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"Nightwatch": Effects of a Nuclear Risk Storyline on the Popular Show *Madam Secretary* on Viewers' Knowledge, Attitudes, and Behaviors

A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Philosophy

in Community Health Sciences

by

Grace Mihye Kim

2020

ABSTRACT OF THE DISSERTATION

"Nightwatch": Effects of a Nuclear Risk Storyline on the Popular Show *Madam Secretary* on Viewers' Knowledge, Attitudes, and Behaviors

by

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Doctor of Philosophy in Community Health Sciences

University of California, Los Angeles, 2020

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Background: Prevention of the proliferation and use of nuclear weapons is of urgent importance to public health. However, persisting trends demonstrate a lack of both public engagement and consistent public discourse regarding issues related to nuclear policy and nuclear weapons. These factors suggest nuclear risk, once a dominant source of public concern, has faded from view and may not be well understood by the general public. This study contemplates how we can make a nuclear risk issue that is abstract into something that is more concrete and accessible for the general public, ultimately mobilizing individuals to take action. This dissertation examines how a storyline in a popular television show can be used to educate and persuade viewers about nuclear risk.

Although entertainment narratives have historically been used to depict traditional public health issues, such as cancer prevention and reproductive health, a growing base of research evidence on narrative persuasion suggests fictional narratives can provide an effective approach

for promoting awareness and communication about individual, community and collective health risks, in this case nuclear weapons. However, most research examining the impact of entertainment narratives has largely overlooked the complex role of viewer characteristics, such as political ideologies and core beliefs, in narrative persuasion mechanisms, despite their theoretical importance.

Methods: This study explores the impact of a nuclear risk storyline on the comprehension and acceptance of information conveyed via the popular television show *Madam Secretary*. This study implements a unique mixed-methods approach using a viewer pre/post survey (N=295) and social media data (N=3629). First, regular viewers of the show were surveyed before and after the finale episode with the nuclear risk storyline, with a total of 295 participants completing both surveys. Multivariate regression was used to analyze effects of narrative exposure on viewers' knowledge, attitudes, and behaviors. Latent profile analysis and moderation were used to examine differential impact among subgroups of viewers defined by their political ideologies and beliefs. Among viewers of the episode, mechanisms of narrative persuasion were subsequently examined to determine whether narrative engagement, perceived realism, or emotion mediated the relationship between viewers' political ideologies and beliefs (represented by latent viewer subgroups) and their nuclear knowledge, attitudes, and behaviors. Tweets from the social media platform Twitter were also collected to analyze tweets related to the show to expand on quantitative findings. Media content analysis of tweets aimed to examine viewer engagement through social media as a mechanism to explain audience impact.

Results: Findings suggest that fictional television narratives can help educate viewers about nuclear risk, but did not affect all viewers equally. Latent profile analysis identified two distinctive latent viewer subgroups: one group that is more conservative, hawkish, less anti-

nuclear and another group that is more liberal, dovish, and more anti-nuclear. Latent class moderation revealed that only those who were more liberal, dovish, and more anti-nuclear experienced an increase in nuclear knowledge. However, mediation analysis surprisingly found that viewers who were more conservative, hawkish, and less anti-nuclear experienced a more positive emotional response to the storyline, but learned less than the more liberal, dovish, and more anti-nuclear viewers.

Thematic analysis of tweets revealed that most tweets expressed enjoyment of the show and its characters, followed by narrative presence and perceived realism. Viewers were not always reacting to the nuclear risk storyline, but content experts and organizations played an important role in clarifying and reinforcing the intended message of the storyline.

Conclusion: Results suggested the potential for selectivity, where viewer subgroups engage or dismiss parts of the narrative that do not align with their beliefs. Tweets also revealed additional barriers to viewers' narrative engagement, such as competing storylines.
These findings shed light on unique challenges in communicating health messages that are potentially political controversial and provide a more nuanced understanding of narrative engagement that have implications that can advance the field of narrative persuasion.

The dissertation of Grace Mihye Kim is approved.

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2020

To my parents and friends who have supported me along this journey.

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CHAPTER 1. INTRODUCTION

A. Problem Statement

The development, manufacturing, testing, and proliferation of nuclear weapons poses a direct risk on health and the environment (MacDonald, 2005) and should be considered a major global health priority. Nuclear policies and agreements that reduce or prohibit the production, testing, and threat of use of nuclear weapons can have benefits for public health by eliminating potential deaths as well as the long-term health consequences of radioactive fallout that would result from a nuclear attack or accident.

The number of nuclear armed states, including Pakistan and North Korea, has increased since the Cold War, and the probability of an eventual nuclear war is not meaningfully lower than it was decades ago (Snyder & Ruyle, 2017). Given the current uncertain international security environment, experts are calling for new momentum for nuclear policy to reduce dangers posed by nuclear arms, warning that we are currently the closest to nuclear war since 1950 (Frumkin & Helfand, 2012; Hollywood, Health, and Society, 2019).

Despite these warnings, the 2018 Nuclear Posture Review called for the development of new types of nuclear weapons and expanded the range of conditions under which the U.S. may use nuclear force, beyond response to a nuclear attack (Office of the Secretary of Defense, 2018). Moreover, the current administration decided to withdraw from the 1987 Intermediate-range Nuclear Forces (INF) Treaty in 2019, which was an agreement between the superpowers to reduce nuclear arsenals, and is debating whether to extend arms control treaties with Russia. The U.S. has also expanded plans for a multi-decade program to modernize its nuclear arsenal and to

increase the capacity of its weapons production, in the case that the only existing strategic arms control treaty expires or a new arms race accelerates.

In response to these recent decisions, some members of Congress are taking action to preserve existing nuclear arms control agreements, prevent development of new types of nuclear weapons, scale back funding for nuclear modernization, and require Congressional approval for first use of nuclear weapons (Kull, Gallagher, Fehsenfeld, Lewitus, & Read, 2019). An additional concern is that current protocols through which the U.S. can launch a nuclear attack are alarmingly simple. Specifically, if there is an incoming nuclear attack, a decision about launching a counterattack would have to be made in a few minutes by the executive branch. Currently, the President of the United States has the sole power to make this decision without checks and balances (Drozdenko, 2019). Although these specific procedures were developed during the Kennedy administration, Harry Truman was the first one to assert presidential control over nuclear weapons during the Cold War, when a quick response system was deemed necessary (Drozdenko, 2019). Raising public awareness and engagement regarding the potential public health implications of these kinds of policies is needed, particularly as the general population largely remains unaware of these protocols.

Although the current administration is making highly consequential decisions about U.S. nuclear policies and arms control agreements, the public has had virtually no role in this process (Kull et al., 2019) and public interest in nuclear war has waned (Snyder & Ruyle, 2017). A 2010 CNN opinion survey reported that most people do not believe nuclear war to be very likely in the next decade (Brown, 2015). These general trends of ambivalence and complacency towards nuclear issues have remained relatively stable since the 1980s. Despite the Cold War, nuclear war seemed to the public as fairly unlikely to occur and people described it mostly in the abstract

(Fiske, 1986). Simultaneously, the average person imagined total destruction and did not expect to survive, and overwhelmingly favored a mutual nuclear freeze (Fiske, 1986).

Studies have consistently reported a general lack of knowledge of matters related to nuclear policy (Granberg & Faye, 1972; Kull et al., 2019; Kull, Ramsay, Subias, & Lewis, 2004). Despite understanding the devastation that a nuclear war could bring and also voicing support for more constrained policies, over the past few decades most individuals do not actively engage in issues of nuclear risk or nuclear policy (Fiske, 1987; Fiske, Pratto, & Pavelchak, 1983; Milburn, Watanabe, & Kramer, 1986; Tyler & McGraw, 1983). The relatively low level of concern towards nuclear war is puzzling given people's horrific images of nuclear war and low estimates of personal survival (Fiske, 1986).

Overall, these persisting trends reveal that individual attitudes towards nuclear issues are not necessarily consistent with their actions (Fiske, 1986). Such discontinuity may be due to the abstractness of the threat of nuclear war, uncertainty regarding what can be done to prevent nuclear war, or the powerlessness individuals feel with regard to personally influencing the risk of nuclear war (Fox-Cardamone, Hinkle, & Hogue, 2000; French & Van Hoorn, 1986). However, public engagement is critical for policy change, particularly within the context of nuclear policy (Ripberger, Rabovsky, & Herron, 2011), since research has repeatedly demonstrated how public opinion influences foreign and security policy outcomes (Aldrich, Sullivan, & Borgida, 1989; Burstein & Freudenburg, 1978; Foyle, 1999; Graham, 1989; Hartley & Russett, 1992; Jacobs & Page, 2005; Page & Shapiro, 1983). Thus, identifying innovative ways to remind and educate the public of the urgency to engage in issues of nuclear security and to ultimately restore democracy around nuclear policy becomes salient.

A1. An Opportunity for Entertainment Narratives

In cinematic history, Hollywood has often capitalized on narratives about nuclear arms that are sensational and dramatic, as exemplified by storylines found in older classics like *China Syndrome* and *The Leftovers* that depict the iconic "mushroom cloud." The depiction of nuclear related issues on entertainment television has largely been limited to fantastical images of nuclear disasters or nuclear attacks, perpetuating myths and misconceptions (Hollywood, Health, and Society, 2019). These persisting narratives may contribute to the public's views that a nuclear attack is improbable, and that that issues of nuclear security are personally irrelevant.

Political communication research suggests that the media is a major source of beliefs, feelings, and action around nuclear security (Fiske, 1986). Moreover, long held concepts in communication research, such as agenda setting, suggest that the more a topic is discussed or promoted in the mass media, the more the public attributes importance to it (McCombs & Shaw, 1972). Although a great deal of media influence is attributed to journalistic or political sources, fictional narratives, in particular, can influence story-consistent knowledge, attitudes, and behaviors through narrative engagement, such that audiences are immersed into the story world through mental processes involving attention, imagery, and emotion (Green & Brock, 2000). Thus, entertainment narratives provide an opportunity to change the narrative around issues related to nuclear risk and security.

Narrative communication where storylines about health, social and policy issues are created and placed in popular media formats is a promising approach for behavior change information delivered through engaging storytelling and characters whom the viewer cares about is more likely to attract viewers' attention than information presented in a more didactic fashion (Lang, 2000; Singhal, Cody, Rogers, & Sabido, 2003; Singhal & Rogers, 2012; Slater & Rouner, 2002). Efforts to increase narrative communication through education outreach and advocacy

have involved topic experts working with the film and television industries, which is the work of organizations like Hollywood, Health & Society at the University of Southern California. In the U.S. context, the most notable campaign was the Harvard Alcohol Project, which worked with film and television industries to promote the concept of the designated driver on more than 140 primetime television shows (Glik et al., 1998). Developing full programs devoted to issues of public health or other social issues is much more challenging given the competing priorities of Hollywood. With the exception of a few outstanding programs like *East Los High, 16 and Pregnant, Doc McStuffins,* and *Degrassi*, most prosocial messages are embedded as single or multi-episode storylines in popular television programs, such as *Friends* and *ER.* These approaches have been found to influence viewers' awareness, knowledge, attitudes, and behaviors on issues ranging from condom efficacy (Collins, Elliott, Berry, Kanouse, & Hunter, 2003) to the use of cancer patient navigators (Marcus, Huang, Beck, & Miller, 2010; Singhal & Rogers, 2012). Given the success of entertainment narratives in these other areas, there is promise for television narratives to increase awareness, change attitudes, and increase public engagement in issues of nuclear risk and security.

A2. Examining Narrative Persuasion and Persisting Challenges

Studying the impact of entertainment narratives, particularly on television, is becoming increasingly complex given that audiences are dispersed and new streaming platforms have emerged that allow audiences to watch content anywhere anytime. Thus far, the evaluation of entertainment narratives has focused on the direct effects of the narrative on viewers' story-consistent knowledge, attitudes, and behaviors, using both experimental, observational, and survey research designs (Hether, Huang, Beck, Murphy, & Valente, 2008; Murphy, Hether, Felt, & de Castro Buffington, 2012; Valente et al., 2007; Wang & Singhal, 2016). Drawing from

theories of communication and psychology, this research has expanded to examine indirect effects of narratives, exploring cognitive and affect pathways that may influence the extent to which viewers become immersed in the story world and identify with characters, which then influence subsequent persuasive outcomes.

As communication researchers are still determining how to best evaluate entertainment narratives and their impact on audiences, new methodological approaches that can more holistically understand the impact of these programs are needed. One area of the evaluation literature that has been underdeveloped is understanding the role of viewer characteristics in the context of narrative persuasion mechanisms. Various narrative persuasion theories posit viewer or receiver characteristics, such as sociodemographic attributes, previous knowledge or exposure, and personal beliefs, to be an essential component to mechanisms of narrative persuasion (Busselle & Bilandzic, 2008; van Laer, de Ruyter, Visconti, & Wetzels, 2014), asserting that viewers are active agents of the narratives they consume (Fishbein & Yzer, 2003).

Narrative persuasion research indicates differential impact of storylines on different subgroups of viewers, based on individual characteristics, such as gender and political ideology (Gillig & Murphy, 2016; Slater, Rouner, & Long, 2006). Thus, there is theoretical and empirical value in exploring how narrative persuasion mechanisms may differ across different types of viewers. Moreover, communicating health messages that might be more politically controversial may present its own unique challenges. While political ideology has long been seen to clearly influence people's views towards controversial issues, such as reproductive health rights, LGBTQ rights, legalization of cannabis or guns, optics about what is controversial has shifted as well. For example, political views about state regulations and overreach, including vaccinations and most recently, taking preventive measures during a pandemic. While these latter issues may

appear to be novel, they reveal basic underlying ideological differences in audiences that can be assessed in observational and survey research studies. Given these empirical linkages between individual characteristics and political beliefs, attitudes, and behaviors (Ripberger et al., 2011), how viewers' political ideologies and core beliefs, in particular, might influence the impact of narratives depicting more controversial health messages is worth investigating.

In addition, utilizing the vast data available on social media may also provide a complementary approach to understanding audience response to storylines addressing more controversial or politicized health issues. Social media monitoring, such as collecting and analyzing Facebook posts or tweets, provides an effective way to explore organic viewer responses to storylines as they discuss shows online. For example, prior studies using social media data were able to examine how viewers identified with characters (Tully & Ekdale, 2014), tweeting activity patterns over time (Kearney & Levine, 2015), and how viewers catalyze social movements in protest of familiar tropes of marginalized groups on television (Waggoner, 2018). These studies will be reviewed in the next chapter.

B. Study Overview and Aims

Preventing the spread of nuclear weapons and other weapons of mass destruction remain one of Americans' top foreign policy goals in 2017 (McCarthy, 2017). Despite being on political and governmental agendas, many individuals have a difficult time relating to the issue of nuclear arms since nuclear policy has not been a subject of major interest in recent public discourse with few news stories, public discussions or visible advocacy efforts. Alternatively, other global threats, such as climate change, that have gained more attention in the public discourse may be viewed as more immediate and relevant, even though the potential impact of nuclear war on

human life and the environment could far exceed those of climate change (Snyder & Ruyle, 2017).

In response to this lack of public discourse around nuclear policy and the gravity of its consequences on public health, a well-regarded television program *Madam Secretary* included a storyline into its fourth season finale "Nightwatch", which aired on May 20, 2018, to address issues of nuclear threats and vulnerabilities and renew public interest. *Madam Secretary* is an American political drama on CBS following Elizabeth McCord (Tea Leoni) as the U.S. Secretary of State as she encounters office politics, navigates international diplomacy, and balances life at home. In particular, the storyline depicts implications of the "hair trigger alert," which is the current policy that maintains nuclear weapons in ready to launch status.

The storyline was based on a true event that occurred in the 1970's, where the White House received a phone call in the middle of the night that Russia had launched a nuclear attack, but discovered it to be just a simulation. The *Madam Secretary* storyline similarly depicts the President getting a phone call while having a casual time at the golf course and is notified that Russia has launched a nuclear attack against the U.S. With only a few minutes to decide a course of action, the President chooses to launch a counterattack, but is later notified that the presumed nuclear attack was false. They are able to abort the counterattack seconds before the missiles launch due to a delay caused by issues of permission in the chain of command. The President declassifies the event, and the public rallies together to change nuclear policy. A few years pass, and we see that policy changes have been successfully made.

Utilizing a mixed-methods approach with both quantitative survey data and qualitative data based on Twitter feeds of audience members, this dissertation examines the impact of a single-episode storyline on viewer knowledge, attitudes, and behaviors related to nuclear policy

and explore how these effects may differ across viewer subgroups characterized by their political ideologies and beliefs. Regular viewers of the show were surveyed before and after the finale episode, with a total of 295 participants completing both surveys. Tweets from the social media platform Twitter were also collected to analyze tweets related to the show to expand on quantitative findings.

These objectives can be translated into the following aims, with Aims 1 and 2 based on the storyline impact dataset, and Aim 3 based on Twitter data:

Aim 1. To examine whether exposure to a televised storyline featuring nuclear issues influences related knowledge, attitudes, and behaviors.

1a. To identify latent subgroups of *Madam Secretary* viewers based on their political ideologies and core beliefs.

1b. To examine whether exposure to a televised storyline featuring nuclear issues influence related knowledge, attitudes, and behaviors differs across viewer subgroups characterized by their political ideologies and core beliefs.

Aim 2. To examine how narrative persuasion mechanisms that viewers of the episode experience mediate related knowledge, attitudes, and behaviors linked to a televised storyline featuring nuclear issues.

2a. To determine whether narrative engagement mediates the relationship between political ideologies and beliefs and nuclear knowledge, attitudes, and behavior among viewers of the episode.

2b. To determine whether perceived realism mediates the relationship between political ideologies and beliefs and nuclear knowledge, attitudes, and behavior among viewers of the episode.

2c. To determine whether emotional response mediates the relationship between political ideologies and beliefs and nuclear knowledge, attitudes, and behavior among viewers of the episode.

Aim 3. To explore the qualitative content of tweets related to *Madam Secretary* during the week that a televised storyline featuring nuclear issues aired.

C. Significance

Public understanding of health and social issues is influenced by socially constructed narratives in the popular media, such as news, advertisements, social media, books, or television and film. Understanding how messages in these media impact audiences, and how to best design research to do this well is thus timely and relevant. Moreover, using entertainment narratives to shift public awareness and views towards more politicized health messages, such as those related to LGBTQ populations, gun control, systemic racism, and guidelines to control a pandemic, may present unique challenges. Understanding how to communicate more politicized health issues and overcome viewers' pre-existing political ideologies and affiliations thus becomes salient particularly due to the current politically polarized climate. This dissertation aims to explore how viewers are impacted and engage with a potentially controversial health message, specifically a nuclear risk message, presented on a popular television show. It contemplates how to communicate these messages with viewers, especially those who have views that may not align with those implicitly supported by the storyline. Findings from this study have implications for narrative persuasion in the context of more controversial public health messages and how we can use entertainment narratives to shift perceptions within different audiences.

D. Summary

This dissertation examines how a storyline in the popular CBS show *Madam Secretary* can be used to educate and persuade viewers about nuclear risk. This chapter discussed the timeliness in improving public awareness and action around nuclear policy due to its implications on public health. Entertainment narratives on television may provide an effective platform for informing and engaging the public with issues of nuclear risk and security. Chapter 2 reviews the relevant literature in three parts. The first section explains why nuclear security should be considered a global public health issue. The second section emphasizes the potential for entertainment media to be an effective platform to communicate issues of nuclear risk. The last section reviews the methodological trends in narrative persuasion to inform the methods utilized in this study. I review the empirical literature to highlight the importance of considering political ideologies and beliefs when communicating more politically controversial health messages as well as the empirical literature on how mediators, specifically narrative engagement, perceived realism, and emotion, can overcome pre-existing political ideologies and beliefs in order to experience changes in knowledge, attitudes, and behaviors.

Chapter 3 reviews the theories of narrative persuasion and behavior change (Bandura's Social Cognitive Theory, Busselle and Bilandzic's model of narrative comprehension and engagement, and Ripberger's model for nuclear policy beliefs) that inform the integrated conceptual model that aims to explain the relationship between a political narrative and relevant outcomes and help facilitate understanding of how this relationship may differ across subgroups of viewers. Chapter 4 details the mixed-methods approach to examine the impact of a nuclear storyline on the CBS show *Madam Secretary* on audiences. This section describes data collection

and analysis of survey data and qualitative social media data to answer questions around viewer impact and engagement.

Chapter 5 and 6 present the findings of this study. Chapter 5 presents the results from the viewer survey data, which suggest that fictional television narratives can help educate viewers about nuclear risk, but may not affect all viewers equally. I describe the results from the latent profile analysis and moderation to examine these differential effects on viewer subgroups. I also present results from the mediation analysis to explore mechanisms of narrative persuasion among those who watched the finale episode with the nuclear risk storyline. Chapter 6 presents the results from the media content analysis of tweets responding to the nuclear risk storyline. This chapter presents descriptives of the sample of tweets collected as well as identified themes, and how these themes differed across Twitter users.

Chapter 7 first summarizes major findings. It then attempts to interpret and make meaning of the results from the viewer survey and Twitter analysis by situating them in the context of the theoretical and empirical literature, highlighting the unique challenges in communicating more politicized health messages. This chapter ends with study strengths and contributions to the field and limitations. Lastly, Chapter 8 concludes the dissertation with a brief review of major findings and its implications.

CHAPTER 2. LITERATURE REVIEW

To inform my research aims concerning the relationship between exposure to a *Madam Secretary* storyline on nuclear security and knowledge, attitude, and behavior outcomes, I conducted a review of the empirical literature, which will be presented in three parts. The first section will explain why nuclear security should be considered a global public health issue. The second section emphasizes the potential for entertainment media to be an effective platform to communicate issues of nuclear risk to the general American public and increase public engagement with nuclear policy. I review empirical studies on media effects on policy attitudes and a collection of studies from the 1980's studying the impact of fictional films depicting nuclear war.

The last section reviews the methodological trends in narrative persuasion to inform the methods utilized in this study. I review the empirical literature on moderators of narrative exposure, but highlight the importance of considering political ideologies and beliefs when communicating more politically controversial health messages. Subsequently, I review the empirical literature testing the mechanisms of narrative persuasion through which narratives are theorized to influence viewers, particularly when narratives must overcome pre-existing political ideologies and beliefs that may not be aligned with those implicitly supported by the storyline. Collectively, these studies demonstrate the potential for using latent variable modeling and social media data to examine narrative processing and viewer response.

This review of the literature ultimately aims to highlight the utility of entertainment narratives to address health issues using as a case study public engagement with nuclear policy. A goal is the need to expand conventional methodological approaches in the evaluation of

narrative impact to address outstanding limitations in measuring audience response, and specifically addressing differential impact on audiences with diverse characteristics. This has implications regarding the extent to which our current understanding of narrative persuasion can apply to the communication of health messages that are considered more politically controversial.

A. Nuclear Security as a Global Public Health Issue

Reducing the risks of nuclear war, nuclear nonproliferation, and reducing global nuclear weapons stockpiles are key national and international security goals, but also have significant public health implications (Dreicer & Pregenzer, 2014). This can be attributed to the direct risk to health and the environment resulting from the development, manufacturing, testing, stockpiling, maintenance, transport, dismantling, storage, and disposal of nuclear weapons (MacDonald, 2005). Thus, nuclear policies that address issues of use of nuclear weapons, nuclear testing, and arms control have a direct impact on public health.

Policies that reduce the likelihood of use of nuclear weapons as well as the risk of accidental nuclear war prevent the health impact that would result from their use (Dreicer & Pregenzer, 2014). For example, the devastating effects on public health are demonstrated by the nuclear bombs dropped at Hiroshima and Nagasaki in 1945. Within four months, there were 120,000-240,000 related deaths, accounting for 25% - 50% of the contaminated population (Dreicer & Pregenzer, 2014). Over the long term, additional deaths from leukemia and solid cancers, as well as non-cancer health effects, including cataracts, hyperparathyroidism, growth retardation and arteriosclerosis were observed in long-term, large scale epidemiological studies of exposed populations (Kamiya et al., 2015; The National Academy of Science, 2003). In addition to negative effects on physical health, atomic bomb survivors experienced adverse

psychological effects, such as post-traumatic stress disorder and anxiety symptoms caused by concerns about their health and grieving the death of family members and the collapse of the community (Douple et al., 2011; Honda et al., 2002; Kamiya et al., 2015; Yamada, 1991; Yamada & Izumi, 2002).

Nuclear test limitation treaties that ban atmospheric nuclear tests also significantly reduced the release of radioactive contamination to the environment and consequently, their detrimental impacts to public health (Dreicer & Pregenzer, 2014). Historically, 430,000 deaths worldwide from fatal cancer have been attributed to U.S. atmospheric nuclear testing from 1945 to 1963 (MacDonald, 2005). Research examining the effects of the radioactive dose received from fallout in the 1950s and 1960s released from testing sites in Nevada, Semipalatinsk Kazakhstan, and the Marshall Islands, concluded that approximately 49,000 fallout related thyroid cancers resulted from iodine exposure due to above-ground nuclear testing at the Nevada test site alone (Simon, Bouville, & Land, 2006). The full implications of these exposures that occurred 60 year years ago over the life course will not be understood until the end of the lifetimes of these exposed populations (Dreicer & Pregenzer, 2014).

It is estimated that 27,000 nuclear weapons currently exist worldwide, with an explosive force equivalent to 10 billion tons of TNT and producing a force more powerful than 200,000 of the bombs dropped on Hiroshima (Carnegie Endowment for International Peace, 2006; Norris RS, 2006a, 2006b, 2006c; Sidel & Levy, 2007). Approximately 2,000 to 3,000 of these weapons are mounted on missiles on hair-trigger alert, ready to be launched on a few minutes' notice (Sidel & Levy, 2007). Thus, nuclear risk poses an urgent threat to public health and nuclear policies that ensure public safety and security are urgent.

Public health researchers and practitioners have an important role in educating and communicating nuclear risk to the public. Thus far, the contributions of public health workers to the prevention of war, and specifically to the control of nuclear proliferation, have taken a wide variety of forms, ranging from public health activities and advocacy efforts to prevent war to nuclear weapons abolition, and educating residential communities about the risks of nuclear weapons production (MacDonald, 2005; Sidel & Levy, 2007). However, using entertainment media to educate the public about nuclear risk has yet to be explored.

B. Potential for Entertainment Media to Communicate Nuclear Risk

Given the clear deleterious public health risks posed by the potential for nuclear proliferation and nuclear war, innovative ways to communicate nuclear risk and motivate public action around nuclear policy are needed. Although political issues, including those related to nuclear policy, often remain abstract in the public mindset, people look to the media as the principal source of information for public diplomacy and foreign affairs, issues that most people have little personal experience with (Soroka, 2003). Given the popularity of political, legal, and crime dramas, the effects of these dramas on political beliefs, attitudes, and behaviors have been a focus in political science and political communication research. Traditionally, this literature has drawn from mass media theories, such as cultivation theory, media framing, priming, and agenda setting (Iyengar & Kinder, 1987; McCombs & Shaw, 1972) that explain how the media can guide viewers on what to think about by giving certain issues more attention. Increased attention on specific issues in the media can increase the salience of the topics featured by heightening public concern (Jones & Paris, 2018) and ultimately the prominence of these issues for policy makers (Iyengar & Kinder, 1987).

While this area of research within political communication has typically focused on various forms of news, such as broadcast television and newspapers (McLeod & McDonald, 1985), the literature has since expanded to other genres, including documentaries (Holbert & Hansen, 2006; Holbert, Hansen, Caplan, & Mortensen, 2007) and late night comedy shows (Baumgartner & Morris, 2006; Baym, 2005; Hollander, 2005; Moy, 2006). More recently, greater attention has been given to the possibility that entertainment and fictional media exact similar influences upon political preferences and behaviors (Holbert et al., 2003; Holbert, Shah, & Kwak, 2003). From a political science perspective, the presentation of the political domain in entertainment media deserves special attention because of their wider reach compared to news programs or other public affairs programs (Eilders & Nitsch, 2015), particularly among younger generations who increasingly rely on entertainment programming to follow politics (Eilders & Nitsch, 2015; Williams & Delli Carpini, 2011).

Empirical evidence demonstrating the impact of fictional entertainment on politically relevant beliefs, attitudes, and behaviors is well-established. First, fictional narratives can shift more fundamental beliefs that are associated with partisanship and political ideologies. For example, belief in a just world, or the belief that we live in a world where people get what they deserve (Lerner & Miller, 1978), is associated with perspectives towards the distribution of rewards and punishment in society, which is affiliated with support for policies, such as welfare and criminal justice (Gierzynski, 2018). Considering most fictional narratives depict a just world, where the criminal is caught and good triumphs over evil, the frequency of watching fiction on television has been positively associated with viewers' belief in a just world (Appel, 2008). On the other hand, viewers of an unjust story world, where corrupt characters are repeatedly not

served justice, as depicted in *Game of Thrones* or *House of Cards*, were consistently less likely to believe in a just world than non-viewers (Gierzynski, 2018).

Studies also support the proposition that fictional narratives on television can influence public attitudes towards or increase the salience of a range of controversial policies. Single episode storylines found in the television dramas *Law and Order:* SVU and a short feature from the Home Box Office series, "*If These Walls Could Talk II*" were found to shift attitudes on the death penalty, but did not show the same effect on issues of gay marriage (Slater et al., 2006). Systematic studies of the Doyle Dane Bernbach (DDB) Life Style datasets on the influence of various genres of prime-time entertainment television found significant associations with individual-level, sociopolitical attitudes and behaviors related to issues of capital punishment and the death penalty (Holbert, Shah, & Kwak, 2004) and women's rights (Holbert, Shah, & Kwak, 2003b), but not the environment (Holbert, Kwak, & Shah, 2003a). Given issues of the environment are often portrayed in a neutral or apathetic stance (Holbert et al., 2003a), the framing of policy issues may help explain these findings.

Experimental approaches have illuminated how framing of controversial policy issues in entertainment media can influence opinions in ways consistent with the specific frame with regards to legal abortion in incest (Mulligan & Habel, 2011). Similar effects were found with portrayals of the criminal justice system, particularly among viewers that empathized more with the characters (Mutz & Nir, 2010). Given opinions on abortion and the death penalty tend to be entrenched in deeper values and beliefs (Bobo & Johnson, 2004), these studies provide evidence that framing of issues even in fictional media can have lasting implications on Americans' political views and policy opinions. In addition to effects on political beliefs and attitudes,

political communication research has explored the effects of entertainment television on politically relevant behaviors, such as political discussion (Landreville & LaMarre, 2011).

B1. Impact of Mass Media Featuring Nuclear Issues

Extant literature suggests that entertainment media can influence viewers' political beliefs, attitudes towards policies and the government, and behaviors, particularly through processes of framing. Although there are no recent studies examining the effects of entertainment media featuring nuclear issues on political outcomes, media effects studies from the peak of the Cold War have examined the impact of two films addressing nuclear issues. *Hiroshima-Nagasaki: 1945* is a short black and white film that first portrays the bombings and their graphic effects on life, property, and stories of survivors (Granberg & Faye, 1972). The ABC docudrama *The Day After* was released shortly after in 1983 and aimed to show "ordinary Americans and what their lives would be like after a nuclear war" (Feldman & Sigelman, 1985).

The earlier film *Hiroshima-Nagasaki 1945* reported mixed findings with regards to the effects on knowledge and attitudes related to nuclear issues. The film had no effect on viewers' knowledge of nuclear weapons or perceptions of the likelihood of nuclear war itself (Granberg & Faye, 1972). However, the film did increase people's reported anxiety towards nuclear weapons and decreased their desire to survive a nuclear war (Granberg & Faye, 1972). Effects of *Hiroshima-Nagasaki: 1945* on viewer attitudes were also limited, although it significantly raised the level of provocation seen as necessary for initiating a nuclear war (Granberg & Faye, 1972).

The airing of *The Day After* was a social and political event of national significance (Adams & Webber, 1984) and was the second most watched program in American television history at the time (Fiske, 1986), thus attracting immense interest in its potential impact on public opinion. Initial findings from major public opinion polls following the airing of *The Day*

After suggested the film had relatively little impact on audiences (Adams, et al., 1984; Kelley, 1983; Knap, 1983; McFadden, 1983) (Schofield & Pavelchak, 1989). However, succeeding studies examining changes in knowledge, attitudes, cognitions, emotions, and behaviors related to nuclear issues that were more relevant to the film's content provided a more nuanced understanding of its effects (Schofield & Pavelchak, 1989). For example, *The Day After* seemed to have a limited but significant effect on knowledge concerning nuclear issues (Feldman & Sigelman, 1985), with the less educated, younger, and more politically inexperienced more likely to report an increase in knowledge and awareness of nuclear issues (Fiske, 1986; Oskamp & et al., 1985). Another study reported reduced reliance on nuclear illusions after seeing the film, suggesting an increased understanding of the effects and scope of nuclear war (Kulman & Akamatsu, 1988).

The film largely focused on depicting the aftermath of a nuclear war (Feldman & Sigelman, 1985), thus people's beliefs regarding the aftermath of nuclear events became even more pessimistic regarding the availability of resources and supplies (Feldman & Sigelman, 1985), their perceived likelihood of survival, and the country rebuilding afterward (Feldman & Sigelman, 1985; Kulman & Akamatsu, 1988; Oskamp, 1986; Schofield & Pavelchak, 1989). However, viewing *The Day After* did not change perceptions of the likelihood of nuclear war itself (Feldman & Sigelman, 1985; French & Van Hoorn, 1986; Kulman & Akamatsu, 1988; Wolf, Gregory, & Stephan, 1986). Studies also reported marginal effects on orientations towards general foreign and defense policy issues, such as U.S. defense spending (Feldman & Sigelman, 1985; French & Van Hoorn, 1986; Kulman & Akamatsu, 1988), although some of these effects differed by gender (French & Van Hoorn, 1986) and education level (Feldman & Sigelman, 1985).

