 2) or the imagination prompt and recommended-actions information (condition 3). The result of an independent samples  $t$ -test showed that levels of pride at  $t_1$  were lower when exposed to the proximity cue ( $M = 2.10, SD = 1.28$ ) than when exposed to the imagination prompt and recommended-actions information ( $M = 2.54, SD = 1.14$ ), but the difference was statistically not significant,  $t(72) = -1.45, p = .15, r = 0.18$ . In addition, I compared the initial change in pride ( $t_1 - t_0$ ) in conditions 1 and 2 with that from condition 3 to examine whether *changes* in pride differed between message features. On average, participants experienced less pride after exposure to not only the proximity cue ( $M_{change} = -0.48, SD = 1.49$ ) but also the imagination prompt and recommendation actions information ( $M_{change} = -0.08, SD = 0.63$ ) and the difference was statistically not significant,  $t(72) = -1.31, p = .19, r = 0.17$ .

The results overall revealed that the imagination prompt and recommended-actions information produced greater pride than the proximity cue (although the difference was not statistically significant). Changes in pride indicated that both message features decreased pride, and in both cases, participants felt somewhere between “a little bit” and “somewhat” proud. There was no statistically significant difference in change in pride in response to two message features.

### Summary of Message Effects

The preceding sections investigated the message-effect by emotion. At this point, it may be useful to summarize the effects by message condition: (a) proximity cue or (b) imagination prompt and recommended-actions information. Based on the change scores, I learned that exposure to the proximity cue decreased hope and pride, but increased fear, anger, and sadness. In comparison, exposure to the imagination prompt and recommended-actions information increased hope, fear, and sadness, decreased pride, and had no effect on anger. Of these changes in emotions, only the change in hope in response to the proximity cue and to the imagination prompt and recommended-actions information was significantly different. But, the study is generally underpowered.

### RQ1: Patterns of Change in Emotions

RQ1 explored whether and how levels of the five emotions change over time. Both conditions 1 and 2 have overtime measures that provide information about the change in emotions from baseline ( $t_0$ ) to time 1 ( $t_1$ ). Preliminary analyses showed that there was no difference in baseline hope, fear, anger, sadness, and pride between conditions 1 and 2 based on the results of the omnibus  $F$  test. I combined the two conditions to consider the change in each emotion from  $t_0$  to  $t_1$ . Only the condition 1 measured emotions at three different time points, providing information about the change in emotions from time 1 ( $t_1$ ) to time 2 ( $t_2$ ). I focused only on condition 1 to examine the change in emotions from  $t_1$  to  $t_2$ .

**Initial changes in emotions: Proximity effects.** Table 3.7 shows the means and standard deviations for initial changes (from  $t_0$  to  $t_1$ ) in emotions, which was after exposure to the proximity cue.

Table 3. 7

*Initial Changes in Emotions after Exposure to Proximity Cue (Conditions 1 and 2;  $n = 48$ )*

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Hope	Fear	Anger	Sadness	Pride
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Change ( $t_1 - t_0$ )	<i>M</i>	-0.26	0.65	0.23	0.44	-0.48
	( <i>SD</i> )	(1.09)	(0.76)	(0.93)	(0.92)	(1.49)

*Note.* Participants were shown the proximity cue between  $t_0$  and  $t_1$ .

To examine whether initial changes in emotions were significantly different from zero, one-sample *t*-test was conducted. The change score for hope was negative ( $M_{change} = -0.26$ ,  $SD = 1.09$ ), but not significantly different from 0,  $t(47) = -1.60$ ,  $p = .12$ ,  $r = 0.23$ . The change score for fear was positive ( $M_{change} = 0.65$ ,  $SD = 0.76$ ) and significantly different from 0,  $t(47) = 5.91$ ,  $p < .001$ ,  $r = 0.65$ . The change score for anger was positive ( $M_{change} = 0.23$ ,  $SD = 0.93$ ) and not significantly different from 0,  $t(47) = 1.71$ ,  $p = .09$ ,  $r = 0.24$ . The change score for sadness was positive ( $M_{change} = 0.44$ ,  $SD = 0.92$ ) and significantly different from 0,  $t(47) = 3.29$ ,  $p < .01$ ,  $r = 0.43$ . The change score for pride was negative ( $M_{change} = -0.48$ ,  $SD = 1.49$ ) and significantly different from 0,  $t(47) = -2.23$ ,  $p < .05$ ,  $r = 0.31$ .

Results indicate that after being exposed to the proximity cue, participants reported higher levels of fear, anger, and sadness, and lower levels of hope and pride. Of these changes in emotions, only the changes in fear, sadness, and pride were significantly different from 0. These results provide some answers to RQ1. Of note, the general hypothesis of this dissertation, that a proximity cue would increase hope, was not supported.

**Secondary changes in emotions: Imagination and recommendation effects.** Table 3.8 shows the means and standard deviations for secondary changes (from  $t_1$  to  $t_2$ ) in emotions in condition 1, which was after exposure to the imagination prompt and recommended-actions information.

Table 3. 8

*Secondary Changes in Emotions after Exposure to Imagination Prompt and Recommended-Actions Information (Condition 1;  $n = 25$ )*

	Hope	Fear	Anger	Sadness	Pride
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Change ( $t_2 - t_1$ )	<i>M</i>	1.00	-0.60	-0.04	-0.56	0.56
	( <i>SD</i> )	(1.15)	(0.76)	0.54	0.77	1.66

*Note.* Participants were shown the imagination prompt and recommended-actions information between  $t_1$  and  $t_2$ .

The change score in hope from  $t_1$  to  $t_2$  was positive ( $M_{change} = 1.00$ ,  $SD = 1.15$ ) and significantly different from 0,  $t(24) = 4.33$ ,  $p < .001$ ,  $r = 0.66$ . The change score for fear was negative ( $M_{change} = -0.60$ ,  $SD = 0.76$ ) and significantly different from 0,  $t(24) = -3.93$ ,  $p < 0.01$ ,  $r = 0.63$ . The change score for anger was negative ( $M_{change} = -0.04$ ,  $SD = 0.54$ ), but not significantly different from 0,  $t(24) = -0.37$ ,  $p = .71$ ,  $r = 0.08$ . The change score for sadness was negative ( $M_{change} = -0.56$ ,  $SD = 0.77$ ) and significantly different from 0,  $t(24) = -3.65$ ,  $p < .01$ ,  $r = 0.60$ . The change score for pride was positive ( $M_{change} = 0.56$ ,  $SD = 1.66$ ), but not significantly different from 0,  $t(24) = 1.69$ ,  $p = .11$ ,  $r = 0.24$ .

Results indicate that after being exposed to the imagination prompt and recommended-actions information, participants reported higher levels of hope and pride, and lower levels of fear, anger, and sadness. Of these changes in emotions, only the changes in hope, fear, and sadness were significantly different from 0. These results provide additional answers for RQ1. Of note, the general hypothesis of this dissertation, that imagination prompt and recommended-actions information would increase hope, was supported.

**RQ1 summary.** In light of RQ1, the findings demonstrate that five emotions changed over time, from baseline to after the proximity cue (from  $t_0$  to  $t_1$ , in conditions 1 and 2), and after the imagination prompt and recommended-actions information (from  $t_1$  to  $t_2$ , in condition 1). Specifically, hope decreased in response to the proximity cue (although not to a statistically significant degree) and then increased after exposure to the imagination prompt and recommended-actions information. Fear increased in response to the proximity cue and then decreased after exposure to the imagination prompt and recommended-actions information. Anger increased in response to the proximity cue and then decreased after the

imagination prompt and recommended-actions information (although neither of these changes was statistically significant). Sadness increased in response to the proximity cue and then decreased after the imagination prompt and recommended-actions information. Pride decreased in response to the proximity cue and then increased after the imagination prompt and recommended-actions information (although not to a statistically significant degree).

### **RQ2: Mirroring**

RQ2 explored whether over-time changes in fear and hope show a mirrored pattern in response to the proximity cue, and also in response to a combination of imagination prompt and recommended-actions information. To compare the over-time change in emotions, I focused on condition 1 of which measured emotions at three different points. Figure 3.1 displays change in all five emotions measured in this study with 95% confidence intervals. The graphs show how each of five emotions changes from baseline ( $t_0$ ) to after exposure to the proximity cue ( $t_1$ ) and to after exposure to the imagination prompt and recommended-actions information ( $t_2$ ).

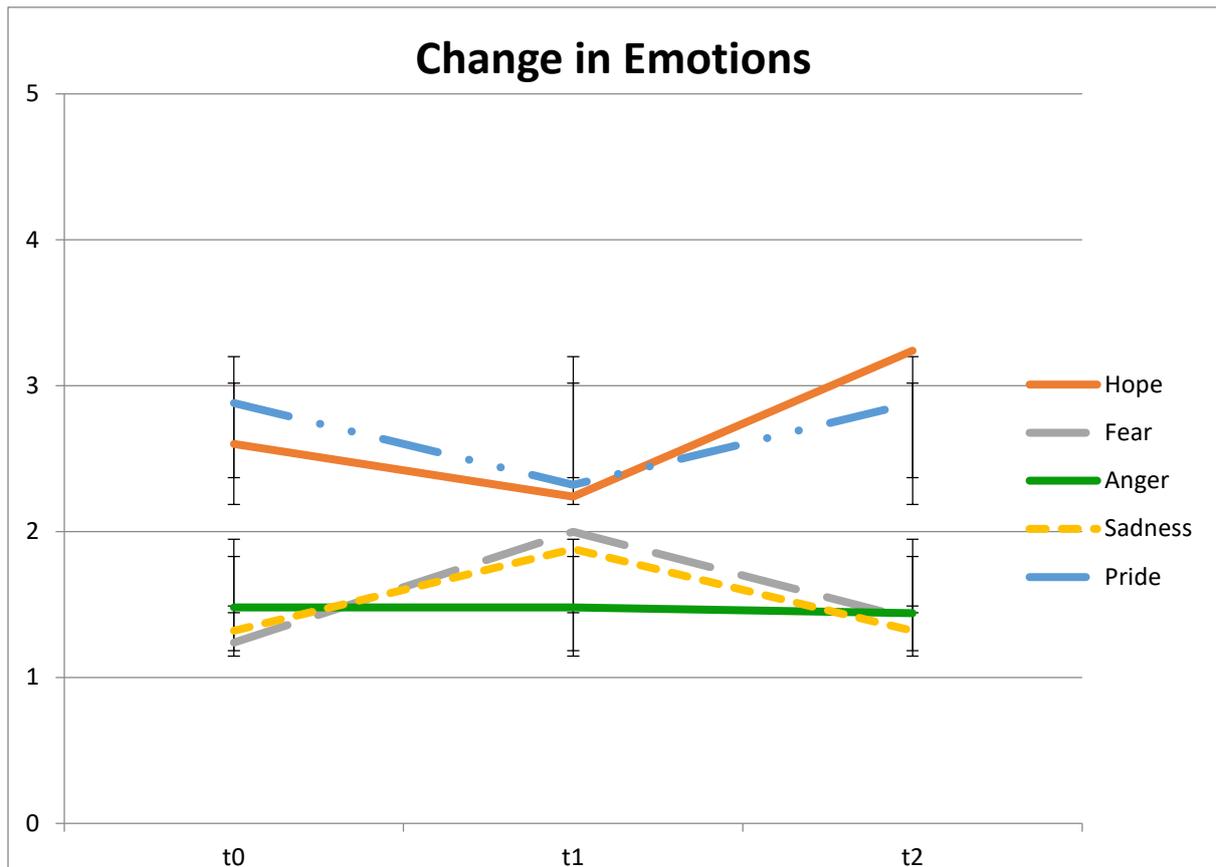


Figure 3. 1. Change in emotions during message processing in condition 1

Figure 3.1 revealed a mirroring pattern between the overtime change in fear and hope averaged across all the participants. To further explore this relationship, I correlated participants' change in fear scores with change in hope scores (see Table 3.9). The correlation showed that initial changes ( $t_1 - t_0$ ) in fear and hope were unrelated  $r(23) = -.06, p = .77$ , but secondary changes ( $t_2 - t_1$ ) in fear and hope, were strongly negatively associated,  $r(23) = -.61, p < .01$ . The results indicate that secondary changes in fear and hope, which were induced by exposure to imagination prompt and recommended-actions information, showed a statistically significant mirroring pattern; after exposure to the imagination and recommended actions, participants' level of fear tended to decrease as their level of hope increased.

Table 3. 9

*Correlations among Changes in Emotions in Condition 1 (n = 25)*

	1	2	3	4	5	6	7	8	9
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1. Hope (t <sub>1</sub> - t <sub>0</sub> )										
2. Hope (t <sub>2</sub> - t <sub>1</sub> )	.37									
3. Fear (t <sub>1</sub> - t <sub>0</sub> )	-.06	.30								
4. Fear (t <sub>2</sub> - t <sub>1</sub> )	.13	-.61**	-.72**							
5. Anger (t <sub>1</sub> - t <sub>0</sub> )	-.05	-.05	.15	.21						
6. Anger (t <sub>2</sub> - t <sub>1</sub> )	.12	-.34	.08	.14	-.41*					
7. Sadness (t <sub>1</sub> - t <sub>0</sub> )	.10	.44*	.31	-.51	-.13	-.32				
8. Sadness (t <sub>2</sub> - t <sub>1</sub> )	.10	-.42*	-.25	.47*	.14	.45*	-.87			
9. Pride (t <sub>1</sub> - t <sub>0</sub> )	.37	-.42	-.29	.43*	.07	-.08	-.18	.34		
10. Pride (t <sub>2</sub> - t <sub>1</sub> )	-.37	.57**	.46*	-.55**	-.10	-.07	.19	-.33	-.72**	

\* $p < .05$ , \*\* $p < .01$ .

**RQ2 summary.** Regarding RQ2, the changes in fear and hope generally showed a mirroring pattern. The negative relationship between initial changes in two emotions in response to the proximity cue was statistically not significant whereas the negative relationship between the secondary changes following the imagination prompt and recommended-actions information was statistically significant. In short, participants' level of fear decreased as their level of hope increased in response to the imagination prompt and recommended-actions information.

**Post-hoc analyses.** As an exploration, I examined the correlations between changes in hope with changes in anger, sadness, and pride (Table 3.9). The correlations between initial changes (t<sub>1</sub>- t<sub>0</sub>) in hope and anger, and hope and sadness, were very small (highlighted in yellow). One exception was pride; initial change in hope and pride showed a medium-size, positive correlation. The relationships between secondary changes (t<sub>2</sub> - t<sub>1</sub>) in hope and anger, and hope and sadness showed moderate negative correlations. Secondary change in hope and pride showed a strong, positive correlation (highlighted in green).

Based on medium-sized negative correlation coefficients for secondary changes, I further examined whether the mirroring pattern in response to the imagination prompt and recommended-actions information appears uniquely between hope and fear,  $r(23) = -.61$ ,  $p < .01$ , or between hope and anger,  $r(23) = -.42$ ,  $p < .05$ , and hope and sadness,  $r(23) = -.42$ ,  $p < .05$ . One way to assess the equality of correlations that share a variable is to use Fisher's

r-to-z transformation, and then apply Steiger's (1980) equations for an asymptotic  $z$  test (Lee & Preacher, 2013). Asymptotic  $z$ -test comparing secondary changes in hope and fear with secondary changes in hope and anger,  $r(23) = -.34, p = .10$ , was statistically not significant,  $z = -1.20, p = .23$ . Asymptotic  $z$ -test comparing secondary changes in hope and fear with secondary changes in hope and sadness,  $r(23) = -.42, p < .05$ , was statistically not significant,  $z = -1.08, p = .28$ . Thus, the mirroring pattern is not unique to hope and fear: as seen with hope and fear, after exposure to the imagination and recommended actions message, participants' levels of anger and sadness decreased as their level of hope increased.

### **Discussion**

The purpose of Study 2 was to explore how emotions change over time. In this study, I focused on five discrete emotions—hope, fear, anger, sadness, and pride—and examined whether participants' reports of emotional intensity change over time as a response to message features used in Study 1 (proximity cue and/or a combination of imagination prompt and recommended-actions information). The results showed that the five emotions changed over time (Figure 3.1) and that changes in emotions showed mirroring (e.g., hope and fear, hope and anger, and hope and sadness) and synchronous (e.g., hope and pride) patterns (Table 3.9). Although there remain concerns for testing effects for sadness and pride, changes in emotions generally did not seem to be due to the effects of repetitive presentations of emotion measures.

### **Message Effects**

The initial (baseline to post-exposure) results showed that the imagination prompt and recommended-actions information, compared to the proximity cue, made people feel more hopeful and less sad, but led to no difference in fear, anger, and pride. These message features were designed to evoke hope. Based on these findings, the proximity cue was not successful, but the combination of the imagination prompt and recommended-actions information was

successful in producing hope.

The imagination prompt and recommended-actions information was respectively designed to reflect four cognitive appraisals (i.e., importance, goal congruence, future expectation, and possibility) and collective efficacy. Because these appraisals are thought to be uniquely associated with hope (Lazarus, 1991, 1999), the effect of these message features on sadness was not expected. Core relational theme of sadness is “*irrevocable loss*” (Lazarus, 1991, p. 248). Notably, Lazarus (1991) argued that if the loss is not considered irrevocable, people are likely to experience hope, which is related to the possibilities of restorative actions. It makes sense that an act of imagining a better future, especially when accompanied with information about concrete actions that can improve the current situation, lessened sadness.

When *changes* in emotions after exposure to different message features were examined, the proximity cue decreased hope and pride while increasing fear, anger, and sadness. The combination of imagination prompt and recommended-actions information increased hope, fear, and sadness while decreasing pride; it barely had any impact on anger. Of these findings, a statistically significant difference was found only in the change in hope; the extent to which hope diminished after exposure to the proximity cue and the extent to which hope increased after exposure to the imagination prompt and recommended-actions information was statistically significant.

Even if some of the effects were small, the findings still provide insights into the direction of changes in emotions in response to the message features. For instance, the proximity cue decreased positive emotions (e.g., hope and pride), but increased negative emotions (e.g., fear, anger, and sadness). Such findings raise a question of the mechanism through which the proximity cue influences these emotions. The purpose of the proximity cue was to make the issue of lead exposure in the neighborhoods salient to individual residents,

thereby offering them an opportunity to appraise a shared future as something to be hopeful of. Unlike the expectation, the proximity cue might have influenced people's risk perceptions, which are related to greater negative emotions and lesser positive emotions (e.g., Bilandzic, Kalch, & Soentgen, 2017; E. L. Cohen, 2020; Lerner & Keltner, 2001). Future research should be done to better understand why and how the proximity cue influences emotions people experience about a shared future.

The influence of imagination prompt and recommended-actions information on emotions seems to be complex. For example, it increased a particular positive emotion (e.g., hope) while decreasing a different positive emotion (e.g., pride). It could be that the imagination prompt and recommended-actions information led people to be hopeful about a better neighborhood future, but not necessarily be proud of it. Alternatively, it could be that the imagination prompt and recommended-actions information instilled hope in a certain group of people while diminishing pride in other individuals. The current study design that assessed the mean change of emotions across individuals in response to a message does not allow the testing for what a message does to any specific individual.

