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Race/Ethnic Differences in Prevalence and Correlates of Posttraumatic Stress Disorder in World Trade Center Responders: Results from a Population-Based, Health Monitoring Cohort

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Abstract

Objective: This study evaluated race/ethnic differences in the prevalence and correlates of World Trade Center (WTC)-related posttraumatic stress disorder (PTSD) in WTC responders.

Methods: Data were analyzed from a population-based, health monitoring cohort of 15,440 non-traditional (i.e., construction workers) and 13,403 police WTC responders.

Results: Among non-traditional responders, the prevalence of WTC-related PTSD was highest in Latino/a (40.4%) vs. Black (27.3%) and White (26.5%) responders; among police responders, Latino/a (10.4%) responders also had higher prevalence of PTSD relative to Black (9.8%)

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and White (8.7%) responders. However, multivariable analyses revealed that prior psychiatric diagnosis, greater severity of WTC-related exposures, post-9/11 stressful life events, (in police responders only) older age, and (in non-traditional responders only) lower income and education levels accounted for substantially higher prevalence of WTC-related PTSD across ethnic/racial groups. Additionally, among non-traditional responders, subgroups with added risk included responders who were: Latino/a or White had high post-911 stressful events; Latino/a or Black and had pre-9/11 psychiatric history; and Latinas. Among police responders, subgroups with added risk were Latino/a or Black police with a low annual income.

Conclusions: Collectively, results of this study underscore the burden of differential vulnerability that can contribute to higher prevalence of PTSD in certain cultural subgroups following large magnitude traumatic events.

Keywords

PTSD; disaster responders; ethnic differences; race/ethnicity; vulnerability

When terrorists flew two hijacked planes into the World trade Center (WTC) on September 11, 2001 (9/11), the impact, bolstered by 10,000 gallons of jet fuel, demolished four WTC buildings and killed 2,606 people in the WTC and surrounding area (Plummer, 2013). Workers involved in the ensuing months of rescue, recovery and restoration efforts faced extraordinarily catastrophic conditions, inhaling air laced with toxic fumes, navigating steel girders for several stories beneath the ground and uncovering buried human remains until the site was cleared in May 2002 (Ozbay et al., 2013). 9/11 workers continue to report substantial physical and mental health sequelae, with 31.9% self-reporting posttraumatic stress symptoms (Wisnivesky et al., 2011).

Posttraumatic stress disorder (PTSD) can significantly impair an individual's ability to cope with stress, sustain work and familial social relationships, and maintain employment (i.e., Kessler, 2000). PTSD is a risk factor for a myriad of negative outcomes and associated epigenetic changes have been linked to increased mortality (i.e., Katrinli et al., 2020). Thus, understanding the social, environmental, and structural factors that increase vulnerability to traumatic stress in diverse survivors is important for planning and delivering mental health services to these populations (Dean, Williams, & Fenton, 2013).

Individuals who identify as Latino/a or (although somewhat less consistently) Black were among those most impacted by PTSD following the WTC disaster (i.e., DiGrande et al., 2008; Galea et al., 2004; Adams, Allwood, & Bowler, 2019). In a representative sample of 2,616 WTC-area residents surveyed by phone six months after 9/11, Latino/as of Dominican or Puerto Rican origin were twice as likely as Whites, Blacks and other Latino/as to screen positive for PTSD (Galea et al., 2004). In a survey which assessed 11,037 WTC-area adults by phone one to two years following the disaster, people who were Latino/a or Black, even after controlling for confounding variables (i.e., income, education, proximity to the disaster and participation in disaster work), were more than twice as likely than those who were White to screen positive for PTSD (DiGrande et al., 2008). Alternatively, those of Asian ancestry were somewhat less likely than Whites to screen positive for PTSD. Pietrzak and colleagues (2014) examined the long-term trajectories of PTSD over a 12-year period

in 4,487 9/11 rescue and recovery workers. Latino/a workers were more likely than all other groups to exhibit a chronic, WTC-related PTSD symptom trajectory. Additionally, among 2,355 survivors who had been inside the WTC towers during the disaster, individuals who identified as Black or Latino/a consistently reported a higher level of WTC-related posttraumatic stress over an 9-year period than did White and Asian individuals (Adams, Allwood, & Bowler, 2019).

To fully understand PTSD outcomes, research must consider the social, environmental, and structural factors that increase vulnerability to the disorder (Boyd, Lindo, Weeks, & McLemore, 2020). The theory of differential vulnerability posits that a subpopulation or group may be more affected by stressors than other groups because of shared characteristics and experiences (Frohlich & Potvin, 2008). In such cases, contextual conditions, such as limited access to economic and social resources or prior high exposure to stressful events (i.e., racism), may make certain subpopulations more vulnerable to the impact of a traumatic event (Frohlich & Potvin, 2008). For instance, in the Galea and colleagues (2004) sample, people with Dominican and Puerto Rican ancestry had the highest prevalence of PTSD and were also more likely than other groups to be younger, have lower income levels, and less social support.