Mixed evidence emerged regarding how *The Day After* affected behavioral intentions or actual behaviors after viewing the film. Respondents who watched the film were more likely to intend to engage in antinuclear activities after the film than before (Schofield & Pavelchak, 1989), and compared to non-viewers (Schofield & Pavelchak, 1989; Wolf et al., 1986). However, intention may not translate to action. Early polls reported no immediate increase in overt political behaviors related to the issue, including contacting elected officials or the news media (Adams & Webber, 1984; French & Van Hoorn, 1986; Schofield & Pavelchak, 1985). At the individual level, engagement in anti-nuclear activities or information seeking about nuclear war (i.e., reading news or books, attending lectures or panels) was not significant (Kulman & Akamatsu, 1988), although viewers did report increases in sharing opinions about nuclear arms with friends or family (French & Van Hoorn, 1986). The lack of behavioral engagement may be due to inadequate feelings of empowerment or control over the danger of nuclear war, or "personal efficacy" (Kulman & Akamatsu, 1988), which remained unchanged after viewing *The Day After* (French & Van Hoorn, 1986; Wolf et al., 1986). Moreover, the lack of a proposed solution to nuclear conflict in the film itself may have reaffirmed audience beliefs that they have minimal control over the threat of nuclear war (Kulman & Akamatsu, 1988).

Although nuclear issues have been featured in entertainment media, findings on the impact of these narratives on viewer knowledge, attitudes, cognitions, and behaviors are mixed. There are several explanations for the uncertain impact of these films on political attitudes and behaviors related to nuclear issues. First, the films only vaguely addressed the nuclear issues that were asked about in the audience surveys (Fiske, 1986). The director of *The Day After* asserted the film's purpose was to depict what things would look and feel like if a nuclear war were to occur, thus explicit references to arms control or the nuclear freeze movement were intentionally

avoided (Schofield & Pavelchak, 1985). Thus, the expectation for the film to have changed related attitudes and behaviors may have been naïve (Schofield & Pavelchak, 1985). Second, several studies reported that the effects of these films on public opinion towards nuclear issues were moderated by viewer characteristics, including education level, gender, and age, suggesting that effects may differ by subgroups. Evaluation methods that can provide greater clarity about how these narratives impact political knowledge, attitudes, and behaviors and how these effects may differ by subgroups of viewers therefore become salient.

C. Measuring Narrative Impact

Narrative communication is a promising approach for behavior change because it is a fundamental aspect of human interaction and engagement. Beyond day to day interactions, narrative is also the primary means through which various social and political institutions share information with the public (Hinyard & Kreuter, 2007). Research suggests that information delivered through engaging storytelling and characters whom the viewer cares about is more likely to attract viewers' attention than information presented in a more didactic fashion (Lang, 2000; Singhal et al., 2003; Singhal & Rogers, 2012; Slater & Rouner, 2002). Seminal narrative persuasion studies documented the effects of written texts. For example, Green and Brock used an experiment to examine the impact of an excerpt from a popular novel, which described the murder of a child at a mall by a psychiatric patient, on beliefs about policies regarding release of psychiatric patients and the frequency of violent incidents (Green & Brock, 2000).

Narrative persuasion research has since expanded to audiovisual narratives, such as television. This has included entertainment education efforts, which places educational content in entertainment messages (Singhal & Rogers, 2002). The entertainment education strategy has largely been used in developing world contexts, dedicating whole television series to bring about

behavioral and social change, exemplified by shows such as *Soul City* in South Africa addressing HIV/AIDS and later gender-based violence (Usdin, Scheepers, Goldstein, & Japhet, 2005) and more recently, *C'est La Vie* in West Africa addressing health issues, including reproductive health and female genital mutilation. Evaluation of these efforts has traditionally examined the direct effects of general show exposure on knowledge, attitudes, and behaviors (Singhal, Rao, & Pant, 2006), relying primarily on cross-sectional audience surveys after show exposure (Wang & Singhal, 2016).

However, especially in developed world contexts with saturated markets for content, health messages are more often incorporated as single or multi-episode storylines on popular prime-time television series. For example, a single-episode storyline on *ER* promoted the use of cancer patient navigators depicting a patient navigator helping an African-American woman who refused treatment due to the belief in a myth that surgery for cancer causes it to spread (Marcus et al., 2010). While the emergence of using single or multi-episode storylines to promote health issues is partially attributed to the resistance in Hollywood to include explicitly persuasive messages due to the fear of generating controversy and the pressure to obtain adequate audience ratings (Singhal & Rogers, 2002), evaluating a single storyline allows for the exploration of indirect effects to facilitate more nuanced understanding of media effects linked to this form of communication.

Thus, in addition to measuring direct effects, methodological approaches to evaluating entertainment narratives have since expanded to quasi-experimental and experimental designs assessing narrative persuasion mechanisms, particularly with a focus on narrative transportation, character identification, and affect as mediators of the relationship between storyline exposure and knowledge, attitude, and behavior outcomes. For example, studies have implemented non-

randomized research designs using cross-sectional surveys to compare pre and post outcomes of viewers and non-viewers over time. Qualitative methods, such as in-depth interviews, have also been implemented to understand the viewer experience (Singhal & Rogers, 2002; Wang & Singhal, 2016).

However, there is currently no unified approach to evaluating narrative impact and some limitations remain. For example, while most studies utilize either quantitative or qualitative methodologies; a mixed method approach could provide a more holistic understanding of audience reception of these storylines. Research also tends to focus on individual mediators, such as transportation or character identification, but less attention has been given to other essential theoretical components of narrative persuasion, such as viewer characteristics, which are often simplistically adjusted for as covariates. Advanced quantitative analyses, such as latent variable modeling, and utilizing social media data are emerging methods that can then complement traditional methods of evaluating the effects of narratives addressing more politically controversial health messages.

C1. Differential Impact of Storylines

The literature that has attempted to measure the effects of various media programs on viewers' health, social, and political beliefs, attitudes, and behaviors has some limitations. In particular, most studies assume that these narratives affect all viewers in the same way. When studies do examine differential effects based on viewer characteristics, such as age, gender, or political ideology, they often do so one at a time. However, the viewer is also considered to be an active interpreter in accordance to prior knowledge, attention, personality, and demographics (Fishbein & Yzer, 2003), thus reinforcing individual dispositions as an essential component of narrative engagement and subsequent responses.

For example, Busselle and Bilandzic's model of narrative comprehension and engagement identifies that the viewer's real world knowledge and schemas shape how one constructs meaning from the narrative (Busselle & Bilandzic, 2008). Another model, the Extended Transportation-Imagery Model also asserts viewer characteristics, including familiarity, attention, transportability, age, education, and gender, contribute to narrative transportation, and ultimately outcomes, such as affect, beliefs, attitudes, and behavioral intentions (van Laer et al., 2014). In addition to theory, the empirical research suggests that individual dispositions may account for variance previously unexplained by text characteristics or situational factors (Appel & Richter, 2010).

Prior research also supports the proposition that individual characteristics drive policy preferences and attitudes related to nuclear issues. Despite the desire to retain nuclear weapons in the U.S., most Americans do show support for a mutual freeze and a constrained posture towards proliferation, testing, or developing new nuclear weapons (Kull et al., 2019). While the majority favor a somewhat constrained posture towards nuclear arms, the public may consider nuclear force to be necessary if it means protecting U.S. soldiers and civilians and ending the conflict quickly (Sagan & Valentino, 2017). Moreover, this literature suggests that attitudes towards nuclear force and nuclear policy can depend on sociodemographic factors like age and gender and beliefs, specifically political ideology, attitudes towards foreign policy (i.e. collaborative internationalism and militant unilateralism), and religiosity (Kull et al., 2011; Ripberger et al., 2011; Sagan & Valentino, 2017). Thus, these individual dispositions are worth exploring when evaluating how televised storylines featuring nuclear issues impact audiences.

Although individual characteristics are clearly an important part of how viewers process media narratives and are associated with policy attitudes and preferences, the empirical literature,

thus far, has cursorily addressed how individual characteristics may affect the impact of televised storylines addressing health and socio-political issues on persuasive outcomes. Extant literature evaluating televised storylines addressing health issues, such as cancer screenings, sexual health behaviors, and healthy eating, also found differential effects based on race, age, education, gender (Marcus et al., 2010; Moyer-Gusé, Mahood, & Brookes, 2011; Moyer-Gusé & Nabi, 2011; Valente et al., 2007), and prior experience related to the topic (Moyer-Gusé & Nabi, 2011). However, most studies treat individual characteristics simplistically by adjusting for them as covariates or as a moderator represented by a single variable even though some constructs like political ideologies are multi-dimensional and much more complex in nature.

Health messages that may be considered politically controversial may also present unique challenges. Given that public health stems from social justice efforts oriented toward the overall health and well-being of the general population, public health has recognized how social movements and criminal justice, such as issues related to LGBTQ populations, gun control, and the death penalty, have implications for public health. However, attitudes towards these policies are deeply rooted in political ideology and fundamental beliefs. Consequently, narrative exposure and immersion must override pre-existing political ideologies to change political beliefs. This is because ideology may, if inconsistent with the policy position implicitly supported by the narrative, lead to reduced narrative engagement (Slater et al., 2006). Thus, in the context of potentially controversial public health messages, political ideologies and beliefs may be an important moderator of narrative effects on intended outcomes.

For example, post-hoc analyses of a TV storyline on *Royal Pains* (USA Network) featuring a trans individual undergoing transition from male to female revealed a significant interaction between political ideology and narrative exposure, such that the attitudes of more

conservative viewers became increasingly positive as they saw more media portrayals of transgender individuals (Gillig, Rosenthal, Murphy, & Folb, 2018). Another study examined narrative exposure and attitudes towards controversial public policy issues, specifically the death penalty and gay marriage (Slater et al., 2006). They reported storylines found in television dramas (an episode from *Law and Order:* SVU and a short feature from a Home Box Office series, "*If These Walls Could Talk II"*) shifted attitudes on death penalty, but not issues of gay marriage (Slater et al., 2006). Subsequently, investigators reported a significant interaction between political ideology and narrative exposure to examine whether the relationship between degree of liberalism/conservatism and policy support would be weaker for viewers versus non-viewers, such that narrative exposure suppressed the relationship between prior ideology and death penalty support (Slater et al., 2006).

Issues of national security and religiosity are also closely related to maintaining public health, but can be politically controversial. Igartua and Barrios conducted an experimental research study analyzing the attitudinal impact of the controversial Spanish film *Camino* (2008), a melodrama inspired by a real event of a 14-year old girl who died from an illness and undergoes beatification, depicting a critical message of Opus Dei and religion (Igartua & Barrios, 2012). Results revealed that movie exposure induced negative opinions toward Opus Dei and religion, but was moderated by political ideology, such that they observed a greater impact on viewers ideologically most removed from the message cultivated by the film (Igartua & Barrios, 2012).

In another study, Lenart and McGraw analyzed the impact of the television docudrama miniseries *Amerika* (1987), which portrayed life in the U.S. Midwest 10 years after a Soviet takeover of the country, on attitudes towards Communism and political support for military

policy (Lenart & McGraw, 1989). While findings from their panel study suggested that those who watched *Amerika* became less tolerant to Communism and more prone to support U.S. military strength, viewers' political ideology did not moderate the effects of direct exposure to the docudrama (Lenart & McGraw, 1989). Thus, the moderating role of political ideologies and beliefs on narrative effects has proven to be complex and may vary depending on the presentation of the narrative as film, docudrama, or fictional drama.

While research interest in the relationship between entertainment and politics (Delli Carpini, 2001; Jones, 2005; Jones, 2006; Tenenboim-Weinblatt, 2009; Van Zoonen, 2005), and entertainment and health (Marcus et al., 2010; Moyer-Gusé et al., 2011; Moyer-Gusé & Nabi, 2011; Valente et al., 2007) have independently grown, little to no research has examined the impact of television fictional narratives that depict issues at this cross-section, such as those related to disasters, active shootings, or nuclear risk, which are potentially controversial, but also comprise important issues of public health. Communicating these health topics should consider how political ideologies and beliefs might moderate narrative exposure on viewers' knowledge, attitudes, and behaviors.

Research thus far has typically adjusted for political ideology as a covariate or a moderator represented by a single variable, however political ideologies and beliefs are multi-dimensional constructs (Jost, Federico, & Napier, 2009). Rather than representing political ideologies as a single left-right dimension, this area of research could benefit from a more person-centered approach utilizing more modern methods, such as latent profile analysis or latent class analysis, which can create profiles of viewers based on their political ideologies and beliefs. As entertainment narratives continues to gain popularity in providing opportunities to promote awareness of political and social issues, research evaluating such initiatives should consider how

the effects of televised narratives may differ across subgroups of viewers with different political ideologies and orientations.

C2. Mechanisms of Narrative Persuasion

The majority of studies on narrative persuasion have used normative messages (Green & Brock, 2000), such as healthy eating (Valente et al., 2007) or organ donation (Morgan, Movius, & Cody, 2009). However, it remains worth investigating if persuading people with entertainment narratives depicting more controversial health topics works in the same way. As suggested by previous studies (Igartua & Barrios, 2012; Slater et al., 2006), a natural step after examining whether political ideologies and beliefs moderate the effect of narrative exposure on viewers' knowledge, attitudes, and behaviors is to examine mechanisms of narrative persuasion explaining how the narrative might overcome pre-existing political ideologies. Attitudes towards foreign policy and issues of nuclear risk and security are entrenched in political ideologies and fundamental beliefs (Destler, 1984; Hurwitz & Peffley, 1987; Ripberger et al., 2011). Thus, narrative exposure and immersion must override political ideology to change political beliefs, particularly if inconsistent with the policy position implicit in the narrative (Slater et al., 2006). In this section, I draw from literature in both public health and communication to discuss empirical research that support the mechanisms believed to be responsible for narrative persuasion, specifically through narrative engagement, perceived realism, and emotion.

Narrative engagement

The cognitive processes for more subtle forms of persuasion, such as entertainment media and fictional narratives, may differ from those involved in more overt forms of persuasion. Narrative engagement (Busselle & Bilandzic, 2008), transportation (Green & Brock, 2002), and flow (Csikszentmihalyi, 1990) are all related concepts that attempt to describe one's immersion

in the story world through mental processes involving attention, imagery, and emotion (Green & Brock, 2000). Through this process of transportation, the viewer is engaged in imaginative imagery, becomes emotionally attached to the characters and the story world, and loses awareness of the real world. Thus, greater immersion in the story makes viewers less aware of real-world facts that contradict assertions made in the narrative, allowing viewers to be open to new perspectives and ideas (Gierzynski, 2018).

A complementary process when following a narrative is character identification, where audience members not only become absorbed in the plot, but adopt the identity and perspective of the characters (Cohen, 2001). Busselle and Bilandzic hypothesize that transportation and identification work together to produce the broader construct they define as narrative engagement (Busselle & Bilandzic, 2008). Research has repeatedly demonstrated the power of narrative engagement to internalize story messages, adopt values, evoke belief change, and even accept false facts (Gierzynski, 2018). Moreover, most people are unconscious of these cognitive processes taking place, making fictional narratives a powerful platform for learning politically relevant views (Gierzynski, 2018).

The empirical evidence for the importance of narrative engagement for persuasion has been consistent and growing. Fictional narratives aimed to promote health messages, in particular, have repeatedly found transportation to be a significant mediator of narrative exposure on viewer knowledge, attitudes, and behaviors. These include audience reception of film and television storylines on lymphoma on *Desperate Housewives* (Murphy, Frank, Moran, & Patnoe-Woodley, 2011), teen pregnancy and safe sex intention on *The OC* (Moyer-Gusé, 2010), attitudes towards physicians of racial/ethnic and gender minorities on *ER* (Jain, 2017), and

stigmatizing attitudes towards schizophrenia in response to mental health portrayals in a German movie (Röhm, Hastall, & Ritterfeld, 2017).

Similarly, in the context of political communication, experimental studies have reinforced narrative engagement to be an important mediator. For example, using structural equation modeling, no direct effects of the fictional political entertainment film *Man of the Year* depicting voter fraud on viewers' political discussion behavior were found. However, an indirect effect through narrative engagement was significant (Landreville & LaMarre, 2011), suggesting narrative engagement to be an essential mediator through which political entertainment viewing exerts its influence. In another experimental study, political ideology, or the degree of liberalism/conservatism, was directly related to transportation and identification, which in turn were related to support for gay marriage and partnership rights (Slater et al., 2006).

Television narratives have also been used to promote social and political issues. For example, an episode of the primetime drama *Law & Order: SVU* ("Witness") depicted the ongoing conflict in the Democratic Republic of the Congo fueled by the control of "conflict minerals" (used to manufacture products such as cell phones and computers). Using post-only data from a survey of 173 viewers, regression analyses demonstrated a positive relationship between storyline exposure and transportation (Murphy et al., 2012). When both transportation and character identification were entered into a single regression, character identification was the stronger predictor of viewer knowledge of conflict minerals, sexual violence, and immigration/ asylum issues and behavioral intent (i.e., discussing global health), while transportation was the stronger predictor of attitudes (i.e., support for aid) (Murphy et al., 2012). Narratives have also been used to promote scientific literacy and audience engagement in scientific processes to improve the public's trust in research and science. For example, an episode called

"Auskreuzung" ("Cross-Pollination") from the German drama series *Tatort* (Crime Scene) on the topic of genetic engineering was produced with scientific support (Weinmann, Löb, Mattheiß, & Vorderer, 2013). When regarded individually using regression analyses, viewers' degrees of transportation, identification, and enjoyment positively and significantly predicted their perceived knowledge, but transportation alone was a significant predictor of viewers' perceived knowledge when all three variables were considered together using path analysis (Weinmann et al., 2013).

Fictional entertainment narratives can also serve to influence public attitudes towards more controversial issues and policies. For example, the fourth season of the Hulu original program *East Los High* promoted prosocial messages concerning abortion and immigration policy. The level of character identification was a significant or marginally significant predictor for change in attitudes toward abortion and attitudes toward immigration policy, with effects of character identification enhanced by second screening (Walter, Murphy, & Rosenthal, 2018).

Attitudes towards LGBTQ groups and related policies have also been a major area of research in empirical studies examining how entertainment narratives can influence public attitudes towards social and political issues. For example, among viewers of a *Royal Pains* storyline depicting a transgender teen experiencing health complications as she transitions from male to female, the relationships between political ideology and attitudes toward transgender people and policies were mediated by character identification, although transportation did not play a significant role (Gillig et al., 2018). *The Fosters* is another progressive show that intentionally addressed attitudes towards LGBTQ groups and issues. In an experimental setting using selected scenes from *The Fosters*, a study examined how heterosexual and LGBTQ adolescents randomized into narrative versus non-narrative groups (the narrative group watching

the progression of a relationship culminating in the youngest televised same-sex kiss between two young male characters) influenced viewer attitudes (Gillig & Murphy, 2016). Gender identity and sexual orientation were reported to influence character identification, which was associated with a change in attitudes towards LGBTQ groups and issues (Gillig & Murphy, 2016).

Another study used a qualitative approach to examine mechanisms of narrative engagement. After the devastating 2007–2008 postelection violence in Kenya, a television program called *The Team* was developed to promote reconciliation and national unity among Kenyans through the metaphor of Kenya as a soccer team (Tully & Ekdale, 2014). Viewers' comments and posts on the show's official Facebook page were analyzed to gauge viewers' identification with and reaction to specific characters. They reported unanticipated viewer opposition to the death of a character the producers intended to be negative but viewers were sympathetic towards (Tully & Ekdale, 2014), demonstrating the potential for qualitative approaches to provide insight into viewer reception of characters and identify areas of the narrative where the intended message is not communicated clearly.

Perceived realism

Narrative engagement or transportation is related to the concept of perceived realism of a narrative, suggesting perceived realism may also be an indicator of engagement (Busselle & Bilandzic, 2008; Green, 2004). Perceived realism can be defined as the viewer's judgment of the degree to which the narrative world is reflective of the real world (Gerbner & Gross, 1976). This definition has since evolved to consider authenticity and coherence within the narrative (Busselle & Bilandzic, 2008; Shapiro, Peña-Herborn, & Hancock, 2006) to be as important as perceived correspondence with external reality. Media effects research suggests that perceived realism may

be a narrative characteristic activating emotional involvement (Busselle & Bilandzic, 2008; Green, 2004; Larkey & Hecht, 2010), identification (Larkey & Hecht, 2010; Livingstone, 1990; Potter, 1986; Zillmann, 1980), and message evaluation (Cho & Boster, 2008). Through these cognitive processes, a narrative can be perceived differently in realism by individual viewers, leading to differential effects (Bahk, 2001b).

Although perceived realism has been identified as an important persuasive factor in narrative processing (Bilandzic & Busselle, 2011; Morgan et al., 2009; Ritterfeld & Seung, 2006; Taylor, 2005), it has received relatively little attention in the empirical literature (Guttman, Gesser-Edelsburg, & Israelashvili, 2008). When studied in the context of narratives depicting public health issues, perceived realism is often examined as a predictor of persuasive outcomes. Two studies have explored how perceived realism of an entertainment narrative reduced mental health stigma. In an experimental setting, an edited version of the movie *Prozac Nation* displaying representations and stereotypes of depression was presented as either fiction or non-fiction (operationalizing perceived realism) to examine differences in mental health stigma, although no direct effects on perceived stigma were found (Caputo & Rouner, 2011).

In another study, Ritterfield et al. (2006) also used an experimental approach to examine edited versions of the Australian film *Angel Baby* depicting schizophrenia, reporting that perceived reality was positively associated with the film's entertainment value and educational value, which both mediated realism's effect on stigma reduction (Ritterfeld & Seung, 2006). One study utilized textual analysis of a multi-episode storyline about a central character being diagnosed and treated for breast cancer on *Sex and the City* to determine the narrative's realism regarding its portrayal of the breast cancer experience (Gray, 2007). The study reported the breast cancer experience was only partially accurate in depicting the risk factors for breast

cancer, but was realistic regarding the medical treatment that the character undergoes, which has implications for viewers who turn to the media for health information (Gray, 2007).

Likewise, research on narratives that depict public policy or socio-political issues, typically examine perceived realism as a predictor of persuasive outcomes. For instance, studies have compared the effects of documentaries versus historical reenactment films, hypothesizing that viewers would perceive documentaries to be more realistic, and hence encourage more narrative engagement compared to reenactment films (Pouliot & Cowen, 2007). However, these studies reported mixed findings. No significant differences were found between documentary and historical reenactment films depicting the Rwandan genocide in terms of the democratic outcome variables, issue interest and learning (LaMarre & Landreville, 2009). The documentary, although associated with greater perceived realism, was also not associated with increased emotional reactions or memory of film information compared to a fiction film depicting Gandhi's struggle for India's independence (Pouliot & Cowen, 2007). Another study examined the "CSI-effect," or the phenomenon that CSI-type shows have seriously affected the criminal justice system and the role of forensic evidence in verdicts, reporting that those who perceived crime television as more realistic tended to have more positive attitudes toward DNA evidence (Maeder & Corbett, 2015).

While these findings suggest that realism is an important component of narrative processing, what has been lacking in the prior inquiry is the consideration of perceived realism as a mediating variable related to narrative persuasion, particularly narratives featuring socio-political issues. Only one study examined perceived realism as a mediator of political ideology on support for gay marriage and partnership rights with respect to the portrayal of gay marriage in a short feature from a Home Box Office series *If These Walls Could Talk II*. Although

ideology did not have a direct effect on attitudes for gay marriage and partnership rights, political ideology significantly predicted perceived realism, which was predictive of policy support (Slater et al., 2006). However, evidence about the mediating role of realism in media effects has been documented in areas of research such as violence, risk, and alcohol abuse (Atkin, 1983; Bahk, 2001a, 2001b; Bahk & Neuwirth, 2000; Feshbach, 1972; Potter, 1986; Slater & Elliott, 1982). For instance, in an experimental study using selected scenes from the movie *A Star is Born* to depict a negative portrayal of alcohol drinking, perceived realism was a significant mediator, such that the greater the realism perceived about the presentation, the less favorable the attitudes toward alcohol drinking and the less strong the behavioral intention to drink alcohol (Bahk, 2001b).

Emotion

Emotions are organized psychophysiological reactions to ongoing relationships with the environmental or external stimuli (Lazarus, 2000). Theories of narrative influence suggest that viewers who are more emotionally invested will be more likely to be transported into the story and identify with characters, promoting cultivation effects and increasing influence by the messages delivered (Busselle & Bilandzic, 2008; Green & Brock, 2000; Hoffman, Rosenthal, Colditz, McGarry, & Primack, 2018; Moyer-Gusé, 2008; Moyer-Gusé, Jain, & Chung, 2012). In the context of television fictional narratives specifically, emotional involvement can increase attention to story elements, generate imagery, and increase cognitive processes (Morgan et al., 2009).

Narratives depicting public health issues, such as lymphoma and organ donation, have highlighted the importance of emotional importance in narrative persuasion. A study examining the impact of organ donation storylines from 4 U.S. television dramas (*CSI: NY, Numb3rs,*

House, and *Grey's Anatomy*) reported that viewers were more likely to become an organ donor if they were emotionally involved in the narrative (Morgan et al., 2009). Similarly, a study examining a seven-episode cancer storyline in the popular primetime program, *Desperate Housewives,* found that the viewers' emotional response to the lymphoma storyline predicted information seeking and talking to others about the cancer storyline after watching the show (Murphy et al., 2011). Interestingly, a closer examination of emotional response revealed that positive, but not negative, emotion predicted talking about lymphoma or cancer more generally to others (Murphy et al., 2011), suggesting it may be important to distinguish between positive and negative affect (Tal-Or & Cohen, 2010) or assess discrete emotions, such as happiness, anger, fear, and sadness (Ekman, 1992; Nabi, 2002a; Nabi, 2002b).

Similarly, narratives depicting more controversial issues relevant to public health, such as attitudes towards LGBTQ groups and policies, also found emotional responses to be a significant mediator of individual political ideologies and persuasive outcomes. Gillig et al.'s study examining the *Royal Pains* storyline depicting the complications of a transgender teen, Anna, as she transitions from male to female, assessed the effects of the emotions of hope and disgust, two contrasting emotions that may arise towards a character transitioning from male to female, something often viewed as controversial (Gillig et al., 2018). The study found hope and disgust each mediated viewers' attitudes toward transgender people, with hope being more associated with more supportive attitudes and disgust with more negative attitudes (Gillig et al., 2018).

For another LGBTQ related storyline in *The Fosters* depicting the evolution of a same-sex relationship, Gillig observed that gender identity/sexual orientation affected their attitudes towards LGBTQ people and policies, such that viewers whose identity and/or orientation align with that of the characters experienced positive attitudes toward LGBTQ groups (Gillig &

Murphy, 2016). Likewise, emotional involvement, specifically the emotions of disgust and hope, with the story was shown to drive persuasion. However, emotional responses to the narrative diverged, such that LGBTQ viewers experienced hope, which subsequently bolstered their attitudes towards LGBTQ groups and policies, while triggering negative emotional responses, leading to negative attitudes of LGBTQ people and issues, among heterosexual/cisgender youth (Gillig & Murphy, 2016). Given the evidence supporting the mediating role of emotional responses in narrative persuasion mechanisms and the important distinction between positive and negative emotions, the extent to which emotion can help overcome pre-existing ideologies and beliefs when exposed to narratives depicting more controversial health messages is worth investigating.

C3. Social Media Monitoring

Studies of how television audiences use the internet to discuss favorite programs (Baym, 2000; Jenkins, 2006; Jenkins & Culture, 2006; Ross, 2011) have often focused on fan communities discussing particular programs and genres (Deller, 2011). In particular, social media platforms provide spaces for users to interact with one another and create, share, and exchange information and ideas (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011). Thus, analyzing the online discourse that occurs on social media to explore audience responses to entertainment narratives can be a useful addition to current approaches of measuring narrative impact. For example, Facebook has been used to assess audience engagement and identification with specific characters of an EE program called *The Team* that aired in Kenya after the 2007-2008 postelection violence to promote cooperation and national unity (Tully & Ekdale, 2014). Unanticipated viewer responses on Facebook revealed that social media allowed for less controlled discussions in which users questioned, challenged, or misinterpreted the producers'

intended messages (Tully & Ekdale, 2014). Another study analyzed posts in a Facebook group responding to an Australian documentary about vaccines and autism and reported that emotional appeals may override epidemiological evidence (Nicholson & Leask, 2012).

Other emerging technologies, such as Twitter, represent a novel platform for research on audience responses to television, although these approaches are currently underutilized in narrative impact studies. Twitter is a social media platform that allows users to send 140-character messages to one another (Sinnenberg et al., 2017). Twitter is considered an important new channel for public communication, particularly in the context of political communication (Bruns & Burgess, 2011; Christensen, 2011; Harlow & Harp, 2012; Larsson & Moe, 2012; Lotan, Graeff, Ananny, Gaffney, & Pearce, 2011; Small, 2011; Stieglitz & Dang-Xuan, 2013). With regards to television, over 24 million unique users tweeted more than 800 million tweets related to television in 2015 (Casey, 2016), highlighting the extensive data available on this platform as well as its potential to reveal organic viewers' responses without any prompt as they would be in a traditional survey or interview.

A number of opportunities emerge when using social media for narrative impact research. First, it is possible to track total Twitter activity surrounding a television broadcast using associated hashtags, particularly in real time (Harrington, Highfield, & Bruns, 2013). In addition, qualitative analysis of key themes of the online discussion provides important feedback about the program, which can be combined with conventional audience ratings and feedback tools in order to understand audiences in an increasingly converged media environment (Harrington et al., 2013; Simons, 2011). However, the extent to which tweets have been analyzed to measure audience engagement at the intersection of television shows and social and political messages has been limited despite evidence that politically relevant programs, such as political talk shows,

can stimulate public discourse on Twitter (Buschow, Schneider, & Ueberheide, 2014). Thus, such methods are still emerging and have yet to be a frequently used component of evaluating narrative impact.

One approach to evaluating audience engagement on Twitter can involve analyzing frequencies of tweets in response to a show. For example, the MTV show, *16 and Pregnant*, depicts the difficult reality of being a teen mother and childbearing was found to reduce the teen birth rate based on regional data (Kearney & Levine, 2015). To expand on the mechanisms facilitating these outcomes, the study collected Google Trends and Twitter data to measure changing levels of interest in birth control and abortion, as captured by online search and social media activity. Trends from time series analyses on the day and week that a new episode was released revealed large spikes in search activity and tweets, suggesting increased interest in contraceptive use and abortion, particularly in locations in which the show was more popular (Kearney & Levine, 2015). In this case, analyzing patterns in searches and tweets by teens regarding abortion and contraception in response to *16 and Pregnant* suggest these information seeking behaviors may have contributed to decisions around teen pregnancy that reduced the teen birth rate.

In addition to descriptive frequencies as an indicator of audience engagement, studies have also used media content analysis to examine the actual content of tweets. For example, one study accessed tweets in real time to analyze viewer reactions to the show *Code Black*, which follows health professionals in an under-resourced emergency room at a fictional Los Angeles hospital. Using a grounded approach, a qualitative analysis of 1,888 tweets generated live during the EST airing of the program to gage viewers' perception of the emergency perception of the emergency department and emergency department personnel, revealing several key themes

including motivation to pursue health sciences careers, engagement regarding medical accuracy, and respect for the nursing profession (Hoffman et al., 2018).

Other content analyses looked for tweets generated by specific groups, such as health professionals, or specific themes guided by theory to evaluate responses to the behaviors modelled in the show. For example, studies have used Bandura' Social Cognitive Theory to explain concern for television shows that depict characters who model negative behaviors, such as suicide. Given the potential impact of fictional portrayals of suicide on suicide contagion and ideation among youth, one study examined how mental health professionals may help young people critically evaluate the media using Twitter in response to the highly popular Netflix show, *13 Reasons Why*, which depicts teen suicide (Walker & Burns, 2019). A content analysis of 740 tweets about the show from health professionals and educators indicated the largest percentage of tweets was related to social learning, particularly about mental health outcomes that could occur from viewing the show, such as increased calls to suicide hotlines (Walker & Burns, 2019). These results shed light on the role of health professionals' comments on the show, and how this might affect viewers' attitudes and behaviors towards the show (Hu & Sundar, 2010).

Another study concerned about the consequences of suicide portrayals on television analyzed tweets during the week in which a fictional assisted suicide was broadcast on the British television soap opera *Coronation Street* (Scourfield et al., 2016). Although there was no evidence of an increase in tweets expressing possible suicidal intent, there was an increase in tweets containing the word suicide on the day the episode aired (Scourfield et al., 2016). Content analysis found the most common themes to involve information or support, followed by moral issues in relation to suicide, suggesting that Twitter may be used more as a reactive forum than as a medium for disclosing distress (Scourfield et al., 2016).

Lastly, in response to television shows, Twitter data can be used to assess how shows can catalyze social movements among online fan communities. For example, one study utilized theories of fan culture (Bacon-Smith, 1992; Jenkins, 2012) and anthropological methods to assess how fans engage with each other in the fan community on Twitter and Tumblr in reaction to representations of women-loving women (WLW) on television (Waggoner, 2018). Although visibility of LGBTQ groups on television has increased, there remain familiar television tropes, in particular the "bury your gays" trope, that reinforce the invisibility of these marginalized groups and have potentially harmful effects on LGBTQ persons seeking identification through characters (Waggoner, 2018). Tweets from fans were compared before and after a lesbian character's death on the CW network show *The 100* to examine their responses regarding the current television environment's treatment of WLW characters. Results showed that not only did fans voice their dislike of the lesbian trope, they rallied together to create campaigns to change LGBTQ representation on television and even created hashtags to cancel the show (Waggoner, 2018).

In sum, Twitter, along with other social media platforms, is a medium that allows for audience discussion, interaction, fandom and other social activity (Buschow et al., 2014), thus providing an opportunity to gage audience engagement and responses as a part of measuring narrative impact. However, entertainment narratives that attempt to promote more politically controversial health messages have yet to use content analysis of tweets to examine audience reception to the narrative and whether this online discourse aligns with the goals of the storyline.

D. Gaps in the Literature

Nuclear policies that can prevent the devastating effects of nuclear war and nuclear accidents can greatly benefit public health. Given research supporting the effects of media on

audience beliefs, attitudes, and behaviors as well as the success that entertainment narratives have found in addressing public health and socio-political issues, television storylines featuring nuclear policy provide a promising approach to educate the public about nuclear risk and promote public engagement in policies that can reduce nuclear risk.