Additionally, the imagination prompt and recommended-actions information increased at least two negative emotions: fear and sadness. Such results challenge scholars studying emotional appeals to take unintended effects more seriously. Especially when action tendencies of message-evoked emotions are conflicting, such as in the case of hope and sadness, researchers attempting to theorize the effects of emotional appeals need to understand the implications of evoking multiple emotions.

### **Longitudinal Message Effects**

This study provided insights into shifts in emotions over time. Scholars have suggested the concept of *emotional flow* to theorize the constantly changing nature of emotions during message exposure (Nabi, 2015; Nabi & Green, 2015). Findings demonstrate

that five emotions changed over time, from baseline to after the proximity cue (from  $t_0$  to  $t_1$ , in conditions 1 and 2), and also after the imagination prompt and recommended-actions information (from  $t_1$  to  $t_2$ , in condition 1). To be more specific, the proximity cue increased fear, anger, and sadness, and lowered hope and pride. In comparison, the imagination prompt and recommended-actions information increased hope and pride, and decreased fear, anger, and sadness. When focusing on statistically significant changes, proximity cue increased fear and sadness while decreasing pride. A combination of imagination prompt and recommended-actions information increased hope, but decreased fear and sadness. Even though some of these longitudinal message effects were small, these results altogether supported the idea of emotional flow and provided evidence that “as message information unfolds, the emotions experienced over the course of message exposure evolve in response to the changing content” (Nabi, 2015, p. 117).

The presence of emotional flow led me to look into the pattern of change for each emotion and how those patterns relate to one another. Over time, hope exhibited a U-curve pattern, with exposure to the proximity cue decreasing hope while exposure to the imagination prompt and recommended-actions information increasing hope. Changes in pride showed a very similar pattern to changes in hope. In contrast, fear, anger, and sadness generally showed an inverted U-curve pattern, such that exposure to the proximity cue increased the intensity of these emotions whereas exposure to imagination prompt and recommended-actions information decreased the intensity of these emotions.

When comparing the change in hope with change in other emotions, both mirroring (e.g., hope and fear, hope and anger, and hope and sadness) and synchronous (e.g., hope and pride) relationships appeared. Specifically, change in hope showed a mirroring pattern with the change in fear, anger, and sadness. A closer look at correlation coefficients revealed that the initial changes in hope and fear (in response to the proximity cue) were unrelated, but the

secondary changes (in response to the imagination prompt and recommended-actions information) were strongly negatively associated. For hope and anger, the initial change was unrelated but the secondary change was moderately negatively related. For hope and sadness as well, the initial change was unrelated but the secondary change was moderately negatively related. In comparison, change in hope and pride showed a synchronous pattern. The correlation coefficients between change scores in hope and pride suggest that the initial change scores in two emotions were unrelated, but secondary change scores were strongly positively correlated.

Although the theoretical framework of emotional flow has started to receive considerable scholarly attention, empirical testing of emotional flow framework is still lacking. In addition to providing a test of emotional flow, this study showed the possibility that there might exist multiple sets of emotional flows during message processing. Studies have constantly shown that emotional appeals evoke multiple emotions (e.g., Dillard et al., 1996; Nabi & Myrick, 2018), and more recent work has been done to understand how multiple emotions produce persuasive outcomes in a concerted manner. For instance, evoking regret following fear was more effective in increasing intention for health protection behaviors than inducing fear alone (Passyn, 2019). In the context of motivating joint efforts to advance environmental justice, multiple emotions, including anger, anxiety, hope, and happiness, contributed to predicting intention to adopt collective action (Lu, 2021).

Even though the concept of emotional flow relates to research evidence on both (a) the influence of emotional appeals on multiple emotions (e.g., Nabi & Myrick, 2018) and (b) shifts in emotional experience over the course of exposure to a message (e.g., Dillard et al., 2017), emotional flow theorizing has not yet provided an explanation that incorporates both lines of literature. If multiple emotions are evoked during message processing and each of those emotions shifts over time in response to different message components, emotional flow

theorizing should reflect on changes in multiple emotions—as opposed to focusing on shifts in one emotional state. The findings of this study identified some interesting relationships between patterns of over-time change in emotions. Given that an increase in hope following a message feature accompanies a decrease in negative emotions like fear, anger, and sadness (i.e., mirroring pattern), and also an increase in other positive emotions like pride (i.e., synchronous pattern), the theorizing of hope appeals should consider multiple sets of emotional flows and how those emotional flows altogether affect persuasive outcomes.

### **Practical Implications**

The practical implications of this study revolve around the role of emotional flow in health message design. First, one of the unexpected findings is the effects of imagination prompt and recommended-actions information on sadness. Given that feeling sad is associated with inaction, lessening sadness can be a way to help people take action (Lazarus, 1991). At the same time, however, sadness is associated with extended engagement with the message and deeper thinking about a problem (Lazarus, 1991; Nabi, 2015). When framing information in terms of lessening sadness, we thus need to be attentive to specific goal(s) of the message. If a message needs to maintain the audience's attention for an extended period of time to provide detailed information and educate them, sadness might be an appropriate emotion to target. Yet, as in this study, if the goal of a message is to motivate people to take action, what we need might be both enhanced hope and minimized sadness. Findings of this study suggest the combination of imagination prompt and recommended-actions information as one message feature that achieves this goal.

Second, if what matters to persuasion is a trajectory of change in emotions, rather than emotions at the end point, persuasive messages should be more attentive to the emotional flow, or a series of emotional shifts throughout the message. Instead of targeting to maximize the message-induced emotional experience at the end of the message exposure, messages

could be designed in a way that reflects an intended change in emotions. For instance, to better utilize the motivating power of hope in persuasion efforts, understanding how changes in multiple emotions over the course of message exposure affect a persuasion process could be an important next step. In this study, a synchronous pattern between changes in hope and pride emerged; both emotions were decreased after exposure to proximity cue and increased after exposure to imagination prompt and recommended-actions information.

In the context of addressing socially shared health issues, pride is an interesting emotion to note because it can increase one's identification with in-group members, motivate them to approach toward in-group members, and take goal-directed actions (Harth et al., 2013; Williams & DeSteno, 2008). Although message effects on pride were not intended in this study, future research that aims to motivate social actions can capitalize on action tendencies of both hope and pride. Such a pride-hope appeal could be particularly useful in case people need to perceive their in-group identity before taking goal-directed actions to achieve a better shared future (Harth et al., 2013; Williams & DeSteno, 2008). In developing effective health messages, researchers and practitioners may benefit from considering which combinations of emotions work well and in what order, and which message features and structures would be most effective in facilitating the intended emotional flow.

### **Limitations and Future Directions**

This study has several limitations. First, participants in this study were undergraduate students recruited from introductory communication courses at the Pennsylvania State University. Given unique features of the student population—a relatively young, healthy group of people who reside in the same neighborhoods for a limited period of time—their approach toward neighborhood problems could be different from that of the general public. Hence, study findings should be interpreted with caution especially when extending the study findings to the general public.

The data for Study 2 was initially planned to be collected over the course of the 2020 Spring semester (January-May). Due to growing concerns over the coronavirus, however, the University suspended in-person research participation immediately after the spring break (mid-March). As a result, the study findings rest on responses from a total of 122 participants who completed the survey before the spring break. With the sample of 122, power to detect small (.10), medium (.30), and large (.50) bivariate effects at  $\alpha = .05$ , two-tailed was .20, .93, and .99 respectively (Faul, Erdfelder, Buchner, & Lang, 2009). J. Cohen's (1992) recommended level of power (i.e., .80) was achieved for  $r = 0.25$  or greater. In other words, the study was underpowered to detect any effects that are smaller than  $r = 0.25$ . Because many of the observed effects were smaller than this, future studies should make use of larger samples to answer the research questions in this study.

To minimize participants' fatigue in responding to the emotion measures repetitively, I combined the imagination prompt and recommended-actions information in this study and presented them altogether. As demonstrated in Study 1, however, the two message features may have differential effects on emotions. To better understand the exact influence of each message feature, future studies should test these message features separately.

Last but not least, this study did not include measures for persuasive outcomes, and thus, the effects of emotional flow on persuasion remain unanswered. To delve into the effects of emotional flow on persuasion, the research design should measure emotions at multiple time points, and analyses should be done with a method that is capable of assessing the relationship between the curve of a repeated-measures independent variable and an outcome variable (cf. Meczowski et al., 2016). Because few studies have employed a longitudinal design, it remains an empirical question how well a different sequence of emotions ultimately leads to persuasion. Future studies should look into ways to theorize the most effective emotional shift in a given context and design message features that can induce

the sequence of emotions to best facilitate the persuasive process.

### **Conclusions**

Study 2 was an investigation into the change in emotions and how the patterns of change in emotions are related to one another. Despite the expected utility of the concept of emotional flow, there has still been little discussion on how to harness it to create effective health messages. The findings of this study support the notion of emotional flow and further suggest that the flow of multiple emotions may be associated with one another, showing synchronous and/or mirroring patterns. Although Study 3 returns to focusing on the target emotion, hope, the findings of Study 2 provided ample opportunities that novel message features can utilize emotional flow to optimize the persuasion efforts to motivate social actions.

## CHAPTER FOUR: TESTING THE MODEL OF HEALTH ACTIVISM

The main study, Study 3, tests the proposed effects of proximity cue (H1), imagination prompt (H2), and recommended-actions information (H4) on cognitive appraisals, which are expected to predict a feeling of hope (H3, H5). Next, hypotheses that proposed predictors for health activism are tested. Integrated connectedness with a neighborhood storytelling network is expected to increase collective efficacy (H6), which in turn, increases health activism (H7). Finally, the influence of hope (H8) on health activism is examined. The visual depiction of the proposed hypotheses is shown in Figure 4. 1.

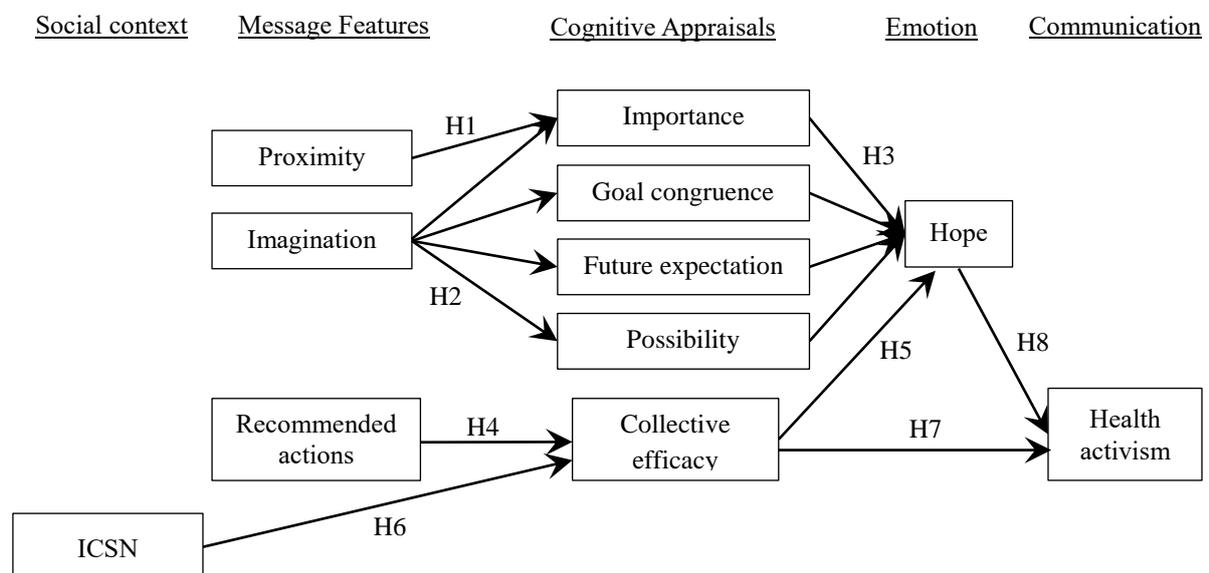


Figure 4. 1. Model of health activism

Note. ICSN refers to an integrated connectedness to a neighborhood storytelling network.

## Method

### Participants

Participants were recruited using Amazon's Mechanical Turk (MTurk). Study participation was limited to residents of Pennsylvania based on Turkers' Internal Revenue Service (IRS) records with the Amazon's payment system. Because IRS records may not

represent the current residential address, participants were also asked “Are you currently living in Pennsylvania?”; those who said *yes* were invited to fill out the survey. An average time to complete the survey was less than 30 minutes ( $M = 28.08$ ,  $SD = 100.37$ ,  $Mdn = 15.78$ ,  $Min = 5.37$ ,  $Max = 1,440.3$ ). Participants were compensated \$4 for their time. A total of 422 participants accessed the survey, but 11 participants who took less than 5 minutes to complete the survey and 4 participants who skipped three or more consecutive items for key variables were eliminated from the analyses.

**Inclusion criteria.** Participants needed to identify with their neighborhood to some degree to be included in the study. This was to ensure that participants appraise the neighborhood’s issue as relevant to themselves and thus experience an emotion about it (Lazarus, 1991; E. R. Smith et al., 2007). To this end, neighborhood identity was measured with six items modified from a three-dimensional measure of social identification scale (Cameron, 2004; Jung & Kim, 2018). The scale contained a total of six statements that tap into three dimensions of identification: cognitive centrality (e.g., “Being a member of the neighborhood is an important reflection of who I am”), in-group affect (e.g., “In general, I am glad to be a member of my neighborhood”), and in-group tie (e.g., “I have a lot in common with neighbors”). Responses were marked on a 5-point Likert-type scale with the verbal labels, and later coded as 1 = *strongly disagree*, 2 = *disagree*, 3 = *neither disagree nor agree*, 4 = *agree*, and 5 = *strongly agree*. A total of 6 participants who reported that they *strongly disagree* with all six items were excluded from the subsequent analyses. The final sample was  $N = 401$ .

**Demographic information.** Participants ( $N = 401$ , 58% female, 41% male, 1% transgender) on average were 36.06 years old ( $SD = 11.35$ ,  $Mdn = 34$ ,  $Min = 18$ ,  $Max = 97$ ). A total of 214 participants (53.4%) reported that they do not have kid and others ( $n = 186$ ; 46.4%) reported having one (16.5%), two (17.7%), three (8.2%), or four or more (3.4%) kids.

On average, the age of youngest child was 10.13 years old ( $SD = 9.56$ ,  $Mdn = 34$ ,  $Min = 1$ ,  $Max = 45$ ). A total of 14 participants reported that their children have been identified as having elevated blood lead levels. Table 4.1 reports detailed demographic information of the participants and compares that with the 2018 American Community Survey data for Pennsylvania (American Community Survey, 2018).

**County representation.** Of 67 counties in Pennsylvania, participants were from 53 counties; 64 participants were living in Allegheny County, 40 people were living in Philadelphia County, 24 people were living in Montgomery County, and all the other counties had less than 20 participants.

A series of single-sample chi-square test was conducted to examine whether demographic characteristics of the participants represented those of the entire Pennsylvania residents. Females were (58%) were overrepresented compared to population proportions (51%),  $\chi^2(1, N=401) = 12.25, p < .001$ . As to ethnicity, Hispanics (1%) were underrepresented compared to population proportions (7%). Participants who indicated multi-ethnicity (4%) were overrepresented compared to population proportions (2%),  $\chi^2(6, N=401) = 29.71, p < .001$ .

As to the education level, a smaller percentage of participants indicated that attending high school as the highest education (1%) than expected based on the population proportions (10%). A smaller percentage of participants indicated associate degree as the highest education (15%) than expected based on the population proportions (24%). A larger percentage of participants indicated bachelors as the highest education (33%) than expected based on the population proportions (19%). A larger percentage of participants indicated graduate or professional degree as the highest education (20%) than expected based on the population proportions (12%),  $\chi^2(4, N=401) = 118.46, p < .001$ .

As to the income level, participants whose monthly income was less than \$20,000

(5.48%) were underrepresented compared to population proportions (16%). Participants whose annual household income was between \$35,000 and \$50,000 (27%) were overrepresented compared to population proportions (18%). Participants whose annual household income was between \$50,000 and \$75,000 (27%) were overrepresented compared to population proportions (18%). Participants whose annual household income is between \$50,000 and \$75,000 (16%) were underrepresented compared to population proportions (27%),  $\chi^2(5, N=401) = 83.98, p < .001$ .

Table 4. 1

*Demographic Information of the Participants and Pennsylvania Residents (N = 401)*

Variable	Study Participants	Pennsylvania Residents %
<b>Sex</b>		
Female	58	51
<b>Ethnicity</b>		
White	81	81
African American	9	11
Asian	4	3
Hispanic	1	7
American Indian or Alaska native	0.2	0.2
Native Hawaiian or Pacific Islander	0	0
Some other race, ethnicity, or origin	1	2
Two or more races, ethnicities, or origins	4	2.4
<b>Education</b>		
Attended high school	1	10
Graduated high school	30	35
Associate degree	15	24
Bachelors degree	33	19
Graduate or professional degree	20	12
<b>Income</b>		
< \$20,000	6	16
\$20,000 – \$35,000	16	14
\$35,000 – \$50,000	20	13
\$50,000 – \$75,000	27	18
\$75,000 – \$100, 000	16	13
> \$100, 000	16	27

*Note.* The reported percentages add up to more than 100% because I allowed the participants to respond to multiple options. The information about Pennsylvania residents came from the American Community Survey (2018).

**Missing data.** Across items, there were a total of 25 missing observations. Missing observation for an individual on a given variable was replaced with the mean for non-missing observations for that variable (A. B. Anderson et al., 1983; Graham, 2009).

### **Study Design and Procedures**

The study was a 2 (Imagination prompt: present vs. absent) x 2 (Recommended actions: present vs. absent) between-subjects design, with a varying degree of proximity to elevated lead exposure induced by different county-level risks presented on the map of Pennsylvania.

After providing informed consent, participants in all conditions were asked three questions about their neighborhood: (a) the name of the neighborhood, (b) the approximate number of people living in the neighborhood, and (c) the number of neighbors they know by name. These questions were asked to orient participants to read the message and respond to the following questions with their neighborhood in mind. Then, participants were asked questions about their length of residence in the neighborhood, neighborhood identity, and their connectedness to a neighborhood's storytelling network.

Next, participants were randomly assigned to four message conditions. This was done by adding a randomizer element to the Qualtrics' survey flow function. This let Qualtrics assign the participants to one of the four conditions through a random number generator. Before reading the message, participants were informed that a health message they are going to read is being considered for dissemination to the public and that they will be asked to provide feedback on the content. They were also informed that the information in the message was aggregated from several scientific sources including the Centers for Disease Control and Prevention, World Health Organization, and Pennsylvania Department of Health.