In contrast to the concept of differential vulnerability is the concept of differential exposure. Differential exposure posits that those who have greater exposures to potentially traumatic events will be more vulnerable to PTSD (Perilla et al., 2002). To best understand the unique contributions of differential exposure and differential vulnerability on PTSD prevalence, researchers (i.e., Alcántara et al., 2013) recommend that investigations of racial/ethnic differences explicitly characterize the sociodemographic status of research samples (including income level, education level, trauma exposure). Further, to best identify patterns of risk and protective factors to a potentially traumatic event, investigations should also examine how race/ethnicity interacts with indicators of vulnerability (i.e., socioeconomic status [SES], past stressors, gender and life stressors) (Alcántara et al., 2013).

In the current study, we evaluated 9/11 disaster responders who were of Latino/a, Non-Latino/a White or Non-Latino/a Black backgrounds. First, consistent with the theories of differential vulnerability and differential exposure, we compared the sociodemographic characteristics (i.e., income level, education level, past stressors) of each group and the types of potentially traumatic exposures they experienced before, during and after the WTC rescue and recovery efforts. Second, we calculated the prevalence of WTC-related PTSD, in these three groups assessed via the PTSD Checklist – Specific-Stressor Version (PCL-S) administered an average of four years after the disaster. Last, we evaluated correlates of WTC-related PTSD, including interactions between race/ethnicity and gender, post-9/11 stressors as well as indicators of vulnerability (i.e., SES, prior stressors, social support) to identify subpopulations most at risk for poor outcomes. Based on previous research (i.e., DiGrande et al., 2008; Galea et al., 2004), we hypothesized that Latino/a 9/11 rescue/recovery workers would be more likely to screen positive for WTC-related PTSD compared to those who are Non-Latino/a White or Non-Latino/a Black, and that this relationship would be at least partially explained by indicators of vulnerability, gender and previous trauma.

Methods

Sample

Participants were WTC general responders participating in the WTC Health Program (WTCHP), a regional clinical consortium comprising, for our purposes, five medical institutions in the greater New York City (NYC) area. There are separate programs for the Fire Department of NYC responders, and for Survivors [NYC Health + Hospitals]. The WTCHP was launched in 2011 by the Centers of Disease Control and Prevention / National Institute for Occupational Safety and Health, replacing the Medical Monitoring and Treatment Program established in 2002. The Program provides health monitoring and treatment to WTC responders residing in the U.S. To be eligible, responders must have either: 1) worked or volunteered on the WTC effort for either ≥4 hours from 9/11/2001 to 9/14/2001, or ≥24 hours in 9/2001 or ≥80 hours from 9/11/2001 to 12/13/2001 (extended to July 2002 with the Zadroga Act); 2) handled and processed relevant human remains as a member of the Office of the Chief Medical Examiner for New York City; or 3) worked for the Port Authority Trans-Hudson Corporation (PATH) and spent ≥24 hours between February 2002 and July 2002 cleaning PATH tunnels. All WTCHP data collected at each of the five institutions have been stored and managed since 2002 by the General Responder Data Center, located at the Icahn School of Medicine, Mount Sinai, New York. In the current study, data were analyzed from 13,408 police responders and 15,440 non-traditional responders (i.e., utility workers, asbestos cleaners, construction workers, administrators, volunteers, transportation workers) who completed their first health monitoring visit at the WTC-HP a median of 4.3 years after 9/11/01 (range=0.8 to 12.8 years). The study was carried out in accordance with the latest version of the Declaration of Helsinki; the study design was reviewed and approved by the Mount Sinai Institutional Review Board.

Participants self-identified their ethnic/racial category from the U.S. Government's Office of Management and Budget (OMB) five racial categories: White, Black, American Indian or Alaskan Native, Asian, and Native Hawaiian/other Pacific Islander; one ethnic category (Latino/a); or "Other" (i.e., for individuals who equally identify with more than one group). This report will use the term "race/ethnicity" to represent common ancestry, geographic origins, cultural norms and social history of groups (Williams et al., 2010). For brevity, we will refer to non-Latino/a people of African heritage as Black, non-Latino/a, people of European heritage as White, and people of Hispanic/Latino/a heritage as Latino/a. To have adequate sample size, participants were 13,403 police and 15,440 non-traditional responders who had completed their first health monitoring visit a median of 4.3 years after 9/11/01, self-reported their ethnic-racial status as one of these three categories (White, Black, Latino/a) and who had complete data for all variables.

Assessments

The following assessment measures were administered at the first health monitoring visit.

WTC-related PTSD symptoms.—The PTSD Checklist Specific-Stressor Version (PCL-S) is a self-report measure comprised of 17 items (range 17–85) that assess DSM-IV symptoms of PTSD (Cronbach's alpha in the current sample=0.96). In this study, PTSD

symptoms were indexed in relation to WTC-related experiences. Probable WTC-related PTSD (hereafter "WTC-related PTSD"), was operationalized as a score ≥ 44 (Blanchard, Jones-Alexander, Buckley & Forneris, 1996).

Sociodemographic characteristics.—Sex, age (continuous), income (≤$80,000, >$80,000), race/ethnicity (White, Black, Latino/a, other), education (>high school, ≤ high school), marital status (single/never married, married/partnered, widowed/separated/ divorced) were assessed.