Research on previous films featuring nuclear issues (*The Day After* and *Hiroshima-Nagasaki: 1945*) found mixed effects on viewers, but mainly focused on the destructive aftermath of the war and did not expand on factors leading up to the war, relevant nuclear policies, or propose any solutions (Fiske, 1986; Granberg & Faye, 1972). Thus, research studies have collectively voiced the inadequacy of such a storyline to instigate changes in attitudes and behaviors among viewers. Changing attitudes towards nuclear issues requires giving people a sense of political efficacy or hope through action (Fiske, 1986). For example, pairing fear-arousing communications with possible action solutions for people, may enhance a sense of efficacy (Fiske, 1986; Granberg & Faye, 1972).

Thus, a major limitation of prior studies that may explain mixed findings is due to the misalignment between survey questions and the actual content of the storyline. In contrast, the current study examines a television storyline that depicts a potentially fear-arousing "close call," where a nuclear missile attack against Russia would have been mistakenly launched, as well as a democratic solution that demonstrates how the public can engage in democratic processes to change nuclear policy, emphasizing political efficacy. This dramatic storyline then provides a unique opportunity to study the effectiveness of a television storyline aimed to address a political issue on persuasive outcomes that are more consistent with its presentation.

Not only is public engagement in nuclear issues an urgent issue for public health, but measuring narrative impact thus far has largely assumed that viewers are impacted in the same

way, meaning there is little consideration of differences linked to viewer characteristics. Moreover, the extent to which the current narrative persuasion theory and literature applies to more politicized health issues, such as those related to nuclear policy and nuclear security, is unclear. In response, the current study seeks to expand narrative persuasion research to better understand the role of viewer characteristics, particularly political ideologies and beliefs, as a factor moderating the impact of entertainment narratives depicting more controversial health issues. Subsequently, I test how narrative persuasion mechanisms can overcome viewers' pre-existing political ideologies and beliefs leading to changes in knowledge, attitudes, and behaviors. Lastly, considering viewers' use of social media provides a complementary approach to survey research to providing evidence for documenting and understanding narrative impact and whether people are engaging with the storyline in ways that reflect its intended messages.

CHAPTER 3. THEORETICAL AND CONCEPTUAL FRAMEWORKS

In this section I discuss the theoretical ideas that form the basis of the conceptual framework for this study, which explores the mechanisms through which a nuclear risk television storyline impacts viewers. In elaborating potential causal mechanisms that underlie if or why audience members shift perceptions after viewing the storyline studied, the framework I have developed also takes into account potential differences in political ideologies and beliefs between viewer subgroups. The conceptual model and hypotheses that drive this study are informed by important theoretical and conceptual frameworks that focus on narrative persuasion and behavior change.

First, I draw from Bandura's Social Cognitive Theory, with a focus on efficacy, which has typically been the foundation for entertainment narrative-based interventions. I then adopt Busselle and Bilandzic's model of narrative comprehension and engagement, which identifies perceived realism, narrative engagement, and emotion as key mediators between narrative exposure and knowledge, attitudes, and behaviors. While viewer characteristics are an essential component of Busselle and Bilandzic's model, it remains an underexplored area in the empirical research. I incorporate Ripberger's model for nuclear policy beliefs to explain how individual dispositions, particularly pre-existing political ideologies and beliefs, may manifest themselves in terms of political perspective and behavior, informing the identification of subgroups of viewers using latent profile analysis. Lastly, I present a conceptual model bringing these theories together in an integrative model that will be applied to examine the relationship between a political narrative and relevant outcomes and help facilitate understanding of how this relationship may differ across subgroups of viewers.

A. Social Cognitive Theory

Bandura's Social Cognitive Theory (SCT) explains psychosocial functioning in terms of triadic reciprocal causation, where personal factors, environmental factors, and human behavior exert influence upon each other (Bandura, 1986). Self-efficacy, or the belief in the ability to carry out a certain action, is considered to be the most important personal factor in behavior change (Glanz & Rimer, 2005) as it acknowledges that people are self-organizing, proactive, self-reflecting, and self-regulating, and are not simply products of their environment or inner forces (Bandura, 2001). Thus, when individuals have a sense of efficacy or personal agency, they can feel that they can exercise control over the desired behavior even when faced with obstacles (Glanz & Rimer, 2005).

Self-efficacy also operates within a broad network of socio-structural influences (Bandura 2001). A key aspect of social or environmental influences on behavior is observational learning or role modeling, where behaviors are acquired or modified by watching others (Bandura, 1977, 1986) in person or through mediated channels like television (Slater, 1999). Given these premises, Social Cognitive Theory has been fundamental to narrative persuasion, particularly efforts involving entertainment education (EE). This comes from a tradition of attributing the beginning of EE to Miguel Sábido, a Latin American artist and intellectual who developed a methodology articulating a theoretical and empirical research-based formula to create soap operas with media messages that initiate socially desirable attitudes and behaviors (Nariman, 1993). The likelihood the behavior will be imitated by the viewer increases when the viewer can identify with the characters, the behaviors are positively and visibly reinforced, and the behaviors are clearly modeled (Slater, 1999). In turn, self-efficacy is enhanced, and the likelihood of intentions turning to behavior may increase in two ways: (1) simply modeling and

encouraging behavioral trials and (2) providing explicit modeling of specific skills required to effectively carry out the behavior (Slater, 1999). Such modeling approaches have been implemented with particular success utilizing melodramas (Slater 1999), such as the Hulu original *East Los High* (Wang & Singhal, 2016).

While narrative persuasion studies typically examine outcomes related to story-consistent knowledge, attitudes, and behaviors, SCT identifies efficacy to also be a relevant outcome. In addition to its theoretical importance, efficacy will be added to the conceptual model as an additional persuasive outcome because efficacy is modeled by characters in the *Madam Secretary* storyline featured in this study. A critique of prior studies on films featuring nuclear issues, such as *The Day After*, was that the outcomes measured did not align with the storyline itself, perhaps explaining the precarious conclusion that the film was ineffective in changing public attitudes and engagement with nuclear policy.

In contrast, efficacy is particularly important for the nuclear storyline featured in *Madam Secretary* because a major goal of the storyline is to model the public coming together to initiate change in public policy through democratic processes, thus reinforcing that viewers do have the ability to enact policy change. The availability of variables in this dataset requires efficacy to be redefined as *nuclear efficacy* rather than self-efficacy. Perceptions of the political process of collective action as an effective means of change may be necessary before individuals will take anti-nuclear action (Lee Fox & Schofield, 1989; Milburn et al., 1986). Thus, nuclear efficacy, or the belief that nuclear war can be prevented, may be a better indicator compared to self-efficacy, or the extent to which one finds they have the ability (i.e., time and resources) of engaging in the action for this study.

This definition has been similarly adjusted in other studies examining the impact of films depicting nuclear issues on efficacy (Fox-Cardamone et al., 2000; Lee Fox & Schofield, 1989; McKenzie-Mohr, Dyal, & McLoughlin, 1992; Wolf et al., 1986). Because of the differences in the operationalization of efficacy, the studies present mixed evidence regarding significant changes in efficacy among viewers who watched films depicting nuclear issues like *The Day After*; however, given its prominence in the storyline itself as well as theoretical considerations, I argue that it is an outcome that is worth exploring in this study.

B. Model of Narrative Comprehension and Engagement

While the importance of Social Cognitive Theory (SCT) with regards to role modeling and demonstrating efficacy is evident, SCT alone cannot sufficiently explain the effects of entertainment narratives (Slater & Rouner, 2002). Given persuasion about specific issues is the main goal of health storylines, drawing from narrative persuasion theories can provide a more complex understanding of the mechanism through which role modeling exhibited in the narrative influences viewers' respective efficacy, knowledge, attitudes, and behaviors.

The nature of cognitive and emotional immersion that follows when individuals make sense of, and respond to, narratives is a central focus of narrative persuasion research (Csikszentmihalyi, 1990; Green & Brock, 2000; Igartua & Barrios, 2012). Several variations of models of narrative persuasion identify that the audience's phenomenological experience of a narrative plays a mediating role in its persuasive effects (De Graaf, Hoeken, Sanders, & Beentjes, 2009). While narrative persuasion theories were initially based on written narratives, more recently, these theories have accommodated audiovisual narratives, such as those present on film and television. One such model is Busselle and Bilandzic's model of narrative comprehension and engagement. This model posits that mental models provide a theoretical

framework explaining how audiences construct meaning from a narrative and the cognitive processes that audiences are engaged in while doing so (Busselle & Bilandzic, 2008, 2009).

The model of narrative comprehension and engagement acknowledges that audience members are active participants who construct their own mental models of meaning that represent a narrative's story world, characters, and situations when processing narratives (Busselle 2008). Audience members construct these mental models using: (1) information about the text and (2) pre-existing knowledge that individuals possess about life in general, the specific topic featured in the narrative, and the genre through their own personal experiences and other fictional or non-fictional mediated experiences. As the narrative moves forward and characters become more developed, viewers progressively construct these mental models. Viewers also engage the narrative through a "deictic shift," a cognitive process that transports viewers into the story world, so they can understand the plot and undertake character's perspectives (Busselle 2008, 2009).

In addition to accounting for how individuals construct meaning from narratives, the model also explains how individuals engage with the narrative to experience the flow-like sensation of transportation as well as identification with characters, and how they may disengage due to violations of realism. These phenomenological experiences make up a multifaceted construct called *narrative engagement* consisting of four dimensions: narrative understanding, attentional focus, narrative presence, and emotional engagement. Narrative understanding describes how viewers make sense of the narrative, and the extent to which recipients are able to grasp the characters' goals and actions and the events that unfold. Attentional focus describes viewers' focus on or distraction from the story plot and characters. Narrative presence entails the immersion into the story world that takes place due to comprehension processes and perspective

taking. This transition process involves losing awareness of the actual world, awareness of oneself, and awareness of the passage of time (Busselle & Bilandzic, 2009). Emotional engagement concerns emotions viewers have with respect to characters, specifically feeling the characters' emotions or feeling for them. While emotional engagement, as originally conceptualized by Busselle and Bilandzic, measures to what extent viewers are engaged with the characters, I expand on this concept in order to distinguish to what extent viewers are experiencing specific positive and negative emotions in response to the storyline.

Elements within the storyline may also interfere with narrative engagement, such as a plot flaw, a behavior that is inconsistent with a character's personality or motivations, or a portrayal that is inconsistent with real world knowledge (Busselle & Bilandzic, 2009). *Perceived realism* consists of judgements of a narrative's plausibility and coherence as well as the consistency between the narrative and the actual world (Busselle & Bilandzic, 2008). Violations of realism may result from an inconsistency between the mental models that represent the narrative, general knowledge structures, and incoming narrative information (Busselle & Bilandzic, 2008). Violations of realism thus prompt negative conditions, interfering with processing, and ultimately inhibiting narrative engagement (Busselle & Bilandzic, 2009). However, narrative experiences that are more engaging and perceived to be more real should result in greater enjoyment and changes in story-consistent belief, attitudes, and behaviors (Busselle & Bilandzic, 2008, 2009). For the current study, I will only focus on outcomes related to knowledge, attitude, and behaviors.

C. Model for Nuclear Weapons Retention Policy Beliefs

Milton Rokeach offers a useful description of how belief structures are organized. A belief system represents all of an individual's beliefs about the nature of physical and social

reality, which one uses to make sense of the signals and cues received from one's environment (Rokeach, 1968). An individual's belief system can be broken down into five levels arranged from central to peripheral in their importance to the individual: primitive beliefs (100% consensus), primitive beliefs (zero consensus), authority beliefs, derived beliefs, and inconsequential beliefs. These beliefs start developing early in life and change as the individual matures and interacts with others (Rokeach, 1968).

Ripberger's model for nuclear weapons retention policy beliefs, which adapts elements of Rokeach's belief systems ideas, similarly posits that there are different levels of beliefs on this topic that range from central or core beliefs to specific policy preferences. According to Ripberger, beliefs regarding nuclear weapons are structured by world views, experiences, and individual perceptions. This is backed by empirical evidence that people draw from a complex mix of values and heuristics to help them express policy preferences that are internally consistent and rational (Conover & Feldman, 1984; Hurwitz & Peffley, 1987; Page & Shapiro, 1983; Popkin & Popkin, 1994; Wildavsky, 1987).

Similarly, individuals form policy preferences on topics, such as nuclear security, that are consistent with their causal beliefs (Ripberger et al., 2011; Rokeach, 1968). Using a hierarchical structure, the belief system consists of three levels, all of which are influenced directly or indirectly by sociodemographic predispositions (Ripberger et al., 2011). At the base level, there are core beliefs, which consist of the fundamental set of beliefs or world views about how the world works and the nature of social reality (Ripberger et al., 2011). These beliefs are absolutely essential, serving as the individual's personal foundation in constructing a working understanding of the world. For example, core beliefs can include religious beliefs, cultural orientations, political ideology, and beliefs about international relations. These core beliefs

condition the second level, domain perceptions. Domain perceptions are defined as general orientations towards broad policy domains like nuclear security. Domain perceptions then condition policy preferences, or specific stances towards policy, such as retaining or abandoning nuclear weapons (Ripberger et al., 2011). In following the literature on belief systems, Ripberger posits that core beliefs constrain policy beliefs by way of domain perceptions (Ripberger et al., 2011). Causal relationships among different levels of beliefs may also be bidirectional and interact across groupings. For the current study, the sociodemographic predispositions and core beliefs from Ripberger's model will inform how I operationalize viewer characteristics that influence persuasive outcomes of nuclear efficacy, knowledge, attitudes, and behaviors.

D. Viewer Characteristics

Although producers may intend to portray a specific message in the narrative, it is possible that viewers may decode the message differently than intended given their own preexisting schemas and personal experiences. The viewer is thus an active interpreter in accordance to their prior knowledge/attention/personality, and demographics (Busselle & Bilandzic, 2009; Fishbein & Yzer, 2003; Green, 2004; van Laer et al., 2014). The viewer as active interpreter is a widely held concept from media and cultural studies, where it is argued that audiences can and do evaluate messages from the media differently based on their previously held value systems (Condit, 1989). In other words, audiences do not respond to texts as "undifferentiated, easily motivated masses" (Overpeck, 2012). However, empirical studies using narrative persuasion theories often assume that all viewers are impacted by storylines in the same way.

Although viewer characteristics are an essential component of narrative persuasion theories, its conceptualization varies widely across theories. Busselle and Bilandzic's model of

narrative comprehension and engagement recognizes viewer characteristics, specifically real-world knowledge and schemas, shape how viewers construct meaning from the narrative, influencing narrative engagement and subsequent persuasive outcomes. Given the overlap in the constructs of transportation and narrative engagement, the literature on Green and Brock's Transportation-Imagery Model (Green & Brock, 2002) and its variations, such as the Extended Transportation Imagery Model (van Laer et al., 2014), may provide insight about how to best conceptualize viewer characteristics that may account for differences in how the narrative impacts them. For example, viewer's familiarity or prior knowledge of the topic was a significant predictor of transportation into the story world (Green, 2004). In developing the Extended Transportation Imagery Model, Van Laer et al. conducted a metanalysis of extant research on narrative transportation, reporting that story-receiver characteristics, including familiarity, attention, transportability, age, education and sex, to be individual level characteristics that determine the intensity and effects of narrative transportation (van Laer et al., 2014). Overall, the concept of viewer characteristics is not well conceptualized in the literature and is often disregarded by studies that test various theories of narrative persuasion. Thus, the extent to which viewer characteristics may derive different persuasive outcomes has been underexplored in the narrative persuasion literature.

To explore these individual differences and fill this theoretical gap, I draw on the previously described models to inform viewer characteristics used to identify viewer subgroups using latent profile analysis. Given the political nature of the health message depicted in the narrative, I focus on political ideologies and core beliefs to operationalize viewer characteristics that influence persuasive outcomes of efficacy, knowledge, attitudes, and behaviors. Based on the availability of variables in the current dataset, latent viewer subgroups are characterized by

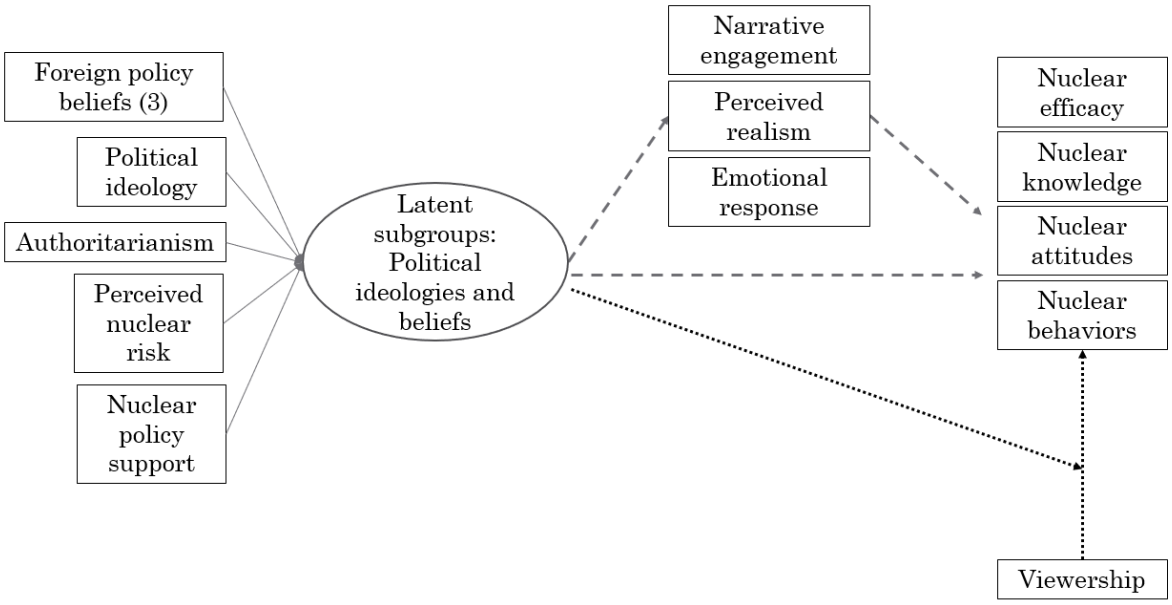
their political ideologies and beliefs, specifically foreign policy beliefs, political ideology, authoritarianism, perceived nuclear risk, and nuclear policy support. I subsequently examine how persuasive outcomes may differ across these latent viewer subgroups.

E. Conceptual Model

Different theories typically focus on different issues in the persuasion and behavior change process, and are therefore potentially complementary (Slater, 1999). This study seeks to conceptualize how to integrate different theories to explain narrative effects on knowledge, attitude, and behavior outcomes and how these mechanisms may differ across different subgroups of viewers. Although entertainment narratives have traditionally depended on Bandura's Social Cognitive Theory (SCT) to explain how observational modeling through storyline characters can instigate behavior change. SCT by itself is insufficient in explaining the specific cognitive processes or the phenomenological experience of being immersed in the story world that allow these behavior changes to occur. I draw from Busselle and Bilandzic's model of narrative comprehension and engagement to describe the processes of making meaning of the narrative and involvement with the narrative. Viewer characteristics have also been underexplored despite it being an essential component of many narrative persuasion theories. I focus on viewers' political ideologies and beliefs, in particularly, because more politically controversial health messages need to overcome pre-existing political ideologies to observe change in political preference and behavior. Ripberger's model of nuclear weapons retention policy beliefs gives insight into how individuals formulate their nuclear policy preferences. Based on this combination of theoretical frameworks and conceptual models, I developed the following conceptual model to motivate the proposed research study.

Figure 1 presents my dissertation's conceptual model. The focal relationship is storyline exposure (viewership) and story-consistent persuasive outcomes (nuclear efficacy, knowledge, attitudes, and behaviors). I then identify viewer subgroups based on political ideologies and beliefs using latent profile analysis and examine how the focal relationship may differ across these viewer subgroups (dotted). Subsequently, I take a closer look at viewers of the episode and examine how latent viewer subgroups (derived from their political ideologies and beliefs) influence subsequent persuasive outcomes, and how narrative engagement, perceived realism, and emotional response mediate this relationship (dashed). The qualitative portion of this dissertation examines how Twitter users discuss the storyline by analyzing how the online discourse on Twitter reflects these mechanisms of narrative impact.

Figure 1. Conceptual Model



Storyline Impact Dataset

Aim 1. To examine whether exposure to a televised storyline featuring nuclear issues influences related knowledge, attitudes and behaviors.

Hypothesis 1. Storyline exposure will be associated with a higher increase in knowledge, more anti-nuclear attitudes, and more politically engaging behaviors.

1a. To identify latent subgroups of *Madam Secretary* viewers based on their political ideologies and core beliefs.

Hypothesis 1a. A model with more than 1 latent class will fit the data better than a model with only 1 class, suggesting there is heterogeneity among *Madam Secretary* viewers.

1b. To examine whether exposure to a televised storyline featuring nuclear issues on related knowledge, attitudes, and behaviors differs across viewer subgroups characterized by their political ideologies and core beliefs.

Hypothesis 1b. Political ideologies and beliefs significantly moderate the association between storyline exposure and nuclear knowledge, attitudes, and behaviors.

Aim 2. To examine how narrative persuasion mechanisms that viewers of the episode experience mediate nuclear knowledge, attitudes, and behaviors linked to a televised storyline featuring nuclear issues.

2a. To determine whether narrative engagement mediates the relationship between political ideologies and beliefs and nuclear knowledge, attitudes, and behavior among viewers of the episode.

Hypothesis 2a. The relationship between political ideologies and beliefs and nuclear knowledge, attitudes, and behavior among viewers of the episode will be mediated by narrative engagement.

2b. To determine whether perceived realism mediates the relationship between viewer characteristics and related knowledge, attitudes, and behavior among viewers of the episode.

Hypothesis 2b. The relationship between political ideologies and beliefs and nuclear knowledge, attitudes, and behavior among viewers of the episode will be mediated by perceived realism.

2c. To determine whether emotional responses mediates the relationship between viewer characteristics and related knowledge, attitudes, and behavior among viewers of the episode.

Hypothesis 2c. The relationship between political ideologies and beliefs and nuclear knowledge, attitudes, and behavior among viewers of the episode will be mediated by emotional response.

Social Media Dataset

Aim 3. To explore the qualitative content of tweets related to *Madam Secretary* during the week that a televised storyline featuring nuclear issues aired.

Hypothesis 3. Tweets will demonstrate narrative engagement in the nuclear storyline.

CHAPTER 4. METHODS

Using methods, measures and theoretical perspectives developed in the fields of narrative persuasion, research for this dissertation follows a mixed-methods approach to examine the impact of a single episode storyline featured on the CBS show *Madam Secretary* depicting the aftermath of a false nuclear attack. Quantitative methods are based on analyses of data from a secondary dataset measuring storyline impact derived from a pre/post viewer survey, addressing Aims 1 and 2. Qualitative methods for this dissertation use social media data collected from Twitter to address Aim 3. Analysis of the storyline impact dataset occurred prior to the media content analysis of tweets, but the interpretation of the survey findings was contextualized within the results from the media content analysis.

A. Storyline Impact Dataset

The survey dataset for the quantitative analysis was obtained from a study conducted by Hollywood, Health & Society, which measured the impact on viewers of a *Madam Secretary* storyline depicting nuclear vulnerabilities. Hollywood, Health & Society (HHS) is a program of the USC Annenberg Norman Lear Center that provides entertainment industry professionals with accurate and timely information for storylines on entertainment shows on health, safety and national security. HHS also works to evaluate the impact of the storylines that are created through these collaborations.

The survey used for this study collected a range of indicators from audience members that include characteristics, viewership, exposure to the storyline, and their knowledge, beliefs and attitudes about nuclear policy and hair trigger alerts. For this analysis the focal relationship examined is the association between viewership, or storyline exposure, and nuclear efficacy (the

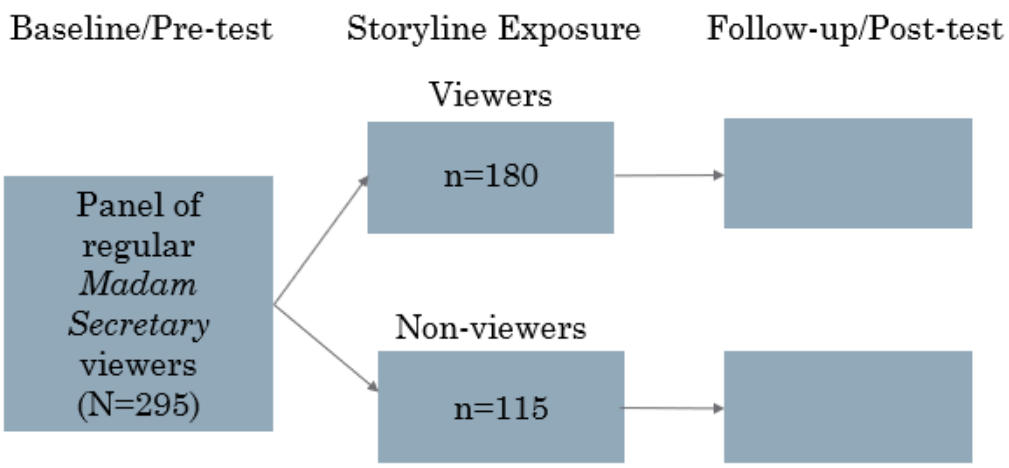
belief that nuclear war can be prevented), as well as nuclear knowledge, attitudes, and behaviors. Latent profile analysis was used to identify latent viewer subgroups derived from viewers' political ideologies and beliefs in order to examine how the focal relationship may vary across different viewer subgroups.

Given the political nature of the health messages depicted in the storyline, the narrative must overcome or be perceived as more persuasive than pre-existing political ideologies and beliefs. Following analyses looking at storyline impact between those who saw or did not see the episode, I also narrowed in on only those who watched the episode with the nuclear risk storyline to examine how narrative persuasion mechanisms, specifically through the potential mediators—narrative engagement, perceived realism, and emotional response, might attenuate the relationship between viewers' political ideologies and beliefs (represented by latent viewer subgroups) and their effects on efficacy, knowledge, attitude, and behavior outcomes.

A1. Data Collection for Storyline Impact Dataset

Study recruitment occurred through Qualtrics Panels, a third-party aggregator of market research survey panels. Although viewers were not representative of the general population, the goal was to recruit audience members who regularly viewed the show and were familiar with the storylines and characters. Incentives were provided for participants. The specific type of compensation depended on the panel to which the individual was recruited to, but included compensation in the form of cash, airline miles, gift cards, redeemable points, sweepstakes entrance, or vouchers.

Figure 2. Storyline impact dataset research design



Baseline recruitment occurred two days (May 16-18) before the airing of the finale episode on May 20, 2018. Recruitment for follow-up occurred for a week (May 22-29) after the finale episode aired. Only individuals ages 18 or older and living in the U.S. were included in the final sample. To be included in the final sample, participants were required to be regular viewers of the show, defined as watching most or all episodes, but were not required to have seen the finale episode live. Participants who were categorized as viewers of the episode were also required to correctly answer multiple choice screening questions to ensure they had seen and paid attention to the target episode "Nightwatch." A total of 2170 individuals accessed the survey, but 740 met the screening criteria and completed the baseline survey.

A total of 295 participants completed both surveys, of which 180 had seen the finale by the time of the post-test survey ('viewers'), and 115 had not ('non-viewers'). To ensure that viewers were comparable to non-viewers, participants in the final sample were required to indicate a high likelihood of watching the finale within a month. For ease of interpretation, the

two samples will be referred to as viewers and non-viewers of the *Madam Secretary* episode, although all participants were regular viewers of the show. There were no significant differences in gender, education, income, and political ideology between those who completed only the baseline survey and those who completed both baseline and follow-up surveys. However, participants who only completed the baseline survey were significantly younger (mean=46.65, SD=13.55) than those who completed both baseline and follow-up surveys (mean=51.61, SD=11.84) ($p<0.001$).

The baseline/pre-test panel survey consisted of 29 items, including television viewing behaviors, demographics, and a series of questions regarding knowledge, attitudes, and political engagement behaviors related to nuclear issues to assess outcomes at baseline. The same items assessing knowledge, attitude, and political engagement behaviors were asked in the follow-up/post-test panel survey to compare outcomes. It also included additional questions, including 9 items asking about exposure and sensitization to nuclear issues and information seeking behaviors. If participants reported to have watched the finale episode at the time of follow-up, they were asked 11 additional questions regarding narrative engagement, character identification, uses and gratifications, emotion, entertainment value of the finale, and viewing behaviors while watching the episode (see Appendix A and B for pre and post-test panel surveys). The study underwent human subjects review by the University of Southern California's Institutional Review Board.

A2. Measures in Storyline Impact Dataset

Only the survey measures (see Appendix C) that pertain to the analyses to be conducted for this dissertation will be presented here. Viewership status categorizes whether participants watched the finale episode with the nuclear storyline at the time of follow-up. Latent viewer

subgroups based on individual political ideologies and beliefs consisted of 7 indicator variables assessing foreign policy beliefs, political ideology, authoritarianism, perceived unclear risk, and nuclear policy beliefs. Nuclear efficacy, knowledge, attitude, and behavioral intention outcomes were assessed. To explore mechanisms of narrative persuasion, narrative engagement, perceived realism, and emotional response will represent mediators of interest. These measures are defined below.

Viewership

Viewership status categorizes whether participants watched the finale episode with the nuclear storyline at the time of follow-up (Figure 2). Participants were coded 1 for "viewers" and 0 for "non-viewers."

Socio-demographics

Gender was categorized as male and female. Race/ethnicity was originally assessed as a categorical variable (e.g., Non-Hispanic White, Latino/a, Black), and participants were able to select as many categories as applied to them, including Other, which allowed specification of any race/ethnicity not listed. Race/ethnicity was collapsed into White and non-White due to small counts of minority racial/ethnic groups. Educational level was collected from a scale of 1 (did not finish high school) to 7 (postgraduate or professional degree), but collapsed into 4 categories: less than high school, some college or associate's degree, bachelor's degree, and some postgraduate or postgraduate/professional degree. Political party categories included Democrat, Republican, Independent, and Other/No party preference. Exposure to nuclear issues was represented by a single item asking respondents if in the last week they had seen or heard any stories about issues related to nuclear weapons/threat from a range of sources. Participants were able to check all that applied among the following choices: feature films, documentary films,

entertainment TV, news, social media, political leaders, friends or family, or other. Responses to these items were summed into a score to represent exposure to nuclear issues.

Nuclear Efficacy

Nuclear efficacy was assessed using 2 items asking respondents to rate on a 7-point Likert scale the extent to which they felt the risk of (a) nuclear attack on the U.S. and (b) nuclear accident could be effectively limited or minimized. The two items were averaged to get an overall efficacy score at baseline and at follow-up, with a higher score indicating greater efficacy (see Appendix C).

Nuclear Knowledge

Two items assessed viewers' nuclear knowledge. The first item asked respondents to correctly identify what the term "hair trigger alert" refers to, with the correct answer being "A U.S. military policy that maintains nuclear weapons in ready to launch status." The second knowledge item asked respondents if it was possible to turn a missile around or change the trajectory once it has been launched, with the correct answer being "No." These items were respectively recoded as correct or not correct, and an overall knowledge score was created based on the number of items the respondent got correct (see Appendix C).

Nuclear Attitudes

To assess attitudes towards nuclear policy, respondents were asked to rate on a 7-point Likert scale the extent to which they support four U.S. foreign policies. Factor analysis revealed only 2 items (hair trigger alert and reduction of nuclear weapons) to load on a single factor. The other 2 items were removed to increase reliability and because they were less relevant to the nuclear risk storyline compared to the hair trigger alert and reduction of nuclear weapons items.

Thus, the overall attitude score was created by averaging the 2 items, with a higher attitude score reflecting more anti-nuclear attitudes (see Appendix C).

Nuclear Behavioral Intention

Nuclear activism was assessed with a single item asking respondents to rate on a 7-point Likert scale how likely they were to engage in offline activism or advocacy on reducing nuclear risks (i.e., donating funds, protesting), with a higher score indicating greater likelihood. In addition to the single item on nuclear activism, an online political engagement score and offline political engagement score served as behavioral outcomes (see Appendix C).

An online political engagement score was created based on 7 items, which asked respondents to report on a 7-point Likert scale the likelihood of engaging in online activities, such as sharing political content online or on social media or signing an online petition. Due to the high reliability of these items, a single score was used to represent online political engagement (see Appendix C). An offline political engagement score was created based on 12 items, which asked respondents to report on a 7-point Likert scale the likelihood of engaging in offline activities, such as signing a petition, discussing politics with family, or participating in a political rally. These items were averaged to obtain an offline political engagement score, with a higher score reflecting higher likelihood of offline political engagement. Due to the high reliability of these items, a single score was used to represent offline political engagement (see Appendix C).

Political ideologies and core beliefs

Seven items measuring foreign policy beliefs, political ideology, authoritarianism, and attitudes towards nuclear weapons and nuclear policies were used to represent viewers' political ideologies and core beliefs (see Appendix C). Three items measured foreign policy beliefs asking

participants about their orientations towards U.S. foreign intervention on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Political ideology was assessed by asking participants to rate on a 7-point Likert scale ranging from 1 (very conservative) to 7 (very liberal) how they would identify on (a) social issues and (b) fiscal and economic issues. Responses to these two items were averaged to create an overall measure of political ideology with higher scores indicating more liberal ideologies.

Authoritarianism was measured using a validated 4-item scale (Feldman & Stenner, 1997), with each item scored as either 1 (non-authoritarian) or 2 (authoritarian). Responses to these 4 items were averaged as an overall measure of authoritarianism.

Perceived nuclear risk was assessed using 12 items asking respondents to rate on a 7-point Likert scale to what extent they agreed with statements, such as "nuclear weapons are morally wrong" and "nuclear weapons keep America safe" (see Appendix C). Responses to these 12 items were averaged to create an overall measure of perceived nuclear risk with higher scores indicating higher perceived risk of nuclear weapons. Nuclear policy support was assessed using 12 items asking respondents to rate on a 7-point Likert scale to what extent they opposed or supported nuclear policies, such as no first use (U.S. cannot initiate a nuclear strike) and a global ban on nuclear weapons (see Table 1). The scale was created by averaging the responses to the items that participants had a response to (excluding items where they responded "I don't know enough to say"), with a greater score indicating stronger support for anti-nuclear policies. Some participants (n=10) reported "I don't know enough to say" for all 12 items, and were treated as missing.

