HHS Public Access

Author manuscript

J Affect Disord. Author manuscript; available in PMC 2017 January 15.

Published in final edited form as:

J Affect Disord. 2016 January 15; 190: 227–234. doi:10.1016/j.jad.2015.09.023.

Traumatic stress and cardiopulmonary disease burden among low-income, urban heart failure patients

April Taylor-Clift[1],
Rush University Medical Center

Lucie Holmgreen[2],
Rush University Medical Center

Stevan E. Hobfoll,
Rush University Medical Center

James I. Gerhart,
Rush University Medical Center

DeJuran Richardson,
Lake Forest College and Rush University Medical Center

James E. Calvin, and
Schulich School of Medicine and Dentistry, Western University

Lynda H. Powell
Rush University Medical Center

Abstract

Background—Traumatic events and posttraumatic stress disorder (PTSD) are associated with increased risk for cardiopulmonary disease (CPD) in veterans, men, and primarily White populations. Less is known about trauma, PTSD, and CPD burden among low-income, racial minority residents who are at elevated risk for trauma and PTSD. It was hypothesized that traumatic events and PTSD would be significantly associated with CPD burden among low-income, racial minority residents.

Methods—We evaluated cross-sectional relationships between traumatic events, PTSD, depression, and CPD burden in 251 low-income, urban, primarily Black adults diagnosed with heart failure. Data were analyzed using bivariate analyses, logistic and linear regression.

Results—Forty-three percent endorsed at least one traumatic event. Twenty-one percent endorsed two or more traumatic events. In logistic regression analyses, traumatic events were associated with increased prevalence of coronary artery disease (adjusted odds=1.33, $p<.05$),

[2]Corresponding Author: Lucie Holmgreen, lucie_holmgreen@rush.edu. Behavioral Sciences Department, Rush University Medical Center, 1645 W. Jackson Blvd., Suite 400, Chicago, IL 60612. Telephone: (312) 942 8258. Fax: (312) 942 4990.
[1]Now at James A. Haley Veterans Affairs Medical Center, Tampa, FL.

hypertension (adjusted odds=1.28, p<.05), chronic obstructive pulmonary disease (adjusted odds=1.52, p<.01), and cardiac arrest (adjusted odds=1.27, p<.05). PTSD was also related to increased risk for chronic obstructive pulmonary disease (adjusted odds=1.22, p<.05) and was associated with earlier onset of heart failure (β=−.13, p < .05).

Limitations—The study utilizes cross-sectional, self-report data.

Conclusions—Findings support the link between traumatic events, PTSD, and CPD burden in low-income, primarily Black patients with heart failure. Depression appears to be less closely linked to CPD burden, despite receiving significant attention in the literature. The accumulation of traumatic events may exacerbate CPD burden among urban, low-income, racial minority residents with heart failure; findings highlight the importance of PTSD screening.

Keywords

Cardiopulmonary health; traumatic stress; health disparities; posttraumatic stress disorder; depression

Background[3]

The association between non-traumatic stress, depression, and cardiopulmonary disease (CPD) is well documented, whereas exposure to traumatic, life-threatening events and subsequent posttraumatic stress disorder's (PTSD) relationship to cardiopulmonary disease is less well studied. PTSD is a common psychiatric disorder that represents a dysregulation in the adaptive stress response to traumatic events. Lifetime prevalence of PTSD among U.S. residents is approximately 7 to 8% (Kessler et al., 2005), with prevalence rates ranging from 22 to 43% among low-income, inner-city residents (Alim et al., 2006; Davis et al., 2008; Liebschutz et al., 2007; Schwartz et al., 2005). Because urban, low-income communities in the U.S. are plagued with neighborhood disorder, violence, and high rates of sexual assault and intimate partner violence (Alim et al., 2006; Gapen et al., 2011; Gillespie et al., 2009), lifetime rates of traumatic events and PTSD are higher among their residents (Asnaani et al., 2010; Breslau, 2009; Hien and Ruglass, 2009; Schwartz et al., 2005). In the current study, we explore how traumatic events and PTSD are related to CPD burden (defined as a count of cardiopulmonary conditions known to precede, complicate, or result from heart failure (e.g., Taylor-Clift et al., 2015) among a low-income, primarily Black, urban population, and whether the relationships of traumatic events and PTSD with CPD burden are independent of the known relationship of depression with CPD burden (e.g., Barrick, 1999; Brown et al., 2009; Kupper et al., 2012; Shanmugam et al., 2007). Such findings could contribute to an understanding of health disparities in CPD for urban Blacks.

Past research has primarily examined the association between PTSD and CPD in large samples of higher income, White men. In a sample of primarily White, World War II prisoners of war, those with PTSD were at an increased risk of hypertension, circulatory diseases, and chronic ischemic heart disease (Kang et al., 2006). O'Toole and Catts (O'Toole and Catts, 2008) also found male, primarily White veterans with PTSD to be at increased

[3]Mandatory First Page Abbreviations Footnote: CPD: Cardiopulmonary disease.

risk for hypertension. Other studies have found, among similar samples of primarily White, male veterans with PSTD symptoms, increased risk for chronic heart disease (Kubzansky et al., 2007), atrioventricular conduction deficits and infarctions (Boscarino and Chang, 1999), pulmonary diseases (Boscarino, 1997; Pacella et al.,2013) and cardiopulmonary-related mortality, even after controlling for risk factors (Ahmadi et al., 2011; Boscarino, 2008; Flood et al., 2010). A large study of White men and women found that those with PTSD were at increased risk for angina and heart failure (Spitzer et al., 2009).

