HHS Public Access

Author manuscript

J Racial Ethn Health Disparities. Author manuscript; available in PMC 2018 February 01.

Published in final edited form as:

J Racial Ethn Health Disparities. 2017 February ; 4(1): 94–103. doi:10.1007/s40615-015-0206-8.

Racial Differences in Posttraumatic Stress Disorder Vulnerability Following Hurricane Katrina Among a Sample of Adult Ever Smokers from New Orleans

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Abstract

Although blacks are more likely than whites to experience posttraumatic stress disorder (PTSD) after a natural disaster, the reasons for this disparity are unclear. This study explores whether race is associated with PTSD after adjusting for differences in preexisting vulnerabilities, exposure to stressors, and loss of social support due to Hurricane Katrina using a representative sample of 279 black and white adult ever smokers who were present when Hurricane Katrina struck, and identified it as the most traumatic event in their lifetime. Multiple logistic regression models evaluated whether differential vulnerability (pre-hurricane physical and mental health functioning, and education level), differential exposure to hurricane-related stressors, and loss of social support deterioration reduced the association of race with PTSD. Blacks were more likely than whites to screen positive for PTSD (49% vs. 39% respectively, p=0.030). Although blacks reported greater pre-hurricane vulnerability (worse mental health functioning and lower educational attainment) and hurricane-related stressor exposure, and had less social support after the hurricane, only pre-hurricane mental health functioning attenuated the association of race with screening positive for PTSD. Thus, racial differences in pre-hurricane functioning, particularly poorer mental health, may partially explain racial disparities in PTSD after natural disasters, such as Hurricane Katrina. Future studies should examine these associations prospectively using representative cohorts of

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Conflict of Interest: All authors declare that they have no competing interests.

COMPLIANCE WITH ETHICAL STANDARDS

Ethical Approval: Procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments (or comparable ethical standards). This protocol was approved as ethical by the University of Memphis's Institutional Review Board.

Informed consent: Informed consent was obtained from all individual participants included in the study.

black and whites, and include measures of residential segregation and discrimination, which may further our understanding of racial disparities in PTSD after a natural disaster.

Keywords

Racial disparity; PTSD; vulnerability; exposure; social support; & Hurricane Katrina

INTRODUCTION

Over the course of a lifetime, 80–90% of people in the United States will experience a traumatic event (e.g., a serious accident or natural disaster), and of those, 5–10% will be diagnosed with Posttraumatic Stress Disorder (PTSD) [1]. The social, psychological, and health-related consequences of PTSD are considerable, including increased risk for unemployment, marital instability, homelessness, aggression, and criminality [2]; impaired social functioning [3]; secondary mental and substance use disorders [4, 5]; increased risk for suicide [6]; and increased risk for cardiovascular, gastrointestinal, and musculoskeletal disorders [7–9].

Cross-sectional studies using large nationally representative datasets, including the Collaborative Psychiatric Epidemiology Surveys and National Epidemiologic Survey on Alcohol and Related Conditions, consistently show a racial disparity in the lifetime prevalence of PTSD. Blacks have the highest prevalence of PTSD compared to whites, Hispanics, and Asians [10–12]. Similarly, studies examining the incidence of PTSD after a natural disaster find that blacks, compared to whites, have an increased risk for PTSD [13–14].

Why blacks are at a greater risk for PTSD is not well understood. Previous research suggests this disparity may be related to specific preexisting, trauma-specific, and post-trauma factors [14–16]. In terms of preexisting factors (also known as *differential vulnerability*), blacks may have an increased risk for PTSD due to historical, economic, and social circumstances that influence their response to traumatic events. For example, blacks, compared to whites, have limited access to economic and social resources that buffer the impact of traumatic events [17], and these preexisting vulnerabilities will increase their risk for PTSD regardless of whether they are similarly or differentially exposed to a traumatic event.

