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Psychological Implications of Indirect Media Exposure to Collective Traumas

DISSERTATION

submitted in partial satisfaction of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

in Psychology & Social Behavior

by

Rebecca Robin Thompson

Dissertation Committee:

Professor Roxane Cohen Silver, Chair

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2018

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ACKNOWLEDGEMENTS

I have been so fortunate to have had so many wonderful people in my life who have supported and helped me throughout my journey towards earning my PhD. I would never have made it to this point if I didn't have such a strong support system of colleagues, friends, and family who have inspired me to do my best work over the years, and would like to use this space to mention a few of these people.

First and foremost, I'd like to thank my advisor, Dr. Roxane Cohen Silver, for all her support over the past six years. Over the course of my time at UC Irvine, she has brought me up from a scared undergrad who was too scared to speak during lab meetings into an independent researcher. Because of her mentorship and guidance, I have grown immensely both as a researcher and as a person, and I have been so fortunate to have had her as a mentor. Thank you for teaching me how to think about and articulate my own research ideas, for impressing upon me the importance of crafting a compelling story, and for always pushing me to reach for more. For the countless meetings, hours of manuscript revisions, and both personal and professional advice, I will forever be enormously grateful.

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I have also been so fortunate to have so many wonderful friends who have supported me through these past six years. When I first came to UC Irvine, I had never lived more than an hour's drive away from home, and was so nervous about living all the way across the country. I needn't have worried; the friends I have made here have taken care of me like family. From all the happy hours, to exploring Southern California together, to intramural sports, to helping me rediscover my love of yoga, to our Bachelor parties on Monday nights, you have all been a source of relaxation and fun during the sometimes grueling process of graduate school. Special thanks to Emily Urban, Sean Wojcik, Marie Cross, Lauren Reiser, Kevin Cochran, and Nickolas Jones (yes, again) – six years of giggling and stuffing our faces together has gone by entirely too

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My family has also been invaluable sources of support these past six years. To Mom and Dad – thank you for raising me to believe I can do anything I set my mind to, and for supporting me throughout my PhD even though I chose to move across the country to do it. To Alison – thank you for always pushing me to be the best version of myself (even if it was out of a one-sided, little-sister sense of competition). To Mallory – thank you for being my boo snake, even when we hate each other, and for talking me down whenever I'm spiraling. I wouldn't be where I am today without your unconditional love and support.

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MANUSCRIPTS UNDER REVIEW:

Thompson, R. R., Holman, E. A., & Silver, R. C. (2018). Media, forecasted posttraumatic stress symptoms, and the amplification of psychological responses to Hurricane Irma.

Thompson, R. R., Jones, N. M., Holman, E. A., & Silver, R. C. (2018). Media exposure to mass violence events can fuel a cycle of distress.

Thompson, R. R., Garfin, D. R., Holman, E. A., & Silver, R. C. (2018). National opinions on death penalty punishment for Dzhokhar Tsarnaev before and after sentencing.

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ABSTRACT OF THE DISSERTATION

Psychological Implications of Indirect Media Exposure to Collective Traumas

By

Rebecca Robin Thompson

Doctor of Philosophy in Psychology and Social Behavior

University of California, Irvine, 2018

Professor Roxane Cohen Silver, Chair

The dissertation examines the impact of indirect media exposure to stressful life events. Prior research suggests that exposure to trauma-related media content is associated with negative mental health outcomes. This relationship is further explored in three studies. Study 1 assesses how prior acute stress responses and media consumption influence subsequent psychological responses to a public health crisis, more specifically, the 2014 Ebola outbreak. Psychological distress, functional impairment, and worry about the Ebola crisis were measured in a nationally representative sample; the relationships of these variables with media exposure to the crisis were assessed. Results suggest that individuals with higher Boston Marathon bombing (BMB)-related acute stress and who consumed more Ebola-related media were later more worried about contracting Ebola. Study 2 assesses whether prior life events, prior media exposure and responses to events, and fears of future events may prospectively predict consumption of trauma-related media in the future and acute stress responses. Exposure and responses to the 2016 Pulse nightclub massacre (PNM) were assessed in the same representative national sample as was utilized in Study 1. Path analyses revealed that media exposure to the BMB was associated with posttraumatic stress symptoms six months later, which was in turn associated with worry about

future events, which predicted hours of media exposure and acute stress responses to the PNM. Additionally, BMB-related media exposure indirectly predicted PNM-related acute stress through BMB posttraumatic stress symptoms, worry about future events, and PNM-related media exposure. Study 3 explores the role of anticipated posttraumatic stress as a mediator of the relationship between media exposure to collective trauma and mental health outcomes in the context of a natural disaster. A probability sample of adults in Florida was recruited and assessed in the days prior to Hurricane Irma's landfall, then reassessed approximately one month later (N=1,427). Path analyses revealed that media exposure to the hurricane partially mediated the relationship between anticipated PTS responses and subsequent PTS, general distress, anger, functional impairment, and worry, controlling for demographics and hurricane exposure. Implications for the media, mental health professionals, and public health across all three studies are discussed.

CHAPTER 1:

Introduction

Introduction

On April 20, 1999, two teenagers attacked Columbine High School in Littleton, CO with sawed-off shotguns, assault rifles, pistols, and 30 bombs, killing 12 classmates and one teacher and injuring another 24. Within 20 minutes of the beginning of this killing spree, every newsroom in the Denver market had sent news crews to the scene, broadcasting live updates of the carnage. One network even broadcast live via telephone the terrified voices of students who were trapped inside the school, hiding from the shooters. According to Diane Mulligan, KMGH news director, "The most difficult decision that day was how much live to put on the air because the story was unfolding, and because we didn't know all the facts or whether the shooters were in the school. The most important thing was being in the control room deciding what shots to put on the air because the carnage was fairly massive" (Shepard, 2003, p. 57). The Columbine High School shooting was one of the first acts of mass violence in the United States to unfold on live television, while millions of Americans across the country watched in horror and fascination. Since then, there have been countless acts of violence across the world that have received similar attention from the media, including the 9/11 terrorist attacks, the 2013 Boston Marathon bombing, and the 2015 attacks in Paris, among many others. Given the relative frequency of these events and the media attention they attract, it is important that we understand the mental and physical health impacts of consuming such content.

There has been a lively debate among psychologists over the existence of a link between media exposure to trauma and distress. The current version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) *explicitly* excludes indirect exposure to trauma via the media as a potential inciting event for posttraumatic stress disorder (PTSD; American Psychiatric Association, 2013), which suggests that the prevailing view is that consumption of this media

does not constitute traumatic exposure. However, there is some evidence that this exclusion might be unwarranted. In fact, prior research has suggested that extensive exposure to trauma-related media content is associated with negative mental and physical health outcomes.

Negative Correlates of Traumatic Media Exposure

The idea that individuals may be impacted by a collective trauma (i.e., a trauma that is shared by a large group of people, such as a terrorist attack or natural disaster), even in the absence of direct exposure, is not a novel one (Wright, Ursano, Bartone, & Ingraham, 1990). Associations between television exposure and trauma-related symptoms have been found in studies of children following the 1990 Gulf War (Cantor, Mares, & Oliver, 1993) and the 1995 Oklahoma City Bombings (Pfefferbaum, 2001). Research conducted following the September 11, 2001 (9/11) terrorist attacks demonstrated the relationship between increased exposure to disaster-related media content and ongoing worry and posttraumatic stress responses (Bernstein et al., 2007; Otto et al., 2007; Silver et al., 2013). In the subsequent years, independent research teams have noted that a small proportion of Americans across the country met the criteria for probable 9/11-related PTSD as defined by the DSM-IV – even when they were only indirectly exposed to the attacks through the media (Schlenger et al., 2002; Silver, Holman, McIntosh, Poulin, & Gil-Rivas, 2002; Torabi & Seo, 2004). More specifically, people who reported high frequency of seeing television images of people falling or jumping from the Twin Towers to their deaths reported higher prevalence of PTSD (Ahern, Galea, Resnick, & Vlahov, 2004). Media coverage of the 9/11 attacks was so extensive that it extended all the way to the United Kingdom, where exposure to 9/11 coverage was also associated with posttraumatic stress responses and functional impairment in London schoolchildren (Holmes, Creswell, & O'Connor, 2007). Following the 2013 Boston Marathon bombings, research indicated that extensive media

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exposure to the bombings (6+ hours on average per day) was a stronger predictor of acute stress responses than was direct exposure to the bombings themselves (Holman, Garfin, & Silver, 2014).

There is also evidence that exposure to trauma-related media content is associated with physical health ailments. Exposure to media coverage of public health scares is often associated with increased symptom reporting and demand for health services above and beyond burden from the disease itself (Faasse, Gamble, Cundy, & Petrie, 2012; McDonnel, Nelson, & Schunk, 2012; Yuji, Narimatsu, Tanimoto, Komatsu, & Kami, 2011). Furthermore, after 9/11, live media exposure to the attacks was associated with increased incidence of physical health problems over 3 years later, even for people geographically distant from the site of the attacks (Holman & Silver, 2011). There was also an increase in adverse birth outcomes among women across the United States who were pregnant during the 9/11 attacks but were only exposed indirectly via the media (Bruckner, Catalano, & Ahern, 2010).

This work is supported by the large body of research suggesting that chronic worry and arousal has a deleterious impact on physical health (cf. Brosschot, Gerin, & Thayer, 2006). In the age of the 24-hour news cycle, coverage of traumatic events is nonstop, and the proliferation of mobile technologies means that much of the viewing public is constantly plugged into these news updates. This means that the stress response is continually being activated by this coverage, which can lead to health problems down the road. For example, after 9/11, acute stress response, compounded with ongoing worry about future acts of terrorism, was predictive of cardiovascular disease onset over the next three years among people who were only exposed to the attacks via the media (Holman et al., 2008). This an important public health issue to understand before future crises arise.

It is true that the bulk of the evidence in support of the link between trauma-related media exposure and negative outcomes has been correlational – this has been by necessity so as to assess how people consume this type of media coverage in an ecologically valid way. However, this precludes the drawing of causal inferences from much of this work (Grimes & Bergen, 2008). It is possible that viewing trauma-related news footage causes distress among viewers, but it is equally possible that individuals who are distressed are more likely to view this footage in the first place (MacLeod, Mathews, & Tata, 1986; Mathews & MacLeod, 1985). However, there are some clues from the experimental literature as to the causal direction of this relationship.

Distress Caused by Media Images

One common argument against the idea that media exposure to trauma can cause distress is that individuals who are only indirectly exposed to traumas via the media are not in any "real" danger, and so distress following trauma-related media exposure must be due to some other psychological factors. However, according to Lazarus and Folkman's (1984) model of stress appraisal, primary appraisals of stimuli are the main indicators of whether those stimuli are threatening; each person decides whether a given stimulus is considered stressful or not. It is these primary appraisals that are important for understanding distress in the context of media exposure to trauma. It has been proposed that exposure to trauma-related media content can distort people's relative risk appraisals, such that even individuals who were not directly threatened with death or bodily harm may perceive great individual risk for future, similar events. Media saturation of trauma-related content can confer that the risk for events is high (Marshall et al., 2007), even when objective risk for such events is low. This can amplify the signal potential of an event – or the ability of an event to communicate that a dangerous threat has entered the environment – which comes from both *dread risk* (event is perceived as

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uncontrollable and catastrophic) and *unknown risk* (event is perceived as being unobservable and unpredictable; Slovic, 1987). Trauma-related images in the media can amplify both these types of risk appraisals, evoking a sense of immediacy and threat (Callahan, Hilsenroth, Yonai, & Waehler, 2005; Cho et al., 2003).

Indeed, there is a robust body of literature in support of the hypothesis that trauma-related content in the media can be distressing. Negative images are often used as experimental stimuli intended to evoke negative emotional responses. For example, the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2008), a standardized set of emotionally-evocative images used for experimental studies of emotion, has been cited over 3,000 times in the literature. Of these images, those depicting threats to the life of human agents consistently induce the greatest physiological arousal (Bradley & Lang, 2007). Negatively arousing images have also been associated with increased startle response (Cuthbert, Bradley, & Lang, 1996), which has been related to fear conditioning and emotional responses to negative stimuli (Lang, Bradley, & Cuthbert, 1990). Traumatic imagery in video footage has an even stronger association with distress than do still images (James et al., 2016). Graphic video footage has been used to elicit PTSD-like intrusions similar to those typically expected from direct exposure to traumatic events (e.g., Bourne, Mackay, & Holmes, 2013). A recent meta-analysis found a robust effect size showing that media exposure to disasters and large-scale violence was followed by negative psychological outcomes (Hopwood & Schutte, 2017; Houston, Spialek, & First, 2018). These data bolster the suggestion that media is an important purveyor of distress in the aftermath of a collective trauma, not the other way around.

However, trauma-related images remain an important part of media coverage, in part because images can create emotional investment where otherwise there might be apathy. For

example, images of the Vietnam War, including one of a little girl running naked from her village after being napalmed by American soldiers, brought attention to the atrocities of war back in the United States, and led to anti-war protests and public pressure to withdraw (Hallin, 1986; Kaplan, 2008). This demonstrates the "Identifiable Victim Effect," or the tendency for people to feel greater empathy for identified victims of some misfortune, and to then expend greater resources to provide aid for that victim (Jenni & Loewenstein, 1997). Furthermore, increases in giving to identified victims appear to be driven by increases in positive affect, rather than negative arousal (Genevsky, Västfjäll, Slovic, & Knutson, 2013). This work suggests that news coverage may be perversely impacting efforts to engage the public with a collective trauma by increasing distress at the expense of empathy for direct victims.

Real vs. Fictional Violence in Media

It is important to note that the present dissertation will be focused exclusively on the psychological predictors and sequelae of exposure to media coverage of real life events. This is distinct from fictional media in multiple ways. There is work that suggests that exposure to violent television programming or violent video games is associated with desensitization to violence, including decreases in empathy, increases in pro-violence attitudes (Funk, Baldacci, Pasold, & Baumgardner, 2004), and increases in tolerance for violent behavior (Drabman & Thomas, 1974; Molitor & Hirsch, 1994). Exposure to both real and fictional violent and/or graphic content is correlated with increases in disgust, stress, and discomfort (Lazarus, Speisman, Mordkoff, & Davison, 1962; Weaver & Wilson, 2009), but this association is moderated by participants' appraisals of the violence. That is, when participants are encouraged to believe that scenes are staged and no one was actually harmed, this leads to a reduction in stress reactions (Lazarus, 1964; Lazarus, Opton, Nomikos, & Rankin, 1965; Speisman, Lazarus,

Mordkoff, & Davison, 1964). Also, individuals report greater disgust reactions to violence in documentary footage than they do to dramatizations (Haidt, McCauley, & Rozin, 1994). This is thought to be because framing violent media in a fictional way allows individuals to distance themselves emotionally from the graphic scenes, which results in a dampened stress response (Apter, 1992; McCauley, 1998). This is not possible when viewing trauma-related coverage in the news media, as these are always depictions of real people and real events.

Plan for the Dissertation

There is a wealth of evidence suggesting that media exposure to trauma is associated with a host of negative mental and physical health outcomes. As such, it is important to understand the correlates of this association, as well as whether and for how long these effects persist over time. This dissertation describes the results of three studies that examine these relationships in greater detail. Chapter 2 extends the prior literature on the mental health sequelae of exposure to trauma-related media coverage by assessing psychological responses to a public health crisis: the 2014 Ebola outbreak. Chapter 3 assesses the degree to which this relationship may be cyclical, such that responses to media exposure of collective trauma predict greater distress, which then predicts greater media exposure and distress following a subsequent collective trauma. These relationships are evaluated using a longitudinal dataset that culminated in assessment of responses to the 2016 Orlando Pulse nightclub shooting. Chapter 4 explores the role of pre-trauma forecasts of posttraumatic stress responses in the relationship between media exposure and distress in the context of 2017's Hurricane Irma. Implications of these studies for public health, the media, and clinical practice is discussed in Chapter 5.