Psychiatric history prior to 9/11—We assessed if anxiety disorder, depression, or PTSD was ever diagnosed by a health professional before 9/11/2001. These particular disorders were assessed given that they were hypothesized to be key risk factors for WTC-related PTSD and related disorders in WTC responders.

Number of WTC-related exposures.—We summed the count of 10 WTC-related exposures, which were determined by a multi-disciplinary group of experts in psychiatry, psychology, and public health to be associated with an increased likelihood of developing mental health difficulties: 1) arrived at the WTC site between 9/11 and 9/13/2001; 2) worked primarily/adjacent to the collapse site, known as the 'pit' or the 'pile' during September 2001; 3) participated in search and rescue; 4) worked longer than the median number of hours at the WTC site; 5) exposed to human remains; 6) was caught in the dust cloud; 7) slept at the site; 8) death of a colleague, friend or family member because of 9/11; 9) received treatment for an illness or injury during WTC recovery work; and 10) knows someone who suffered an injury on 9/11.

Number of life stressors in the year before and since 9/11.—We assessed two separate counts of 15 life stressors from the Disaster Supplement of the Diagnostic Interview Schedule (i.e., lost a job/laid off/lost income, moved, separated from partner, divorced from spouse, broken up with best friend, domestic violence, car trouble, something stolen from you, been mugged or beaten up, had debt trouble, serious illness/injury, trouble with the law, illness in family, death in family, serious personal illness) that responders experienced in the one-year period prior to and the one-year period following 9/11.

Medical conditions after 9/11.—We summed the count of WTC-related conditions (asthma or chronic respiratory condition, chronic rhinitis or sinusitis, sleep apnea, GERD or acid reflux). These conditions were selected given their high prevalence among WTC responders who participated in monitoring and treatment services as part of the WTC Health Program.

WTC-related social support.—summed the number of important sources of family support (count range 0 to 5 [spouse, partner, children, parent{s}, other family]) and work support (dichotomized [supervisor and/or co-workers] vs. none) while working for the WTC recovery effort.

Data Analysis

Data analyses proceeded in four steps and were stratified by occupational responder type—police vs. non-traditional WTC responders—as these groups differ in disaster preparedness, as well as in prevalence of major WTC-related health conditions (i.e., Pietrzak et al., 2014). First, we computed chi-square analyses and analyses of variance to compare demographic, exposure and psychosocial characteristics between White, Black, and Latino/a WTC responders. We then conducted the same analyses by responder type to compare differences between police and non-traditional WTC responders who did and did not screen positive for WTC-related PTSD. Third, we conducted multivariable logistic regression analyses to examine independent correlates of WTC-related PTSD in police and non-traditional WTC responders. These analyses included main effect terms for all the variables shown in Table 1 (except for PTSD), as well as interaction terms of these variables x race/ethnicity. Fourth, to illustrate interaction effects, we computed predicted probabilities of WTC-related PTSD from the full regression models and then conducted univariate analyses of variance to compare these probabilities for significant interactions of risk factors and race/ethnicity.

Results

Race/Ethnicity

Of 13,403 police responders, 62.6% (n=8,393) were White, 12.6% (n=1,686) Black and 24.8% (n=3,324) Latino/a. Of 15,440 general responders in non-traditional occupations, 59.7% (n=9,217) were White, 11.1% (n=1,709) Black and 29.2% (n=4,514) Latino/a. Table 1 presents associations of sociodemographic characteristics and WTC exposures with race/ethnicity. After correcting for multiple testing, variables that were significantly associated with race/ethnicity (for both police and non-traditional responders) included gender, marital status, education, income, history of psychiatric disorder, having fewer sources of family social support and work social support, as well as greater number of exposures to stressful life events (Sum Before-9/11 Stressors, Sum WTC-related Exposures, Sum After 9/11 Stressors and Sum 9/11 Medical Conditions; all p's < .001).

To better understand differential exposure to WTC-related, potentially traumatic events, we also compared racial/ethnic differences in types of highly stressful events that were endorsed. After correcting for multiple testing, with the exception of "worked longer than the median number of hours at the WTC site", White responders were more likely to endorse nine of the ten WTC-related exposures (Chi-Square values are listed in Supplemental Table 1). However, for "caught in WTC dust cloud" (non-traditional White responders only) and "injured at WTC site" (White police responders only), the effect was limited by responder type. Non-traditional Black responders were more likely than Latino/a responders to endorse being "caught in WTC dust cloud" (non-traditional responders only), "arrival at site between 9/11 and 9/13," "exposed to human remains," knew someone who was injured," or "death of friend/ family member."

WTC-Related PTSD

Police responders identifying as Latino/a were more likely to screen positive for WTC-related PTSD (10.4%) than were those identifying as White (8.7%) but not Black (9.8%).