Narrative engagement

Busselle and Bilandzic's scale for narrative engagement (Busselle & Bilandzic, 2009)

was adapted to measure narrative engagement. The scale consisted of 11 items, and derived a Cronbach's alpha of 0.644. Respondents were asked to respond to each item on a 7-point Likert scale, with higher scores indicating stronger agreement. Items 1 through 6 were reverse coded. One items (item 7) was excluded due to poor reliability. After the exclusion of this item, Cronbach's alpha increased to 0.713. A narrative engagement measure was created by taking the average across the 10 item responses, with a higher score indicating greater narrative engagement.

Perceived realism

Perceived realism was assessed using a single item. Respondents were asked to rate on a 7-point Likert scale the extent to which they believed the events portrayed in this episode were realistic, with higher scores indicating greater perceived realism.

Emotional response

Respondents were asked to report to what extent they felt 8 emotions (angry, hopeful, disgusted, empathetic, sad, afraid, surprised, and happy) immediately after finishing watching the episode on a 7-point Likert scale, with higher scores indicating greater feeling. Factor analysis was run on 8 different emotions, revealing two dimensions, which were identified as positive and negative emotions. Based on these results, a positive emotion scale was created by averaging responses to hopeful, empathetic, surprised, and happy, which had a Cronbach's alpha of 0.807. A negative emotion scale was created by averaging responses to angry, disgusted, sad, and afraid, with a Cronbach's alpha of 0.871.

A3. Data Analysis of Storyline Impact Dataset

Descriptive analysis was conducted of survey data to obtain sample descriptives and identify potential differences between viewers and non-viewers. Before conducting outcome

analyses, I examined the distribution of all outcome variables for normality. Transformations of variables were considered if distributions seemed skewed and if transformations sufficiently improved the distributions.

Survey analysis focused on first assessing if viewing the storyline influenced knowledge attitudes and behaviors of episode viewers compared to episode non-viewers. A second set of analyses focused on identifying latent subgroups of *Madam Secretary* viewers derived from their political ideologies and core beliefs and examining whether knowledge, attitude, and behavior outcomes differ across identified viewer subgroups. Subsequent analyses assessed the degree to which latent classes identified moderated media effects of episode viewership. Finally, I also tested the degree to which narrative engagement, perceived realism, and emotional responses mediated storyline impact among episode viewers.

Storyline Impact Dataset				
Aim 1*. To examine whether exposure to a televised storyline featuring nuclear issues influences related knowledge, attitudes and behaviors.*				
Hypothesis	IV	DV	Mediator/ Moderator	Analysis
H1. Storyline exposure will be associated with a higher increase in knowledge, more anti-nuclear attitudes, and more politically engaging behaviors.	Viewership	Nuclear knowledge, attitudes, and behaviors	N/A	Multivariate regression
1a*. To identify latent subgroups of Madam Secretary viewers based on their political ideologies and core beliefs.*				
Hypothesis	IV	DV	Mediator/	Analysis

			Moderator	
H1a. A model with more than 1 latent class will fit the data better than a model with only 1 class, suggesting there is heterogeneity among *Madam Secretary* viewers.	N/A	N/A	N/A	Latent Profile analysis
1b. *To examine whether exposure to a televised storyline featuring nuclear issues on related knowledge, attitudes, and behaviors differs across viewer subgroups characterized by their political ideologies and core beliefs.*				
Hypothesis	IV	DV	Mediator/ Moderator	Analysis
H1b. Political ideologies and beliefs significantly moderate the association between storyline exposure and nuclear knowledge, attitudes, and behaviors.	Viewership	Nuclear knowledge, attitudes, and behaviors	Political ideologies and core beliefs (latent classes)	Latent class moderation

Multivariate Regression

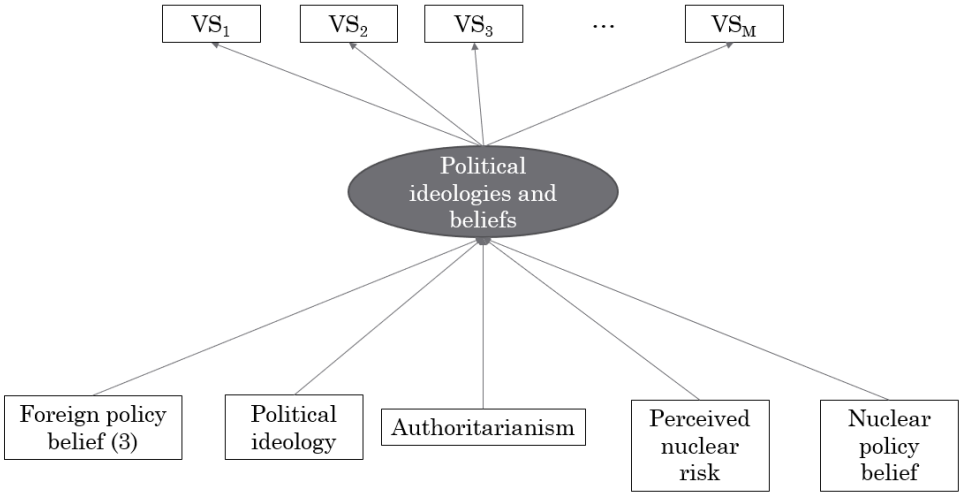
To examine whether exposure to a televised storyline featuring nuclear issues influences related efficacy, knowledge, attitudes, and behaviors (Hypothesis 1), I used linear regression to examine differences in outcomes between viewers and non-viewers of the finale episode. Outcome measures represent change scores calculated based on changes from baseline

to follow-up. All regression models were adjusted for age, gender, race/ethnicity, age, education level, political party, and exposure to nuclear issues because they have previously been shown to be associated with attitudes toward nuclear weapons or policies (Ripberger et al., 2011; Sagan & Valentino, 2017). Age and education were also included as covariates in the regression model due to significant differences found between viewers and non-viewers of the episode.

Latent Profile Analysis and Moderation

To examine differential effects of the *Madam Secretary* storyline across different types of viewers (Hypothesis 1a and 1b), viewer subgroups were first identified using latent profile analysis. Latent class (LCA) and latent profile analysis (LPA) both capture unobserved heterogeneity in a population by clustering individuals into mutually exclusive and exhaustive subgroups (see Figure 3), represented by a categorical latent variable, based on similar patterns of responses on a group of indicator variables (Goodman, 1974; Lazarsfeld & Henry, 1968). Although similar to latent class analysis, latent profile analysis requires indicators to be continuous.

Figure 3. Latent profiles of Madam Secretary viewers' political ideologies and beliefs



Latent class moderation provides a complementary approach to understanding narrative impact and associated mechanisms of narrative persuasion by enabling a comprehensive examination of types of *Madam Secretary* viewers as defined by a broad set of individual characteristics (Aiken, West, & Reno, 1991). A traditional moderation analyses would focus on differential effects of a narrative based on a single characteristic, such as gender or political ideology, which has been the most common way to examine differential effects. However, latent class moderation, which defines latent class by the intersection of multiple potential moderators, has multiple advantages (Lanza & Rhoades, 2013; Wang & Ware, 2013). First, this approach can address some of the limitations to the traditional moderation approach, such as low statistical power for examining higher order interactions (Rhoades Cooper & Lanza, 2014). Second, a strength of latent profile or latent class analysis is its ability to empirically identify underlying subgroups of individuals based on the most common combinations of a particular set of variables.

In the present study, latent profile analysis can identify subgroups composed of individuals who share a particular combination of political ideologies and core beliefs, and who may respond differently to the narrative. Communicating more politicized health messages, such as issues of nuclear risk and nuclear security, need to address viewers' pre-existing political ideologies, which might shape political preferences and behavior related to nuclear policy. While political ideology is often treated as a single one-dimensional variable, ranging from liberal to conservative, or political party, this does not adequately capture the more complex nature of political ideologies (Jost et al., 2009). Thus, the latent class analysis approach provides a more person-centered conceptualization of the profiles of *Madam Secretary* viewers and their political ideologies and core beliefs. Given the evidence summarized earlier that suggests there may be

differential effects of narratives on different types of viewers, latent class moderation can be used to identify and understand the profiles of viewers that are likely to benefit most from these kinds of narratives.

In this study, LPA was used to indicate whether there was unobserved heterogeneity within a sample of regular *Madam Secretary* viewers. The choice of indicators included in the LPA was based on empirical and theoretical literature that posit that viewer characteristics, particularly political ideologies and beliefs, may moderate the effect of narratives on knowledge, attitude, and behavior outcomes (Feldman & Sigelman, 1985; Fiske, 1986; Oskamp & et al., 1985; Sagan & Valentino, 2017). The measures for the LPA included 7 items measuring foreign policy beliefs, political ideology, authoritarianism, and attitudes towards nuclear weapons and nuclear policies were used to represent viewers' political ideologies and core beliefs. The LPA was run on all participants, both those who watched the finale episode and those who did not. Including non-viewers in the analysis helped to control for potential environmental factors, such as news coverage of events that may be related to nuclear policy, that could contribute to viewers' knowledge, attitude, and behavior outcomes.

Analysis was conducted in tidyLPA, a R package developed for latent profile analysis. If multiple latent classes provide a better fit to the data compared to one class, this suggests there is heterogeneity among *Madam Secretary* viewers that could account for differential effects of the storyline on different viewer subgroups. Models with 1 to 5 classes, with the possibility of equal and unequal variances, were compared using model fit indices: AIC, BIC, and log likelihood. In addition to considering parsimony and interpretability, model selection was guided by Akogul and Erisoglu's model selection procedure (Akogul, 2017), which integrates information from

multiple fit indices and selects the best model using Saaty's Analytic Hierarchy Process (AHP) (Saaty, 1978).

After identifying latent viewer subgroups using LPA, I then included the moderator (i.e., the latent class) and the interaction between viewership (viewer vs. non-viewer) and latent class to test whether latent classes characterizing viewers' political ideologies and core beliefs significantly moderate the association between storyline exposure and nuclear knowledge, attitudes, and behaviors (H2b). Separate models were conducted for each outcome of interest (Y): efficacy, knowledge, attitudes, and behaviors in SAS. These were also adjusted for age, gender, race/ethnicity, age, education level, and exposure to nuclear issues.

Mediation

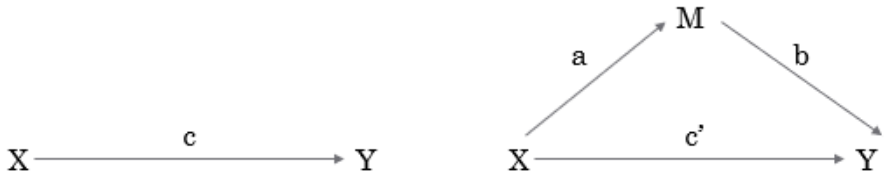
While it is important to examine whether the health storyline has an effect on viewers' nuclear knowledge, attitudes, and behaviors, it is also important to examine how such effects occur. In the subsequent analysis, I explored psychological and cognitive processes as captured by narrative engagement, perceived realism, and emotion taking place among viewers of the *Madam Secretary* storyline.

Storyline Impact Dataset				
Aim 2*. To examine how narrative persuasion mechanisms that viewers experience mediate related knowledge, attitudes, and behaviors linked to a televised storyline featuring nuclear issues.*				
Hypothesis	IV	DV	Mediator/ Moderator	Analysis
2a. *To determine whether narrative engagement mediates the relationship between viewer characteristics and related knowledge, attitudes, and behavior among viewers of the episode.*				
H2a. The relationship between political ideologies and	Political ideologies and beliefs	Nuclear knowledge, attitudes, and behaviors	Narrative engagement	Mediation

beliefs and nuclear knowledge, attitudes, and behavior among viewers will be mediated by narrative engagement.				
2b. *To determine whether perceived realism mediates the relationship between viewer characteristics and related knowledge, attitudes, and behavior among viewers of the episode.*				
H2b. The relationship between political ideologies and beliefs and nuclear knowledge, attitudes, and behavior among viewers will be mediated by perceived realism.	Political ideologies and beliefs	Nuclear knowledge, attitudes, and behaviors	Perceived realism	Mediation
2c. *To determine whether narrative engagement mediates the relationship between viewer characteristics and related knowledge, attitudes, and behavior among viewers of the episode.*				
H2c. The relationship between political ideologies and beliefs and nuclear knowledge, attitudes, and behaviors among viewers will be mediated by emotional response	Political ideologies and beliefs	Nuclear knowledge, attitudes, and behaviors	Emotional response (Positive and negative)	Mediation

Whereas moderator variables specify when certain effects will hold, mediators speak to how or why such effects occur (Baron & Kenny, 1986). Various methods exist to test causal pathways through which the storyline exerts its effect, including the traditional Baron and Kenny's causal steps approach (Baron & Kenny, 1986) and the Sobel test (Sobel, 1982, 1986), however both have serious limitations, such as issues with power or requiring assumptions of normality (Hayes, 2009). Alternatively, this study uses bootstrapping to examine indirect effects (Figure 4), which simulation research has demonstrated to be one of the more valid and powerful approaches to testing intervening variables (MacKinnon, Lockwood, & Williams, 2004; Williams & MacKinnon, 2008). In this mediation model, *a* is the coefficient for X in a model predicting M from X, while *b* and *c'* are the coefficients in a model predicting Y from both M and X, respectively (Hayes, 2009). Additionally, *c'* represents the direct effect of X, whereas the product of *a* and *b* represents the indirect effect of X on Y through M (Hayes, 2009).

Figure 4. Mediation model



Bootstrapping allows many point estimates of the mediated effect to be calculated from multiple resamples with replacement. Each resample constructs its own estimates of *a* and *b* and the product of the path coefficients. This process is repeated for a total of *k* times (typically at least 1000). The *k* estimates of the indirect effect thus create a sampling distribution of the indirect effect, from which we can make an inference about the size of the indirect effect to generate a confidence interval (Hayes, 2009).

Mediation analyses were conducted with PROCESS, a SAS macro that uses Ordinary Least Squares regression modelling and a bootstrapping estimation (Hayes, 2017). Hayes' PROCESS procedure for SAS conducts a series of regressions and calculates conditional indirect effects simultaneously using bias-corrected 95% confidence intervals (CIs) based on 1,000 bootstrap samples (Hayes, 2013). From these results, I determined whether the mediated effect was significant if the confidence interval did not include zero. The model was run for the four mediators (M), narrative engagement, perceived realism, and positive and negative emotions, and for each knowledge, attitude, and behavioral outcome (Y).

B. Qualitative Social Media Dataset

The qualitative portion of this dissertation uses a different dataset requiring primary data collection of data comprised of tweets, or microblogs, from the social media platform Twitter.

Social Media Dataset				
Aim 3. *To explore the qualitative content of tweets related to Madam Secretary during the week that a televised storyline featuring nuclear issues aired.*				
Hypothesis	IV	DV	Mediator/ Moderator	Analysis
H3. Tweets will demonstrate narrative engagement with the nuclear storyline.	N/A	N/A	N/A	Media content analysis

In the context of audience reception studies, the Twitter platform provides an opportunity to observe public behavior and sentiment. Moreover, Twitter is generally a "public-facing" platform, with an estimated 88% of users allowing their content to be viewed publicly (Beevolve, 2014), distinguishing Twitter from sites such as Facebook, for which most content can only be

viewed by a select group of friends (Hoffman et al., 2018). To facilitate data collection and analysis of tweets, Twitter and individual developers maintain tools that facilitate automatic downloading and processing of tweets and their associated metadata (Denecke et al., 2013; Hanson, Cannon, Burton, & Giraud-Carrier, 2013).

Most research studies using Twitter data access tweets through the Twitter Application Programming Interfaces (API), which provide access to both historic and real-time data collections (Sinnenberg et al., 2017). Twitter maintains several public APIs, which vary in cost and comprehensiveness of access. For example, multiple APIs enable access to real-time tweets. The Firehose API provides access to 100% of all tweets and allows all tweets to be automatically downloaded in real-time, but is very costly and thus often used by commercial users (Morstatter, Pfeffer, Liu, & Carley, 2013). The Streaming API provides approximately 1% of all real-time tweets and can be filtered with search terms, including keywords (words, phrases, or hashtags), geographical boundaries, and user ID (Morstatter et al., 2013).

In the context of examining audience response to a television show, tweets are well-suited for a qualitative approach because the textual content itself is highly unstructured, allowing for examination of users' lived experiences (Colditz, Welling, Smith, James, & Primack, 2019; Hoffman et al., 2018). Moreover, combining emergent coding methods of the tweet content with additional metadata associated with tweets, including the time stamp, user mentions, and hashtags, has utility for a wide variety of social media-related research work (Murthy, 2016).

B1. Data Collection of Social Media Dataset

The present study accessed historical tweets using Twitter's Search API. Twitter's Search API enables access to historical tweets that match a search query, which can involve keywords,

usernames, locations, named places, and date restrictions. I adapted a *Python* package called *search-tweets-python* (https://github.com/twitterdev/search-tweets-python) to retrieve data from Twitter's Search API (Twitter, INC., 2017). The Twitter API delivers data via JSON, which makes this format useful for its accessibility as it consists of a series of defined attributes and values rather than having abstract or numerical variable names (Murthy, 2016). For example, JSON data derived from Twitter provides useful metadata such as 'user_mentions', 'hashtags' and 'in_reply_to_user_ID_str' (Murthy, 2016), can be easily converted to csv or excel formats for analysis.

The specific Search API used gives access to the full archive of tweets, but only allows access at the "sandbox tier," which has some limitations: 100 tweets per request, a search query length of 128 characters, a rate of 30 requests per minute, and 5000 tweets per month (Twitter, 2019). Given this restricted use, several considerations were taken into account for the creation of the search query to collect relevant tweets. Research suggests that viewers use social media to engage with television programs; particularly, when there are prompts such as designated hashtags (TvTechnology, 2012). Thus, to identify relevant tweets for the content analysis, the search query used the hashtag "#madamsecretary" to filter the Twitter stream. The restrictions of query length allowed for either one hashtag with a larger time frame or multiple hashtags with a narrow time frame. Thus, the query was restricted to up to 7 after the finale episode aired (May 20, 2018). Thus, the final search query required tweets to include the hashtag "#MadamSecretary" and be published from 12:01 AM (PST) May 20,2018 to 12:00 AM (PST) on May 27, 2018. In addition to the textual content of the tweet, extracted metadata included the timestamp, the user's Twitter handle, user information, number of favorites, number of replies, and number of retweets. This study received an IRB exemption from UCLA for data collection

and use of textual content because of the public nature of the data and because this study does not use any identifying user data.

B2. Data Analysis of Social Media Dataset

The availability of metadata allowed for some quantitative descriptive analyses and qualitative comparisons. Percentages and frequencies were calculated in SAS, while qualitative coding was facilitated using excel spreadsheets. Based on available user information, I decoded users into four user types: official show accounts (i.e., network, producers, cast members), organization (i.e., Hollywood, Health & Society, Ploughshares Fund), content experts (i.e., academics in nuclear policy, representatives from nuclear policy advocacy groups or organizations), and individuals. The number of favorites, replies, and retweets were also assessed to examine how much attention specific tweets received.

Media content analysis was conducted on original tweets responding to the *Madam Secretary* finale episode (N=831). Coding and analysis moved through two major stages: an initial stage of identification that uses a priori codes or emergent codes, and a second stage of refining or interpreting to develop more analytical categories ("focused coding") (Saldana, 2009). For the development of the codebook, a priori codes were based on theories of narrative persuasion and concepts measured in the viewer survey. Thus, the four dimensions of narrative engagement (narrative understanding, attentional focus, emotional engagement, and narrative presence), perceived realism, and nuclear knowledge, attitudes, and behaviors served as initial coding categories. Understanding of the codes and how they may be interconnected is an evolving process such that coding occurs in a cycle, or recursive, process (Miles, Huberman, Huberman, & Huberman, 1994); thus, the codebook was revised iteratively. Additional thematic codes for the codebook were generated inductively and were refined through an iterative process

of collaborative discussion and code clarification after two independent coders assessed 10% of the tweets in the final sample. This process was repeated 3 more times until the Cohen's kappa score for each code reached at least 0.70 representing good reliability (Bernard & Ryan, 2010). Memos were also written regularly to inform coding and analysis processes.

After 4 rounds of double coding, the final codebook consisted of 13 thematic codes: narrative understanding, attentional focus, emotional engagement, narrative presence, perceived realism, character identification, nuclear knowledge, nuclear attitudes, nuclear behavior, enjoyment, promotion, resources, and negative response. The final codebook with definitions for each thematic code is in Table 1. Kappa scores for each code were 0.70 and above. Codes were dichotomous and were non-exclusive, allowing multiple thematic codes to be applied to each tweet. After good reliability was established and the codebook was finalized, one coder completed the thematic coding for the remaining tweets. To examine each thematic code more carefully, tweets were grouped into a new excel spreadsheet according to each code. These tweets were subsequently analyzed to identify emergent sub-themes and further synthesized within the context of narrative persuasion theory.

Table 1. Definitions for thematic codes and example content

Code	Definition	Example Tweets
Narrative understanding	Demonstrated processing and critical thinking of the narrative, the characters' goals and actions	• Okay, one more thought about #MadamSecretary. Perhaps my favorite line is when @TeaLeoni says in the Oval Office, "Maybe emotion is what's missing from the stupid so-called logic behind our dehumanized nuclear posture." Amen! Do we control the weapons or do they control us?
Attentional focus	Demonstrates focus on the story plot and characters	• @MadamSecretary Ive been binging season 4 recently. loving it :)
Emotional engagement	Exhibits emotions (i.e., anger, fear, surprise, hope, happiness) viewers have with respect to characters or general emotional reactions to the narrative	• I nearly had a heart attack. #MadamSecretary • #MadamSecretary I LOVE THIS SHOW in tears if tonight's episode.... https://t.co/favPNzkLGt
Narrative presence	Entails immersion into the story world that takes place due to comprehension processes and perspective taking (i.e. showing support for McCord running for president, quotes from episode)	• They just broke out nuclear launch codes on #MadamSecretary. What is happening?!?! • President McCord if the character was real I'd vote for her 100% #MadamSecretary @MadamSecretary
Perceived Realism	Judgements of a narrative's plausibility and drawing connections to the real world	• "This was a powerful show. It makes you think. This can happen #MadamSecretary https://t.co/Y6RzFlq6di" • Mount Weather is a real place. https://t.co/KFgfbHo5qp #MadamSecretary
Character identification	Expressing empathy towards character, taking on the role of the character, or identifying with the character	• "After thinking I was seeing my children for the last time, you're damn right I'm emotional!!" #MadamSecretary @TeaLeoni
Nuclear knowledge	Gaining knowledge specifically about what hair trigger alert is, de-alerting, and about missile turnaround, and current system and policies	• #MadamSecretary -This was a powerful episode. Elizabeth is right, there should be more safeguards to activating nuclear weapons. because if the call is wrong and the weapons are launched there is NO way to bring them back. World destroyed
Nuclear attitudes	Clearly taking a side on an issue towards nuclear policies or foreign policies, general attitudes towards nuclear weapons or nuclear war	• Given how unreliable the current @POTUS is we really need to take this decision out of his hands. #MadamSecretary
Nuclear behavior	Expressing desire to or a call to action to engage in nuclear behavior or activism, such as engaging in political activism	• Congress must act to restore the integrity of American elections https://t.co/GpAllXMIux #nevertrump #FBR… https://t.co/b4YCN5hSxJ
Enjoyment	Expressing general appreciation of the show or the finale episode, and admiration of the characters or complimenting the acting	• TÉA DESERVES AN EMMY FOR THIS SCENE ALONE #MadamSecretary • I love how this show models how to have open honest communication about tough subject matter. #MadamSecretary
Promotion	Promoting the show, show finale, panel or live tweeting	• Follow #MadamSecretary tonight as nuclear experts live tweet the season finale. https://t.co/OApx8yMmtV
Resources	Imparting information or providing resources related to the nuclear risk storyline	• That's not the only close call we've had. Check out @OutriderFdn's worrying list of close calls over the years https://t.co/pdo6j332PR #MadamSecretary
Negative Response	Questioning validity or demonstrating skepticism of the storyline or the show	• most of the time #MadamSecretary is neo-liberal USian imperialist bs, but i appreciate the FYI episodes detailing procedures for invoking the 25th amendment and launching nuclear weapons

CHAPTER 5. RESULTS FOR STORYLINE IMPACT DATASET

A. Descriptive Analysis

Of the 295 participants who completed both surveys at baseline and follow-up, participants ranged in age from 23 to 68 with a median age of 56 (Table 2). Most participants were White (79.0%). More than half (57%) were female and about half had a bachelor's degree or higher (52%). Nearly half (45.8%) identified as Democrats, with significant numbers of Republicans (29.5%) and Independents (20.0%). Most participants also reported little to no exposure to nuclear issues through a variety of media and personal sources (mean= 1.20, SD=1.35).

Viewers and non-viewers of the finale episode were compared across participant characteristics (Table 2). Viewers tended to be older than non-viewers ($p=0.036$). Viewers were also significantly less educated than non-viewers ($p=0.013$). However, no significant differences in gender, race/ethnicity, political party, and exposure to nuclear issues between viewers and non-viewers were found.

Table 2. Participant characteristics

Characteristics	Total N(%)[1]	Viewers of episode N(%)[1]	Non-viewers of episode N(%)[1]	*p*
Age[2]	51.6 (11.84)	52.9 (11.09)	49.5 (12.71)	0.036*
Gender				
Male	125 (42.4)	82 (45.6)	43 (37.4)	0.154
Female	169 (57.3)	97 (53.9)	72 (62.6)	
Race/Ethnicity				
White	233 (79.0)	144 (80.0)	89 (77.4)	0.592
Non-White	62 (21.0)	36 (20.0)	26 (22.6)	
Education				
Less than high school	50 (17.0)	36 (20.0)	14 (12.2)	0.013*
Some college or associate's degree	91 (30.9)	63 (35.0)	28 (24.4)	
Bachelor's degree	93 (31.5)	52 (28.9)	41 (35.7)	
Some postgraduate or postgraduate/professional degree	61 (20.7)	29 (16.1)	32 (27.8)	
Political Party				
Democrat	135 (45.8)	85 (47.2)	50 (43.5)	0.916
Republican	87 (29.5)	51 (28.3)	36 (31.3)	
Independent	59 (20.0)	36 (20.0)	23 (20.0)	
Other or no party Preference	14 (4.7)	8 (4.4)	6 (5.2)	
Exposure to nuclear issues (0-8)[1]	1.20 (1.35)	1.30 (1.41)	1.04 (1.23)	0.145

[1]Column percentages; Note: Because of missing data, some percentages may not sum to 100. Mean (SD) presented for continuous variables.

[2]Non-parametric rank sum test for skewed variables

*Significant under α=0.05 level

B. Storyline Impact Analysis

To examine overall storyline impact, I first used multivariate regression to analyze effects of narrative exposure on viewers' knowledge, attitudes, and behaviors. Latent profile analysis and moderation were then used to explore the differential impact among subgroups of viewers defined by their political ideologies and beliefs. Among viewers of the episode, I explored mechanisms of narrative persuasion to determine whether narrative engagement, perceived realism, or emotion mediated the relationship between viewers' political ideologies and beliefs (represented by latent viewer subgroups) and their nuclear knowledge, attitudes, and behaviors.

B1. Overall Storyline Impact

Multivariate regression was used to analyze potential differences in nuclear knowledge, attitudes, and behavioral outcomes between viewers and non-viewers of the finale episode. Storyline exposure was a dichotomous variable representing viewers and non-viewers of the episode, while nuclear knowledge, attitudes and behavioral outcomes were represented by change scores. Regression analyses also adjusted for demographics, including age, gender, race/ethnicity, education, political party, and exposure to nuclear issues.

Hypothesis 1 was partially correct; storyline exposure was associated with higher nuclear knowledge, but not more anti-nuclear attitudes or more politically engaging behavior. Based on the nuclear knowledge scale, multivariate regression analysis showed that viewers of the episode had significantly greater increases in nuclear knowledge compared to non-viewers ($b=0.16$, $SE=0.08$, $p=0.053$) (Table 2), adjusting for demographic characteristics. No significant differences in nuclear efficacy ($b=-0.10$, $SE=0.21$, $p=0.642$), nuclear attitudes ($b=0.17$, $SE=0.16$, $p=0.273$), and nuclear behavioral intentions for offline political engagement ($b=-0.14$, $SE=0.10$, $p=0.180$), online political engagement ($b=-0.13$, $SE=0.14$, $p=0.346$), and nuclear activism

(b=0.19, SE=0.21, p=0.366) were found between viewers and non-viewers of the finale episode (Tables 3,4). However, Independents reported smaller increases in support of anti-nuclear policies compared to Democrats with marginal significance (b= -0.39, SE= 0.20, p= 0.057). Some of the non-significant findings may be attributed to the small sample size.

For nuclear efficacy, knowledge, and attitudes, I conducted additional post-hoc analyses examining each individual item as an outcome rather than as a cumulative scale. Results presenting the multivariate regression models for both individual item and cumulative scale outcomes are presented in Appendix D. However, there were no significant differences between viewers and non-viewers of the episode for individual item outcomes for nuclear efficacy, knowledge, and attitudes.

Table 3. Multivariate associations between predictors and nuclear efficacy, knowledge, and attitudes

	Nuclear Efficacy Scale		Nuclear Knowledge Scale		Nuclear Attitude Scale	
	Adjusted *b* (SE)	p	Adjusted *b* (SE)	p	Adjusted *b* (SE)	p
Viewed Episode						
Viewer	-0.10 (0.21)	0.642	0.16 (0.08)	0.053*	0.17 (0.16)	0.273
Non-viewer (ref)	--	--	--	--	--	--
Age	-0.01 (0.01)	0.187	0.004 (0.003)	0.253	-0.001 (0.01)	0.857
Education						
Less than high school (ref)	--	--	--	--	--	--
Some college or associate's degree	-0.17 (0.30)	0.560	-0.07 (0.12)	0.561	-0.13 (0.23)	0.567
Bachelor's degree	-0.01 (0.30)	0.966	-0.03 (0.12)	0.785	-0.24 (0.23)	0.303
Some postgraduate or postgraduate/ professional degree	-0.15 (0.32)	0.653	-0.16 (0.13)	0.200	-0.30 (0.25)	0.232
Political Party						
Democrat (ref)	--	--	--	--	--	--
Republican	-0.43 (0.23)	0.064	-0.01 (0.09)	0.892	-0.14 (0.18)	0.434
Independent	-0.06 (0.26)	0.826	-0.11 (0.10)	0.300	-0.39 (0.20)	0.057
Other	-0.20 (0.50)	0.694	-0.06 (0.19)	0.764	-0.64 (0.37)	0.083
Exposure to Nuclear Issues	-0.14 (0.08)	0.069	-0.003 (0.03)	0.926	0.03 (0.06)	0.598

*Significant under α=0.05 level

Table 4. Multivariate associations between predictors and nuclear behaviors

	Behavior- Offline political engagement		Behavior- Online political engagement		Behavior- Activism on reducing nuclear risk	
	Adjusted *b* (SE)	p	Adjusted *b* (SE)	p	Adjusted *b* (SE)	p
Viewed Episode						
Viewer	-0.14 (0.10)	0.180	-0.13 (0.14)	0.346	0.19 (0.21)	0.366
Non-viewer (ref)	--	--	--	--	--	--
Age	-0.0003 (0.004)	0.950	0.01 (0.01)	0.285	-0.00003 (0.01)	0.997
Education						
Less than high school (ref)	--	--	--	--	--	--
Some college or associate's degree	0.07 (0.15)	0.650	0.04 (0.20)	0.851	0.33 (0.30)	0.277
Bachelor's degree	-0.06 (0.15)	0.700	0.13 (0.20)	0.528	-0.13 (0.30)	0.681
Some postgraduate or postgraduate/ professional degree	-0.11 (0.17)	0.513	0.30 (0.22)	0.165	0.08 (0.33)	0.809
Political Party						
Democrat (ref)	--	--	--	--	--	--
Republican	0.05 (0.12)	0.676	-0.05 (0.16)	0.749	0.11 (0.24)	0.646
Independent	-0.07 (0.13)	0.601	-0.05 (0.18)	0.762	-0.05 (0.27)	0.845
Other	0.02 (0.24)	0.937	0.39 (0.32)	0.230	-0.04 (0.49)	0.927
Exposure to Nuclear Issues	0.03 (0.04)	0.424	0.03 (0.05)	0.516	0.09 (0.08)	0.230

*Significant under α=0.05 level

B2. Identifying Viewer Subgroups

Latent profile analysis was conducted to explore profiles of political ideologies and core beliefs of regular *Madam Secretary* viewers using seven indicator variables. The seven indicators included three foreign policy beliefs towards U.S. foreign intervention, political ideology, authoritarianism, attitudes towards nuclear weapons, and nuclear policy attitudes (see Table 1). No significant differences were found when comparing viewers versus non-viewers of the finale episode with regards to the seven indicator variables. Missingness for indicator variables was also minimal.

The latent profile analysis supported Hypothesis 1a, which stated that a model with more than 1 latent class would fit the data better than a model with only 1 class. Results suggest a 2-class model with unequal variances to be the best fit model (see Table 5), suggesting heterogeneity among regular *Madam Secretary* audiences. Given lower values of model fit indices suggest better balance between fit and parsimony, comparison of model fit indices narrowed it down to two potential models: a 4-class model with equal variances and a 2-class model with unequal variances. While the 4-class model with equal variances had the lowest BIC, the 2-class model with unequal variances had the lowest AIC and was also the recommended best fit model by Akogul and Erisoglu's procedure (Akogul, 2017). Parsimony and interpretability also favored the 2-class model over the 4-class model. LPA also excludes cases with any missing values for indicator variables. To further validate the selected model, I compared the recommended model as determined by Akogul and Erisoglu's procedure with and without single imputation and achieved the same result, suggesting the 2-class model is a good fit. The 2-class model was also characterized by high average posterior probabilities for latent

classes, suggesting low classification error. Specifically, average posterior probabilities were 0.92 for Class 1 and 0.96 for Class 2.