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CHAPTER 2:

Distress, worry, and functioning following a global health crisis:

A national study of Americans' responses to Ebola

Abstract

The 2014 Ebola crisis received unprecedented media attention in the United States, despite low risk of transmission. We examined theoretically derived correlates of psychological response to the crisis, including Ebola-related media exposure, prior mental health history, and stress response to a recent prior collective trauma (the 2013 Boston Marathon bombing, BMB). A national probability sample completed a survey 2–4 weeks post-BMB; 18 months later, the same sample reported responses to the Ebola crisis (N = 3,447). History of mental health diagnoses, acute stress response to the BMB, and Ebola-related media exposure were associated with greater psychological distress and functional impairment. Prior acute stress and Ebola-related media exposure were also associated with Ebola-related worry; individuals with higher BMB-related acute stress who consumed more Ebola-related media were more worried about contracting Ebola. Media coverage of the Ebola public health crisis was associated with negative psychological outcomes, even among individuals at low risk for contracting the disease.

Distress, worry, and functioning following a global health crisis:

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As the recent Zika outbreak, the 2009 H1N1 pandemic, and the 2014 Ebola epidemic demonstrate, threats to public health often impact people worldwide in our globally interconnected modern society. This impact likely exceeds the actual threat to their physical heath. That is, the ubiquitous media coverage of these crises is often disproportionate to the actual risk indicated for many, resulting in untoward and unnecessary adverse psychological and social responses (Vasterman, Yzermans, & Dirkzwager, 2005). Despite the extremely low incidence of Ebola infection in the United States, the West African epidemic was the most closely followed news story in the U.S. in Fall 2014 (Hamel, Firth, & Brodie, 2014), and many Americans endorsed high concern about Ebola as a threat to their personal health. A Kaiser Health U.S. national tracking poll found that 64% of respondents reported high worry about a serious outbreak in the U.S. within the next year and 45% reported high worry that they or someone in their family would get sick from Ebola (Hamel et al., 2014). This worry also manifested itself behaviorally – schools were closed and quarantines implemented for hundreds of individuals who *might* have been exposed to an individual who was sick with Ebola. Given that Ebola virus transmission requires contact with infected bodily fluids, the vast majority of these otherwise common-sense public health measures were grossly unnecessary, mimicking health anxiety symptoms (Hadjistavropoulos, Craig, & Hadjistavropoulos, 1998) on a societal scale.

This stark incongruence between risk appraisals of the Ebola virus and actual risk likely resulted in negative physical and mental health consequences beyond the impact of the actual biological agent. Persistent activation of the stress response has been associated with a wide

variety of deleterious outcomes including depression (Grippo & Johnson, 2009) and decreased immune functioning (McEwen, 2004). After 9/11, acute stress response, compounded with ongoing worry about future acts of terrorism, was associated with increased incidence of new onset cardiovascular disease over the next 3 years, even for people geographically distant from the site of the attacks (Holman et al., 2008). Perseverative cognition more generally has numerous physiological concomitants (Ottaviani et al., 2016). Given these robust associations, it is imperative to better understand how psychological stress and anxiety is spread during a public health crisis (Faasse, Gamble, Cundy, & Petrie, 2012).

During the Ebola epidemic, it is likely that sensationalized media coverage contributed to the widespread worry and disproportionate behavioral responses exhibited in the U.S. (Bernstein et al., 2007; Silver et al., 2013), and individuals with preexisting mental health conditions may be particularly attentive and reactive to these media reports (cf. Holman & Silver, 2011; Silver et al., 2013). Moreover, repeated exposure to graphic images (e.g., injured or dead bodies)–which were prominent in Ebola crisis media coverage–is thought to be especially detrimental. In the wake of 9/11, people who reported high frequency of seeing television images of people falling or jumping to their death reported higher prevalence of posttraumatic stress disorder (PTSD; Ahern, Galea, Resnick, & Vlahov, 2004). Data from laboratory settings using functional magnetic resonance imaging (fMRI) suggests that viewing such traumatic imagery can elicit PTSD-like flashbacks similar to those typically expected from direct exposure to traumatic events (Bourne, Mackay, & Holmes, 2013).

Finally, distress responses to public health crises like the Ebola outbreak are likely correlated with a history of prior adverse responses to negative societal events. This is known as the sensitization hypothesis, which posits that prior stressful life events can have a deleterious

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effect on one's ability to cope with future stressors. For example, prior epidemiological research has suggested that repeated exposure to negative events is associated with increased likelihood of acute and posttraumatic stress responses (Breslau, Chilcoat, Kessler, & Davis, 1999; Garfin, Holman, & Silver, 2015). Furthermore, prior posttraumatic stress responses predict diagnoses of PTSD following exposure to future events (Breslau, Peterson, & Schultz, 2008). Both acute stress and posttraumatic stress reactions to 9/11 were significant predictors of posttraumatic stress reactions to the Iraq War (Silver et al., 2013). To date, however, this work has not been extended to examinations of the impact of public health crises, like the Ebola outbreak.

The present study examined national responses to the Ebola public health crisis in three domains. Specifically, we assessed predictors of psychological distress, functional impairment, and ongoing worry about the Ebola crisis among a representative sample of Americans. Our design provided an unusual opportunity to examine the link between responses to the Ebola crisis and prior responses to collective trauma because the individuals in our sample had previously been evaluated for responses to the 2013 Boston Marathon bombing. We predicted that prior mental health difficulties, stress responses to this prior collective trauma, and exposure to media coverage of Ebola would be significant predictors of negative Ebola-related outcomes.

Methods

Design, Sample, and Data Collection

Participants were drawn from the GfK KnowledgePanel, which uses address-based sampling methods to randomly sample and recruit individuals within U.S. households. To ensure panel representativeness, individuals receive compensation or free Internet as an incentive to participate on the panel and a computer (if needed) in exchange for completion of Web-based surveys. The individuals reported here had previously participated in a study about responses to

the Boston Marathon bombing, conducted between April 29 and May 13, 2013 (Holman, Garfin, & Silver, 2014). That study included 4,675 individuals, with oversamples of metropolitan Boston (*n*=846) and New York City (*n*=941), and the remainder representing the rest of the U.S. (*n*=2888; 79.1% response rate). For approximately four weeks starting December 29, 2014, all those still in the GfK panel (N=3,196) or willing to be contacted despite having terminated from the panel (N=1,140) were invited to participate in a study of their responses to Ebola (*N*=4,336). (Three hundred thirty-nine individuals had withdrawn from the GfK panel and requested no further contact from researchers.) To encourage participation, email, postcard, and telephone reminders were implemented. The final sample was comprised of 3,447 participants (79.5% participation; 73.7% retention). Overall, 3,114 individuals (90.3%) completed the survey online; 333 (9.7%) completed it via paper-and-pencil format and returned it to GfK in prepaid envelopes. All procedures for this study were approved by the Institutional Review Board of the University of California, Irvine.

Measures

  Demographics and mental health history. Prior to the start of the study, participants from the GfK KnowledgePanel provided demographic (e.g., age, gender, ethnicity, education, income, employment, marital status) and mental health information. Prior mental health difficulties were assessed using two items modeled after the U.S. Centers for Disease Control's National Center for Health Statistics annual National Health Interview Survey (NHIS; U.S. Department of Health and Human Services, 2001). Respondents reported whether a physician had ever diagnosed them with depression or anxiety disorders (coded 0 for no prior diagnoses, 1 for either anxiety or depression, and 2 for both). Just over 94% of respondents provided mental health histories prior to the Ebola outbreak. To retain sample representativeness, missing values

for prior depression and anxiety diagnoses were imputed using Sequential Hot-Deck imputation (Holman, Garfin, & Silver, 2014). This measure of prior mental health diagnoses has been benchmarked against the NHIS, which itself has been validated against medical records (U.S. Department of Health and Human Services, 2001) and is considered a valid measure of mental health diagnoses in a U.S. sample.

Prior television habits. Prior to the start of the study, the television-watching habits of the majority of the sample (n=3,266) were measured. Respondents reported the frequency with which they watched 117 broadcast and cable television networks over the previous 6 months on a 5-point scale. An index of prior television-watching habits was created representing the mean frequency across all channels a respondent reported having watched in the 6 months prior to the assessment.

Acute stress response to the BMB. Boston Marathon bombing-related acute stress responses were assessed 2-4 weeks after the BMB using the Stanford Acute Stress Response Questionnaire (SASRQ; Cardeña, Koopman, Classen, Waelde, & Spiegel, 2000). Respondents used a six-point scale from 0 (*not experienced*) to 5 (*very often experienced*) to describe how often they experienced 30 acute stress symptoms "since the Boston Marathon bombings and their aftermath."

Exposure to Ebola-related media. Participants reported the average number of hours/day spent consuming Ebola-related media from all sources ["(TV, radio, videos or text on Internet news sites, social media, mobile phones, newspapers and other print media)"] in October, 2014. A categorical measure of Ebola-related media exposure was created, guided by prior work on media exposure to collective disasters (Silver et al., 2013). Participants could report being exposed to less than one hour, 1-3 hours, 4-6 hours, or more than 6 hours of Ebola-

related media per day across all sources; the latter two groups were combined due to the small cell size in the 6+ hour group ($n=23$, 0.7% of the sample).

Psychological distress. The Brief Symptom Inventory (BSI-18; Derogatis, 2001) measured general psychological distress by assessing the severity of 18 symptoms of depression, anxiety, and somatization on a scale from 0 (*not at all*) to 4 (*extremely*). This measure displayed excellent internal consistency in the present sample ($\alpha = 0.93$).

Functional impairment. The extent to which one's emotional and physical health interfered with social/work activities was assessed with four items adapted from the SF–36 Health Survey (Ware & Sherbourne, 1992) on a scale from 1 (*none of the time*) to 5 (*all of the time*). Items were recoded to 0-4 to give all variables a comparable baseline score. This measure displayed good internal consistency in the present sample ($\alpha = 0.87$).

Ebola-related worry. Items assessing worry about the Ebola crisis were adapted from measures used in prior research conducted after 9/11 (Holman et al., 2008; Silver, Holman, McIntosh, Poulin, & Gil-Rivas, 2002). Specifically, two items assessed the frequency of fear/worry in the last week about being personally affected by Ebola on a scale from 1 (*never*) to 5 (*all the time*). Items were recoded to 0-4 to give all variables a comparable baseline score. This measure displayed good internal consistency in the present sample ($\alpha = 0.84$).

Data Analysis

Statistical analyses were conducted using STATA 14 (Stata Corp, College Station, TX). Data were weighted to account for probability of selection into the KnowledgePanel and differences in the demographic makeup of our sample compared to U.S. Census benchmarks, while accounting for systematic oversampling in Boston and New York (Holman et al., 2014). Summary scores were computed for prior acute stress response to the BMB, psychological

distress, functional impairment, and Ebola-related worry to account for variability in each of these constructs (MacCallum, Zhang, Preacher, & Rucker, 2002).

Ordinary Least Squares (OLS) regression models were constructed to examine predictors of psychological distress, functional impairment, and Ebola-related worry. First, demographics (i.e., age, gender, ethnicity, education, income, employment status) were entered, followed by mental health history, prior television use, prior acute stress response to the BMB, and hours of Ebola-related media exposure. Models were trimmed for parsimony; marital status, income, and region (to account for systematic oversampling in Boston and New York City metropolitan areas) were not significant predictors and are not reported here. An interaction term for prior acute stress and Ebola-related media exposure was constructed and entered in an additional model examining predictors of Ebola-related worry.

Results

The composition of the final weighted sample (N=3,447) closely matched U.S. population estimates (see Supplemental Table A for the weighted and unweighted demographic composition). The final weighted sample was 52.33% female, ranged in age from 18-94 ($M =$ 52.29, $SD = 16.57$), and was 68.01% white (non-Hispanic), 10.57% Black/African American, 13.45% Hispanic, and 7.97% other ethnicities (non-Hispanic). Almost 58% were married, 60.94% had at least some college education, and 62.77% had an annual income of $50,000 or more. Over 58% of the sample was currently employed (n=2,005), either as a paid employee or self-employed. Almost 12% of the sample reported a prior diagnosis of either depression or anxiety (n=412), 7% reported both diagnoses (n=235), and 81% reported neither mental health diagnosis (n=2,800). Most participants (n=2,555, 73.40%) reported an average of less than one hour per day of Ebola-related media exposure; 740 participants (22.33%) reported exposure to 1-

3 hours of Ebola-related media per day and 108 participants (4.16%) reported exposure to four or more hours of Ebola-related coverage per day.

The three outcome measures in the present study were significantly correlated with one another. Psychological distress and functional impairment were highly correlated (r=0.73, p<.001). Additionally, worry about the Ebola crisis was significantly associated with both psychological distress (r=0.32, p<.001) and functional impairment (r=0.25, p<.001).

Table 1 presents multivariate OLS regression analyses examining predictors of psychological distress, functional impairment, and Ebola-related worry. Adjusting for demographics (age, gender, ethnicity, education, income, employment status), BMB-related acute stress predicted all three outcomes. Controlling for prior television consumption habits, increased daily hours of Ebola-related media exposure were significantly associated with incremental increases in all three outcomes. Prior mental health status was a significant predictor of both psychological distress and functional impairment, but not Ebola-related worry. Standardized regression coefficients for prior mental health, prior acute stress response to the BMB, and Ebola-related media for each outcome measure are plotted in Figure 1.