Blacks may be at a greater risk for PTSD because of deterioration of social support—derived from families and communities—in the aftermath of a traumatic event (also known as *social support deterioration)* [18]. Blacks, more so than other populations, rely on support received from their family and community to cope with stressful or traumatic events [19, 20]; the support derived from these relations insulates them from the harmful effects of stress [21]. As such, the erosion of families and communities because of large-scale traumatic events, such as a natural disaster or a terrorist attack, may disproportionately cause distress among blacks [22, 33].

Lastly, blacks may be more likely than whites to experience PTSD because they experience more severe consequences of traumatic experiences, which may be related to living in areas

susceptible to traumatic events, juxtaposed with the inability of these areas to effectively manage these events [15]. For example, following Hurricane Andrew, blacks, compared to whites, reported increased exposure to personal and neighborhood trauma (e.g. community destruction), and higher rates of posttraumatic stress among blacks was explained by the level of exposure [15].

These preexisting, trauma-specific, and post-trauma factors have been selectively examined in national [10, 11] and regional samples [13, 14, 24]. Roberts et al. tested the differential exposure hypothesis in a representative sample of U.S. adults, and found that across a lifetime, blacks had a lower rate of exposure to any traumatic event, but a slightly higher likelihood of developing PTSD compared to whites [11]. Alegría et al. replicated these findings in another representative sample of U.S. adults, finding that although certain traumatic events, such as combat or witnessing a homicide, were more common among blacks than other ethnic groups, after adjusting for these differences, the higher lifetime risk for PTSD was not eliminated or reduced [10]. Alegría et al. also tested components of the social support deterioration and differential vulnerability hypotheses. Surprisingly, they found that rather than reducing the risk differential for PTSD, adjusting for clinical history (i.e. history of mental illness) and social support increased the racial disparity in PTSD.

Regional studies have examined these hypotheses in the context of exposure to specific natural disasters. One study examined the incidence of screening positive for mental illness among a representative sample of Hurricane Katrina survivors (N=144). Blacks were three times more likely than whites to screen positive for serious mental illness after Hurricane Katrina. However, after adjusting for sociodemographic factors, disaster-related trauma, and social support, race was no longer associated with serious mental illness [24]. Another study used a sample of 304 military veterans exposed to Hurricane Katrina, and found that blacks, compared to whites, were more likely to screen positive for PTSD, even after controlling for key social support, vulnerability, exposure, and sociodemographic variables [14]. Lastly, a study of 1,249 adult survivors of Hurricane Ike found that blacks, compared to whites, were more likely to screen positive for PTSD; however, adjusting for differential exposure did not explain race differences in screening positive for PTSD [13].

As reviewed above, only a few studies have examined racial disparities in PTSD resulting from exposure to a disaster. While blacks consistently have been shown to be more likely to experience PTSD, findings have been mixed as to whether this disparity is related to differential vulnerability, exposure, or social support deterioration. We examined these associations in a population at high risk for developing PTSD—New Orleans adults who reported Hurricane Katrina as the most traumatic event in their lifetime, and were current or former cigarette smokers. Smoking is an important risk factor for PTSD [25, 26]. Based on previous literature, we predicted that blacks, compared to whites, would be more likely to screen positive for PTSD following Hurricane Katrina. Further, we hypothesized that blacks would be more likely to report preexisting vulnerabilities, trauma-specific exposures, and post-trauma social support deterioration, and adjusting for these factors would reduce the association of race with PTSD.

METHODS

Design and Participants

Data for this study were collected as part of a larger study on the effects of Hurricane Katrina on tobacco use. Participants were New Orleans residents, 18–74 years of age, English-speaking, who had smoked at least 100 cigarettes in their lifetime, and who had been in New Orleans immediately prior to Hurricane Katrina, and then returned to New Orleans by the time of survey administration. They were selected using random digit dialing methods (procedures described below). Approximately 1,531 eligible participants were contacted, and 1,003 (65.5%) completed the survey; 274 participants refused to participate in the study, and 254 participants discontinued the survey before completion. The final sample was 66.7% white, 26.6% black, 3.3% Hispanic, .6% Asian, and 2.7% “other”.