Table 5. Model fit indices for 1-, 2-, 3-, 4-, and 5- Class Models

Model	Number of classes	Model fit indices		
		Log likelihood	AIC	BIC
1	1	-3049.811	6127.621	6178.658
1	2	-2910.246	5864.493	5944.693
1	3	-2853.434	5766.867	5876.230
1	4	-2827.177	5730.354	5868.881
1	5	-2814.244	5720.488	5888.179
6	1	-2836.423	5742.847	5870.438
6	2	-2745.144	5632.288	5891.114

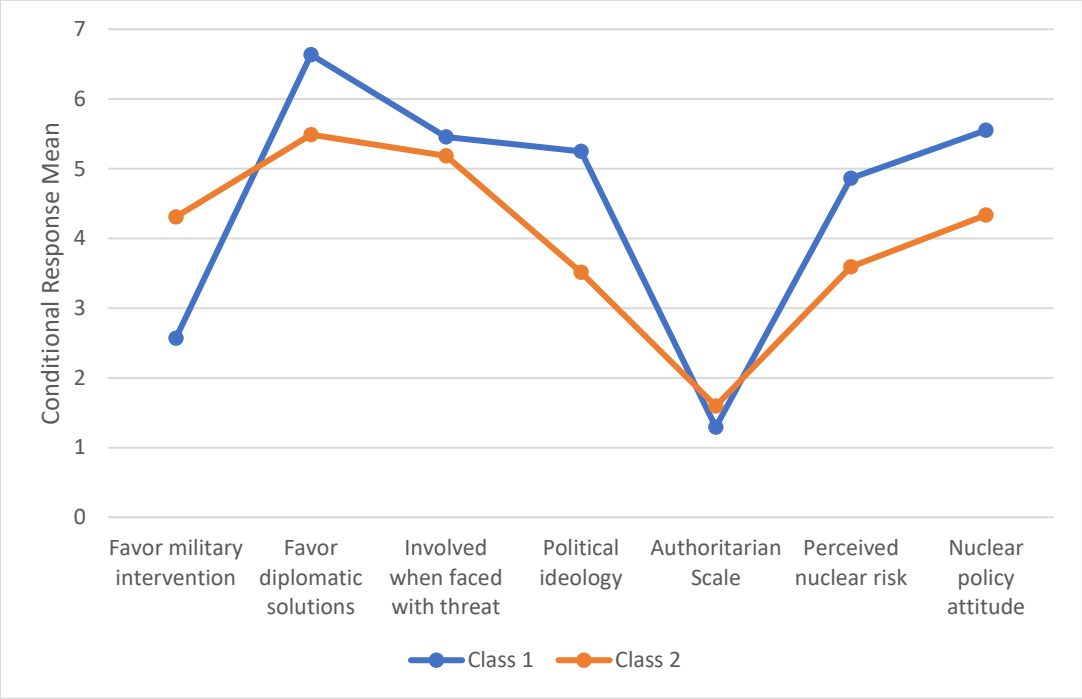
Notes: AIC= Akaike Information Criterion, BIC= Bayesian Information Criterion

Table 6 presents the conditional response means for the 2-class model with a visual depiction of the profiles of the two classes in Figure 5. Class 1 (n=112) held more dovish positions towards military and foreign intervention, were more liberal, less authoritarian, had higher perceived nuclear risk, and held more anti-nuclear policy attitudes. Class 2 (n=171) held more hawkish positions towards military and foreign intervention, were more conservative, more authoritarian, had lower perceived nuclear risk, and held less anti-nuclear policy attitudes. Twelve participants were not able to be classified into latent classes due to missing values.

Table 6. Viewer Profile Conditional Response Means for 2-Class Model

Viewer characteristic	Class 1: Liberal, Dovish, More Anti-nuclear (n=112)	Class 2: Conservative, Hawkish, Less Anti-Nuclear (n=171)
	Mean (SD)	Mean (SD)
I generally favor U.S. military intervention in conflicts with foreign countries (1-7)	2.57 (1.65)	4.31 (2.10)
I generally favor diplomatic solutions in conflicts with foreign countries before U.S. military intervention (1-7)[1]	6.64 (0.24)	5.49 (1.62)
The U.S. military should only be involved in conflicts when the U.S. faces a direct and imminent threat (1-7)[1]	5.45 (2.27)	5.19 (2.40)
Political Ideology (1-7)	5.25 (2.00)	3.51 (2.81)
Authoritarian Scale (1-2)	1.29 (0.08)	1.60 (0.08)
Perceived nuclear risk (1-7)	4.86 (0.73)	3.59 (0.54)
Nuclear policy support (1-7)	5.55 (0.94)	4.34 (1.80)

Figure 5. Profiles of 2-class model



B3. Differential Impact of Storyline on Viewer Subgroups

To address whether grouping characteristics of viewers moderated storyline impact, I conducted latent class moderation. In this analysis, I used multivariate regression and included an interaction between exposure to the episode (viewer vs. non-viewer) and latent viewer subgroup (as derived from political ideologies and core beliefs) to examine differential effects of the nuclear risk storyline. Findings partially support Hypothesis 1b, which proposed that latent viewer subgroups defined by political ideologies and beliefs would significantly moderate the association between storyline exposure and nuclear knowledge, attitudes, and behaviors.

Table 7 shows F statistics and p values for the main effects for viewer and latent class as well as the interaction between viewership and latent class on nuclear efficacy, knowledge, attitude, and behavioral outcomes. Storyline impact did not vary significantly across latent classes for nuclear efficacy, attitudes, and behaviors. However, storyline impact did significantly vary across latent classes for the nuclear knowledge scale (F/X^2= 8.70, p=0.004). For the nuclear knowledge scale, the main effects of viewer (b=0.43, SE=0.12, p<0.001) and latent class (b=0.27, SE= 0.12, p=0.026) were both significant and there was a significant interaction (b= -0.47, SE=0.16, p=0.004) (Table 8). Simple slope analyses revealed that for the more liberal, dovish, more anti-nuclear class (Class 1), those who viewed the episode had significantly greater knowledge compared to non-viewers (b=0.41, SE= 0.12, p=0.001). However, for the more conservative, hawkish, less anti-nuclear class (Class 2), the effect of watching the episode was not significant (b= -0.03, SE=0.11, p=0.813). Figure 6 plots the interaction between class and viewership.

Table 7. Test statistics for Viewer, Latent Class, and Viewer × Latent Class predicting nuclear outcomes

	Viewer		Latent Class		Viewer × Latent Class	
Outcome	F/X^2	p	F/X^2	p	F/X^2	p
Nuclear efficacy scale	0.06	0.804	0.46	0.499	0.37	0.545
Nuclear knowledge scale	5.69	0.018*	5.02	0.026*	8.70	0.004*
Nuclear attitudes scale	0.96	0.327	0.05	0.830	0.08	0.772
Nuclear behavior- Offline political engagement scale	0.72	0.398	2.16	0.143	0.29	0.590
Nuclear behavior- Online political engagement scale	0.01	0.907	0.14	0.706	1.17	0.280
Nuclear behavior- Activism on reducing nuclear risk	0.72	0.396	1.26	0.263	1.17	0.281

*Significant under α=0.05 level

Table 8. Multivariate regression between predictors and nuclear knowledge with latent moderator, adjusted for age, education, and exposure to nuclear issues

	Nuclear Knowledge Scale	
	Adjusted *b* (SE)	p
Viewed Episode		
Viewer	0.43 (0.12)	0.001*
Non-viewer (ref)	--	--
Latent class		
Class 1 (ref)	--	--
Class 2	0.27 (0.12)	0.026*
Viewer*Class		
Viewer*Class 1	--	--
Viewer*Class 2	-0.47 (0.16)	0.004*
Age	0.004 (0.003)	0.213
Education		
Less than high school (ref)	--	--
Some college or associate's degree	-0.07 (0.12)	0.529
Bachelor's degree	-0.02 (0.12)	0.847
Some postgraduate or postgraduate/ professional degree	-0.13 (0.13)	0.300
Exposure to Nuclear Issues	-0.002 (0.03)	0.955

*Significant under α=0.05 level

Figure 6. Interaction plot

B4. Mechanisms of Narrative Persuasion Among Viewers of Episode

Mediation analysis was conducted to test Hypotheses 2a, 2b, and 2c, which predicted that greater narrative engagement, perceived realism, and emotional response would mediate the relationship between political ideologies and beliefs (as represented by latent classes) of those who watched the nuclear risk storyline and their subsequent nuclear knowledge, attitudes, and behaviors. I tested four different mediators: narrative engagement, perceived realism, positive emotion, and negative emotion.

Only participants who watched the finale episode (N=180) were asked to report on items related to narrative persuasion mechanisms (Table 9). On a scale of 1-7 with a higher score indicating more narrative engagement, viewers reported a mean of 5.09 (SD=0.89). They also reported perceiving the narrative to be fairly realistic and accurate with a mean of 5.24 (SD=01.53), and responded with more positive emotion (mean= 5.5, SD= 2.16) compared to negative emotion (mean=3.27, SD=2.10).

Table 9. Mediators (N=180)

Mediator	Mean (SD)
Narrative engagement (1-7)	5.09 (0.89)
Perceived Realism (1-7)	5.24 (1.53)
Positive emotion (1-7)	5.35 (2.16)
Negative emotion (1-7)	3.27 (2.10)

Narrative Engagement

Narrative engagement did not mediate the relationship between the latent class and any of the outcomes, thus findings did not support Hypothesis 2A. Although suppression may have been possible, the indirect effect of narrative engagement was not significant for nuclear efficacy (b=0.012, SE=0.045, 95% CI (-0.070, 0.116)), nuclear knowledge (b=-0.003, SE=0.018, 95% CI (-0.045, 0.032)), and nuclear attitudes (b=-0.048, SE=0.039, 95% CI (-0.141, 0.009)). No

significant indirect effects of narrative engagement were found for any of the nuclear behaviors: nuclear activism (b=-0.008, SE=0.053, 95% CI (-0.111, 0.104)), online engagement (b=0.001, SE=0.028, 95% CI (-0.047, 0.069)), and offline engagement (b=0.004, SE=0.025, 95% CI (-0.046, 0.060)).

Perceived Realism

Likewise, perceived realism did not mediate the relationship between the latent class and any of the outcomes, thus findings did not support Hypothesis 2B. Despite the potential for a suppression effect, the indirect effect of perceived realism was not significant for nuclear efficacy (b=0.008, SE=0.040, 95% CI (-0.079, 0.095)), nuclear knowledge (b=0.000, SE=0.007, 95% CI (-0.017, 0.018)), or nuclear attitudes (b=-0.008, SE=0.036, 95% CI (-0.097, 0.053)). Similarly, the indirect effect of perceived realism was not significant for any of the behavioral outcomes, including nuclear activism (b=0.007, SE= 0.032, 95% CI (-0.067, 0.072)), online engagement (b=0.001, SE=0.028, 95% CI (-0.047, 0.069)), and offline engagement (b=-0.001, SE=0.010, 95% CI (-0.023, 0.020)).

Positive Emotion

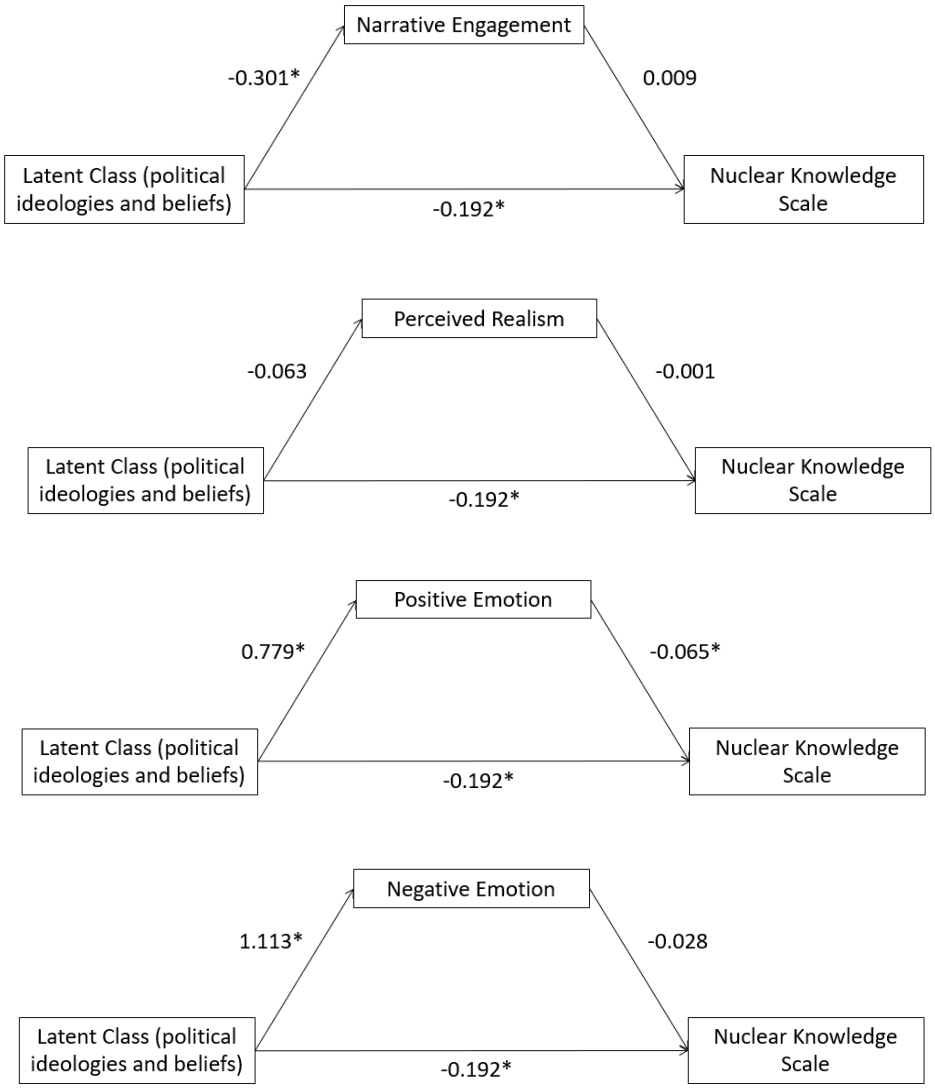
Findings partially support Hypothesis 2C. Positive emotion had a significant indirect effect (b= -0.051, SE= 0.028, 95% CI (-0.115, -0.007)) on nuclear knowledge (Figure 7). The more conservative, hawkish, less anti-nuclear class (Class 2) experienced greater positive emotion compared to the more liberal, dovish, more anti-nuclear class (Class 1) (b= 0.779, SE= 0.323, p=0.017). Interestingly, those who experienced greater positive emotion reported lower nuclear knowledge increases (b= -0.065, SE=0.023, p=0.005). The reduction of the effect of political ideologies and core beliefs (latent classes) on nuclear knowledge through positive emotion indicates partial mediation.

However, positive emotion did not have a significant indirect effect for nuclear efficacy (b=-0.013, SE= 0.055, 95% CI (-0.138, 0.097)), nuclear attitudes (b=0.014, SE=0.046, 95% CI (-0.075, 0.118)), or the nuclear behavior outcomes: nuclear activism (b=-0.023, SE=0.059, 95% CI (-0.146, 0.102)), online engagement (b=-0.000, SE=0.041, 95% CI (-0.088, 0.083)), and offline engagement (b=-0.004, SE=0.028, 95% CI (-0.059, 0.055)).

Negative Emotion

Negative emotion did not mediate the relationship between the latent class and any of the outcomes, thus findings only partially support Hypothesis 2C. Given that a suppression effect was possible, the indirect effect of negative emotion for each outcome was tested. However, negative emotion did not have a significant indirect effect for nuclear efficacy (b=-0.013, SE=0.083, 95% CI (-0.190, 0.154)), nuclear knowledge (b=-0.031, SE=0.026, 95% CI (-0.086, 0.014)), or nuclear attitudes (b=0.087, SE= 0.062, 95% CI (-0.014, 0.232)). The indirect effect of negative emotion also remained insignificant for the nuclear behaviors, including nuclear activism (b=0.057, SE=0.084, 95% CI (-0.111, 0.242)), online engagement (b=0.043, SE=0.052, 95% CI (-0.055, 0.140)), and offline engagement (b=0.019, SE= 0.035, 95% CI (-0.052, 0.089)).

Figure 7. Mediation models for nuclear knowledge



*= $p<0.05$

C. Summary

In sum, findings from the storyline impact dataset revealed that exposure to the storyline did significantly increase audiences' knowledge of nuclear issues (Hypothesis 1). However, latent profile analysis results suggest that there is heterogeneity among regular *Madam Secretary* viewers that may need to be considered (Hypothesis 1a), identifying two latent viewer subgroups: one that is more liberal, dovish, less authoritarian, and more anti-nuclear and another that is more conservative, hawkish, more authoritarian, and less anti-nuclear. Latent class moderation results suggest that the storyline may have only influenced viewers who were more liberal, dovish, and more anti-nuclear (Hypothesis 1b). In other words, there was a differential impact based on viewer subgroups defined by their political ideologies and core beliefs, such that those who were more likely to gain nuclear knowledge were viewers who already had beliefs that aligned with those implicitly supported by the nuclear risk storyline. When examining potential mechanisms of narrative persuasion among viewers that watched the episode, narrative engagement and perceived realism were not significant mediators (Hypothesis 2a and 2b), but positive emotion was a significator mediator between latent viewer subgroups as defined by political ideologies and beliefs and nuclear knowledge (Hypothesis 2c). Interestingly, the directions of these relationships were unexpected, with the more conservative, hawkish, less anti-nuclear group experiencing more positive emotion, but reporting lower knowledge increases than the more liberal, dovish, more anti-nuclear group.

CHAPTER 6. RESULTS FOR SOCIAL MEDIA DATASET

Tweets from the Twitter social media platform were collected for narrative data about audience opinions and responses regarding *Madam Secretary* and its finale following its airing on May 20, 2018. Findings from the Twitter analysis can complement and may help explain quantitative findings from the storyline impact dataset.

A. Descriptive Analysis

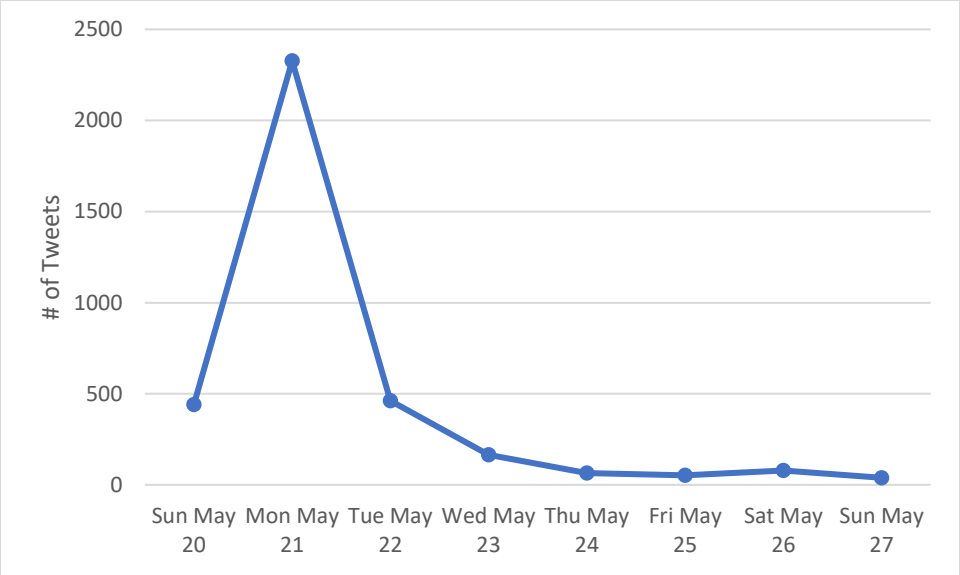
Initial extraction enabled collection of 3717 tweets with the hashtag "#MadamSecretary" and were published between May 20, 2018-May 27, 2018; after excluding those not in English, the remaining sample was N=3629. Retweets and modified tweets were included to answer questions about which tweets received the most engagement and attention, but were removed from thematic coding. Out of the 3629 tweets, the majority were retweets (n= 2798, 77.1%) and 831 tweets were original tweets (22.9%) (see Table 10). About 89% of tweets generated that week with the hashtag '#madamsecretary' occurred within the first three days after the finale episode aired, with the most tweets generated the day after the finale aired (n=2327, 64.1%) (see Table 10, Figure 8).

Table 10. Tweet characteristics (N=3629)

Characteristics	N(%)[1]
Date	
May 20	441 (12.2)
May 21	2327 (64.1)
May 22	462 (12.7)
May 23	165 (4.5)
May 24	64 (1.8)
May 25	52 (1.4)
May 26	79 (2.2)
May 27	39 (1.1)
Type of tweet	
Original tweet	831 (22.9)
Retweet	2798 (77.1)

[1]Column percentages

Figure 8. Tweets generated from May 20-May 27, 2018



B. Identifying Tweets with the Most Engagement

Retweets, replies, and favorites were used to identify the tweets that obtained the most engagement from Twitter users (Tables 11-13). Number of retweets ranged from 0-948, with a median of 0. Number of favorites ranged from 0-2293, with a median of 0. Number of replies ranged from 0-173, with a median of 0. In other words, only a few tweets gained significant attention or engagement. Generally, there was overlap across tweets that received the most retweets, replies, and favorites. In particular, tweets from Senator Ed Markey and *Madam Secretary* cast members received the most engagement from Twitter users, although one tweet from the previous president of a nuclear non-proliferation non-profit organization also generated high interest. In terms of content, many tweets that garnered the most engagement did not involve the nuclear risk storyline. For example, some tweets promoted the season finale, commented on other storylines within the episode (i.e. Elizabeth McCord's decision to run for president), or involved a cast member expressing gratitude and admiration for the show upon her leaving the show.

While the majority of tweets that received the most engagement were not related to the nuclear risk storyline, the tweet that acquired the most engagement with regards to retweets, favorites, and replies was Senator Ed Markey's tweet problematizing the current U.S. policy that allows the president to order a nuclear strike for any reason at any time. The tweet also promotes a bill that he and U.S. Representative Ted Lieu wrote together that prohibits presidents from launching a nuclear first strike without declaration of war by Congress. Other tweets that were related to the nuclear risk storyline also advocated for changing the policy that allows presidents to have sole authority to launch a nuclear first strike and instead promoted the no first use policy that would prohibit the U.S. from launching a nuclear strike against another country first. These

tweets from Senator Markey also connected the nuclear risk storyline to the real world, explaining that President Donald Trump has the sole authority to launch a nuclear strike. In addition, Téa Leoni was the only cast member to tweet about the nuclear risk storyline specifically. In a tweet, she asked users if they knew how many times a “close call” may have evolved into a nuclear attack or nuclear war in the past. In another tweet, she posted a humorous emotional reaction to the nuclear risk storyline suggesting fear.

Table 11. Top 10 tweets with most retweets

Source User	Tweet Text	Frequency
@SenMarkey	For any reason or for no reason at all, @realDonaldTrump could launch a nuclear first strike and no one could stop him. That's wrong. That's why @RepTedLieu and I authored a bill to require congressional authorization before we start a nuclear war. #MadamSecretary https://t.co/8EPgS8ipj3	948
@Cirincione	This debate of the president having the power and pressure to launch nukes is too real. That's why @SenMarkey & @tedlieu introduced a bill prohibiting presidents from launching a nuclear first strike without declaration of war by Congress. #MadamSecretary https://t.co/pPyIIaZ4DP	311
@SenMarkey	As long as @realDonaldTrump has a Twitter account, the U.S. needs a nuclear no first use policy. #MadamSecretary https://t.co/BR4EfMqh6D	283
@MadamSecretary	We're with you, #MadamSecretary! Thank you for following along tonight and all season long. We'll see you next season for more family, politics, and fun! https://t.co/iyPKKHhozL	153
@SenMarkey	It's time Congress put limits on the President's unilateral authority to launch a nuclear first strike. We should pass HR 669/S 200 by @RepTedLieu & me which requires @POTUS to get congressional approval before launching a nuclear first strike. #MadamSecretary https://t.co/KDnYaFyhHb	140
@SaraRamirez	The experience of working at @MadamSecretary with kind & fiercely talented humans like this gentleman @erichbergen was comparable to a dream becoming a new reality. It's heartening when a group knows how special what they've got is, and isn't afraid to nurture & protect it. https://t.co/NxreGzAQ9R	137
@SaraRamirez	THANK YOU @TeaLeoni for your brilliant leadership & friendship. And thank you to the entire @MadamSecretary family & @CBS for welcoming me in the ways you did! #LuckyKat #Finale #Season4 #422 https://t.co/W4uV2204Em	137
@TeaLeoni	I love when my kids lose their phones. I pretend to help them look for 'em, secretly kicking 'em further under the couch . . . #MadamSecretary	133
@MadamSecretary	This is not a test...#MadamSecretary's Season Finale airs tonight at 10/9c! https://t.co/fUVAhB8L3R	131
@ TeaLeoni	This episode scared the pants off me… we cut that part out. #MadamSecretary	129

Table 12. Top 10 tweets with most favorites

Source User	Tweet Text	Frequency
@TeaLeoni	I love when my kids lose their phones. I pretend to help them look for ‘em, secretly kicking ‘em further under the couch . . . #MadamSecretary	2293
@SaraRamirez	The experience of working at @MadamSecretary with kind & fiercely talented humans like this gentleman @erichbergen was comparable to a dream becoming a new reality. It's heartening when a group knows how special what they've got is, and isn't afraid to nurture & protect it. https://t.co/NxreGzAQ9R	2174
@SenMarkey	For any reason or for no reason at all, @realDonaldTrump could launch a nuclear first strike and no one could stop him. That’s wrong. That’s why @RepTedLieu and I authored a bill to require congressional authorization before we start a nuclear war. #MadamSecretary https://t.co/8EPgS8ipj3	2134
@TeaLeoni	This episode scared the pants off me… we cut that part out. #MadamSecretary	1697
@SaraRamirez	THANK YOU @TeaLeoni for your brilliant leadership & friendship. And thank you to the entire @MadamSecretary family & @CBS for welcoming me in the ways you did! #LuckyKat #Finale #Season4 #422 https://t.co/W4uV2204Em	1595
@MadamSecretary	We're with you, #MadamSecretary! Thank you for following along tonight and all season long. We'll see you next season for more family, politics, and fun! https://t.co/iyPKKHhozL	1135
@TimmyDaly	HUMANS!!! Thanks so much for all of your kind words about the #MadamSecretary season finale. We’re lucky to have you. Stay tuned for season 5! https://t.co/esf7Lum2o7	1035
@TimmyDaly	HUMANS!!! Remember to hug the ones you love. Even when it’s not the end of the world. #MadamSecretary	991
@MadamSecretary	This is not a test...#MadamSecretary's Season Finale airs tonight at 10/9c! https://t.co/fUVAhB8L3R	918
@TimmyDaly	HUMANS!!! Don’t forget to watch the season finale of #MadamSecretary tomorrow night! https://t.co/Zdm0mjYmNs https://t.co/jVDS7K6fzx	890

Table 13. Top 10 tweets with most replies

Source User	Tweet Text	Frequency
@SenMarkey	For any reason or for no reason at all, @realDonaldTrump could launch a nuclear first strike and no one could stop him. That's wrong. That's why @RepTedLieu and I authored a bill to require congressional authorization before we start a nuclear war. #MadamSecretary https://t.co/8EPgS8ipj3	173
@TeaLeoni	This episode scared the pants off me… we cut that part out. #MadamSecretary	168
@TeaLeoni	Can anyone guess how many times a sitting US President has been faced with a call this close and dire? #MadamSecretary	78
@TimmyDaly	HUMANS!!! Could Henry become the First Man?!?!?! #MadamSecretary #MadamPresident	72
@MadamSecretary	We're with you, #MadamSecretary! Thank you for following along tonight and all season long. We'll see you next season for more family, politics, and fun! https://t.co/iyPKKHhozL	63
@SaraRamirez	The experience of working at @MadamSecretary with kind & fiercely talented humans like this gentleman @erichbergen was comparable to a dream becoming a new reality. It's heartening when a group knows how special what they've got is, and isn't afraid to nurture & protect it. https://t.co/NxreGzAQ9R	62
@TimmyDaly	HUMANS!!! Thanks so much for all of your kind words about the #MadamSecretary season finale. We're lucky to have you. Stay tuned for season 5! https://t.co/esf7Lum2o7	55
@TeaLeoni	I love when my kids lose their phones. I pretend to help them look for 'em, secretly kicking 'em further under the couch . . . #MadamSecretary	55
@TimmyDaly	HUMANS!!! Don't forget to watch the season finale of #MadamSecretary tomorrow night! https://t.co/Zdm0mjYmNs https://t.co/jVDS7K6fzx	37
@SaraRamirez	THANK YOU @TeaLeoni for your brilliant leadership & friendship. And thank you to the entire @MadamSecretary family & @CBS for welcoming me in the ways you did! #LuckyKat #Finale #Season4 #422 https://t.co/W4uV2204Em	37

C. Thematic Analysis

The 831 original tweets were examined for relevance and coded for emergent themes; 132 tweets were deemed irrelevant to the show *Madam Secretary* and were excluded from thematic analysis. This left a final sample of 699 tweets from 348 unique Twitter users. User type was decoded based on user descriptions and were categorized as individuals, content experts, organizations, and official show accounts. Out of 699 tweets, 443 tweets were from 297 individual accounts, 110 tweets were from 20 content expert accounts, 86 tweets were from 24 organization accounts, and 60 tweets were from 7 official show accounts or cast members' accounts. In addition to thematic analysis, post-hoc analysis using chi-squared and fisher's exact tests revealed strong, consistent associations between the presence of thematic codes and user type, demonstrating patterns regarding motivation for using Twitter and the kind of content users tweet about in response to a television show (Table 15). Fisher's exact tests were used instead of chi-squared tests where cell counts were low.

Table 14. Thematic Codes

Theme	N(%)
Narrative Understanding	122 (17.5)
Attentional Focus	6 (0.86)
Emotional Engagement	100 (14.3)
Narrative Presence	166 (23.8)
Perceived Realism	133 (19.0)
Character Identification	48 (6.9)
Nuclear Knowledge	12 (1.7)
Nuclear Attitudes	60 (8.6)
Nuclear Behavior	20 (2.9)
Enjoyment	202 (28.9)
Promotion	107 (15.3)
Resources	83 (11.9)
Negative Response	12 (1.7)

Table 15. Thematic Codes Association with User Type (n=699)

Theme	Individual N (%)[a]	Content expert N (%)[a]	Organization N (%)[a]	Official show /cast N (%)[a]	X^2 (p)[b]
Narrative Understanding	39 (8.8)	67 (61.0)	12 (14.0)	4 (6.7)	N/A (<0.001)*
Attentional Focus	6 (1.4)	0 (0.0)	0 (0.0)	0 (0.0)	N/A (0.064)
Emotional Engagement	93 (21.0)	1 (0.9)	2 (2.3)	4 (6.7)	N/A (<0.001)*
Narrative Presence	135 (30.5)	11 (10.0)	4 (4.7)	16 (26.7)	N/A (<0.001)*
Perceived Realism	45 (10.2)	66 (60.0)	20 (23.3)	2 (3.3)	N/A (<0.001)*
Character Identification	41 (9.3)	3 (2.7)	0 (0.0)	4 (6.7)	N/A (<0.001)*
Nuclear Knowledge	10 (2.3)	2 (1.8)	0 (0.0)	0 (0.0)	N/A (0.017)*
Nuclear Attitudes	19 (4.3)	34 (30.9)	6 (7.0)	1 (1.7)	N/A (<0.001)*
Nuclear Behavior	3 (0.7)	13 (11.8)	4 (4.7)	0 (0.0)	N/A (<0.001)*
Enjoyment	191 (43.1)	3 (2.7)	5 (5.8)	3 (5.0)	N/A (<0.001)*
Promotion	18 (4.1)	18 (16.4)	48 (55.8)	23 (38.3)	176.68 (<0.001)*
Resources	8 (1.8)	55 (50.0)	20 (23.3)	0 (0.0)	N/A (<0.001)*
Negative Response	12 (2.7)	0 (0.0)	0 (0.0)	0 (0.0)	N/A (0.004)*

[a]Column percentages
[b]Fisher's exact test for small cell counts

Enjoyment

Enjoyment was the most common theme found in *Madam Secretary* tweets (n=202, 28.9%) (Table 14), and was the main focus of tweets from individual Twitter users. The majority of these tweets expressed general excitement about the show or the season finale:

"Awwww it ends so beautifully. I'm really grateful we get one more season. #MadamSecretary"

Admiration of specific characters, particularly Elizabeth McCord, the McCord family, and Kat Sandoval was also common:

"the emotion and the realism in Téa's performance is what makes this show so good, this is the kind of character we absolutely need on television @TeaLeoni #MadamSecretary"

"The McCord family is MY fave tv family #MadamSecretary"

"I love Kat! #MadamSecretary https://t.co/9VB42HB0ZT"

Other tweets commented on the excellent writing or acting, with some calling for an Emmy nomination:

> *"@MadamSecretary What an absolutely incredible episode and end to the season! Kudos to the writers that continue to create such an amazing story, and kudos to the amazing actors and all those that make this show possible. Hope next season shows up soon! #MadamSecretary"*

Lastly, a few tweets also expressed appreciation towards the show for highlighting important nuclear issues:

> *"Thank you CBS@CBS for renewing #MadamSecretary. @TeaLeoni and @TimmyDaly are great together. The season finale brought to home so many memories of growing up with the fear of nuclear war. I love how the series touches on things that matter most in our lives. Awesome dialogue!"*

Narrative Engagement

Narrative engagement consists of four dimensions: narrative understanding, attentional focus, emotional engagement, and narrative presence. Users seemed to be actively engaged in the storyline, although attentional focus was rarely mentioned in tweets. Aside from attentional focus, all other dimensions of narrative engagement were significantly associated with user type (Table 15).

Narrative understanding was demonstrated in 122 (17.5%) of original tweets. Users processed the possibility and implications of a nuclear attack or nuclear war:

> *"The emotional moments in this episode with @TeaLeoni & @TimmyDaly are simply amazing. The horror of a nuclear attack & the ramifications on leaders,*

family, friends, & the world. Bravo to #MadamSecretary for tackling this subject https://t.co/b5wUkTOoh5"

Users also demonstrated understanding and commenting or questioning on current nuclear policies on de-alerting and presidential authority to launch a nuclear strike or the need for nuclear weapons:

"Loving #MadamSecretary for addressing the dilema of dealerting nuckear weapons, risk of miscalculation and 'dehumanized' posture"

Others commented on Mount Weather and the bleak reality of being on a list of government officials that would be separated from their families if a nuclear attack were to occur. In addition, some commented on the part of the narrative that revealed that the nuclear attack was actually just a simulation and how close calls similar to what was depicted in narrative had happened in real life:

"This isn't Hollywood sensationalism! @globalzero Bruce Blair's article outlines the very real threat of the President launching on false information or a mistake due to our current alert level. #MadamSecretary https://t.co/lqXTUiyBBa"

Lastly, tweets commented on the need and potential for change, raising public awareness of nuclear policy issues, and increasing public involvement:

#MadamSecretary is right -- people need to know about the risks of our nuclear posture to their lives. We need a national dialogue about solutions

User type was significantly associated with the presence of narrative understanding (X^2=172.76, p<0.001); a little over half of these tweets were from nuclear policy content experts, revealing that content experts or advocates can and do have a role in processing the narrative and clarifying key points from the narrative for other users (Table 15).

