The Effects of Perceived Life Threat and Direct Exposure on Psychopathology in Parents and

Their Young Children Following the September 11th, 2001 World Trade Center Attacks

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Thesis submitted to the faculty of

Virginia Polytechnic Institute and State University

in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

in

Psychology

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April 23, 2009

Blacksburg, Virginia

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ABSTRACT

The impact of the September 11th, 2001 World Trade Center attacks was expansive in nature, and so many people were deeply affected by this disaster. In the years following this attack, many researchers attempted to assess this level of impact. Data point to increased prevalence rates of posttraumatic stress and depressive symptomatology among adults and a variety of difficulties among children following trauma. Additionally, research has shown that geographic proximity to a traumatic event plays a role in identifying those with increased psychological distress. One's subjective experience of a traumatic event, and in particular, one's perception of threat to life, also appears to be important in the identification of those in need. Moreover, understanding the psychological effects of individuals who have experienced a traumatic event is essential to the effective screening and identification of those in need of mental health services. As such, the purpose of this study was to examine the ability of geographic exposure and the perceived life threat to predict psychological outcomes in parents and their young children following the World Trade Center attacks in New York City. Additionally, the moderational roles of race/ethnicity and socio-economic status were also examined. Neither maternal geographic exposure nor perception of life threat significantly predicted mental health outcomes in mothers or their young children. However, socio-economic status significantly moderated the relationship between maternal geographic exposure and children's externalizing behaviors. Finally, the effect of race/ethnicity approached significance for maternal PTSD symptoms; however, no significant moderation was found.

Table of Contents

<p style="text-align:center">List of Tables</p>

List of Figures

Introduction

September 11, 2001 is a day that changed the lives of so many, both nationally and globally. That morning, America experienced one of the worst terrorist attacks in its history, and many people's perspective of the world, including their sense of safety, was severely damaged. Estimates suggest that more than 100,000 individuals directly witnessed the attacks with countless others exposed via media coverage (Yehuda, 2002). Moreover, this act of terrorism occurred suddenly and without any forewarning and continues to serve as a constant reminder that threats persist indefinitely. Notably, Norris (2001) suggested that the likelihood for psychological distress is highest when two or more of the following are present: high levels of injury, threat to life, loss of life, human intent, serious ongoing problems for the community, and extreme damage to property. Sadly, the September 11th, 2001 attacks included all of these factors.

In the aftermath, many struggled to make sense of and cope with not only what had occurred but the devastating psychological effects that quickly ensued. As a result, researchers and clinicians responded with various screenings, assessments, and interventions to identify those individuals, both adults and children, who were in need of mental health services. Therefore, accurate identification of individuals experiencing psychological distress, as well as those at greater risk for psychopathology, is crucial to thwarting the potential short-term and chronic mental health effects of trauma.

Trauma and Adult Outcomes

Exposure to a traumatic event is surprisingly common. Kessler and colleagues (1995) suggested a lifetime prevalence rate of exposure to a traumatic event ranging from 51.2% for women to 60.7% for men. Therefore, more than half of the population will likely experience a traumatic event in their lifetime; however, the majority of individuals do not develop subsequent psychopathology. The small subset of individuals that is deeply affected can develop significant mental health difficulties, most commonly posttraumatic stress and depressive symptoms. Studies have found that as many as 10-40% of individuals will develop Posttraumatic Stress Disorder (PTSD) and Major Depressive Disorder (MDD) following a traumatic event (e.g., O'Donnell, Creamer & Pattison, 2004, Shalev et al., 1998).

Posttraumatic Stress Disorder. Epidemiological research has provided invaluable information regarding posttraumatic stress symptomatology estimates in the general population. In particular, suggested estimates of full-blown PTSD range from less than 1% (Kessler et al., 1995) to 9.5% in the population (Breslau et al., 1998). As such, many studies have examined the rates of posttraumatic stress following large-scale disasters and found, not surprisingly, elevated rates of PTSD (e.g., North et al., 1999; Tucker et al., 2007; Weidmann, Fehm & Fydrich, 2008; Zimering, Gulliver, Knight, Munroe & Keane, 2006). Rates of mental illness following a trauma, including posttraumatic stress symptoms, range from 5-40% with the majority of studies reporting rates in the lower half of this range (e.g., Canino, Bravo, Rubio-Stipec & Woodbury, 1990). For example, researchers found that 34.3% of individuals met full diagnostic criteria for PTSD in the six months following the bombing of the Murrah Federal Building in Oklahoma City (North et al., 1999). Similarly, researchers suggested a 30.3% prevalence rate of PTSD among a sample of pre-hurricane residents following Hurricane Katrina (Galea et al., 2007). Notably, research suggests that exposure to terrorist attacks, when compared to other non-terrorist-related traumas, leads to higher rates of psychopathology, and in particular, PTSD (e.g., Gidron, 2002; Shalev & Freedman, 2005).

The September 11th, 2001 World Trade Center attacks was a major disaster with mass casualties and trauma survivors. To make matters more complicated, the New York City metropolitan area is a densely populated region with approximately 15 million people living in the vicinity and tri-state area. Further, the attacks were perceived as an attack on the entire United States (Kennedy, 2001). Therefore, researchers looked towards other similar major disasters to inform their study designs aimed at assessing the potential mental health consequences. Posttraumatic stress symptoms have been the most commonly identified and studied.

Early studies attempted to determine PTSD prevalence rates of those affected individuals. Silver and colleagues (2006) examined national prevalence rates via web-based survey immediately following the WTC attacks and found a PTSD prevalence rate of 17%. Galea and colleagues (2002) suggested a 7.5% probable prevalence rate of individuals suffering from a current PTSD diagnosis with a significant increase to 20% for those individuals closer in proximity to Ground Zero. Breaking down the diagnostic criteria of PTSD, Galea and colleagues (2006) found that 20.4% of individuals met re-experiencing criteria, 9.9% met avoidance criteria,

and 20.7% met hyper-arousal criteria following the attacks. Similarly, Schlenger and colleagues (2002) found a prevalence rate of 11.2% for individuals in the NYC metropolitan area following the September 11th, 2001 attacks. Moreover, it is clear that individuals were affected and developed posttraumatic stress symptoms following these terrorist attacks.

Depression. It is clear that post-traumatic stress symptoms are not the only mental health sequelae experienced by those exposed to a traumatic event; depressive symptomatology often follow in a close second place. For example, While PTSD was the most commonly reported psychiatric disorder following the 1995 Oklahoma City bombings with a 34% prevalence rate, major depression was also reported in 23% of the sample (North et al., 1999). Another study assessing the mental health impact from exposure to ongoing terrorism in Israel suggested that, while only 9.4% of the sample met criteria for PTSD, an astounding 58.6% reported feeling depressed (Bleich, Gelkopf, & Solomon, 2003). Further, workers exposed to the Chernobyl disaster in 1986 reported more than double the rates of depressive disorder (14.9%) 18 years after the event compared to a control group (7.1%).

Following the September 11th, 2001 WTC attacks, Galea and colleagues (2002) suggested a 9.7% probable prevalence rate of current depression for directly affected individuals. Depression rates were also elevated among adults in Connecticut that were sampled 5-15 months following the WTC attacks with a prevalence rate of 6.8% (Ford, Adams & Dailey, 2006). A wide range of mental health consequences as well as chronicity of psychological distress were reported following this traumatic event. Notably, however, the majority of studies assessing the impact of trauma note the high rates of comorbidity of PTSD and depression among affected individuals.

PTSD and depression comorbidity. Epidemiological studies have found PTSD to be highly comorbid with other psychological disorders (e.g., Brown, Campbell, Lehman, Grisham & Mancill, 2001). The Treatment Guidelines of the International Society for Traumatic Stress Studies suggest that 80% of individuals suffering from PTSD also met criteria for at least one other disorder (Foa, Keane, & Friedman, 2000). Some researchers have suggested comorbidity rates as high as 93.5% for lifetime PTSD and another mental health disorder (Koenen et al., 2008). Further, comorbidity seems to increase functional impairment in social and occupational domains (e.g., Koren, Arnon, & Klein, 1999). And, PTSD and depression seem to be the most

commonly researched and identified psychological sequelae following a traumatic event (e.g., Resnick et al., 1993; Kilpatrick et al., 1987).

Following the September 11th, 2001 WTC attacks, Bonanno and colleagues (2007) studied a sample of adults directly affected and found that 37.7% of them suffering from probable PTSD also exhibited depression elevations compared to only 21.7% of those suffering from mild-moderate posttraumatic stress levels. Further, for those with no posttraumatic stress symptoms, only 1.3% exhibited depressive symptoms. These results support a "symptom severity" approach to distress following a traumatic event; experiencing a traumatic event can lead to greater overall psychological distress, not only posttraumatic stress symptoms.

Studies examining the effects of other traumatic events have reported similar findings with regard to high rates of comorbidity. For example, O'Donnell and colleagues (2004) assessed a sample of individuals following traumatic injury and found that, of the individuals meeting PTSD criteria, only 30% of them had PTSD as their only diagnosis, and of those meeting depression criteria, only 19% of them had depression as their only diagnosis. Further, the authors reported that more than half (59%) of the individuals with PTSD endorsed comorbid depression.

Research has also pointed to the chronic psychological distress experienced by those with comorbid PTSD and depression, suggesting that this subgroup of individuals experiences greater levels of global impairment. For example, Momartin and colleagues (2004) examined a group of Bosnian refugees resettled in Australia and found that the comorbid PTSD and depression group reported significantly more distress, global functional impairment, and social and occupational impairment compared to both the PTSD only and no diagnosis groups. The authors also suggested that those with comorbidity endorsed more symptom intensity than those with only PTSD. Notably, the authors reported that the depression only group sample size was too small to carry out analyses.

Some research also points to the role of pre-trauma-exposure mental health. Specifically, it has been found that individuals with pre-morbid mental health disorders are more vulnerable to developing PTSD following a traumatic event (e.g., Silver et al., 2006). Moreover, examining the high comorbidity rates of PTSD and depression can potentially offer greater insight into the complexity of the psychological impact experienced by trauma-exposed individuals.

A Cognitive Model. It is not uncommon for prevalence rates of PTSD following a traumatic event to remit as time passes. Such declines were found in a nationwide, longitudinal study following the September 11th, 2001 attacks; 17% of those examined via web-based survey reported full PTSD criteria two months after the attack, which declined to 5.8% at six months post-attack (Silver et al., 2002). Despite this trend, it seems as though a subset of individuals continues to suffer from posttraumatic stress long after the traumatic event is over. Further, some studies have found evidence to support the chronic nature of PTSD. For example, a follow-up study of individuals affected by the 1995 Oklahoma City bombings found that most of the individuals initially meeting PTSD criteria continued to suffer from PTSD almost 1 ½ years post-trauma (North, 2001). Similarly, the initial prevalence rates of PTSD (27.2%) declined to 17.7% at 13-14 months post-trauma following the 1991 mass shooting in Killeen, Texas (North, Smith, & Spitznagel, 1997). Yet, this rate is still significantly higher than commonly reported baseline prevalence rates, suggesting that a subset of individuals continues to experience posttraumatic stress symptomatology long after the traumatic event.

In an attempt to explain the chronic and persistent nature of PTSD, Ehlers and Clark (2000) proposed a cognitive model of PTSD. According to these authors, posttraumatic stress symptomatology occurs when an individual's processing of the traumatic event leads to the perception of a continued, current threat. This "faulty" processing is a function of an individual's appraisal of the event and their memory for it. Further, this perception of threat, not the actual likelihood of threat, is activated and thus leads to symptoms of re-experiencing, arousal and anxiety, to name a few. Consequently, this perceived threat then serves to prevent cognitive change. In the short-term, the perception of threat causes changes in one's behaviors and cognitions (i.e., avoidance and/or safety behaviors), with the goal of distress reduction, that are in fact maladaptive. The long-term effect is maintenance of PTSD.

Research has also pointed to the role of cognition in the development of depression. Succinctly put, Ingram and colleagues (1998) posited that depression is the result of the interaction of cognitive vulnerability and specific stressors. Notably, few studies have examined the cognitive impact of trauma in those individuals reporting depressive symptomatology. However, Ehring and colleagues (2008) examined the role of specific cognitive factors, based on the previously discussed cognitive theories of PTSD and depression, and found that these cognitive variables better predicted subsequent distress levels than previously established

predictors (see Ozer et al., 2003). Moreover, these findings point to the importance of early and accurate identification of those likely to develop posttraumatic stress and depressive symptoms with the goal of thwarting chronic distress.

Hence, in light of the above findings, one of the aims of the present study is to examine the chronic effects of the September 11th, 2001 WTC attacks with regards to posttraumatic stress and depression among adults in the New York City metropolitan area.

Trauma and Children

As previously discussed, posttraumatic stress is the most commonly studied disorder in the field of trauma. Many studies have examined this type of reaction in children following a variety of traumatic events. Findings suggest a broad range of symptomatology. One particular study found that children exposed to the 1999 Greek earthquake reported elevated rates of PTSD and anxiety symptoms (Giannopoulou et al., 2006). Specific to terrorism, Laor and colleagues (1997) also assessed symptomatology among Israeli preschool children who had been exposed to Scud missile attacks during the Persian Gulf War at six- and 30-months post-war. The authors found that at initial follow-up, 7.8% of the children had sufficient criteria to meet a PTSD diagnosis while 35.3% exhibited mild symptomatology, and an additional 37.3% displayed moderate symptomatology. More comprehensively, a review of the literature on terrorism and children from 1994-2004 concluded PTSD rates of 28-50% (Freemont, 2004). However, similar to adult reactions, posttraumatic stress is not the only psychologically distressing reaction that children experience following a trauma, and these reactions are often understudied.

Steinberg and Avenevoli (2000) suggested that trauma and its correlates may serve as a "nonspecific risk factor" to a variety of mental health difficulties. Following the September 11th, 2001 attacks, Hoven and colleagues (2005) reported that children appeared to be experiencing symptoms not commonly examined in the trauma literature. Moreover, implications for the current study point to the importance of using an assessment tool that taps a wide range of symptoms, such as anxiety, emotional disturbance, depression, aggression, and sleep difficulties.

The September 11th, 2001 WTC attacks. Vast amounts of children were exposed to the events of September 11th, 2001 in either a direct or peripheral way. For example, two weeks after September 11th, 2001, Gil-Rivers, Holman and Silver (2004) examined acute stress symptoms among a small national sample of adolescents indirectly exposed to the attacks via the media exposure and found symptoms of dissociation (68.3%), anxiety (45.1%), avoidance

(38%), re-experiencing (38.2%), and functional impairment (9.9%). Coates and Schechter (2004) also cite a study by Klein, Devoe, and Miranda (2003) who interviewed parents of children below age 5 years in relation to the September 11th, 2001 WTC attacks. Of importance, all of the children in the study were either within viewing distance of the World Trade Center, or were living nearby. The authors found that 96% of those children experienced at least one PTSD symptom and 35% of them met full PTSD criteria. Similarly, Hoven and colleagues (2005) found that not only did children experience posttraumatic stress reactions after September 11th, 2001 WTC attacks, they also experienced elevated rates of probable major depression, generalized anxiety, separation anxiety, panic disorder, agoraphobia, conduct disorder, and alcohol abuse/dependence six months after September 11th, 2001. These findings suggest a wide range of possible psychopathology in children following a trauma such as the September 11th, 2001 WTC attacks.

Why study young children following a trauma. Much work has been done studying the effects of war and terrorism on children, adolescents, and adults, yet young children are a cohort that is often overlooked. Understandably, this age group may be a difficult group to study due to developmental barriers, such as limited communicative and comprehension skills as well as adults' limited ability to understand their emotionality. Further, psychologists have posited that very young children are more likely to have a differential and more negative response to trauma due to their lack of psychological maturity (Osofsky, 1995) compared to adolescents and adults. Studies have examined differential outcomes using Achenbach's Child Behavior Checklist measure (Achenbach, 1991a) and found elevations in a variety of areas among children, including increased attention problems, aggression, withdrawal behavior, and somatic complaints (e.g., Allwood, Bell-Dolan & Husain, 2002) following a traumatic event. In an attempt to explain such findings, theories have implicated the role of the social support network, suggesting that younger children do not have the resources to develop a strong social support network compared to older children and adults (Cryder, Kilmer, Tedeschi, & Calhoun; 2006).

The Board of Education study's findings (Hoven et al., 2005) support this age-dependent vulnerability, concluding that younger children exposed to the September 11th, 2001 attacks had higher rates of PTSD, separation anxiety, and agoraphobia despite the fact that a greater number of older children attended schools nearer to Ground Zero and had a greater likelihood of prior traumatic experiences. Additional studies have similarly found young children to be the most

vulnerable to the effects of a traumatic event (e.g., Pfefferbaum et al., 1999), suggesting that their symptomatology is related both to direct exposure to the trauma and indirectly to the impact of the trauma on their parents/family. For example, Schlenger and colleagues (2002) studied reactions to September 11th, 2001 and found that, of the children sampled, 60.7% in NYC, 57.3% in other metropolitan areas, 54.9% in Washington, D.C., and 48.0% in the rest of the U.S. reported feeling upset as a result of the attacks. Moreover, 19.8% had trouble sleeping, 29.9% behaved in an irritable or grouchy manner, and 26.5% had new fears of separation from their parents. Similarly, Chemtob and colleagues (in press) found mothers with comorbid PTSD and depression following the WTC attacks to be more likely to have preschool-age children suffering from a variety of symptoms, such as emotional reactivity, aggression, attention problems, and somatic complaints compared to mothers with only one disorder and compared to a control group. Similar findings have been reported for very young children with regards to behavioral problems and PTSD-related behavioral changes (Endo, Shioiri, Someya, Toyabe & Akazawa, 2007). Thus, research findings clearly support the critical need to identify and treat young children that have been exposed to a traumatic event.