For the current study, we selected black and white participants who reported at least one traumatic event in their lifetime (defined as an experience involving actual or threatened death or serious injury, and involving intense fear, helplessness, or horror), and identified Hurricane Katrina as the most traumatic event in their lifetime; 279 participants met these criteria.

Procedures

The target population—residents of New Orleans Metropolitan Area—was covered by the phone area code (504), and primarily included the cities of New Orleans, Metairie, Kenner, Chalmette, and residential neighborhoods located to the south of the Mississippi river, also known as the West Bank. New Orleans landline telephone numbers in the 504 area code were purchased from a large commercial marketing agency (Scientific Telephone Samples, CA). Records were kept on all calls to working and non-working numbers.

A two-stage sampling protocol was used where (1) a household with a working telephone was selected using random digit dialing, and (2) a smoker within a household was selected if they met eligibility criteria (described above). If more than one eligible adult resided in the selected household, then the person with the most recent birthdate was interviewed. Substitutions were allowed only when the pre-designated person refused to participate or could not be reached. At least 25 attempts were made to contact a household before listing it as a non-contact.

Interviews were conducted approximately 15 months after Hurricane Katrina, between October 25, 2006 and January 20, 2007, and were completed by trained personnel using computer-assisted telephone interviewing. The protocol was approved by the University of Memphis Institutional Review Board, and verbal informed consent to complete the survey was obtained from participants.

Measures

Variables analyzed in this study included PTSD symptomatology, social support, physical and mental health, exposure to Hurricane Katrina-related stressors, smoking status, and sociodemographics, as described below.

PTSD—The primary outcome variable was whether the participant screened positive for PTSD, based on Breslau's Short Screening Scale for DSM-IV Posttraumatic Stress Disorder [1, 27]. The questionnaire is comprised of seven dichotomous items based on the PTSD section of the National Institute of Mental Health Diagnostic Interview Schedule for DSM-IV, and the World Health Organization Composite International Diagnostic Interview, version 2.1 [28]. A cut-off score of four represents a positive screen for PTSD (80% sensitivity, 97% specificity) [27]. This instrument demonstrates construct validity, evidenced by a strong correlation with PTSD diagnosis based on the structured clinical interview for DSM-IV Disorders [27].

Preexisting vulnerabilities—Two items selected from the Short Form Health Survey (SF-36) assessed physical and mental health prior to Hurricane Katrina. The SF-36 is a widely used instrument that measures subjective functional health and well-being [29]. The first item came from the general health subscale of the SF-36 and asked, "Before Hurricane Katrina, how was your health?", responses included "excellent", "very good", "good", and "poor". Due to substantial skewing, this variable was dichotomized to compare "excellent" and "very good" health to "good" and "poor" health. The second item came from the mental health subscale of the SF-36 and asked, "During the last 30 days before Hurricane Katrina, for how many days was your mental health not good?", and participants reported the number of days of poor mental health (min=0 and max=30). This variable was dichotomized to compare participants who reported ≥14 days of poor mental health against participants who did not. A participant who reported ≥14 days was identified as having frequent mental distress (FMD), which is associated with clinical depression and anxiety disorders [30].

Lastly, education was measured with one item, "What is your highest level of education?", responses included "no school", "1–4 years", "5–8 years", "some high school", "completed technical school instead of high school", "completed high school", "post high school business or trade school", "1–3 years of college", "completed college", and "completed advanced degree". This variable was dichotomized to compare participants who had >12 years of education against those who had ≤12 years of education.

Social Support—The following four items from the Medical Outcomes Study Social Support Survey (MOS-SSS) [31] were used to measure social support: How often was someone available to help you if you were confined to bed?"; "How often was someone available to help give you good advice about a crisis?"; "How often was someone available to love you and make you feel wanted?"; and "How often was someone available to do something enjoyable with?". Responses included "none", "some", "most", and "all the time". All questions were asked twice, but were prefaced with either "during the last 30 days…" or "30 days before Hurricane Katrina…" in order to measure social support both before and after Hurricane Katrina. In prior research, the MOS-SSS showed high internal consistency (α=.91–.96) [31], and demonstrated construct validity, as evidenced by moderate correlations with loneliness (r=− .67), family functioning (r=.53), marital functioning (r=.56), and mental health (r=.45) [31]. The inter-item reliabilities of both scales in this present study also were high (α=.871 and α=.809, respectively).