After reading the experimental message, participants responded to questions about message quality, cognitive appraisals, subjective feelings of hope, and health activism intention.

Participants were also asked several demographic questions. At the end of the survey, an open-ended question asked participants to write down any thoughts or questions they had about the study.

### **Stimulus**

Participants were randomly assigned to see one of four message conditions: (a) Proximity cue alone, (b) proximity cue and imagination prompt, (c) proximity cue and recommended-actions information, and (d) proximity cue, imagination prompt, and recommended-actions information.

To begin, all participants saw a map of Pennsylvania that served as the *proximity cue*. The map presented the number and percentage of children aged 0-71 months confirmed with elevated blood lead level (EBLL) by county. Lead levels in the blood are measured in micrograms per deciliter (mcg/dL) and lead blood levels of 5 mcg/dL are considered as higher than normal (CDC, 2019). The county-level data came from the 2017 childhood lead surveillance annual report published by the Pennsylvania Department of Health. Across the counties, the number of children confirmed with EBLL per 1000 children ranged from .01 to 1.14 ( $M = .34$ ,  $SD = .36$ ,  $Mdn = .20$ ) while the percentage of children confirmed with EBLL ranged from 1.01 to 28.87 ( $M = 5.70$ ,  $SD = 4.92$ ,  $Mdn = 4.20$ ). Given the positive correlation between the two scores,  $r(399) = .15$ ,  $p < .01$ , proximity to the issue was calculated by averaging the (a) number of children confirmed with EBLL per 1000 children and (b) percentage of children tested with EBLL in the county one lives in ( $M = 3.02$ ,  $SD = 2.49$ ).

Participants who received the *imagination prompt* read the following instruction. “Imagine a better future where your neighborhood is completely free from the risks of lead exposure. Imagine that all residents become healthier, more kids play in the neighborhood,

and water anywhere from your neighborhood becomes safe to drink. Think about how the daily lives of residents in your neighborhood will be changed and try to visualize a better future in your mind.”

Participants who received *recommended-actions information* read a description of behaviors that neighbors could take to eliminate lead exposure. The presented behaviors were recommended as ways to eliminate lead exposure by different agencies including the Clean Water Action (2019) and Centers for Disease Control and Prevention (2019b). Specifically, the message first described that neighbors have the capability to make a better future for all (e.g., “Keep in mind that collective efforts can bring about a better future for the neighborhood!). Then, the message presented information about the behaviors that can reduce lead exposure in the neighborhood (e.g., “As neighbors, we can run the water for a few minutes before using it for drinking,” and “As neighbors, we can contact the elected officials in our area to request a test for lead in tap water of public facilities”).

The Flesch reading ease of the message that included all three message features (proximity cue, imagination prompt, and recommended-actions information) scored 43.7, and its Flesch-Kincaid grade level was 13, suggesting that the message should be easily understood by those who completed the high school education. As the imagination prompt contained 63 words and recommended-actions information had 91 words, the message with both imagination prompt and recommended-actions information had a total of 154 more words than the message that presented neither of them. There was no significant difference in the readability between the imagination prompt (Score: 52.6, grade level: 11) and recommended-actions information (Score: 49.9, grade level: 11).

### **Message Quality: Experimental Check**

Participants’ impressions of the message’s value were measured to assess whether the message conditions unintentionally changed that perception. Message quality was assessed

with five items modified from Cacioppo, Petty, and Morris (1983). Participants were asked to evaluate whether the message was persuasive, effective, credible, accurate, and clear.

Responses were marked on a 5-point Likert-type scale with the verbal label, and later coded as 1 = *strongly disagree*, 2 = *disagree*, 3 = *neither disagree nor agree*, 4 = *agree*, and 5 = *strongly agree* (Cronbach's  $\alpha = .71$ ).

On average, participants perceived the message as persuasive ( $M = 3.98$ ,  $SD = .81$ ), effective ( $M = 4.04$ ,  $SD = .76$ ), credible ( $M = 4.16$ ,  $SD = .68$ ), accurate ( $M = 3.87$ ,  $SD = .74$ ), and clear ( $M = 4.13$ ,  $SD = .84$ ). To confirm that there was no unintended difference in perceived message quality between the message conditions, ANOVA was conducted with perceived message quality (e.g., persuasiveness, effectiveness, credibility, accuracy, and clarity) as the dependent variable and the message condition (the four alternatives) as the independent variable. The results showed that perceived message quality did not vary by message condition,  $F(3, 397) = 1.73$ ,  $p = .16$ ,  $\eta^2 = .01$ . In addition, the confidence intervals for the message conditions overlapped: proximity cue alone ( $M = 3.94$ ,  $SD = .06$ , 95% CI [4.05, 3.83]), proximity cue and imagination prompt ( $M = 4.03$ ,  $SD = .06$ , 95% CI [4.14, 3.92]), proximity cue and recommended-actions information ( $M = 4.11$ ,  $SD = .06$ , 95% CI [4.22, 4.00]), and proximity cue, imagination prompt, and recommended-actions information ( $M = 4.07$ ,  $SD = .06$ , 95% CI [4.18, 3.96]). The overlapping confidence intervals indicated that differences between conditions were not statistically significant.

## Measurements

Because the responses were collected from individuals living in different counties of Pennsylvania, individual (resident) data are nested within groups (county). To take into account the clustering effects of the nested data in estimating factor structures, multilevel confirmatory factor analyses (ML-CFA; L. Muthén & B. Muthén, 2017) were conducted with Mplus 8.3. Intraclass correlation coefficient (ICC) quantifies the extent to which participants'

responses varies across the groups (Hox, 2010). A positive ICC suggests that observed variance in the variables of interest is due to between-group rather than within-group differences; higher values indicate greater proportions of between-group variance. For example, ICC values of 0.20 mean that about 20% of the variation in a given measure is at the group-level (Hox, 2010). In this study, ICC values of 54 items ranged from 0.01 to 0.13, meaning that 1% to 13% of the variance of the variables results from between-county variation (See Tables 4.2-4.8 for ICC values of items for each scale. Tables present abbreviated versions of the items and the exact items used in the study can be found in Appendix C).

The interdependence in the data structure also suggests that classical reliability estimates, such as Cronbach's alpha, may provide inaccurate reliability estimates (Bonito, Ruppel, & Keyton, 2012; Geldhof, Preacher, & Zyphur, 2014). Classical reliability estimates assume that item error terms vary randomly, and do not covary with either one another or the true score of the latent construct (DeVellis, 2012). Because these assumptions may not be tenable when the participants' true scores on a given construct depend, in part, on the group interaction, reliability estimates unadjusted for interdependence tend to overestimate the scale reliability (Geldhof et al., 2014),

Following Geldhof et al.'s (2014) recommendations, I calculated level-specific composite reliability ( $\omega$ ) for each scale. Assuming a scale with variance is fixed to 1,  $\omega$  at the individual level is estimated with the following formula:

$$\omega_{individual-level} = \frac{(\sum_{i=1}^k \gamma_i)^2}{\sum_{i=1}^k \gamma_i + \sum_{i=1}^k \theta_{ii}}$$

where  $\gamma$  represents the factor loading of item  $i$  onto a single common individual-level factor and  $\theta_{ii}$  represents the unique individual-level residual variances of item  $i$ .

Composite reliability ( $\omega$ ) at the county level is estimated with the following formula:

$$\omega_{\text{county-level}} = \frac{(\sum_{i=1}^k \gamma_i)^2}{\sum_{i=1}^k \gamma_i + \sum_{i=1}^k \theta_{ii}}$$

where  $\gamma$  represents the factor loading of an item  $i$  onto a single common county-level factor and  $\theta_{ii}$  represents the unique county-level residual variances of item  $i$ .

**Integrated connectedness to a neighborhood storytelling network (ICSN).** Based on Kim and Ball-Rokeach (2006a, 2006b), ICSN was computed as a weighted summation of three interaction terms between the intensity of interpersonal neighborhood storytelling (INS), scope of connections to community organizations (OC), and local media connectedness (LC). Each of three variables was standardized and then entered into the following formula:

$$\text{ICSN} = \sqrt{\text{LC} \times \text{INS}} + \sqrt{\text{LC} \times \text{OC}} + \sqrt{\text{INS} \times \text{OC}}$$

The distribution of ICSN ranged from 1 to 15 ( $M = 4.65$ ,  $SD = 2.72$ ).

**Intensity of interpersonal neighborhood storytelling.** The intensity of participation in interpersonal storytelling with neighbors was measured with five items (e.g., “How often do you have discussions with other people about things happening in your neighborhood?”) modified from previous studies (Kim & Ball-Rokeach, 2006b; R. A. Smith et al., 2020). Responses were marked on a 5-point Likert-type scale with the verbal labels, and later coded as 1 = *never*, 2 = *rarely*, 3 = *sometimes*, 4 = *frequently*, and 5 = *always*.

ML-CFA showed that the five items loaded stronger onto the single factor at the within- than the between level, which suggests that the scale for the intensity of interpersonal neighborhood storytelling operates mainly at the individual level,  $\chi^2 (df = 10, N = 401) = 242.63$ ,  $p < .001$ , CFI = 0.89, RMSEA = .24, SRMR<sub>within</sub> = .05, SRMR<sub>between</sub> = .27. The composite reliability was .92 at individual level, and .99 at group level. Table 4.2 presents the descriptive statistics of the items for the intensity of interpersonal neighborhood storytelling. Responses were averaged into a composite score, with higher scores indicating a greater intensity of interpersonal neighborhood storytelling.

Table 4. 2

*Descriptive Statistics of Interpersonal Neighborhood Storytelling*

Items	<i>M</i>	<i>SD</i>	Range	Skewness	Kurtosis	<i>ICC</i>
things	2.99	1.01	1,5	-0.19	-0.35	0.04
what happens	3.05	1.05	1,5	-0.27	-0.40	0.04
problems	2.74	1.04	1,5	0.01	-0.50	0.07
advance neighborhood	2.40	1.01	1,5	0.32	-0.51	0.01
improve life	2.35	1.06	1,5	0.48	-0.33	0.01

**Scope of connections to community organizations.** The scope of connections to community organizations was assessed with two-step measures. First, participants were asked about the existence of eight types of community organizations (e.g., political, volunteer, and religious organizations). Responses were marked on two response options with verbal labels, and later coded as 1 = *yes* and 2 = *no (do not exist or do not aware)*. Then, if participants indicated that there exists an organization, the frequency of their participation in each organization was asked. Responses were marked on a 5-point Likert-type scale with the verbal labels, and later coded as 1 = *never*, 2 = *rarely*, 3 = *sometimes*, 4 = *frequently*, and 5 = *always*. Responses of the participants who indicated *no* to the first question were later coded as 0.

ML-CFA showed that eight items loaded stronger onto the single factor at the within- than the between level, which suggests that the scale for the scope of connections to community organizations operates mainly at the individual level,  $\chi^2$  ( $df = 40$ ,  $N = 401$ ) = 178.21,  $p < .001$ , CFI = .91, RMSEA = .09, SRMR<sub>within</sub> = .06, SRMR<sub>between</sub> = .44. The composite reliability was .89 at individual level, and .92 at group level. Table 4.3 presents the descriptive statistics of the items for the scope of connections to community organizations. Responses were averaged into a composite score, with higher scores indicating greater connectedness to community organizations.

Table 4. 3

*Descriptive Statistics of Scope of Connectedness to Community Organizations*

Items	<i>M</i>	<i>SD</i>	Range	Skewness	Kurtosis	<i>ICC</i>
sport/recreational	1.50	1.41	0,5	0.80	-0.28	0.04
cultural	0.94	1.17	0,5	1.23	0.82	0.08
ethnic	0.75	1.24	0,5	1.57	2.35	0.09
religious	1.53	1.36	0,5	0.76	-0.41	0.13
political	1.08	1.22	0,5	1.18	0.86	0.03
educational	1.44	1.47	0,5	0.76	-0.56	0.09
volunteer	1.56	1.35	0,5	0.56	-0.56	0.05
development	1.13	1.23	0,5	1.09	0.59	0.12

**Local media connectedness.** The connectedness to local media was assessed with two-step measures. First, participants were asked if there exist seven types of local media outlets (e.g., local/neighborhood newspapers, radio broadcasts, and magazines). Responses were marked on two response options with verbal labels, and later coded as 1 = *yes* and 2 = *no (do not exist or do not aware)*. Then, if participants indicated that there exists a media outlet, the frequency of each media outlet usage was asked. Responses were marked on a 5-point Likert-type scale with the verbal labels, and later coded as 1 = *never*, 2 = *rarely*, 3 = *sometimes*, 4 = *frequently*, and 5 = *always*. Responses of the participants who indicated *no* to the first question were later coded as 0.

ML-CFA showed that seven items loaded stronger onto the single factor at the within- than the between level, which suggests that the scale for the connectedness to local media operates mainly at the individual level,  $\chi^2 (df = 28, N = 401) = 74.44, p < .001, CFI = .94, RMSEA = .06, SRMR_{within} = .05, SRMR_{between} = .21$ . The composite reliability was .80 at individual level, and .96 at group level. Table 4.4 presents the descriptive statistics of the items for the connectedness to local media. Responses were averaged into a composite score, with higher scores indicating greater connectedness to local media.

Table 4. 4

*Descriptive Statistics of Scope of Local Media Connectedness*

Items	<i>M</i>	<i>SD</i>	Range	Skewness	Kurtosis	<i>ICC</i>
newspapers	1.70	1.54	0,5	0.32	-1.15	0.02
radio broadcast	0.69	1.25	0,5	1.50	1.48	0.04

television broadcast	0.97	1.36	0,5	1.35	0.83	0.07
magazines	1.30	1.47	0,5	0.81	-0.63	0.09
newsletters	1.34	1.35	0,5	0.71	-0.63	0.11
social media	1.99	1.55	0,5	0.17	-1.18	0.07
townhall website	1.48	1.35	0,5	0.47	-0.87	0.05

**Hope-related cognitive appraisals.** Each of the four cognitive appraisals was assessed using four respective items. Responses were marked on a 5-point Likert-type scale with the verbal labels, and later coded as 1 = *strongly disagree*, 2 = *disagree*, 3 = *neither disagree nor agree*, 4 = *agree*, and 5 = *strongly agree*.

*Appraisal of importance* was measured with four items including “Eliminating neighborhood risks of lead exposure is important to my neighborhood” and “Risks of lead exposure affects my neighborhood in many ways.” ML-CFA showed that the four items loaded stronger onto the single factor at the within- than the between level, which suggests that the scale for the importance appraisal operates mainly at the individual level,  $\chi^2 (df = 4, N = 401) = 6.52, p = .16, CFI = 1.00, RMSEA = .04, SRMR_{within} = .02, SRMR_{between} = .53$ . The composite reliability was .86 at individual level, and .18 at group level.

*Appraisal of goal congruence* was measured with four items including “Eliminating the neighborhood risks of lead exposure is in line with achieving the goal of my neighborhood,” and “Eliminating the neighborhood risks of lead exposure would help achieve other important goals my neighborhood have.” ML-CFA showed that the four items had a unidimensional structure at both the within- and between-group level,  $\chi^2 (df = 4, N = 401) = 11.91, p = .02, CFI = .99, RMSEA = .07, SRMR_{within} = .01, SRMR_{between} = .06$ . The composite reliability was .95 at individual level, and .24 at group level.

*Appraisal of future expectation* was measured with four items including “Eliminating the neighborhood risks of lead exposure will make a much better future for my neighborhood” and “Eliminating the neighborhood risks of lead exposure will make the future for my neighborhood wonderful.” ML-CFA showed that the four items showed a reasonable fit,

operating mainly at the individual level,  $\chi^2 (df = 4, N = 401) = 104.86, p < .001, CFI = .91, RMSEA = .25, SRMR_{within} = .05, SRMR_{between} = .36$ . The composite reliability was .89 at individual level, and .98 at group level.

*Appraisal of possibility* was measured with four items including “Eliminating the neighborhood risks of lead exposure is possible,” and “Eliminating the neighborhood risks of lead exposure is achievable.” One item to measure possibility appraisal (“Eliminating risks of lead exposure in my neighborhood is likely to happen”) was dropped because it showed high standardized residual values ( $> 3.00$ ) with several other items. ML-CFA showed that three items had a unidimensional structure at both the within- and between-group level,  $\chi^2 (df = 0, N = 401) = 0.33, p < .001, CFI = .99, RMSEA < .001, SRMR_{within} < .01, SRMR_{between} = .05$ . The composite reliability was .88 at individual level, and .87 at group level.

Responses for each of four appraisal dimensions were respectively averaged into separate composite scores, with higher scores indicating stronger importance, goal congruence, future expectation, and possibility. Table 4.5 presents the descriptive statistics of the items for four cognitive appraisal scales.

Table 4. 5

*Descriptive Statistics of Four Hope-Relevant Appraisals*

Items	<i>M</i>	<i>SD</i>	Range	Skewness	Kurtosis	<i>ICC</i>
Importance						
important	3.91	0.88	1,5	-0.67	0.39	0.01
affects in many ways	3.76	1.00	1,5	-0.50	-0.50	0.02
matters	3.85	0.92	1,5	-0.65	-0.65	0.01
of concern	3.59	1.03	1,5	-0.38	-0.38	0.01
Goal congruence						
in line with goals	3.66	0.91	1,5	-0.57	0.23	0.04
helps achieve goals	3.65	0.89	1,5	-0.42	-0.02	0.03
conducive to	3.62	0.88	1,5	-0.38	0.08	0.02
favorable conditions	3.89	0.86	1,5	-0.73	0.65	0.03
Future expectation						
much better future	4.24	-0.76	1,5	-1.09	1.95	0.02
wonderful future	3.80	2.14	1,5	-0.44	-0.12	0.02
contribute to future	4.18	1.83	1,5	-0.95	1.55	0.02

bright future	3.93	1.50	1,5	-0.47	-0.20	0.02
		Possibility				
achievable	3.85	0.82	1,5	-0.76	0.60	< 0.01
possible	4.00	0.79	1,5	-1.08	1.94	< 0.01
feasible	3.85	0.85	1,5	-0.84	0.89	0.02

**Collective efficacy.** Collective efficacy was measured with three items adapted from Bandura (2000): “My neighbors have the ability to eliminate the risks of lead exposure,” “I believe that my neighbors are capable of eliminating the risks of lead exposure,” and “I am confident that my neighbors can eliminate the risks of lead exposure.” Responses were marked on a 5-point Likert-type scale with the verbal labels, and later coded as 1 = *strongly disagree*, 2 = *disagree*, 3 = *neither disagree nor agree*, 4 = *agree*, and 5 = *strongly agree*.

ML-CFA showed that three items had a unidimensional structure at both the within- and between-group level,  $\chi^2$  ( $df = 0$ ,  $N = 401$ ) = 0.32,  $p < .001$ , CFI = 1.00, RMSEA < .01, SRMR<sub>within</sub> < .01, SRMR<sub>between</sub> = .01. The composite reliability was .93 at individual level, and .99 at group level. Table 4.6 presents the descriptive statistics of the items for collective efficacy. Responses were averaged into a composite score, with higher scores indicating stronger collective efficacy.