Table 1

Predictors of Psychological Distress, Functional Impairment, and Worry about Ebola (*N*=3,447)

Predictor Variable	Psychological Distress B(95% CI)	β	Functional Impairment B(95% CI)	β	Ebola-Related Worry B(95% CI)	β	Ebola-Related Worry - Model 2 B(95% CI)	β
Age	-0.04(-0.07, -0.02)	-0.08**	-0.01(-0.01, 0.01)	-0.02	-0.01(-0.01, 0.01)	-0.01	0.00(-0.01, 0.01)	0.00
Gender	-0.29(-1.08, 0.51)	-0.02	-0.17(-0.43, 0.08)	-0.03	0.02(-0.11, 0.15)	0.01	0.03(-0.10, 0.16)	0.01
Ethnicity								
Black	-0.09(-2.14, 1.97)	-0.01	0.01(-0.53, 0.56)	0.01	0.16(-0.14, 0.46)	0.03	0.15(-0.15, 0.45)	0.03
Hispanic	2.76(1.27, 4.25)	0.11***	0.71(0.24, 1.18)	0.08**	0.31(0.06, 0.55)	0.07*	0.30(0.05, 0.54)	0.07*
Other	2.49(0.61, 4.37)	0.07*	0.42(-0.09, 0.92)	0.04	0.77(0.46, 1.08)	0.14***	0.76(0.45, 1.06)	0.14***
Education								
High School	0.09(-1.64, 1.81)	0.01	-0.62(-1.42, 0.18)	-0.10	-0.31(-0.69, 0.06)	-0.10	-0.32(-0.69, 0.04)	-0.11
Some College	0.58(-1.19, 2.34)	0.03	-0.50(-1.31, 0.30)	-0.08	-0.21(-0.59, 0.16)	-0.07	-0.21(-0.58, 0.16)	-0.07
Bachelor's or More	0.22(-1.50, 1.94)	0.01	-0.35(-1.16, 0.46)	-0.06	-0.42(-0.79, -0.05)	-0.14*	-0.42(-0.78, -0.06)	-0.14*
Income	-0.21(-0.32, -0.10)	-0.11***	-0.08(-0.12, -0.04)	-0.13***	-0.01(-0.03, 0.01)	-0.03	-0.01(-0.03, 0.01)	-0.03
Employment Status	-0.64(-1.52, 0.24)	-0.04	-0.51(-0.80, -0.22)	-0.09***	-0.13(-0.28, 0.02)	-0.05	-0.13(-0.28, 0.02)	-0.04
Prior Mental Health	4.22(3.31, 5.14)	0.29***	1.46(1.16, 1.76)	0.30***	0.01(-0.11, 0.13)	0.01	0.02(-0.10, 0.14)	0.01
Prior Media Use	0.80(0.21, 1.39)	0.06**	0.17(-0.01, 0.35)	0.04	0.12(0.02, 0.22)	0.06*	0.11(0.01, 0.22)	0.06*
BMB Acute Stress	0.09(0.07, 0.12)	0.22***	0.03(0.02, 0.03)	0.18***	0.02(0.01, 0.02)	0.26***	0.00(-0.01, 0.01)	0.05
Ebola-related Media								
1-3 hours	0.74(-0.26, 1.75)	0.04	0.22(-0.11, 0.55)	0.03	0.49(0.31, 0.67)	0.14***	0.36(0.17, 0.55)	0.11***
4+ hours	4.19(0.79, 7.60)	0.09*	1.42(0.48, 2.37)	0.09**	1.03(0.57, 1.48)	0.13***	0.55(0.08, 1.01)	0.07*
Ebola-related Media x BMB AS Interaction	--	--	--	--	--	--	0.01(0.00, 0.01)	0.25**
Constant	5.34(2.26, 8.42)		2.29 (1.16, 3.42)		0.66(0.09, 1.24)		0.74(0.16,1.31)	
Model Statistics	F(15,3208)=19.27*** R²=0.24		F(15, 3204)=19.13*** R²=0.24		F(15, 3207)=14.20*** R²=0.19		F(16, 3206)=15.02*** R²=0.20	

Note: Table presents both standardized (*β*) and unstandardized (*B*) regression coefficients. Mental health was coded as follows: 0 = no anxiety or depression, 1 = depression or anxiety, 2 = both depression and anxiety. The reference groups for gender, race, education, and employment status were males, Whites, "less than high school," and not employed, respectively. The reference group for Ebola-related media exposure is "less than 1 hour." The interaction term represents the interaction of hours of Ebola-related media exposure and Boston Marathon bombing acute stress (BMB AS).
* *p*<.05; **ptp*<.01; ***p*<.001

Figure 1

Standardized Regression Coefficients for Predictors of Psychological Distress, Functional Impairment, and Ebola Worry
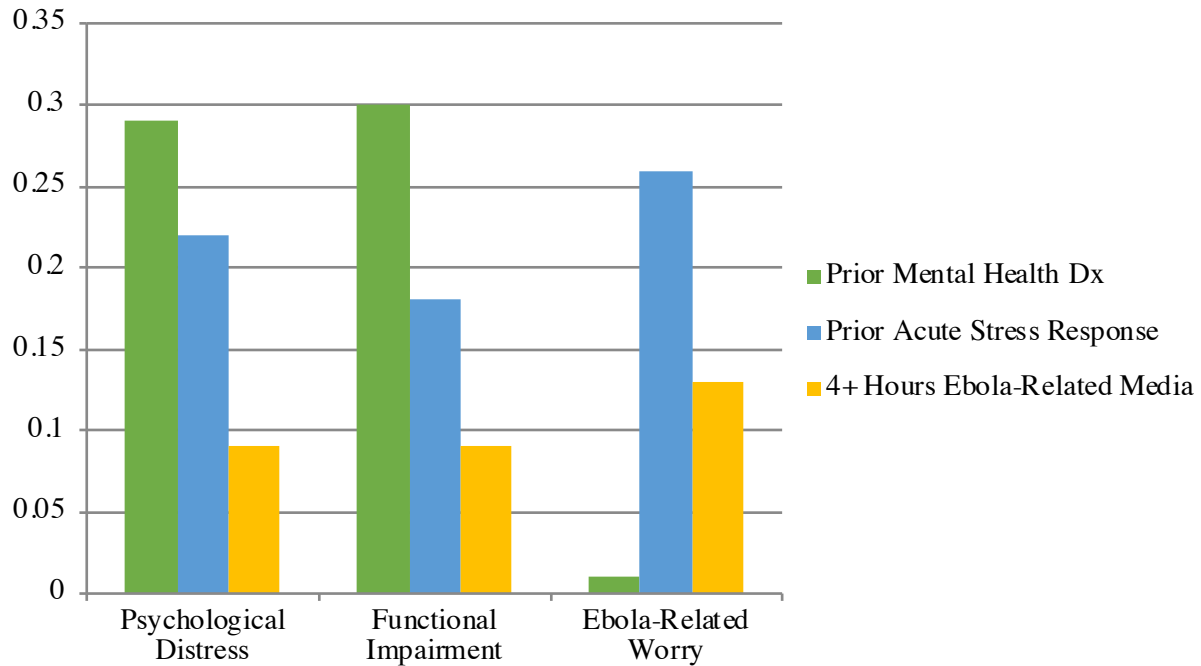
There was a significant interaction between prior acute stress and Ebola-related media exposure on Ebola-related worry. For individuals who reported low acute stress following the Boston Marathon bombing, the association between Ebola-related media exposure and Ebola worry was very small. However, individuals who reported high acute stress and high Ebola-related media exposure also reported the greatest Ebola-related worry. Thus, the relationship between Ebola-related media exposure and worry about Ebola was strongest for individuals who also reported high acute stress in the aftermath of a previous collective trauma ($p<.001$; see Figure 2).

Figure 2

Graph of the Interaction between Boston Marathon Bombing-Related Acute Stress and Hours of Ebola Media on Ebola Worry
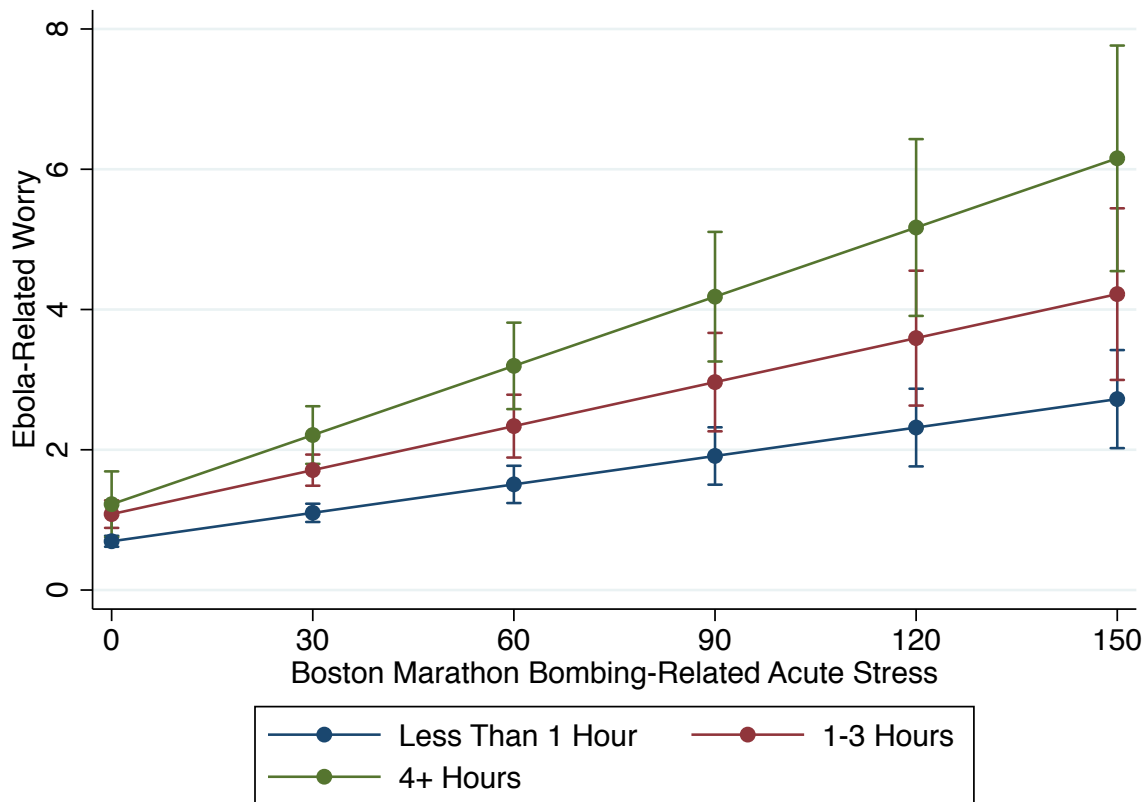
It is possible that these analyses are tapping anxiety sensitivity among individuals who are seeking threat-relevant information in the media and reporting a great deal of worry. Data from a subsequent survey of this panel were used to test this possibility. Approximately 18 months following the Ebola survey, a subsample of these respondents participated in another wave of data collection (n=2,861). This survey assessed trait neuroticism using the 2-item neuroticism subscale of the Ten Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003). When included in the models, neuroticism was a significant predictor of psychological

distress (β=.24, p<.001), functional impairment (β=.17, p<.001), and Ebola-related worry (β=.10, p=.001). However, its inclusion did not account for the relationships between prior mental health diagnoses, prior acute stress responses, and media exposure to Ebola with any of the outcome measures. Moreover, when controlling for trait neuroticism, the interaction between prior acute stress responses and Ebola-related media exposure on Ebola-related worry remained significant (β=.32, p<.001).

Discussion

Findings demonstrated that extensive Ebola-related media exposure and stress responses to a prior collective trauma were key indicators of negative psychological responses to the Ebola public health crisis. Having a history of mental health diagnoses was also a significant predictor of outcomes, although this did not mediate or moderate significant relationships between other variables. There was a significant interaction between Ebola-related media exposure and prior BMB-related acute stress on Ebola worry, such that the relationship between media exposure and worry about Ebola was augmented in individuals who reported greater acute stress responses 18 months earlier. These associations held even when controlling for patterns of prior television use, employment status, income, and trait neuroticism. This suggests that individuals who have the strongest reactions to collective traumas are at the greatest risk for distress that can follow extensive media exposure to subsequent distressing events, in support of the sensitization hypothesis (cf. Silver et al., 2013). This conclusion is supported by prior work suggesting that it is individuals who have previously been diagnosed with PTSD who are most likely to develop psychopathology following subsequent exposures (Breslau et al., 2008). As prior work has demonstrated, these incremental effects of cumulative exposures, ubiquitous in daily media coverage in contemporary society, correlate with increased distress responses across the

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population (see Garfin et al., 2015). Moreover, while the group of individuals who reported being exposed to 4 or more hours of Ebola-related media per day during the Ebola outbreak was a relatively small proportion of the present sample (approximately 4%), this may represent a group of almost 13 million Americans when referred to population estimates. Though not everyone is exposed to extensive media during a crisis, many are, and it is important to understand the implications of this exposure.

These results are consistent with analyses conducted shortly after the Boston Marathon bombings demonstrating that media exposure was a powerful predictor of event-related acute stress responses; effect size indicators for the highest levels of media exposure were stronger than direct exposure to the bombing or subsequent lockdown (Holman et al., 2014). Taken together, our findings bolster the suggestion that media is an important purveyor of distress. Moreover, findings suggest that those with pre-existing mental health conditions and those who responded with acute stress to a previous community trauma may exhibit higher distress following media exposure to subsequent community-wide stressful events (Garfin et al., 2015; Silver et al., 2013). This worry may translate into measurable consequences for individual and public health (Holman et al., 2008; Ottaviani et al., 2016).

Despite our longitudinal design, a number of key findings are correlational, prohibiting causal inferences. Yet, demographic information, mental health history, and acute stress responses to the Boston Marathon bombing were assessed 18 months *prior* to the assessment of Ebola-related outcomes, providing important temporal information about associations that is not available in cross-sectional studies. Moreover, the unparalleled media attention to Ebola, coupled with the preexisting large representative national sample on which we had already collected valuable information, provided a unique opportunity to examine adjustment processes in the

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absence of methodological limitations that are frequent in research on disasters (e.g., lack of pre-event data; retrospective data collection; small, demographically homogenous samples; Silver et al., 2006). It should also be noted that there are limitations with some of our measures. Specifically, our measure of mental health is rather narrow in that it only captures prior diagnoses of depression and anxiety by a medical professional; a measure assessing severity of anxiety and depressive symptomatology more generally would provide a broader assessment of prior mental health. Additionally, our measure of neuroticism was very brief, and was assessed approximately 18 months following the Ebola data collection period. Nonetheless, the TIPI has adequate test-retest reliability and convergent validity when compared to other longer personality inventories (Gosling et al., 2003), and personality traits are considered relatively stable in adult samples (Costa & McCrae, 1988).

Finally, it should be acknowledged that Ebola-related media exposure was measured concurrently with psychological distress, functional impairment, and worry about Ebola, and so the causal direction of these relationships remains to be more fully explicated. Future studies should attempt to disentangle the interrelationships between individuals consuming a great deal of negative media and increased distress that then may lead to more media exposure that elicits more distress. Furthermore, although we made every attempt to control for possible third variable explanations, it is still possible that the associations reported here may be explained by another factor that we were unable to capture (e.g., trait anxiety not captured by neuroticism or prior mental health diagnoses). Other cognitive and psychological mediators of these relationships likely exist and should be explored in future research. For example, more experimental work is needed to assess the impact of media exposure outside a context in which individuals self-select into media exposure categories. Regardless, our findings suggest an

important link between exposure to media coverage of stressful content and distress – something individuals may want to remember when making their own media consumption decisions.

Our findings have several important implications. Distress responses to the Ebola crisis likely posed considerable detriment to public health above and beyond those presented from the biological Ebola virus. First, public response in the U.S. likely diverted essential financial and human resources from locations most directly impacted by the virus (Cohen, 2014). Second, unfounded worry may unnecessarily burden healthcare providers. Such ramifications occurred in the midst of the 2009 outbreak of influenza H1N1, resulting in an increase in emergency department visits, even during a period without actual H1N1 influenza in the community (McDonnel, Nelson, & Schunk, 2012). Conversely, people's fear of being infected during visits to health clinics can also prevent them from seeking necessary health care. For example, the Severe Acute Respiratory Syndrome (SARS) epidemic in 2003 correlated with a substantial decrease in health care utilization in areas most affected by the epidemic (Chang et al., 2004).

We were unable to differentiate among different types of media sources (e.g., traditional vs. "new" media) in the present analyses. While the demographic differences among users of various media types are well documented (Kohut, Doherty, Dimock, & Keeter, 2012), we do not yet know whether the experience of getting one's news from these sources also differs across platforms. For example, perhaps the act of seeking out news stories on the Internet results in a different experience than passively consuming news presented on the television. Future research should consider how differences among users and experiences of using these various media sources might impact the relationship between media use and crisis-related distress.

Communicating with the public about the dangers of Ebola and other health crises in order to raise awareness without propagating excessive worry is imperative (Fischhoff, 2011),

and must be a discussion for those in the field of traumatic stress, public health policy, media reporting, and service provision (Lubens, 2015). For example, news stories with potentially stressful content should focus on providing tangible information rather than sensationalized reports of worst-case scenarios. At the individual level, mental health professionals should be aware that their patients' anxiety or other psychopathology may be exacerbated by these external social phenomena. Our findings provide support for growing evidence that media reports of collective crises are associated with distress among many individuals, a problem that will only increase with the proliferation of portable technologies (e.g., smartphones). Responsible media reporting before, during, and following stressful events should be considered an important topic to address before future crises arise. In order to maintain the mental and physical health of our communities, it is crucial that a balance be struck between responsible dissemination of information and overly sensationalized coverage that may be proliferating distress responses.