Change in social support was calculated by subtracting the pre-Katrina social support rating from the post-Katrina rating. Change scores ranged from −12 to 12, with positive scores reflecting gains in social support.

Hurricane Katrina-related stressful exposures—We created an 11-item checklist of Hurricane Katrina-specific stressful exposures. Participants responded “yes” or “no” to items asking whether “One or more persons of your immediate family was missing?”, “One or more persons of your extended family or one of more of your close friends was missing?”, “A member of your immediate family died because of Katrina?”, “A member of your extended family died or one of your close friends died because of Katrina?”, “You spent time inside the Superdome.”; “You spent time inside the Convention Center.”, “You spent time in a public shelter?”, “You spent time at least a day outside on the street or overpass?”, “You were trapped in your home and had to be rescued?”, and “You were trapped somewhere other than your home and had to be rescued?” The last question asked, “As far as you know, was your home where you were living when Katrina struck…” responses included “destroyed”, “seriously damaged”, and “not seriously damaged”. Due to substantial skewing, this variable was dichotomized to compare homes that were not seriously damaged to homes that were “seriously damaged” or “destroyed”.

Because the scale did not weight items in terms of severity or consequences of the exposures, we created two categorical variables reflecting severe stressors, including having a family or friend who was missing because of Katrina, and having a family member of friend die because of Katrina. These two computed variables, along with the item reflecting whether one’s home was damaged, were used in multivariable models as dummy-coded indicators of hurricane-related stressful exposures. Lastly, we created a single-item continuous variable reflecting the sum of all exposures reported by summing responses to the 11 items (range of 0–11).

Covariates—Covariates for analyses included sex, age, household income, and smoking status. For analysis, smoking status was dichotomized (former smoker vs. current smoker), and income was trichotomized (≥ $40,000 (ref) vs. <$40,000 vs. refused to answer).

Data Analysis Plan

The sample contained more whites and females, and was slightly older, than the New Orleans Metropolitan area population distribution based on the 2000 U.S. census for Louisiana; thus, we weighted the sample for race, sex, and age in each analysis. To incorporate sample design in analyses, PROC SURVEYLOGISTIC was used in SAS 9.3 [32].

Descriptive statistics presented as means (SD) or percentages, with independent t-tests and chi-square tests conducted as appropriate. The Baron and Kenny [33] approach assessed how each set of determinants (differential vulnerability, differential exposure, and social support deterioration) affected the association of race with PTSD. First, the association of race with PTSD was tested before adjusting for preexisting vulnerabilities, trauma-specific exposures, and post-trauma social support deterioration factors. Next, separate multiple logistic regression models tested the associations of differential vulnerability, differential exposure,

and social support deterioration, and race with screening positive for PTSD following Hurricane Katrina. A final model tested the association of race with PTSD adjusted for all hypothesized factors. All models included sex, age, income, and smoking status as covariates, and non-significant (p>.10) interactions were removed.

RESULTS

Sample Characteristics

As shown in Table 1, study participants were on average 42 years of age, 71% were female, 43% earned less than $40,000, and 57% were current smokers.

Association of Race with PTSD Following Hurricane Katrina

In the sample as a whole, the average weighted score for Breslau's 7-item PTSD scale was 3.3 (SD=2.0), and 41% screened positive for PTSD (Breslau's 7-item PTSD scale ≥4). As shown in Table 1, blacks scored higher on Breslau's 7-item PTSD scale than whites (3.8 vs. 3.1, respectively, p<.001), and were more likely to screen positive for PTSD (49% vs, 39%, respectively, p=.003). Adjusted for covariates (sex, income, age, and smoking status), blacks had approximately two-fold greater odds of screening positive for PTSD compared to whites (OR=2.14, 95% CI=1.07–4.29) (Table 2, Model 1).