Even the very young who may not have even been born on September 11th, 2001 are at risk for impaired functioning due to the impact of trauma on caregivers. Research has pointed to the impact of both exposure to air pollutants from the collapse of the towers and to prenatal stress and distress levels. Lederman and colleagues (2004) found mothers who were pregnant on September 11th, 2001 and living within two miles of Ground Zero gave birth to infants significantly lower in birth weight and body length. Specific to the effects of maternal PTSD on children's symptomatology, a study conducted by Diego and colleagues (2006) found that pregnant women exposed to the psychological distress (e.g., depression, anxiety) had elevated levels of the hormone cortisol. Further, cortisol levels were negatively associated with their children's birth weight. Elevated levels of this stress hormone are associated with PTSD, which suggests an increased risk among these infants in developing the disorder later in life. Similar findings have been suggested for other types of trauma exposure (e.g., Yehuda et al., 2007). Moreover, while the effects of trauma on unborn children are not commonly examined, there is evidence to suggest that these unborn children are also at an increased risk for developing difficulties post-trauma.

Therefore, another aim of the present study is to examine the chronic effects of the September 11th, 2001 WTC attacks with regards to a wide range of symptoms among young children in the New York City metropolitan area.

How do we Define Exposure to Traumatic Events?

The September 11th, 2001 WTC attacks and their aftermath were expansive and pervasive in their level of exposure as many people were both directly and indirectly exposed. Some research has suggested that exposure, specifically geographic proximity to the traumatic event, is a strong predictor of subsequent symptomatology in adults and children alike. For example, Piotrkowski and Brannen (2002) found that direct exposure, along with threat appraisal and reduced self confidence, predicted posttraumatic stress symptomatology in NYC workers. Another study (Groome & Soureti, 2004) found that posttraumatic stress and anxiety symptomatology were associated with proximity to the epicenter of the 1999 Greek earthquake in a sample of children. Moreover, Schlenger and colleagues (2002) found that probable PTSD was associated with direct exposure to the September 11th, 2001 attacks in a sample of adults in the NYC metropolitan area. Similarly, a study conducted by DeVoe, Bannon, and Klein (2006) found that direct exposure was the strongest predictor for parents actively seeking counseling for their children. Thus, it is common for trauma research to identify target populations based on geographic proximity to the site of the traumatic event. Research on the September 11th, 2001 WTC attacks followed suit. For example, a large-scale study (n = 8236) conducted by the NYC Board of Education examined the effects of the WTC attacks on children and adolescents in the NYC area. The authors did find evidence to support an overall dose-response relationship between level of exposure and psychopathology; however, they suggested that direct exposure was not the best predictor of outcome. Moreover, the authors found that family exposure may have a greater emotional impact on these children and thus better predict mental health outcomes compared to direct exposure (Hoven et al., 2005). Thus, not all research has found direct exposure to be the best predictor of mental health outcomes following a trauma.

Additionally, the definitions of "direct exposure" and "indirect exposure" vary significantly in the literature. Some studies defined "direct exposure" based on geographic proximity (e.g., Brown & Bobrow, 2004; Hoven et al., 2005; North et al., 1999) while others defined it based on witnessing the trauma (e.g., Silver et al., 2006). Similarly, Zimering and colleagues (2006) defined direct exposure as actual contact with the disaster site and indirect

exposure as exposure to narratives from survivors in a sample of disaster relief workers. More variability is found when studies attempt to define "indirect exposure" as a comparison or control group. Some investigations have defined "indirect exposure" as media exposure (e.g., Pfefferbaum, Seale, & Brandt Jr., 2003). Others defined it as being an arbitrarily selected cut-off distance from the trauma site, such as below 110th Street (Bonnano, Galea, Bucciarelli & Vlahov, 2007), below 14th Street (Piotrkowski & Brannen, 2002) or below Canal Street (Chemtob et al., in press) following the September 11th, 2001 WTC attacks. Thus, such variability in the operational definitions of "exposure" can lead to findings that, at best, should not be directly compared or meta-analyzed, and at worst, are potentially confounded.

For example, the NYC Board of Education Study (Hoven et al., 2005) identified three strata for population sampling based on proximity. Stratum 1 included schools in the actual WTC area, stratum 2 included high-risk areas, such as schools below 14th Street and areas where line-of-sight to the WTC area was high (e.g., Washington Heights, Staten Island), and stratum 3 included all other schools in the city. Notably, these authors found that those children going to school near the Ground Zero area (stratum 1) reported lower levels of psychopathology. Similarly, Zimering and colleagues (2006) examined direct versus indirect exposure in a group of disaster relief workers following the 9/11 WTC attacks. This particular study conceptualized "direct exposure" as geographic proximity to the site and "indirect exposure" as exposure to survivor narratives. Notably, the authors found higher posttraumatic stress and depression symptoms among those directly exposed but duly noted the role of indirect exposure on psychopathology outcomes; those indirectly exposed reportedly exhibited symptoms comparable to individuals who were only exposed via media outlets.

Moreover, among studies examining the unitary variable of exposure via geographic proximity, there seems to be a considerable amount of variability. Further, this variability begs the question of the arbitrary cut-off point, which could have huge ramifications in the literature. If there is significant overlap, this considerably decreases the ability to compare findings across studies.

Other studies have attempted to develop a composite exposure variable, taking into consideration multiple variables previously shown to predict psychopathology following a traumatic event. One such study provides a good example of such attempts. Following the WTC attacks, Piotrkowski and Brannen's (2002) study identified three variables, namely 1) objective

exposure (defined as the sum total of responses to six yes/no items tapping witnessing the collapse, escaping the collapse, evacuation, difficulty getting home, and geographical proximity to the attacks (defined as below 14th Street)); 2) threat appraisal (defined as the sum total of responses to two items tapping one's current appraisal of threat of future terrorist attacks); and 3) lost confidence in one's self (defined as the sum total of responses to five items tapping one's reduction of confidence in oneself in the context of 9/11). Notably, the authors found that direct, objective exposure only accounted for 6% of the variance while threat appraisal and lost confidence combined for more than 33% of the variance.

Agronick and colleagues (2007) provide another example of the "composite exposure" approach. The authors defined "exposure" to the 9/11 attacks as a composite variable, consisting of: 1) seeing the NYC attacks live; 2) self/other harm, and 3) lost resources. Further, it is worth noting that, while these authors found evidence to support a dose-response relationship between exposure and subsequent psychological distress, they did not examine the predictive ability of each individual variable comprising the composite "exposure" variable. This raises the question of whether to consider "exposure," as a unitary variable defined as geographic proximity, or as a composite variable, incorporating a variety of variables that all play a unique role in the development of psychopathology following a trauma. Further, if a variety of variables are implicated, which are responsible for explaining the most variance?

The Role of Perceived Life Threat

With regards to "exposure" to a traumatic event, there are contradictions in the literature regarding how "exposure" is operationally defined as well as its predictive power for distress levels. Therefore, research has attempted to identify additional peritraumatic variables that could potentially predict distress following a trauma. Notably, Brewin, Andrews, and Valentine (2000) conducted a meta-analysis on risk factors for PTSD and found that factors *during* and *after* the trauma had an increased effect compared to pretrauma factors. These findings suggested that factors proximal to the traumatic event accounted for more variance than more distal factors. Additionally, LaGreca and colleagues (1996) examined the effects of Hurricane Andrew on post-disaster functioning of children. The authors found evidence supporting the hypothesis that life threatening events, including perceived life threat, and loss and disruption, significantly predicted subsequent posttraumatic stress symptomatology in these children. Furthermore, some studies have suggested that perceived life threat has shown to be the most consistent predictor of

PTSD following a trauma (e.g., March, 1993). For instance, Kutz and Dekel (2006) examined the long-term effects of the Israeli missile attacks and found that participants who had experienced the attack and developed PTSD reported significantly greater feelings of perceived danger and fear and less perceived coping ability compared to both a control group who did not experience the attack as well as participants who had experienced the attack but did not develop PTSD.

In a large-scale meta-analytic study (N = 3,524), Ozer and colleagues (2003) aimed to identify potential non-demographic predictors of posttraumatic stress following a variety of traumatic events. Their results suggest a statistically significant weighted average correlation (ES = .26, ranging from .13 to .49) for perceived life threat for the prediction of PTSD and its symptoms. A further interesting finding was the increase of effect size among studies: 1) with greater elapsed time between the traumatic event and the assessment of symptoms, and 2) when the traumatic event was non-combat, violence-related as opposed to accidental. Similar findings were reported for a group of assault survivors for the predictive ability of perceived life threat and PTSD six months post-trauma (OR = 2.12; $p < .0001$) (Kleim, Ehlers & Glucksman, 2007). In summary, it seems reasonable to suggest that perceived threat is another predictor of psychological distress in addition to geographic proximity to the traumatic event.

While these and other studies have suggested the predictive role of perceive life threat on posttraumatic stress symptoms, identifying the mechanism underlying this relationship has proved to be a more daunting task. Studies have identified differences in cognitions between individuals who develop PTSD following a traumatic even than those who did not (e.g., Foa, Ehlers, Clark, Tolin & Orsillo, 1999; Solomon, Iancu & Tyano, 1997). For example, Foa and colleagues (1999) found that those who developed PTSD perceived the world as a more dangerous place than those who did not. Kutz and Dekel (2006) also examined this relationship among victims of a terrorist attack in Israel and found that those who developed PTSD experienced greater feelings of fear and danger and a decreased ability to cope than those who did not develop PTSD as well as a control group. Notably, Ehring, Ehlers and Glucksman (2008) suggested that such cognitive variables have been shown to predict PTSD and depression more accurately than initial symptom levels following a trauma. Thus, it seems that perception of life threat is a salient characteristic implicated in the cognitive and psychological processing of the traumatic event.

Lazarus and Folkman (1984) postulated the *Transactional Model of Stress* theory, which addresses how individuals cope with stressful situations. Moreover, the theory defines stress as "a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being," (p. 19). Further, what is key to understanding which individuals experience distress is not their objective experience but rather their subjective experience, or their interpretation of the situation. Applying this theory to traumatic events and the development of PTSD, it could be posited that the subjective perception of threat to life is more important in determining whether an individual experiences psychological distress than actual exposure to the traumatic event. Further, Lazarus and Folkman (1984) suggest that cognitive appraisal processes intervene between exposure to the event and an individual's reaction to it. Hence, an appreciation of individuals' interpretation of the event is paramount to understanding subsequent psychopathology.

Laubmeier and Zakowski (2004) tested this notion by studying perceived life threat and actual life threat, defined as disease stage, among a group of cancer patients. The authors found that while disease stage did not predict outcome, perceived life threat was significantly associated with psychological distress (r = 0.28) and quality of life (r = -0.54) and explained 8% and 20% of the variance, respectively. Thus, it seems plausible to suggest that an individual's perception of the traumatic event, specifically, their perception of threat to their life and the life of their loved ones, might differentially predict subsequent psychopathology.

Finally, it is important to address the likelihood of overlap between the constructs of geographic exposure to a trauma and the perception of life threat. The question is: are actual geographic exposure and perceived life threat measuring the same construct? Or, are they separate constructs that differentially predict outcomes following a trauma? Given the previously discussed discrepancies in operational definitions of exposure, combined with the fact that many studies have not reported individual predictive abilities of variables comprising a composite "exposure" variable, a major goal of this study is to determine if these two constructs differentially predict outcomes in a sample of parents affected by the September 11th, 2001 WTC attacks.

Parental perception of life threat and child psychopathology. Notably, there is currently no known data in the literature that addresses the impact of parent perceptions of trauma as a predictor of child outcomes, perhaps for a variety of reasons. First, as previously discussed,

younger children are often understudied in the trauma literature in general due to developmental limitations (e.g., the ability to accurately report self-symptoms does not occur until school-age years). As such, researchers who do focus on young children must rely on parental reports of children's symptoms, which can be somewhat problematic. For example, maternal depression has been shown to produce deficits in a mother's ability to accurately identify the emotional states of her children (Zahn-Waxler & Wagner, 1993). Nevertheless, this method continues to be used in the field for obvious reasons.

In an effort to identify and organize the multitude of factors that are related to child outcomes following a traumatic event, Pynoos, Steinberg and Piacentini (1999) posed a *Developmental Psychopathology Model of Childhood Traumatic Stress*. To date, this appears to be the most comprehensive model in the trauma literature, focusing on both proximal factors, such as trauma reminders, and distal factors, including secondary stresses. The model also accounts for a variety of familial factors with particular interest on parental factors. To name a few, the authors pose that a parental past trauma exposure and loss, reactivity to reminders, current responsiveness to the child, and trauma-related psychopathology are all related to child outcomes. Thus, one of the most important factors affecting psychopathology in young children is the influence of their parents' reactions.

It is also worth noting the psychological effects of trauma on the parent-child relationship. For example, Laor and colleagues' (1997) examined a sample of Israeli children and their mothers and found that the younger children (age three years) displayed PTSD symptoms that were correlated significantly with their mothers' intrusive and avoidant symptomatology. Similarly, Hoven and colleagues (2005) found that family exposure to the September 11th, 2001 WTC attacks was a strong predictor of child symptomatology whereas direct exposure was not. Research has also implicated the role of parental depression as affecting the parent-child relationship. Specifically, increased depressive symptoms in mothers has been associated with a decrease in concern for their child, supportive behavior provided to their child, and positive emotions exhibited toward their child, in addition to an increase in negative emotions exhibited toward their child (e.g., Dix , Gershoff, Meunier, & Miller, 2004). Implications of these findings point to a diminished parental engagement resulting from impaired mental health. Moreover, data show that parental trauma reactions clearly affect child outcomes, especially for younger children.

For these reasons, another aim of this study is to examine how parental perception of life threat impacts their child's mental health outcomes following the WTC attacks.

Race/Ethnicity

The role of race and/or ethnicity as a risk factor for developing posttraumatic stress symptoms following a trauma has been widely researched. For example, Norris and colleagues (2002) conducted an empirical review of the literature and found evidence to support the notion that minority groups tend to display more distress and/or fared poorly compared to majority groups following three types of traumatic events, namely natural disasters, technological disasters, and mass violence. Similarly, Perilla and colleagues (2002) found strong group differences in the prevalence of PTSD following Hurricane Andrew; Latino participants had the highest prevalence rate (38%), followed by African Americans (23%), and Caucasians with the lowest prevalence rate (15%). More generally, evidence suggests that minority groups, and in particular African-Americans, experience more lifetime traumatic events compared to Caucasians and Hispanics (e.g., Turner & Lloyd, 2004). Other epidemiological research suggests increased prevalence of PTSD among immigrants and refugees (e.g., Cervantes, Salgado de Snyder & Padilla, 1989).

Further research has examined more general differences among racial/ethnic groups. In particular, studies have suggested that African Americans exhibit more emotions (i.e. sympathy, sadness) compared to Caucasians (e.g., Chu, Seery, Ence & Silver, 2006), experience greater levels of anger (e.g., Barnes, Treiber & Ludwig, 2005), are at an increased risk for stress-related health problems (e.g., Mayet et al., 1998), and higher exposure to stressful situations (e.g., Turner & Avison, 2003), all of which are associated with negative outcomes over time and/or following a trauma.

It is worth noting, however, a particular gap in the literature. While the majority of research discusses the impact of minority status on mental health sequelae (as previously discussed), few, if any, studies have specifically examined a sample of Asian individuals. Often, this sub-sample has not yielded enough participants to be examined as a particular ethnicity group. As such, it is commonplace for this sub-group to be re-coded into an "other" category (e.g., Chu, Seery, Ence, Holman, & Silver, 2006) or simply excluded from analyses (e.g., Adams & Boscarino, 2005; Turner & Avison, 2003), which thus leaves significant gaps in our understanding of the impact of trauma on the Asian community.

Following the September 11th, 2001 terrorist attacks, the research continued. Chu and colleagues (2006) conducted a nationwide online study in the days follow the attacks assessing for a variety of trauma-related symptoms. They found that Hispanics reported significantly more distress and posttraumatic stress symptoms compared to Whites. Notably, however, no long-term effects for other ethnicities, including African Americans, were found when compared to Whites. Similarly, Galea and colleagues (2002) found Hispanic ethnicity to be a significant predictor of both PTSD and depression when compared with adults of White/Caucasian ethnicity.