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CHAPTER 3:

Media exposure to mass violence events can fuel a cycle of distress

Abstract

The established link between trauma-related media exposure and distress may be cyclical: it can increase subsequent trauma-related media consumption that promotes increased distress to later events. We tested this hypothesis in a 3-year longitudinal study following the 2013 Boston Marathon bombings (BMB) and 2016 Orlando Pulse Nightclub massacre using a representative U.S. sample (N=2,450). Data were collected shortly after the bombings, six and 24 months later, and beginning 5 days after the Pulse massacre. Bombing-related media exposure predicted posttraumatic stress symptoms (PTS) six months later; PTS predicted worry about future negative events 2 years post-bombings, which predicted increased media consumption and acute stress following the Pulse massacre one year later. Trauma-related media exposure perpetuates a cycle of high distress and media use.

Media exposure to mass violence events can fuel a cycle of distress

Countless mass violence events have stunned the world in recent years, including tragedies such as the massacre at the Pulse Nightclub in Orlando, FL and the mass shooting at a country music festival in Las Vegas, NV, each described at the time as the "worst mass shooting" in the United States' history. Unfortunately, coverage of these and other large-scale collective traumas (e.g., terrorist attacks, disasters) appears in traditional and social media with increasing frequency; this extensive media coverage is often repetitious and regularly includes graphic images and videos (Jones, Garfin, Holman, & Silver, 2016), as well as sensationalized descriptions of the events. Repeated exposure to news coverage of these events has been linked to poor mental health outcomes (e.g., acute stress) in the immediate aftermath (Holman, Garfin, & Silver, 2014; Hopwood & Schutte, 2017; Silver et al., 2013), and posttraumatic stress responses and physical health problems over time (Ahern, Galea, Resnick, & Vlahov, 2004; Silver et al., 2013). The 24-hour news cycle and the proliferation of mobile technologies means that much of the viewing public is regularly plugged into news updates. Thus, media coverage of collective, community-based trauma may transmit distress by broadcasting an event to whole populations, extending the reach of an event that would otherwise have been restricted to local communities (Vasterman, Yzermans, & Dirkzwager, 2005).

Research also suggests that consumption of media coverage of collective traumas may be a rational response for individuals who are anxious about such events. The uncertainty management hypothesis (Heath & Gay, 1997; Lachlan, Spence, & Seeger, 2009; Seeger, Sellnow, & Ullmer, 2003) states that individuals may experience anxiety resulting from feelings of uncertainty associated with collective traumas. To mitigate this anxiety and the uncertainty from which it stems, individuals who are concerned about a collective trauma may seek

information from the media. Thus, individuals with increased event-related fear should be more likely to cope by consuming trauma-related media. Furthermore, this is likely to be true even for individuals without a history of mental health problems – even healthy individuals pay greater attention to stimuli they perceive as threatening (Field, 2006; Keogh, Ellery, Hunt, & Hannent, 2001; Lipp & Derakshan, 2005). However, this strategy of reducing uncertainty by seeking information via the media may backfire when individuals are exposed to graphic trauma-related media content. For example, in the aftermath of the September 11th (9/11) terrorist attacks, individuals who perceived the media as a provider of useful information were more likely to consume 9/11-related media coverage, but this media use was associated with *increased* distress over time (Lachlan et al., 2009).

Thus, an individual's media use after a collective trauma may fuel a cycle of distress by exacerbating distress and worry about future events, which promotes even greater distress when these events ultimately occur. Worry about the future is commonly associated with posttraumatic stress (Laubmeier & Zakowski, 2004; Piotrkowski & Brannen, 2002) and is a hallmark symptom of most anxiety disorders. Because worry about the future is associated with protective decision making (Weinstein, Lyon, Rothman, & Cuite, 2000), to the extent that people consume media to gather information they can use to protect themselves from a perceived threat, previous worries about future events should be associated with future media use as well.

After a collective trauma, certain individuals are more likely to be vulnerable to information-seeking behaviors and its consequences: individuals with a history of either prior life trauma or mental health difficulties encounter more media images of trauma compared to healthy individuals with no trauma history (Jones et al., 2016). Those who have experienced more violence in their lives often see themselves at greater risk for exposure to future negative events

(Blum, Silver, & Poulin, 2014) and are more likely to develop mental health problems following subsequent violent and nonviolent traumas (Breslau, Chilcoat, Kessler, & Davis, 1999). Individuals with previously diagnosed mental health ailments are also more likely to report high distress and greater incidence of physical health ailments over time following community-based traumas (Holman & Silver, 2011; Otto et al., 2007). Thus, these individuals in particular may be at greater risk for falling into patterns of traumatic media exposure and distress in the trauma's aftermath.

We hypothesize that distress responses to a past collective trauma may sensitize individuals – that is, make them more emotionally responsive – to media coverage of future events, resulting in heightened distress and worry following subsequent media exposure. This heightened distress may also lead to increased media attention to future events. Although underexplored, there is some evidence for this cyclical pattern. Both direct and media-based indirect exposures to past collective traumas are known risk factors for future posttraumatic stress responses to subsequent trauma (Brewin, Andrews, & Valentine, 2000; Garfin, Holman, & Silver, 2015; Silver et al., 2013). For example, following the 2014 Ebola public health crisis, worry about contracting Ebola was strongest for individuals who reported both high distress about a prior trauma and greater exposure to Ebola-related media coverage (Thompson, Garfin, Holman, & Silver, 2017). A cycle of sensitization may therefore exist such that individuals who consume extensive media about a collective trauma will respond more strongly both to that event and future events as a function of their ongoing worry. This cycle has yet to be demonstrated, and a recent meta-analysis confirms this remains a significant gap in the literature. Indeed, to this point there have been no longitudinal studies examining the potential transactional effects of media use after a collective trauma (Houston, Spialek, & First, 2018). Such a study would

"address the ways in which disaster media use affects reactions, how those reactions drive

additional disaster media use, how additional media use affects future reactions, and so on"

(Houston et al., 2018, p. 16). The present study aimed to address this gap by demonstrating how

these relationships play out over time in the context of exposure to consecutive collective

traumas.

Methods

Study Design

We conducted a longitudinal study of a representative national sample of U.S. residents

who were surveyed four times[1] over a three-year period, including in the days following two

mass violence events in the United States: the bombings at the finish line of the 2013 Boston

Marathon, which resulted in three deaths and over 260 people injured, and the 2016 massacre in

the Pulse Nightclub in Orlando, Florida, which resulted in 49 deaths and 58 people injured.

Participants were randomly drawn from the GfK KnowledgePanel, a nationally representative

panel of U.S. residents recruited using address-based sampling methods. In address-based

sampling, individuals are randomly sampled within households to participate on the panel

through a series of mailings to randomly selected addresses; if a phone number is attached to an

address, phone invitations may also be used. KnowledgePanelists complete online surveys in

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[1] In addition to the data described here, panelists completed two additional waves of data

collection between Waves 2 and 3 (Boston Marathon Bombing Anniversary Wave: 4/18/2014-

5/6/14, $n=3,260$ responses, 74.2% participation; Ebola Outbreak Wave: 12/29/2014-3/3/2015,

$n=3,450$, 79.6% participation). The data collected at these waves are not relevant to the questions

in this manuscript and will not be discussed further (See Appendix).

exchange for Internet access or other compensation (e.g., points that participants may accumulate that can be redeemed for cash, gift prizes, or sweepstakes opportunities). Households without computer access are supplied with a laptop to facilitate survey completion and ensure panel representativeness. Individuals may only join the KnowledgePanel after being randomly selected. Email, postcard, and telephone reminders were sent to encourage participation. All procedures were approved by the Institutional Review Board of the University of California, Irvine.

The first survey was fielded 2-4 weeks following the BMB and its associated lockdown, and included oversamples in New York and Boston metropolitan areas (Wave 1, N=4,675, 4/29/13-5/13/13, 79.1% participation; Holman et al., 2014). The second survey was fielded to all available Wave 1 participants (n=4,429) approximately six months later (Wave 2, n=3,588, 10/18/13-11/17/13, 80.9% participation). The third survey was fielded at around the two-year anniversary of the BMB (Wave 3, n=3,341, 4/29/15-6/24/15, 78.1% participation) to all available Wave 1 participants (N=4,276). The final survey was fielded starting five days after the Pulse Nightclub massacre (Wave 4, n=3,199, 6/17/16-7/22/16, 74.7% participation), again to all available participants (N=4,282). The present analyses included only those participants who completed all four waves of data collection (N=2,450). This design enabled us to capture individuals' responses to both events, a rare feature among post-disaster studies (Silver et al., 2006). As a result of this longitudinal design, we were also uniquely positioned to examine how post-event responses to one national trauma might sensitize people to news coverage of another tragedy over time.

Measures

Prior to the start of the first survey, participants provided demographic information (e.g., age, ethnicity, gender, income) and mental health history (physician-diagnosed depression or anxiety disorders, coded 0 for no diagnoses, 1 for either depression or anxiety, 2 for both diagnoses) upon entry to the GfK KnowledgePanel. Sample characteristics may be found in Table 1. Media exposure to the Boston Marathon bombings was assessed at Wave 1; hours of exposure to each of seven sources of media (television; radio; pictures, videos, or text updates on social media; online news; print media) were summed to create a composite media exposure variable. Cumulative hours of daily media consumption were capped at 33 (3 standard deviations above the mean) to account for outliers.[2] Direct exposure to the bombing and resulting lockdown was also assessed at Wave 1 by asking participants to report whether they or someone close to them was at, injured in, or near the site of the Boston Marathon on April 15; whether they knew someone who died in the attack; and whether they or someone close to them was in the locked down area during the search for the perpetrator. At Wave 2, participants' life event histories were assessed using an inventory of 37 possible events that has been used previously in surveys of national samples (Seery, Holman, & Silver, 2010). Participants indicated whether each event had occurred prior to or following the Boston Marathon bombings; responses to violence items (Blum et al., 2014) that had occurred prior to the bombings were summed to create a composite prior violence score. Posttraumatic stress symptoms from the Boston Marathon bombings were assessed at Wave 2 using a slightly modified version of the Primary Care – PTSD Screen (Calhoun et al., 2010), which is comprised of four items, each of which corresponds to one of the

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[2] Because individuals could report up to 11 hours of event-related media exposure per day across seven (Boston Marathon bombing) or five (Pulse nightclub massacre) sources, many participants reported cumulative media use in excess of 24 hours per day across sources

four hallmark constructs of PTSD (re-experiencing, avoidance, numbing, and hyperarousal). Responses are scored on a 1-5 Likert-type scale (1=*never* to 5=*all the time*) and summed to create a composite Boston Marathon bombing-related posttraumatic stress score for each participant ($\alpha=0.78$). At Wave 3, worry about future events was assessed using an 8-item scale that has been adapted from one used in previous studies of collective traumas (Silver, Holman, McIntosh, Poulin, & Gil-Rivas, 2002). Participants reported on a 1-5 Likert-type scale (1=*never* to 5=*all the time*) the degree to which they had fears of terrorism, community violence, natural disaster, or economic hardship affecting them or their families over the prior week ($\alpha=0.87$). At Wave 4, beginning two weeks after the Pulse nightclub massacre, acute stress symptomatology in response to the shooting was assessed using the Acute Stress Disorder Scale 5 (Bryant, 2016). This scale measured the frequency of experiencing 14 DSM-5 (American Psychiatric Association, 2013) symptoms of acute stress "since the Orlando mass shooting and its aftermath" on a 5-point Likert-type scale (0=*not at all* to 4=a *great deal*) ($\alpha=0.88$). Total hours of daily exposure to each of five sources of media (i.e., television, radio, online news, pictures and text on social media sources) regarding the Pulse nightclub massacre were also assessed at this time. Hours of daily media consumption were capped at 18 (3 standard deviations above the mean) to account for outliers (see footnote on p. 47). Direct exposure to the Pulse nightclub massacre was also assessed at Wave 4; participants reported whether they or someone they knew was at or near the site of the shooting.

Table 1

Descriptive statistics for all variables of interest (*N*=2,450)

Variable	*n*	%	Mean (SD)
Gender			
Male	1,163	47.47	
Female	1,287	52.53	
Ethnicity			
White, Non-Hispanic	1,945	79.39	
Black/African American	157	6.41	
Other, Non-Hispanic	187	6.57	
Hispanic	161	7.63	
Education			
Less than high school	122	4.98	
High school diploma	589	24.04	
Some college/Associate degree	664	27.10	
Bachelor degree or beyond	1,075	43.88	
Household income ($)			
< 25,000	283	11.55	
25,000–49,999	500	20.41	
50,000–74,999	457	18.65	
75,000–99,999	400	16.33	
100,000-124,999	353	14.41	
≥ 125,000	284	11.59	
Sample Area			
Boston Metro	512	20.90	
New York City Metro	523	21.35	
National	1,415	57.76	
Mental Health Diagnoses			
None (0)	2,033	82.98	
Depression OR Anxiety (1)	300	12.24	
Depression AND Anxiety (2)	117	4.78	
Age			52.00 (16.13)
Boston Marathon bombings daily media (hours)[a]			6.04 (6.68)
Boston Marathon bombings direct exposure			
Yes	2,195	89.59	
No	255	10.41	
Boston Marathon bombings PTS[b]			5.08 (1.97)
Worry about future events[c]			1.86 (0.72)
Pulse nightclub massacre daily media (hours)[d]			3.40 (3.88)

Pulse nightclub massacre direct exposure		
Yes	2,347	95.80
No	103	4.20
Pulse nightclub massacre AS[e]		7.02 (7.71)

[a] Daily hours of Boston Marathon bombing-related media range: 0-33 hours

[b] PTS=Posttraumatic stress symptoms; range: 4-20

[c] Worry about future events range: 0.5-5

[d] Pulse nightclub massacre daily media range: 0-18

[e] AS=Acute stress symptoms; range: 0-56

Analytic Strategy

All analyses were conducted in Stata 14.2 using the Structural Equation Modeling (SEM) Builder. Path models examined relationships between media exposure and distress responses to both the Boston Marathon bombings and Pulse Nightclub massacre. This analysis incorporates several regression analyses simultaneously, which enables testing of possible causal pathways over time. Covariates included: age, gender, income, education (Bachelor's degree or greater vs. other), ethnicity (White, Non-Hispanic vs. Other), and sample area (Boston metropolitan area, New York City metropolitan area, or national sample). Correlations among these exogenous variables may be found below in Table 2; beta weights for each of these structural paths (not shown in Figure 1) may be found below in Table 3.

Table 2

Correlations among exogenous variables presented in the path model

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Age	1.00										
2. White Ethnicity	0.19***	1.00									
3. Female Gender	-0.04*	0.02	1.00								
4. Income	-0.01	0.11***	-0.07***	1.00							
5. College Degree	-0.01	0.06**	-0.06**	0.33	1.00						
6. Boston Metro	0.04*	0.15***	0.08***	0.05*	0.15***	1.00					
7. NYC Metro	0.08***	-0.06**	-0.09***	0.06**	0.05*	-0.27***	1.00				
8. Prior Mental Health Dx.	-0.01	0.03	-0.09***	-0.13***	-0.07**	0.02	0.00	1.00			
9. Prior Violence Exposure	-0.01	-0.11***	-0.00	-0.11***	-0.04*	0.01	0.01	0.18***	1.00		
10. BMB Direct Exposure	-0.10***	0.08***	0.06**	0.10***	0.15***	0.39***	-0.06**	-0.00	0.06**	1.00	
11. Pulse Direct Exposure	-0.10***	-0.04	0.01	0.01	0.03	-0.03	-0.02	0.01	0.08***	0.08***	1.00

Note: *p<.05; **p<.01; ***p<.001

Table 3

Standardized coefficients for paths not presented in full model (*N*=2,450)

	Outcome Variable	
Predictor Variable	Boston Marathon Bombing-Related Media	Boston Marathon bombing Posttraumatic Stress
Age	-0.04	0.01
Female Gender	-0.05*	-0.03
White Ethnicity	-0.07***	-0.07***
Income	-0.03	-0.05**
College Degree	-0.04*	-0.06**
Boston Metro	0.23***	0.02
NYC Metro	0.08***	0.05**

*Note: *p<.05; **p<.01; ***p<.001*

In the initial theoretical model, previously diagnosed mental health ailments and prior history of violence exposure predict both exposure to media coverage of the Boston Marathon bombings and posttraumatic stress symptomatology. Exposure to Boston Marathon-related media also predicts Wave 2 posttraumatic stress symptomatology, controlling for direct exposure to the bombings. Higher bombing-related symptoms predict Wave 3 worry about future events, which predicts Wave 4 consumption of Pulse Nightclub massacre-related media coverage and acute stress symptomatology, also controlling for direct exposure. Stability paths are included for Wave 1 and Wave 4 media consumption, as well as for Wave 2 and Wave 4 symptoms. Pre-Boston Marathon bombings covariates (i.e., demographics and sample area) also predict both

bombing-related media exposure and posttraumatic stress symptoms. This theoretical model fit the data satisfactorily ($\chi^2(36)=352.89$, $p<.001$; CFI=.90; RMSEA=.060; SRMR=.035), but further analyses were pursued to attain a model with better fit for the data.