Associations of Preexisting Vulnerabilities, Race, and PTSD

Fifty-three percent of participants reported that their overall health was less than "good" ("fair" or "poor"), and there was no association of overall health with race (p=.943). Blacks, compared to whites, were more likely to have less than 12 years of education prior to Hurricane Katrina (65% vs. 40% respectively, p=.001). Further, Blacks, compared to whites, were more likely to experience frequent mental distress (≥14 days of poor mental health) prior to Hurricane Katrina (29% vs. 14% respectively, p=.010).

In the logistic regression model, race did not significantly interact with overall health, frequent mental distress, or education (all p-values >.220). After adjusting for overall health, frequent mental distress, education, and covariates, the association of race with a positive a screen for PTSD was reduced, and was no longer statistically significant (adjusted OR=1.93 [0.88–4.21], p=.100). In addition, frequent mental distress prior to Hurricane Katrina was significantly associated with a positive a screen for PTSD (adjusted OR=5.92 [2.46–14.23]). Overall health and education were not associated with a positive a screen for PTSD (Table 2, Model 2).

To evaluate which preexisting vulnerabilities had the greatest influence on reducing the association of race and PTSD, we conducted three additional multivariate logistic regression analyses, each model including only one of the vulnerabilities (overall health, frequent mental distress, or education level). Frequent mental distress reduced the association of race with PTSD, and race was no longer statistically significant (adjusted OR=1.90 [0.89–4.06], p=0.10). Overall health and education did not reduce the association of race with PTSD, nor were these factors significantly associated with PTSD.

Associations of Social Support Deterioration, Race, and PTSD

Blacks and whites reported similar levels of social support before Katrina, but blacks reported less social support in the past month (8.4 vs. 9.5, p=.018). Social support decreased slightly more among blacks than whites from before to after Katrina (−1.0 vs. −0.4), but this difference was not statistically significant (p=.139).

In a logistic regression model predicting PTSD screening status, the interaction terms for race with pre-Katrina social support and change in social support were not significant (p=.482 and p=.956 respectively). After removing non-significant interactions and repeating the analysis, the association of race and screening positive for PTSD was slightly attenuated but remained significant (adjusted OR=2.11 [1.04–4.25], p=.038) (Table 2, Model 3). In addition, greater social support before Katrina was associated with lower risk of screening positive for PTSD (adjusted OR=0.84 [0.75–0.94]). Change in social support was not associated with a positive a screen for PTSD.

Associations of Hurricane Katrina-Related Stressful Exposures, Race, and PTSD

Blacks and whites did not differ significantly in the likelihood of reporting the death of a family member or friend, or having a home damaged. However, blacks were more likely to report a missing family member or friend (44% vs. 33% respectively, p=.027). Further, blacks were on average exposed to more Katrina-related events (2.0 vs. 1.1, respectively, p<.001).

In a logistic regression model predicting PTSD screening status, race did not significantly interact with housing damage, reporting a death of a close family member or friend, or reporting a missing family member or friend (all p-values ≥.380). After adjusting for reporting the death of a family member/friend, having a family member or friend missing, and housing damage, as well as covariates, the magnitude of the association of race with screening positive for PTSD increased and remained significant (adjusted OR=2.25 [1.11–4.60], p=.025;Table 2, Model 4). In addition, reporting the death of a close family member or friend was associated with reduced odds of screening positive for PTSD (adjusted OR=0.37 [0.15–0.93]). Having housing damage or a missing family member or friend was not associated with a positive a screen for PTSD.

Lastly, an additional multivariable logistic regression analysis investigated the total number of Katrina-related stressful exposures as a predictor. The interaction of race by total number of exposures was not significant (p=.928). After removing the non-significant interaction and repeating the analysis, race remained significantly associated with screening positive for PTSD, even after adjusting for total number of exposures and covariates (adjusted OR=2.01 [1.00–4.39], p=.050). Total number of exposures was not associated with a positive a screen for PTSD.