Several explanations have been posited in an attempt to explain this apparent discrepancy among racial groups' outcomes following a trauma, with the most prominent being differential exposure, differential vulnerability, and acculturation theories. *Differential exposure* refers to the notion that these groups differ in terms of the extent of exposure experienced following a trauma. For example, Perilla, Norris and Lavizzo (2002) examined differences among racial/ethnic groups in the development of PTSD following Hurricane Andrew and found that Hispanics and African Americans reported greater levels of neighborhood trauma and personal trauma compared to Caucasians. These findings thus translate into a greater exposure severity for racial/ethnic minorities, which may increase their risk for developing posttraumatic stress symptoms.

Secondly, *differential vulnerability* refers to the notion that racial/ethnic minority groups respond more negatively to stressors regardless of exposure severity. That is, differential vulnerability suggests that what is important is the context in which the traumatic event occurs in terms of understanding a group's response to it. Examples of factors influencing this context include limited access to resources and culture-specific attitudes, both of which likely affect a group's ability to adaptively cope with a traumatic event. Perilla and colleagues (2002) also found evidence to support this theory.

Thirdly, *acculturation* refers to "the process of cultural change resulting from contact with a different culture and the process of adapting to a new cultural environment…" (Jung, Hecht, & Wadsworth, 2007, p. 609). In terms of its relationship to trauma exposure, researchers have questioned whether certain cultural factors might serve either as a resiliency or vulnerability factor in the development of psychopathology following a trauma. For example, acculturation was found to be negatively associated with peritraumatic dissociation in a sample

of Latino young adults exposed to community violence, thereby suggesting that certain variables of Latino culture serve as a protective role (Marshall & Orlando, 2002). Further, culture may also affect the interpretation of or labeling that people place on stress and trauma (e.g., Sander et al., 2007).

Despite these findings for adult populations, studies of race/ethnicity for child populations have not yielded as strong results. One can postulate that children of varying ethnicities/cultures have not had as much exposure, as a result of their young age, to the beliefs and attitudes specific to their traditions (e.g., coping styles, attributional styles) that moderate their reaction to traumatic events. For example, Vigil and Geary (2008) found that family coping style mediated the relationship between trauma exposure and psychological distress among adolescent survivors of Hurricane Katrina.

Interestingly, variability in the strength of race/ethnicity effects in research has led to a more in-depth examination of whether race does, in fact, serve as a risk factor for psychopathology following a traumatic event, or whether additional variables exist to moderate this relationship. In response to this question, Brewin, Andrews and Valentine (2000) conducted a meta-analysis of trauma-exposed samples of adults and found minority status to be a weak predictor of PTSD. This finding was consistent across all studies examined. However, the authors posited that this moderation might not remain significant when type of exposure is controlled for. Another study (Agronick, Stueve, Vargo, & O'Donnell, 2007) did not find race/ethnicity to be associated with any outcome variables, including PTSD and depression, among a sample of economically disadvantaged adults in the NYC area. Similarly, Bonanno and colleagues (2007) suggested that, while the research points to race/ethnicity as being a risk factor for developing PTSD, many studies have not taken into consideration the confounding effects of socio-economic status (SES). Further, when SES was controlled for in this study, race/ethnicity no longer statistically predicted differences in the development of PTSD. Similar findings were suggested by Adams and Boscarino (2005) and Agronick, Stueve, Vargo and O'Donnell (2007). Consequently, a goal of this study was to examine the role of race/ethnicity as it relates to the development of PTSD and depression following the September 11th, 2001 WTC attacks.

Socio-Economic Status

Research has suggested that individuals in the lowest socio-economic (e.g., Turner & Avison, 2003; Turner & Lloyd, 2004) and lowest education (e.g., Breslau et al., 1991) groups

tend to report experiencing significantly more lifetime traumatic events. Similarly, income level has been examined in terms of predicting trauma prevalence. For example, Breslau and colleagues (1998) found that those in the lowest education and income groups reported experiencing greater assault-related violence. Conversely, individuals in the highest occupational category tend to report the lowest levels of stressful life events (Turner & Turner, 2005). Additionally, a meta-analytic review of the data (Brewin, Andrews, & Valentine, 2000) found a weighted average effect size for low socioeconomic status to be .14 with a range of .01 to .38.

However, findings have not been entirely consistent. For instance, Koster and colleagues (2005) found significant effects for income but no differences for education or occupation with regard to trauma exposure. Similarly, when examining potential maintenance factors for PTSD following motor vehicle accidents, Ehlers, Mayou and Bryant (1998) found that social class, defined as occupation level, had no significant effect on this relationship.

Socio-economic variables have also been examined among individuals affected by the September 11th, 2001 WTC attacks. Specifically, Ahern and Galea (2006) found a significant correlation between income inequality and depression; individuals from a low income group reported greater depressive symptoms. Notably, this relationship was not found for individuals from higher incomes. Another study (Agronick et al., 2007) found educational status to be negatively associated with subsequent hopelessness, depression, and global distress levels. Silver and colleagues (2006) similarly found that individuals reporting higher education and higher income levels also reported few posttraumatic stress symptoms.

Similar to findings in the general trauma literature, inconsistencies have been found among WTC studies. For example, Galea and colleagues (2002) assessed PTSD and depression among individuals affected by the WTC attacks, and their findings suggest a differential predictive ability. Specifically, yearly household income and level of education were significantly related to depression, but not PTSD. Nevertheless, another goal of this study was to examine the role of socio-economic variables, specifically, education and occupation levels, as they relate to psychopathology following a traumatic event, while controlling for race/ethnicity.

The Present Study

This study aimed to achieve several goals. Firstly, it attempted to assess the predictive ability of two composite variables, which have previously been implicated in the development of

psychopathology post-trauma, in parents and young children following the September 11th, 2001 World Trade Center attacks. Specifically, these two variables were: 1) actual exposure to the traumatic event, defined in terms of mothers' geographic proximity to the event, and 2) mothers' perception of threat of danger and injury to themselves, their spouse and their children. Secondly, this study attempted to answer the question: does parental perception of life threat have better predictive ability for adult posttraumatic stress and depressive symptoms and overall levels of difficulty in their children than actual exposure to the event? Thirdly, the moderating relationships of race/ethnicity and socio-economic status between trauma exposure and subsequent psychopathology were also examined.

<div align="center">Study Hypotheses</div>

Refer to figure 1 for the conceptual model for the present study.

Hypotheses for Adult Outcomes

1. Level of actual exposure of parent, as defined by geographic proximity when the planes hit the WTC, would better predict parent symptomatology; those who were geographically closer to Ground Zero would be more likely to experience psychological distress than those who were farther from Ground Zero.

2. Level of parental perceived threat, as defined by a mean composite score, would predict greater levels of parent symptomatology than would level of actual exposure of parent, as defined by geographic proximity to Ground Zero.

3. Minority groups (e.g., Black, Hispanic, Asian or Pacific Islander) would exhibit greater parent symptomatology compared to Caucasians. Race/ethnicity would moderate the relationship between the predictors of actual, geographic exposure and perceived life threat on adult outcomes.

4. Parents from a lower socio-economic status would exhibit greater symptomatology compared to those from a higher socio-economic status. Socio-economic status would moderate the relationship between the predictors of actual, geographic exposure and perceived life threat on adult outcomes.

Hypotheses for Child Outcomes

1. Level of actual exposure of parent, as defined by geographic proximity when the planes hit the WTC, would better predict child symptomatology; children whose

parents were geographically closer to Ground Zero would be more likely to experience psychological distress than those who were farther from Ground Zero.

2. Level of parental perceived threat, as defined by a mean composite score, would predict greater levels of child symptomatology than would level of actual exposure of parent, as defined by geographic proximity to Ground Zero.

3. Parents in minority groups (e.g., Black, Hispanic, Asian or Pacific Islander) would have children who exhibit child symptomatology compared to Caucasians. Race/ethnicity would moderate the relationship between the predictors of actual, geographic exposure and perceived life threat on child outcomes.

4. Parents from a lower socio-economic status would have children who exhibit greater child symptomatology compared to those from a higher socio-economic status. Socio-economic status would moderate the relationship between the predictors of actual, geographic exposure and perceived life threat on child outcomes.

Methods

This is a retrospective data-analytic study. Data were collected as part of a larger study assessing the effects of the September 11th, 2001 World Trade Center attacks on families with young children who were affected. This larger study was reviewed and approved by the Mount Sinai School of Medicine's Institutional Review Board (IRB). Data collection occurred between March of 2003 and June of 2006. The larger study aimed to: (a) to identify and treat children born between 9/11/1996 and 9/11/2002 (up to age 5 years on 9/11/2001) affected by the WTC attack, (b) to identify and treat psychologically distressed mothers and fathers of children, and (c) to increase our knowledge base to advance best practice development for very young children and their families who may be affected by future terror attacks or disasters.

Inclusion/Exclusion Criteria

For the larger study, any child who was five years of age or younger on 9/11/2001, including any child born in the 12 months following the WTC attacks, was eligible if they either: 1) at the time of recruitment, lived or attended school (which includes daycares, preschools and elementary schools) below Canal Street in the Downtown Manhattan area, regardless of whether they were living below Canal Street on September 11th, 2001, 2) were attending school (including daycares, preschools and/or elementary schools) or living below Canal Street in the Downtown Manhattan area on the day of September 11th, 2001, or 3) if born between September

11th, 2001 and 9/11/02, his/her primary caregiver was living or working below Canal Street in the Downtown Manhattan area on the day of September 11th, 2001. Children who were born in the 12 months following September 11th, 2001 were eligible due to risks to their development from parental PTSD or depression, or changes in parental beliefs, attitudes, and perceptions of their child and parents' own efficacy or sense of safety. Children with developmental disorders and mental retardation, and children older than 5 years of age on September 11th, 2001 were excluded from study participation.

Procedures

The larger study began in spring of 2003 with the aim of identifying young children and their parents/caregivers who continued to suffer significant mental health sequelae of exposure to the September 11th, 2001 WTC attacks. Families were recruited via two methods: 1) school-based recruitment was conducted at preschools, daycares, and Head Start programs in the downtown Manhattan area. Schools were chosen based on their geographical location in the study's catchment area. Study staff collaborated with site directors and head and assistant teachers, and formal collaboration agreements were made prior to initiating participant recruitment. Teachers, family workers and other school staff attended training sessions run by the study, outlining our inclusion/exclusion criteria, participation, and general knowledge on how to identify young children who have been negatively affected by a trauma. Recruitment tables were then set up during parent/child pick-up and drop-off times at each site, and parents/caregivers were invited to learn about the project participation via various participation handouts (brochures and flyers) and direct contact with staff members. 2) Community-based recruitment entailed expansion to the wider community (e.g., tenants' boards, community centers, job sites, houses of worship, etc.). Study brochures and flyers were posted at various community sites, and interested individuals were invited to call a confidential hotline number for more information about participation.

When a parent/caregiver expressed her/his desire to participate in the study, a study member met with her/him individually to fully explain the details of participation and to review whether they met inclusion/exclusion criteria. Once full parental comprehension was assured, he/she signed a consent form, allowing us to collect screening information on both the parent/caregiver and the child and to approach the child's head teacher and, where applicable assistant teachers, for multiple informants. The parent/caregiver was then given the self-report

screening booklet to take home, complete, and return to the project, ideally within one-week. A study member then met with the child's teacher(s) to obtain their informed consent to provide information on the child. The teacher(s) were given the child observation booklet to complete and return within the same one-week timeframe.

Data consisted of measures on both the parent/caregiver and the child. Generally, the measures pertaining to the parent assessed their demographic information, level of exposure to the September 11th, 2001 attacks, mood/depressive symptomatology, post-traumatic stress symptomatology, and handedness. The measures pertaining to the child assessed a broad spectrum of emotional and behavioral concerns based on parent and teachers' perception. Parents/Caregivers were reimbursed $30 for the time and expenses associated with study participation.

Participants

A total of 170 families with 200 children consented to participate in the larger study. Among these 200 children were 33 siblings who were excluded from the present study because they were older than 5 years, 11 months at the time of participation, allowing us to focus on a younger subset of children. Twenty-two families withdrew their participation prior to completing the study, and an additional 30 families were removed for research purposes due to missing data on key variables. Therefore, the present study consists of 115 children (57 girls, 58 boys) and their mothers. At the time of data collection, the children's age ranged from 1.8 to 5.9 years of age (M = 4.14, SD = .874), and on September 11th, 2001, the children's age ranged from 0 to 3.9 years of age (M = 1.24, SD = 1.27).

To address the potential for selection bias in the study sample, analyses were conducted on key dependent, independent and demographic variables for excluded versus included participants; categorical variables were analyzed using one-way analysis of variance (ANOVA), and continuous variables were analyzed using chi-square test statistics. The results of these analyses were as follows: mothers' perception of life threat composite variable ($F(1, 192) = .015$, $p > .05$), total number of endorsed PTSD symptoms ($F(1, 226) = 1.492$, $p > .05$), and depression score ($F(1, 209) = 2.636$, $p > .05$) did not statistically differ between the two groups; child's internalizing T-scores ($F(1, 166) = .592$, $p > .05$), externalizing T-scores ($F(1, 166) = 1.433$, $p > .05$) total problems ($F(1, 116) = 1.219$, $p > .05$) T-scores, and gender ($F(1, 166) = .050$, $p > .05$) did not statistically differ between the two groups; mother's geographic exposure to the WTC

attacks (χ^2(2, $N = 213$) = 0.537, $p > .05$) and race (χ^2(4, $N = 203$) = 6.070, $p > .05$) did not statistically differ between the two groups. Finally, mother's socioeconomic status, as defined by Hollingshead (1975) Four Factor Index of Social Status (F(1, 240) = 4.333, $p = .038$) significantly differed between the two groups; those participants included in the current study sample reported significantly lower socio-economic status ratings compared to those participants excluded from the study.

It is important to identify the potential cause of this difference in socio-economic status between participants in the study and those who were excluded. The larger study began participant recruitment in the spring of 2003 and focused on identifying young children and their parents closest in geographic proximity to Ground Zero. Given this approach, three of the first four preschool/daycare sites that participated in the project enrolled families based on their children's preschool/daycare location in downtown Manhattan. As such, these families were more likely to be from a higher socio-economic status. Further, participants from these sites were also more likely to be missing key study information due to an initial lack of study quality control procedures. Following this procedural oversight, standardized recruitment procedures were put into place, and proper quality control checks were employed. The next site to participate in the project was a Head Start program located above Canal Street in the Chinatown area. It was targeted due to the limited resources available to these families. By virtue of qualifying for enrollment in a Head Start program, families enrolled in the program were from a lower socio-economic status. Further, 41% of the current study participants were enrolled at this particular Head Start program, which likely accounts for the significant difference in socio-economic status between those included in the current study and those who were excluded.

Overall, these findings suggested that study participants did not significantly differ from participants excluded from the study on key outcome and independent variables; however, they did differ with regards to their socioeconomic status.

Measures

Basic Information Sheet. This questionnaire collects child date of birth, child gender, caregiver contact information, parent occupation, parent education level, parent birth place, sibling information, and primary language spoken in the home.

Demographic Questionnaire. This questionnaire collected child's school address, child's head and assistant teachers' names, child's birth place, parent country of origin, language spoken

at home, parent and child native language, and parent and child bilingual capabilities, along with parent and child race, parent marital status, parent level of education, parent occupation, parent income, and number of years parent(s) have lived in the U.S.

Due to limitations in the current study's sample size, race/ethnicity was examined by identifying three groups, namely White/Caucasians, Asian/Pacific Islanders, and a group of Hispanics and African-Americans; Hispanics and African Americans were grouped to maintain group membership large enough to validly conduct analyses and given the multitude of research suggesting negative mental health outcomes following a trauma.

Socio-economic status was examined using two factors of Hollingshead's (1975) Four Factor Index Scale of Social Status. Each parent's composite score was computed by multiplying the Occupation scale value by a weight of 5 and the Education scale value by 3 and summing the products. Education scores ranged from 1 (less than seventh grade) to 7 (graduate professional training), and Occupation codes ranged from 1 (farm laborers/menial service workers) to 9 (higher executives, proprietors of large businesses, and major professionals). Hollingshead Index raw scores can range from 8 to 66, with higher scores reflecting higher SES.

Exposure Measure. This questionnaire obtained 9/11-related exposure information via parent report. It collected September 11th, 2001 parent and child location, parent and child subjective experiences, including perceived threat, injury/loss information, familial exposure, parent and child media exposure, and subsequent stressors.

To determine perception of life threat, a composite variable was computed by tallying the 6 parent-reported items corresponding to this construct. These items were: "As a result of the 9/11 attack, were you scared that your life might be in danger?" "As a result of the 9/11 attack, were you scared that your child's life might be in danger?" "As a result of the 9/11 attack, were you scared that your spouse's life might be in danger?" "As a result of the 9/11 attack, were you scared that you might be physically injured?" "As a result of the 9/11 attack, were you scared that your child might be physically injured?" "As a result of the 9/11 attack, were you scared that your spouse might be physically injured?" Individual responses were a dichotomous yes/no. Mean composite scores were utilized for analyses in order to account for participants who had items that were not applicable to their situation (e.g., not answering the two items regarding perception of threat to life and physical integrity for a spouse as she does not have a spouse or partner); the goal was to assess the most accurate and applicable estimate of participants'

perception of life threat. Possible PLT scores ranged from 0.00 to 1.00. Table 1 depicts the Phi Coefficient correlations for these items.