First, modification indices suggested an additional path between pre-bombing violence exposure and Wave 3 worry about future events (MI=57.62); addition of this path improved the model fit significantly ($\chi^2(1)=58.31$, $p<.001$). Further modification indices suggested an additional path between Wave 2 posttraumatic stress symptoms and Wave 4 media consumption (MI=38.08); addition of this path also improved model fit relative to the more constrained model ($\chi^2(1)=38.03$, $p<.001$). Model fit indices suggested acceptable fit of this model to the data ($\chi^2(34)=256.55$, $p<.001$; CFI=.93; RMSEA=.052; SRMR=.030).

Based on this final model and theoretical considerations, a few additional paths were tested. The first was a path between prior mental health diagnoses and worry about future events. A likelihood ratio test suggested that the addition of this path significantly improved model fit relative to the more constrained model, and was included in the final model ($\chi^2(1)=14.79$, $p<.001$). The second path was between bombing-related media exposure and worry about future events. A likelihood ratio test suggested that the addition of this path did not significantly improve model fit ($\chi^2(1)=3.74$, $p=.053$), and the indices of fit remained approximately the same (RMSEA=.051; CFI=.94), so the more constrained model was chosen. The final model, including fit indices, may be found in Figure 1.
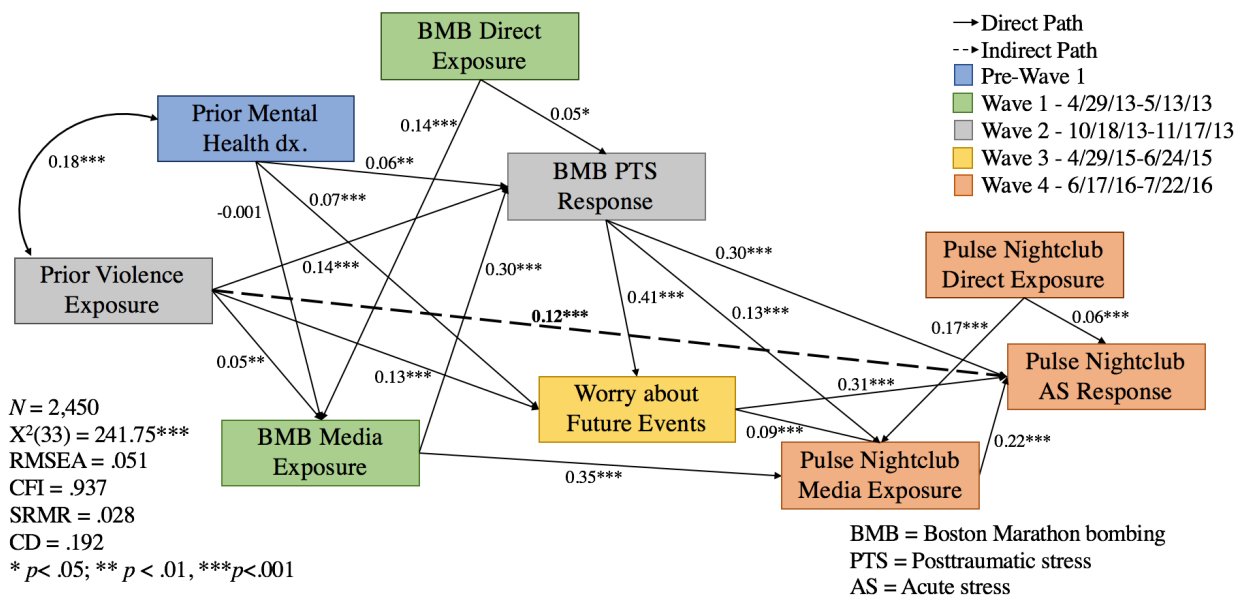
Results

We examined the relationships among exposure to news coverage of both the Boston Marathon bombings and Pulse Nightclub massacre and acute and posttraumatic stress responses. We used Path analysis to test the fitness of proposed model; after appropriate adjustments, the

final model that best fit the data is presented in Figure 1. We found that, controlling for covariates, media exposure to the BMB was associated with posttraumatic stress symptoms six months later, which in turn was associated with worry about future negative events at the two-year anniversary of the bombings. Bombing-related posttraumatic stress and worry about future events each uniquely predicted both hours of media exposure and acute stress responses to the Pulse nightclub massacre. Pulse massacre-related acute stress symptoms were also uniquely associated with hours of media exposure to this event. Violence exposure that respondents reported experiencing before the BMB indirectly predicted Pulse nightclub massacre-related acute stress through bombing-related media exposure, posttraumatic stress symptoms, worry about future events, and Pulse massacre-related media exposure. Fit indices for this model indicated good fit: (see Figure 1).

Figure 1

Path model predicting relationships between media exposure and distress responses over time

Discussion

These results suggest that distress responses to past large-scale collective traumas (e.g., terror attacks) may sensitize some individuals to media coverage of later collective tragedies, thereby exacerbating distress responses in their aftermath. In other words, this sensitization process may fuel a cycle of distress. Our findings also suggest that exposure to repeated trauma-related media coverage may render some individuals more vulnerable to mental health consequences (e.g., flashbacks and intrusive memories; Bourne, Mackay, & Holmes, 2013; Clark, Holmes, Woolrich, & Mackay, 2016) as collective traumas accumulate over time. Given the apparent role that worry about the future plays in perpetuating this cycle of sensitivity to distress, this cycle may contribute to a prolonged physiological stress response that heightens risk for stress-related diseases (Brosschot, Pieper, & Thayer, 2005; Ottaviani et al., 2016). Acute stress responses following a terror attack have also been associated with increased incidence of cardiovascular disease over time, even among individuals who were not directly exposed to the attack (Holman et al., 2008). Thus, this cycle of media exposure and distress appears to have downstream implications for public health. In a rapidly evolving news climate, the pressure to generate clicks and shares for online content can lead to sensationalism, and in some cases can even facilitate the spread of unverified rumors (Silverman, 2015), which are associated with even greater distress when information is scarce (Jones, Thompson, Dunkel Schetter, & Silver, 2017). Our findings suggest that media organizations should seek to balance the sensationalistic aspects of their coverage (e.g., providing more informational accounts as opposed to lengthy descriptions of carnage) as they work to inform the public about breaking news events. This may reduce the impact of exposure to one event, reducing the likelihood of increased worry and media-seeking behavior over time.

Although we conducted prospective, longitudinal analyses, attrition across the 3 years of data collection suggest that the sample of individuals included in the present Path model (i.e., those who completed all four waves of data collection) was older, wealthier, more educated, and more likely to be White and male. Additionally, media use was assessed retrospectively, albeit within a very short timeframe after each event. Future research might ask respondents to complete daily reports of media use to obtain more accurate reports of their media exposure. Despite these limitations, longitudinal studies that capture repeated exposure to large-scale collective traumas among individuals drawn from a nationally representative panel are very rare, particularly when they include assessments of acute stress.

Our findings have important policy implications for both the news media and the general population. They suggest that social media platforms and other media organizations need to recognize the vital role they can play in broadcasting distress in the aftermath of mass violence events. The sooner these platforms begin monitoring themselves for potentially sensitive, graphic content, the better the outcomes for their users, who may not always be successful at monitoring their own media habits. While a well-informed public is essential during crisis events, it is also important that viewers understand how they may be putting their long-term mental and physical health at risk by closely following along with collective traumas as they unfold in the news media. That way, consumers will be able to make more mindful and informed choices about how to stay informed about collective traumas across the world.

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CHAPTER 4:

Media, forecasted posttraumatic stress symptoms, and the amplification of psychological

responses to Hurricane Irma

Abstract

Prior research suggests that exposure to the media coverage of disaster events is associated with negative mental health outcomes. However, it is unclear whether there are some a priori risk factors that put certain individuals at greater risk for mental health difficulties in the aftermath of this exposure. The present study sought to examine one potential risk factor – forecasted posttraumatic stress (PTS) responses – in the context of media exposure to an impending collective trauma, Hurricane Irma. A representative probability sample of adults across the State of Florida (N=1,478) was recruited and assessed during the 60 hours prior to Hurricane Irma's landfall, then re-surveyed approximately one month later. Path analyses revealed that media exposure to the hurricane partially mediated the relationship between forecasted PTS responses and post-hurricane PTS, general distress, functional impairment, and worry about the future. These relationships held when controlling for demographics, prior mental health diagnoses, and perceived evacuation zone status. These results provide a more thorough understanding of how pre-hurricane psychological factors influence post-storm adjustment via media consumption.

Media, forecasted posttraumatic stress symptoms, and the amplification of psychological

responses to Hurricane Irma

For those in coastal communities, hurricanes are fairly regular weather hazards that can

cause major destruction and loss of life. In the days leading up to a major hurricane, daily life is

disrupted as individuals prepare their homes and evacuate if necessary. The psychological impact

of these events may also be severe; exposure is often associated with posttraumatic stress

symptoms (PTS) and other mental health conditions (Galea, Nandi, & Vlahov, 2005; Norris et

al., 2002). In fact, one study of affected populations following Hurricane Katrina found a

prevalence rate of PTS to be as high as 30% and almost 50% prevalence for any anxiety disorder

(Galea et al., 2007). However, conducting research urgently with disaster-threatened populations

is difficult (Garfin & Silver, 2016), so we know little about how the psychological experience of

individuals anticipating a disaster may influence their subsequent responses. Given that the

science surrounding the changing global climate suggests that warming sea temperatures will

lead to greater activity during hurricane season, it is important to understand how populations at

risk for exposure to these storms are responding to the threat of disaster.

The news media is an important source for information for many in the path of these

storms. In the past, individuals relied heavily on local television news reports for storm-related

information (Piotrowski & Armstrong, 1998), but with the advent of online media, digital

sources are becoming more prevalent as backchannels of information to supplement disaster

reports from more official sources (Palen & Hughes, 2018). Though information-seeking

behavior may be a rational response among community members facing an evolving community

hazard, decades of research on media exposure to trauma has suggested that extensive media

consumption during a disaster event is often associated with negative consequences. A recent

review of the literature on this topic found evidence for a link between disaster-related media consumption and psychological outcomes, including PTS (Pfefferbaum et al., 2014). Specifically, use of both television (McLeish & Del Ben, 2008) and social media (Goodwin, Palgi, Hamama-Raz, & Ben-Ezra, 2013) in the aftermath of hurricanes has been linked to increased PTS and depression. However, natural disasters account for a much smaller proportion of the literature on this topic relative to studies conducted after man-made or technological disasters (Pfefferbaum et al., 2014). Also, to date, there has been no research on consumption of media during and shortly after an impending disaster, like a hurricane.

Individuals' anticipated response to a disaster is an important factor that may influence both their media consumption surrounding a natural disaster and their subsequent responses. People are often making predictions about how they might feel in the future, through a process called affective forecasting (cf. Wilson & Gilbert, 2003). While a future-oriented cognitive style is associated with better mental health outcomes in the aftermath of a community trauma (Holman & Silver, 2005), a tendency towards negative emotional forecasts, or negative future orientation, has been associated with *increased* posttraumatic stress (Ben-Zur & Almog, 2013) and psychological distress (Holman & Silver, 2005). Furthermore, some recent work has found that *pre*-traumatic stress, or intrusive thoughts or images related to negative future events, was a strong predictor of subsequent posttraumatic stress symptoms in a sample of Danish soldiers from pre-to post-deployment (Berntsen & Rubin, 2015). Taken together, these findings suggest that individuals' forecasted posttraumatic stress responses in the days leading up to a hurricane may predict greater negative mental health outcomes in its aftermath.

Forecasted posttraumatic stress is also likely to predict increased hurricane-related media use. Prior research has suggested that both anxious (Mogg, Millar, & Bradley, 2000) and healthy

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individuals (Keogh, Ellery, Hunt, & Hannent, 2001; Lipp & Derakshan, 2005) tend to orient towards stimuli that they find threatening. Similarly, through a process known as uncertainty management, individuals who are worried about a particular event may assuage their anxiety by seeking out information related to that event, thus reducing feelings of uncertainty surrounding an unknown hazard (Heath & Gay, 1997). However, if individuals choose to mitigate their hurricane-related anxiety by seeking information in the media about the impending storm, this may lead to *increased* anxiety instead (Pfefferbaum et al., 2014). In this situation, disaster-related media consumption may mediate the relationship between forecasted PTS and negative mental health outcomes.

Furthermore, some individuals are more likely than others to forecast greater PTS responses in anticipation of an impending disaster. Most people are not particularly accurate in their predictions of their future emotional responses, especially when it comes to predicting the durability of their responses to negative events (Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998). However, individuals who are higher in depression and anxiety reliably forecast more negative emotional responses to future events (Hoerger, Quirk, Chapman, & Duberstein, 2012; Wenze, Gunthert, & German, 2012). As a result, these individuals may become more vulnerable to this cycle of increased media consumption and psychological distress in the aftermath of a collective disaster event.

The Present Study

The 2017 Atlantic Hurricane season was the most active in over a decade, meeting the U.S. National Oceanic and Atmospheric Administration's predictions for the season and producing 17 named storms, 10 of which progressed to the level of hurricane (National Oceanic and Atmospheric Administration, 2017). These included the first major hurricanes to hit the

mainland United States in over a decade – including Hurricane Irma, one of the strongest hurricanes ever recorded in the Atlantic Ocean at peak intensity. Irma was a Category 5 storm at its strongest, but had weakened to a Category 3 storm by the time it made landfall on the U.S. mainland at around 3:30 pm on September 10, 2017. As a result of this storm, 92 American lives were lost (with 42 additional fatalities in Caribbean nations), and around 50 billion dollars' worth of damage was done (Cangialosi, Latto, & Berg, 2018). There was also intense media coverage surrounding this storm. Wall-to-wall, sensationalized coverage could be found on most traditional outlets, which described the possibility of "a catastrophic hit" and "worse than feared" destruction (Mottishaw, 2017). Many news reports also featured reporters standing in high winds and rain to illustrate the dire conditions outside (Deb, 2017). This coverage was not limited to local news outlets, but was also broadcast nationally, thus expanding the reach of this disaster past the communities that were directly affected.

This storm also presented a unique research opportunity for our research team; we sought to study the link between anticipated responses to an impending disaster and actual responses in the aftermath by collecting data from individuals in the path of the storm both immediately before and soon after landfall. This allowed us to examine how responses to the storm evolved from pre- to post-hurricane. We hypothesized that forecasted PTS responses to Hurricane Irma would predict increased media consumption surrounding the event, which in turn would predict higher distress responses across a range of psychological indicators after the storm, while controlling for demographics, prior mental health status, and objective indicators of storm exposure. In particular, we were interested in changes in post-hurricane PTS, psychological distress, functional impairment, and worry about the future as a function of increased exposure to hurricane-related media and forecasted PTS.