Non-Traditional responders identifying as Latino/a were more likely to screen positive (40.4%) than did those identifying as either White (26.5%) and Black (27.3%). (See Supplemental Table 2 for bivariate associations between sociodemographic characteristics and PTSD). A higher prevalence of WTC-related PTSD was also found in responders who were older; widowed/divorced; with lower education and income levels; with a history of psychiatric disorder; with fewer sources of family and work social support; and with a greater number of exposures to stressful life events (Sum Before-9/11 Stressors, Sum WTC-Related Exposures, Sum After 9/11 Stressors and Sum 9/11 Medical Conditions). Additionally, in the non-traditional responder group only, a higher prevalence of WTC-related PTSD was associated with being female.

Multivariable Correlates of WTC-related PTSD

Third and last, we examined the variables correlated with a positive screen for WTC-related PTSD via multivariate logistic regression analysis, with and without interactions between indicators of vulnerability (i.e., low SES, prior trauma) and race/ethnicity.

WTC Police Responders.—Results of a multivariable logistic regression analysis evaluating variables associated with screening positive for WTC-related PTSD in police responders are shown in Table 2. Model 1 accounted for 22.5% of the total variation in WTC-related PTSD. Among Latino/a police responders, the odds of WTC-related PTSD were 1.3 times greater when compared to White responders. Individuals with a history of a psychiatric diagnosis had nearly five-fold greater odds of WTC-related PTSD compared to those without a diagnosis. Regarding SES factors, the odds of WTC-related PTSD were 19% lower for responders with higher income levels. Being single/never married, as well as each of the WTC-related exposures, were also significant predictors of WTC-related PTSD.

When interactions of race/ethnicity x all independent variables were added (see Table 2, Model 2), the model accounted for 23.0% of variance in WTC-related PTSD in police, an increase of 0.5%. Older age was correlated with WTC-related PTSD; Latino/a race/ethnicity and being single/never married was not. Examination of interactions revealed that among police with lower annual income, Black and Latino/a police had a higher probability of WTC-related PTSD than White police (see Figure 1A).

WTC Non-Traditional Responders.—Results of multivariable logistic regression analyses examining variables associated with WTC-related PTSD in non-traditional responders, with and without interaction variables, are shown in the last six columns of Table 2. Model 1 accounted for 22.6% of the variance in WTC-related PTSD. Among Latino/a responders, the odds of positive WTC-related PTSD screen were 1.6 times greater compared to Whites. Non-traditional responders with a history of a psychiatric disorder had nearly three-fold greater odds of screening positive for WTC-related PTSD compared to those without such a history. With regard to SES factors, the odds of WTC-related PTSD were 31% and 29% lower for responders with higher income and education levels, respectively. Older age, being female, WTC exposures and stressors before and after 9/11 were also significant correlates of WTC-related PTSD.

When interactions of race/ethnicity by all independent variables were added (Model 2, see the last three columns of Table 2), 23.2% of the variance in WTC-related PTSD was explained, an increase of 0.6%. Being widowed/divorced, having lower income level and lower education level continued be correlated with WTC-related PTSD. However, the main effects of Latino/a race/ethnicity, older age, female gender and marital status on WTC-related PTSD were no longer significant. Results of interaction analyses, illustrated in Figure 1B, revealed that: 1) among responders with high post-9/11 stressful life events, Latino/a responders had higher probability of WTC-related PTSD than White responders, who had a higher probability of this outcome than Black responders; 2) among responders with pre-9/11 psychiatric history, Latino/a responders had a higher probability of WTC-related PTSD than Black responders, who had a higher probability of this outcome than White responders; 3) among responders with high WTC exposures; Latino/a responders had a higher probability of WTC-related PTSD than Black responders, who had a higher probability of this outcome than White responder and 4) Latina responders had a higher probability of WTC-related PTSD than female White and Black responders.

Discussion

This is the first known study to examine racial/ethnic differences in correlates of WTC-related PTSD in WTC responders. We expected that individuals who identified as Latino/a would have a higher prevalence of WTC-related PTSD and hypothesized that the relationship between Latino/a ethnicity and WTC-related PTSD would be at least partially explained by indicators of vulnerability. Findings supported our hypotheses. When not accounting for other contributing factors, police responders who identified as Latino/a were more likely to screen positive for WTC-related PTSD (10.5%) than police responders identifying as White (8.7%) or Black (9.9%). The racial/ethnic differences in prevalence of WTC-related PTSD among non-traditional responders were more pronounced, with 40.3% of Latino/a responders screening positive compared to 26.5% of White and 27.3% of Black responders. These findings are consistent with previous research that examined other samples of individuals (i.e., residents, visitors) who were in the area during the WTC disaster (Farfel et al., 2008; Galea et al., 2004). Importantly, Latino/a ethnicity no longer predicted WTC-related PTSD in both police and non-traditional responders when interactions of race/ethnicity with other factors were analyzed simultaneously. As we will discuss, these findings point to the role of cumulative stressors facing certain Latino/a subgroups (Cuevas, Sabina & Picard, 2010; Galea et al., 2004; Gavranidou & Rosner, 2003), which may increase vulnerability to developing PTSD in response to large magnitude traumatic events such as the WTC disaster.