Association of Race and PTSD Following Full Adjustment for Potential Factors

The final model (Table 2, Model 5) included all variables from the differential vulnerability, differential exposure, and social support deterioration hypotheses. This model included no interactions, and was adjusted for covariates (e.g. sex, income, age, and smoking status). The

association of race with PTSD was reduced and became non-significant after fully adjusting for preexisting vulnerabilities, trauma-specific exposures, and post-trauma social support deterioration factors (adjusted OR=1.96 [0.90–4.26], p=.088). Frequent mental distress prior to Hurricane Katrina was significantly associated with screening positive for PTSD (adjusted OR=5.14 [2.07–12.80]). Moreover, greater social support before Katrina was associated with lower risk of screening positive for PTSD (adjusted OR=0.87 [0.77–0.98]). None of the other hypothesized factors was associated with screening positive for PTSD following Hurricane Katrina.

DISCUSSION

This study examined whether blacks were more likely than whites in New Orleans to screen positive for PTSD after Hurricane Katrina, and if so, whether this disparity could be explained by differences in pre-Katrina vulnerabilities, exposure to hurricane-related stressors, or deterioration of social support. Blacks had approximately two-fold greater odds of screening positive for PTSD. In addition, blacks reported worse mental health in the month prior to Katrina, more hurricane-related stressful events, and less social support after Katrina. Although most of these factors increased the risk for screening positive for PTSD, only pre-Katrina vulnerabilities, in particular reporting frequent mental distress during the month before Hurricane Katrina substantially reduced the strength of the association of race with PTSD, lending support that differential vulnerability between blacks and whites may be an important factor to consider when exploring racial disparities in PTSD.

These findings differ from Davis et al. [14] who found that adjusting for these factors did not reduce the association of race with PTSD. These conflicting results may be due to differences in how mental health before Hurricane Katrina was measured; Davis et al. collected data on mental disorders by reviewing participants' medical records for formally diagnosed mental disorders. Blacks, compared to whites, underutilize mental health services [34, 35], and are less likely to be formally diagnosed with mental disorders, such as depression [35, 36]. In addition, psychological distress is often expressed within a cultural framework [37, 38], and cultural variations of common disorders may not be formally diagnosed when using the DSM-V5 [39], leading to the false impression that blacks have low rates of psychopathology. In contrast to Davis et al. [14], our study assessed self-reported mental health functioning rather than formal psychiatric diagnoses, which may provide a more sensitive indicator of distress among blacks.

The differential vulnerability hypothesis reduced the association of race with screening positive for PTSD largely because blacks, compared to whites, were more likely to experience frequent mental distress (≥14 days of poor mental health) prior to Hurricane Katrina (29% vs. 14% respectively, p=.010). In general, blacks, report more negative events and chronic stressors—witnessing violence, receiving bad news, death events, lifetime major discrimination, daily discrimination—than whites, which negatively affects their mental health [40, 41]. In addition, survivors of disasters with prior mental health problems are at a greater risk for new or renewed mental disorders including PTSD [42–44]. Altogether, these findings suggest that blacks, compared to whites, were at a high-risk for screening positive

for PTSD, or perhaps had delayed onset PTSD [45], before Hurricane Katrina struck, and the hurricane may have triggered the symptoms to manifest.

The fact that only preexisting mental illness reduced the race disparity in PTSD indicates that other preexisting vulnerabilities need to be accounted for when attempting to explain race disparities in mental health, such as racial segregation and discrimination [41]. Blacks have a history of marginalization, face racial and social discrimination, and have multigenerational cultural experiences that encourage mistrust. These experiences might affect how blacks respond to and cope with a natural disaster such as Hurricane Katrina. In addition, blacks are more segregated than any other racial/ethnic group in the United States [46, 47], and racial segregation is associated with poorer quality housing and neighborhoods that have limited resources to enhance health and well-being. Further, concentrated poverty in racially segregated environments is associated with elevated levels and increased exposure to chronic and acute stressors [41]. A recent study found that blacks, compared to whites and U.S. born Hispanics, reported more exposure to psychosocial stressors, and psychosocial exposure partially explained the association of race with health status [40]. Baseline traumatic event exposure, perceived discrimination, and racial segregation should be incorporated into explanatory models because these variables may affect how blacks respond to traumatic stressors.