Methods

Participants, Design, and Procedures

Participants for the present study were drawn from the GfK KnowledgePanel, a panel of adult U.S. residents from across the country who answer Web-based surveys in exchange for Internet access and other compensation, including a computer if necessary. Panelists are recruited using address-based sampling methods in order to ensure the geographic representativeness of the panel. For the present investigation, all KnowledgePanelists from the State of Florida were recruited to participate in a study about their responses to the impending Hurricane Irma, which was approaching the Florida coast as a Category 4 storm after making landfall in Cuba at Category 5 windspeeds. Beginning at 6pm on the evening of September 8, 2017, respondents were sent a link to a brief online survey that could be completed either on a computer, tablet, or smartphone. Surveys assessed individuals' actual/expected evacuation status and forecasted psychological responses to the storm, among other variables. Surveys were available for completion until 3pm on September 11, 2017; 95% of participants completed the Wave 1 survey in within 48 hours of survey deployment. This first survey was fielded to 2,873 KnowledgePanelists and was completed by 1,637 participants (57.0% participation rate).

Approximately one month after Irma made landfall in Florida (10/12/17-10/29/17), a second survey was fielded to all Wave 1 participants, and those KnowledgePanelists from Florida who had previously participated in a national longitudinal study of Americans' responses to the Boston Marathon bombing (total N=1,723; Holman, Garfin, & Silver, 2014). A total of 1,518 participants (87.9% participation) completed the Wave 2 survey, which included questions about participants' psychological and social functioning since the storm, their media consumption about the storm, and the degree to which they were impacted by the storm's

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landfall. The final sample of individuals who completed both surveys was N=1,478 individuals (90.3% retention from Wave 1). GfK provided poststratification weights for all participants at both waves to account for discrepancies between the sample and U.S. Census benchmarks for the State of Florida. All procedures were approved by the Institutional Review Board of the University of California, Irvine.

Measures

Demographics and mental health diagnoses. Prior to the Wave 1 survey, all KnowledgePanelists provided information about their demographic characteristics (age, gender, education, ethnicity) and mental health history. Participants reported whether a physician had ever diagnosed them with an anxiety or depressive disorder; responses were coded as 0 (no, neither), 1 (either anxiety or depression), or 2 (both anxiety and depression).

Perceived evacuation zone status. Perceived evacuation zone status was calculated based on participants' responses to two questions in the Wave 1 survey. Participants who reported having evacuated and those who perceived that they were in an evacuation zone were coded as 1; participants who reported not having evacuated because they did not perceive they were in an evacuation zone were coded as 0.

Hurricane Irma direct exposure. At Wave 2, participants reported on a 9-item scale the degree to which they were directly exposed to Hurricane Irma. Participants could report such occurrences as staying in their home while under evacuation order, experiencing damage to their home or property, personal injury, or knowing someone who was injured or killed in the storm.

Hurricane Irma media exposure. At Wave 2, participants reported the average number of hours per day they spent engaging with three media sources "in the days during and following the recent hurricanes": traditional media (i.e., TV, radio, and print news), online news sources

(CNN, Yahoo, NYTimes.com, etc.), and social media (Facebook, Twitter, Reddit, etc.).

Participants could report up to a maximum of 11 hours per day for each source; because of the

possibility of simultaneous exposure across multiple media platforms, respondents could report a

maximum of 33 hours per day across all sources.

Posttraumatic stress (PTS) symptoms. At Waves 1 and 2, PTS symptoms were

measured using the Primary Care PTSD Screen for DSM-5 (PC-PTSD-5; Prins et al., 2016). This

5-item scale assesses the severity of symptoms corresponding to the DSM-5 PTSD symptom

clusters on a scale from 1 (never) to 5 (all the time). At Wave 1, participants were asked: "with

respect to Hurricane Irma and its aftermath, how often do you think you will experience [these

symptoms] a *week or two from now*?" At Wave 2, they were asked to report how often they had

experienced these symptoms with respect to Hurricane Irma over the previous week. At both

time points, this scale maintained good internal reliability (Wave 1 α=0.86; Wave 2 α=0.87).

Psychological distress. General psychological distress (anxiety, depression,

somatization) was measured at Wave 2 using nine items drawn from the Brief Symptom

Inventory-18 (BSI-18; Derogatis, 2001), along with four anger items from the original 53-item

BSI (Derogatis, 1982). Items assessed symptom severity on a 0 (not at all) to 4 (extremely)

Likert-type scale. Thirteen items identified through exploratory factor analysis comprised the

modified version of scale (BSI-13) used in the present study. This measure maintained excellent

internal reliability in this sample (α=0.92).

Functional impairment. Functional impairment was assessed at Wave 2 using four

items modified from the SF-36 Health Survey (Ware & Sherbourne, 1992). These items assessed

the extent to which participants' mental and physical health interfered with their work and social

functioning on a scale from 1 (none of the time) to 5 (all of the time), and maintained good internal reliability in this sample (α=0.86).

Worry about future events. Worry was assessed at Wave 2 using eight items adapted from those used in prior research after 9/11 (Holman et al., 2008; Silver, Holman, McIntosh, Poulin, & Gil-Rivas, 2002). These items assessed worries in the previous week about the likelihood of being exposed to natural disasters, environmental hazards, violence, and economic hardship sometime in the future. These items maintained excellent internal consistency in this sample (α=.90).

Analytic Strategy

All analyses were conducted in Stata 14.2 (StataCorp, College Station, TX). For each outcome variable, means were calculated for each participant to create composite PTS, psychological distress, functional impairment, and worry scores. To assess the impact of forecasted PTS responses and media exposure on outcomes, a series of path models were constructed using Stata's SEM Builder. This analysis incorporates several regression analyses simultaneously, which enables testing of possible causal pathways over time. The theoretical model tested the influence of media exposure to Hurricane Irma as a possible mediator of the relationship between forecasted PTS responses and post-hurricane mental health outcomes, controlling for covariates. The baseline path models were constructed and specified using the Wave 2 PTS model; the finalized model was then applied to the other three outcomes (e.g., psychological distress, functional impairment, and worry about future events). Covariates included: age, gender, education (Bachelor's degree or greater vs. other), ethnicity (White, Non-

Hispanic vs. Other),[1] perceived evacuation zone, and prior mental health diagnoses. Stata 14's

SEM builder also allows for the inclusion of sampling weights, which were implemented in all

models in order to facilitate population inferences.[2] The initial model included the basic

mediation model, with covariates included at the most exogenous level. Based on theoretical

considerations, additional paths were drawn from prior mental health diagnoses to Wave 2 PTS,

and from perceived evacuation zone status to Hurricane-related media exposure; the latter path

was not significant and was not included in the final model. Finally, an additional path from W2

direct hurricane exposure to W2 PTS was added.

Goodness of fit was assessed using the coefficient of determination (CD) and the

standardized root mean square residual (SRMR). The CD is a representation of the percentage of

variance in the dependent variable that the model explains and may be interpreted similarly to an

R^2 value in linear regression. For the SRMR, a value of less than .08 indicates good model fit.

The CD and SRMR are appropriate for the weighted survey data in this study, as many other

typically used goodness-of-fit indices are not stable or reliable when using complex sampling

methods or survey weights (Bollen, Tueller, & Oberski, 2013).

Results

The final weighted sample (*N*=1,478) closely approximated U.S. Census benchmarks for

the State of Florida. The weighted mean age of respondents was 51.70 years (*SD*=0.69), and

55.36% (weighted *n*=810) were female. The ethnic breakdown of the sample was 62.06% Non-

Hispanic White (weighted *n*=908), 11.50% Black or African American (weighted *n*=168),

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[1] Further ethnic breakdowns were tested in the present model and did not reveal any significant differences on outcomes.

[2] Analyses were conducted both with and without the final posttratification weights, and the pattern of results remained the same. In order to retain sample representativeness, all statistics including percentages reported here were conducted using posttratification weights.

21.64% Hispanic or Latino/a (weighted n=317), and 4.80% identified as multiracial or some

other race/ethnicity (weighted n=70). Approximately 5% of the sample did not finish high school

(weighted n=72), 33.36% had a high school diploma (weighted n=488), 32.42% attended some

college (weighted n=474), and 29.32% had a Bachelor's degree or better (weighted n=429). The

median income for the weighted sample was between $50,000 and $59,000.

Table 1 presents the correlations among the variables included in the path models. The

four dependent variables of interest were highly correlated with one another (variables 10-13 in

the correlation matrix; correlations ranged from r=.53 to r=.72). This was to be expected, given

their relatedness as negative psychological outcomes; however, due to the conceptual

distinctness of these constructs, all four were included in subsequent analyses.

Table 1

Correlations among the variables included in the model

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Age	1.00												
2. Female Gender	-0.09***	1.00											
3. College Degree	-0.10***	-0.09***	1.00										
4. White Ethnicity	0.33***	-0.04	-0.01	1.00									
5. Mental Health Dx.	-0.07**	0.11***	-0.05*	0.00	1.00								
6. Perceived Evac Zone (y/n)	0.03	-0.03	-0.03	0.03	0.07**	1.00							
7. Forecasted PTS	-0.13***	0.15***	0.00	-0.10***	0.13***	0.19***	1.00						
8. Media Exposure	-0.11***	0.08**	-0.11***	-0.13***	0.10***	0.07*	0.30***	1.00					
9. Direct Exposure	-0.06*	0.00	-0.01	-0.01	0.10***	0.38***	0.20***	0.11***	1.00				
10. W2 PTS	-0.08**	0.10***	-0.06*	-0.12***	0.24***	0.15***	0.52***	0.32***	0.31***	1.00			
11. W2 Psychological Distress	-0.16***	0.10***	-0.06*	-0.14***	0.34***	0.14***	0.38***	0.26***	0.20***	0.68***	1.00		
12. W2 Functional Impairment	-0.04	0.11***	-0.08**	-0.08**	0.34***	0.13***	0.27***	0.23***	0.18***	0.58***	0.72***	1.00	
13. W2 Worry	-0.15***	0.14***	-0.05*	-0.13***	0.23***	0.14***	0.47***	0.33***	0.26***	0.71***	0.63***	0.53***	1.00

Note: PTS= Posttraumatic stress symptoms
*p<.05; **p<.01; ***p<.001

Figures 1-4 present the path models predicting Wave 2 outcomes (PTS, psychological distress, functional impairment, and worry, respectively). In each model, Wave 1 forecasted PTS responses significantly predicted both hurricane-related media exposure and psychological responses at Wave 2, controlling for covariates. Hurricane-related media exposure also significantly predicted each of the four outcomes. Additionally, in each model, the indirect path from forecasted PTS responses at Wave 1 to Wave 2 outcomes through Hurricane Irma-related media exposure was significant, consistent with partial mediation. Beta weights for these paths, along with 95% confidence intervals, may be found in Table 2.
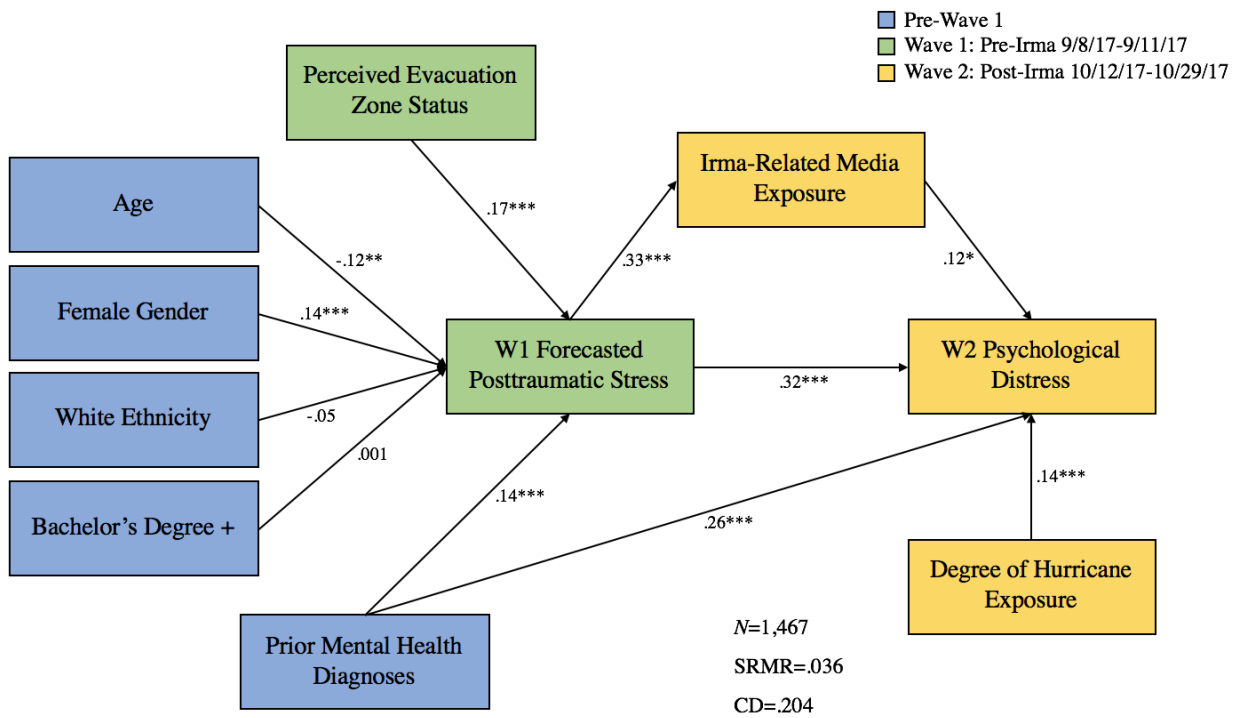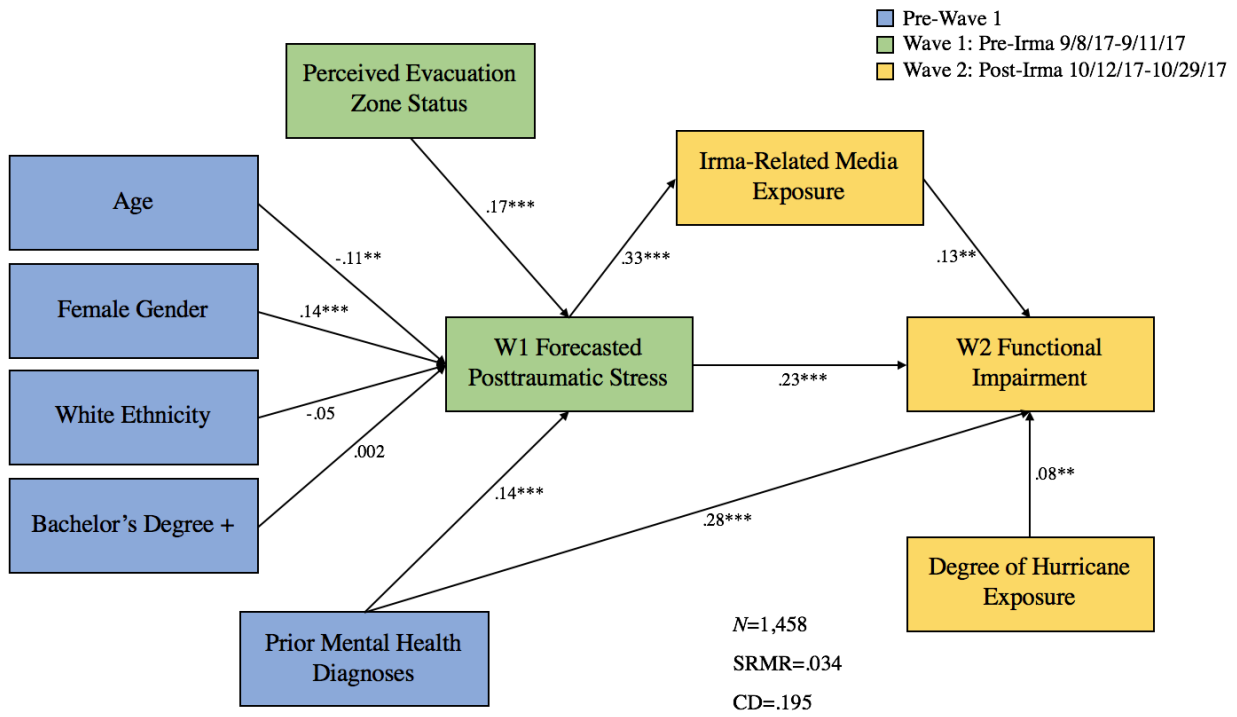
Figure 1