To understand a population, scholars in the field (i.e., Alcántara et al., 2013) recommend that investigations of racial/ethnic differences characterize sociodemographic status and exposure to stressors in research samples. Thus, a goal of the current study was to compare such characteristics (i.e., income, education, past stressors and WTC-related exposures) by race/ethnicity. Despite having the lowest prevalence of WTC-related PTSD, White responders as a group reported more WTC-related exposures and medical conditions than the other two groups. The concept of differential exposure proposes that individuals with greater exposure to potentially traumatic events will be more vulnerable to PTSD (Alcántara et al.,

2013; Perilla et al., 2002). Results of our analyses suggest that differential exposures to WTC-related events *per se* did not account for the differences in prevalence of WTC-related PTSD seen in Latino/a responders.

In contrast to differential exposure, differential vulnerability theory contends that certain subgroups may be more affected by stressors than other groups because of shared characteristics (i.e., living in poverty) and experiences (i.e., having previous life stressors; Frohlich & Potvin, 2008). Results of the present study align with this notion by suggesting that responders who identified as Black or Latino/a had increased existing (pre-WTC) and subsequent (post-WTC) contextual conditions (i.e., lower income, less education, more life stressors prior to the 9/11 attacks, and, for Latino/as, greater life stressors following the 9/11 attacks) compared to Whites, suggesting that such factors account for higher WTC-related PTSD.

Social inequality, poverty, systemic oppression, and discrimination are associated with poor health outcomes and psychological distress in Latino/a populations (i.e., Chavez-Duenas et al., 2019). Latino/as in the U.S. receive lower pay (Pew Research Center, 2016) and experience more cultural stressors (i.e., immigration, acculturation, and interpersonal and structural racism) than do Whites (Myers et al., 2015; Williams et al., 2010). Latinas experience higher rates of traumatization (i.e., physical and sexual assault discrimination, childhood adversities and chronic stressors compared to White women (Myers et al., 2015; Williams et al., 2010). Moreover, Latino/a's level of cumulative stressors and traumatization has been linked to negative psychological sequelae (i.e., Cuevas, Sabina & Picard, 2010; Gavranidou & Rosner, 2003). Thus, pre-9/11 exposure to trauma combined with fewer resources may have contributed to Latino/a responders' overall rates of WTC-related PTSD.

Although lower income predicted WTC-related PTSD for all individuals, Black police responders with lower income had the highest risk for WTC-related PTSD compared to those who were White or Latino/a. U.S. population studies indicate that, compared to other groups, individuals who identify as Black have a higher pre-event prevalence of PTSD (Alegría et al., 2013; Roberts et al., 2011), as well as higher rates of child maltreatment, domestic violence, war-related trauma (Roberts et al., 2011) and racism (Myers et al., 2015; Sibrava et al., 2019; Williams et al., 2010) than do Whites. Such pre-9/11 stressors combined with fewer resources may have contributed to added risk for WTC-related PTSD in Black police responders with low income levels. Interaction results further revealed that Black non-traditional responders with high post-9/11 stressors were less likely to screen positive for WTC-related PTSD compared to Whites with a comparable number of post-9/11 stressors. One possible explanation for this finding is that Black responders may have had a greater fear of being viewed as 'mentally ill' relative to White responders (Conner, Copeland, Grote, Koeske, Rosen, Reynolds, & Brown, 2010), which in turn led to their being less likely to screen positive for PTSD despite having endured a comparable number of stressors.

Of note, responders who reported a history of pre-9/11 psychiatric diagnosis were 2-to-4 times more likely to screen positive for WTC-related PTSD. In non-traditional responders, this finding was even more pronounced for Latino/as, and to a lesser extent, Blacks. It is

possible that Latino/a responders may be more sensitized to the effects of trauma due to the contextual factors discussed previously. Further, some research suggests that Latino/as a group acknowledge mental health symptoms more openly compared to other racial/ethnic groups because doing so is less stigmatizing (Alcántara et al., 2013; Ortega & Rosenheck, 2009).

Older police responders in this study had increased risk for WTC-related PTSD. One factor that may be at play in older police, compared to middle-aged or young officers, is that older police are closer to retirement. Research suggests that workplace stigma and professional ramifications related to mental illness may dissuade younger police officers from admitting their psychological symptoms (Stuart, 2017). In contrast, police responders who are close to retirement may be established in their careers and have less concern about the occupational ramifications of admitting to mental health problems.

Further, as has been observed in prior studies, (i.e., DiGrande et al., 2008), responders with a low level of social support from family and co-workers, non-traditional responders who were widowed/separated/divorced, and non-traditional responders who had low education were more likely to screen positive for WTC-related PTSD, even after controlling for the interaction effects of race/ethnicity.

Limitations

Notable strengths of this study include the large samples of both traditional (i.e., police) and non-traditional WTC responders, and inclusion of pre-, peri-, and post-event factors in our evaluation of risk for WTC-related PTSD. However, some factors that may contribute to racial/ethnic disparities in PTSD prevalence, such as history of discrimination/racism, were not assessed, which limits the inferences that can be made. Further, we did not assess prevalence and correlates of WTC-related PTSD in specific racial/ethnic groups (i.e., those of Puerto Rican ancestry, Dominican ancestry, etc.) and as a function of immigrant status, which is needed to further clarify how race/ethnicity might impact risk for PTSD (i.e., Onoye et al., 2017). Finally, while the median time from 9/11 until survey completion was 4.3 years, there was considerable variability with regard to when responders presented for their first health monitoring visit. Thus, it is possible some differences in the prevalence of PTSD may, at least in part, be accounted for by natural recovery or prior treatment.