Actual exposure to the WTC attacks was based on mothers' geographic proximity to Ground Zero. The corresponding item is as follows: "Where were you [parent] when the planes hit the WTC?" Mothers were then coded into three groups based on their response: those who were below Canal Street, those who were above Canal Street but still within Manhattan city limits, and those who were outside of Manhattan (e.g., New York boroughs, New Jersey, etc.).

Child Behavior Checklist for Ages 1 ½ - 5 (CBCL) (Achenbach & Rescorla, 2000). The CBCL/1 ½-5 version is a revision of the CBCL/2-3 (Achenbach, 1991a) for parents/caregivers with children age 1 ½ to 5 years. It is a child behavior rating scale that comprises 100 items rated on a 3-point likert scale ranging from 0 (not true) to 2 (often true). The measure assesses three broad-band scales, two global categories of "Internalizing" and "Externalizing" scales and a "Total Problems" scale incorporating all items, in addition to seven narrowband subscales (Emotionally Reactive, Anxious/Depressed, Somatic Complaints, Withdrawn, Sleep Problems, Attention Problems and Aggressive Behavior). The measure also yields scores for five DSM-oriented scales: Affective Problems (including Major Depressive Disorder and Dysthymic Disorder), Anxiety Problems (including Generalized Anxiety Disorder, Separation Anxiety Disorder and Specific Phobia), Attention Deficit/Hyperactivity Problems (including Hyperactive-Impulsive and Inattentive types), Pervasive Developmental Problems (including Asperger's Disorder) and Oppositional Defiant Problems (including Oppositional Defiant Disorder). Scale scores are dependent on child sex and age. The Language Development Survey (LDS) was not collected for this sample.

T-scores 64 and higher (90th percentile) were deemed clinically significant, T-scores ranging from 60-63 (84th to 90th percentiles) were deemed of "borderline" clinical significance, and T-scores below 60 were deemed within the normal range. Original test-retest reliability (n = 68) was "very good" for the three broad-band scales, and the subscales yielding Pearson correlations ranging from .87 to .90 and .68 to .87, respectively. Inter-rater agreement between mothers and fathers (n = 72 pairs) was "good." Validity was assessed by comparing matched, referred versus non-referred children (N = 563 per group) using regression analyses. The variance ranged from 3-25% on the CBCL scales and from 2-24% on the C-TRF scales.

The current study utilized t-scores for the Internalizing, Externalizing and Total Problems broad-band scale as the child outcome variables. Internal consistency for the current study sample yielded Chronbach alphas of .92, .95, and .97 (T-scores for the Internalizing, Externalizing and Total Problems subscales, respectively).

Posttraumatic Distress Scale (PDS) (Foa, 1995). The PDS is a 49-item, self-report questionnaire, which was used to assess the presence and severity of adult PTSD symptoms as well as identifying participants with diagnosable PTSD. Its structure and content parallel the DSM-IV diagnostic criteria for Post Traumatic Stress Disorder (American Psychiatric Association, 1994) pertaining to the experience of traumatic event(s), re-experiencing symptoms (5 items), avoidance/numbing symptoms (7 items), arousal symptoms (5 items), symptom duration, and functional impairment. A PTSD diagnosis was assigned to participants who met all criteria based on the DSM-IV. Original test-retest reliability (N = 110) yielded a kappa of .74 for PTSD diagnoses and a Pearson correlation coefficient of .83 for symptom severity scores. Internal consistency yielded a Cronbach alpha of .92 for symptom severity scores. And, a kappa of .59 with 79.4% agreement (N = 248) was obtained when a comparison of the PDS and the PTSD module of the SCID was conducted (PDS sensitivity = 82.0%; PDS specificity = 76.7%).

The parent outcome variable assessing post-traumatic stress symptoms was defined as a sum total of PTSD symptoms endorsed during the screening process. Internal consistency for the current study's sample yielded the following Cronbach alpha scores: Exposure Criterion A1 = .59; Exposure Criterion A2 = .84; Re-experiencing Criterion = .89; Avoidance Criterion = .89; Hyperarousal Criterion = .87; and Overall Measure = .912.

Center for Epidemiological Studies – Depression (CES-D) (Radloff, 1977). The CES-D is a short self-report questionnaire used to assess adult depressive symptomatology in the time period of the past week. It contains 20 items arranged on a 4-point likert scale from 0 (rarely or none of the time; less than 1 day) to 3 (most or all of the time; 5-7 days) and assesses four domains: dysthymic affect, lack of positive affect, somatic and retarded activity difficulties, and interpersonal difficulties. Clinical scoring was determined by adding the responses of the 20 items with the 4 positive affect items receiving reverse-scoring (i.e., 3 = 0) yielding a possible scoring range of 0 to 60. A cut-off score of 16 was implemented (McDowell & Newell, 1996) with 16 and above representing clinical significance for this sample. This questionnaire has high reliability, ranging from a coefficient alpha of .84 to .85 for a general population (N = 1422) to

.90 for a psychiatric population (N = 70) and demonstrated good construct validity with the BDI (Beck et al., 1961) ($p < .0001$) and the MMPI-II Depression scale (Hathaway et al., 1989) (raw: p = .015; T scores: $p = .027$) and good internal consistency (coefficient alpha = .8195) (Bush, Novack, Schneider & Madan, 2004).

The parent outcome variable assessing depressive symptoms was defined as the total score on the CES-D. Internal consistency for the current study's sample yielded a Cronbach alpha of .84.

Analyses

Research has shown that geographic exposure to a trauma event, such as the September 11th, 2001 WTC attacks, is significantly related to subsequent psychological distress. In particular, elevated rates of PTSD and depression have been found among adults, and a variety of trauma-related and other symptoms have been found among children. To test this, the first set of analyses included an Ordinary Least Squares (OLS) multiple regression of actual, geographic exposure on five outcomes variables (PTSD and depression in adults, and Internalizing, Externalizing, and Total Problems T-scores in children), resulting in five unique regression models. The dummy coding technique was used to analyze the categorical variable of actual, geographic exposure. Three groups were identified based on their geographic location when the planes hit the World Trade Center, namely those mothers who were below Canal Street (reference group), those mothers who were above Canal Street but still within Manhattan, and those mothers who were outside of Manhattan (e.g., NYC boroughs, New Jersey, etc.). The first dummy code variable compared mothers who were above Canal Street but still within Manhattan to mothers below Canal Street. The second dummy code variable compared mothers who were outside of Manhattan to mothers below Canal Street; mothers below Canal Street were the reference group.

Although geographic exposure to a traumatic event has been shown to significantly predict psychological distress, it was hypothesized that the perception of life threat also plays a role in predicting psychological outcomes. As such, the second set of analyses included an OLS multiple regression of both actual, geographic proximity and perception of life threat as two separate predictors for each of the five outcome variables. Perception of life threat was mean centered to decrease multicholinearity and allow for appropriate testing of moderation (discussed below).

In addition to the possible predictive abilities of the independent variables (actual, geographic exposure and perception of life threat), it was also hypothesized that race/ethnicity and socio-economic status would moderate the effects of the independent variables on the outcome variables. According to Barron and Kenny (1986), testing moderation when both the hypothesized moderator variable and independent variable are continuous, the outcome variable is then regressed on both the independent variable and the interaction between the moderator and independent variables. If a significant moderation effect exists, the interaction between the moderator and independent variables would be significant. Therefore, the third set of analyses included an OLS multiple regression for the two predictor variables (actual, geographic exposure and perception of life threat), the hypothesized race/ethnicity moderator, and the interactions between race/ethnicity with each of the individual predictor variables for each of the five outcome variables. The dummy coding technique was used to analyze the categorical variable of race/ethnicity. The first dummy coded variable compared Hispanic and African American mothers to White/Caucasian mothers (i.e., the reference group). The second dummy coded variable compared Asian mothers to White/Caucasian mothers. Further, interaction terms were computed for the two dummy codes for actual, geographic exposure and perception of life threat for both race/ethnicity dummy codes, resulting in six interaction terms for each regression model.

The final set of analyses tested the moderation of socio-economic status on the predictor variables. Mothers' socio-economic status was defined using Hollinghead's (1975) Four Factor Index of Social Status criteria and mean centered to decrease multicholinearity and allow for tests of moderation. Interaction terms were computed for the two dummy codes for actual, geographic exposure and perception of life threat for socio-economic status, resulting in three interaction terms for each regression model.

When a significant interaction was found for the covariates of race/ethnicity and/or socio-economic status, post hoc probing of the interactions was performed to better explain the relationship of this moderator between the outcome and predictor variable(s) (Aiken & West, 1991).

The four regression models for adult and child outcome variables were as follows:

For Adult Outcomes:

Model 1: $DV = b_0 + [b_1 AE_1 + b_2 AE_2] + b_3$ time

Model 2: $DV = b_0 + [b_1 AE_1 + b_2 AE_2] + b_3 PLT_c + b_4$ time

Model 3: $DV = b_0 + [b_1 AE_1 + b_2 AE_2] + b_3 PLT_c + [b_4 Race_1 + b_5 Race_2] + [[b_6 AE_1 * Race_1] + [b_7 AE_1 * Race_2] + [b_8 AE_2 * Race_1] + [b_9 AE_2 * Race_2]] + [b_{10} PLT_c * Race_1] + [b_{11} PLT_c * Race_2] + b_{12}$ time

Model 4: $DV = b_0 + [b_1 AE_1 + b_2 AE_2] + b_3 PLT_c + b_4 SES_c + [b_5 AE_1 * SES_c + b_6 AE_2 * SES_c] + b_7 PLT_c * SES_c + b_8$ time

For Child Outcomes:

Model 1: $DV = b_0 + [b_1 AE_1 + b_2 AE_2] + [b_3$ time $+ b_4$ gen $+ b_5$ dep $+ b_6 PTSD]$

Model 2: $DV = b_0 + [b_1 AE_1 + b_2 AE_2] + b_3 PLT + [b_4$ time $+ b_5$ gen $+ b_6$ dep $+ b_7 PTSD]$

Model 3: $DV = b_0 + [b_1 AE_1 + b_2 AE_2] + b_3 PLT_c + [b_4 Race_1 + b_5 Race_2] + [[b_6 AE_1 * Race_1] + [b_7 AE_1 * Race_2] + [b_8 AE_2 * Race_1] + [b_9 AE_2 * Race_2]] + [b_{10} PLT_c * Race_1] + [b_{11} PLT_c * Race_2] + [b_{12}$ time $+ b_{13}$ gen $+ b_{14}$ dep $+ b_{15} PTSD]$

Model 4: $DV = b_0 + [b_1 AE_1 + b_2 AE_2] + b_3 PLT_c + b_4 SES_c + [b_5 AE_1 * SES_c + b_6 AE_2 * SES_c] + b_7 PLT_c * SES_c + [b_8$ time $+ b_9$ gen $+ b_{10}$ dep $+ b_{11} PTSD]$

R-squared change statistics were computed to test whether the introduction of additional variables significantly adds to the model's overall explained variance. Given that there are four regression models being tested for each outcome variable, three separate R-squared change statistics were computed. However, it is important to note that this change statistic can only be computed when you are simply adding additional variables to the model. Therefore, R-squared change statistics were computed for the following model comparisons: Model 1 vs. Model 2 (the addition of perceived life threat), Model 2 vs. Model 3 (the addition of race/ethnicity and related interaction terms), and Model 2 vs. Model 4 (the addition of SES and related interaction terms).

Finally, several potential confounding variables were statistically controlled for in this study by entering them into the regression analyses as covariates. Specifically, the amount of time elapsed between September 11th, 2001 and the date data were collected was controlled for all outcome variables analyses, and child gender and parent psychopathology was controlled for child outcome variables analyses.

Results

Descriptive Statistics

Means and standard deviations for outcome variables are presented in table 2. Means for mothers reported depressive symptoms (M = 13.48, SD = 10.52) and endorsed number of PTSD symptoms (M = 3.96, SD = 4.75) are generally below previously established clinical cut-off levels. Nevertheless, 34.8% of mothers reported depressive symptoms in the clinical range (Radloff, 1977) and 2.6% met full PTSD criteria (DSM-IV). More specifically, 16.5% met the re-experiencing criterion, 7.8% met the avoidance criterion, and 16.5% met the arousal criterion for PTSD.

Similarly, means for children's internalizing (M = 49.52, SD = 12.47), externalizing (M = 46.74, SD = 12.26) and total problems (M = 48.10, SD = 13.26) symptoms are within normal ranges (Achenbach & Rescorla, 2000). Notably, however, the distribution of children falling within the borderline range for internalizing, externalizing, and total problems symptoms is 1.7%, 3.5%, and 4.3%, respectively, and the distribution of children falling above the clinical cutoff for internalizing, externalizing, and total problems symptoms is 7.8%, 3.5%, and 6.1%, respectively. Table 3 presents the two-tailed Pearson's correlations among continuous, key study variables.

With regards to mother's actual exposure, defined as geographic proximity to the WTC attacks, 53.0% were below Canal Street, 26.1% were above Canal Street but still within Manhattan city limits, and 20.9% were outside of Manhattan city limits (e.g., NYC boroughs, New Jersey, etc.). Table 4 presents the descriptive statistics for outcome variables by each geographic exposure group.

With regards to mother's "perception of life threat" (PLT) mean composite score (M = .71, SD = .38), table 5 presents the descriptive statistics for outcome variables by PLT scores. It is important to note that, for illustrative purposes only, two groups were arbitrarily identified for outcome variables' mean comparisons. Group 1 PLT mean scores ranged from 0.00 to .49, and group 2 PLT mean scores ranged from .50 to 1.00. A median split approach was not possible as more than half of the sample (55%) reported a PLT mean score of 1.00.

Means and standard deviations for maternal race/ethnicity and socio-economic status are presented in table 6 and table 7, respectively, for each of the outcome variables. Mothers varied

in their reported race/ethnicity (25.2% Hispanic; 24.3% Asian/Pacific Islander; 23.5% White/Caucasian; 10.4% Black/African American; 6.9% other/mixed; and 9.6% preferred not to answer) and their socio-economic status (M = 42.94, SD = 16.14), based on Hollingshead's Four Factor Index of Social Status scale (Hollingshead, 1975). Further, the table addressing the socio-economic information was divided into five groups using Hollingshead's (1975) definition of social strata (e.g., major business and professional, skilled craftsmen, unskilled laborers, etc.) for illustrative purposes only.

Finally, the amount of time elapsed between September 11th, 2001 and the date of data collection ranged from 18 to 56 months (M = 35.90, SD = 11.99). One-way analysis of variance (ANOVA) utilizing a median split technique revealed that the number of endorsed PTSD symptoms increased as elapsed time increased; mothers' PTSD symptoms with regards to the September 11th, 2001 WTC attacks appeared to worsen as a function of time.

One-Way Analysis of Variance (ANOVA) Analyses

One-way ANOVA tests were conducted to determine whether group differences exist between the three geographic exposure groups and the outcome variables. No significant main effects were found with respect to all outcome variables.

One-way ANOVA tests were also conducted to determine whether group differences exist between the three racial/ethnic groups and the outcome variables. Significant effects for race/ethnicity were found for mothers' total number of endorsed PTSD symptoms ($F(2, 92) = 3.284, p < .05$) and mothers' depression score ($F(2, 92) = 3.391, p < .05$). Due to the unequal group samples, post hoc Scheffe's tests were conducted to identify where the differences between the means lie while adjusting for multiple pair-wise comparisons. These analyses revealed that White/Caucasian mothers marginally differed from Asian mothers with regards to number of PTSD symptoms ($p < .10$), and Asian mothers marginally differed from Hispanic and African American mothers with regards to their depression score ($p < .10$). No significant main effects were found with respect to the child outcome variables.

Adult Outcomes

With regards to hypothesis 1 for adult outcomes, the overall model examining the predictive ability of mothers' actual, geographic exposure on their number of endorsed PTSD symptoms approached statistical significance ($F(3, 113) = 2.349, p < .10$) while controlling for time elapsed between September 11th, 2001 and date of data collection; the model explained

6.0% of the total variance. However, maternal actual, geographic exposure to the WTC attacks did not significantly predict their PTSD symptoms; neither dummy coded variable for actual, geographic exposure was statistically significant ($p > .05$). The controlled variable of time elapsed was statistically significant ($\beta = .091$, $t(113) = 2.351$, $p < .05$); the greater the time elapsed between 9/11/2001 and date of testing, the greater the number of endorsed PTSD symptoms.

The overall model examining the predictive ability of mothers' actual, geographic exposure on mothers' total depression score was non-significant ($F(3, 114) = 1.231$, $p > .05$); the model explained 3.2% of the total variance. Maternal actual, geographic exposure did not significantly predict their depressive symptoms; neither dummy coded variable for actual, geographic exposure was statistically significant ($p > .05$). Similarly, the statistically controlled for variable of time elapsed was non-significant ($p > .05$). For all associated unstandardized regression coefficients for PTSD and depression findings related to model 1, refer to table 8.