Table 4. 6

*Descriptive statistics of Collective Efficacy*

Items	<i>M</i>	<i>SD</i>	Range	Skewness	Kurtosis	<i>ICC</i>
have the ability	3.35	1.00	1,5	-0.43	-0.41	0.02
are capable of	3.39	1.00	1,5	-0.53	-0.26	0.03
confident	3.14	1.05	1,5	-0.19	-0.76	0.02

**Subjective feelings of hope.** Subjective feelings of hope after the message exposure were measured by asking participants how much of the following six emotions—hopeful, inspired, encouraged, heartened, energized, and anticipated—they feel about the future of their neighborhood. Responses were marked on a 5-point Likert-type scale, with verbal labels later to be coded as 1 = *none of this emotion*, 2 = *a little bit*, 3 = *somewhat*, 4 = *moderate*, 5 = *a*

*great deal of this emotion.*

ML-CFA showed that six items loaded stronger onto the single factor at the within- than the between level, which suggests that the scale for hope operates mainly at the individual level,  $\chi^2 (df = 18, N = 401) = 34.18, p < .001, CFI = .99, RMSEA = .05, SRMR_{within} = .02, SRMR_{between} = .31$ . The composite reliability was .93 at individual level, and .99 at group level. Table 4.7 presents the descriptive statistics of the items for hope. Responses were averaged into a composite score, with higher scores indicating stronger hope.

Table 4. 7

*Descriptive Statistics of Subjective Feelings of Hope*

Items	<i>M</i>	<i>SD</i>	Range	Skewness	Kurtosis	<i>ICC</i>
hopeful	2.75	1.27	1,5	0.11	-1.06	0.01
inspired	2.50	1.29	1,5	0.32	-1.08	< 0.01
encouraged	2.67	1.29	1,5	0.08	-1.27	0.01
energized	2.41	1.27	1,5	0.37	-1.04	0.01
heartened	2.49	1.27	1,5	0.27	-1.12	0.02
anticipated	2.32	1.23	1,5	0.42	-0.98	< 0.01

**Intention to engage in health activism.** Intention for health activism was measured with nine items that were created based on theoretical constructs from TPH and CIT. Nine items to measure health activism intention addressed five topics: (a) one item for the problem (e.g., “I intend to talk with neighbors about the lead exposure in the neighborhood”), (b) five items for solutions (e.g., “I intend to talk with neighbors that we should run water for a few minutes before using it for drinking or cooking”), (c) one item for collective efficacy (“I intend to talk with neighbors about our ability to eliminate the risks of lead exposure in the neighborhood”), (d) one item for hopeful thinking (“I intend to talk with neighbors about the better future that can be achieved by eliminating the risks of lead exposure in the neighborhood”), and (e) one item for hopeful feeling (“I will talk about how hopeful I am about eliminating the risks of lead exposure in the neighborhood”). Responses were marked on a 5-point Likert-type scale with the verbal labels, and later coded as 1 = *very unlikely*, 2 =

unlikely, 3 = unsure, 4 = likely, and 5 = very likely.

ML-CFA showed that the nine items loaded stronger onto the single factor at the within level (individual level) than the between level (county level), which suggests that the scale for the health activism intention operates mainly at the individual level,  $\chi^2$  ( $df = 54$ ,  $N = 401$ ) = 263.94,  $p < .001$ , CFI = .95, RMSEA = .10, SRMR<sub>within</sub> = .02, SRMR<sub>between</sub> = .21. The composite reliability was .96 at individual level, and .99 at group level. Table 4.8 presents the descriptive statistics of the items for health activism intention. Responses were averaged into a composite score, with higher scores indicating stronger health activism intention.

Table 4. 8

*Descriptive Statistics of Health Activism Intention*

Items	<i>M</i>	<i>SD</i>	Range	Skewness	Kurtosis	<i>ICC</i>
risks of lead exposure	3.07	1.26	1,5	-0.35	-1.06	0.01
how to eliminate risk	2.94	1.24	1,5	-0.15	-1.06	0.03
ability to eliminate risk	2.91	1.19	1,5	-0.13	-0.98	0.03
better future	2.86	1.24	1,5	-0.09	-1.13	0.02
how hopeful I am	2.76	1.23	1,5	0.09	-1.06	0.02
run water	3.22	1.26	1,5	-0.42	-0.87	0.02
request a test for lead	2.96	1.27	1,5	-0.04	-1.09	0.02
request funding	2.80	1.26	1,5	0.04	-1.17	0.03
lead monitoring results	3.07	1.26	1,5	-0.26	-1.04	0.02

**Demographic variables.** Participants' age, sex, ethnicity, education, income, number, and age of children, and whether any of their children has been identified as having elevated blood lead levels were assessed at the end of the survey.

## Results

### Descriptive Statistics for Study Variables

The means, standard deviations, ranges, and normality estimates for study variables appear in Table 4.9. For all the variables, the deviation of data from normality is acceptable based on Kline's (2009) criteria of absolute value of skewness and kurtosis being below 3 and 10 respectively. The mean level of ICSN ( $M = 4.65$ ,  $SD = 2.72$ , on a 16-point scale

ranging from 0 to 15) suggests that participants were somewhat connected with a neighborhood storytelling network, but the connections were below a moderate degree. All other variables were measured on a 5-point scale ranging from 1 to 5. The results showed that participants, on average, felt somewhere between “a little bit” and “somewhat” hopeful ( $M = 2.52$ ,  $SD = 1.10$ ). Participants, on average, reported moderate hope appraisals. They generally agreed that eliminating the risks of lead exposure is important to their neighborhood ( $M = 3.78$ ,  $SD = 0.81$ ), helps achieve other goals of the neighborhood ( $M = 3.70$ ,  $SD = 0.78$ ), brings about a better future for the neighborhood ( $M = 4.04$ ,  $SD = 0.71$ ), and is something that can be achieved ( $M = 3.71$ ,  $SD = 0.71$ ). On average, participants reported “neutral” assessments of their neighbors’ capability to eliminate lead exposure risk ( $M = 3.29$ ,  $SD = 0.95$ ), and “unsure” (the scale’s mid-point) of their intention to engage in health activism ( $M = 2.95$ ,  $SD = 1.08$ ).

Table 4. 9

*Descriptive Statistics of Study Variables*

	<i>M</i>	<i>SD</i>	Scale range	Observed range	Skewness	Kurtosis
Pre-message variables (self-reported)						
ICSN	4.65	2.72	0,15	0,15	0.39	0.22
Post- message variables (self-reported)						
Importance	3.78	0.81	1,5	1,5	-0.46	0.15
Goal congruence	3.70	0.78	1,5	1,5	-0.46	0.53
Future expectation	4.04	0.71	1,5	1,5	-0.56	0.95
Possibility	3.71	0.71	1,5	1,5	-0.72	1.25
Hope	2.52	1.10	1,5	1,5	0.18	-1.08
Collective efficacy	3.29	0.95	1,5	1,5	-0.41	-0.23
Health activism	2.95	1.08	1,5	1,5	-0.32	-0.83

*Note.* ICSN refers to an integrated connectedness to storytelling network, which is calculated based on the intensity of interpersonal neighborhood storytelling, scope of connections to community organizations, and local media connectedness.

Zero-order correlations among message features and study variables were calculated and appear in Table 4.10. The correlations should be interpreted with caution because they have not been adjusted for the interdependence in the data.

Table 4. 10

*Correlations among the Study Variables (N = 401)*

Variable	1	2	3	4	5	6	7	8	9	10
1. Proximity cue	--									
2. Imagination prompt	-.02	--								
3. Recommended actions	.04	.01	--							
4. Importance	.03	.05	-.05	--						
5. Goal congruence	.04	.11*	-.01	.61**	--					
6. Future expectation	-.00	.07	-.05	.58**	.51**	--				
7. Possibility	-.03	-.06	.07	.14**	.25**	.17**	--			
8. ICSN	-.11*	-.02	.01	.22**	.26**	.17**	.13*	--		
9. Collective efficacy	-.07	-.08	.10*	.20**	.26**	.28**	.37**	.21**	--	
10. Hope	.04	.18**	.18**	.23**	.27**	.27**	.23**	.30**	.33**	--
11. Health activism intention	.04	.03	.03	.44**	.44**	.38**	.16**	.44**	.36**	.46**

*Notes.* The variable for proximity cue was created by calculating the mean score for the (a) number of children confirmed with EBLL per 1000 children and (b) percentage of children confirmed with EBLL by county. The variables for Imagination prompt and Recommended-actions information were recoded such that 1 = presence of the message feature, -1 = absence of the message feature. ICSN refers to an integrated connectedness to neighborhood storytelling network. Zero-order correlations were calculated using the observed standard deviations; they are not adjusted based on dependencies in the data.

\* $p < .05$ , \*\* $p < .01$ .

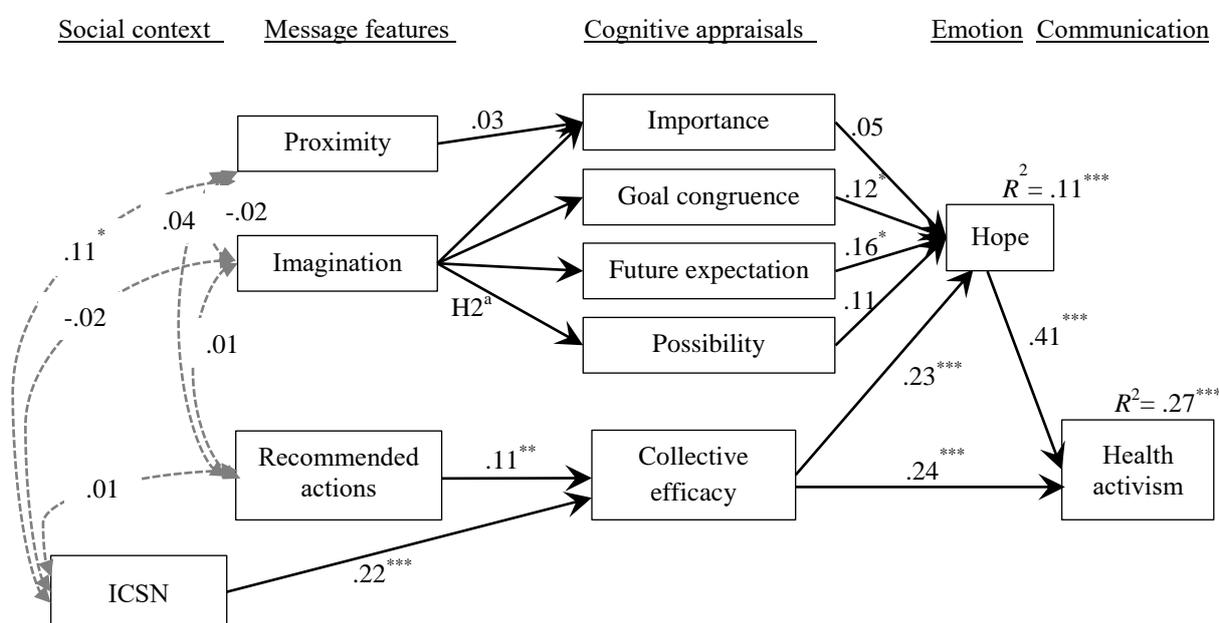
## Analysis Plan

Data collected for this study is multilevel with a nested structure of residents within the county. When testing the mediational hypotheses with clustered data, a multi-level structural equation model (ML-SEM) can be an ideal analysis method for several reasons. First, ML-SEM can test clustered data that violates the assumption of independence of observations (Preacher, Zhang, & Zyphur, 2011). In this study, the sample is hierarchical, with residents nested within the counties, resulting in two-level data. Second, ML-SEM decomposes variability in variables into two latent components (i.e., within-unit and between-unit) and enables modeling of the relationships among these components within each level through the specification of measurement and structural models (Asparouhov & B. Muthén, 2009). This allows for the estimation of measurement errors in the data (Rabe-Hesketh, Skrondal, & Zheng, 2012). Third, ML-SEM can estimate the mediational pathways among predictors more precisely because variance is decomposed into two components, thereby avoiding conflated estimate of between (i.e., county-level) and within (i.e., individual-level) components of indirect effects (Preacher, Zyphur, & Zhang, 2010; Preacher et al., 2011).

For these reasons, the proposed hypotheses were tested with ML-SEM. In Mplus, there are two approaches to analyze the data with nested structure: complex modeling and multilevel modeling. Complex modeling (TYPE=COMPLEX) produces a model for the entire population while taking into account the sampling features that cause interdependence between the observations (L. Muthén & B. Muthén, 2017). Multilevel-modeling (TYPE = TWO LEVEL) specifies a model for each level of the multilevel data (L. Muthén & B. Muthén, 2017). Because I aimed to account for the fact that individuals are nested in counties, and did not intend to analyze the data at the two different levels, complex modeling was used to test ML-SEM in this study.

## Hypotheses Testing

To test the proposed hypotheses, ML-SEM was estimated using Mplus version 8.3. The following criteria were used to evaluate the overall model fit:  $\chi^2/df < 3.00$ , CFI  $> .90$ , RMSEA  $< .08$ , and SRMR  $< .08$  (Bentler & Raykov, 2000; T. A. Brown, 2014; Hu & Bentler, 1999). The fit indices for the hypothesized model were  $\chi^2 (df = 613, N = 401) = 1611.05, p < .001$ ,  $\chi^2/df$  ratio = 2.63, CFI = 0.90, RMSEA = .064, 90% CI: [.06, .07], SRMR = 0.19. The estimates appear in Figure 4. 2.



*Figure 4. 2.* Observed causal relationships among variables that predict health activism  
*Notes.* ICSN refers to an integrated connectedness to neighborhood storytelling network. Complex modeling (Type = Complex) was used to test the proposed model in Mplus. Standardized beta coefficients are reported in the model.

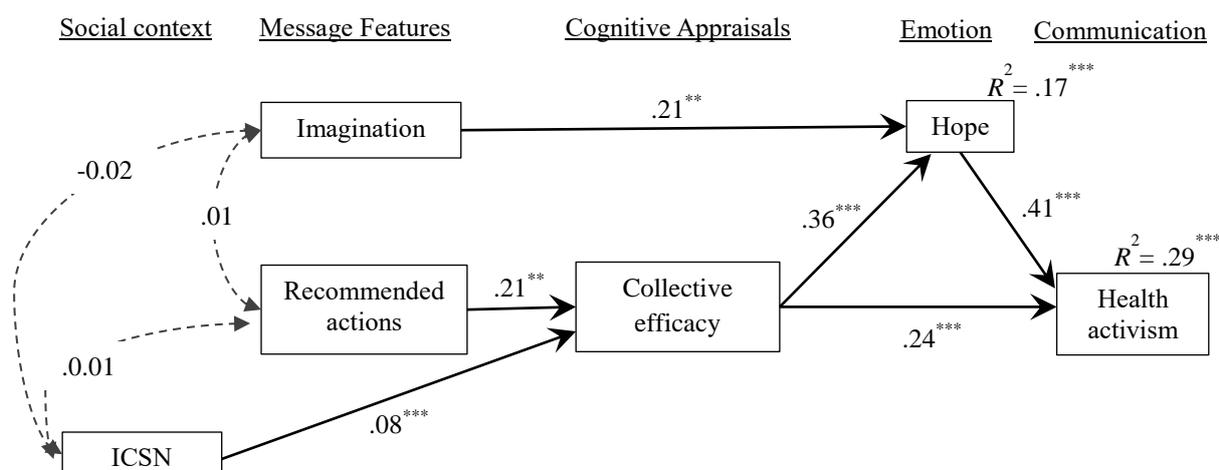
<sup>a</sup>For H2, the influence of imagination prompt on (b) goal congruence ( $\beta = .12, p < .05$ ) was significant, but on (a) importance ( $\beta = .04, p = .46$ ), (c) positive future expectation ( $\beta = .07, p = .32$ ), and (d) possibility ( $\beta = -.06, p = .24$ ) was not significant.

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

Although the  $\chi^2/df$  ratio and RMSEA were acceptable, the CFI was at the cutoff value, and the SRMR value of 0.19 was unacceptable. Therefore, I decided to consider alternative models. Hypotheses testing results indicated that some predicted paths, especially those from message features to cognitive appraisals, and cognitive appraisals to hope, are not significant. I used such information as I crafted alternative models.

### **Exploration: Estimating Alternative Models**

**Alternative model 1.** Drawn from hypotheses testing results and correlation coefficients between the variables (Table 4.10), I made three adjustments to the initial model. (1) I removed the proximity cue because it did not affect either importance appraisal or hope. (2) Because the four hope-related cognitive appraisals (i.e., importance, goal congruence, future expectation, and possibility) were largely unrelated to hope, those appraisals were removed from the model as well. (3) Given the positive correlation between the imagination prompt and hope,  $r(399) = .18, p < .01$ , a direct path from imagination prompt to hope was added. The fit indices for alternative model 1 were  $\chi^2(df = 183, N = 401) = 373.48, p < .001$ ,  $\chi^2/df$  ratio = 2.04, CFI = 0.96, RMSEA = .05, 90% CI: [.04, .06], SRMR = 0.08. In comparison with the initial model ( $R^2 = .27$ ), the alternative model 1 explained more variance in health activism intention ( $R^2 = .29$ ) with fewer variables and paths. With a preference for parsimony, I selected the alternative model 1, which is a simpler model with greater explanatory power over the initial model. The estimates for the alternative model 1 appear in Figure 4.3.

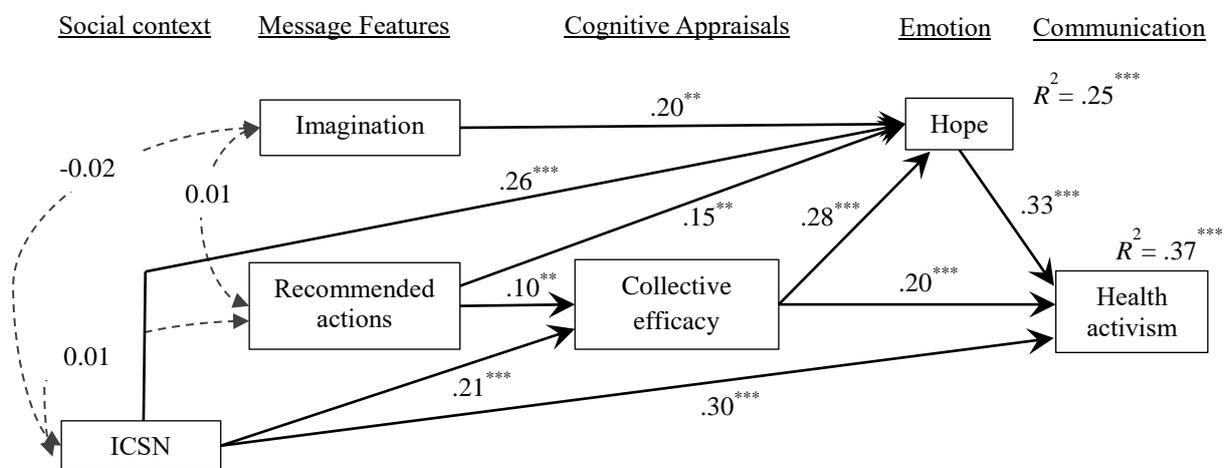


*Figure 4. 3.* Observed causal relationships among variables in the alternative model 1  
*Notes.* Complex modeling (Type = Complex) was used to test the model in Mplus. ICSN refers to an integrated connectedness to neighborhood storytelling network. Standardized beta coefficients are reported in the model.