Conclusion and Clinical Implications

Results of this study suggest that the greater prevalence of WTC-related PTSD in Latino/a responders is likely due to contextual factors that increase their vulnerability to PTSD. Controlling for such factors allowed for a more nuanced examination of subgroups at risk for WTC-related PTSD. Specifically, Police responders who were older had a higher probability of PTSD, but only Latino/a and Black police who had a low annual income emerged as having added risk. Non Traditional responders who were widowed/separated/divorced and who had a lower income or education level had a higher probability of WTC-related PTSD, as did Latino/a and White responders with high post-911 stressful events; Latino/a and Black responders with pre-9/11 psychiatric history; and Latinas.

Scholars contend that interventions that address the contextual conditions facing vulnerable subgroups (i.e., through improved education and reduction of poverty and other ongoing stressors) will: 1) have significant potential for impact, 2) enable a broad reach to diverse segments of society and 3) require minimal individual effort when compared to traditional medical and mental health interventions (i.e., Chavez-Duenas et al., 2019; Dean, Williams, & Fenton, 2013; Fortuna, Porche, & Alegria, 2008; Fredan, 2010). Results of the current study suggest that PTSD risk mitigation may be achieved when clinicians, policy makers, program developers and administrators address these broader influences on health outcomes in clinical and public health interventions.

This study extends knowledge regarding the differential impact of WTC-related, potentially traumatic exposures on a large sample of White, Black and Latino/a police and non-traditional WTC responders. Further research is needed to replicate these results in other samples of disaster responders; to characterize biopsychosocial mechanisms underlying differential vulnerability to WTC-related exposures in different race/ethnic subgroups—particularly those not examined in the current study; and to evaluate race/ethnicity-sensitive assessment and treatment approaches in disaster responders and other trauma-affected populations.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Clinical Impact Statement:

The relatively high rates of WTC-related PTSD found in Latino/a WTC responders are likely due to the social and economic stressors Latino/a subgroups more commonly face. Vulnerability factors, such as low socioeconomic status, having a psychiatric disorder, low social support from family and workplace and additional life stressors following the event contributed to higher rates of WTC-related PTSD regardless of racial/ethnic group. These results underscore the importance of implementing interventions that address the unique contextual conditions facing vulnerable subgroups, such as improved education and income, and mitigation of ongoing stressors.