With regards to hypothesis 2 for adult outcomes, the overall model examining the predictive ability of mothers' actual, geographic exposure and their perception of life threat on their number of endorsed PTSD symptoms approached statistical significance ($F(4, 113) = 2.044$, $p < .10$) while controlling for time elapsed between September 11th, 2001 and date of data collection; the model explained 7.0% of the total variance. The relationships between maternal actual, geographic exposure and perception of life threat with their PTSD symptoms were non-significant; the dummy coded variables for actual, geographic exposure were statistically non-significant, and the mean centered perception of life threat variable was also non-significant ($p > .05$). The controlled variable of time elapsed was statistically significant ($\beta = .089$, $t(113) = 2.299$, $p < .05$); the greater the time elapsed between 9/11/2001 and date of testing, the greater the number of endorsed PTSD symptoms. The R-square change statistic for the addition of perceived life threat over and above actual, geographic exposure did not add a significant amount of explained variance to the overall model for PTSD ($\Delta R^2 = .010$, $p > .05$).

The overall model examining the predictive ability of mothers' actual, geographic exposure and their perception of life threat on their total depression score was non-significant ($F(4, 114) = .954$, $p > .05$) while controlling for time elapsed between September 11th, 2001 and date of data collection; the model explained 3.4% of the total variance. The relationships between maternal actual, geographic exposure and perception of life threat with their depressive

symptoms were non-significant; the dummy coded variables for actual, geographic exposure were statistically non-significant, and the mean centered perception of life threat variable was also non-significant ($p > .05$). The controlled variable of time elapsed was also non-significant ($p < .05$). The addition of perceived life threat over and above actual, geographic exposure did not add a significant amount of explained variance to the overall model for depression ($\Delta R^2 = .001$, $p > .05$). For unstandardized regression coefficients for PTSD and depression findings related to model 2, refer to table 9.

With regards to hypothesis 3 for adult outcomes, the overall model examining the predictive ability of mothers' actual, geographic exposure and their perception of life threat on their number of endorsed PTSD symptoms with the test of moderation for race/ethnicity was non-significant ($F(11, 94) = 1.365$, $p > .05$) while controlling for time elapsed between September 11th, 2001 and date of data collection; the model explained 15.3% of the total variance. Notably, the effect of race approached significance ($\beta = -3.310$, $t(113) = -1.900$, $p < .10$); Asian mothers reportedly marginally less PTSD symptoms compared to Caucasian mothers. However, no differences were found between Asian mothers and Hispanic and African American mothers or between Caucasian mothers and Hispanic and African American mothers. Additionally, no significant interaction was found between race/ethnicity and the two predictors (actual, geographic exposure and perception of life threat) for PTSD; none of the interaction terms were significant ($p > .05$). The controlled variable of time elapsed was also non-significant ($p > .05$). Further, the addition of race/ethnicity and its interactions terms, over and above the two predictors did not add a significant amount of explained variance to the overall model for PTSD ($\Delta R^2 = .074$, $p > .05$).

Supplementary post hoc analyses reveal additional key differences among the three race/ethnicity groups. Specifically, a significant difference was found with regards to socio-economic status ($F(2, 76) = 32.247$, $p < .001$); Asian mothers reported a significantly lower socio-economic status (M = 26.55, SD = 15.34) compared to Caucasian mothers (M = 56.05, SD = 8.41). Additionally, the majority of Asian mothers (68%) were below Canal Street when the WTC attacks occurred, compared to 32% who were above Canal Street but within Manhattan.

The overall model examining the predictive ability of mothers' actual, geographic exposure and their perception of life threat on their total depression score with the test of moderation for race/ethnicity was non-significant ($F(11, 95) = 1.315$, $p > .05$) while controlling

for time elapsed between September 11th, 2001 and date of data collection; the model explained 14.7% of the total variance. No significant interaction was found between race/ethnicity and the two predictors (actual, geographic exposure and perception of life threat) for depression; none of the interaction terms were significant ($p > .05$). The controlled variable of time elapsed was also non-significant ($p > .05$). Further, the addition of race/ethnicity and its interactions terms, over and above the two predictors did not add a significant amount of explained variance to the overall model for depression ($\Delta R^2 = .104$, $p > .05$). For unstandardized regression coefficients for PTSD and depression findings related to model 3, refer to table 10.

With regards to hypothesis 4 for adult outcomes, the overall model examining the predictive ability of mothers' actual, geographic exposure and their perception of life threat on their number of endorsed PTSD symptoms with the test of moderation for socio-economic status was non-significant ($F(8, 83) = 1.076$, $p > .05$) while controlling for time elapsed between September 11th, 2001 and date of data collection. No significant interaction was found between socio-economic status and the two predictors (actual, geographic exposure and perception of life threat) for PTSD; none of the interaction terms were significant ($p > .05$). The controlled variable of time elapsed was also non-significant ($p > .05$). Further, the addition of socio-economic status and its interactions terms, over and above the two predictors did not add a significant amount of explained variance to the overall model for PTSD ($\Delta R^2 = .048$, $p > .05$).

The overall model examining the predictive ability of mothers' actual, geographic exposure and their perception of life threat on their total depression score with the test of moderation for socio-economic status was non-significant ($F(8, 84) = .612$, $p > .05$) while controlling for time elapsed between September 11th, 2001 and date of data collection. No significant interaction was found between socio-economic status and the two predictors (actual, geographic exposure and perception of life threat) for depression; none of the interaction terms were significant ($p > .05$). The controlled variable of time elapsed was also non-significant ($p > .05$). Further, the addition of socio-economic status and its interactions terms, over and above the two predictors did not add a significant amount of explained variance to the overall model for depression ($\Delta R^2 = .043$, $p > .05$). For unstandardized regression coefficients for PTSD and depression findings related to model 4, refer to table 11.

Child Outcomes

With regards to Hypothesis 1 for child outcomes, the overall model examining the predictive ability of mothers' actual, geographic exposure on children's Internalizing T-scores was statistically significant ($F(6, 112) = 3.153$, $p < .05$) while controlling for time elapsed between September 11th, 2001 and date of data collection, child gender and parent psychopathology (PTSD and depression); the model explained 15.1% of the total variance. However, the relationship between maternal actual, geographic exposure and children's internalizing symptoms was non-significant ($p > .05$). The controlled variables of time elapsed and child gender were non-significant ($p > .05$); however, maternal depression was statistically significant ($\beta = .346$, $t(112) = 3.123$, $p < .05$), and maternal PTSD approached significance ($\beta = .430$, $t(112) = 1.695$, $p < .10$). As mothers' depression scores and endorsed PTSD symptoms increased, children's Internalizing T-Scores also increased.

The overall model examining the predictive ability of mothers' actual, geographic exposure on children's Externalizing T-scores was statistically significant ($F(6, 112) = 5.895$, $p < .001$) while controlling for time elapsed between September 11th, 2001 and date of data collection, child gender and parent psychopathology (PTSD and depression); the model explained 25.0% of the total variance. However, the relationship between maternal actual, geographic exposure and children's externalizing symptoms was non-significant ($p > .05$). The controlled variables of time elapsed and maternal PTSD were non-significant ($p > .05$); however, child gender ($\beta = 4.367$, $t(112) = 2.050$, $p < .05$) and maternal depression ($\beta = .476$, $t(112) = 4.658$, $p < .001$) were statistically significant. Boys were more likely to have higher levels of reported externalizing symptoms. And, as mothers' depression scores increased, children's Externalizing T-Scores also increased.

The overall model examining the predictive ability of mothers' actual, geographic exposure on children's Total Problems T-scores was statistically significant ($F(6, 112) = 5.419$, $p < .001$) while controlling for time elapsed between September 11th, 2001 and date of data collection, child gender and parent psychopathology (PTSD and depression); the model explained 23.5% of the total variance. However, the relationship between maternal actual, geographic exposure and children's total problems symptoms was non-significant ($p > .05$). The controlled variables of time elapsed and child gender were non-significant ($p > .05$); however, maternal depression was statistically significant ($\beta = .495$, $t(112) = 4.428$, $p < .001$), and

maternal PTSD approached significance ($\beta = .427$, $t(112) = 1.666$, $p < .10$). As mothers' depression scores and endorsed PTSD symptoms increased, children's Total Problems T-Scores also increased. Refer to table 8 for unstandardized regression coefficients and standard errors for model 1 child outcomes.

With regards to Hypothesis 2 for child outcomes, the overall model examining the predictive ability of mothers' actual, geographic exposure and their perception of life threat on children's Internalizing T-scores was statistically significant ($F(7, 112) = 2.778$, $p < .05$) while controlling for time elapsed between September 11th, 2001 and date of data collection, child gender and parent psychopathology (PTSD and depression); the model explained 15.6% of the total variance. However, the relationships between maternal actual, geographic exposure and perception of life threat with children's internalizing symptoms were non-significant (p > .05). The controlled variables of time elapsed, child gender, and maternal PTSD were non-significant ($p > .05$); however, maternal depression was statistically significant ($\beta = .344$, $t(112) = 3.104$, $p < .01$). The addition of perceived life threat over and above actual, geographic exposure did not add a significant amount of explained variance to the overall model for children's Internalizing T-Scores ($\Delta R^2 = .005$, $p > .05$).

The overall model examining the predictive ability of mothers' actual, geographic exposure and their perception of life threat on children's Externalizing T-scores was statistically significant ($F(7, 112) = 5.013$, $p < .001$) while controlling for time elapsed between September 11th, 2001 and date of data collection, child gender and parent psychopathology (PTSD and depression); the model explained 25.0% of the total variance. Nonetheless, the relationships between maternal actual, geographic exposure and perception of life threat with children's externalizing symptoms were non-significant ($p > .05$). The controlled variables of time elapsed and maternal PTSD were non-significant ($p > .05$); however, child gender ($\beta = 4.374$, $t(112) = 2.044$, $p < .05$) and maternal depression ($\beta = .476$, $t(112) = 4.640$, $p < .001$) were statistically significant. The addition of perceived life threat over and above actual, geographic exposure did not add a significant amount of explained variance to the overall model for children's Externalizing T-Scores ($\Delta R^2 = .000$, $p > .05$).

The overall model examining the predictive ability of mothers' actual, geographic exposure and their perception of life threat on children's Total Problems T-scores was statistically significant ($F(7, 112) = 4.605$, $p < .001$) while controlling for time elapsed between

September 11th, 2001 and date of data collection, child gender and parent psychopathology (PTSD and depression); the model explained 23.5% of the total variance. However, the relationships between maternal actual, geographic exposure and perception of life threat with children's total problems symptoms were non-significant ($p > .05$). The controlled variables of time elapsed and child gender were non-significant ($p > .05$); however, maternal depression was statistically significant ($\beta = .496$, $t(112) = 4.410$, $p < .001$), and maternal PTSD approached significance ($\beta = .430$, $t(112) = 1.665$, $p < .10$). The addition of perceived life threat over and above actual, geographic exposure did not add a significant amount of explained variance to the overall model for children's Total Problems T-Scores ($\Delta R^2 = .023$, $p > .05$). Refer to table 9 for unstandardized regression coefficients and standard errors for model 2 child outcomes.

With regards to hypothesis 3 for child outcomes, the overall model examining the predictive ability of mothers' actual, geographic exposure and their perception of life threat on their children's Internalizing T-scores with the test of moderation for race/ethnicity was statistically significant ($F(14, 94) = 2.319$, $p < .05$) while controlling for time elapsed between September 11th, 2001 and date of data collection, child gender and parent psychopathology (PTSD and depression); the model explained 28.9% of the total variance. No significant interaction was found between race/ethnicity and the two predictors (actual, geographic exposure and perception of life threat) for children's Internalizing T-scores; none of the interaction terms were significant ($p > .05$). The controlled variable of maternal depression was significant ($\beta = .409$, $t(94) = 3.233$, $p < .01$); however, time elapsed, child gender and maternal PTSD were non-significant ($p > .05$). Further, the addition of race/ethnicity and its interactions terms, over and above the two predictors did not add a significant amount of explained variance to the overall model for children's Internalizing T-Scores ($\Delta R^2 = .045$, $p > .05$).

The overall model examining the predictive ability of mothers' actual, geographic exposure and their perception of life threat on their children's Externalizing T-scores with the test of moderation for race/ethnicity was statistically significant ($F(14, 94) = 2.875$, $p < .01$) while controlling for time elapsed between September 11th, 2001 and date of data collection, child gender and parent psychopathology (PTSD and depression); the model explained 33.5% of the total variance. No significant interaction was found between race/ethnicity and the two predictors (actual, geographic exposure and perception of life threat) for children's Externalizing T-scores; none of the interaction terms were significant ($p > .05$). The controlled variable of

maternal depression was significant (β = .469, $t(94)$ = 3.783, $p < .001$); however, time elapsed, child gender and maternal PTSD were non-significant ($p > .05$). Further, the addition of race/ethnicity and its interactions terms, over and above the two predictors did not add a significant amount of explained variance to the overall model for children's Externalizing T-Scores (ΔR^2 = .068, $p > .05$).

The overall model examining the predictive ability of mothers' actual, geographic exposure and their perception of life threat on their children's Total Problems T-scores with the test of moderation for race/ethnicity was statistically significant ($F(14, 94)$ = 2.950, $p < .01$) while controlling for time elapsed between September 11th, 2001 and date of data collection, child gender and parent psychopathology (PTSD and depression); the model explained 34.0% of the total variance. However, no significant interaction was found between race/ethnicity and the two predictors (actual, geographic exposure and perception of life threat) for children's Total Problems T-scores; none of the interaction terms were significant ($p > .05$). The controlled variable of maternal depression was significant (β = .501, $t(94)$ = 3.770, $p < .001$); however, time elapsed, child gender and maternal PTSD were non-significant ($p > .05$). Further, the addition of race/ethnicity and its interactions terms, over and above the two predictors did not add a significant amount of explained variance to the overall model for children's Total Problems T-Scores (ΔR^2 = .053, $p > .05$). Refer to table 10 for unstandardized regression coefficients and standard errors for model 3 child outcomes.

With regards to hypothesis 4, the overall model examining the predictive ability of mothers' actual, geographic exposure and their perception of life threat on children's Internalizing T-score with the test of moderation for socio-economic status approached statistical significance ($F(11, 83)$ = 1.757, $p < .10$) while controlling for time elapsed between September 11th, 2001 and date of data collection, child gender and parent psychopathology (PTSD and depression); the model explained 21.2% of the total variance. However, no significant interaction was found between socio-economic status and the two predictors (actual, geographic exposure and perception of life threat) for children's Internalizing T-scores; none of the interaction terms were significant ($p > .05$). The controlled variable of maternal depression was significant (β = .330, $t(83)$ = 2.631, $p < .05$) ; however, time elapsed, child gender and maternal PTSD were non-significant (p > .05). Further, the addition of socio-economic status and its interactions terms, over and above the two predictors did not add a significant amount of

explained variance to the overall model for children's Internalizing T-Scores ($\Delta R^2 = .037$, $p > .05$).

The overall model examining the predictive ability of mothers' actual, geographic exposure and their perception of life threat on children's Externalizing T-scores with the test of moderation for socio-economic status was significant ($F(11, 83) = 3.129$, $p < .01$) while controlling for time elapsed between September 11th, 2001 and date of data collection, child gender and parent psychopathology (PTSD and depression); the model explained 32.3% of the total variance. Notably, a significant interaction was found between socio-economic status and actual, geographic exposure (refer to figure 2). Post hoc analyses reveal that those mothers above Canal Street but within Manhattan reported significantly different Externalizing T-Scores for their children based on their socio-economic status compared to those who were below Canal Street ($\beta = -.419$, $t(83) = -2.353$, $p < .05$). However, no interaction was found for the predictor of perception of life threat and the socio-economic status ($p > .05$). The controlled variable of maternal depression was significant ($\beta = .407$, $t(83) = 3.347$, $p < .01$), and child gender approached significance ($\beta = 4.345$, $t(83) = 1.808$, $p < .10$); however, time elapsed and maternal PTSD were non-significant ($p > .05$). Further, the addition of socio-economic status and its interactions terms, over and above the two predictors did not add a significant amount of explained variance to the overall model for children's Externalizing T-Scores ($\Delta R^2 = .066$, $p > .05$).

Supplementary post hoc analyses reveal additional key differences among the three actual, geographic exposure groups. Specifically, a significant difference was found with regards to socio-economic status ($F(2, 84) = 9.307$, $p < .001$); mothers outside Manhattan reported the highest socio-economic status (M = 52.44, SD = 9.15), followed by mothers below Canal Street (M = 43.81, SD = 15.46), and mothers above Canal Street but within Manhattan (M = 31.74, SD = 16.95). Similarly, a significant difference with regards to race/ethnicity was obtained ($\chi^2(4, N = 96) = 14.300$, $p < .01$). However, further analyses to examine this effect are not feasible with the dataset given the negative impact of adding additional parameters in the regression model.