An unexpected finding was that reporting the Katrina-related death of a family or friend was associated with a reduced risk of screening positive for PTSD. This counterintuitive finding may have resulted from the relatively small number of participants who reported a death in our study (n=56), unmeasured confounding factors such as how directly they experienced these stressors (e.g., whether a death was witnessed), the strength of the relationship with the victim, or benefits that may have accrued due to a death that reduced the risk of PTSD (e.g., enhanced social or financial support).

Limitations of this study should be noted. First, all data were self-reported and cross-sectional, and pre-Katrina functioning (e.g., mental and physical health status, and social support) was assessed retrospectively; therefore this study cannot establish the directionality of these associations, and participants who reported current PTSD symptoms may be more likely to describe their mental health before Hurricane Katrina as poor, indicating reverse causation. Further, widespread media coverage of Hurricane Katrina, its devastation, and the poorly organized response by the Federal Government afterwards may have caused participants to overestimate self-reported PTSD symptoms and other physical and mental health issues. These design features and the unfortunate circumstances surrounding Hurricane Katrina may produce error or bias in recall, which may cause some degree of misspecification of the race/PTSD association [48]. Second, this study included only participants who reported Hurricane Katrina as their most traumatic event in their lifetime. Participants who experienced a more traumatic event in their lifetime other than Hurricane Katrina were excluded; these participants may have experienced PTSD symptomatology as a result of Hurricane Katrina, which would lower our incidence estimates. Third, our sample was selected from a population of current and former cigarette smokers. Although smoking is an important risk factor for PTSD, these findings may not be applicable to the general population. Fourth, because the study was a large, phone-based survey, we could only assess

self-reported PTSD symptomatology, and some degree of misclassification is inevitable. However, the PTSD screener used in our study has shown excellent sensitivity and specificity compared to interviewer-elicited PTSD diagnosis [27]. Lastly, although we used population-based, representative sampling, this sample is only representative of people who used landline phones and had returned to New Orleans at the time of the survey. In 2006, the New Orleans population was 187,525 (44% white and 46% black) [49]. New Orleans lost nearly half of its population after Hurricane Katrina, and most of the city's black residents, who were formerly 66.7% of the population, were the slowest to return [50]. Blacks who did not return to New Orleans may have been more marginalized, and have suffered even higher levels of PTSD than the blacks who returned, which suggests that we may have underestimated PTSD symptomatology.

In conclusion, among a high risk for PTSD sample—adult ever smokers in New Orleans who reported Hurricane Katrina as the most traumatic event in their lifetime—blacks had a twofold greater likelihood of screening positive for PTSD because of Hurricane Katrina, compared to whites. Although blacks reported greater preexisting vulnerabilities, hurricane-related stressful exposures, and worse social support, only greater pre-Hurricane mental distress reduced the association of race with screening positive for PTSD. Future studies should examine these associations prospectively using representative cohorts of black and whites, and include more comprehensive measures of preexisting vulnerabilities such as residential segregation and discrimination, which may increase our understanding of racial disparities in PTSD after a natural disaster.

Acknowledgments

Funding: The study was supported by a National Institute on Drug Abuse grant (1 R21 DA021782-01, K. Ward, PI).