Compared to narrative understanding, which was driven by content experts, individual Twitters users seemed to use Twitter to express emotional engagement and narrative presence. *Attentional focus* rarely appeared (n=6, 0.86%), but these tweets expressed that they were currently watching the show or binge watching the show, demonstrating viewers' focus on the story plot:

"@MadamSecretary Ive been binging season 4 recently. loving it :)"

Emotional engagement was expressed in 100 tweets (14.3%), with the most common emotion being fear or anxiety:

"Jesus! I'm just now watching the last episode of @MadamSecretary ! Talk about nerve wrecking... I'm hyperventilating here! #MadamSecretary https://t.co/O2AmPyVMS8"

Other emotions were sadness, particularly in response to the part of the storyline where Elizabeth McCord chooses to forego going to Mount Weather to stay with her family in the last moments before the alleged nuclear attack, but gasps in relief when she is informed that it was a false alarm:

"@CBS @MadamSecretary Please don't make me cry"

Other common tweets were expressing excitement or happiness about Elizabeth McCord's to run for president, a major turning point for the series:

"YAAAASSSS SHE'S GOING TO RUN FOR PRESIDENT!!! #MadamSecretary @TeaLeoni @TimmyDaly"

Narrative presence was found in 166 tweets (23.8%), demonstrating immersion into the story world. The majority of these tweets consisted of viewers' support for Elizabeth McCord's decision to run for president:

"Finally Elizabeth wants to run for president #MadamSecretary"

Other tweets were responding to the nuclear risk storyline, believing that the U.S. and Russia might soon engage in a nuclear war:

> *"O.M.G they just broke out nuclear launch codes on #MadamSecretary. What is happening?!?!"*

Also related to the nuclear risk storyline, viewers seemed to be immersed in the conversations that follow after the realization of the false alarm and Elizabeth McCord's proposal to declassify the event, problematize current nuclear policies, and raise public awareness for nuclear policy change:

> *"Maybe emotion is what is missing from the stupid so-called logic of our dehumanized nuclear posture." #MadamSecretary https://t.co/K2ETiwKtJ4"*

Several of these tweets quoted lines directly from the show.

Perceived Realism

Perceived realism was found in 133 tweets (19.0%). These tweets drew many connections to the real world, commenting on how the episode portrayed real nuclear policies, processes, and systems current in place in the U.S.:

> *"Great representation of a Launch Control Center. Got to visit one just like it at Vandenberg Air Force Base. The process depiction is also spot on. https://t.co/LYpGJJIY4c"*

For example, some tweets reinforced the reality of a possible nuclear war, particularly as a result of the current U.S. nuclear posture, but that there is potential to prevent nuclear war by raising public awareness and involvement:

"#MadamSecretary was exactly right. We cannot change outdated dangerous nuclear policies unless our leaders hear from the American public. Get involved today and help us in our fight: https://t.co/XIzvYVW7Dc)"

A few tweets also problematized the current policy that allows the U.S. president to have sole authority to launch a nuclear attack, questioning President Donald Trump's ability to make a safe, informed decision:

"@TeaLeoni Finally watched the DVRd season finale. I won't sleep tonight thinking of Trump having 5 minutes to make a retaliatory decision about nuclear war. #Bess2020 #MadamSecretary"

Lastly, some tweets also pointed out that the U.S. has actually had several close calls in the past:

"There are many more close calls then you know about. Some have been kept secret, but many are on the public record. Yes, we have survived the nuclear age so far by luck, not wise policy. #MadamSecretary https://t.co/ffyPR21xMO"

The presence of perceived realism was also significantly associated with user type (X^2=153.07, p<0.001); about 65% of these tweets were from organizations or content experts, suggesting that these groups have a role in emphasizing the accuracy of the narrative and the narrative's portrayal of current U.S. policies and systems for viewers (Table 15).

Character Identification

Character identification was not mentioned often, only appearing in 48 tweets (6.9%). Tweets often identified with Elizabeth McCord's decisions and emotions, specifically identifying her decision to not go to Mount Weather and stay behind with her family and the scene when she cries in relief after discovering that the nuclear attack was a false alarm:

"@MadamSecretary Just about gave me a heart attack! When Bess was relived, I was too and I almost cried. Love, Compassion are what will really make America Great. #ImStillWithHer #MadamSecretary @TeaLeoni"

Tweets also identified with Elizabeth McCord's character, not only as the U.S. Secretary of State, but as a mother:

"@Lakotasky Must say this episode had me in tears. The show keeps getting better. I liked when Stevie was being a brat about her boss not returning her messages and Elizabeth shut her down. Just like any mom. #MadamSecretary"

Although unrelated to the nuclear risk storyline, some users tweeted about identifying with the bisexual and trans characters on the show, expressing how they related with the portrayal of these characters:

"As a trans man, that was the most relatable thing I've ever heard on tv so thank you, @SaraRamirez #MadamSecretary #KatSandoval #LuckyKat https://t.co/GVL5nUE4tY"

Nuclear Knowledge, Attitudes, and Behaviors

To assess to what extent tweets were demonstrating changes in knowledge, attitudes, and behaviors in response to the nuclear risk storyline, thematic codes for nuclear knowledge, attitudes, and behaviors were also examined. Although nuclear knowledge, attitudes, and behaviors were rarely present in tweets, they were all significantly associated with user type (Table 15). Only a few tweets demonstrated gaining *nuclear knowledge* (n=12, 1.7%), all of which came from individual users. One tweet exhibited learning that once nuclear missiles are launched, they cannot be stopped or changed:

"#MadamSecretary –"This was a powerful episode. Elizabeth is right, there should be more safeguards to activating nuclear weapons. because if the call is wrong and the weapons are launched there is NO way to bring them back. World destroyed"

Another tweet described learning that the president has the sole authority to decide to launch a retaliatory nuclear attack:

"@TeaLeoni Finally watched the DVRd season finale. I won't sleep tonight thinking of Trump having 5 minutes to make a retaliatory decision about nuclear war. #Bess2020 #MadamSecretary"

However, with regards to outcomes, *nuclear attitudes* were the most common, found in 60 tweets (8.6%), but were mainly from content experts (Table 15). The majority of tweets that expressed nuclear attitudes consisted of anti-nuclear advocacy, such as the reduction or abolition of nuclear weapons:

"On #MadamSecretary we learned why #nuclearweapons don't make us safe. 122 nations already favor banning & totally eliminating nukes https://t.co/WMKjm3ovow https://t.co/xKm39boXh2"

There were also tweets expressing attitudes towards more specific policies, such as de-alerting land missiles:

"#MadamSecretary proposes they remove the warheads from the missiles as a way to take our systems off hair trigger alert. It's possible. This paper from @UCSUSA shows us how we can de-alert our nuclear forces: Reducing the Risk of Nuclear War (2016) https://t.co/OXic3GxQUN"

and problematizing the current policy allowing the president to have sole authority over launching a nuclear attack:

"It's time Congress put limits on the President's unilateral authority to launch a nuclear first strike. We should pass HR 669/S 200 by @RepTedLieu & me which requires @POTUS to get congressional approval before launching a nuclear first strike. #MadamSecretary https://t.co/KDnYaFyhHb"

Tweets addressing nuclear attitudes also advocated for restoring democratic processes to bring about nuclear policy change:

"#MadamSecretary was exactly right. We cannot change outdated dangerous nuclear policies unless our leaders hear from the American public. Get involved today and help us in our fight: https://t.co/XIzvYVW7Dc"

Nuclear behavior was evident in 20 tweets (2.9%). Similar to nuclear attitudes, most of these tweets were from content experts (Table 15). This makes sense given the majority of nuclear behavior tweets involved a call to action to become politically involved and increase awareness of nuclear policies:

"TAKE ACTION: It would only take 10 minutes for the President to order the launch of over 800 nuclear weapons. This is not just television. It's very, very real. Tell Congress this must be changed. #MadamSecretary https://t.co/L1v4u7Nbom https://t.co/p4815EKjI6"

Some tweets encouraged viewers to question current nuclear policies in general:

"#MadamSecretary Ask your elected officials -- all of them, state, local and federal -- what they are doing to protect you from the kind of nuclear scenario depicted in this episode"

and to question specific policies, such as de-alerting nuclear missiles:

"The concerns about de-alerting verification and re-alerting instability are valid. We need to do a deep dive on all of this. https://t.co/TbGZSKa77E #MadamSecretary"

Promotion

Promotion of the show, show finale, and outreach events related to the nuclear risk storyline appeared in 107 tweets (15.3%). As expected, most of these tweets were from organizations and official show accounts (Table 15). Tweets promoted the show or the show finale and the live tweeting from nuclear policy experts:

"See you tonight for the Season Finale of #MadamSecretary! https://t.co/aceSDbCuv8"

Tweets were also important for the promotion of events on Reddit and on Facebook for viewers to engage with Ernest Moniz, a former U.S. Secretary of Energy, and David Grae, the show's executive producer:

"Interested in @MadamSecretary, nukes, or both? Join @ErnestMoniz and #MadamSecretary Producer David Grae for an AMA on Monday 5/21 at 1PM EST following this weekend's season finale, with its nuclear missile attack storyline https://t.co/Ty2yiewJ5q"

Resources

Resources were provided in 83 tweets (11.9%). The majority of these tweets, largely from nuclear policy content experts, imparted information or facts that were related to the nuclear risk storyline. For example, one tweet clarified that nuclear missiles cannot be recalled once they are launched:

"Once a presidential nuclear use authorization is given, it takes only four to five minutes for USAF crews to launch their Minuteman ICBMs (of which there are currently 400, each armed with a single warhead). They cannot be recalled. #MadamSecretary"

Some tweets included links to additional resources, such as a timeline outlining the steps to make a decision to launch a nuclear counterstrike, a list of actual close calls similar to the one depicted in the episode, and even a nuclear decision-making game:

> *"A decision to launch a nuclear counter strike would have to be made within minutes & often with incomplete info like why would country X start a nuclear war. Here's outline of the timeline. https://t.co/A8ef8qw15R #MadamSecretary"*
>
> *"That's not the only close call we've had. Check out @OutriderFdn's worrying list of close calls over the years https://t.co/pdo6j332PR #MadamSecretary"*
>
> *"After watching the #MadamSecretary season finale, head over to PRI and play this nuclear decision-making game. https://t.co/uMDvwxaV3B"*

Negative Responses

Lastly, not all viewers responded positively to the nuclear risk storyline. Although infrequent, *negative responses* were found in 12 tweets (1.7%), all of which were from individual users (Table 15). Some tweets demonstrated how viewers' political ideologies may influence how they engage with the storyline. For example, a few tweets expressed frustration that the show was left-leaning and accused the show of making a political statement:

> *"There's a tendency for current US TV shows to be either read as being a comment on today's political situation when they're not (#TheHandmaidsTale) or literally used to comment on Trump through the thinnest of veils (#MadamSecretary) I find both of these trends hugely annoying."*

Other tweets questioned the accuracy of the show:

> *"@MadamSecretary #MadamSecretary @CBS What a lack of knowledge ignorance and stupidity of your script writers @CBS and shows of @MadamSecretary about Turkey, US*

Government is really disappointed that the coup failed? what kind of democracy works for you? there is no death penalty"

Lastly, a few tweets were not about the finale episode, but addressed sexual harassment allegations about Morgan Freeman, one of the show producers.

D. SUMMARY

In sum, findings from the social media dataset suggest that there was viewer engagement with the show on Twitter (Hypothesis 3), however viewers were not always reacting to the nuclear risk storyline. During the week that the finale episode aired, only a few tweets related to the show garnered significant attention or engagement in terms of retweets, favorites, and replies, which were from cast members and public figures. However, in terms of content, many tweets that garnered the most engagement did not necessarily involve the nuclear risk storyline. Thematic analysis of tweets revealed that most tweets expressed enjoyment of the show and its characters, followed by narrative presence and perceived realism. Post-hoc analysis using chi-squared tests revealed that the presence of some of these themes significantly differed by user type. While individual users tended to use Twitter to express enjoyment and demonstrate they were immersed in the story world, content experts and organizations played an important role in clarifying and reinforcing the intended message of the storyline.

CHAPTER 7. DISCUSSION

A. Summary of Findings

This study contemplates whether entertainment narratives can be used to shift audiences' knowledge, attitudes, and behaviors related to a potentially controversial health issue, namely around the individual and collective risk of nuclear weapons. Analysis examining overall storyline impact revealed that exposure to the nuclear risk storyline did significantly increase audiences' knowledge of nuclear issues (Aim 1). However, latent class moderation revealed there was a differential impact based on viewer subgroups defined by their political ideologies and core beliefs, such that those who were more likely to gain nuclear knowledge were viewers who already had beliefs that aligned with those implicitly supported by the nuclear risk storyline (Aims 1a and 1b).

Given the political nature of the nuclear risk storyline, considering how mechanisms of narrative persuasion can help overcome viewers' pre-existing political affiliations becomes salient. Among viewers that watched the episode, only positive emotion was a significant mediator between latent viewer subgroups (as defined by political ideologies and beliefs) and nuclear knowledge (Aim 2). However, the directions of these relationships were unanticipated, with the more conservative, hawkish, less anti-nuclear group experiencing more positive emotion, but reporting lower knowledge increases than the more liberal, dovish, more anti-nuclear group.

Findings from the social media dataset may help complement and explain some of the quantitative findings. While viewers were engaging with the show on Twitter, they were not always reacting to the nuclear risk storyline (Aim 3). Post-hoc analysis using chi-squared tests

revealed that the presence of some of these themes significantly differed by user type. Individual users tended to use Twitter to express enjoyment, emotional responses of fear or happiness and relief, and immersion into the story world. Content experts and organizations helped to clarify and reinforce the intended message of the storyline, and thus largely accounted for the presence of themes, such as narrative understanding, narrative attitudes, and behaviors, which were more directly related to the nuclear risk storyline.

B. Storyline Impact Dataset

The main objective of this research was to examine the effects of a nuclear storyline on *Madam Secretary* viewers' efficacy, knowledge, attitudes, and behavioral intentions. First, this research aimed to examine whether there was an overall storyline impact on nuclear efficacy, knowledge, attitudes, and behavioral outcomes. Then, I explored the potential differential effects of a nuclear storyline on different viewer subgroups characterized by their political ideologies and core beliefs using latent profile analysis (LPA) and moderation. Study findings suggest that entertainment narratives can be effective in educating viewers about issues of nuclear risk and security, but may not be able to shift viewers' nuclear attitudes or behaviors given they are more deeply rooted in political beliefs and values. However, only those who were more liberal, dovish, and supported more anti-nuclear policies experienced significant increases in nuclear knowledge, while those whose views were more conservative or "hawkish" in orientation did not change knowledge levels after viewing the episode.

My initial analysis demonstrated regular *Madam Secretary* viewers who watched the finale episode with the nuclear risk storyline reported greater increases in nuclear knowledge compared to those who did not watch the episode, but no significant differences were observed for nuclear attitudes or behavioral intentions. These findings support that entertainment

narratives can facilitate education around nuclear policy, which can be understood in the context of theories of narrative persuasion explaining how narratives can increase knowledge through processes of narrative engagement and transportation into the narrative world (Busselle & Bilandzic, 2008; Green & Brock, 2000). While these findings supported an increase in nuclear knowledge among those who viewed the finale episode, latent class moderation analysis revealed that not all viewers were affected equally. Previous studies examining narrative effects largely treated all viewers as the same, but the results from the LPA revealed heterogeneity among *Madam Secretary* viewers that should be acknowledged. Other studies evaluating the potential moderating effects of entertainment narratives on various health and social issues often look at one moderator at a time, such as political ideology or gender (Gillig et al., 2018; Slater et al., 2006). However, more holistic ways to evaluate these storylines could help us understand some of the nuances of narrative impact on different types of viewers.

Narratives depicting more politically controversial health issues need to address viewers' pre-existing political ideologies and core beliefs, especially if those beliefs are inconsistent with those implicitly supported by the storyline (Slater et al., 2006), thus political ideologies may significantly moderate the relationship between narrative exposure and individual nuclear knowledge, attitudes, and behavioral intentions. I conducted LPA to identify distinct subgroups among regular *Madam Secretary* viewers based on their political ideologies and core beliefs. The LPA results revealed two latent classes: (1) one class that is more liberal, dovish, and supportive of more anti-nuclear policies and (2) another class that is more conservative, hawkish, and less supportive of anti-nuclear policies. The impact of the storyline on viewers' nuclear knowledge was significantly moderated by latent viewer subgroups, where those who were more liberal, dovish, and more anti-nuclear were more likely to experience an increase in knowledge. Since

the Vietnam war, the debate over nuclear weapons has developed along distinctive ideological lines, such that liberals are often associated with the nuclear freeze movement and other anti-nuclear advocacy groups, and tend to emphasize the immorality and dangers associated with nuclear weapons (Ripberger et al., 2011). Whereas conservatives have largely remained opened to the idea that nuclear weapons provide the U.S. with strategic benefits, such as deterrence (Ripberger et al., 2011), and thus view nuclear abolition as undesirable and infeasible. Thus, this political divide could contribute to the significant moderating effects of the latent class.

Narrative persuasion theories posit that entertainment narratives can reduce message counterarguing, or resistance due to individual beliefs and attitudes that are inconsistent with the persuasive argument presented in the narrative through the processes of transportation and absorption into the narrative, thus increasing acceptance of the messages contained in the narrative (Green & Brock, 2000; Slater & Rouner, 2002). The *Madam Secretary* storyline may have failed to overcome pre-existing ideologies of the more conservative, hawkish, anti-nuclear viewer group to become fully immersed into the narrative, disrupting the experience of transportation or narrative engagement necessary to reduce counterarguing and change viewers' nuclear attitudes and behaviors.

Subsequent mediation analyses aimed to examine more closely the mechanisms contributing to viewers' increase in nuclear knowledge among those who watched the finale episode. However, results from the mediation analysis were unexpected. Narrative persuasion theories describe how narrative engagement and perceived realism are fundamental to narrative persuasion (Busselle & Bilandzic, 2008), suggesting that narrative engagement and perceived realism should allow viewers to overcome their predisposed political affiliations and experience increases in nuclear knowledge. In other words, narrative engagement and perceived realism

should mediate the relationship between viewers' political ideologies and beliefs and nuclear knowledge. However, neither of these were significant mediators of the relationship between viewers' political ideology and nuclear knowledge among those who watched the finale episode. In fact, out of the four potential mediators (narrative engagement, perceived realism, negative emotion, and positive emotion), only positive emotion had a significant indirect effect. Although positive emotion mediated the effect of pre-existing political ideologies and beliefs on nuclear knowledge, the more conservative, hawkish, less anti-nuclear class experienced greater positive emotion compared to the more liberal, dovish, more anti-nuclear class, but experienced smaller nuclear knowledge increases. The directions of these relationships were particularly challenging to interpret and explain. One possible explanation may be that the more conservative, hawkish, less anti-nuclear viewers interpreted the storyline differently than intended, such that they perceived the current systems and policies to be working and thus felt positive emotions when the crisis was averted. This highlights the importance of considering viewer characteristics and remembering that people are active agents of what they watch (Fishbein & Yzer, 2003), using their personal experiences and beliefs to interpret what they see. Further, post-hoc analysis revealed that other potential mediators of narrative persuasion, such as character identification (Cohen, 2001) or reactance (Moyer-Gusé, 2008), were also not significant, suggesting that the narrative itself may have been limited in overcoming viewers' predisposed political beliefs and values associated with nuclear policy. These findings bring attention to potential barriers to facilitating narrative persuasion, particularly in the context of communicating more politicized public health issues, competing storylines, as well as important issues of study design and questionnaire development when evaluating storyline impact.

First, study findings reveal the complexity of communicating potentially controversial public health issues. Much of the narrative persuasion research in the context of public health has focused on messages that are not politically controversial, such as breast cancer prevention (Hether et al., 2008), mental illness stigma (Caputo & Rouner, 2011), using cancer patient navigators (Marcus et al., 2010), and promoting healthy diet (Valente et al., 2007). In comparison, communicating more politicized health issues may present additional barriers given they are grounded in deeper values and beliefs. However, research in this area has been scarce (Igartua & Barrios, 2012) and mixed. Previous studies have demonstrated that fictional television narratives can change viewers' attitudes towards controversial issues, such as the death penalty (Slater et al., 2006) and transgender groups and policies (Gillig et al., 2018); however, these effects were less straightforward in other areas, such as the support of gay marriage (Slater et al., 2006). Thus, questions about how the nature of the health message and the presentation of the message may affect persuasive outcomes are important not only because they explore the theoretical boundaries of narrative persuasion mechanisms, but also because ambiguous narratives with conflicting messages and ambiguous conclusions are common in entertainment media (Cohen, Tal-Or, & Mazor-Tregerman, 2015; Draper & Lotz, 2012).

Given the nuclear risk storyline presents a potentially controversial message, findings from this study may signal the presence of selectivity, an issue that may be fundamental to the understanding of narrative persuasion in the context of more politically controversial health topics. Klapper suggested that the media merely reinforces preexisting opinions because people tend to select media that already coincide with their own opinions and interests (Klapper, 1960). The term selective exposure has since emerged to denote that media users exhibit biases in their message selection and are also affected by the messages they select for consumption (Knobloch-

Westerwick, 2015; McGuire, 2002; Zillmann & Bryant, 2013); these ideas have gained traction particularly in the current media environment, characterized by audience fragmentation and media choice (Valenzuela & Brandão, 2015). Selective exposure is particularly prone to occur when it comes to politics (Stroud, 2011). Political affiliation and ideologies have been documented to contribute to selective exposure to news programs as well as docudramas, but much less research has been done on how political affinity may lead to selective exposure of fictional television dramas (Tenenboim-Weinblatt, 2009; Valenzuela & Brandão, 2015). One study reported that political affinity did not influence motivation to watch the political show, *24*, suggesting that television dramas may serve as a platform for political discussion in an increasingly polarized news and media environment (Tenenboim-Weinblatt, 2009).

However, research thus far has not examined how selective exposure may come into play while viewers are watching a television storyline. In other words, political ideologies and beliefs may play a role in selectivity, such that political ideologies predispose viewers to specific parts of the storyline that they can agree with, while dismissing parts of the storyline that run counter to their beliefs and values. If selectivity is at work here, then the most likely effect of the narrative is to merely reinforce viewers' political attitudes and behavioral intentions (Holbert, Garrett, & Gleason, 2010; Lazarsfeld, 1948; Valenzuela & Brandão, 2015), which may explain study findings suggesting that only the latent class with more liberal, dovish, anti-nuclear affiliations experienced an increase in nuclear knowledge after watching the episode. Selectivity effects have also been observed elsewhere. For example, Slater referred to selectivity in his reinforcing spirals framework describing how media selectivity and media effects are dynamic, mutually influencing processes, creating a spiral of ongoing influence (Slater, 2007). Gillig observed a similar selectivity effect in a study examining how a fictional narrative depicting the

evolving romance between two LGBTQ teenagers instigated contrasting emotional reactions from young viewers depending on their sexual identity (Gillig & Murphy, 2016). For LGBTQ viewers, the story evoked hope and fostered positive attitudes towards LGBTQ issues. On the other hand, the narrative triggered a disgust response among heterosexual/cisgender youth, evoking more negative attitudes toward LGBTQ people and policies, indicating a "boomerang effect" (Gillig & Murphy, 2016).

Another potential explanation for study findings is related to that of study design. This study unexpectedly found that while positive emotional responses to the narrative attenuated the relationship between political ideology and viewers' nuclear knowledge, the more conservative, hawkish, less anti-nuclear latent class reported more positive emotion compared to the more liberal, dovish, more anti-nuclear class. The survey question asks individuals to report how they feel immediately after the episode, but the episode ends with a potential nuclear war being averted and an emotional final scene with Elizabeth McCord telling her husband her decision to run for president. Thus, participants may have been reporting their emotional engagement associated with another part of the storyline, unrelated to the nuclear risk storyline. Nabi and Green suggest that viewers go through an emotional flow when engaged in a narrative (Nabi & Green, 2015), thus viewers may have experienced more negative emotional engagement, such as fear, anxiety, or anger, earlier in the storyline leading up to the climax of discovering that the nuclear attack was a false alarm, which was not adequately captured by the wording of the survey question.

Another issue related to study design is the implementation of the storyline. Considering that reinforcement is the most likely outcome of partisan selective exposure (Holbert et al., 2010; Lazarsfeld, 1948; Valenzuela & Brandão, 2015), communication strategies that avoid mere

reinforcement of already existing ideologies and beliefs need to be considered. For example, it may be conservative to believe that a single storyline would be able to facilitate significant changes in nuclear attitudes and behaviors, given these are deeply rooted in individual values and worldviews. Exposure to more narratives in the media about socio-political issues, such as attitudes towards LGBTQ groups, has been found to be more effective (Gillig et al., 2018). Thus, more exposure to nuclear security narratives with similar messages regarding the dangers of the hair trigger alert through a multi-episode storyline or integrating the message into a major story arc may be required to improve political awareness and engagement in these issues. In addition to increasing exposure of nuclear risk narratives that problematize the hair trigger alert and the risk that nuclear weapons pose on public health, providing an alternative frame for considering an issue that is attractive to those for whom the message would normally be counter-attitudinal may be another effective strategy (Slater et al., 2006). For example, in the context of nuclear policy, reframing the issue as a public safety issue may be an alternative frame that is less partisan.

C. Social Media Dataset

To examine how Twitter users were engaged and responded to the nuclear risk storyline on *Madam Secretary*, I conducted a content analysis of tweets generated about *Madam Secretary* during the week that the season finale aired. Moreover, Twitter analysis could also help explain nuances in the findings from the viewer survey. Twitter results revealed several observations about narrative engagement and immersion into the story world, as well as how the narrative itself may facilitate or be a barrier to viewer engagement with the nuclear risk storyline. Lessons learned from these findings will be helpful in informing health communication research and practice utilizing narratives and popular media.

First, tweets from official show accounts, cast members, and content experts played an important role in promoting the show and the nuclear risk storyline, as well as reinforcing the intended message about reducing nuclear risk. Tweets from professionals or content experts are often excluded from research in health communication that occurs on social media (Lee, DeCamp, Dredze, Chisolm, & Berger, 2014; Walker & Burns, 2019); however, study findings suggest tweets from cast members, politicians, and other public figures, as well as context experts, that reinforced the health messaging were particularly important to how viewers understood and responded to the nuclear risk storyline. These tweets garnered the most replies, retweets, and favorites, thus expanding the reach of these tweets beyond *Madam Secretary* viewers and into viewers' own networks, suggesting that tweets from public figures were important gatekeepers who helped maximize message dissemination.

In addition to expanding the reach of the nuclear risk message, tweets from public figures and content experts were essential in clarifying or reinforcing the intended message. While narrative understanding of the storyline was present in almost 20% of original tweets, many of these tweets were from content experts. These tweets focused on the nuclear risk messaging and provided thought-provoking commentary, encouraging viewers to think about whether they agree with current nuclear policies, including first-use policy and de-alerting nuclear missiles, as depicted in the episode. About half of the tweets mentioning perceived realism were from content experts, emphasizing timely relevance and accuracy of the storyline by drawing connections to the real world and instilling a sense of urgency to take action. Some tweets even included links to additional resources (11.9%), such as a timeline outlining the steps made to make a decision to launch a nuclear counterstrike, a list of actual close calls similar to the one depicted in the episode, related academic papers or articles, and even a nuclear decision-making

game. Similarly, another study found that while a Kenyan television drama promoting national unity depicted its message more ambiguously, the show's Facebook page was much more explicit in its promotion of the intended message of national unity and identity (Tully & Ekdale, 2014).

Although there may be a danger in content that is overtly persuasive due to reactance and counterarguing (Moyer-Gusé, 2008; Quick, Kam, Morgan, Montero Liberona, & Smith, 2015; Quick, Shen, & Dillard, 2013), other studies have found that explicit appeals about the health messaging in a television show do not necessarily incite a negative response, particularly if the messages are from cast members with whom viewers may already have a parasocial relationship with (Cohen, Alward, Zajicek, Edwards, & Hutson, 2018; Hoffman et al., 2018; Moyer-Gusé et al., 2012). For example, a tweet from Téa Leoni asked viewers if they knew how many times nuclear attack "close calls" like the one depicted in the episode occurred. Interestingly, this study expands this idea by demonstrating that even though viewers did not have an established relationship with content experts, they did not exhibit negative responses or comment on their perceived persuasive intent. Online health information is perceived differently when the source of the information is a professional rather than a layperson (Hu & Shyam Sundar, 2010; Walker & Burns, 2019). Thus, content experts may be perceived as credible and taken more seriously when individuals assess online sources (Freeman & Spyridakis, 2004; Walker & Burns, 2019). Moreover, the official show accounts repeatedly tagged some content experts when promoting events associated with the finale episode, potentially contributing to their perceived credibility.

Tweets responding to the season finale episode generally seemed to be well received by the audience. Enjoyment was the most common thematic code (28.9% of original tweets), with viewers expressing a range of positive responses, including general admiration of the show, its

characters, the acting and writing, and an appreciation towards the show for addressing difficult topics, like issues of nuclear risk and nuclear security. Given that enjoyment has often been identified as an essential motivator for audiences to use media (Bilandzic & Busselle, 2011; Nabi & Krcmar, 2006), enjoyment of the program is a fundamental precursor to watching the episode and exposure to the health messaging. Enjoyment is also closely related to narrative engagement because it entails escape—both losing awareness of the actual world and entering the fictional world, where they can assume characters' experiences and motivations (Bilandzic & Busselle, 2011).

Viewers also demonstrated that they were actively engaged in the narrative, however some tweets suggested that viewers may have been engaged with other storylines within the same episode. Busselle and Bilandzic's construct of narrative engagement consists of four dimensions: narrative understanding, attentional focus, emotional engagement, and narrative presence, which served as thematic codes for the tweet analysis. Out of these four dimensions, findings suggest that viewers mainly experienced narrative presence, or being immersed in the story world, which may help facilitate the nuclear risk message to viewers. However, most of the tweets indicating narrative presence were responding to Elizabeth McCord's decision to run for president. The tweets that did respond to the nuclear risk storyline commented on the potential for the U.S. and Russia to engage in nuclear warfare or demonstrating relief that it was a false alarm. Some tweets also directly quoted lines from the show demonstrating immersion into the story world and resonating with the dialogue. This might suggest that screenwriters have an important role in providing poignant lines that can help reinforce the message. For example, in this study, specific lines or phrases were repeatedly quoted in tweets, such as "dehumanized nuclear posture," "What if these missiles don't protect us nearly as much as they threaten us?",

and “Let’s scare the crap out of America!” Similar to the concept of a catchphrase or slogan used in marketing and mass media campaigns, utilizing unique and creative phrases may be helpful for viewers to remember and disseminate the health message (Noar, 2006).

In response to the nuclear risk storyline, viewers were simultaneously emotionally engaged in the narrative, exhibiting negative emotions of fear, anxiety, and surprise, as well as positive emotions, such as relief and happiness. Viewers were responding with fear and anxiety to the nuclear risk storyline, especially as the narrative climaxed to directing the chain of command to launch the nuclear counterattack against Russia. However, this was followed by relief when they realized it was a false alarm. In particular, viewers seemed to find the scene when Elizabeth McCord cries in relief after being notified that the attack was a false alarm (momentarily believing they were sharing their last moments together as a family at the arcade) to be particularly moving. Viewers also expressed excitement and happiness, however this was largely in response to Elizabeth McCord’s decision to run for president in the final scene. Emotion is a fundamental part of the narrative experience (Cupchik, 1995; Nabi & Green, 2015; Oatley, 1999), with more emotional arousing messages achieving better recall and generally considered more effective compared to less emotional messages (Dunlop, Wakefield, & Kashima, 2008). Specifically, a heightened emotional response may be a necessary component for transportation into a narrative and into the story world (Green & Brock, 2000). Emotional engagement may also help sustain viewer attention, promoting cognitive states that are conducive to narrative involvement and persuasive influence (Nabi & Green, 2015). Compared to emotional reactions to Elizabeth McCord’s decision to run for president, tweets expressed more negative emotions, such as surprise and fear, towards the nuclear risk storyline. Some evidence supports that negative affect, compared to positive affect, can increase information

processing (Nabi, 2002a; Nabi, 2002b; Petty, 1998; Schwarz, 1996); thus instigating negative emotions, such as fear, may be an effective way to communicate issues of nuclear risk.

Although viewers demonstrated various dimensions of narrative engagement, few tweets demonstrated change in nuclear knowledge, attitude, and behavior outcomes. There are some potential explanations for the lack of observing these thematic codes. First, even though popular media is a source of information for audiences, individuals are still motivated to watch dramas for entertainment rather than education purposes (Hoffman et al., 2018; Mutz & Nir, 2010). Thus, tweets focusing on expressing general enjoyment or commenting on the plot and characters, rather than what viewers learned or intended behavior may not be surprising. This limitation may suggest that Twitter alone may be an inadequate measure of audience impact. Rather, Twitter can provide useful data that can complement survey data measuring narrative impact, offering alternative or more nuanced explanations to survey findings. Future studies may use social network analysis to complement content analysis of tweets to shed light on retweeting or response patterns, revealing what kind of tweets become viral and a deeper analysis of Twitter threads that occur in response to the narrative.