The overall model examining the predictive ability of mothers' actual, geographic exposure and their perception of life threat on children's Total Problems T-scores with the test of moderation for socio-economic status was significant ($F(11, 83) = 2.762$, $p < .01$) while

controlling for time elapsed between September 11th, 2001 and date of data collection, child gender and parent psychopathology (PTSD and depression); the model explained 29.7% of the total variance. The interaction between socio-economic status and actual, geographic exposure approached significance (refer to figure 3). Post hoc analyses reveal that those individuals above Canal Street but within Manhattan reported different Total Problems T-Scores based on their socio-economic status compared to those who were below Canal Street ($\beta = -.348$, $t(83) = -1.946$, $p < .10$). However, no interaction was found for the predictor of perception of life threat and socio-economic status ($p > .05$). The controlled variable of maternal depression was significant ($\beta = .443$, $t(83) = 3.627$, $p < .01$); however, time elapsed, child gender and maternal PTSD were non-significant ($p > .05$). Further, the addition of socio-economic status and its interactions terms, over and above the two predictors did not add a significant amount of explained variance to the overall model for children's Total Problems T-Scores ($\Delta R^2 = .049$, $p > .05$). Refer to table 11 for unstandardized regression coefficients and standard errors for model 4 child outcomes.

Finally, regression diagnostic analyses were conducted to determine whether any significant outliers existed in the dataset. Specifically, an analysis of influential observation was performed using influence on the regression line (DFFITS), and a measure of standardized change in the regression coefficient when a case is deleted (DFBETAS) was also obtained. One case met Neter, Wasserman, and Kutner's (1989) criteria for determining an influential case; however, there was not a significant change in that case's regression coefficient for all key predictor variables. As such, this case was not removed from the dataset as there was not a sufficient argument to do so (e.g., measurement error) (Cohen, Cohen, West & Aiken, 2003).

Discussion

This study represents an attempt to delineate between an objective and subjective measure of exposure in terms of their predictive ability of mental health outcomes in both young children and their mothers following the September 11th, 2001 WTC attacks. Specifically, it aimed to determine whether the mother's actual, geographic exposure significantly predicted both mothers' and their young children's subsequent symptomatology after the WTC attacks. Second, it also aimed to assess the predictive ability of a subjective exposure variable, namely the perception of life threat, on adult and child symptomatology. Building on Ehlers and Clark's (2000) Cognitive Model of PTSD and Lazarus and Folkman's (1984) Transactional Model of Stress theory, it was hypothesized that one's perception of threat following a trauma will better predict outcomes for mothers and their young children compared to actual, geographic exposure. However, neither mothers' geographic exposure nor their perception of life threat significantly predicted trauma-related outcomes for themselves or their children.

Additionally, this study aimed to test the moderational roles of race/ethnicity and socio-economic status. With regards to race/ethnicity, marginal significance was found for mothers' number of PTSD symptoms. That is, mothers who identified themselves as Asian/Pacific Islander were somewhat less likely to endorse PTSD symptomatology compared to the groups of White/Caucasians and Hispanics/African-Americans. However, no significant interactions were found with regards to race/ethnicity and child outcomes for the predictor variables (actual, geographic exposure and perception of life threat). Comparatively, interesting results were obtained for socio-economic status. Specifically, a significant interaction was found between socio-economic status and geographic exposure for children's Externalizing T-Scores. Further, the interaction between socio-economic status and geographic exposure approached significance for children's Total Problems. However, no significant interaction was found for socio-economic status and children's Internalizing T-Scores. Finally, no significant interactions were found for socio-economic status and child outcomes for maternal perception of life threat.

Exposure Variables

The present study did not find a significant relationship between mothers' actual, geographic exposure to the September 11th, 2001 WTC attacks and mental health outcomes among mothers and their young children. It is commonplace for trauma researchers to identify potentially at-risk individuals based on their geographic proximity to the site of the traumatic

event. Generally speaking, there is some evidence in the literature to support an overall dose-response relationship between level of geographic exposure and subsequent mental health difficulties. However, definitions and measurement of exposure are not without their major limitations. For example, there is considerable variation with regards to how studies determine an appropriate cut-off distance from the trauma site, and definitions of "direct exposure" and "indirect exposure" also vary significantly in the literature. As such, it is not totally surprising that some studies have found direct exposure to be a poor predictor of mental health outcomes following a trauma (e.g., Piotrkowski & Brannen, 2002). The present study's findings of non-significance for mothers' geographic proximity to the WTC attacks in predicting both adult and child outcomes are not wholly unexpected given these definitional and measurement drawbacks.

In light of these drawbacks with geographic proximity, the present study attempted to identify a second predictor of outcomes following trauma, namely maternal perception of life threat. Again, no significant relationship was found for this variable and mental health outcomes among mothers and their young children. Similar to the goals of the present study, other studies have begun to look at the effects of one's subjective experience of trauma with regards to predicting subsequent distress levels. Findings have supported the importance of the role of perception of life threat, not necessarily actual threat, following a trauma (e.g., March, 1993). This subjective "perception" of danger, threat to life, and threat to one's integrity has been found to have an inverse relationship with adaptive coping abilities; the greater the perception of threat, the less coping skills utilized (Kutz & Dekel, 2006). Further, adaptive coping skills are known to be essential to resiliency and healthy mental health outcomes following a trauma (e.g., Park, Aldwin, Fenster, & Snyder, 2008). Moreover, there seems to be evidence supporting the hypothesis that perceived life threat significantly predicts subsequent posttraumatic stress symptomatology.

Yet, the present study's findings of non-significance for mothers' perceived threat to life and subsequent adult and child outcomes is not totally surprising in light of the following potential explanations. First and foremost, perception of life threat in the present study was defined as the mean composite score after summing a total of six dichotomous items assessing mothers' perceived life threat and physical integrity. Descriptive statistics reveal that the majority of participants (55%) endorsed the highest level of life threat perception (i.e., a mean score of "1"). While this reveals an exceptionally elevated rate of perceived life threat for study

participants, data did not allow for sufficient variation to distinguish differences with regards to this predictor variable, also known as a ceiling effect. Remarkably, this approach is not uncommon in the literature. For example, Laubmeier and Zakowski's (2004) research also defined perceived life threat as the sum total of six items. Further, LaGreca, Silverman and Wasserstein (1998) used only one item to assess perception of life threat in their study of the effects of Hurricane Andrew on children. Moreover, it is obvious that greater attention is needed to better assess this important construct.

A recent step in this direction was proposed by Chemtob, Nomura and Abramovitz (in press), which utilized the same sample as the present study. They assessed young children's exposure to the September 11th, 2001 WTC attacks by examining emotionally-laden, high intensity events (e.g., saw either of the towers collapse, saw injured people, saw dead bodies, or saw people jumping out of the building) as they involved a strong sensory impact and related to threat of death and/or injury; children were coded as "index positive" if they met at least one of the high intensity event criteria. When the authors excluded the effects of other lifetime trauma history for these young children, the emotional and high-intensity exposure variable was not related to children's subsequent behavioral outcomes. Nevertheless, the authors' proposed definition of exposure further points to the pursuit of the trauma field for a more comprehensive mode for accurately assessing trauma exposure. It is also worth noting studies that effectively identified predictors of posttraumatic distress in children following a trauma. One such large-scale study conducted by LaGreca and colleagues (1996, 1998) identified actual exposure to Hurricane Andrew (i.e., actual threat), perceived life threat, social support, coping skills and other major traumas, in addition to pre-existing child characteristics (e.g., ethnicity, gender, and pre-morbid functioning) among children. Moreover, it seems that a "composite approach" to defining exposure will explain more variance and more aptly predict mental health distress following trauma exposure.

Outcome Variables

The present study assessed current depressive and chronic posttraumatic stress symptoms among mothers and behavioral problems in young children following the September 11th, 2001 WTC attacks. A prevalence rate of clinically significant depression levels were found for 34.8% of mothers. Additionally, 2.6% of mothers met full PTSD criteria. With regards to the specific criteria of PTSD, 16.5% met the re-experiencing criterion, 7.8% met the avoidance criterion, and

16.5% met the arousal criterion for PTSD. When compared to prevalence rates of other studies following the WTC attacks, the present study found higher rates for depression and somewhat lower rates for PTSD. For example, Galea and colleagues (2002) found prevalence rates of 7.5% for PTSD and 9.7% for present depression among adult individuals living south of 110th Street in Manhattan 1-2 months following the attacks. Similarly, Schlenger and colleagues (2002) found rates of probable PTSD to be 11.2% for adults in the NYC metropolitan area, 2.7% in the Washington, D.C. area, and 4.0% nationally.

In an attempt to offer an explanation for the discrepancy among PTSD prevalence rates, it is important to note that participants in the present study were asked to complete a measure of PTSD symptoms for the event of the September 11th, 2001 WTC attacks only. They were also given the option of completing a separate measure had they experienced another traumatic experience; however, these data were not used in the analyses as there was no direct relationship between the traumatic event of interest, the WTC attacks, and PTSD symptoms resulting from another trauma. As such, data used in analyses for PTSD were only in reference to the WTC attacks event. Therefore, the reported prevalence rate of PTSD is likely an underestimate of overall rates of PTSD but is directly related to the event of interest.

When compared to other studies of adults following the WTC attacks, the prevalence of elevated depression levels was considerably higher among the present study sample. With regards to a potential explanation, the recruitment methods of the present study may have been influential. In particular, participation in the study was obtained via school-based and community-wide recruitment. Families were given detailed information about the study and asked if they would be interested in participating. Further, they were informed that more comprehensive assessment and treatment would be offered at no cost if needed. As such, it is possible that parents experiencing elevated distress levels at that time opted to participate due to this available resource. Conversely, previous studies of the WTC attacks utilizing a random digit-dial approach or web-based surveys would not result in a self-selected sample. Therefore, it is possible that those individuals with the opportunity to self-select to the present study were most in need with regards to depressive symptoms.

The present study also examined the broader symptoms of externalizing and internalizing behaviors following the WTC attacks among a sample of young children. A small but important subset of these young children fell within borderline and clinical cutoff ranges, suggesting some

difficulties following the attacks. However, a significant relationship between mothers' geographic exposure and children's internalizing, externalizing and total problems was not obtained. Similarly, the null hypothesis was supported with regards to mothers' perceived life threat and children's internalizing, externalizing and total problems.

These findings were disappointing in that previous research has suggested a significant relationship between traumatic events and behavioral difficulties in children (e.g., Steinberg & Avenevoli, 2000).   Further, while posttraumatic stress symptoms remain the most commonly observed, studies have also pointed to the need for a more global assessment of symptoms. For example, Kim, Conger, Elder Jr., and Lorenz (2003) found evidence suggesting that stressful life events exacerbated both internalizing and externalizing behavioral difficulties in a group of adolescents. Additionally, Rubin, Burgess, Dwyer, and Hastings (2003) found that increased levels of maternal negativity, commonly associated with depression, was associated with externalizing problems among their toddler-aged children. Nonetheless, despite the lack of significant findings in the present study, it remains plausible to suggest that young children are negatively impacted by traumatic events and should be studied to identify those most likely at risk for behavioral difficulties.

Moderator Variables

Race/Ethnicity. Maternal race/ethnicity was not significantly related to the majority of outcome variables examined in the current study, including maternal depression and child behavioral problems.   However, a marginally significant relationship was found for maternal race/ethnicity and reported PTSD symptoms. Specifically, Asian mothers reported marginally fewer posttraumatic stress symptoms compared to Caucasian mothers. However, no other race/ethnicity group differences were obtained. This finding is somewhat inconsistent with previous research, which has suggested that Hispanic and African-American individuals are generally most vulnerable to the effects of trauma and are more likely to develop posttraumatic stress symptoms as a result (e.g., Perill et al., 2002). Further, given this inconsistency, and the gap in the literature with regards to the Asian population and the effects of trauma, it is essential to note additional differences among and even within the three race/ethnicity groups that may be influential.

As previously stated, the low presence of Asian individuals in many regions of the country has led to insufficient numbers in nationally representative samples to estimate this

group's prevalence of psychopathology (Kessler, 2005). The few studies that have examined Asian individuals have found lower rates of most mental health issues, including PTSD. Additionally, Pole and colleagues (2008) stress the within-group variability that exists between geographic subgroups, and the more than 40 subgroups of the Asian population (e.g., Chinese, Japanese, Koreans, Vietnamese, Cambodians, etc.) allow for considerable heterogeneity with regards to differences in cultural and ethnic backgrounds and native languages, to name a few. For example, the Hawaii Vietnam Veterans Project (Friedman, Schnurr, Sengupta, Holmes, & Ashcraft, 2004) reported that Japanese Americans endorsed the lowest rates of PTSD, followed by Chinese Americans, and Native Hawaiians. Additionally, Southeast Asian refugees have some of the highest rates of PTSD given their extensive trauma history. While the present study did not examine this particular aspect, this significant within-group variability points to the vital necessity of examining the effects of trauma on varying racial/ethnic subgroups. Moreover, other important examinations are also needed.

Bonanno and colleagues (2007) indicated that, in trauma research, it is not uncommon for socio-economic status information to be ignored as a potential confounder. However, the authors suggested that, when the effects of socio-economic status are considered and included in the analyses, the effects of race decrease to near zero. In the present study, post hoc analyses revealed that socio-economic status significantly differed as a function of race/ethnicity with Asian mothers reporting the lowest SES level, followed by Hispanic and African-American mothers, and then Caucasian mothers. Therefore, it is possible that the marginally significant effects of race may be somewhat influenced by the effects of socio-economic status.

Socio-economic status. Interesting results were found with respects to socio-economic status. Specifically, socio-economic status was found to significantly moderate the relationship between mothers' actual, geographic exposure and children's externalizing behaviors. For those mothers who were above Canal Street but within Manhattan when the WTC attacks occurred, children's prevalence of externalizing behaviors decreased as socio-economic status increased; the higher the mother's socio-economic standing, the fewer reported externalizing symptoms among their children. Comparatively, for those mothers who were below Canal Street when the attacks occurred, children's prevalence of externalizing behaviors increased as socio-economic status increased. It is also worth noting that, for those mothers who were outside the Manhattan area when the attacks occurred, a similar relationship was found with those who were above

Canal Street; however, limited power likely affected the ability of this relationship to reach statistical significance. Similarly, the interaction effect of socio-economic status between mothers' geographic exposure and children's total problems approached significance; the same trend was found for total problems with regards to level of exposure as was found for externalizing behaviors.

Research is generally consistent with regards to the negative mental health impact of low socio-economic status on families. Children reared in poverty-level family incomes are at an increased risk for many troubled experiences, including maltreatment and/or abuse (e.g., McLoyd, 1998), violence exposure (e.g., Emery & Laumann-Billings, 1998), and family relational discord (e.g., Bradley, Corwyn, McAdoo, & Coll, 2001). McLoyd (1998) also reported on the impact of poverty on parenting behaviors, such as increased parental irritability, harsher punishments, inconsistent parenting behaviors and greater parent-child conflict, which in turn is linked with the development of behavioral problems in young children. Lansford and colleagues (2006) also reported that low socio-economic status for young children is a developmental vulnerability factor linked with greater levels of both internalizing and externalizing behaviors over time.

Given this information, one would expect to find an inverse relationship between socio-economic status and behavior problems in children. In the present study, this relationship was obtained for mothers above Canal Street but within Manhattan and mothers outside Manhattan with regards to their children's externalizing and total problems. However, the opposite trend was found for mothers below Canal Street. This finding thus raises the question: are mothers who were below Canal Street when the WTC attacks occurred different than the other mothers? With regards to symptoms of depression and PTSD, there were no significant differences. As such, there are at least three potential explanations that may be influencing this abnormal trend for mothers who were below Canal Street. The first potential explanation of this finding may be due to geographic group differences with respects to race/ethnicity. However, the present study was unable to further examine this potential relationship due to the negative impact of additional parameters to the regression model. This remains an empirical question for future studies. The second potential explanation of this finding may be related to outlier data points. However, regression diagnostic analyses did not reveal any significant outlier data point that could be influencing the regression slope for mothers who were below Canal Street. Finally, the third

potential explanation of this finding could be due to the limited sample size. Nevertheless, despite obtaining results inconsistent with previous research with regards to socio-economic status and children's externalizing behaviors of mothers below Canal Street, a significant moderation was still found.

Statistically Controlled for Variables

Maternal depression. To control for the effects of maternal depression on all child outcome variables, it was entered into each of the four models as a covariate. Notably, maternal depression was significantly related to all child outcomes (Internalizing, Externalizing and Total Problems T-Scores) for all four models. The effects of maternal depression on the development of children are well-known. Research has found that depressed moms are more likely to have impaired interactions with their child (e.g., Beck, 1995). Impairment of mothers' emotional functioning can also put the child at increased risks for developmental problems (e.g., Gotlib & Goodman, 1999). Further, children of depressed mothers are more likely to suffer from a variety of problems, such as psychological disturbances, social-emotional maladjustment, and cognitive deficits (e.g., Gotlib & Goodman, 1999). Depressed mothers are also typically less responsive to their child, show less affection, and do not reciprocate baby's vocalizations as much as when compared to a non-depressed mother (Fleming, Ruble, Flett & Shaul, 1998) and are also more likely to show angry and/or intrusive behavior (Field, Healy, Goldstein & Gutherz, 1990). In the present study, children whose mothers reported clinically elevated levels of depression were more likely to experience behavior problems. For a comprehensive review of findings for maternal depression and child outcomes, refer to Chemtob and colleagues (in press) as they examined the same sample of mothers and their children.