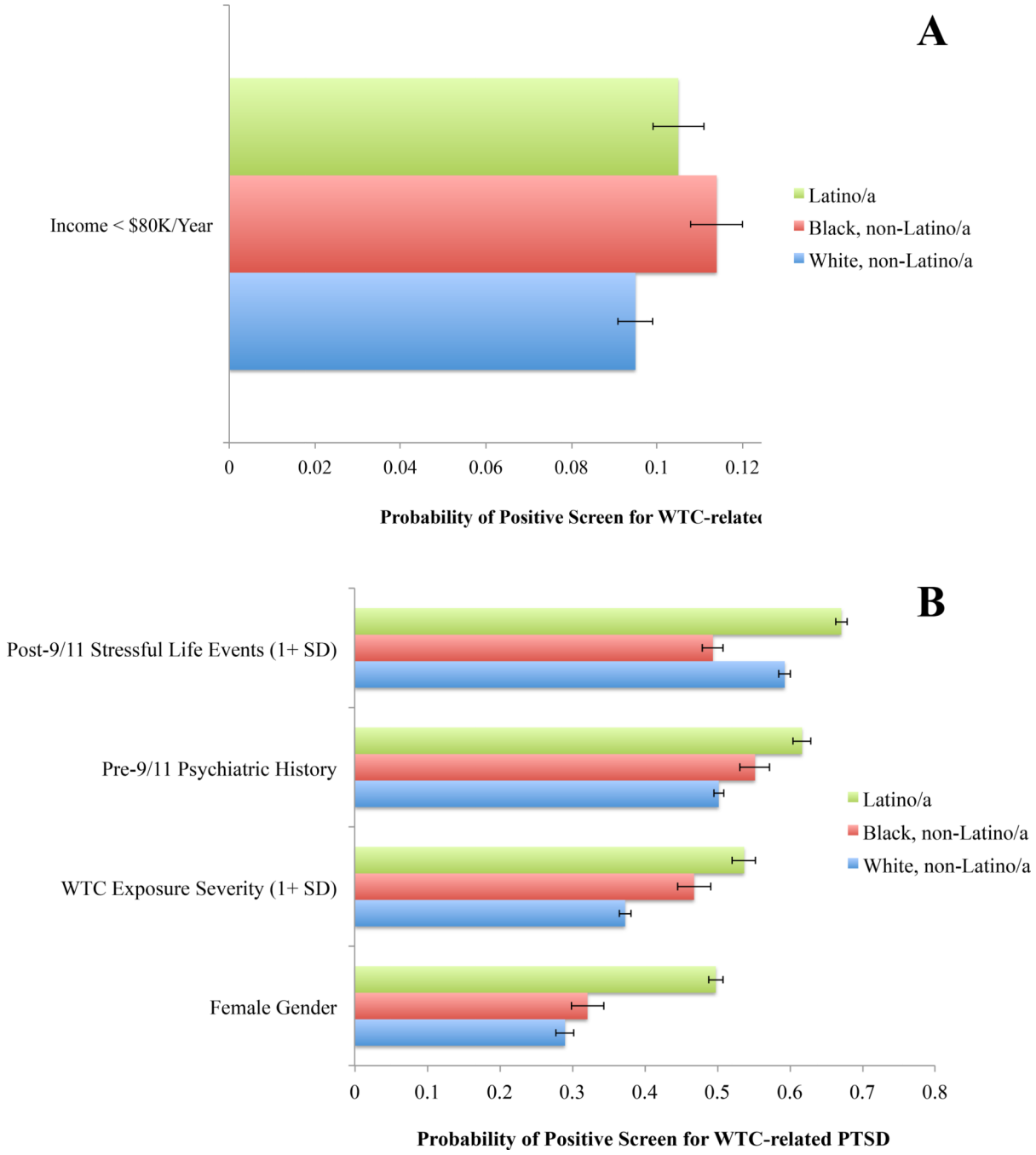

Figure 1.

Probabilities of positive screen for WTC-related posttraumatic stress disorder for risk factors that interacted significantly with race/ethnicity in police (A) and non-traditional (B) World Trade Center responders

Note. Error bars represent 95% confidence intervals.

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Table 1

Demographic, Exposure and Psychosocial Characteristics by Racial/Ethnic Group in Police (n=13,403) and Non-Traditional (n=15,440) WTC General Responders

		Police Responders					Non-Traditional Responders				
Demographic Variables		White (n=8,44) (1)	Black (n=1,675) (2)	Latino/a (n=3,234) (3)	Chi-Square	Pairwise Contrast	White (n=9,217) (1)	Black (n=1,709) (2)	Latino/a (n=4,514) (3)	Chi-Square	Pairwise Contrast
Gender	Male	90.6%	70.2%	78.7%	605.22***	1>2>3	91.2%	85.6%	75.9%	604.89***	1>2>3
	Female	9.4%	29.8%	21.3%			8.7%	14.4%	24.1%		
Marital Status	Single/Never Married	10.9%	22.6%	12.5%	358.97***	1>3>2	14.5%	20.9%	15.1%	300.61***	1>3>2
	Married/Partnered	71.2%	48.9%	63.4%			66.9%	50.9%	56.1%		
	Widowed/Sep/ Dvrcd	17.9%	28.5%	24.0%			18.6%	28.1%	28.8%		
Education	High School or Less	21.3%	16.7%	22.4%	23.69***	2>1,3	41.3%	42.2%	57.4%	326.43***	1,2>3
	Some College or More	78.7%	83.3%	77.6%			58.7%	57.8%	42.6%		
Income	≤$80,000/year	53.1%	71.6%	71.1%	433.64***	1>2,3	68.0%	82.7%	89.7%	834.71***	1>2>3
	>$80,000/year	46.9%	28.4%	28.9%			32.0%	17.3%	10.3%		
History of Psychiatric Disorder		10.0%	7.4%	7.9%	19.46***	1>2,3	18.8%	12.8%	13.4%	83.82***	1>2,3
		White (1)	Black (2)	Latino/a (3)	F	Pairwise Contrast	White (1)	Black (2)	Latino/a (3)	F	Pairwise Contrast
Mean Age in Years		47.1	43.0	40.9	55.85***	1>2>3	45.9	47.2	42.7	2>1>3	201.00***
Psychosocial Variables											
Sum Before 9/11 Stressors		1.1	1.4	1.2	27.17***	2>3>1	1.5	1.9	1.8	44.13***	2,3>1
Sum WTC-Related Exposures		5.3	4.6	4.8	116.71***	1>3>2	3.8	3.5	3.0	258.39***	1>2>3
Sum After 9/11 Stressors		2.4	2.9	2.8	69.23***	2,3>1	3.0	3.8	4.0	187.08***	3>2>1
Sum WTC-related Medical Conditions		0.7	0.6	0.6	13.19***	1>2,3	0.6	0.5	0.4	102.97***	1>2>3

Social Support during WTC Recovery Effort – Family	2.2	2.0	2.1	17.55***	1>3>2	1.6	1.3	1.3	87.13***	1>2,3
Social Support during WTC Recovery Effort - Work	0.8	0.7	0.7	13.97***	1>2,3	0.6	0.5	0.4	61.38***	1>2,3
Probable WTC-related PTSD	8.7%	9.8%	10.4%	8.66	3>1	26.5%	27.3%	40.4%	284.52***	3>1,2

Note. Probable WTC-related PTSD was assessed using the Posttraumatic Stress Checklist-Specific Version (PCL-S)