Path model predicting Wave 2 PTS Symptoms
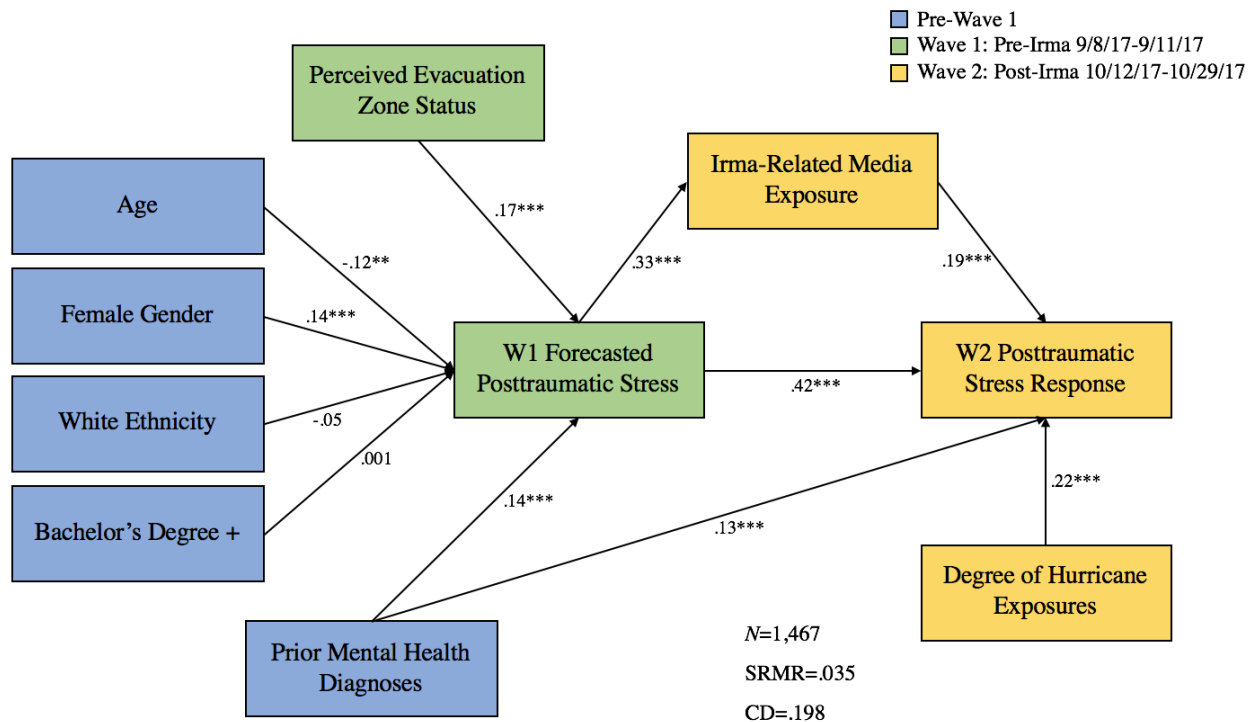
Figure 2

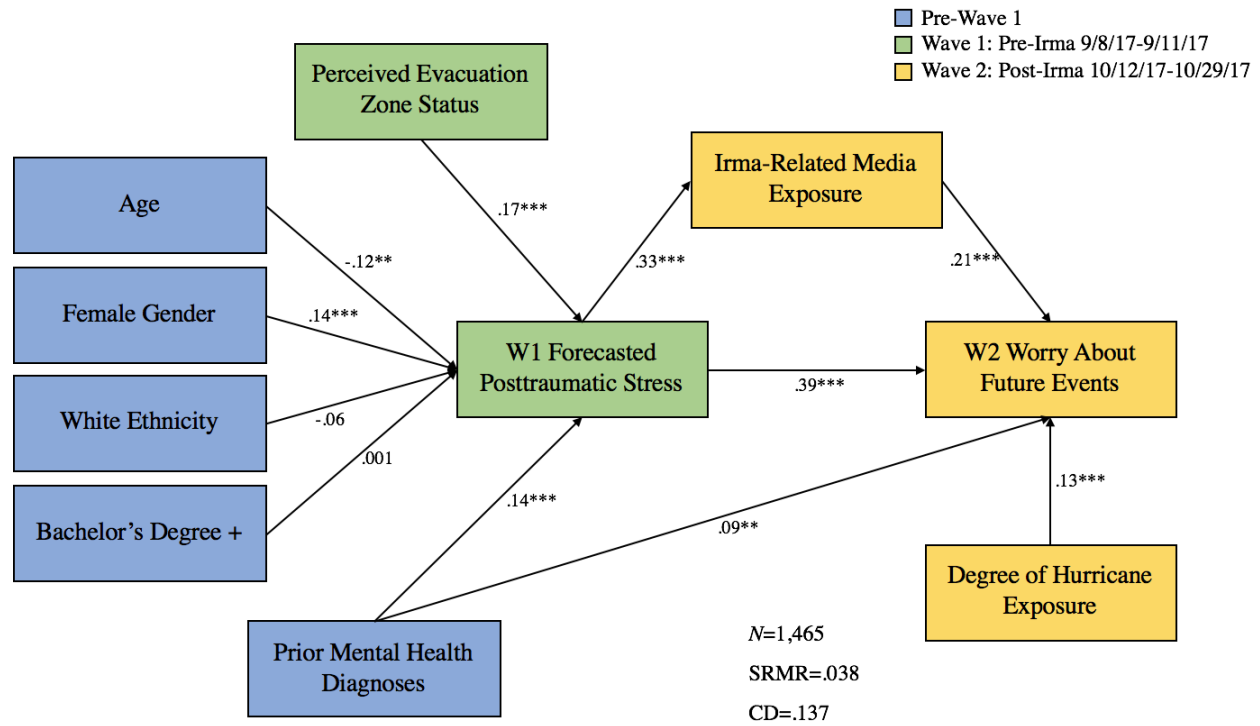Path model predicting Wave 2 Psychological Distress

N=1,467
SRMR=.036
CD=.204

77

Figure 3

Path model predicting Wave 2 Functional Impairment

Legend:
- Pre-Wave 1
- Wave 1: Pre-Irma 9/8/17-9/11/17
- Wave 2: Post-Irma 10/12/17-10/29/17

Perceived Evacuation Zone Status

Age

Female Gender

White Ethnicity

Bachelor's Degree +

Prior Mental Health Diagnoses

W1 Forecasted Posttraumatic Stress

Irma-Related Media Exposure

W2 Functional Impairment

Degree of Hurricane Exposure

.17***
-.11**
.14***
-.05
.002
.14***
.28***
.33***
.23***
.13**
.08**

N=1,458
SRMR=.034
CD=.195

Figure 4

Path model predicting Wave 2 Worry

Table 2

Beta weights for indirect paths between forecasted PTS and W2 outcomes through hurricane-related media exposure

Outcome Variables	β	p-value	95% CI
PTS	0.06	.001	0.03; 0.10
Psychological Distress	0.04	.033	0.01; 0.08
Functional Impairment	0.04	.013	0.01; 0.08
Worry	0.07	<.001	0.04; 0.10

Note: PTS=posttraumatic stress

Discussion

The findings from the present study suggest that forecasted PTS responses in advance of a community trauma are an important predictor of subsequent mental health outcomes in its aftermath. Furthermore, this relationship is partially mediated by the amount of disaster-related media coverage that individuals consume. Thus, forecasted PTS predicted increased engagement with media coverage that resulted in greater distress responses, regardless of perceived storm risk. In fact, forecasted PTS responses predicted increased media consumption, but perceived evacuation zone status did not, meaning that pre-storm psychological factors appear to play a more important role in media engagement surrounding a disaster than is typically acknowledged. Given that this media engagement during a disaster can result in negative psychological consequences with downstream implications for physical health over time (Holman & Silver, 2011), it is particularly important to understand the predictors of this behavior.

These results are also important because they represent the first attempt by researchers to analyze how pre-storm psychological factors may influence subsequent adjustment through prospective analyses with surveys fielded in the days leading up to a hurricane. Because we are not relying on retrospective reports of participants' psychological functioning or storm perceptions, which can be influenced by situational factors (Loftus, Miller, & Burns, 1978) or degrade over time (Schmolck, Buffalo, & Squire, 2000), we can be more confident in the validity of these results. Furthermore, our study design, which involved sampling from within a state-wide panel and the use of sampling weights to adjust for probability of inclusion into the study, enables us to extrapolate from these findings to make population inferences.

Despite this strength, we acknowledge that the present sample is not necessarily representative of Florida residents. When conducting the pre-hurricane survey, invitations to

participate were sent to all KnowledgePanelists who reside in the State of Florida, in order to capture as much data on Floridians' responses as possible. However, this sampling design is not typical and it precluded our ability to oversample in harder-to-recruit populations. Furthermore, the KnowledgePanel is designed to recruit samples that are demographically representative of the populations from which they are drawn, but this does not include geographic representation within smaller communities. As a result, the geographic distribution of participants in our sample does not necessarily mirror that of the State of Florida. This is important for studies of natural hazards because the geographic distribution of the sample may not be representative in terms of how the population was exposed to the hurricane itself, both objectively via strong winds and storm surge, as well as subjectively via local media reports. Sampling weights can correct for any discrepancies between the sample and census benchmarks in order to facilitate population inferences, but it would be helpful for future research to improve geographic representation as well.

Implications and Future Directions

An important next step for this research is to consider how the relationships among forecasted PTS, media exposure, and psychological outcomes might differ as a function of where individuals are getting their information. For example, forecasted PTS might lead individuals to seek out hurricane-related media reports from different sources, such as online social media, which can more rapidly disseminate updates and relevant information. Differential media consumption across sources may have an impact on subsequent responses, as well: the use of online social media for updates during a developing crisis is associated with greater distress responses relative to other sources (Jones, Thompson, Dunkel Schetter, & Silver, 2017). Furthermore, it is important to understand what kinds of content is being distributed across

different media sources and how it might influence people's hurricane-related responses. Prior work has analyzed the content of reports from official channels (Gallagher, Fontenot, & Boyle, 2007), but most people appear to get their storm-related information from local TV news and social media (Goodwin et al., 2013; McLeish & Del Ben, 2008). Media coverage in the days leading up to and following a disaster event can be something of a double-edged sword – it is a vital resource for disseminating information to the public, which keeps people safe, but sensationalization of coverage and repetitious content only appears to add stress during an already stressful period. It may be important to assess how these media outlets are communicating information about approaching hazards, as well as instructions they are offering for people living in the path of the threat.

Another potential avenue for future research is to assess how participants' evolving perceptions about the storm may have changed along with the forecast, as well as how these perceptions influenced subsequent media consumption and responses to the storm in the aftermath. From the time the Wave 1 survey was first fielded on September 8 to when data collection was closed on September 11, the forecasted path of the storm shifted from the east coast of Florida, through Miami, to the west coast, bypassing Miami entirely but directly striking the Florida Keys. Thus, for many individuals who completed the survey earlier in the data collection period, their anticipated storm risk was quite different to how the storm actually occurred. This is a fairly common situation as hurricanes approach a shoreline; they can be somewhat unpredictable as they approach landfall and conditions change, and many times do not make landfall in the exact location they are initially forecasted. An important next step is to assess how these evolving conditions impact individuals' forecasted PTS and subsequent adjustment. It is possible that individuals are able to make appropriate adjustments as conditions

change, but it is more likely that initial forecasted responses influence how people perceive their later responses, even if storm conditions and damage turn out to be quite different from what was initially forecast. Given that initial risk perceptions are an important predictor of both protective decision making (Thompson, Garfin, & Silver, 2017) and post-disaster adjustment (McDermott, Lee, Judd, & Gibbon, 2005), it is important to study how these perceptions evolve over time.

Lastly, it is also important to assess how perceived and objective risk may interact to predict post-storm adjustment. It is apparent from the geographic distribution of the individuals in our sample who reported residing in an evacuation zone that there was some confusion among respondents as to whether or not they were under a mandatory evacuation order. As such, it appears as though some individuals may have been receiving some conflicting information regarding their evacuation order status, and may have put themselves at even greater risk by evacuating unnecessarily, causing a drain on resources and packing the roads with superfluous traffic. Future studies should assess how these individuals came to their perception of their hurricane-related risk, as well as how these risk perceptions combine with objective storm exposure to predict psychological responses to the storm.

These results have important implications for both the news media and emergency management and public health officials. That pre-storm psychological factors are more important than perceived evacuation zone status for predicting both storm-related media consumption and subsequent adjustment suggests a need to improve hurricane-related risk communications for the public. Communicating a hazard-appropriate level of risk could mitigate this concern by ensuring that sensationalized reports are not creating undue levels of pre-storm stress among the population, which can contribute to increased forecasted PTS and more negative psychological responses later on. Furthermore, forecasted PTS responses may be malleable in the pre-storm

period, presenting an important inflection point for potential intervention. Emergency management personnel could leverage public service announcements or other education efforts to inform the public about the potential risks of exposure to sensationalized media coverage. As climate scientists predict more active Atlantic hurricane seasons, it is more important than ever that we consider ways in which we can mitigate the psychological risks that accompany the increasing frequency and intensity of hurricanes in coastal communities.

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CHAPTER 5:

Epilogue

Epilogue

Decades of research on media exposure to collective trauma and negative psychological outcomes has found consistent relationships between these two variables (Hopwood & Schutte, 2017; Houston, Spialek, & First, 2018). However, due to the inherent difficulties in conducting postdisaster research (i.e., time constraints for IRB and funding approval; hard-to-reach populations that are recovering from a trauma), longitudinal work that examines the development of these relationships over time is exceedingly rare (Garfin & Silver, 2016). This dissertation contributes to this body of work by explicating how these processes play out over time through the utilization of longitudinal data collected among individuals exposed to multiple disparate types of collective traumas.

Chapter 2 examines the relationship between media exposure to a collective trauma and distress in the context of a public health crisis – specifically, the 2014 Ebola outbreak that began in West Africa. In this chapter, it was demonstrated that Ebola-related media exposure, compounded with prior acute stress responses to the 2013 Boston Marathon bombing, was associated with heightened worry about Ebola among a national U.S. sample. Additionally, controlling for covariates, Ebola-related media exposure was directly associated with increased psychological distress, functional impairment, and worry. These results suggest that individuals' responses to prior collective traumas may be an important risk factor when considering who is most vulnerable to trauma-related media coverage.

Chapter 3 examines how the relationships between media exposure and psychological responses to collective traumas play out over time in the context of multiple traumas, extending the results described in Chapter 2. Following a representative national sample of U.S. residents from the 2013 Boston Marathon bombings to the 2016 Orlando nightclub massacre, analyses

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demonstrate that not only is exposure to media coverage of collective traumas associated with distress, but that distress appears to be associated with increased media use in the aftermath of future collective traumas. This suggests that media exposure and distress influence one another in a cyclical way, with each increasing over time. As a result, individuals who consume a great deal of media in the aftermath of one trauma are likely to consume even more media following subsequent traumas, and consequently are likely to experience heightened distress responses in the future.