Maternal PTSD. To control for the effects of maternal symptoms of PTSD on all child outcome variables, it was entered into each of the four models as a covariate. Maternal symptoms of PTSD were marginally related to Internalizing and Total Problems T-Scores for model 1 and Total Problems T-Scores for model 2; as the number of maternal PTSD symptoms increased, children's internalizing and total problems behaviors also increased. In the literature, not much is known about the effects of maternal PTSD on young children as many studies of the effects of maternal psychopathology on children have largely focused on maternal depression (Pilowsky et al., 2006). Nevertheless, Chemtob and colleagues (in press) examined the same sample as the present study and found that children of mothers with both probable depression

and PTSD had the highest rate of significant behavior problems, compared to children of mothers with depression, and to the children of mothers with neither disorder. However, given the small sample size, the authors were not able to assess the effects of depression alone and PTSD alone. As such, the findings may be a result of either having two diagnoses (comorbidity), or to differential effects of maternal PTSD and depression; this answer is presently unknown.

Elapsed time. To control for the effects of elapsed time between the date of the trauma, September 11th, 2001 and the date data were collected, this information was entered into each of the four models as a covariate. It is relatively common for posttraumatic stress symptoms to remit as time passes. Notably, research has focused on early detection of PTSD (e.g., several months) following a traumatic event, and follow-up studies have suggested that symptomatology generally decreases over some time. For example, Silver and colleagues found approximately 11% decrease in probable PTSD from two months to six months post-September 11th, 2001. However, a relatively recent meta-analysis revealed that the predictive ability of subjective exposure on PTSD increased as more time elapsed between the traumatic event and assessment (Ozer, Best, Lipsey, & Weiss, 2003). The present study is generally consistent with these results, finding that mothers' endorsed PTSD symptoms increased as a function of time. Moreover, it seems plausible to suggest that, while an initial decrease in PTSD symptoms is likely, chronic PTSD (i.e., greater than six months symptom duration), may perhaps be associated with a worsening of symptomatology over greater lengths of time.

Child gender. To control for the potential effects of child gender on all child outcome variables, it was entered into each of the four models as a covariate. Child gender was found to be significantly related to young children's Externalizing T-Scores for model 2, which tested both predictor variables (mothers' actual, geographic exposure and perception of life threat). Further, young boys were found to have a significantly higher Externalizing T-Score compared to young girls. Several studies have implicated child gender as a potential moderator for psychological distress following a traumatic event (e.g., Mirza, Bhadrinath, Goodyer & Gilmour, 1998; Stallard, Velleman, & Baldwin, 1998). The general consensus is that girls are more likely to develop subsequent psychopathology after experiencing a traumatic event. For example, a prospective study (Stallard, Salter, & Velleman, 2004) found that girls were significantly more likely to develop PTSD following road traffic accidents compared to same-age boys. Similarly, the Board of Education study (Hoven et al., 2005) found that girls were at an increased risk for

developing negative post-trauma symptomatology, compared to boys, for many probable disorders beyond PTSD, such as generalized anxiety, separation anxiety, agoraphobia, and depressive disorders to name a few, with the exception of conduct and alcohol abuse/dependence problems. Given that these findings are in opposition to the present study's findings, an explanation is thus offered. Research suggests that boys are more likely than girls to engage in overt, externalizing behaviors in general (e.g., Bongers, Koot, van der Ende, & Verhulst, 2003; Thompson, 2009). Moreover, given that the majority of children's externalizing behaviors were within the normal ranges (i.e., below clinical cutoff), it is possible that the effects of trauma did not play a major role in influencing behavioral difficulties among the present sample compared to other studies.

Limitations of the Present Study

There are several limitations of the present study that are important to address. First and foremost, the sample size was relatively small, which likely impacted the power of statistical analyses. Along the same lines, standard listwise deletion techniques were employed for regression analyses. As such, missing data for key variables led to a further reduction in sample size within these analyses, which further reduced their power. Moreover, it is possible that findings approaching significance (e.g., the interaction effect for socio-economic status and geographic exposure on children's Total Problems T-Scores), and perhaps even null findings, would have been found to be significant had there been increased power. However, this is only a speculation and would require statistical testing to confirm.

The small sample size also affected the analyses that could be carried out with regards to the effects of race/ethnicity. Specifically, the number of African-American participants in the present study was too small to examine as a unique group. As such, these participants were combined with Hispanic participants to create a group large enough to statistically examine rather than exclude them from analyses. While it is definitely not optimal to combine two racial/ethnic groups for obvious reasons, previous findings suggest that these groups are similarly vulnerable to the effects of trauma. Nevertheless, it is possible that this method skewed the findings for the effects of race/ethnicity.

Further, the study sample size also limited the regression model parameters. Specifically, previous findings suggest that, when both race/ethnicity and socio-economic status are simultaneously included in the analyses, the effects of socio-economic status likely causes the

effects of race/ethnicity to approach zero (Bonanno, Galea, Bucciarelli, & Vlahov, 2007). However, testing this finding with the present sample was not possible given the small sample size; race/ethnicity and socio-economic status could only be examined separately to keep the number of regression parameters within an acceptable range.

The limited variance in the perception of life threat variable may have also affected the present study's findings. As previously noted, 55% of the sample endorsed the highest rate of perceived life threat possible, endorsing all six items assessing threat to life and threat of injury to oneself, spouse and child. While this is conceptually very telling, this did not allow for differentiation among the sample. Moreover, it remains possible that, despite null findings, perceived life threat may be an indicator of subsequent distress following a trauma.

Another limitation of the present study was its reliance parent-report data for their young children's behavioral difficulties. Given the young ages of children examined, mothers' endorsement of behavioral difficulties in their children may be biased, especially with regards to their mental health status. Nevertheless, given the developmental stage of the children in the study, parent-report remains one of the only options as children at this stage do not yet possess the cognitive and communicative skills necessary for reliable self-report.

Additionally, the present study did not examine the potential effects of fathers on their young children's mental health response following the WTC attacks. While considerable evidence substantiates the important influence of paternal involvement on children's development (e.g., Lamb, Pleck, & Levine, 1986), it is unfortunately commonplace for trauma and other related studies to solely examine maternal influences on child outcomes. One such reason for this methodological limitation has to do with data collection procedures. For the present study's procedures with regards to data collection, the majority of parents exposed to study participation were mothers. As such, results from this study should not be generalized to all parents without specific assessment of the effects of paternal exposure variables on young children's mental health outcomes.

The present study also did not examine child's age as a potential confound for child outcome variables. It is well known that externalizing behaviors are more prevalent in toddlerhood (Tremblay et al., 2004) and in boys, and the normative developmental trend is for these behaviors to decrease after four years of age (Stanger, Achenbach, & Verhulst, 1997). Comparatively, internalizing behaviors generally show a gradual increase in trend after age two

years (Gilliom & Shaw, 2004). The child participants in the present study ranged in age from 1.8 to 5.9 years at the time of data collection. Further, while T-scores for Internalizing, Externalizing, and Total Problems behaviors were utilized to minimize the effect of age, it remains possible that the variability of this age group may have impacted the results. Optimally, age would have been entered into the regression models to control for this possibility. However, the negative impact of additional regression parameters outweighed the benefit of doing so. Nevertheless, age of children exposed to traumas, even those who are very young, may be an important predictor of subsequent distress.

Implications for Future Research

Based on the findings of the present study, several implications for future research are noted. First, a more accurate assessment measure of perceived life threat may help to elucidate the actual effects of this exposure variable (i.e., whether this variable significantly predicts mental health distress following a trauma). Second, it seems plausible to suggest that a "composite variable" approach to defining exposure will help explain a greater, overall proportion of total variance in the data. Specifically, including objective, subjective and emotional aspects of the traumatic experience may better capture the overall effects on mental health outcomes and help to identify those individuals who may be at a greater risk for developing difficulties following trauma. For example, the effects of resource loss have also been widely studied in terms of mental health sequelae following a trauma. According to Hobfoll's (1989) Conservation of Resources theory, the threat of a potential or actual loss of resources valued by the individual (e.g., objects, conditions, personal characteristics) can result in subsequent distress. Therefore, the greater the perceived or actual loss of resources, the greater the lack of resources or depletion of resources used by the individual in the coping process and the higher the feelings of stress experienced.

Social support is another variable in trauma research that could help predict outcomes. The lack of such support has been reliably associated with PTSD (e.g., Brewin et al., 2000), and the presence of social support has been linked with health, well-being, and recovery following a trauma (Koenen, Stellman, Stellman, & Sommer, 2003). With regards to the WTC attacks, Bonanno and colleagues (2007) obtained further evidence lending support of a link between social support and resilience. Moreover, while the addition of assessing resource loss and social support following a trauma seems warranted, there are other variables that can influence

outcomes. Therefore, an assessment measure that includes most or all of these variables may more aptly predict both adult and young children's trauma-related psychopathology.

The effects of race/ethnicity and socio-economic status also remain somewhat unclear in the literature. First, the initial assessments of ethnoracial subgroups have found considerable within-group variation with regards to the effects of trauma (Pole, Gone, & Kulkarni, 2008). This finding points to the inadequacy of generalizing to the greater population with data from only one subgroup. As such, inclusion of subgroups is vital to our understanding of the effects of race/ethnicity following a trauma. Second, many studies have found effects for both variables, but few have examined these variables simultaneously. One such study, conducted by Bonanno and colleagues (2007), suggested that, while the research points to race/ethnicity as being a risk factor for developing PTSD, many studies have not taken into consideration the confounding effects of socio-economic status. Further, when SES was controlled for in this study, race/ethnicity no longer statistically predicted differences in the development of PTSD. Replication of these findings is necessary to further clarify the unique effects of these variables.

Additionally, it may be beneficial to include more variables of socio-economic status in addition to education and occupation levels. For instance, income level has been examined in terms of predicting trauma prevalence. For example, Breslau and colleagues (1998) found that those in the lowest income groups reported experiencing greater assault-related violence. While it is likely that income level is highly correlated with education and occupation levels, it is not a given. Therefore, the inclusion of this variable may provide additional information as to the total effects of socio-economic status following a trauma. Similarly, the inclusion of spousal socio-economic information may provide a more accurate picture of the family's socio-economic status.

The potential for a three-way interaction between actual, geographic exposure, perceived life threat and the moderator variables was unable to be tested in the present study given the limited power. However, this effect is possible and should be examined in future research. Finally, given the limitations of self-report and mothers' reporting on their children, future research may benefit from a multiple informants approach to determine whether any reporting biases exist (e.g., in mothers' report of their children's behaviors).

Conclusions

   The present study attempted to address several gaps in the existing literature with regards to exposure to a traumatic event and subsequent adult and young children's psychopathology. First, the findings shed light on the critical need of a comprehensive assessment measure that taps a variety of exposure-related constructs. Second, despite a lack of findings in the present study, the need to examine the effects of young children, even those children who are pre-verbal, was illustrated. However, inherent limitations of assessment methods remain problematic for this population. Third, the effects of race/ethnicity and socio-economic status on mental health outcomes were particularly insightful. Findings point to the necessity of continued research aimed at more clearly identifying the exact influences these variables play following a trauma. By attempting to address these key issues, this study advances the field's understanding of the effects of trauma exposure on mothers and their young children. Yet, more work clearly needs to be done.

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Table 1. Phi Coefficient Correlations for Perceived Life Threat (PLT) Items

	1	2	3	4	5	6
1. As a result of the 9/11 attack, were you scared that your life might be in danger?	1	-	-	-	-	-
2. As a result of the 9/11 attack, were you scared that your child's life might be in danger?	.878*	1	-	-	-	-
3. As a result of the 9/11 attack, were you scared that your spouse's/partner's life might be in danger?	.677*	.710*	1	-	-	-
4. As a result of the 9/11 attack, were you scared that you might be physically injured?	.636*	.599*	.442*	1	-	-
5. As a result of the 9/11 attack, were you scared that your child might be physically injured?	.608*	.678*	.489*	.867*	1	-
6. As a result of the 9/11 attack, were you scared that your spouse/partner might be physically injured?	.460*	.507*	.692*	.625*	.665*	1

* correlation is significant at the .01 level (2-tailed).

N = 115

Table 2. Outcome Variables: Means, Standard Deviations, and Internal Consistency Reliabilities

	N	Mean	SD	Range (Min-Max)	Cronbach's Alpha
Mother's Depression Score (CES-D)	115	13.48	10.52	0 - 46	0.84
Mother's Number of Endorsed PTSD Symptoms (PDS)	114	3.96	4.75	0 - 16	0.91
Child's Internalizing T-Score (CBCL Subscale)	114	49.52	12.47	29 - 83	0.92
Child's Externalizing T-Score (CBCL Subscale)	114	46.74	12.26	28 - 82	0.95
Child's Total Problems T-Score (CBCL Subscale)	114	48.1	13.26	28 - 89	0.97

Table 3. Two-Tailed Pearson's Correlations among Key Study Variables

	Perception of Life Threat (PLT)	Socio-economic Status (Hollingshead)	Mother's PTSD Symptoms (PDS)	Mother's Depression Score (CES-D)	Child's Internalizing T-Score (CBCL)	Child's Externalizing T-Score (CBCL)	Child's Total Problems T-Score (CBCL)
Perception of Life Threat (PLT)	1						
Socio-economic Status (Hollingshead)	.229*	1					
Mother's PTSD Symptoms (PDS)	.106	.208	1				
Mother's Depression Score (CES-D)	.002	.020	.224**	1			
Child's Internalizing T-Score (CBCL)	.087	.072	.244**	.340**	1		
Child's Externalizing T-Score (CBCL)	.023	.223*	.248**	.432**	.741**	1	
Child's Total Problems T-Score (CBCL)	.003	.143	.266**	.440**	.917**	.912**	1

NOTE: N = 115

* indicates correlation significant at the .05 level (1-tailed).

** indicates correlation significant at the .01 level (1-tailed).

Table 4. Outcome Variables by Mothers' Actual, Geographic Exposure

Outcome Variables	Actual Geographic Exposure Groups	N	Mean	Standard Deviation
Mother's Number of PTSD Symptoms (PDS)	Below Canal Street	60	4.20	4.94
	Above Canal St. & in Manhattan	30	4.30	5.48
	Outside Manhattan	24	2.92	2.98
Mother's Depression Score (CES-D)	Below Canal Street	61	12.82	10.67
	Above Canal St. & in Manhattan	30	16.50	10.22
	Outside Manhattan	24	11.38	10.09
Child's Internalizing T-Score (CBCL)	Below Canal Street	60	49.62	11.70
	Above Canal St. & in Manhattan	30	51.13	14.78
	Outside Manhattan	24	47.25	11.32
Child's Externalizing T-Score (CBCL)	Below Canal Street	60	47.07	13.00
	Above Canal St. & in Manhattan	30	46.37	11.18
	Outside Manhattan	24	46.38	12.09
Child's Total Problems T-Score (CBCL)	Below Canal Street	60	47.68	12.92
	Above Canal St. & in Manhattan	30	50.23	15.60
	Outside Manhattan	24	46.46	10.94

Table 5. Outcome Variables by Mothers' Mean Perception of Life Threat Composite Score

Outcome Variables	Mean Perception of Life Threat (by Group)	N	Mean	Standard Deviation
Mother's Number of PTSD Symptoms (PDS)	PLT Mean Group 1	24	3.54	5.14
	PLT Mean Group 2	90	4.07	4.67
Mother's Depression Score (CES-D)	PLT Mean Group 1	24	13.39	9.76
	PLT Mean Group 2	91	13.50	10.76
Child's Internalizing T-Score (CBCL)	PLT Mean Group 1	24	48.96	14.55
	PLT Mean Group 2	90	49.67	11.94
Child's Externalizing T-Score (CBCL)	PLT Mean Group 1	24	47.25	12.98
	PLT Mean Group 2	90	46.60	12.13
Child's Total Problems T-Score (CBCL)	PLT Mean Group 1	24	49.25	15.94
	PLT Mean Group 2	90	47.79	12.54

Note:

Group 1 mean PLT scores range from 0.00 - .49.

Group 2 mean PLT scores range from .50 - 1.00.