* p < .05

** p <.01

*** p < .001.

Table 2

Results of Multivariable Logistic Regression Analyses Evaluating Factors Associated With Probable PTSD

		Police (n=13,403)						Non-Traditional Occupations (n=15,440)					
		Model 1 (R^2=0.225)			Model 2 (R^2=0.230, ΔR^2=0.05)			Model 1 (R^2=0.226)			Model 2 (R^2=0.232, ΔR^2=0.06)		
		OR	95% CI	Wald X^2	OR	95% CI	Wald X^2	OR	95% CI	Wald X^2	OR	95% CI	Wald X^2
Demographic Characteristics													
Race/Ethnicity	Non-Latino/a White			**14.47** ***			2.72			**137.86** ***			2.75
	Non-Latino/a Black	1.21	0.99–1.48	3.42	0.33	0.06–1.70	1.75	0.91	0.80–1.03	2.23	1.16	0.54–2.50	0.15
	Latino/a	**1.34**	**1.15–1.56**	**13.76** ***	0.47	0.14–1.54	1.57	**1.65**	**1.50–1.80**	**117.26** ***	1.48	0.93–2.35	2.75
Age	Number of Years	**1.04**	**1.03–1.05**	**53.89** ***	**1.03**	**1.01–1.04**	**17.84** ***	**1.00**	**1.00–1.01**	**4.03** *	1.01	1.00–1.01	3.60
Gender	Male	0.98	0.82–1.18	0.05	0.97	0.74–1.28	0.04	**1.21**	**1.08–1.35**	**11.37** ***	0.88	0.73–1.07	1.66
Marital Status	Single/Never Married			**9.71** **			3.63			5.96			**6.17** *
	Married/Partnered	1.10	0.89–1.35	0.76	1.12	0.84–1.49	0.62	1.11	0.99–1.24	2.99	1.17	1.00–1.37	3.64
	Widowed/Sep/Dvrcd	0.84	0.67–1.06	2.09	0.91	0.66–1.26	0.34	**1.17**	**1.03–1.33**	**5.96** *	**1.26**	**1.05–1.51**	**6.11** *
		Socioeconomic Indicators											
Income	>$80,000/year	**0.81**	**0.71–0.93**	**8.79** **	**0.84**	**0.70–0.99**	**4.11** *	**0.69**	**0.62–0.76**	**55.87** ***	**0.70**	**0.62–0.78**	**37.08** ***
Education Level	Some College or Higher	0.90	0.77–1.05	1.87	0.87	0.72–1.07	1.75	**0.71**	**0.65–0.76**	**77.48** ***	**0.71**	**0.64–0.79**	**41.77** ***
Psychosocial Variables													
Before 9/11 Psychiatric Diagnosis		**4.67**	**4.00–5.44**	**386.98** ***	**5.30**	**4.39–6.41**	**298.44** ***	**2.52**	**2.28–2.78**	**332.92** ***	**2.70**	**2.39–3.05**	**249.41** ***
Sum Before 9/11 Stressors		**0.96**	**0.92–0.99**	**5.43** *	**0.93**	**0.88–0.98**	**8.04** **	**0.96**	**0.94–0.98**	**18.70** ***	**0.95**	**0.92–0.97**	**17.65** ***
Sum WTC-Related Exposures		**1.32**	**1.27–1.37**	**246.10** ***	**1.33**	**1.27–1.39**	**150.35** ***	**1.17**	**1.15–1.19**	**229 91** ***	**1.15**	**1.12–1.18**	**108.69** ***
Sum After WTC Stressors		**1.28**	**1.25–1.32**	**294.14** ***	**1.27**	**1.23–1.33**	**146.25** ***	**1.24**	**1.22–1.26**	**777.25** ***	**1.26**	**1.23–1.28**	**436.62** ***
Sum WTC-Related Medical Conditions		**1.12**	**1.04–1.20**	**8.18** **	**1.16**	**1.05–1.27**	**8.69** **	0.95	0.90–1.00	3.36	0.98	0.92–1.05	0.41
Family Support during WTC Recovery Effort		**0.89**	**0.84–0.93**	**22.71** ***	**0.86**	**0.81–0.92**	**19.91** ***	**0.94**	**0.91–0.97**	**17.88** ***	**0.91**	**0.87–0.94**	**21.62** ***
Work Support during WTC Recovery Effort		**0.85**	**0.77–0.93**	**11.39** ***	**0.83**	**0.74–0.94**	**9.28** **	**0.88**	**0.83–0.93**	**19.06** ***	**0.91**	**0.84–0.98**	**6.33** *

Note. Probable PTSD (posttraumatic stress disorder) was assessed using the Posttraumatic Stress Checklist-Specific Version (PCL-S); R2= coefficient of determination, a number that indicates how well data fit a statistical model as the proportion of total variation of outcomes explained by the model; ΔR^2=change in coefficient of determination when race/ethnicity x independent variable interaction terms incorporated into model (from Model 1; OR= exponentiated coefficient exp(β); Significant predictors are bolded

*
p < .05

**
p <.01

***
p < .001.

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