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

**Alternative model 2.** To examine whether the model fit indices could be further improved, I explored three possible additional paths to predict health activism intention and its antecedents. First, I added a direct path from recommended-actions information to hope, considering the possibility that hope is a direct reaction to efficacious information. Positive correlation between recommended-actions information and hope,  $r(399) = .18$ ,  $p < .01$ , supported this decision. Next, I added two additional paths based on the assessment of modification indices. Whereas integration into the neighborhood storytelling network (ICSN) was hypothesized as predicting only collective efficacy in the initial model, I added a path from ICSN to hope and from ICSN to health activism in the alternative model 2. As part of post-hoc exploration, I expected that an integrated connectedness to a neighborhood storytelling network may influence any perceptions residents have about the neighborhood. To be specific, residents who are more connected to a neighborhood storytelling network may be more confident about neighbors' capability and more hopeful about the neighborhood's

future, and likely to engage in health activism to a greater extent. The fit indices for the resulting alternative model 2 that added three additional paths to the alternative model 1 were  $\chi^2 (df = 180, N = 401) = 296.90, p < .001, \chi^2/df$  ratio = 1.65, CFI = 0.98, RMSEA = .04, 90% CI: [.03, .05], SRMR = 0.04. Overall, the fit indices indicated that the alternative model 2 had an excellent fit to the data and had a better fit than the alternative model 1,  $\Delta\chi^2 = 76.58, df = 3, p < .001$ . The estimates for the alternative model 2 appear in Figure 4.4.



*Figure 4. 4.* Observed causal relationships among variables in the alternative model 2.  
*Notes.* A complex modeling (Type = Complex) was used to test the model in Mplus. ICSN refers to an integrated connectedness to neighborhood storytelling network. Standardized beta coefficients are reported in the model.

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

Overall, the alternative model 2 shows that stronger intention to engage in health activism was directly predicted by stronger hope, greater collective efficacy, and a stronger perception of the integrated connectedness to the neighborhood storytelling network. Stronger hope was directly predicted by greater collective efficacy, exposure to the imagination prompt, exposure to the recommended-actions information, and a stronger perception of the integrated connectedness to the neighborhood storytelling network. Some of these findings aligned with the hypotheses and others did not.

**Testing message effects on cognitions.** H1 proposed that when proximity to the issue is higher, appraisals of importance of achieving a desired future outcome will be stronger. In the original model (Figure 4.2), greater proximity to the issue was not related to appraisals of importance ( $\beta = .03, p = .44$ ). The path was eliminated in the alternative models 1 and 2. H1 was not supported.

H2 proposed that when the imagination prompt is presented (vs. absent) in the message, appraisals for (a) importance, (b) goal congruence, (c) positive future expectation, and (d) possibility of achieving a desired future outcome will be stronger. In the original model (Figure 4.2), the presence (vs. absence) of the imagination prompt in the message predicted a stronger goal congruence appraisal ( $\beta = .13, p < .05$ ), but was unrelated to the appraisals for importance ( $\beta = .04, p = .46$ ), positive future expectation ( $\beta = .07, p = .32$ ), and possibility ( $\beta = -.06, p = .24$ ). The appraisals were dropped altogether from the alternative models 1 and 2. H2 was not supported.

H4 proposed that when recommended-actions information is presented (vs. absent) in the message, collective efficacy will be stronger. The presence of recommended-actions information in the message predicted stronger collective efficacy ( $\beta = .10, p < .01$ , in the alternative model 2). H4 was supported.

**Testing predictors of health activism.** H3 proposed that higher appraisals of (a) importance, (b) goal congruence, (c) future expectation, and (d) possibility will predict a stronger subjective feeling of hope. In the original model (Figure 4.2), higher appraisals of goal congruence ( $\beta = .12, p < .05$ ) and positive future expectation ( $\beta = .16, p < .05$ ) predicted stronger hope, but appraisals of importance ( $\beta = .05, p = .54$ ) and possibility ( $\beta = .11, p = .13$ ) were not related to hope. None of the appraisals were retained in alternative models 1 and 2. H3 was not supported.

H5 stated that stronger collective efficacy would predict stronger hope. Stronger collective efficacy predicted stronger hope ( $\beta = .28, p < .001$ , based on the alternative model 2). H5 was supported.

H6 stated that ICSN will predict stronger collective efficacy. Greater ICSN predicted stronger collective efficacy ( $\beta = .21, p < .001$ , based on the alternative model 2). H6 was supported.

H7 and H8 respectively predicted the positive influence of hope and collective efficacy on health activism. Stronger hope predicted greater health activism intention ( $\beta = .33, p < .001$ , based on the alternative model 2). H7 was supported. Stronger collective efficacy predicted greater health activism intention ( $\beta = .20, p < .001$ , based on the alternative model 2). H8 was supported.

**Alternative model findings.** The alternative models revealed two unanticipated message-effects. In the final alternative model 2, the presence (vs. absence) of imagination prompt predicted stronger hope ( $\beta = .20, p < .01$ ). The presence (vs. absence) of recommended-actions information on hope also predicted stronger hope ( $\beta = .15, p < .01$ ). In addition, the post-hoc analysis revealed two additional influences of ICSN. Stronger connectedness to a neighborhood storytelling network predicted stronger hope ( $\beta = .26, p < .001$ ) and greater health activism intention ( $\beta = .30, p < .001$ ).

**Post-hoc analysis: Examining indirect effects.** I examined the mediating role of the variables in the final alternative model 2. Indirect effects were estimated with bootstrapping procedures (2,000 bootstrap samples) and bias-corrected confidence (Hayes & Scharkow, 2013). Bootstrapping procedure was conducted in Mplus version 8.3.

I first tested the possible mediating role of collective efficacy in the model. The indirect effect of recommended-actions information on hope through collective efficacy was statistically significant ( $\beta = .03, p < .01, 95\% \text{ CI } [.01, .05]$ ). The indirect effect of ICSN on

hope through collective efficacy was statistically significant ( $\beta = .06, p < .05, 95\% \text{ CI } [.02, .09]$ ). The indirect effect of ICSN on health activism through collective efficacy was statistically significant ( $\beta = .04, p < .01, 95\% \text{ CI } [.05, .12]$ ).

I then tested the possible mediating role of hope in the model. The indirect effect of imagination prompt on health activism through hope was statistically significant ( $\beta = .07, p < .01, 95\% \text{ CI } [.05, .25]$ ). The indirect effect of recommended-actions information on health activism through hope was statistically significant ( $\beta = .05, p < .01, 95\% \text{ CI } [.02, .08]$ ). The indirect effect of ICSN on health activism through hope was statistically significant ( $\beta = .09, p < .001, 95\% \text{ CI } [.02, .07]$ ).

### **Exploration: Predicting Online Health Activism**

Although Study 3 focused on in-person health activism among neighbors, neighbors can utilize online platforms to address common health concerns. I thus examined whether the predictors of in-person health activism are also predictive of online health activism. The items to measure online health activism intention were presented right after the items for in-person health activism intention in the Study 3 questionnaire.

To measure online health activism intention, participants were first asked to indicate how often they engage in community-oriented social media such as a private Facebook page for the neighborhood or neighborhood apps like Nextdoor. Responses were marked on a 5-point Likert-type scale (1 = *never*, 2 = *rarely*, 3 = *sometimes*, 4 = *frequently*, and 5 = *always*). Participants who reported that they *never* ( $n = 97$ ) use community-oriented social media were not included in this exploration. The rest of the participants ( $n = 304$ ) were asked three questions to assess their intentions to engage in online health activism: (a) “I intend to initiate a conversation about lead contamination, (b) “I intend to seek information about lead contamination,” and (c) “I intend to share ways to eliminate risks of lead exposure” on the community-oriented social media platforms were further presented to measure their online

health activism intention.” Responses were marked on a 5-point Likert-type scale (1 = *very unlikely*, 2 = *unlikely*, 3 = *unsure*, 4 = *likely*, and 5 = *very likely*).

ML-CFA showed that the three items loaded stronger onto the single factor at the within level (individual level) than the between level (county level), which suggests that the scale for the online health activism intention operates mainly at the individual level,  $\chi^2 (df = 0, N = 304) = 0.35, p < .001, CFI = 1.00, RMSEA < .01, SRMR_{within} < .01, SRMR_{between} = .27$ . The composite reliability was .89 at individual level, and .88 at group level. Table 4.11 presents the descriptive statistics of the items for online health activism intention. Responses were averaged into a composite score, with higher scores indicating stronger online health activism intention ( $M = 3.10, SD = 1.10$ ). On average, participants were “unsure” as to whether they intend to engage in online health activism.

Table 4. 11

*Descriptive Statistics of Online Health Activism Intention*

Items	<i>M</i>	<i>SD</i>	Range	Skewness	Kurtosis	<i>ICC</i>
initiate a conversation	2.86	1.22	1,5	-.10	-1.03	< 0.01
seek information	3.39	1.24	1,5	-.71	-.52	< 0.01
share ways	3.06	1.21	1,5	-.36	-.93	< 0.01

Based on the high correlation coefficient between health activism intention and online health activism intention  $r(302) = .70, p < .01$ , it is reasonable to assume that direct predictors of health activism intention would also be predictive of online health activism intention. To test the influence of collective efficacy and hope on online health activism intention, ML-SEM was estimated using Mplus version 8.3. A complex modeling (Type = Complex) was used. The estimated model overall showed a good fit to the data,  $\chi^2 (df = 51, N = 304) = 84.88, p < .001, CFI = 0.98, RMSEA = .05, 90\% CI: [.03, .06], SRMR = 0.04$ . As in Figure 4.5, the influence of collective efficacy ( $\beta = .21, p < .001$ ) and hope ( $\beta = .36, p < .001$ ) on online health activism intention was statistically significant.

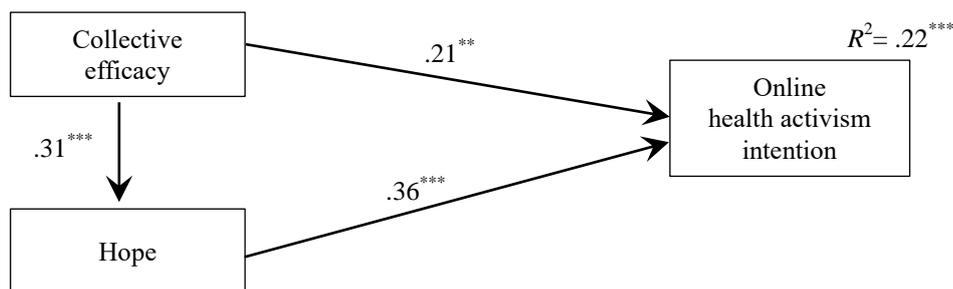


Figure 4. 5. Observed relationships among variables that predict online health activism

\*\*  $p < .01$ , \*\*\*  $p < .001$ .

## Discussion

In Study 3, the proposed model of health activism was tested in the context of lead-exposure risks in Pennsylvania. The overall goal of Study 3 was to examine the process by which exposure to a neighborhood-oriented health message motivates health activism. The findings provided support for some hypotheses (4-8), but not others (1-3).

### Theoretical Implications for Hope Appeals

One goal of this study was to assess whether three novel message features motivate health activism by evoking cognitive appraisals related to hope, collective efficacy, and subjective feelings of hope. Three message features were designed with attributes of neighborhood issues in mind. People need to relate to the issue based on its relevance to their neighborhood (i.e., proximity cue), have a positive expectation toward a better, shared future (i.e., imagination prompt), and have confidence in the collective's ability to bring about a better shared future (i.e., recommended-actions information). Two novel message features – a proximity cue and an imagination prompt – were hypothesized to evoke hope by influencing hope-related cognitive appraisals (i.e., importance, goal congruence, future expectation, and possibility). Recommended-actions information was expected to increase hope through collective efficacy.

Results from the initial multilevel model showed that the proximity cue was not related to importance appraisal. Imagination prompt had a significant influence on one appraisal (goal congruence), but not on the other three appraisals. Recommended-actions information, in contrast, was successful: it predicted collective efficacy. As hypothesized, collective efficacy, in turn, had a positive influence on hope. Based on such results, I deleted the proximity cue and cognitive appraisals and from the model to estimate the alternative models. Additionally, based on positive correlations, I added a direct path from the imagination prompt to hope and from recommended-actions information to hope, which led to an improvement in the model fit.

**Hope-relevant cognitive appraisals.** The failure of hope-relevant cognitive appraisals in mediating the influence of message features on hope can be explained in a few different ways. First, there might have been a mismatch between the county-level information presented in the proximity cue and participants' sense of neighborhood that they based on to appraise the future outcome. Conceptualization and operationalization of neighborhoods have been controversial in previous studies (E. Campbell et al., 2009; Glynn; 1986; Weiss et al., 2007). Even though using pre-defined boundaries, such as census tracts and counties, renders accessibility to the data and replicability of the findings, their disadvantages lie in possible discrepancies with residents' perceptions of neighborhood boundaries (Pickett & Pearl, 2001). In the context of this study, although it is reasonable to expect that participants who live in the county with high lead exposure risk are likely to perceive the issue as relevant to their neighborhood, it might as well be the case that they believe the specific neighborhood they live in is safe despite the county-level high risk. Future studies should consider dynamic ways to conceptualize neighborhoods in examining the effects of neighborhood-oriented health messages.

The implications for the second message feature, imagination prompt, are a bit more complicated. Exposure to the imagination prompt only influenced one hope-related cognitive appraisal: goal congruence. The limited influence of imagination prompt suggests that a specific message feature may affect a certain appraisal but not all four cognitive appraisals that were theorized as evoking hope in discrete-emotions perspective (Lazarus, 1991). Instead of assuming that a given message feature would tap into all of the hope-relevant appraisals, clarifying the mechanism by which a specific message feature evokes hope could be a way to push the program of research on hope appeals.

An operational issue that may explain the results for both proximity cue and imagination prompt relates to the measurement of the appraisals. When Chadwick (2015) investigated the effects of appraisals on hope, only the appraisal of future expectation had a positive influence on hope whereas the other three types of appraisals did not. Chadwick argued that it may be “changes in appraisals that affect feelings of hope” (p. 606). A message that makes a future outcome be perceived as more important, goal congruent, positive, and possible than it seemed previously may make an individual experience hope despite its small magnitude *per se*. Study 3 does not have repeated measures of appraisals needed to test Chadwick’s alternative explanation.

**The role of efficacy.** Alternatively, the findings suggest that the discrete-emotions perspective’s theorization of hope may be wrong. Unlike what is theorized by the discrete-emotions perspective, the results showed that appraisals of importance, goal congruence, future expectation, and possibility had very small or no influence on feelings of hope. Instead, hope was predicted by collective efficacy. Indeed, a third message feature, recommended-actions information, was successful in predicting greater collective efficacy, which in turn, led to stronger feelings of hope. Moreover, adding a direct path from recommended-actions information to hope further improved the model fit (Final, alternative model 2).

Drawn from the discrete-emotions perspective, Chadwick (2015) argued in the TPH that the action tendency of hope would lead to behaviors independent of efficacy perceptions. TPH thus focused on designing message features that could respectively evoke hope and efficacy perceptions. Yet, the findings of this study suggest a different explanation. The indirect effect of recommended-actions information on hope through collective efficacy indicates collective efficacy may be a precursor to collective hope; having confidence in the collective's capability to bring about a better future can boost hopeful feelings about the future of the neighborhood. Thus, hope may be the emotional response to efficacy appeals.

Of note, this study focused on Bandura's (2000) understanding of collective efficacy (i.e., confidence in the collective's capability to achieve a particular goal) over Samson et al.'s (1997) conceptualization (i.e., perceived willingness of others' in intervening for the common good that grounds in social cohesion and trust). It could be that collective efficacy conceptualized in each tradition is a completely distinct construct that independently affects social action as well as hope. It is also a possibility that informal social control and social cohesion are antecedents to confidence in the collective's capability. Further research should be directed at understanding how these constructs are related. At the same time, more research is needed to illuminate factors that enhance different dimensions of collective efficacy given the critical role it plays in the model of health activism.

**Messages and emotions.** Last, it should be noted that the imagination prompt and recommended-actions information had direct positive effects on hope. Regarding the influence of imagination prompt, previous research mostly focused on demonstrating how an act of imagining an event could increase the perceived likelihood of the event (e.g., Carroll, 1978; Gregory et al., 1982; Sherman et al., 1985). This study found emotional effects.

The effects of imagination prompt were not mediated by the measured cognitions, and the effects of recommended-actions were only partially mediated by collective efficacy. Such

results suggest that these message features may have produced hope by tapping into cognitive appraisals that were not considered in this study. The message features might have the power to cultivate a positive outlook regardless of an assessment on the possibility or efficacy perceptions. As is reflected in the everyday usage of hope, such as “hold onto hope,” hope can exist when the perceived likelihood of achieving a desired outcome is low and/or when paths to a better future are not so salient (Bury, Wenzel, & Woodyatt, 2020; Lazarus, 1999). It is also possible that cognitions do not mediate the message effects on hope. Finding ways to inspire hope “when the odds do not greatly favor it” (Lazarus, 1991, p. 282) and in even the direst situations may be an important way to help people sustain efforts and engage in coping processes against despair.

### **Implications for Motivating Engagement in Social Health Issues**

Findings revealed the importance of considering neighborhood-related perceptions when motivating social action through a persuasive message. Specifically, participants had stronger intentions to engage in health activism around lead-exposure risks in their neighborhood as they felt stronger hope, greater collective efficacy, and perceived themselves to be more integrated into a neighborhood storytelling network. The final model explained more than one third of the variance in health activism intention ( $R^2 = .37$ ).

**Integrated connectedness to a neighborhood storytelling network (ICSN).** One important neighborhood-related perception that was investigated in this study is the integrated connectedness to a neighborhood storytelling network (ICSN), a variable proposed in the communication infrastructure theory (CIT; Kim & Ball-Rokeach, 2006a). Studies of CIT have shown that connectedness to a neighborhood storytelling network offers people more opportunities to become aware of local health issues and easier access to health-promoting resources (e.g., Martin, Murphy, Ball-Rokeach, Frank, & Moran, 2019; Matsaganis & Wilkin, 2015). Given the importance of neighborhood storytelling networks in

bringing about positive health outcomes, researchers have increasingly proposed CIT-based health communication strategies and suggested different ways to utilize and advance neighborhood storytelling networks (Wilkin, 2013). Yet, less has been studied about how ICSN influences message effects. In this study, a greater ICSN predicted not only greater collective efficacy as hypothesized, but also stronger hope and greater intentions to engage in health activism (Final alternative model 2). The model of health activism is one of the first to theorize how ICSN could be connected to message-induced cognitive and emotional outcomes.