Moreover, Twitter analysis revealed that competing storylines may also be a barrier to viewer engagement in the nuclear risk storyline. Elizabeth McCord running for president was a dominant topic of the tweets responding to the finale episode, particularly from individual user accounts. While the nuclear risk storyline was a single-episode storyline, Elizabeth McCord's decision to run for president presented a major cliffhanger to the ongoing show storyline that may have unintentionally overshadowed the nuclear risk storyline. This brings into question the importance of storyline placement, which is typically overlooked when evaluating narrative impact. While featuring the health storyline into the season finale may increase reach,

positioning it within a major storyline that is irrelevant to the health message may compromise the impact of the health storyline. Thus, intertwining the health storyline into a major storyline or using a multi-episode storyline rather than a single-episode storyline may produce a clearer and more sustained effect on viewers.

D. Understanding Survey Results within the Twitter Discourse

This dissertation implements a unique mixed methods approach to understanding the impact of a nuclear risk storyline on viewers' related knowledge, attitudes, and behaviors. Results from the storyline impact dataset suggested that the effects of the nuclear risk storyline were rather weak, such that the storyline only increased nuclear knowledge among viewers who already had political ideologies that were aligned with those implicit to the storyline, indicating a reinforcement effect. These findings may be better understood within the context of the results from the Twitter data. Results from the media content analysis of tweets suggested that while there were themes demonstrating mechanisms of narrative persuasion at work, audiences were not always responding to the nuclear risk storyline, but with another competing storyline (Elizabeth McCord deciding to run for president) or the show in general. In fact, it was the nuclear policy content experts and some of the official show accounts or cast members that seemed to drive most of the conversation directly related to the nuclear risk storyline. Given that Twitter captures how individuals respond and discuss the show in an organic environment without any prompt, the online discourse provides insight into what parts of the narrative that audiences are responding to and how they interpret the narrative. This can therefore reveal how other elements at the forefront can undermine the health message that is trying to be communicated. In this particular case, the nuclear risk message may have been subordinate to the major arc of character development leading to the main protagonist announcing her plans to run

for president. Thus, the mixed methods approach highlights how social media data can help contextualize the findings from the viewer panel survey and provide possible explanations as to why the nuclear risk storyline may have had a limited impact on audiences.

E. Strengths and Significance

This study is positioned at a very timely moment in history. The current U.S. administration has recently withdrawn from international agreements to reduce nuclear arsenals and has instead expanded plans to modernize its nuclear arsenal, increasing the capacity for nuclear weapons production. These decisions have implications for public health as nuclear policies can prevent the occurrence and negative health effects of a nuclear arms race, nuclear war, and nuclear accidents. This study thus contemplates how we can communicate politicized health issues, like those related to nuclear risk and security, in a way that can effectively inform and engage the public, particularly in the current politically polarized climate.

Previous entertainment narratives on television and films featuring nuclear issues did not intentionally expand on factors leading up to the war, relevant nuclear policies, or propose any solutions (Fiske, 1986; Granberg & Faye, 1972), which may explain mixed findings of their impact. This study uses a carefully crafted storyline informed by nuclear policy experts, providing a unique opportunity to study the effectiveness of a television storyline aimed to address a political issue on persuasive outcomes that are more consistent with its presentation.

This study also has several methodological strengths. In the context of politicized health messages, narratives must overcome viewers' pre-existing political ideologies and beliefs to initiate changes in related knowledge, attitudes, and behaviors. Previous research often treated individual characteristics like political ideology simplistically by adjusting for them as covariates or as a moderator represented by a single variable. This study used latent profile analysis to

better reflect the multi-dimensional nature of political ideologies, constructing a more holistic profile of viewer subgroups. Lastly, this study implemented a unique mixed-methods approach utilizing both survey and social media data to examining how audiences engage and respond to entertainment narratives.

Implications for Research

Study findings have implications for research on narrative persuasion and relevant theory. While narrative persuasion theories acknowledge the role of viewer characteristics, the focus of these theories tend to be the mediators, such as narrative engagement, transportation, or character identification. However, this study highlights the value of examining the role of viewer characteristics more carefully. Moreover, prior research often treats individual characteristics like political ideology simplistically by adjusting for them as covariates or as a moderator represented by a single variable. This study used latent profile analysis to better reflect the multi-dimensional nature of political ideologies, constructing a more holistic profile of viewers. Lastly, mixed methods approaches are valuable for evaluating narrative impact. In addition to survey data, social media monitoring allows for the examination of viewer engagement in a more organic environment outside of an experimental setting, which can provide useful nuanced explanations of how viewers are engaged, what part of the narrative they are focused on, and who is driving the conversation.

Implications for Practice

This study also has implications for practice when using fictional television narratives for health messaging. First, while fictional television narratives can help educate viewers and raise awareness of public health issues, careful implementation of the health storyline, particularly depicting health messages that are potentially politically controversial, is essential. Identifying

competing storylines that may compromise the impact of the health storyline, utilizing multi-episode storylines, as well as reframing the health message as a less partisan issue to avoid selectivity may be effective strategies. Second, reinforce the message. Viewers may quote the show dialogue directly, thus using poignant phrases or words that can clarify the message can help to reinforce the intended message. Moreover, content experts and public figures also have an important role in maximizing reach and clarification of the message.

F. Limitations

This study is not without its limitations. First, the study sample was not a representative sample and was restricted to those who are regular viewers of *Madam Secretary*; thus, findings from our study are only generalizable to this population. Moreover, age significantly predicted returning to complete the follow-up survey, further influencing generalizability of the findings. In addition, for interpretability of the latent classes, I characterized one class as more liberal, dovish, and anti-nuclear and the other class as more conservative, hawkish, and less anti-nuclear; however, it is important to note that while these labels seem binary, they are representing continuous variables. The implementation of the storyline may have also limited the effects of the episode on viewer outcomes. In particular, although examining the impact of a single storyline may be an effective way to control examining the effects of a narrative, a single-episode storyline may not be sufficient in changing viewer knowledge, attitudes, and behaviors compared to an entire serial or multi-episode storyline that can develop characters and the plot increasing narrative engagement over time.

The storyline impact dataset itself also presented some limitations. Constructs like efficacy and perceived realism are limited by the variables available in the dataset. For example, in this study, efficacy is operationalized as whether respondents felt that the risk of a nuclear

attack on the U.S. or a nuclear accident could be effectively limited, which has been similarly operationalized in other studies (Tyler & McGraw, 1983). However, this may capture only a specific dimension of efficacy, excluding other related dimensions, such as the extent to which individuals feel they or citizens like them can play a role in reducing the threat of nuclear war (Lee Fox & Schofield, 1989). The wording of some survey items may have also skewed or complicated study findings. For example, the questions asking respondents to report discrete emotions asked viewers how they felt immediately after the episode, which may not capture how they felt earlier in the episode.

Lastly, there remain several challenges with the data collection and analysis of Twitter data. Because Twitter's Search API does not collect tweets in real-time, any tweets that have been deleted or are from deleted user accounts will be excluded from the dataset. If there is a systematic pattern to the deletion of these tweets, this could unintentionally contribute to selection bias. In addition to data accessibility, it cannot be ensured that the tweets collected are from users who actually viewed the finale episode or if they are regular *Madam Secretary* viewers. Moreover, Twitter users who engage with *Madam Secretary* online may be different from those who do not engage online, also contributing to potential selection bias. Signal to noise issues (i.e., validity of hashtags) may also be of concern. For example, the hashtag "#madamsecretary" may not capture all tweets that mention the show and are relevant to the discussion of the finale episode. These limitations will need to be considered when interpreting study findings.

CHAPTER 8: CONCLUSION

Finding innovative ways to promote awareness and engagement with nuclear policy is relevant and timely. Given the success of entertainment narratives in other areas of public health, such as reproductive health, using television narratives to address issues of nuclear risk and security provides a unique opportunity that has not yet been implemented. However, communicating health messages that can be politically controversial presents unique challenges. Narratives must overcome deeply ingrained ideologies and beliefs to allow for the engagement and immersion needed to change their political opinions and attitudes. This study found that a nuclear risk storyline can educate viewers and raise awareness of issues of nuclear risk and security. Entertainment content may lower viewers' expectations for explicitly persuasive content because viewers tend to watch fiction mainly as a source of entertainment (Mutz & Nir, 2010). Thus, exposure to fictional television dramas may not be as susceptible to selective exposure compared to news programs or late night comedy shows (Tenenboim-Weinblatt, 2009). Accordingly, fictional television may serve as an appropriate "cultural forum" in which socially important issues are raised for public consideration and discussion (Newcomb & Hirsch, 1983; Tenenboim-Weinblatt, 2009).

Moreover, understanding narrative persuasion, particularly persuasive messages addressing more politically controversial health issues, is still being understood. Extant literature on the persuasive impact of fictional television narratives typically rely on traditional main effects analyses examining the impact of a whole program or single storyline. These approaches to evaluation have involved a wide variety of research designs and methodologies, including viewer surveys, online analytics tracking, and laboratory experiments. However, traditional main

effects analyses may obscure the benefit of these kind of storylines for specific subgroups of viewers. Consequently, we may be missing information about nuances among viewers and how differences among them can affect desired outcomes of knowledge, attitudes, and behaviors. In this study, latent profile analysis and moderation revealed that only viewers with political ideologies and beliefs that were already aligned with the nuclear risk message experienced changes in knowledge, suggesting a potential reinforcement effect. Subsequent mediation analysis examining mechanisms of narrative persuasion among those who watched the episode also revealed curious findings that suggested that the latent viewer subgroup that was more conservative, hawkish, and had less anti-nuclear affiliations experienced more positive emotion, but learned less than the group that was more liberal, dovish, and more anti-nuclear. Collectively, these findings revealed potential issues with selectivity and implementation that may have affected results. Shedding light on these nuances demonstrates the potential value of data analysis techniques such as latent profile analysis, which employs a more person-centered approach that can contribute to understanding differences among viewers and how this may contribute to differential effects of the storyline on viewer subgroups. In other words, this study utilized methodologies that can be used to identify and understand the profiles of viewers that are likely to be influenced most from these kinds of narratives than others. These methods can then be replicated in other evaluation studies of narrative impact to understand how viewers are responding to these narratives and how or why certain subgroups may be affected more from these initiatives.

While most narrative impact studies follow a traditional media effects approach by examining whether goals were met through specific viewer knowledge, attitude, and behavior change measures, fewer studies have explored how viewers create meaning through their

interaction with the narrative (de Block, 2012; Guttman et al., 2008; Skuse, 2007; Sypher, 2002; Tully & Ekdale, 2014). With the emergence of social media, analyzing how viewers discuss and engage with one another online can provide insight on how viewers are personally responding to these storylines in an uncontrolled, organic online environment. This study addresses this gap by implementing a unique mixed methods methodological approach that combines survey data with Twitter data to evaluate the effectiveness of a nuclear risk storyline. Content analysis of tweets related to *Madam Secretary* during the week that the finale episode aired revealed that content experts and public figures have a major role in increasing the reach of the message and also reinforcing and clarifying the intended message. In addition, viewers demonstrated active narrative engagement, but the majority of these tweets were about a competing storyline, which may have overshadowed the nuclear risk storyline. Tweets actually responding to the nuclear risk storyline, rarely demonstrated changes in nuclear knowledge, attitude, and behaviors, but rather used tweets to express enjoyment, immersion into the story world, and emotions of fear and relief. In conclusion, this research has shown how entertainment narratives can be an effective way of educating audiences about health issues that may be considered politically controversial and presents implications for how efforts utilizing fictional television narratives as a means for social change should concentrate their efforts.

APPENDIX

A. Baseline/Pre-test Viewer Panel Survey

Landing Page

Welcome!

The University of Southern California is doing a survey on various social and policy issues in TV, and would love to hear your opinions!

First you will be asked a few questions to determine whether you qualify. Then you will be asked to answer some questions about your media consumption and your attitudes on certain social and policy issues. This will take no more than 15 minutes, and your participation is totally voluntary. In about a week, your survey panel may contact you again to take a follow-up survey, which will take about 10 minutes.

If you take this survey on your phone, try rotating your phone to view it in "landscape" mode. Make sure to use the arrows at the bottom of the page, instead of your browser navigation buttons, to go to the next page.

We care about the quality of our survey data and hope to receive the most accurate measures of your opinions, so it is important to us that you thoughtfully provide your best answer to each question in the survey.

Do you commit to providing your thoughtful and honest answers to the questions in this survey?

- ○ I will provide my best answers
- ○ I will not provide my best answers
- ○ I can't promise either way

1. How old are you?

Resident

2. What U.S. state do you live in?

Viewing

3. Which of the following TV shows have you ever watched?

(Check all that apply)

- ☐ 1. Empire (FOX)
- ☐ 2. For the People (ABC)
- ☐ 3. Madam Secretary (CBS)
- ☐ 4. NCIS: Los Angeles (CBS)
- ☐ 5. Roseanne (ABC)
- ☐ 6. None of the above

3a. How often do you watch each of these shows in the current (2017-2018) season?

	Rarely (seen 1 or 2 episodes)	Occasionally (seen several episodes)	Most episodes	Every episode
» 1. Empire (FOX)	○	○	○	○
» 2. For the People (ABC)	○	○	○	○
» 3. Madam Secretary (CBS)	○	○	○	○
» 4. NCIS: Los Angeles (CBS)	○	○	○	○
» 5. Roseanne (ABC)	○	○	○	○
» 6. None of the above	○	○	○	○

3b. How likely are you to watch the upcoming 2018 season finale of each of these shows?

	Unlikely	Not sure	Likely to watch within a MONTH	Likely to watch within a WEEK	Likely to watch LIVE or NEXT DAY
» 1. Empire (FOX)	○	○	○	○	○
» 2. For the People (ABC)	○	○	○	○	○
» 3. Madam Secretary (CBS)	○	○	○	○	○
» 4. NCIS: Los Angeles (CBS)	○	○	○	○	○
» 5. Roseanne (ABC)	○	○	○	○	○
» 6. None of the above	○	○	○	○	○

3c. On what platform do you typically watch each of these shows?

	Live TV	DVR or On Demand	Hulu	Netflix	Other
» 1. Empire (FOX)	○	○	○	○	○
» 2. For the People (ABC)	○	○	○	○	○
» 3. Madam Secretary (CBS)	○	○	○	○	○
» 4. NCIS: Los Angeles (CBS)	○	○	○	○	○
» 5. Roseanne (ABC)	○	○	○	○	○
» 6. None of the above	○	○	○	○	○

Consent Form - New Participants

University of Southern California
Annenberg School for Communication and Journalism

INFORMATION SHEET FOR EXEMPT NON-MEDICAL RESEARCH

TV and Social Issues

You are invited to participate in a research study being conducted by the Annenberg School for Communication and Journalism at the University of Southern California because you are

a U.S. resident who is aged 18 or older and indicated you watch popular TV shows on a regular basis. Research studies include only people who voluntarily choose to take part. This document explains information about this study. You should ask questions about anything that is unclear to you.

PURPOSE OF THE STUDY

We are studying the relationship between entertainment and people's knowledge, beliefs, attitudes, and behavior and would like to learn about your thoughts on various social and policy issues.

PARTICIPANT INVOLVEMENT

If you agree to take part in this study, you will be asked to answer some questions about your media habits, your knowledge and attitudes regarding various social and policy issues, and your personal characteristics. The survey should take no more than 15 minutes to complete. You do not have to answer any questions you don't want to.

If you meet certain requirements, you may be contacted again in about a week to participate in a follow-up survey. This second survey will take no more than 10 minutes. Both surveys are voluntary.

PAYMENT/COMPENSATION FOR PARTICIPATION

If you agree to take part in this study, you will be compensated in some form. The specific type of compensation will vary depending on the panel you are part of (it may include cash, airline miles, gift cards, redeemable points, sweepstakes entrance, or vouchers). Please contact your panel manager with any questions related to compensation.

CONFIDENTIALITY

Your answers to the questions on the survey will be confidential. There will be no identifiable information obtained in connection with this study. Your name, address, or other identifiable information will not be collected. The two surveys will be linked via a unique ID that will automatically be generated and assigned to you through the survey software. The research team will not be able to link your ID back to you. The anonymous data will be stored on a password-protected computer. Only members of the research team, the funding agency, and the University of Southern California's Human Subjects Protection Program (HSPP) may access the data. The HSPP reviews and monitors research studies to protect the rights and welfare of research subjects.

INVESTIGATOR CONTACT INFORMATION

Principal Investigator Erica Rosenthal at erosenth@usc.edu

IRB CONTACT INFORMATION

University Park Institutional Review Board (UPIRB), 3720 South Flower Street #301, Los Angeles, CA 90089-0702, (213) 821-5272 or upirb@usc.edu

- ○ I agree to participate in this survey
- ○ I do not want to participate in this survey

Outcomes

4. To what extent do you oppose or support the following U.S. foreign policies (or policy proposals), on a scale from 1 (strongly oppose) to 7 (strongly support).

	Strongly Oppose 1	2	3	Neutral 4	5	6	Strongly Support 7
Sending ground troops into Syria to fight ISIS	○	○	○	○	○	○	○
Reducing the U.S. stockpile of nuclear weapons	○	○	○	○	○	○	○
Withdrawing from the Iran Nuclear Deal	○	○	○	○	○	○	○
Relocating the U.S. Embassy in Israel from Tel Aviv to Jerusalem	○	○	○	○	○	○	○
Taking land-based nuclear missiles off hair-trigger alert status	○	○	○	○	○	○	○
Withdrawing from NATO	○	○	○	○	○	○	○
Military use of enhanced interrogation tactics, such as waterboarding	○	○	○	○	○	○	○
Accepting Syrian refugees	○	○	○	○	○	○	○

	Strongly Oppose 1	2	3	Neutral 4	5	6	Strongly Support 7
Establishing a nuclear agreement or treaty with North Korea	○	○	○	○	○	○	○

5. How much of a threat do you believe each of the following is to the United States, from 1 (not at all threatening) to 7 (extremely threatening)?

	Not at all threatening 1	2	3	4	5	6	Extremely threatening 7
Cyber attacks	○	○	○	○	○	○	○
Nuclear attack by U.S.	○	○	○	○	○	○	○
Nuclear attack against U.S. by a foreign power	○	○	○	○	○	○	○
Climate change	○	○	○	○	○	○	○
Democratic party	○	○	○	○	○	○	○
Republican party	○	○	○	○	○	○	○
U.S. media	○	○	○	○	○	○	○
Domestic terrorism	○	○	○	○	○	○	○
Facebook	○	○	○	○	○	○	○
Islamic terrorism	○	○	○	○	○	○	○
Vladimir Putin	○	○	○	○	○	○	○
Illegal immigration	○	○	○	○	○	○	○
Opioid addiction	○	○	○	○	○	○	○
Donald Trump	○	○	○	○	○	○	○
Accidental nuclear launch	○	○	○	○	○	○	○

6. How fearful are you about each of the following affecting you (or your loved ones) in the next 12 months?

	Not at all fearful 1	2	3	4	5	6	Extremely fearful 7
Mass shooting	○	○	○	○	○	○	○

	Not at all fearful 1	2	3	4	5	6	Extremely fearful 7
Terminal illness	○	○	○	○	○	○	○
Hate crime	○	○	○	○	○	○	○
Nuclear accident	○	○	○	○	○	○	○
Gang violence	○	○	○	○	○	○	○
Nuclear attack on the U.S.	○	○	○	○	○	○	○
Terrorist attack	○	○	○	○	○	○	○
Serious car accident	○	○	○	○	○	○	○

7. To what extent do you feel the risk of each of the following can effectively be limited or minimized, from 1 (not at all) to 7 (definitely)?

	Not at all 1	2	3	4	5	6	Definitely 7
» Terrorist attack	○	○	○	○	○	○	○
» Nuclear attack on the U.S.	○	○	○	○	○	○	○
» Hate crime	○	○	○	○	○	○	○
» Serious car accident	○	○	○	○	○	○	○
» Mass shooting	○	○	○	○	○	○	○
» Nuclear accident	○	○	○	○	○	○	○
» Gang violence	○	○	○	○	○	○	○
» Terminal illness	○	○	○	○	○	○	○

8. What does the term "hair-trigger alert" refer to?

- ○ 1. The perception that the U.S. President might be irrational or volatile
- ○ 2. A U.S. military policy that maintains nuclear weapons in ready to launch status
- ○ 3. A U.S. military policy that permits equal response to provocations by foreign leaders
- ○ 4. U.S. military simulations of potential responses by foreign leaders to the U.S. President's provocations
- ○ 5. A warning statement preceding content (such as video or writing) that may be distressing

9. How would you rate your knowledge on U.S. foreign policy issues?

- ○ 1. Not at all knowledgeable
- ○ 2. Slightly knowledgeable
- ○ 3. Moderately knowledgeable
- ○ 4. Very knowledgable
- ○ 5. Extremely knowledgable

10. Please indicate the extent to which you agree with these statements, on a scale from 1 (strongly disagree) to 7 (strongly agree).

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
A. I generally favor U.S. military intervention in conflicts with foreign countries	○	○	○	○	○	○	○
B. I generally favor diplomatic solutions in conflicts with foreign countries before U.S. military intervention	○	○	○	○	○	○	○
C. The U.S. military should only be involved in conflicts when the U.S. faces a direct and imminent threat	○	○	○	○	○	○	○

11. Is it possible to turn a missile around or change the trajectory once it has been launched?

- ○ 1. No
- ○ 2. No, but the U.S. military can shoot it down
- ○ 3. Yes, but only while the missile is gaining altitude
- ○ 4. Yes, but only until 5 minutes before it hits the target

12. Under what circumstances would you approve of the U.S. using nuclear weapons?

(Check all that apply)

- ☐ 1. In retaliation against another nuclear-armed country
- ☐ 2. In retaliation against a non-nuclear-armed country
- ☐ 3. First strike against another nuclear-armed country
- ☐ 4. First strike against a non-nuclear-armed country
- ☐ 5. Under no circumstances

Political engagement

13. How often do you pay attention to politics and elections?

- ○ 1. Never
- ○ 2. Rarely
- ○ 3. Occasionally
- ○ 4. Frequently
- ○ 5. All the time

14. Are you registered to vote?

- ○ 1. Yes
- ○ 2. No, but planning to register in time to vote in November 2018
- ○ 3. No, not planning to vote in November 2018
- ○ 4. Not eligible to register
- ○ 5. Not sure

15. Please indicate your likelihood of engaging in the following **online** activities in the next six months.

	Not at all likely			Neither likely nor unlikely			Extremely likely
	1	2	3	4	5	6	7

	Not at all likely 1	2	3	Neither likely nor unlikely 4	5	6	Extremely likely 7
A. Access official websites or social media of political candidates	○	○	○	○	○	○	○
B. Sign up online as a supporter for a political cause	○	○	○	○	○	○	○
C. Use online tools to campaign/promote parties	○	○	○	○	○	○	○
D. Join a political group online or on social media	○	○	○	○	○	○	○
E. Post political comments online or on social media	○	○	○	○	○	○	○
F. Please select not at all likely for this question	○	○	○	○	○	○	○
G. Share political content online or on social media	○	○	○	○	○	○	○
H. Sign an online petition	○	○	○	○	○	○	○

16. Please indicate your likelihood of engaging in the following **offline** activities in the next six months.

	Not at all likely 1	2	3	Neither likely nor unlikely 4	5	6	Extremely likely 7
A. Sign a petition offline	○	○	○	○	○	○	○
B. Discuss politics with family	○	○	○	○	○	○	○
C. Discuss politics with friends	○	○	○	○	○	○	○
D. Volunteer for a candidate (or a cause)	○	○	○	○	○	○	○

	Not at all likely 1	2	3	Neither likely nor unlikely 4	5	6	Extremely likely 7
E. Donate to a candidate (or a cause)	○	○	○	○	○	○	○
F. Call or write to an elected representative	○	○	○	○	○	○	○
G. Participate in a political rally, march, or demonstration	○	○	○	○	○	○	○
H. Attend in-person meetings of a political group	○	○	○	○	○	○	○
I. Engage in direct voter outreach through canvassing or text/phone banking	○	○	○	○	○	○	○
J. Register voters	○	○	○	○	○	○	○
K. Vote in primary election	○	○	○	○	○	○	○
L. Vote in general election (November)	○	○	○	○	○	○	○

17. How likely are you engage in **offline** activism or advocacy on the following issues?

(This might include actions like attending meetings, volunteering, donating funds, protesting, or contacting elected representatives.)

	Extremely unlikely 1	2	3	Neither likely nor unlikely 4	5	6	Extremely Likely 7
1. DACA (Deferred Action for Childhood Arrivals)	○	○	○	○	○	○	○
2. Gun control	○	○	○	○	○	○	○
3. Restrictions on travel to the U.S.	○	○	○	○	○	○	○
4. Reducing nuclear risks	○	○	○	○	○	○	○

	Extremely unlikely 1	2	3	Neither likely nor unlikely 4	5	6	Extremely Likely 7
5. Climate change	○	○	○	○	○	○	○
6. Affordable health care	○	○	○	○	○	○	○

18. How many days per week do you watch, listen to, or read news on any media?

	0	1	2	3	4	5	6	7
Number of days/week								

19. From which of the following sources do you typically receive news?

(Check all that apply)

- ☐ 1. National broadcast network television news programs (NBC, ABC, CBS, etc.)
- ☐ 2. Local broadcast networks television news programs (local affiliates of NBC, ABC, CBS, etc.)
- ☐ 3. Cable news programs (Fox News, CNN, MSNBC, etc.)
- ☐ 4. Comedy or satirical news programs (The Daily Show, Last Week Tonight with John Oliver, Real Time with Bill Maher, etc.)
- ☐ 5. Television talk shows, public affairs, or news analysis programs
- ☐ 6. Newspapers
- ☐ 7. Internet sites, chat rooms, or blogs
- ☐ 8. Radio news or talk shows, or podcasts
- ☐ 9. Social media
- ☐ _____ 10. Other:
- ☐ 11. None of the above

Demographics

Almost done! Just a few more questions.

20. What is your gender?

- ○ 1. Male
- ○ 2. Female
- ○ _____ 3. Other gender identification:

21. How would you describe your race/ethnicity? (Check all that apply)

- ☐ 1. White/Caucasian (Non-Hispanic)
- ☐ 2. Black/African American
- ☐ 3. Hispanic/Latino(a)
- ☐ 4. Middle Eastern
- ☐ 5. East Asian
- ☐ 6. South Asian
- ☐ 7. Pacific Islander
- ☐ 8. American Indian/Native Hawaiian/Alaska Native
- ☐ _____ 9. Other (Specify):

22. What is your marital status?

- ○ 1. Single or not living with partner
- ○ 2. Living with partner
- ○ 3. Married
- ○ 4. Divorced or separated
- ○ 5. Widowed
- ○ 6. Other

23. What is your highest level of education?

- ○ 1. Did not finish high school
- ○ 2. High school diploma or GED
- ○ 3. Started college or trade school but did not finish
- ○ 4. Two year associate's degree

- ○ 5. Four year college or university degree/Bachelor's degree
- ○ 6. Some postgraduate schooling, no postgraduate degree
- ○ 7. Postgraduate or professional degree

24. What is your total annual household income?

- ○ 1. Less than $25,000
- ○ 2. $25,000-34,999
- ○ 3. $35,000-49,999
- ○ 4. $50,000-74,999
- ○ 5. $75,000-99,999
- ○ 6. $100,000-149,999
- ○ 7. $150,000 or more

25. Which of the following best describes your religious affiliation?

- ○ 1. Christian - Catholic
- ○ 2. Christian - Protestant
- ○ _____ 3. Christian - other (specify):
- ○ 4. Jewish
- ○ 5. Muslim
- ○ 6. Atheist/Agnostic
- ○ 7. Buddhist
- ○ 8. Hindu
- ○ 9. Unaffiliated
- ○ _____ 10. Other

26. On a scale from 1 (not at all religious) to 7 (extremely religious), how religious are you?

	Not at all Religious 1	2	3	4	5	6	Extremely Religious 7
Religiosity	○	○	○	○	○	○	○

27. On a scale from 1 (very conservative) to 7 (very liberal), how would you identify your political ideology? Check one.

	Very conservative 1	2	3	4	5	6	Very liberal 7
A. Social issues	○	○	○	○	○	○	○
B. Fiscal and economic issues	○	○	○	○	○	○	○
	Very conservative						Very liberal

28. What is your political party affiliation?

- ○ 1. Democrat
- ○ 2. Republican
- ○ 3. Independent
- ○ [ ] 4. Other (specify):
- ○ 5. No party preference

29. For whom did you vote in the 2016 Presidential election?

- ○ 1. Donald Trump
- ○ 2. Hillary Clinton
- ○ 3. Gary Johnson
- ○ 4. Jill Stein
- ○ 5. Other candidate
- ○ 6. Did not vote (or not eligible to vote)

Thank you for your help with this survey!
Your survey panel may contact you in about a week to complete a follow-up survey.

Please click the right arrow below to submit.

B. Follow-up/Post-test Viewer Panel Survey

Landing Page

Welcome back!

Thank you for participating in the first part of our survey about social and policy issues on TV. This follow-up survey will only take about 10-15 minutes, and your participation is voluntary. Once again, your answers will be confidential, and you don't have to answer any question that makes you feel uncomfortable.

If you take this survey on your phone, try rotating your phone to view it in "landscape" mode. Make sure to use the arrows at the bottom of the page, instead of your browser navigation buttons, to go to the next page.

We care about the quality of our survey data and hope to receive the most accurate measures of your opinions, so it is important to us that you thoughtfully provide your best answer to each question in the survey.

Do you commit to providing your thoughtful and honest answers to the questions in this survey?

- ○ I will provide my best answers
- ○ I will not provide my best answers
- ○ I can't promise either way

3d. In the first part of the survey, you indicated you were a regular viewer of Madam Secretary and planning to watch the 2018 season finale.

How likely are you now to watch the finale episode of Madam Secretary, which aired on May 20?

	Unlikely	Not sure	Likely to watch within a MONTH	Likely to watch within a WEEK	Already seen
Madam Secretary (CBS)	○	○	○	○	○

Outcomes

4. To what extent do you oppose or support the following U.S. foreign policies (or policy proposals), on a scale from 1 (strongly oppose) to 7 (strongly support).

	Strongly Oppose 1	2	3	Neutral 4	5	6	Strongly Support 7
Withdrawing from NATO	○	○	○	○	○	○	○
Sending ground troops into Syria to fight ISIS	○	○	○	○	○	○	○
Establishing a nuclear agreement or treaty with North Korea	○	○	○	○	○	○	○
Relocating the U.S. Embassy in Israel from Tel Aviv to Jerusalem	○	○	○	○	○	○	○
Accepting Syrian refugees	○	○	○	○	○	○	○
Taking land-based nuclear missiles off hair-trigger alert status	○	○	○	○	○	○	○
Withdrawing from the Iran Nuclear Deal	○	○	○	○	○	○	○
Reducing the U.S. stockpile of nuclear weapons	○	○	○	○	○	○	○
Military use of enhanced interrogation tactics, such as waterboarding	○	○	○	○	○	○	○

5. How much of a threat do you believe each of the following is to the United States, from 1 (not at all threatening) to 7 (extremely threatening)?

	Not at all threatening 1	2	3	4	5	6	Extremely threatening 7
Democratic party	○	○	○	○	○	○	○
Opioid addiction	○	○	○	○	○	○	○
U.S. media	○	○	○	○	○	○	○
Nuclear attack by U.S.	○	○	○	○	○	○	○
Islamic terrorism	○	○	○	○	○	○	○
Cyber attacks	○	○	○	○	○	○	○
Illegal immigration	○	○	○	○	○	○	○
Domestic terrorism	○	○	○	○	○	○	○
Climate change	○	○	○	○	○	○	○
Republican party	○	○	○	○	○	○	○
Accidental nuclear launch	○	○	○	○	○	○	○
Nuclear attack against U.S. by a foreign power	○	○	○	○	○	○	○
Facebook	○	○	○	○	○	○	○
Donald Trump	○	○	○	○	○	○	○
Vladimir Putin	○	○	○	○	○	○	○

6. How fearful are you about each of the following affecting you (or your loved ones) in the next 12 months?

	Not at all fearful 1	2	3	4	5	6	Extremely fearful 7
Mass shooting	○	○	○	○	○	○	○
Nuclear attack on the U.S.	○	○	○	○	○	○	○
Hate crime	○	○	○	○	○	○	○
Gang violence	○	○	○	○	○	○	○
Serious car accident	○	○	○	○	○	○	○
Terrorist attack	○	○	○	○	○	○	○
Terminal illness	○	○	○	○	○	○	○
Nuclear accident	○	○	○	○	○	○	○

7. To what extent do you feel the risk of each of the following can effectively be limited or minimized, from 1 (not at all) to 7 (definitely)?

	Not at all 1	2	3	4	5	6	Definitely 7
» Serious car accident	○	○	○	○	○	○	○
» Nuclear attack on the U.S.	○	○	○	○	○	○	○
» Terminal illness	○	○	○	○	○	○	○
» Nuclear accident	○	○	○	○	○	○	○
» Hate crime	○	○	○	○	○	○	○
» Terrorist attack	○	○	○	○	○	○	○
» Mass shooting	○	○	○	○	○	○	○
» Gang violence	○	○	○	○	○	○	○

8. What does the term "hair-trigger alert" refer to?

- ○ 1. The perception that the U.S. President might be irrational or volatile
- ○ 2. A U.S. military policy that maintains nuclear weapons in ready to launch status
- ○ 3. A U.S. military policy that permits equal response to provocations by foreign leaders
- ○ 4. U.S. military simulations of potential responses by foreign leaders to the U.S. President's provocations
- ○ 5. A warning statement preceding content (such as video or writing) that may be distressing

8a. What does "de-alerting" refer to in the context of nuclear policy?

- ○ 1. Retiring submarine-based nuclear missile systems
- ○ 2. Retiring land-based nuclear missile systems
- ○ 3. Requiring the Senate authorize any launch of nuclear weapons
- ○ 4. Separating nuclear warheads from land-baed missiles

8b. What are the potential impacts of taking land-based missiles off of hair-trigger alert status?

(Check all that apply)

- [ ] 1. Reduce the risk of an accidental missile launch
- [ ] 2. Reduce the risk of a deliberate missile launch in response to a false alarm
- [ ] 3. Remove all deterrents to a nuclear attack by a foreign power
- [ ] 4. May encourage Russia to also take its missiles off of hair-trigger alert
- [ ] 5. May encourage U.S. military officials to disobey Presidential commands
- [ ] 6. None of the above

9. How would you rate your knowledge on U.S. foreign policy issues?

- ○ 1. Not at all knowledgeable
- ○ 2. Slightly knowledgeable
- ○ 3. Moderately knowledgeable
- ○ 4. Very knowledgable
- ○ 5. Extremely knowledgable

10. Please indicate the extent to which you agree with these statements, on a scale from 1 (strongly disagree) to 7 (strongly agree).