Chapter 4 examines how anticipated responses to an impending trauma – 2017's Hurricane Irma – precipitate increased media consumption and even greater psychological distress after the storm has passed. Media exposure to the hurricane partially mediated the relationship between pre-hurricane forecasted PTS responses and experienced distress, as measured approximately one month after landfall. This pattern of results is consistent with the model presented in Chapter 3; those individuals who had the greatest pre-event anxiety (in this case, forecasted PTS) consumed more media and reported the greatest post-event deficits across four psychological outcome measures.

Taken together, these findings demonstrate the importance of considering individuals' pre-event psychological functioning when studying their responses to collective traumas. These studies build on prior work suggesting that a history of mental health difficulties might put people at risk for worse outcomes following exposure to collective trauma (Holman & Silver, 2011; Otto et al., 2007), as well as increase their likelihood of consuming disaster-related media (Jones, Garfin, Holman, & Silver, 2016). The studies presented in this dissertation were able to explicitly demonstrate this hypothesized pattern of findings over time using longitudinal data. Because the bulk of postdisaster research has been cross-sectional, with no pre-event data (Norris

et al., 2002; Thompson, Garfin, & Silver, 2017), this has been a significant gap in the literature. The longitudinal design of the dataset examined in this dissertation enables this gap to be addressed.

There are several challenges to conducting this work that should also be addressed. Because the types of events that are the focus of this dissertation occur with very little warning (or none at all), it is exceedingly difficult to conduct rigorous scientific research on individuals responses to these events. Furthermore, approaching individuals in the immediate aftermath of trauma carries with it its own logistical and ethical challenges. For example, those in communities that have been damaged by a trauma are difficult to reach, and may not feel ready to disclose the details of such a recent trauma. By leveraging a pre-existing national panel, our research team has been able to overcome some of these challenges – data may be collected quickly, with little disruption to the lives of participants, and with the ability to extrapolate past just the sample at hand onto the rest of the population. While this program of research has been difficult and costly, these findings nonetheless represent important contributions to the field of stress and coping with collective traumas.

Limitations and Future Directions

One limitation of this dissertation is that the assessments of media exposure and psychological outcomes were sometimes collected concurrently (e.g., Chapters 2 & 4), which precludes inferences about temporal ordering of relationships. In the future, efforts should be taken to collect this information separately, in order to correct for this confound. Alternative research methodologies (i.e., ecological momentary assessment) might be leveraged to collect information about how people are consuming media and their responses to that media in real time, which will allow for more fine-grained analyses about the interactions between these

variables. This will also enable the assessment of peritraumatic variables that might moderate the relationship between media exposure and distress, such as level of engagement with trauma-related media (Verduyn, Ybarra, Résibois, Jonides, & Kross, 2017). Experience sampling methods may be utilized in the future to determine how individuals are engaging with trauma-related content and updates on social media, and how this might change the relationship between media exposure and distress over time.

Another limitation of this work is that it relies upon correlational data to make inferences about the nature of the relationships between trauma-related media exposure and psychological outcomes. While a strength of this research includes its use of population-based, representative samples and longitudinal data, until this topic is brought into a laboratory setting, we cannot explore the causal mechanisms at work. While the bulk of the extant research on media exposure and distress has been interpreted to mean that consumption of trauma-related media directly precipitates the development of psychopathology (Silver et al., 2013), and suggestive evidence of this pattern was demonstrated in Chapter 3, this causal interpretation cannot be considered valid unless it is supported by controlled laboratory research. There is a small experimental literature on this topic in existence that supports this interpretation (Hopwood & Schutte, 2017), but there are many aspects of this relationship that remain unexplored, including characteristics of the coverage itself that predict greater distress responses. For example, is it the presence of graphic imagery in the media that is driving the association between media exposure to collective trauma and distress? Or, is the repetitious presentation of these graphic images? What are the relative contributions of images and sounds in the media coverage of collective traumas? These questions have yet to be explicated in a laboratory experiment. By manipulating aspects of media coverage (i.e., graphic vs. non-graphic) that is presented to participants in a laboratory setting, it will be

possible to tease apart the factors that are most responsible for the postdisaster increases in psychological distress that are common among media consumers. This will enable more targeted recommendations for those who work in the news media, so as to prevent undue anxiety and distress among the population.

Lastly, an important next step for this work is to continue to follow up with samples that have been exposed to collective traumas over the long term, in order to assess the duration of these outcomes and explore how they might be related to physical health deficits as well. There is some evidence in the literature that media exposure to collective trauma is associated with increased incidence of physical health ailments (Holman & Silver, 2011; Silver et al., 2013) as well as adverse birth outcomes (Bruckner, Catalano, & Ahern, 2010), which may be driven by increases in worry (Brosschot, Gerin, & Thayer, 2006; Holman et al., 2008). However, this type of longitudinal work is rare and challenging to conduct, and addresses a significant gap in the literature on the deleterious outcomes associated with trauma-related media exposure. Without assessing the strength and durability of these associations over time, as well as connections with physical health outcomes, it is impossible to know the true public health impact of these kinds of events beyond that of the direct victims.

This work also has important implications for clinical practice. Given that the most recent version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) *explicitly* excludes exposure via the media as a potentially traumatic stressor (American Psychiatric Association, 2013), it is likely that a great deal of distress in the community is going unnoticed by mental health professionals. Additionally, for those with pre-existing psychopathology, exposure to disaster-related content might exacerbate feelings of anxiousness in the wake of a collective trauma. Understanding this phenomenon is thus important for clinical practitioners,

who can provide support for community members as well as recommendations for more healthy

media consumption habits. The proliferation of mobile technologies means that more and more

people are exposed to disaster-related content on a daily basis. We must continue to explore how

these exposures might be negatively influencing wellbeing, both mental and physical, for the

improved health of our communities.

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Appendix

Overview of the Dataset

Following the Boston Marathon bombing on April 15, 2013, which was the first terrorist attack on American soil since 9/11, a multi-year study was undertaken by our research team in order to assess Americans' responses to this attack, both acutely and over time. Figure 1 presents a timeline of the waves of data that were collected in this study. In order to recruit and maintain a sample that was representative of the population of interest – that is, residents from across the United States – we collaborated with the survey research company GfK (formerly Knowledge Networks). GfK has created and maintains a nationally representative panel of U.S. residents (i.e., the KnowledgePanel) who are recruited using address-based sampling methods. This sampling method allows for probability-based sampling from the U.S. Postal Service's Delivery Sequence File, which covers approximately 97% of U.S. households. This presents an advantage over previously used random-digit dialing sampling methods, which have an estimated noncoverage rate as high as 19% as well as a declining participation rate due to the proliferation of call-screening technologies and nonhousehold telephone numbers (Link, Battaglia, Frankel, Osborn, & Mokdad, 2008). In address-based sampling, individuals are randomly sampled within households to participate on the panel through a series of mailings to randomly selected addresses; if a phone number is attached to an address, phone invitations may also be used. KnowledgePanelists complete online surveys in exchange for Internet access or other compensation (e.g., points that participants may accumulate that can be redeemed for cash, gift prizes, or sweepstakes opportunities). Households without computer access are supplied with a laptop as well to facilitate survey completion and ensure panel representativeness. Individuals may only join the KnowledgePanel after being randomly selected; this protects the panel from

the pitfalls of other opt-in survey panels, such as the "professional respondent" problem (Hillygus, Jackson, & Young, 2014).

The first survey in this multi-wave study was fielded to a random sub-sample of the GfK KnowledgePanel between April 29 and May 13, 2013, or approximately 2-4 weeks following the Boston Marathon bombings and 10 days following the end of the lockdown in Boston and capture of the perpetrators. The sample for this survey included oversamples of metropolitan Boston (*n*=846) and metropolitan New York City (*n*=941), and the remainder representing the rest of the U.S. (*n*=2888), for a total sample of 4,675 US residents (79.1% participation rate; Holman, Garfin, & Silver, 2014). The main focus of this survey was to assess exposure (both direct and indirect) and acute stress responses to the bombings. Approximately six months later, between October 18 and November 17, 2013, a second online survey was fielded to all eligible KnowledgePanelists who had participated in Wave 1 (some individuals had withdrawn from the GfK panel and requested no further contact from researchers). The Wave 2 survey was completed by 3,588 participants (81% participation rate, 76.7% retention from Wave 1). At the one year anniversary of the Boston Marathon bombings, between April 18 and May 5, 2014, a third survey was fielded to all available participants, yielding 3,260 responses (Wave 3; 74% participation rate, 70% retention from Wave 1). The Wave 3 survey included only one open-ended question requesting that respondents to write about any Boston Marathon bombing-related thoughts or feelings they wanted to share.

Beginning in Fall 2014, the Ebola outbreak in West Africa began to garner intense scrutiny by the American news media, including stories on the outbreak in Africa and the cases that crossed the Atlantic back to the United States. The West African Ebola epidemic was the most closely followed news story in the U.S. in Fall 2014 (Hamel, Firth, & Brodie, 2014). For

approximately four weeks starting December 29, 2014, all those Wave 1 respondents still in the GfK panel (N=3,196) or willing to be contacted despite having terminated from the panel (N=1,140) were invited to participate in a study of their responses to the Ebola crisis (N=4,336). The final sample was comprised of 3,447 participants (79.5% participation; 73.7% retention from Wave 1). Overall, 3,114 individuals (90.3%) completed the survey online; 333 (9.7%) completed it via paper-and-pencil format and returned it to GfK in prepaid envelopes.

The fifth wave of data collection was conducted between April 29 and June 24, 2015, around the second anniversary of the Boston Marathon bombing. This survey was fielded to all available panelists (N=4,276). Ultimately, 3,029 individuals completed the survey online (n=2,788 active; n=241 withdrawn); 318 completed the survey in paper-and-pencil format, for a total sample of 3,315 (78% participation rate; 70.9% retention from Wave 1).

The sixth wave of data collection was conducted between June 19 and July 24, 2016, in the aftermath of the Orlando nightclub massacre, which occurred on the morning of June 12, 2016 in the Pulse nightclub in Orlando, FL and at the time was the deadliest mass shooting in U.S. history. This survey, which focused on exposure and acute stress responses to the massacre, was fielded to all participants who were available for surveys at that time (N=4,292). Ultimately, 3,035 respondents completed the survey online (2,489 active, 546 withdrawn); 164 completed the survey in a paper-and-pencil format, for a final sample size of 3,199 (74.5% participation; 68.4% retention from Wave 1). To encourage participation, email and telephone reminders were implemented during all waves of data collection.

The next wave of data collection was conducted in the days leading up to the landfall of Hurricane Irma, between September 8 and 11, 2017. Rather than sending this survey to those individuals who were available for surveys from the previous waves of data collection, the Wave

7 survey was fielded to all 5,940 KnowledgePanelists in the states of Texas (*N*=3,067) and

Florida (*N*=2,873), in order to maximize participation in states that were directly impacted by

hurricanes that fall. This survey included questions about preparations for the approaching

Hurricane Irma, as well as responses to Hurricane Harvey, which had made landfall in Houston,

TX, two weeks prior on August 26, 2017. Participants in this survey included 1,137 individuals

in Texas (*n*=1,046 newly recruited) and 1,637 in Florida (*n*=1,554 newly recruited).

Approximately one month after Hurricane Irma's landfall, between October 12 and 29,

2017, the eighth and final wave of data collection was fielded to all Wave 7 participants, plus

those from Wave 1 in Florida, Texas, and NYC metro who did not complete the Wave 7 survey

(*N*=3,797). This survey included 3,109 participants (*n*=1,515 from Florida; *n*=1,049 from Texas,

and *n*=545 from metropolitan NY City; 81.9% participation). Survey questions surrounded

participants' experiences with Hurricane Irma, their exposure to the storm (direct and indirect via

the media), and their psychological responses to the storm.

Data from all waves of this dataset (except for Wave 3, which included only one open-

ended question) are presented in this dissertation. Chapter 2 presents data from Waves 1 and 4.

Chapter 3 presents data from waves 1, 2, 5, and 6. Chapter 4 presents data from Waves 7 and 8

from the Florida sample only. The specific measures for all outcomes and predictor variables, as

well as the timing of data collection for each variable, are described in greater detail in each

chapter. This dataset provides a unique opportunity to examine the mental health sequelae of

exposure to media coverage of collective traumas in the absence of methodological limitations

that frequently characterize research on disasters (e.g., lack of pre-event data; retrospective data

collection; small, demographically homogenous samples; Silver et al., 2006). All procedures for

this study were reviewed and approved by the Institutional Review Board of the University of

California, Irvine.

Figure 1

Timeline of the waves of data collection
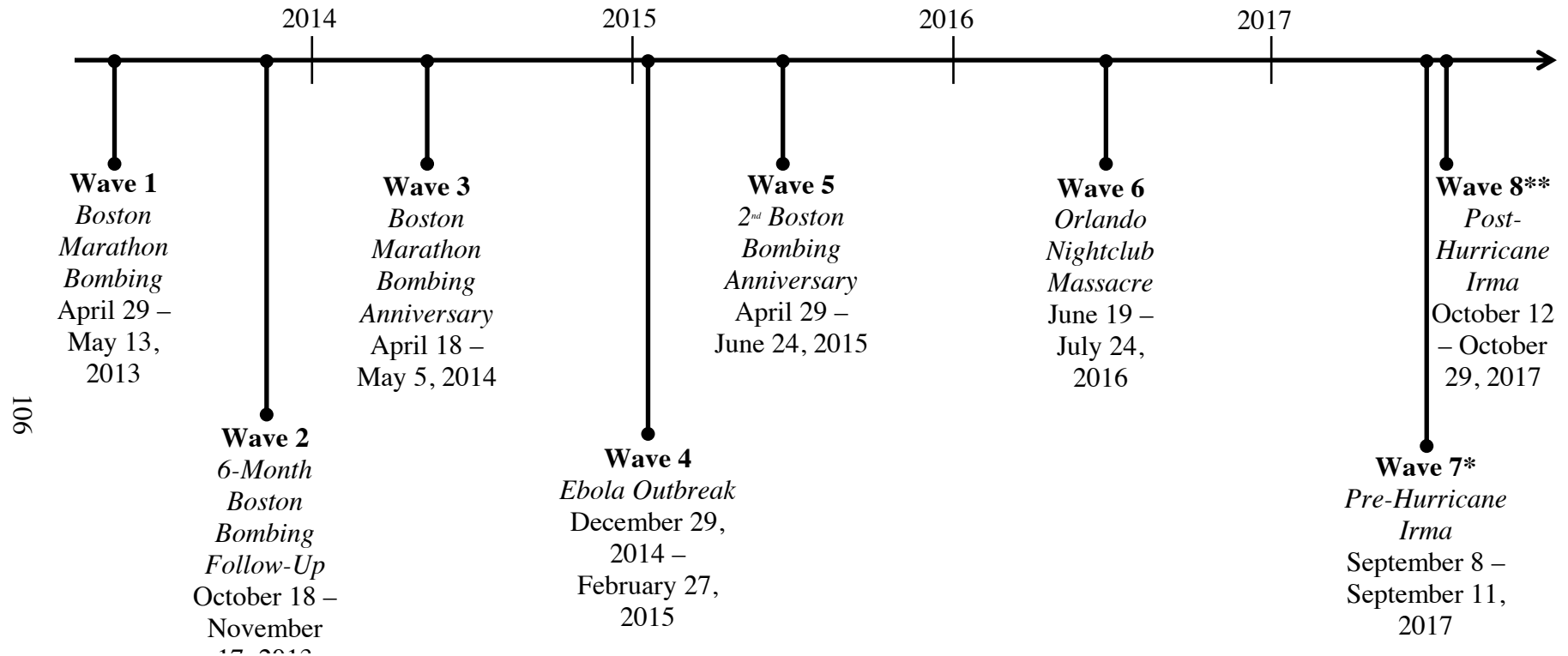
*Texas & Florida KnowledgePanelists only

**Texas, Florida, & metropolitan NY City KnowledgePanelists only

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