**Capacity building.** Facilitating health activism, or engagement in social health issues more broadly, should accompany neighborhood capacity-building efforts. Capacity building in health promotion involves various processes relevant to “the development of knowledge, skills, commitment, structures, systems, and leadership to enable effective health promotion” (B. J. Smith, Tang, & Nutbeam, 2006, p. 341). Of numerous different dimensions of neighborhood capacity (see Chaskin, 2001 and Simmons, Reynolds, & Swinburn, 2011 for a review), this study focused on communication capacity.

In line with what the model of health activism revealed about the importance of neighborhoods’ communication capacity, participants’ comments demonstrated how individuals living in neighborhoods with greater communication resources and opportunities are better positioned to engage in neighborhood-problem solving processes. For instance, participants were more likely to talk about risks of lead exposure with neighbors when they already had close relationships. In cases where participants knew their neighbors well-enough, they were likely to tailor the message when having conversations (e.g., “Two of my neighborhood families have young children, and another has granddaughters who visit frequently. I will tell these neighbors that Dauphin County has the highest level of lead contamination tested and that this level is dangerous, particularly for children”). In contrast,

cynicism and mistrust towards neighbors were reported as barriers to health activism (e.g., “My neighbors are old racist white people who have had zero interest in talking to me or my family”). Participants also shared that existing neighborhood-wide events (e.g., “township meeting,” “block party,” “neighborhood food drive,” etc.) could be utilized as venues for health activism. These findings provide evidence to suggest that more studies should wrestle with ways to build and strengthen neighborhood capacity.

**Online mobilization.** For those who have online presence, their online health activism was positively associated with in-person health activism. The finding that hope and collective efficacy are significant predictors for online health activism is promising. Although much has been researched about the role of online platforms in contemporary mobilization efforts as well as individuals’ online health information seeking and sharing behaviors (e.g., Bimber, Flanagin, & Stohl, 2005; Boogerd, Arts, Engelen, & van de Belt, 2015), how health activism unfolds in the online space so far remained unexplored. Understanding factors that might facilitate (or hinder) online health activism thus remains a critical research agenda.

As suggested by open-ended responses from those who use community-oriented social media, online health activism might have unique purposes. For instance, participants indicated that they would use community-oriented social media to gauge the community’s general interest in the issue, seek local-specific information, and share local resources. Some of the participants also mentioned the benefits of community-oriented social media, such as allowing them to remain anonymous and reach more people when needed. Findings of this study suggest that efforts to design a health message that evokes hope about social health issues and consider neighborhood-related perceptions are both heading in the right direction to promote online as well as in-person health activism.

## **Limitations**

The results of study 3 are limited by the sampling, context, self-report measurement, and cross-sectional design. The participants were residents living in Pennsylvania who were recruited using the Amazon's MTurk. MTurk allowed access to a diverse sample of participants across different counties in Pennsylvania, but not a random sample. The context, risks of lead exposure, is a good example of a shared problem in Pennsylvania, but it has some unique characteristics. Lead exposure risk is an invisible risk with significant concerns for kids. The findings from this study may not generalize to neighborhood health issues with other kinds of features. Study 3 relied on self-report data. Although self-reported measures may be suitable for evaluating perceptions and intentions, they may not accurately represent people's actual behaviors. Future research should consider different recruitment strategies, health topics, and measurement strategies.

The cross-sectional design also limited the findings. By engaging in health activism, individuals' perceptions about the neighborhood may change. For instance, individuals who had positive experience as they communicate with neighbors about a shared health issue may have enhanced confidence in neighbors' collective power and more positive expectations about the neighborhood's future. Depending on their experience from engaging in health activism, individuals may or may not be further motivated to participate in neighborhood problem-solving processes. In addition, neighborhoods may change. According to CIT (Kim & Ball-Rokeach, 2006b), dynamic features of neighborhoods, such as neighborhood-level ethnic heterogeneity and residential stability, might affect individuals' engagement in neighborhood problem-solving processes. Because the Study 3 employed cross-sectional data, it was impossible to investigate the dynamics of neighborhood features, neighborhood-related perceptions, and health activism.

## Conclusion

Health communication efforts often target a health goal that can be achieved through personal behavior change. With a few exceptions, such efforts have largely assumed individuals' health behaviors as a function of psychological processes. For instance, health messages sometimes aim to increase hope with an expectation that message-induced hope will motivate individuals to work toward achieving their own health goals (Chadwick, 2015; Nabi & Myrick, 2018). In this study, I extended this work to consider a social health issue that can be addressed through collective efforts. Knowledge of the message features to create hope about social issues can be utilized to develop interventions where causes of the issue are beyond a single individual's controllability and relevant to social determinants and systems. Findings also highlight the importance of envisioning health communication efforts while considering social contexts a health issue is embedded in. Health activism was not only a result of message-evoked hope but also a product of localized communication resources and greater confidence in neighbors' ability to address the problem. More research that considers social contexts that shape individual health behaviors and explores ways to challenge existing social structures could push this program of research forward.

## CHAPTER FIVE: OVERALL DISCUSSION

The general goal of this dissertation was to examine how neighborhood-oriented health messages and residents' social connections motivate health activism (i.e., communication with neighbors to address shared health concerns) through hope. This dissertation advances theory by engaging research rooted in persuasion and civic engagement. Two theories framed this investigation: the theory of persuasive hope (Chadwick, 2015) and communication infrastructure theory (Kim & Ball-Rokeach, 2006a). Theory of persuasive hope (Chadwick, 2015) highlights how and why theory-based persuasive messages evoke hope (i.e., hope appeals). Communication infrastructure theory (Kim & Ball-Rokeach, 2006a) focuses on how and why people's social connections and communication opportunities in a geographically bound community (i.e., neighborhood) promote social cognitions, such as collective efficacy, that enable civic engagement.

What is missing from the current theorizing of hope appeals is a social orientation that pertains to hope about a shared future and a clear understanding of what message features evoke social hope. Research on communication infrastructure has paid little attention to how and why persuasive messages, particularly hope appeals, can facilitate civic engagement. By expanding and integrating these two theories, this dissertation offered a novel model of health activism that considers how and why neighborhood-oriented health messages and connections to local communication opportunities can motivate health activism through collective efficacy and hope.

To test the model of health activism, I focused on the risk of lead exposure in neighborhoods of Pennsylvania. This dissertation project included three studies, which considered the effects of a neighborhood-oriented health message on hope and other discrete emotions (Study 1), changes in emotions over time (Study 2), and the effects of emotions and social factors on health activism (Study 3). With the three studies, I hoped to provide the

theoretical basis for extending the research on persuasion to motivate people to engage in neighborhood problem-solving processes. In this chapter, I reflect on how this dissertation contributes to theory and to practice, and consider future directions for research.

### **Theoretical Contributions**

This dissertation project makes contributions to theory related to (a) hope appeals, (b) health activism, and (c) capacity building.

**Hope appeals.** Findings of this dissertation invite us to revisit the way we understand and conceptualize hope appeals. Across three studies, the proximity cue did not evoke hope. One way to explain this finding relates to a possible disconnection between the county-level information and individuals' perceptions of neighborhood that they based on to appraise the future outcome. In theorizing hope appeals for a social issue, understanding different perceptions people might have toward a relevant social group (e.g., neighborhood, community, etc) remains a critical task. Although proximity cue failed to induce hope, findings of Study 1 and Study 2 suggest unexpected roles proximity might play. For example, as the three-way interaction effect of message features on worry (Study 1) shows, the proximity cue could moderate the influence of the other two message features on emotions. Additionally, by increasing emotions other than hope (e.g., fear, anger, and sadness; Study 2), the proximity cue can contribute to emotional flow people experience during the course of message exposure. Instead of theorizing the proximity cue as evoking hope, theorization efforts could capitalize its moderating role on other message effects. Presenting the proximity cue to evoke relevant emotions so as to induce emotional flow could be another way to utilize this message feature in future studies.

Next, the results of this dissertation showed that exposure to the imagination prompt and recommended-actions information results in feeling more hopeful about social health issues. The imagination prompt had a small, direct influence on hope across all three studies;

but there was no indirect effect through cognitive appraisals as theorized in the discrete-emotions perspective. One possibility is that people may experience hope not by perceiving particular configurations of appraisals but by visualizing a better future. It could be a mere possibility, not the probability, that is needed to make people experience hope (Bury et al., 2020), and as Lazarus (1999) notes, people can experience hope “even against the odds” (p. 674).

Exposure to recommended-actions information consistently predicted hope in all three studies. Of note, the imagination prompt and recommended-actions information were presented together in Study 2 and thus might have produced stronger effects than a sole presentation of recommended-actions information. Study 3 showed that the presence (vs. absence) of recommended-actions information predicted greater hope, in part, through collective efficacy. In other words, in the context of improving neighborhoods’ health conditions, residents experience hope about a shared future when they are confident in neighbors’ capability to cope with the current situation. These findings are consistent with previous studies, which also demonstrated a positive relationship between efficacy perceptions and hope (Feldman & Hart, 2016; Nabi & Myrick, 2018; Włodarczyk et al., 2017).

As I reflect on this dissertation, I recommend a new direction for hope appeals. While acknowledging the possibility that the findings may be related to study design or methodology specific to this dissertation, the discrete-emotions perspective’s theorization of hope may be wrong. The discrete-emotions perspective theorizes hope as based on four cognitive appraisals (i.e., importance, goal congruence, future expectation, and possibility; Lazarus, 1991). The findings from Study 3 and previous research (Chadwick, 2015) provide little evidence that cognitive appraisals theorized by the discrete-emotions perspective are related to hope. Such findings indicate that message effects on hope may not be mediated by

the cognitive appraisals predicted by Lazarus (1991). Instead, messages that enhance efficacy perceptions increase hope because efficacy is an antecedent to hope. The right type of efficacy to evoke hope depends on the study context. In the context of evoking hope about a shared future for a social group, messages should target to evoke efficacy of the collective.

**Health activism.** With this dissertation, I aimed to answer the question of what motivates people to challenge existing social situations and improve community health. Health activism is one form of communication that empowers people to gain broader control over the decisions and actions that affect their health by challenging the existing social system (Zoller, 2005). In an attempt to theorize communicative processes associated with health activism, Zoller (2005) drew mainly from critical and cultural approaches to health communication. Using a social scientific approach, this project further illuminated how communication research can be employed to understand and promote health activism. Of the many communicative processes involved with health activism, this project centered on two: public appeals and construction of public solutions.

**Public appeals.** In this dissertation, I attempted to shift the focus of persuasive approaches to health promotion from changing individual health behaviors to facilitating social actions to improve the collective's health conditions. In line with individualized approaches to managing health that are dominant in the U.S. (P. Brown, 2007; Knight, Benjamin, & Yanich, 2016), theorizing efforts have centered on promoting individual health behaviors rather than changing broader social factors (Niederdeppe, Bu, Borah, Kiding, & Robert, 2008). Even though several studies highlighted the potential of health activism to change social conditions (e.g., Gibbs, 2002; Freudenberg, Picard Bradley, & Serrano, 2009; Zoller, 2017), this dissertation appears to be the first to theorize mechanisms that promote health activism.

Findings from Study 3 revealed that social systems do matter, and social forms of appraisals, like collective efficacy, are important for experiencing hope about a neighborhood's future and for engaging in health activism. These findings begin to answer researchers' call for theoretical guidance on how to develop messages that facilitate public debate about the social determinants of health as well as motivate actions to address social factors for the betterment of health and well-being of populations (e.g., Niederdeppe et al., 2008; Viswanath & Emmons, 2006). I believe that persuasive messages aiming to bring about societal changes should address social psychological mechanisms underlying social actions, which are different from mechanisms for personal behavior change. In trying to improve the neighborhood's health conditions, for instance, people would look to see whether they can pool the resources and efforts of their neighbors and what are the expected consequences and implications of doing so. This is why theorizing efforts on persuasive appeals for social actions should be attentive to broader social contexts and dynamics.

***Public solutions.*** In employing a communication perspective to theorize processes of health activism, I extended the conceptualization of health activism into explicitly incorporating "small-scale, individual-level efforts, such as spreading a message by word of mouth" (Bobel, 2007, p. 155). Different types of communication between neighbors, from information seeking and sharing to persuading to join collective efforts, could be ways to engage in health activism. Following this conceptualization, health activism could be a promising way for ordinary people to construct collective actions to address social problems.

In their responses to open-ended questions in Study 3, several participants noted that communication with neighbors can be a process by which they look for viable solutions and develop concrete action-oriented ideas. Some participants expressed interest in political advocacy, as described in the following response: "I would tell them that we, as a neighborhood could show strength in numbers and write our local officials about putting

pressure on the utility companies and those responsible for lead contamination.” The following comments demonstrated interests in co-creating new resources for the neighborhood: “I’d like to ask them if they’d consider helping me start a fundraiser to raise money/awareness of this issue,” and “I would create some kind of resource for the neighborhood about how to get free lead testing in the homes.” Notably, several participants commented that collective actions (e.g., “collaborate with fellow neighbors” and “mobilize together”) would be necessary to address the root causes and prevent the risk.

By locating neighbor-to-neighbor conversations at the center of communication processes involved in health activism, this dissertation advanced a more inclusive understanding of health activism. Whereas the measurements that I created to assess health activism intention focused on the likelihood of talking about *various topics* related to a shared health concern, open-ended responses suggest that willingness to mobilize *different solutions* in the face of *multiple barriers* might also matter to powerful health activism. The next phase of health activism research should illuminate whether different motivations and expected barriers are associated with particular ways of engaging in health activism.

**Capacity building.** *Capacity building*, or *empowerment*, are the terms that are frequently used to describe the process by which people gain understanding and ability to take actions to improve their life situations (Israel, Checkoway, Schulz, & Zimmerman, 1994; Simmons et al., 2011). The notion of capacity building is particularly important in health promotion because it is key to explaining how members of the social group can change the existing social systems that negatively affect health and well-being. This dissertation posited communication processes and resources at the center of the inquiry into capacity building for health promotion. Although both the concepts of capacity building and empowerment have received constant attention in past communication studies (e.g., Albrecht, 1988; Barge, 2003),

how capacity building and empowerment are achieved and how they are manifested in communication behaviors have not been fully understood (E. M. Rogers & Singhal, 2003).

In recent decades, interest in neighborhood effects on health has grown enormously (Diez-Roux, 2001). Based on the recognition that individual health is influenced by not only individual characteristics and lifestyles but also contexts to which individuals belong, researchers have demonstrated the influence of various elements of neighborhoods' physical (e.g., walkability, environmental pollution, etc.) and social (e.g., social capital, local networks, etc.) environment on individual health outcomes (Berkman, Kawachi, & Glymour, 2014). To explain how neighborhood characteristics influence health outcomes, some researchers have taken the communication perspective (Matsaganis, 2015). For instance, Yamamoto and Jo (2018) theorized communication as a social process linking neighborhood walkability with physical exercise in the neighborhood (e.g., walking, jogging, and bicycling). Data from the survey of Chicago residents revealed that frequent casual communication with neighbors was associated with perceived social cohesion and reduced anonymity, both of which were related to frequent physical exercise in the neighborhood. Similarly, Matsaganis and Wilkin (2015) showed that local communication networks of neighbors, community organizations, and local media play an important role in accessibility to health-enhancing resources like medical care and healthy food options.

Importantly, the way neighborhood conditions shape health outcomes is not fixed; neighborhood effects on health could be challenged by enhanced neighborhood capacity and its empowered members (C. Campbell & Jovchelovitch, 2000; Heritage & Dooris, 2009). What has not yet been uncovered is how communication might work to *challenge* the existing neighborhood conditions. In this dissertation, I proposed health activism as communication processes through which individuals challenge existing public norms, policies, and social structures to gain understanding and control over choices surrounding health. Such a

communication-based understanding of health activism is in line with Zoller's (2005) argument who stressed the potential contributions of health communication research to interdisciplinary work on health activism.

In addition to advancing Zoller's (2005) claim, this dissertation demonstrated how communication-based approaches to study health activism speak to the scholarship concerning community capacity building. First, communication processes involved with health activism closely relate to the ways of building community capacity, such as understanding the collective's problem and its causes, building networks of relationships, providing support for other group members, and mobilizing resources (Chaskin, 2001). Participants' responses to open-ended questions, in particular, revealed many of the communication processes that contribute to community capacity building. For instance, participants indicated that they would raise awareness of the neighborhood's health issue (e.g., "I would want to talk to them about how Erie County is one of the worst counties in Pennsylvania for lead contamination"). Several participants also reported that they would advocate actions to address lead exposure risk. Such actions not only included individual-level actions (e.g., "I'd tell them to run their water for a little bit before drinking or cooking") but also collective actions that aim to implement policy-level interventions and structural changes (e.g., "I could share a petition or a copy-able letter that we could all send to officials," and "We should all come together as a team to eliminate lead contamination and do things to get it done faster").

Second, this dissertation also emphasized the role of communication infrastructure in motivating health activism, alluding to the importance of communication capacity in neighborhood problem-solving processes. The extent to which residents are connected to a neighborhood storytelling network predicted greater collective efficacy and social hope, both of which predicted stronger intentions to engage in health activism. Participants' comments

also revealed that more opportunities for communication, such as closely networked neighborhoods (both in daily lives and online spaces) and frequent neighborhood events like block parties or township meetings, facilitate health activism. These findings challenge scholars studying health promotion to take communication processes and localized communication resources more seriously to strengthen community capacity.

### **Practical Implications**

This project has practical implications for collective health promotion efforts. First, through theory-driven inquiry, the novel model of health activism stresses why persuasive efforts to motivate a social action should be attentive to the influence of social contexts. One concrete suggestion is to develop multilevel interventions that not only consider individual-level factors but also address broader contexts and social structural influences in promoting community health. If a lack of social connectedness is what deters conversations among neighbors, an intervention might need to seek ways to build social trust and cohesion before attempting to mobilize collective action (Kim & Ball-Rokeach, 2006a; Rojas, Shah, & Friedland, 2011). Conversations about neighborhood health issues are less likely to occur when there are fewer communication opportunities among neighbors. In this case, creating physical spaces and organizing neighborhood events could be ways to increase communication opportunities, and eventually, stimulate conversations about shared health concerns. This, in turn, can lead to stronger motivation to engage in neighborhood problem-solving processes.

In pursuing this line of research, different ways of conceptualizing and operationalizing neighborhood and community require attention (Deng, 2016; Diez-Roux, 2001). While I focused on participants' perceptions about a place-based neighborhood in this dissertation, researchers may incorporate creative strategies in practice. For instance, asking people to mark their neighborhood on the map, using photography and stories about photos to

identify people's understanding about the community, and analyzing geosocial big data (e.g., Kim & Ball-Rokeach, 2006b; Poorthuis, 2018; Nykiforuk, Vallianatos, & Nieuwendyk, 2011) are some of the innovative ways to capture a proper sense of neighborhood and community in a given study context and to develop appropriate multilevel interventions accordingly.