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
A. I generally favor U.S. military intervention in conflicts with foreign countries	○	○	○	○	○	○	○
B. I generally favor diplomatic solutions in conflicts with foreign countries before U.S. military intervention	○	○	○	○	○	○	○
C. The U.S. military should only be involved in conflicts when the U.S. faces a direct and imminent threat	○	○	○	○	○	○	○

11. Is it possible to turn a missile around or change the trajectory once it has been launched?

- ○ 1. No
- ○ 2. No, but the U.S. military can shoot it down
- ○ 3. Yes, but only while the missile is gaining altitude
- ○ 4. Yes, but only until 5 minutes before it hits the target

12. Under what circumstances would you approve of the U.S. using nuclear weapons?

(Check all that apply)

- ☐ 1. In retaliation against another nuclear-armed country
- ☐ 2. In retaliation against a non-nuclear-armed country
- ☐ 3. First strike against another nuclear-armed country
- ☐ 4. First strike against a non-nuclear-armed country
- ☐ 5. Under no circumstances

Political engagement

15. Please indicate your likelihood of engaging in the following **online** activities in the next six months.

	Not at all likely 1	2	3	Neither likely nor unlikely 4	5	6	Extremely likely 7
A. Access official websites or social media of political candidates	○	○	○	○	○	○	○
B. Sign up online as a supporter for a political cause	○	○	○	○	○	○	○
C. Use online tools to campaign/promote parties	○	○	○	○	○	○	○
D. Join a political group online or on social media	○	○	○	○	○	○	○

	Not at all likely 1	2	3	Neither likely nor unlikely 4	5	6	Extremely likely 7
E. Post political comments online or on social media	○	○	○	○	○	○	○
F. Share political content online or on social media	○	○	○	○	○	○	○
G. Sign an online petition	○	○	○	○	○	○	○

16. Please indicate your likelihood of engaging in the following **offline** activities in the next six months.

	Not at all likely 1	2	3	Neither likely nor unlikely 4	5	6	Extremely likely 7
A. Sign a petition offline	○	○	○	○	○	○	○
B. Discuss politics with family	○	○	○	○	○	○	○
C. Discuss politics with friends	○	○	○	○	○	○	○
D. Volunteer for a candidate (or a cause)	○	○	○	○	○	○	○
E. Donate to a candidate (or a cause)	○	○	○	○	○	○	○
F. Call or write to an elected representative	○	○	○	○	○	○	○
G. Participate in a political rally, march, or demonstration	○	○	○	○	○	○	○
H. Attend in-person meetings of a political group	○	○	○	○	○	○	○
I. Engage in direct voter outreach through canvassing or text/phone banking	○	○	○	○	○	○	○
J. Register voters	○	○	○	○	○	○	○

	Not at all likely 1	2	3	Neither likely nor unlikely 4	5	6	Extremely likely 7
K. Vote in primary election	○	○	○	○	○	○	○
L. Vote in general election (November)	○	○	○	○	○	○	○

17. How likely are you engage in **offline** activism or advocacy on the following issues?

(This might include actions like attending meetings, volunteering, donating funds, protesting, or contacting elected representatives.)

	Extremely unlikely 1	2	3	Neither likely nor unlikely 4	5	6	Extremely Likely 7
1. DACA (Deferred Action for Childhood Arrivals)	○	○	○	○	○	○	○
2. Gun control	○	○	○	○	○	○	○
3. Restrictions on travel to the U.S.	○	○	○	○	○	○	○
4. Reducing nuclear risks	○	○	○	○	○	○	○
5. Climate change	○	○	○	○	○	○	○
6. Affordable health care	○	○	○	○	○	○	○

Exposure to Nuclear Issues/Info Seeking

30. Although there are a number of qualities people feel that children should have, every person thinks that some are more important than others. We will show you pairs of desirable qualities. Choose the one you think is more important for a child to have.

A1. Independence	○ ○	A2. Respect for elders
B1. Curiosity	○ ○	B2. Good manners
C1. Obedience	○ ○	C2. Self-reliance

D1. Being considerate ○ ○ D2. Being well-behaved

31. Have you seen or heard any stories about issues related to nuclear weapons/threats from any of the following sources, in the last week? (Check all that apply)

- ☐ _____ 1. Feature films (specify):
- ☐ _____ 2. Documentary films (specify):
- ☐ _____ 3. Entertainment TV (specify):
- ☐ 4. News (TV, radio, podcasts, newspapers/magazines, online news sources)
- ☐ 5. Social media
- ☐ 6. Political leaders
- ☐ 7. Friends or family
- ☐ _____ 8. Other (specify):
- ☐ 9. None of the above

32. How much have you heard about the following topics in the news in the last week?

	Nothing at all 1	2	3	4	5	6	A great deal 7
A. President Trump's May 12 decision to withdraw from the Iran nuclear deal	○	○	○	○	○	○	○
B. Discussion of a possible new nuclear agreement with Iran	○	○	○	○	○	○	○
C. Secretary of State Pompeo's May 21 speech announcing new sanctions on Iran	○	○	○	○	○	○	○
D. Tension between the U.S. and European countries that remain in the Iran nuclear deal	○	○	○	○	○	○	○

	Nothing at all 1	2	3	4	5	6	A great deal 7
E. The planned June 12 Singapore summit between President Trump and North Korean leader Kim Jong Un	○	○	○	○	○	○	○

	Nothing at all 1	2	3	4	5	6	A great deal 7
F. North Korea's threats to back out of negotiations	○	○	○	○	○	○	○
G. The proposed deal the Trump administration is seeking with North Korea	○	○	○	○	○	○	○
H. National Security Advisor Bolton's suggestion that North Korea follow the 'Libya model' (give up its nuclear weapons program in return for sanctions relief)	○	○	○	○	○	○	○
I. Discussion of awarding President Trump a Nobel Peace Prize for denuclearization of North Korea	○	○	○	○	○	○	○
J. Any other news stories related to nuclear threats or negotiations	○	○	○	○	○	○	○

33. Have you actively searched for information about any of the following in the last week? (Check all that apply)

- ☐ 1. Iranian nuclear threats
- ☐ 2. Iran nuclear deal

- [ ] 3. North Korean nuclear threats
- [ ] 4. North Korean nuclear negotiations or June 12 summit
- [ ] 5. Russian nuclear threats
- [ ] 6. Chinese nuclear threats
- [ ] 7. Nuclear risks or vulnerabilities
- [ ] 8. Nuclear accidents or near accidents
- [ ] 9. None of the above

34. Please indicate the extent to which you agree with these statements, on a scale from 1 (strongly disagree) to 7 (strongly agree).

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
A. The main risk of nuclear weapons is when enemies of the U.S. have them	○	○	○	○	○	○	○
B. The main risk of nuclear weapons is their existence	○	○	○	○	○	○	○
C. Nuclear weapons are morally wrong	○	○	○	○	○	○	○
D. Reduction of the U.S. nuclear arsenal would reduce risks to national security	○	○	○	○	○	○	○
	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
E. Reduction of the U.S. nuclear arsenal would increase risks to national security	○	○	○	○	○	○	○
F. The U.S. should maintain its nuclear arsenal because they are our best and strongest weapons	○	○	○	○	○	○	○

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
G. The more nuclear weapons in existence, the greater the risk of theft or accident	○	○	○	○	○	○	○
H. Nuclear weapons create risk rather than reducing it	○	○	○	○	○	○	○

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
I. Nuclear weapons protect the U.S. against threats from those who wish to do us harm	○	○	○	○	○	○	○
J. The destructiveness of nuclear weapons makes them useful for deterrence	○	○	○	○	○	○	○
K. Nuclear terrorism is the greatest threat to our national security	○	○	○	○	○	○	○
L. Nuclear weapons keep America safe	○	○	○	○	○	○	○

35. To what extent do you oppose or support the following policy proposals around nuclear weapons?

	I don't know enough to say	Strongly oppose 1	2	3	4	5	6	Strongly support 7
A. Phasing out intercontinental ballistic missiles (ICBMs)	○	○	○	○	○	○	○	○
B. Cancelling the new nuclear cruise missiles	○	○	○	○	○	○	○	○
C. No first-use (U.S. cannot initiate a nuclear strike)	○	○	○	○	○	○	○	○

	I don't know enough to say	Strongly oppose 1	2	3	4	5	6	Strongly support 7
D. No launch-on-warning (U.S. cannot launch nuclear weapons before incoming weapons reach their targets)	○	○	○	○	○	○	○	○

	I don't know enough to say	Strongly oppose 1	2	3	4	5	6	Strongly support 7
E. Instituting checks on the President's power to launch nuclear weapons	○	○	○	○	○	○	○	○
F. Taking nuclear weapons off hair-trigger alert	○	○	○	○	○	○	○	○
G. Banning production of highly-enriched uranium worldwide	○	○	○	○	○	○	○	○
H A global ban on nuclear weapons	○	○	○	○	○	○	○	○

	I don't know enough to say	Strongly oppose 1	2	3	4	5	6	Strongly support 7
H. Working with Russia and other nuclear-armed states to reduce nuclear weapons	○	○	○	○	○	○	○	○
I. Reducing the U.S. nuclear arsenal, independent of Russian cooperation	○	○	○	○	○	○	○	○
J. Preventing the spread of nuclear weapons-grade materials and technology	○	○	○	○	○	○	○	○
K. Halting all testing of nuclear weapons	○	○	○	○	○	○	○	○

The next few questions are about entertainment TV, broadly defined. This includes fictional and reality TV shows on broadcast networks, cable, or streaming platforms, such as Netflix, Hulu, or Amazon.

36. I watch entertainment TV ____:

	Not at all 1	2	3	4	5	6	Exactly 7
A. Because it relaxes me	○	○	○	○	○	○	○
B. So I won't have to be alone	○	○	○	○	○	○	○
C. Just because it's there	○	○	○	○	○	○	○
D. When I have nothing better to do	○	○	○	○	○	○	○
E. Because it entertains me	○	○	○	○	○	○	○
F. Because it's something to do with friends (in-person or virtually)	○	○	○	○	○	○	○
G. Because it helps me learn things about myself and others	○	○	○	○	○	○	○
	Not at all 1	2	3	4	5	6	Exactly 7
H. Because it's thrilling	○	○	○	○	○	○	○
I. So I can forget about school or work or other things	○	○	○	○	○	○	○
J. Because it allows me to unwind	○	○	○	○	○	○	○
K. When there's no one else to talk to or be with	○	○	○	○	○	○	○
L. Because I just like to watch	○	○	○	○	○	○	○
M. Because it passes the time away, particularly when I'm bored	○	○	○	○	○	○	○

	Not at all 1	2	3	4	5	6	Exactly 7
N. Because it's enjoyable	○	○	○	○	○	○	○

	Not at all 1	2	3	4	5	6	Exactly 7
O. So I can talk with other people about it	○	○	○	○	○	○	○
P. So I can learn about things I don't know about	○	○	○	○	○	○	○
Q. Because it's exciting	○	○	○	○	○	○	○
R. So I can get away from the rest of the family or others	○	○	○	○	○	○	○
S. Because it's a pleasant rest	○	○	○	○	○	○	○
T. Because it makes me feel less lonely	○	○	○	○	○	○	○
U. Because it's a habit, just something I do	○	○	○	○	○	○	○

	Not at all 1	2	3	4	5	6	Exactly 7
V. Because it gives me something to do to occupy my time	○	○	○	○	○	○	○
W. Because it amuses me	○	○	○	○	○	○	○
X. So I can be with other members of the family or friends who are watching	○	○	○	○	○	○	○
Y. So I could learn about what could happen to me	○	○	○	○	○	○	○
Z. Because it peps me up	○	○	○	○	○	○	○
AA. So I can get away from what I'm doing	○	○	○	○	○	○	○

37. Please indicate the extent to which you agree with these statements, on a scale from 1 (strongly disagree) to 7 (strongly agree).

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
A. I like TV shows that challenge my way of seeing the world	○	○	○	○	○	○	○
B. I like TV shows that make me more reflective	○	○	○	○	○	○	○
C. It's important to me that I have fun when watching a TV show	○	○	○	○	○	○	○
D. I like TV shows that focus on meaningful human conditions	○	○	○	○	○	○	○

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
E. TV shows that make me laugh are among my favorites	○	○	○	○	○	○	○
F. I find that even simple TV shows can be enjoyable as long as they are fun	○	○	○	○	○	○	○
G. My favorite kinds of TV shows are ones that make me think	○	○	○	○	○	○	○
H. I am very moved by TV shows that are about people's search for greater understanding in life	○	○	○	○	○	○	○

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
I. I like TV shows that may be considered "silly" or "shallow" if they can make me laugh and have a good time	○	○	○	○	○	○	○
J. For me, the best TV shows are ones that are entertaining	○	○	○	○	○	○	○

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
K. My favorite kinds of TV shows are happy and positive	○	○	○	○	○	○	○
L. I like TV shows that have profound meanings or messages to convey	○	○	○	○	○	○	○

38. Please indicate the extent to which you agree with these statements, on a scale from 1 (strongly disagree) to 7 (strongly agree).

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
A. Entertainment programs should avoid taking a stance on policy issues	○	○	○	○	○	○	○
B. It is appropriate for entertainment programs to have an ideological perspective	○	○	○	○	○	○	○
C. The entertainment industry is biased toward a liberal point of view	○	○	○	○	○	○	○
D. The entertainment industry is biased toward a conservative point of view	○	○	○	○	○	○	○
E. I enjoy when entertainment intersects with real-world issues and events	○	○	○	○	○	○	○

Viewers

The next several questions have to do with the May 20 finale episode of *Madam Secretary*.

39. To what extent did you feel each of the following immediately after you finished watching?

	Not at all 1	2	3	4	5	6	6	7	8	9	A great deal 10
A. Angry											
B. Hopeful											
C. Disgusted											
D. Empathetic											
E. Sad											
F. Afraid											
G. Surprised											
H. Happy											

40. The *Madam Secretary* finale was:

	Not at all 1	2	3	4	5	6	6	7	8	9	Extremely 10
A. Enjoyable											
B. Moving											
C. Entertaining											
D. Meaningful											
E. Pleasurable											
F. Thought provoking											
G. Captivating											

41. Please indicate the extent to which you agree with these statements, on a scale from 1 (strongly disagree) to 7 (strongly agree).

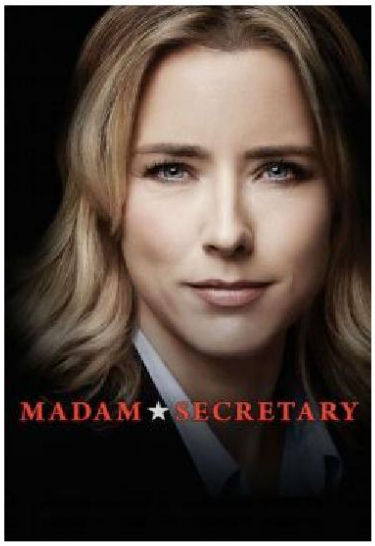
	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
A. At points, I had a hard time making sense of what was going on in the program	○	○	○	○	○	○	○
B. My understanding of the characters is unclear	○	○	○	○	○	○	○
C. I had a hard time recognizing the thread of the story	○	○	○	○	○	○	○
D. I found my mind wandering while the episode was playing	○	○	○	○	○	○	○

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
E. While the episode was playing I found myself thinking about other things	○	○	○	○	○	○	○
F. I had a hard time keeping my mind on the program	○	○	○	○	○	○	○
G. During the episode, my body was in the room, but my mind was inside the world created by the story	○	○	○	○	○	○	○
H. The program created a new world, and then that world suddenly disappeared when the episode ended	○	○	○	○	○	○	○

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
I. At times during the episode the story world was closer to me than the real world	○	○	○	○	○	○	○
J. The episode affected me emotionally	○	○	○	○	○	○	○

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
K. I felt sorry for some of the characters in the porgram	○	○	○	○	○	○	○

42. Please indicate the extent to which you agree with these statements about Elizabeth McCord, on a scale from 1 (strongly disagree) to 7 (strongly agree).



	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
A. I was able to understand the events in the program in the same way that Elizabeth understood them	○	○	○	○	○	○	○
B. I think I have a good understanding of Elizabeth	○	○	○	○	○	○	○
C. I understand the reasons why Elizabeth did what she did	○	○	○	○	○	○	○

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
D. While viewing the episode, I could feel Elizabeth's emotions	○	○	○	○	○	○	○
E. During viewing, I felt I could really get inside Elizabeth's head	○	○	○	○	○	○	○
F. At key moments in the show, I felt I knew exactly what Elizabeth was going through	○	○	○	○	○	○	○
G. While viewing the program, I wanted Elizabeth to succeed in achieving her goals	○	○	○	○	○	○	○
H. When Elizabeth succeeded I felt joy, but when she failed, I was sad	○	○	○	○	○	○	○

43. Please indicate the extent to which you agree with these statements, on a scale from 1 (strongly disagree) to 7 (strongly agree).

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
A. The episode tried to make a decision for me	○	○	○	○	○	○	○
B. The episode tried to pressure me	○	○	○	○	○	○	○
C. The episode threatened my freedom to choose	○	○	○	○	○	○	○
D. The episode tried to manipulate me	○	○	○	○	○	○	○
E. The point of the episode was to be entertaining	○	○	○	○	○	○	○
	Strongly disagree 1	2	3	4	5	6	Strongly agree 7

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
F. It was obvious the episode was trying to be more persuasive than entertaining	○	○	○	○	○	○	○
G. The episode was biased toward a conservative point of view	○	○	○	○	○	○	○
H. The episode was biased toward a liberal point of view	○	○	○	○	○	○	○
I. The episode did not favor any particular ideological perspective	○	○	○	○	○	○	○
J. The episode was accurate in its depiction of nuclear vulnerabilities	○	○	○	○	○	○	○

44. Do you think the episode was created more to entertain or more to persuade?

	Only entertain 1	2	3	4	5	6	Only persuade 7
Entertain or persuade	○	○	○	○	○	○	○

45. To what extent do you believe the events portrayed in this episode were:

	Not at all 1	2	3	4	5	6	Extremely 7
A. Realistic	○	○	○	○	○	○	○
B. Relevant to real-world events	○	○	○	○	○	○	○

46. Please indicate the extent to which you agree with these statements, on a scale from 1 (strongly disagree) to 7 (strongly agree).

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
A. I sometimes felt like I wanted to 'argue back' to what was said	○	○	○	○	○	○	○
B. I sometimes found myself thinking of ways I disagreed with what was being presented	○	○	○	○	○	○	○
C. I couldn't help thinking about ways that the information being presented was inaccurate or misleading	○	○	○	○	○	○	○
D. I found myself looking for flaws in the way information was presented	○	○	○	○	○	○	○

47. Did you do any of the following while watching the finale of *Madam Secretary*? (Check all that apply)

- ☐ 1. Watch two or more episodes in one sitting
- ☐ 2. Watch with someone else (in person)
- ☐ 3. Communicate about the episode online or on social media while watching
- ☐ 4. Use a computer or mobile device to look up information about the cast or characters while watching
- ☐ 5. Use a computer or mobile device to look up information related to the topic of the episode while watching
- ☐ 6. Use a computer or mobile device to do something else related to the show while watching _____(please describe):
- ☐ 7. Use a computer or mobile device to do something unrelated to the show while watching
- ☐ 8. Engage in another activity unrelated to the show while watching, such as reading or writing (not eating)
- ☐ 9. None of the above

48. Did you do any of the following after watching the finale of *Madam Secretary*? (Check all that apply)

- [ ] 1. Watch the episode a second time
- [ ] 2. Talk about the episode with someone else (in-person)
- [ ] 3. Communicate about the episode online or on social media after watching
- [ ] 4. Recommend the show to someone else
- [ ] 5. Search for more information about having nuclear weapons on hair-trigger alert status
- [ ] 6. Search for more information about de-alerting nuclear weapons
- [ ] 7. Search for more information about other nuclear policy issues (please describe):
- [ ] 8. None of the above

49. Did you do any of the following activities online or on social media, while or after watching the finale of *Madam Secretary*? (Check all that apply)

- [ ] 1. Tweet at the show's Twitter handle (@MadamSecretary) or use the hashtag #MadamSecretary
- [ ] 2. Re-tweet a tweet from the show's official handle (@MadamSecretary) or cast or crew
- [ ] 3. Participate in Twitter chat with nuclear experts
- [ ] 4. Participate in Reddit "Ask Me Anything" session with former Secretary of Energy Ernest Moniz and Madam Secretary writer David Grae
- [ ] 5. Other related activity online or on social media (please describe):
- [ ] 6. None of the above

50. Did you learn anything from this episode of *Madam Secretary*? If so, please explain.

Final

Thank you for your help with this survey!

C. Survey Items

VARIABLE	OPERATIONALIZATION	CRONBACH'S ALPHA
Outcomes		
Nuclear efficacy	7-point Likert scale the extent to which they felt the risk of: (1) nuclear attack on the U.S. (2) nuclear accident could be effectively limited or minimized The two items were averaged to get an overall efficacy score at baseline and at follow-up, with a higher score indicating greater efficacy.	Baseline: 0.785 Follow-up: 0.737
Nuclear knowledge	1. What does the term "hair-trigger alert" refer to? (1) The perception that the U.S. President might be irrational or volatile (2) A U.S. military policy that maintains nuclear weapons in ready to launch status* (3) A U.S. military policy that permits equal response to provocations by foreign leaders (4) U.S. military simulations of potential responses by foreign leaders to the U.S. President's provocations (5) A warning statement preceding content (such as video or writing) that may be distressing 2. Is it possible to turn a missile around or change the trajectory once it has been launched? (1) No* (2) No, but the U.S. military can shoot it down, (3) Yes, but only while the missile is gaining altitude, and (4) Yes, but only until 5 minutes before it hits the target These items were respectively recoded as correct or not correct, and an overall knowledge score was created based on the number of items the respondent got correct.	N/A

Nuclear attitudes	7-point Likert scale the extent to which they support the following U.S. foreign policies: (1) Taking land-based nuclear missiles off hair-trigger alert status (2) Establishing a nuclear agreement or treaty with North Korea (3) Reducing the U.S. stockpile of nuclear weapons (4) Withdrawing from the Iran Nuclear Deal (reverse coded) Factor analysis of these 4 items, which revealed only 2 items (hair trigger alert and reduction of nuclear weapons) to load on a single factor. The overall attitude score was created by averaging the 2 items, with a higher attitude score reflecting more anti-nuclear attitudes.	Baseline: 0.639 Follow-up: 0.650
Nuclear behavior		
Nuclear activism	7-point Likert scale how likely they were to engage in offline activism or advocacy on reducing nuclear risks (i.e., donating funds, protesting), with a higher score indicating greater likelihood	N/A
Online political engagement scale	7 items asking respondents to report on a 7-point Likert scale the likelihood of engaging in a number of online: (1) Access official websites or social media of political candidates (2) Sign up online as a supporter for a political cause (3) Use online tools to campaign/promote parties (4) Join a political group online or on social media (5) Post political comments online or on social media (6) Share political content online or on social media (7) Sign an online petition Items were averaged to obtain an online political engagement score, with a higher score reflecting higher likelihood of online political engagement.	Baseline: 0.942 Follow-up: 0.948
Offline political engagement scale	12 items asking respondents to report on a 7-point Likert scale the likelihood of engaging in a number of offline activities: (1) Sign a petition offline (2) Discuss politics with family (3) Discuss politics with friends (4) Volunteer for a candidate (or a cause) (5) Donate to a candidate (or a cause) (6) Call or write to an elected representative (7) Participate in a political rally, march, or demonstration (8) Attend in-person meetings of a political group	Baseline: 0.919 Follow-up: 0.925

	(9) Engage in direct voter outreach through canvassing or text/phone banking (10) Register voters (11) Vote in primary election (12) Vote in general election (November) Items were averaged to obtain an offline political engagement score, with a higher score reflecting higher likelihood of offline political engagement.	
Latent Class Indicators		
Favor military intervention	7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) the extent to which they agreed with favoring U.S. military intervention in conflicts with foreign countries	N/A
Favor diplomatic solutions	7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) the extent to which they agreed with favoring diplomatic solutions in conflicts with foreign countries before U.S. military intervention	N/A
Involved when faced with threat	7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) the extent to which they agreed with the U.S. military should only be involved in conflicts when the U.S. faces a direct and imminent threat	N/A
Political ideology	7-point Likert scale ranging from 1 (very conservative) to 7 (very liberal), how would you identify your political ideology on: (1) social issues (2) fiscal and economic issues Responses to these two items were averaged to create an overall measure of political ideology with higher scores indicating more liberal ideologies.	0.894
Authoritarianism	4-item scale (Feldman & Stenner, 1997) Although there are a number of qualities people feel that children should have, every person thinks that some are more important than others. We will show you pairs of desirable qualities. Choose the one you think is more important for a child to have: 1. Independence vs. Respect for elders 2. Curiosity vs. Good manners 3. Obedience vs. Self-reliance 4. Being considerate vs. Being well-behaved Items were coded as authoritarian (1) and non-authoritarian (0). Responses to these 4 items were averaged as an overall measure of authoritarianism.	0.635

Perceived nuclear risk	12 items asking respondents to rate on a 7-point Likert scale ranging from 1 (Strongly oppose) to 7 (Strongly support) to what extent they agree with the following: (1) The main risk of nuclear weapons is when enemies of the U.S. have them (reverse coded) (2) The main risk of nuclear weapons is their existence (3) Nuclear weapons are morally wrong (4) Reduction of the U.S. nuclear arsenal would reduce risks to national security (5) Reduction of the U.S. nuclear arsenal would increase risks to national security (reverse coded) (6) The U.S. should maintain its nuclear arsenal because they are our best and strongest weapons (reverse coded) (7) The more nuclear weapons in existence, the greater the risk of theft or accident (8) Nuclear weapons create risk rather than reducing it (9) Nuclear weapons protect the U.S. against threats from those who wish to do us harm (reverse coded) (10) The destructiveness of nuclear weapons makes them useful for deterrence (reverse coded) (11) Nuclear terrorism is the greatest threat to our national security (12) Nuclear weapons keep America safe (reverse coded) Responses to these 12 items were averaged to create an overall measure of perceived nuclear risk with higher scores indicating higher perceived risk of nuclear weapons.	0.820
Nuclear policy support scale	12 items asking respondents to rate on a 7-point Likert scale ranging from 1 (Strongly oppose) to 7 (Strongly support) to what extent they oppose or support the following: (1) Phasing out intercontinental ballistic missiles (ICBMs) (2) Cancelling the new nuclear cruise missiles (3) No first-use (U.S. cannot initiate a nuclear strike) (4) No launch-on-warning (U.S. cannot launch nuclear weapons before incoming weapons reach their targets) (5) Instituting checks on the President's power to launch nuclear weapons (6) Taking nuclear weapons off hair-trigger alert (7) Banning production of highly-enriched uranium worldwide (8) A global ban on nuclear weapons	0.920

	(9) Working with Russia and other nuclear-armed states to reduce nuclear weapons (10) Reducing the U.S. nuclear arsenal, independent of Russian cooperation (11) Preventing the spread of nuclear weapons-grade materials and technology (12) Halting all testing of nuclear weapons The scale was created by averaging the responses to the items that participants had a response to (excluding items where they responded "I don't know enough to say"), with a greater score indicating stronger support for anti-nuclear policies. Some participants (n=10) reported "I don't know enough to say" for all 12 items, and were treated as missing.	
Mediators		
Narrative Engagement	11 items asking respondents to respond to each item on a 7-point Likert scale, with higher scores indicating stronger agreement. The 11 items were as follows: (1) At points, I had a hard time making sense of what was going on in the program (R) (2) My understanding of the characters is unclear (R) (3) I had a hard time recognizing the thread of the story (R) (4) I found my mind wandering while the episode was playing (R) (5) While the episode was playing I found myself thinking about other things (R) (6) I had a hard time keeping my mind on the program (R) (7) During the episode, my body was in the room, but my mind was inside the world created by the story (EXCLUDED) (8) The program created a new world, and then that world suddenly disappeared when the episode ended (9) At times during the episode the story world was closer to me than the real world (10) The episode affected me emotionally (11) I felt sorry for some of the characters in the program Item 7 was removed to improve reliability. A narrative engagement measure was created by taking the average across the 10 item responses, with a higher score indicating greater narrative engagement.	0.713

Perceived Realism	Single item asking respondents to rate on a 7-point Likert scale the extent to which they believed the events portrayed in this episode were realistic, with higher scores indicating greater perceived realism.	N/A
Positive emotion	4 items asking respondents to what extent they felt hopeful, empathetic, surprised, and happy immediately after finishing watching the episode on a 7-point Likert scale, with higher scores indicating greater feeling.	0.807
Negative emotion	4 items asking respondents to what extent they felt angry, disgusted, sad, and afraid immediately after finishing watching the episode on a 7-point Likert scale, with higher scores indicating greater feeling.	0.871

D. Post-hoc analyses on nuclear efficacy, knowledge, and attitudes

Table D1. Multivariate associations between predictors and nuclear efficacy

	Nuclear Efficacy Scale		Efficacy-Nuclear Attack		Efficacy-Nuclear Accident	
	Adjusted *b* (SE)	p	Adjusted *b* (SE)	p	Adjusted *b* (SE)	p
Viewed Episode						
Viewer	-0.10 (0.21)	0.642	-0.04 (0.23)	0.871	-0.17 (0.23)	0.469
Non-viewer (ref)	--	--	--	--	--	--
Age	-0.01 (0.01)	0.187	-0.01 (0.01)	0.403	-0.01 (0.01)	0.157
Education						
Less than high school (ref)	--	--	--	--	--	--
Some college or associate's degree	-0.17 (0.30)	0.560	-0.24 (0.33)	0.466	-0.10 (0.34)	0.767
Bachelor's degree	-0.01 (0.30)	0.966	-0.001 (0.33)	0.998	-0.02 (0.34)	0.956
Some postgraduate or postgraduate/ professional degree	-0.15 (0.32)	0.653	-0.23 (0.36)	0.524	-0.08 (0.37)	0.820
Political Party						
Democrat (ref)	--	--	--	--	--	--
Republican	-0.43 (0.23)	0.064	-0.55 (0.26)	0.035*	-0.32 (0.26)	0.228
Independent	-0.06 (0.26)	0.826	-0.19 (0.29)	0.520	0.07 (0.30)	0.809
Other	-0.20 (0.50)	0.694	-0.51 (0.55)	0.357	0.001 (0.55)	0.100
Exposure to nuclear issues	-0.14 (0.08)	0.069	-0.21 (0.08)	0.014*	-0.07 (0.09)	0.429

*Significant under α=0.05 level

Table D2. Multivariate associations between predictors and nuclear knowledge

	Nuclear Knowledge Scale		Knowledge- Hair trigger		Knowledge- Missile turnaround	
	Adjusted *b* (SE)	p	OR (95% CI)[1]	p	OR (95% CI)[1]	p
Viewed Episode						
Viewer	0.16 (0.08)	0.053*	1.43 (0.83, 2.48)	0.202	1.78 (0.90, 3.51)	0.097
Non-viewer (ref)	--	--	--	--	--	--
Age	0.004 (0.003)	0.253	1.01 (0.99, 1.04)	0.232	1.01 (0.98, 1.03)	0.728
Education						
Less than high school (ref)	--	--	--	--	--	--
Some college or associate's degree	-0.07 (0.12)	0.561	0.50 (0.23, 1.07)	0.072	1.65 (0.63, 4.32)	0.309
Bachelor's degree	-0.03 (0.12)	0.785	0.62 (0.29, 1.35)	0.228	1.51 (0.57, 4.00)	0.408
Some postgraduate or postgraduate/ professional degree	-0.16 (0.13)	0.200	0.38 (0.16, 0.91)	0.029*	1.32 (0.46, 3.78)	0.606
Political Party						
Democrat (ref)	--	--	--	--	--	--
Republican	-0.01 (0.09)	0.892	0.99 (0.54, 1.83)	0.981	0.98 (0.46, 2.09)	0.964
Independent	-0.11 (0.10)	0.300	0.58 (0.29, 1.17)	0.128	1.08 (0.46, 2.55)	0.855
Other	-0.06 (0.19)	0.764	0.30 (0.09, 1.07)	0.064	3.82 (0.95, 15.29)	0.058
Exposure to Nuclear Issues	-0.003 (0.03)	0.926	0.94 (0.77, 1.15)	0.536	1.07 (0.84, 1.36)	0.601

*Significant under α=0.05 level

[1]= ordinal logistic regression

Table D3. Multivariate associations between predictors and nuclear attitudes

	Nuclear Attitude Scale		Attitude- Hair trigger		Attitude- Reduce weapons	
	Adjusted *b* (SE)	p	Adjusted *b* (SE)	p	Adjusted *b* (SE)	p
Viewed Episode						
Viewer	0.17 (0.16)	0.273	0.15 (0.21)	0.480	0.20 (0.20)	0.325
Non-viewer (ref)	--	--	--	--	--	--
Age	-0.001 (0.01)	0.857	0.001 (0.01)	0.920	-0.003 (0.01)	0.693
Education						
Less than high school (ref)	--	--	--	--	--	--
Some college or associate's degree	-0.13 (0.23)	0.567	-0.50 (0.31)	0.106	0.24 (0.29)	0.405
Bachelor's degree	-0.24 (0.23)	0.303	-0.54 (0.31)	0.086	0.06 (0.29)	0.831
Some postgraduate or postgraduate/ professional degree	-0.30 (0.25)	0.232	-0.73 (0.34)	0.031*	0.14 (0.31)	0.665
Political Party						
Democrat (ref)	--	--	--	--	--	--
Republican	-0.14 (0.18)	0.434	-0.06 (0.24)	0.792	-0.22 (0.22)	0.337
Independent	-0.39 (0.20)	0.057*	-0.39 (0.27)	0.160	-0.39 (0.25)	0.128
Other	-0.64 (0.37)	0.083	-0.70 (0.50)	0.165	-0.59 (0.46)	0.204
Exposure to Nuclear Issues	0.03 (0.06)	0.598	0.06 (0.08)	0.465	0.004 (0.07)	0.958

*Significant under α=0.05 level

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