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Table 1

Characteristics of the study population (weighted estimates)

	N (%) or mean (SD)			
	Total (*N*=279)	**Whites (n=213)**	**Blacks (n=66)**	***P***
Demographics				
Age	42 (15)	43 (14)	40 (18)	.234
Sex (% of females)	198 (71%)	148 (70%)	50 (76%)	.963
Income				
<40,000$	119 (43%)	76 (36%)	43 (65%)	<.001
≥40,000$	129 (46%)	110 (52%)	19 (29%)	
Refused to Answer	31 (11%)	27 (13%)	4 (6%)	
Smoking history (% of current smokers)	158 (57%)	115 (54%)	43 (65%)	.198
Short screening scale for PTSD score	3.3 (2.0)	3.1 (1.9)	3.8 (2.3)	<.001
PTSD (% of scores ≥4)	114 (41%)	82 (39%)	32 (49%)	.003
Differential Vulnerability Hypothesis				
Overall health (% of health ≤good)	147 (53%)	108 (51%)	39 (59%)	.943
Frequent mental distress (% of ≥14 days of poor mental health)	48 (17%)	29 (14%)	19 (29%)	.010
Education (% under 12 years of education)	129 (46%)	86 (40%)	43 (65%)	.001
Social Support Deterioration Hypothesis				
Social support (before Hurricane Katrina)	9.8 (2.9)	9.9 (2.6)	9.4 (3.6)	.282
Social support (after Hurricane Katrina)	9.2 (3.1)	9.5 (2.8)	8.4 (3.8)	.018
Change in social support (after–before)	−0.6 (2.8)	−0.4 (2.5)	−1.0 (3.5)	.139
Differential Exposure Hypothesis				
Housing damage (% of homes with major damage or destroyed)	109 (39%)	77 (36%)	32 (48%)	.233
Reported death of family member or friend (%)	56 (20%)	34 (16%)	22 (33%)	.219
Reported family member or friend being missing (%)	99 (35%)	70 (33%)	29 (44%)	.027
Total number of Hurricane Katrina-related stressful exposures	1.4(1.3)	1.1 (1.2)	2.0 (1.5)	<.001

J Racial Ethn Health Disparities. Author manuscript; available in PMC 2018 February 01.

Table 2

Results of adjusted logistic regression analyses examining the association of preexisting, trauma-specific, and post-trauma factors with screening positive for PTSD after Hurricane Katrina (weighted estimates)

	Model 1[a]		Model 2[b]		Model 3[c]		Model 4[d]		Model 5[e]	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Race										
Whites	ref									
Blacks	2.14*	1.07–4.30	1.93	0.88–4.21	2.11*	1.04–4.25	2.26*	1.11–4.60	1.96	0.90–4.26
Health										
>Good			ref							
≤ Good			0.74	0.36–1.54					0.77	0.38–1.56
FMD										
No			ref							
Yes			5.92**	2.46–14.23					5.14**	2.06–12.80
Education										
>12 years			ref							
≤12 years			0.98	0.47–2.05					1.01	0.49–2.09
Social Support (Before)					0.84**	0.75–0.94			0.87**	0.77–0.98
Change in Social Support					0.91	0.81–1.02			0.93	0.83–1.05
Housing Damage										
Minor							ref			
>Minor							1.72	0.91–3.28	1.70	0.85–3.39
Death										
No							ref			
Yes							0.37*	0.15–0.94	0.46	0.18–1.14
Missing										
No							ref			
Yes							1.17	0.60–2.30	1.11	0.54–2.30

Note: Analyses were adjusted for sex (male (ref) vs. female), age, income (≥$40,000 (ref) vs. <$40,000 vs. refused to answer), and smoking status (former smoker (ref) vs. current smoker).

[a]Model 1: Association of race and screening positive for PTSD, adjusted for covariates.

[b] Model 2: Fully adjusted associations of race and pre-hurricane vulnerability factors.

[c] Model 3: Fully adjusted associations of race and pre-hurricane social support and change in social support.

[d] Model 4: Fully adjusted associations of race and Katrina-related stressful exposures.

[e] Model 5: Fully adjusted associations of race, pre-hurricane vulnerability factors, pre-hurricane social support, change in social support, and Katrina-related stressful exposures.

* $p<.05$

** $p<.01$