Table 6. Outcome Variables by Race/Ethnicity

Outcome Variables	Race/Ethnicity Groups	N	Mean	Standard Deviation
Mother's Number of PTSD Symptoms (PDS)	White/Caucasian	27	5.41	4.40
	Asian/Pacific Islander	28	2.36	4.10
	Hispanic & African American	40	4.83	5.41
Mother's Depression Score (CES-D)	White/Caucasian	27	11.22	10.20
	Asian/Pacific Islander	28	10.90	9.58
	Hispanic & African American	41	16.58	10.78
Child's Internalizing T-Score (CBCL)	White/Caucasian	27	50.37	10.63
	Asian/Pacific Islander	28	49.96	12.43
	Hispanic & African American	41	50.63	13.86
Child's Externalizing T-Score (CBCL)	White/Caucasian	27	49.56	12.93
	Asian/Pacific Islander	28	45.14	10.61
	Hispanic & African American	41	47.07	13.76
Child's Total Problems T-Score (CBCL)	White/Caucasian	27	49.67	12.17
	Asian/Pacific Islander	28	46.96	11.73
	Hispanic & African American	41	49.49	15.74

Table 7. Outcome Variables by Socio-economic Status Group

Outcome Variables	Hollingshead SES Group	N	Mean	Standard Deviation
Mother's Number of PTSD Symptoms (PDS)	Group I	11	0.55	1.29
	Group II	7	4.43	5.94
	Group III	13	4.15	5.41
	Group IV	29	5.48	4.99
	Group V	24	3.79	3.56
Mother's Depression Score (CES-D)	Group I	11	11.57	9.59
	Group II	7	10.83	6.36
	Group III	13	12.23	9.80
	Group IV	29	14.64	11.73
	Group V	24	10.32	7.71
Child's Internalizing T-Score (CBCL)	Group I	11	50.45	12.18
	Group II	7	46.71	13.10
	Group III	13	46.62	11.98
	Group IV	29	49.69	10.90
	Group V	24	50.00	9.96
Child's Externalizing T-Score (CBCL)	Group I	11	42.82	10.00
	Group II	7	42.43	9.90
	Group III	13	44.62	12.78
	Group IV	29	49.00	12.71
	Group V	24	47.00	10.32
Child's Total Problems T-Score (CBCL)	Group I	11	46.82	11.11
	Group II	7	44.00	11.78
	Group III	13	45.38	12.10
	Group IV	29	49.28	12.36
	Group V	24	47.64	11.32

Note:
Group I – Unskilled laborers, menial service workers
Group II – Machine operators, semiskilled workers
Group III – Skilled craftsmen, clerical, sales workers
Group IV – Medium business, minor professional, technical
Group V – Major business and professional

Table 8. Model 1: Regression Analyses Results for Actual, Geographic Exposure as a Predictor of Outcome Variables

Outcome Variables	R^2	R^2_{Adj}	β_1 (σ)	β_2 (σ)	β_3 (σ)	β_4 (σ)	β_5 (σ)	β_6 (σ)
Mother's Number of PTSD Symptoms (PDS)	.060	.035	.536 (1.059)	-1.896 (1.156)	.091 (.039)*	-	-	-
Mother's Depression Score (CES-D)	.032	.006	3.682 (2.374)	-1.458 (2.596)	.001 (.087)	-	-	-
Child's Internalizing T-Score (CBCL)	.151	.103	.092 (2.741)	-1.280 (2.983)	-.035 (.102)	1.693 (2.308)	.346 (.111)*	.430 (.254)[†]
Child's Externalizing T-Score (CBCL)	.250	.208	-2.171 (2.529)	.271 (2.753)	.018 (.094)	4.367 (2.130)	.476 (.102)*	.321 (.234)
Child's Total Problems T-Score (CBCL)	.235	.191	.849 (2.769)	-.105 (3.014)	-.012 (.103)	2.982 (2.332)	.495 (.112)*	.427 (.256)[†]

* p < .05; † p < .10

Table 9. Model 2: Regression Analyses Results for Actual, Geographic Exposure & Perception of Life Threat as Predictors of Outcome Variables

Outcome Variables	R^2	R^2_{Adj}	$?R_2$	β_1 (σ)	β_2 (σ)	β_3 (σ)	β_4 (σ)	β_5 (σ)	β_6 (σ)	β_7 (σ)
Mother's Number of PTSD Symptoms (PDS)	0.070	0.036	0.010	.814 (1.090)	-1.753 (1.163)	1.274 (1.203)	.089 (.039)*	-	-	-
Mother's Depression Score (CES-D)	0.034	0.000	0.001	3.912 (2.454)	-1.340 (2.623)	1.063 (2.717)	.000 (.087)	-	-	-
Child's Internalizing T-Score (CBCL)	0.156	0.100	0.005	.631 (2.833)	-1.043 (3.004)	2.394 (3.084)	-.036 (.102)	1.663 (2.313)	.344 (.111)*	.412 (.255)
Child's Externalizing T-Score (CBCL)	0.250	0.201	0.000	-2.306 (2.621)	.212 (2.780)	-.595 (2.853)	-.017 (.094)	4.374 (2.140)*	.476 (.103)*	.325 (.236)
Child's Total Problems T-Score (CBCL)	0.235	0.184	0.000	.743 (2.870)	-.152 (3.044)	-.469 (3.124)	-.012 (.103)	2.988 (2.343)	.496 (.112)*	.430 (.258)[†]

* $p < .05$; † $p < .10$

Table 10. Model 3: Regression Analyses Results for Predictors and Race/Ethnicity Interactions for Outcome Variables

Outcome Variables	R^2	R^2_{Adj}	$?R^2$	β_1 (σ)	β_2 (σ)	β_3 (σ)	β_4 (σ)	β_5 (σ)	β_6 (σ)	β_7 (σ)	β_8 (σ)	β_9 (σ)	β_{10} (σ)	β_{11} (σ)	β_{12} (σ)	β_{13} (σ)	β_{14} (σ)	β_{15} (σ)
Mother's Number of PTSD Symptoms (PDS)	.153	.041	.074	1.204 (3.748)	-3.233 (2.280)	1.331 (3.050)	-.838 (1.775)	**-3.310** (**1.742**)†	.343 (4.188)	-.248 (4.276)	.517 (2.967)	-	-1.252 (3.679)	-.145 (3.773)	.064 (.049)	-	-	-
Mother's Depression Score (CES-D)	.147	.035	.104	6.726 (8.102)	-5.171 (4.929)	-5.534 (6.594)	3.298 (3.793)	-3.797 (3.765)	-5.031 (9.025)	-.424 (9.244)	3.823 (6.387)	-	3.000 (7.949)	12.351 (8.156)	-.043 (.106)	-	-	-
Child's Internalizing T-Score (CBCL)	.289	.164	.045	2.770 (9.060)	.871 (5.562)	5.173 (7.357)	-.076 (4.307)	-1.859 (4.321)	-4.035 (10.085)	7.455 (10.323)	-3.876 (7.121)	-	-5.140 (8.833)	4.954 (9.192)	-.122 (.120)	.357 (2.602)	.409 (.127)*	.398 (.278)
Child's Externalizing T-Score (CBCL)	.335	.218	.068	.053 (8.875)	-3.462 (5.448)	-2.735 (7.207)	-5.059 (4.219)	-6.285 (4.233)	-2.995 (9.880)	4.687 (10.113)	2.128 (6.976)	-	-3.838 (8.653)	10.952 (9.004)	-.083 (.118)	3.503 (2.549)	.469 (.124)*	.299 (.273)
Child's Total Problems T-Score (CBCL)	.340	.225	.053	1.716 (9.517)	-2.026 (5.842)	-.259 (7.728)	-2.896 (4.524)	-5.058 (4.539)	-1.499 (10.594)	7.533 (10.844)	-.765 (7.481)	-	-6.050 (9.279)	9.503 (9.655)	-.096 (.126)	2.097 (2.733)	.501 (.133)*	.385 (.292)

* $p < .05$; † $p < .10$

Table 11. Model 4: Regression Analyses Results for Predictors and SES Interactions for Outcome Variables

Outcome Variables	R^2	R^2_{Adj}	$?R^2$	β_1 (σ)	β_2 (σ)	β_3 (σ)	β_4 (σ)	β_5 (σ)	β_6 (σ)	β_7 (σ)	β_8 (σ)	β_9 (σ)	β_{10} (σ)	β_{11} (σ)
Mother's Number of PTSD Symptoms (PDS)	.103	.007	.048	1.707 (1.456)	-1.210 (1.804)	1.493 (1.410)	.061 (.047)	.037 (.080)	-.041 (.131)	.057 (.082)	.040 (.050)	-	-	-
Mother's Depression Score (CES-D)	.061	.000	.043	2.076 (3.119)	5.785 (3.869)	2.750 (3.022)	.091 (.099)	-.106 (.170)	-.467 (.281)	-.146 (.176)	-.087 (.106)	-	-	-
Child's Internalizing T-Score (CBCL)	.212	.091	.037	-.217 (3.367)	-3.271 (4.214)	4.382 (3.268)	.087 (.108)	-.089 (.190)	-.278 (.184)	.204 (.306)	-.005 (.116)	1.972 (2.479)	.330 (.125)*	.242 (.282)
Child's Externalizing T-Score (CBCL)	.323	.220	.066	-2.855 (3.264)	2.379 (4.085)	-.626 (3.168)	**.263 (.105)***	-.268 (.184)	**-.419 (.178)***	-.390 (.297)	-.010 (.112)	4.345 (2.404)	.407 (.121)*	.186 (.274)
Child's Total Problems T-Score (CBCL)	.297	.189	.049	.072 (3.280)	.468 (4.105)	1.111 (3.183)	**.186 (.016)†**	-.209 (.185)	**-.348 (.179)†**	-.190 (.298)	.020 (.113)	3.170 (2.416)	.443 (.122)*	.204 (.275)

* $p < .05$; † $p < .10$

Figure 1. Conceptual Model for the Present Study: A Dose-Response Relationship

Moderators:

*Race/Ethnicity
*Family SES

Perceived Life Threat:

*total composite score
(self, spouse, child)

**Actual Exposure to
WTC Attacks**:

*Geographic Proximity

Parent Symptomatology:

*Depression Sx
*PTSD Sx

Child Symptomatology:

*Internalizing
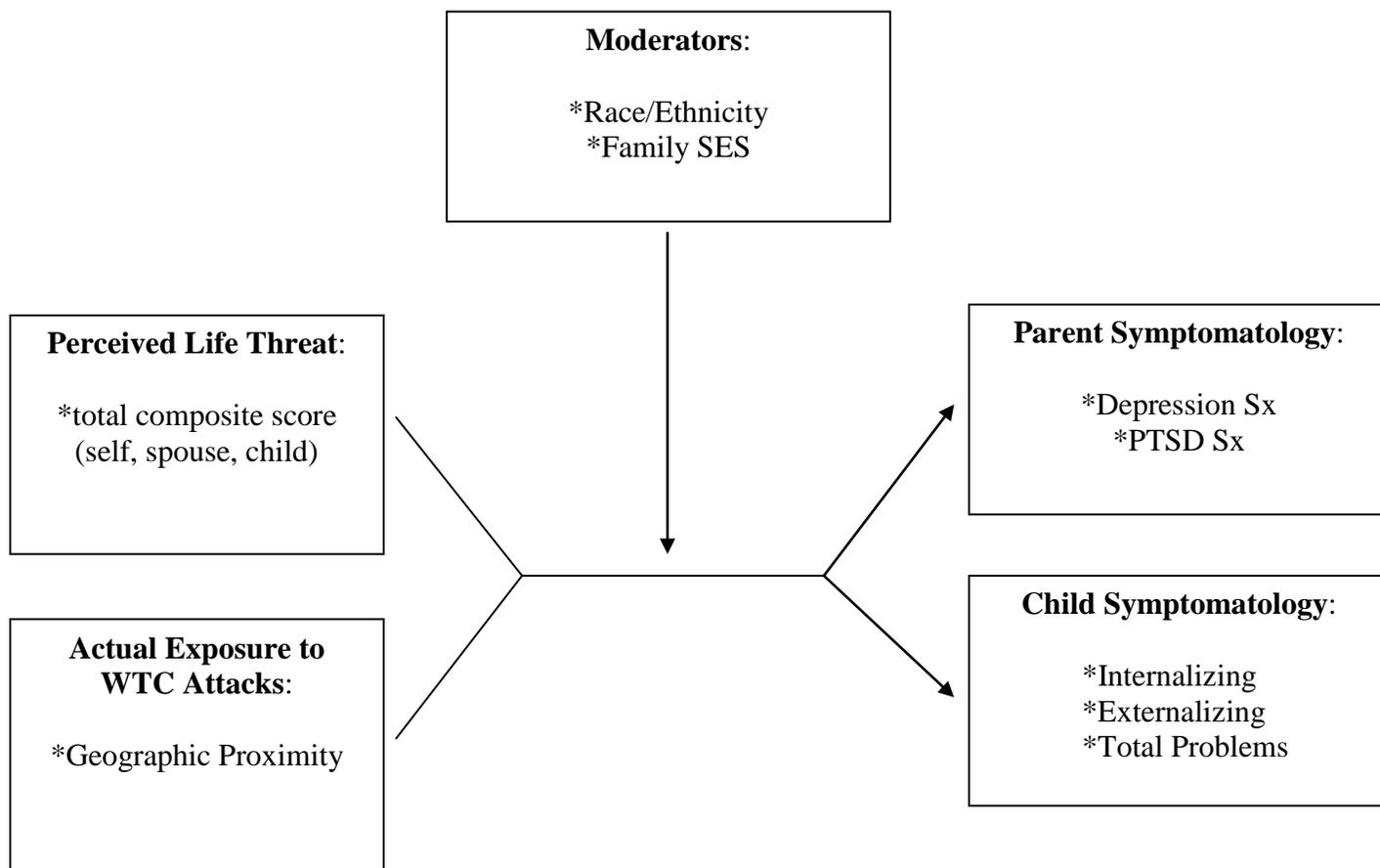*Externalizing
*Total Problems

Figure 2. Effect of SES on Children's Externalizing T-Scores by Levels of Mothers' Actual, Geographic Exposure
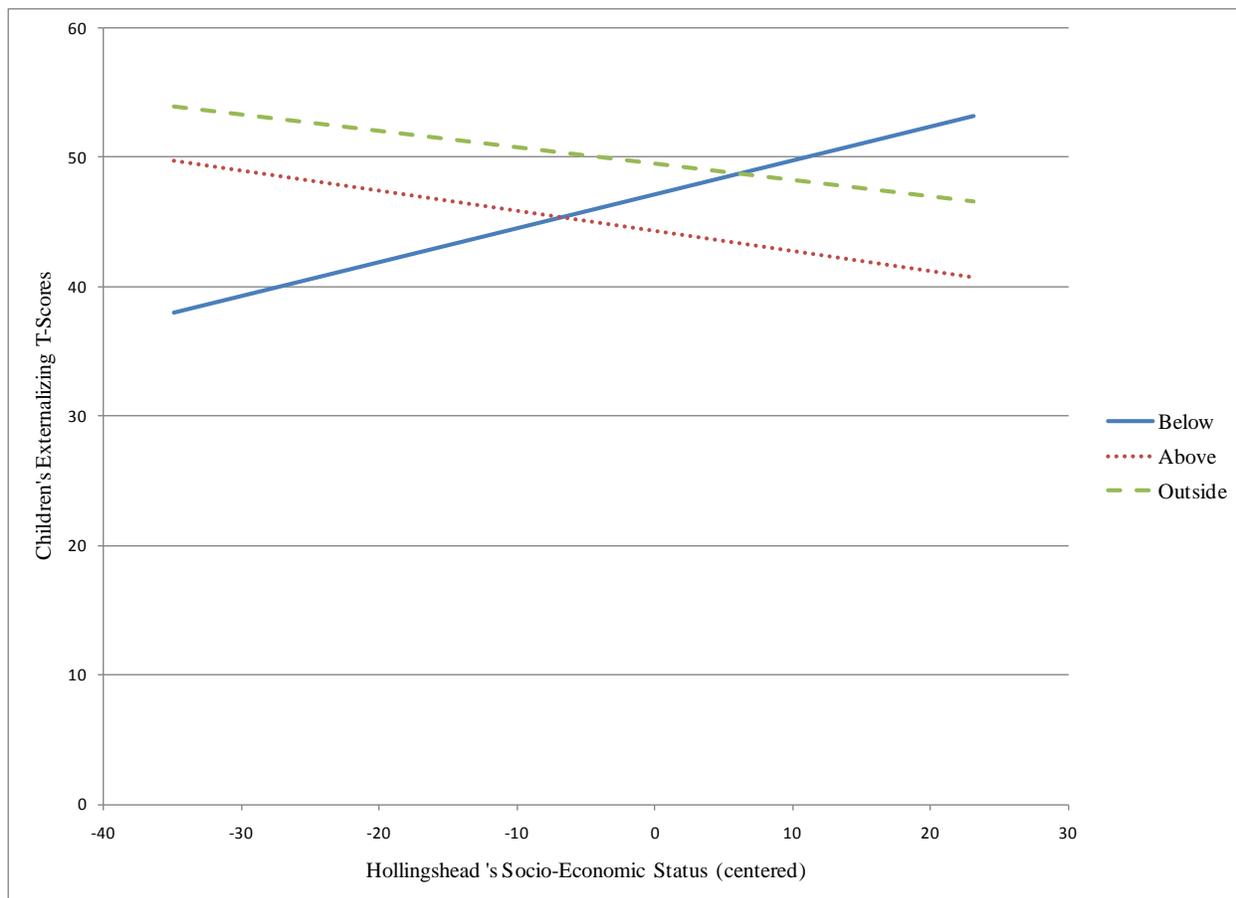
Figure 3. Effect of SES on Children's Total Problems T-Scores by Levels of Mothers' Actual, Geographic Exposure