Second, this dissertation focused on what has been an often overlooked way of addressing social health problems: health activism and particularly, neighbor-to-neighbor communication about a shared health concern. Health campaigns sometimes employ external agents of change to spread messages. Studies on the diffusion of innovation demonstrated that success in intervention dissemination rests on identifying optimized change agents to reach target populations on behalf of a centralized agency and training those change agents to effectively spread innovations (i.e., the novel ideas, objectives, and practices) throughout a social system (Dearing, 2009; Haider & Kreps, 2004; E. M. Rogers, 2003). Other times, health promotion efforts rely on community members to spread the word about health information and potentially to help create changes (Ryder, 2006; Southwell, 2017; Southwell & Yzer, 2009). As early as in Katz and Lazarsfeld's (1955) two-step flow model of communication to relatively recent work to understand when and why conversation matters for media campaign effects (Southwell & Yzer, 2007, 2009), it is generally understood that information does not flow directly from health campaigns or media outlets, but spread via interpersonal communication. In these major approaches to health promotion, innovations come from the outside and are delivered to the target audience in a persuasive manner (Singhal, 2010).

By explicating the mechanism that leads to health activism, I hoped to understand why and how the grassroots come up with their own solutions to address a shared health concern. Results of this dissertation provide guidelines for health interventions that consider ways to work *with* communities around their goals and capacities, instead of presenting

health ideas and practices *for* them. As individuals have conversations with neighbors, they share what they know about a shared health concern and ways to address it. Through conversations, neighbors can seek collective resources and innovative solutions, and encourage one another to engage in the neighborhood problem-solving processes.

Relevant to this dissertation is the positive deviance approach to health promotion (Pascale, Sternin, & Sternin, 2010; Singhal & Svenkerud, 2019). Positive deviance in community health promotion contexts refers to outliers who exhibit good health practices and outcomes against the odds (e.g., low resource setting; Singhal, 2010). Positive deviance approach refers to enabling communities to discover the wisdom they already have and find ways to make it accessible and implementable to the entire community (Dearing & Singhal, 2020). The idea is that as positive deviants (i.e., internal change agents) exhibit their deviant behaviors, which are essentially communicative processes, the norm across the social group can shift (Singhal, 2010). Instead of health communication efforts having people from the outside initiate and push the change, health problems can be addressed by grassroots who challenge the norms, policies, and social structures from the bottom-up. This study showed the potential benefits of investing in local communities to mobilize their social networks and challenge an existing social system to pursue a better future.

### **Insights for Lead Risk**

The findings of this dissertation have several practical implications for addressing the risk of lead exposure in neighborhoods, in particular. As seen in Study 3, the descriptive statistics show that there is room to enhance hope (i.e., the average response was somewhere between “*a little bit*” and “*somewhat*” hopeful), collective efficacy (i.e., the average response was “*neutral*”), and health activism intention (i.e., the average response was “*unsure*”) to resolve the issue of lead exposure in Pennsylvania. Given that both stronger hope and stronger collective efficacy predicted greater health activism intention to engage in the issue

of lead-exposure risk, practitioners who aim to facilitate health activism should find ways to ensure people that a better future *can* and *will* be possible through collaborative efforts.

Furthermore, the strategy of utilizing an informative visual to communicate risk is worth noting. Presenting informative maps could be particularly effective when communicating risks of place-based health issues like lead-exposure risk. As a proximity cue, this research used a map of Pennsylvania with the number and percentage of children with elevated blood lead levels by county. Although the proximity cue failed to evoke hope, it successfully induced variance in the perceived risk of lead exposure (induction check in Study 1). Hazard maps are often used to explain and display hazard distributions and risk levels of areas likely to be affected by hazards (Haynes, Barclay, & Pidgeon, 2007). If people can read them, maps can enable people to gain critical knowledge about spatial tasks such as evacuating during natural disasters (Burigat & Chittaro, 2016). Hazard maps explain and display hazard distributions and risk levels of areas likely to be affected by hazards (Haynes et al., 2007). Given that perceived risk is one of the key motivators for preventive health behaviors (R. W. Rogers, 1975; Witte, 1992), health communication efforts should more actively utilize informative visuals to communicate the likelihood of experiencing risk.

### **Challenges and Future Directions**

As I complete this dissertation, I am aware of limitations in my studies and directions for future scholarship. I will elaborate on a few. The first challenge relates to advancing research on hope appeals. In theorizing hope appeals, future research should be mindful of possible negative outcomes of feeling hopeful. In this dissertation, I focused mostly on the motivating power of hope in addressing a socially shared health issue. However, hope about a desired future that is not grounded in the reality is at risk of becoming “wishful thinking” (Oettingen & Mayer, 2002) or “false hope” (Kwon, 2002; Snyder, Rand, King, Feldman, & Woodward, 2002). Uncovering at which points and under which conditions hope leads

individuals to be optimistically biased rather than motivating behaviors remain critical agendas for future research.

Related to emotional appeals, despite the expected utility of the concept of emotional flow (see Nabi, 2015 for more discussion), there has still been limited discussion on how to harness shifts in emotional states to create effective messages. Novel message features that were designed to evoke hope about social issues influenced other discrete emotions as well (Studies 1 and 2), and the intensity of emotions changed over time after exposure to different components of the message (Study 2). Nevertheless, studies 1 and 2 did not assess whether and how such emotional experiences lead to persuasive outcomes. Especially in the context of addressing social health issues, there remains much to be learned about which emotion pairs work well and in what order, which message features would be most effective in facilitating intended emotional flow, and how emotional flow shapes persuasive outcomes. Moreover, in case people experience both negative and positive emotions, their emotional experience may lead to a unique emotional experience such as feeling tender, moved, or compassionate (Myrick & Oliver, 2015). Understanding how best to mobilize these emotions are especially important in motivating social actions because emotions like compassion are linked to care and concern for others and a desire to alleviate others' suffering (Goetz, et al., 2010; Lu & Schuldt, 2016; Myrick & Oliver, 2015; Oveis, Horberg, & Keltner, 2010).

Second, if individuals better connected to communication resources are more likely to engage in collective problem-solving processes in a way that challenges the existing social system, we need a better understanding of localized communication resources. One way to achieve this goal is through a further investigation into measurements for localized communication resources, including an integrated connectedness to a neighborhood storytelling network (ICSN). In this dissertation, I employed an established measure for ICSN, which is a summation of three interaction terms between the three variables (i.e.,

interpersonal neighborhood storytelling, scope of connections to community organizations, and local media connectedness; Kim & Ball-Rokeach, 2006b). Future studies can investigate the factor structure of these variables (e.g., one latent factor vs. second-order factor structure) and examine whether interaction terms are necessary to properly capture ICSN.

Theoretically, localized communication resources can act as an antecedent for other social mechanisms, such as social capital, that may promote social actions to address shared health concerns. Localized communication resources and communication opportunities they enable may also influence more proximal determinants of health, such as accessibility to resources, utilization of health services, and health behaviors (Matsaganis & Wilkin, 2015; Segrin & Domschke, 2011; Yamamoto & Jo, 2018). Yet, I must caution against being blindly optimistic about the potential of localized communication resources. Even though public health research has generally assumed social capital to have a positive impact on health, researchers have also acknowledged that it might not always be the case. For example, closely networked social groups may be well-positioned to diffuse not only health-promoting but also health-damaging information and norms (Villalonga-Olives & Kawachi, 2017). Researchers have also found that the way social capital affects individual health and well-being varies based on ones' socioeconomic status (e.g., Matsaganis & Wilkin, 2015; Moore, Daniel, Gauvin, & Dubé, 2009). Especially given that people with lower socioeconomic status (e.g., uninsured, less-educated, etc.) are less likely to enjoy beneficial effects of social capital on health (e.g., Matsaganis & Wilkin, 2015; Villalonga-Olives & Kawachi, 2017), health promotion efforts that leverage social capital need to be careful not to worsen health disparities.

Another challenge relevant to building communication capacity for health promotion is to tackle the issues of identity and power dynamics. In this dissertation, I was mainly interested in residents' identification with the neighborhood; but, there likely exist different

sub-groups within the same neighborhood where members share a common identity based on many other factors like economic status, ethnicity, and gender. Especially for those who are marginalized and have less power, a neighborhood may not be what they mainly identify with. For instance, some participants expressed their marginalized ethnic identity through comments like “My neighbors are old racist white people who have had zero interest in talking to me or my family.” In fact, social cohesion, especially in the presence of individuals who do not share group identity, may backfire. Studies have shown that individuals who are deemed to be outsiders and/or newcomers to the networks are vulnerable to health risks for various reasons including distress associated with social exclusion and limited access to health-enhancing resources (e.g., Eriksson, Asplund, & Sellström, 2010; Takagi et al., 2013). In seeking ways to promote health by improving neighborhoods’ capacity and expanding localized communication resources, future studies should be mindful of how group identity and power dynamics might intervene in the process.

Third, the model of health activism should be tested with target health issues other than lead contamination. To test a model of health activism, I needed a health issue that affects geographically bounded residential areas (i.e., neighborhoods), which meets the three criteria of a neighborhood issue. Lead exposure risk in Pennsylvania was an appropriate health issue because (a) it affects multiple members of a society with a varying degree, (b) its causes are beyond a single individual’s controllability and rooted in the social system, and (c) fundamental solutions to the issue require civic engagement that could bring about changes to the social structure and policy-level interventions. My general expectation is that the model of health activism should be applicable to other neighborhood health issues. If anything, people might be more inclined to engage in health activism when a health problem is relevant to social injustice, disproportionately affecting the health and well-being of the underserved groups (Zoller, 2005). Future research should explore whether the model is equally viable for

other health issues; testing the model with chronic versus emerging health issues and common versus region-specific health issues could be some of the concrete ways to understand the commonalities (and differences) of health activism in various contexts.

Fourth and finally, this dissertation looked at ways to motivate one form of social action—health activism—through persuasive messages. The approach to interlock efforts to designing persuasive messages and examining the roles of community contexts can be extended to promote other social actions. For instance, certain health innovations are explicitly communal and framed as collective efforts to address social problems (e.g., community-based malaria interventions, see R. A. Smith et al., 2018, 2020). When implementing a campaign to promote the wide-spread adoption of innovations, it is particularly important to consider various aspects of social contexts such as communication infrastructure, overall acceptance rate (i.e., descriptive norms), and existing power dynamics of the community (R. A. Smith et al., 2018, 2020; Wallerstein & Duran, 2010; Wilkin, 2013). There also exist a number of different community-development projects outside of the health domain that range from lowering the crime rates and revitalizing local culture, which require community-wide engagement (Barge, 2003; Wang, Morrel-Samuels, Hutchison, Bell, & Pestronk, 2004). The novel model of health activism could be extended to understanding how best to design and implement campaigns that promote the collective good through community engagement.

### **Conclusion**

There has been increasing scholarly attention to social systems that shape individuals' physical and mental health as well as health behaviors (Kawachi & Berkman, 2000, 2003; Viswanath, & Emmons, 2006). Following this trend, scholars have questioned dominant approaches to health communication efforts that emphasized changing individual beliefs, attitudes, and behaviors (Dutta-Bergman, 2007; Moran et al., 2016). Given the socially-

embedded nature of individuals' health behaviors, health promotion efforts should consider structural influences on health. This dissertation presented a novel model of health activism in accounting for why and how a neighborhood-oriented health message and residents' social connections combine to facilitate engagement in neighborhood problem-solving processes. The novel model of health activism offers some clues for a theoretical integration of persuasion and civic engagement literature that expand our understanding of motivating collective efforts. While the journey to illuminate mechanisms that promote the collective good through community engagement continues, this dissertation also provides practical suggestions for engaging communities surrounding a shared problem.

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## Appendix A

### Study 1 Pre-Message Questionnaire

Thank you for participating in this study. First, we have a few questions about your residential area, neighborhood, and neighbors. Given that this study addresses neighborhoods in Pennsylvania, it is important to know that you are a current resident of Pennsylvania. Are you currently living in Pennsylvania?

- Yes
- No

In which county is your home located? (Select from the list of 67 counties of Pennsylvania)

\_\_\_\_\_

In what ZIP code is your home located? (Enter 5-digit ZIP code; for example, 16893 or 94305)

\_\_\_\_\_

In this study, we use the word "neighborhood" to refer to the general area around your house where you perform routine tasks such as jogging or grocery shopping and have neighborhood events like block parties or volunteer events. Please take a moment to think about your neighborhood and answer the following questions.

#### **Name/size of the neighborhood**

- If you were to tell someone where you currently live, how would you refer to your neighborhood? Examples include Riverside, Grandale, and Chestnut Hill. Please write down the name of your neighborhood \_\_\_\_\_
- How many people do you think are living in your neighborhood? There is no right or wrong answer to this question. We are just asking for your best guess (Please write down a number). \_\_\_\_\_

#### **Number of neighbors**

- How many neighbors do you know by name? (Please write down a number).

**Lengthy of residency**

- How long have you lived in the same neighborhood?
  - Less than one year
  - About one year
  - More than one year (Please write down a number; # years)

**Neighborhood identity**

Please indicate the extent to which you disagree or agree with each statement below.

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
[Cognitive centrality] Being a member of my neighborhood is an important reflection of who I am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
[Cognitive centrality] I often think about the fact that I am a member of my neighborhood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
[In-group tie] I have a lot in common with my neighbors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
[In-group tie] I feel a sense of being connected with my neighbors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
[In-group affect] In general, I'm glad to be a member of my neighborhood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

On the next page, we are going to show you a health message that is considered for dissemination to the public. After reading the message, you will be asked to provide feedback on it. At this point, please focus on the message's content, not its design (Design will be considered in the future). The information in the message is aggregated from a number of scientific sources listed below.

World Health Organization, Mayo Clinic, Centers for Disease Control and Prevention, Pennsylvania Department of Health, and Clean Water Action

[Insert the message here]

Post-Message Questionnaire

**Message quality**

First, we would like to know your impressions of the message. Please indicate the extent to which you agree or disagree with each statement below.

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
Persuasive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Effective	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Credible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Accurate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clear	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Proximity induction check**

Please respond to the following questions about the [NAME OF THE COUNTY THE PARTICIPANT INDICATED ABOVE] and neighborhood that you are living in now.

	Very low	Low	Average	High	Very high
The risk of lead contamination in [NAME OF THE COUNTY THE PARTICIPANT INDICATED ABOVE] is	<input type="checkbox"/>				
The number of children with elevated blood lead levels in [NAME OF THE COUNTY THE PARTICIPANT INDICATED ABOVE] is	<input type="checkbox"/>				
The percentage of children with elevated blood lead levels in [NAME OF THE COUNTY THE PARTICIPANT INDICATED ABOVE] is	<input type="checkbox"/>				

**Emotions**

How did the message make you feel?

None of this emotion	A little bit	Somewhat	Moderate	A great deal of this emotion
----------------------	--------------	----------	----------	------------------------------

Hope	<input type="checkbox"/>				
Inspired	<input type="checkbox"/>				
Encouraged	<input type="checkbox"/>				
Fear	<input type="checkbox"/>				
Happiness	<input type="checkbox"/>				
Sadness	<input type="checkbox"/>				
Disgust	<input type="checkbox"/>				
Pride	<input type="checkbox"/>				
Surprise	<input type="checkbox"/>				
Compassion	<input type="checkbox"/>				
Worry	<input type="checkbox"/>				
Anger	<input type="checkbox"/>				

---

### Demographic information

Do you have children?

- No
- Yes \_\_\_\_\_ (Please indicate the number of children you have)

(If No is selected, skip these questions)

- Have any of your children been identified as having lead exposure (such as through a blood test?)
  - No
  - Yes

• How old is your youngest child? \_\_\_\_\_

How old are you? \_\_\_\_\_

Which racial and ethnic categories do you identify with? Please mark all boxes that apply.

- White
- Hispanic, Latino, or Spanish origin

- Black or African American
- Asian
- American Indian or Alaska Native
- Native Hawaiian or other Pacific Islander
- Some other race, ethnicity, or origin

What is the highest degree or level of school that you have completed?

- Eighth grade or less
- Attended high school
- Graduated from high school
- Graduated from college with an associate's degree (AA, AS, etc.)
- Graduated from college with a bachelor's degree (BA, BS, etc.)
- Graduated with a graduate degree (MA, JD, MD, PhD, etc.)

Are you currently...?

- Employed by a company that you do not own
- Self-employed
- Full-time student
- Unemployed
- Retired

Approximately, what is your annual household income?

- Less than \$20,000
- \$20,000 to less than \$35,000
- \$35,000 to less than \$50,000
- \$50,000 to less than \$75,000
- \$75,000 to less than \$100,000
- Over \$100,000

Thank you! You have now reached the end of the survey. If you have any comments about the study, please include them here.

---

## Appendix B

### Study 2 Pre-Message Questionnaire

Thank you for participating in this study. First, we have a few questions about your residential area, neighborhood, and neighbors. When answering the following questions, please respond based on the place you currently live in as you go to Penn State, not the place where you used to live, or the place where your parents' house is located.

Given that this study addresses neighborhoods in Pennsylvania, it is important to know that you are a current resident of Pennsylvania. Are you currently living in Pennsylvania? (If you are living in State College or nearby towns as you go to Penn State, your answer to this question should be YES).

- Yes
- No

In which county is your home located? (Select from the list of 67 counties of Pennsylvania)

\_\_\_\_\_

In what ZIP code is your home located? (Enter 5-digit ZIP code; for example, 16893 or 94305)

\_\_\_\_\_

In this study, we use the word "neighborhood" to refer to the general area around your house where you perform routine tasks such as jogging or grocery shopping and have neighborhood events like block parties or volunteer events. Please take a moment to think about your neighborhood and answer the following questions.

#### **Name/size of the neighborhood**

- If you were to tell someone where you currently live, how would you refer to your neighborhood? Examples include Riverside, Grandale, and Chestnut Hill. Please write down the name of your neighborhood \_\_\_\_\_

- How many people do you think are living in your neighborhood? There is no right or wrong answer to this question. We are just asking for your best guess (Please write down a number). \_\_\_\_\_

### Number of neighbors

- How many neighbors do you know by name? (Please write down a number).

### Lengthy of residency

- How long have you lived in the same neighborhood?
  - Less than one year
  - About one year
  - More than one year (Please write down a number; # years)

### Neighborhood identity

Please indicate the extent to which you disagree or agree with each statement below.

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
[Cognitive centrality] Being a member of my neighborhood is an important reflection of who I am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
[Cognitive centrality] I often think about the fact that I am a member of my neighborhood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
[In-group tie] I have a lot in common with my neighbors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
[In-group tie] I feel a sense of being connected with my neighbors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
[In-group affect] In general, I'm glad to be a member of my neighborhood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

On the next page, we are going to show you a health message that is considered for dissemination to the public. After reading the message, you will be asked to provide feedback on it. At this point, please focus on the message's content, not its design (Design will be considered in the future). The information in the message is aggregated from a number of scientific sources listed below.

World Health Organization, Mayo Clinic, Centers for Disease Control and Prevention, Pennsylvania Department of Health, and Clean Water Action

\*The questionnaire below is based on the flow of [Condition1].

### Emotions

How much of this emotion are you feeling about the future of your neighborhood?

	None of this emotion	A little bit	Somewhat	Moderate	A great deal of this emotion
Hope	<input type="checkbox"/>				
Fear	<input type="checkbox"/>				
Anger	<input type="checkbox"/>				
Sadness	<input type="checkbox"/>				
Pride	<input type="checkbox"/>				

[Insert the proximity cue here]

### Emotions

How did the first part of the message make you feel about the future of your neighborhood?

	None of this emotion	A little bit	Somewhat	Moderate	A great deal of this emotion
Hope	<input type="checkbox"/>				
Fear	<input type="checkbox"/>				
Anger	<input type="checkbox"/>				
Sadness	<input type="checkbox"/>				
Pride	<input type="checkbox"/>				

[Insert the imagination prompt and recommended-actions information here]

**Emotions**

How did the second part of the message make you feel about the future of your neighborhood?

	None of this emotion	A little bit	Somewhat	Moderate	A great deal of this emotion
Hope	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fear	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Anger	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sadness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pride	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Demographic information**

Do you have children?

- No
- Yes \_\_\_\_\_ (Please indicate the number of children you have)

(If No is selected, skip these questions)

- Have any of your children been identified as having lead exposure (such as through a blood test?)
  - No
  - Yes

• How old is your youngest child? \_\_\_\_\_

How old are you? \_\_\_\_\_

Which racial and ethnic categories do you identify with? Please mark all boxes that apply.

- White
- Hispanic, Latino, or Spanish origin
- Black or African American
- Asian

- American Indian or Alaska Native
- Native Hawaiian or other Pacific Islander
- Some other race, ethnicity, or origin

What is the highest degree or level of school that you have completed?

- Eighth grade or less
- Attended high school
- Graduated from high school
- Graduated from college with an associate's degree (AA, AS, etc.)
- Graduated from college with a bachelor's degree (BA, BS, etc.)
- Graduated with a graduate degree (MA, JD, MD, PhD, etc.)

Are you currently...?

- Employed by a company that you do not own
- Self-employed
- Full-time student
- Unemployed
- Retired

Approximately, what is your annual household income?

- Less than \$20,000
- \$20,000 to less than \$35,000
- \$35,000 to less than \$50,000
- \$50,000 to less than \$75,000
- \$75,000 to less than \$100,000
- Over \$100,000

Thank you! You have now reached the end of the survey. If you have any comments about the study, please include them here.

---

## Appendix C

### Study 3 Pre-Message Questionnaire

Thank you for participating in this study. First, we have a few questions about your residential area, neighborhood, and neighbors. Given that this study addresses neighborhoods in Pennsylvania, it is important to know that you are a current resident of Pennsylvania. Are you currently living in Pennsylvania?

- Yes
- No

In which county is your home located? (Select from the list of 67 counties of Pennsylvania)

\_\_\_\_\_

In what ZIP code is your home located? (Enter 5-digit ZIP code; for example, 16893 or 94305)

\_\_\_\_\_

In this study, we use the word "neighborhood" to refer to the general area around your house where you perform routine tasks such as jogging or grocery shopping and have neighborhood events like block parties or volunteer events. Please take a moment to think about your neighborhood and answer the following questions.

#### **Name/size of the neighborhood**

- If you were to tell someone where you currently live, how would you refer to your neighborhood? Examples include Riverside, Grandale, and Chestnut Hill. Please write down the name of your neighborhood \_\_\_\_\_
- How many people do you think are living in your neighborhood? There is no right or wrong answer to this question. We are just asking for your best guess (Please write down a number). \_\_\_\_\_

#### **Number of neighbors**

- How many neighbors do you know by name? (Please write down a number).

### Lengthy of residency

- How long have you lived in the same neighborhood?
  - Less than one year
  - About one year
  - More than one year (Please write down a number ; # years)

### Neighborhood identity

Please indicate the extent to which you disagree or agree with each statement below.

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
[Cognitive centrality] Being a member of my neighborhood is an important reflection of who I am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
[Cognitive centrality] I often think about the fact that I am a member of my neighborhood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
[In-group tie] I have a lot in common with my neighbors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
[In-group tie] I feel a sense of being connected with my neighbors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
[In-group affect] In general, I'm glad to be a member of my neighborhood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Integrated connectedness to the storytelling network

[Intensity of interpersonal neighborhood storytelling]

	Never	Rarely	Sometimes	Frequently	Always
How often do you have discussions with other people about things happening in your neighborhood?	<input type="checkbox"/>				
How often do your neighbors talk about what happens in this neighborhood?	<input type="checkbox"/>				
How often do your neighbors speak about problems affecting this neighborhood?	<input type="checkbox"/>				



broadcast

Local/ neighborhood magazines (paper and online)	<input type="checkbox"/>						
Community organization newsletters (e.g., religious organizations, social clubs)	<input type="checkbox"/>						
Social media among neighbors	<input type="checkbox"/>						
Townhall websites or newsletters	<input type="checkbox"/>						

On the next page, we are going to show you a health message that is considered for dissemination to the public. After reading the message, you will be asked to provide feedback on it. At this point, please focus on the message's content, not its design (Design will be considered in the future). The information in the message is aggregated from a number of scientific sources listed below.

World Health Organization, Mayo Clinic, Centers for Disease Control and Prevention, Pennsylvania Department of Health, and Clean Water Action

[Insert the message here]

Post-Message Questionnaire

**Message quality**

First, we would like to know your impressions of the message. Please indicate the extent to which you agree or disagree with each statement below. The message was...

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
Persuasive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Effective	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Credible	<input type="checkbox"/>				
Accurate	<input type="checkbox"/>				
Clear	<input type="checkbox"/>				

**Subjective feelings of hope**

How do you feel about the future of your neighborhood?

	None of this emotion	A little bit	Somewhat	Moderate	A great deal of this emotion
Hopeful	<input type="checkbox"/>				
Inspired	<input type="checkbox"/>				
Encouraged	<input type="checkbox"/>				
Energized	<input type="checkbox"/>				
Heartened	<input type="checkbox"/>				
Anticipated	<input type="checkbox"/>				

**Hope-related cognitive appraisals**

Please indicate the extent to which you disagree or agree with each statement below.

[Importance]

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
Eliminating risks of lead exposure is important to my neighborhood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Risk of lead exposure affects my neighborhood in many ways	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eliminating risks of lead exposure matters to my neighborhood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Risk of lead exposure is of concern to my neighborhood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

[Goal-congruence]

Strongly disagree	Disagree	Neither disagree	Agree	Strongly agree
-------------------	----------	------------------	-------	----------------

---

			nor agree		
Eliminating risks of lead exposure is in line with achieving the goals of my neighborhood	<input type="checkbox"/>				
Eliminating risks of lead exposure helps achieve other important goals of my neighborhood	<input type="checkbox"/>				
Eliminating risks of lead exposure is conducive to meeting the goals of my neighborhood	<input type="checkbox"/>				
Eliminating risks of lead exposure offers favorable conditions to achieve the goals of my neighborhood	<input type="checkbox"/>				

---

## [Future expectation]

---

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
Eliminating the neighborhood risks of lead exposure will make a much better future for my neighborhood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eliminating the neighborhood risks of lead exposure will bring about a wonderful future for my neighborhood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eliminating the neighborhood risks of lead exposure will contribute to making a better future for the neighborhood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eliminating the neighborhood risks of lead exposure will create a bright future for the neighborhood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

---

## [Possibility]

---

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
Eliminating the neighborhood risks of lead exposure is likely to happen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eliminating the neighborhood risks of lead exposure is achievable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Eliminating the neighborhood risks of lead exposure is possible	<input type="checkbox"/>				
Eliminating the neighborhood risks of lead exposure is feasible	<input type="checkbox"/>				

---

### Collective efficacy

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
My neighbors have the ability to eliminate the risks of lead exposure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I believe that my neighbors are capable of eliminating the risks of lead exposure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am confident that my neighbors can eliminate the risks of lead exposure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Health activism intention

In the following, we would like to know how likely you would talk with your neighbors. There is no right or wrong answer to this question, so please indicate your intention to talk with your neighbors about the following issues.

I intend to talk to my neighbors...

---

	Very unlikely	Unlikely	Unsure	Likely	Very likely
about the risks of lead exposure in the neighborhood	<input type="checkbox"/>				
about how to eliminate the risks of lead exposure in the neighborhood	<input type="checkbox"/>				
about our ability to eliminate the risks of lead exposure in the neighborhood	<input type="checkbox"/>				
about the better future that can be achieved by eliminating the risks of lead exposure in the neighborhood	<input type="checkbox"/>				
about how hopeful I am about eliminating the risks of lead exposure	<input type="checkbox"/>				
that we should run water for a few minutes before using it for drinking or cooking	<input type="checkbox"/>				
that we should contact the elected officials of the area to request a test for	<input type="checkbox"/>				

lead in tap water of public facilities

that we should contact the elected officials to request funding for lead abatement activities and replacement of the water service lines in the neighborhood

about the lead monitoring results of the county we live in

[Open-ended question]

Regarding the issue of lead contamination, what are some of the things that you want to tell your neighbors? For example, if you saw a neighbor on the street or at the park and would like to have a conversation about lead contamination, what would you talk about? You could also think about a scenario in which you are having a conversation with a few neighbors at a neighborhood event such as a block party or a neighborhood food drive. If you found a moment that you want to talk about lead contamination, what would you tell them?

If there are multiple things that you would like to talk to your neighbors, please feel free to write down all of them.

**Online health activism intention**

[Frequency of community-oriented social media]

The following question asks your engagement in community-oriented social media such as a private Facebook page or neighborhood apps like Nextdoor. If you use multiple community-oriented social media platforms, please consider a total amount of time you spend on all of the platforms.

Never      Rarely      Sometimes      Frequently      Always

How often do you use community-oriented social media?

[Online health activism intention]

Please indicate the likelihood that you would engage in conversation about lead contamination on the community-oriented social media platform(s) you use. We would like to know how likely you would do the followings on the community-oriented social media platform(s), and there is no right or wrong answer to this question.

Very unlikely      Unlikely      Unsure      Likely      Very likely

I intend to initiate a conversation about lead contamination	<input type="checkbox"/>				
I intend to seek information about lead contamination	<input type="checkbox"/>				
I intend to share ways to eliminate risks of lead exposure	<input type="checkbox"/>				

---

[Open-ended question]

Regarding the issue of lead contamination, what are some of the things that you want to do on the community-oriented social media platforms?

If there are multiple things that you would like to do, please feel free to write down all of them.

---

### Demographic information

Do you have children?

- No
- Yes \_\_\_\_\_ (Please indicate the number of children you have)

(If No is selected, skip these questions)

- Have any of your children been identified as having lead exposure (such as through a blood test?)
  - No
  - Yes

•How old is your youngest child? \_\_\_\_\_

How old are you? \_\_\_\_\_

Which racial and ethnic categories do you identify with? Please mark all boxes that apply.

- White
- Hispanic, Latino, or Spanish origin
- Black or African American

- Asian
- American Indian or Alaska Native
- Native Hawaiian or other Pacific Islander
- Some other race, ethnicity, or origin

What is the highest degree or level of school that you have completed?

- Eighth grade or less
- Attended high school
- Graduated from high school
- Graduated from college with an associate's degree (AA, AS, etc.)
- Graduated from college with a bachelor's degree (BA, BS, etc.)
- Graduated with a graduate degree (MA, JD, MD, PhD, etc.)

Are you currently...?

- Employed by a company that you do not own
- Self-employed
- Full-time student
- Unemployed
- Retired

Approximately, what is your annual household income?

- Less than \$20,000
- \$20,000 to less than \$35,000
- \$35,000 to less than \$50,000
- \$50,000 to less than \$75,000
- \$75,000 to less than \$100,000
- Over \$100,000

Thank you! You have now reached the end of the survey. If you have any comments about the study, please include them here.

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## Appendix D

### Experimental Stimuli

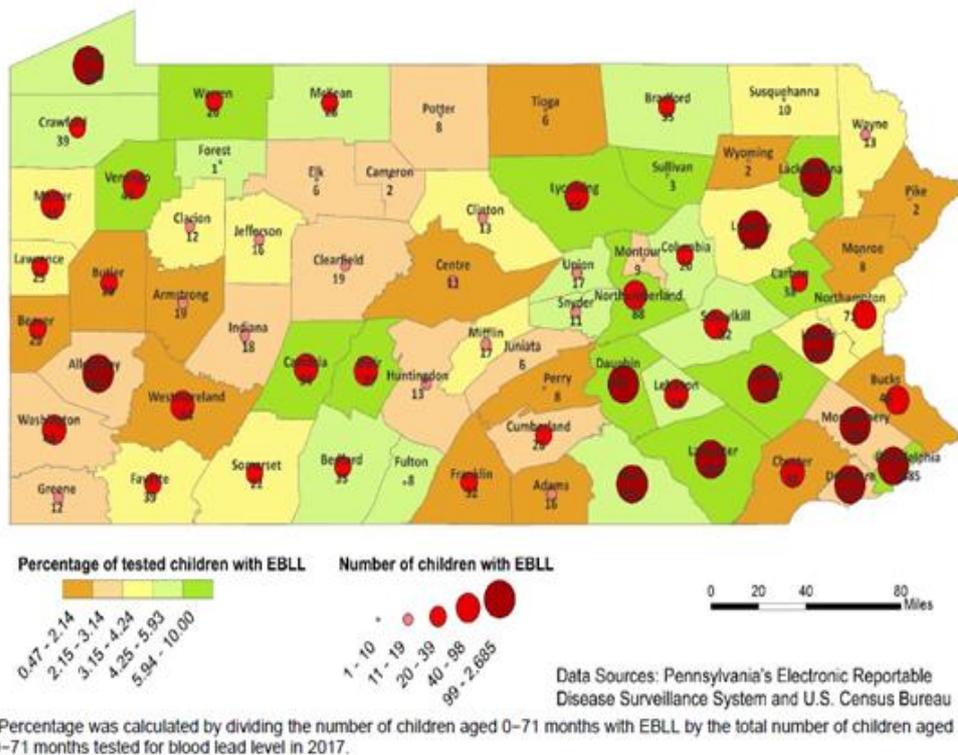
#### Proximity Cue

#### Risks of Lead Exposure in Pennsylvania

Lead is a highly poisonous metal of which widespread use has resulted in extensive environmental contamination and significant public health problems.

Centers for Disease Control and Prevention identify children with 5 micrograms per deciliter of lead in blood as having elevated blood lead levels. Young children are the most vulnerable to the toxic effects of lead such as damage to the brain and nervous system, slowed growth, and learning and behavioral problems.

The following map shows the number and percentage of children aged 0-71 months with a confirmed elevated blood lead level in 2017, in Pennsylvania by county.



On the map, the color of each county represents the percentage of children with an elevated blood lead level in the area. For example, in the counties that are green in color, more than 5.94% of tested children have elevated blood lead levels. The circle with different colors and sizes on each county represents the actual number of children with elevated blood lead levels.

When a county has the largest and darkest red-colored circle, it indicates that there are at least 99 to 2,685 children with elevated blood lead levels.

Every year, public water systems prepare a Consumer Confidence Report (CCR), which includes information on lead monitoring results for each county. For more information and help finding your county results, go to <https://www.epa.gov/ccr>

### **Imagination Prompt**

Imagine a better future where your neighborhood is completely free from the risks of lead exposure. Imagine that all the residents become healthier, more kids play in the neighborhood, and water anywhere from your neighborhood becomes safe to drink. Think about how the daily lives of residents in your neighborhood will be changed and try to visualize a better future in your mind.

### **Recommended-Actions Information**

Keep in mind that collective efforts can bring about a better future for the neighborhood!

- As neighbors, we can run the water for a few minutes before using it for drinking or cooking to effectively avoid lead in drinking water
- As neighbors, we can contact the elected officials in our area to request
  - a test for lead in tap water of public facilities in the neighborhood such as schools, libraries, and community gyms, and
  - funding for lead abatement activities as well as replacement of the water service lines in the neighborhood.

**Youllee Kim**  
**Curriculum Vitae**

**EDUCATION**

- Ph.D. in Communication Arts and Sciences** **2021**  
The Pennsylvania State University, State College, PA
- M.A., in Journalism and Mass Communication** **2015**  
Sungkyunkwan University, Seoul, Korea
- B.A. in Public Policy/ Journalism and Mass Communication** **2013**  
Sungkyunkwan University, Seoul, Korea

**SELECTED PUBLICATIONS**

- Kim, Y.** (*in press*). Channeling anger into hope. In J. H. Lee, C. Y. Oh, & Y. C. Kim (Eds.), *Candlelight for Justice*. New York, NY: Routledge.
- Smith, R. A., **Kim, Y.**, Matthews, S. A., Sternberg E. D., Doudou, D. T., Thomas, M. B. (2020). Communal innovations: Inspiring neighborhoods of hope and advocacy. *Journal of Health Communication, 25*, 444-453. doi: 10.1080/10810730.2020.1785059
- Zhu, X., & **Kim, Y.**, & Park, H. (2020). Do messages spread widely also diffuse fast? Examining the effects of message characteristics on information diffusion. *Computers in Human Behavior, 103*, 37-47. doi:10.1016/j.chb.2019.09.006
- Kim, Y.**, Chung, S., & So, J. (2019). Success expectancy: A mediator of the effects of source similarity and self-efficacy on health behavior intention. *Health Communication, 35*, 1063-1072. doi:10.1080/10410236.2019.1613475
- Kim, Y.**, Dillard, J. P., & Smith, R. A. (2019). Communicating antibiotic stewardship: Emotional responses and their impact on adherence. *Health Communication, 35*, 861-871. doi:10.1080/10410236.2019.1598615
- Smith, R. A., **Kim, Y.**, & M'ikanatha, N. M. (2018). Identifying and predicting profiles of medical noncompliance: Pediatric caregivers' antibiotic stewardship. *Journal of Health Communication, 23*, 485-494. doi:10.1080/10810730.2018.1471109
- Smith, R. A., **Kim, Y.**, Zhu, X., Doudou, D. T., Sternberg, E. D., & Thomas, M. B. (2018). Integrating models of diffusion and behavior to predict innovation adoption, maintenance, and social diffusion. *Journal of Health Communication, 23*, 264-271. doi:10.1080/10810730.2018.1434259

**EMPLOYMENT HISTORY**

- Graduate Research and Teaching Assistant, Pennsylvania State University 2016-2021
- Graduate Research and Teaching Assistant, Sungkyunkwan University 2013-2015