A limited number of studies have found PTSD to be related to CPD in racially diverse samples. PTSD was associated with risk for coronary heart disease among women (Kubzansky et al., 2007) and Native Americans (Sawchuk et al., 2005). In the nationally representative National Comorbidity Survey, which included a substantial portion of racial minority respondents, researchers found an association between PTSD and cardiovascular disease (CVD; Lauterbach et al., 2005), a subset of cardiopulmonary disease. Additionally, studying a large Michigan state Medicaid database, Seng and colleagues found that, as compared to women without PTSD, those with PTSD were more likely to report cardiopulmonary symptoms (Seng et al., 2006). Alternatively, there is also some evidence that Blacks, as compared to Whites, may not experience the same cardiopulmonary risk outcomes as a result of PTSD (Dedert et al., 2013).

Race may be an important contextual factor for understanding the association of traumatic events and CPD because the rates and burden of both traumatic events and CPD are high for Black, low-income, urban residents. Rates of traumatic events are significantly higher in these residents compared to their White, higher-socioeconomic status (SES) counterparts, and Black patients are less likely to seek or receive treatment for trauma-related disorders (Alim et al., 2006; Asnaani et al., 2010; Davis et al., 2008; Liebschutz et al., 2007; Schwartz et al., 2005).

The involvement of traumatic events and PTSD in CPD would have significant implications for CPD disparity in the U.S., and especially in the metropolitan Chicago area. Blacks in America carry a greater CPD disease burden than do Whites; for example, they have higher rates of hypertension (Burt et al., 1995), lose more years of life to stroke (Centers for Disease Control and Prevention, 2005), and die at higher rates from chronic obstructive pulmonary disease (Keppel et al., 2010). CPD disease burden is further compounded by low SES for Blacks; in particular, Black, low-income individuals in the Chicago metro area from which our sample was drawn have greater heart disease and lung cancer mortality than do their White, higher-SES counterparts (Orsi et al., 2010). Furthermore, this disparity has widened significantly, despite targeted efforts at decreasing CPD rates among Black Chicago residents (Orsi et al., 2010). Although SES and its associated variables (such as education and access to health care) have been suggested as additional contributory influences in racial minority CPD disparity, income alone does not appear to account for the differences. For instance, even within each income or educational bracket, Blacks have higher rates of CPD than do their White counterparts (Lillie-Blanton et al., 1996). The role of trauma exposure as an indirect indicator of Black-White health disparities has been under-explored but has been referred to by others (Geronimus, 2000).

The current study examined the associations between traumatic events, PTSD, depression, and CPD burden among a low-income, primarily Black population of inner-city residents from the metropolitan Chicago area who had previously been diagnosed with congestive heart failure. Data were from baseline assessment of participants in the Congestive Heart Failure Adherence Redesign Trial (CHART), an ongoing, prospective, multi-hospital study in the Chicago metropolitan area aimed at reducing repeated hospitalizations in low-income congestive heart failure patients. We examined CPD burden, consisting of a count of conditions known to precede, complicate, or result from heart failure. This measure of burden is important because specific cardiopulmonary risk factors, complications, and comorbidities among patients with heart failure serve as indications of increased disease severity, vulnerability to repeated hospitalizations, and higher rates of mortality (Pistelli et al., 2003; Sidney et al., 2005). The current study specifically examines the presence of chronic obstructive pulmonary disease, coronary artery disease, hypertension, and history of myocardial infarction (heart attack) at baseline, prior to study intervention. Age at heart failure diagnosis and age when a myocardial infarction occurred were also collected. We predicted that lifetime exposure to traumatic events, not including health-related events, and current PTSD symptoms would predict earlier onset of heart failure above depression symptoms. We also predicted that traumatic events and PTSD symptoms would be related to increased CPD burden, as defined by higher numbers of CPD risk factors, comorbidities, and complications, independent of depression.

Method

Participants and Procedure

Data were from baseline assessment of participants in the CHART study, designed to reduce hospitalizations in patients with heart failure. The study recruited and intervened with physicians and their patients, with patients recruited first in most cases and physicians contacted and consented subsequently. Patients were recruited in three ways; specifically, they were screened as medical inpatients or outpatients at five Chicago hospitals or were referred by physicians at those hospitals who had already been enrolled in the study themselves. Patients were therefore recruited on the basis of medical, not mental health, treatment seeking. A subset of CHART participants (consisting of the first 251 enrolled) were examined for this study. In total, the current sample represents recruiting at a stage with 61 physicians recruited, 1874 patients screened, 1132 patients excluded for failure to meet inclusion criteria or for meeting exclusion criteria (see below), and a final 251 patients enrolled following screening.

Eligibility included being 18 years or older, English or Spanish speaking, diagnosis of heart failure, earning less than $30,000 per year, having at least one hospitalization for heart failure during the prior 6 months, and physical evidence of systolic dysfunction, defined by an ejection of less than 50 according to an echocardiography, radiographic contrast ventriculography, or nuclear vetriculography, within the past 12 months. Patients were not eligible if they were listed for imminent cardiac transplant, had an advanced directive of “do not resuscitate,” or otherwise had an uncertain 12-month prognosis according to the study

cardiologist (author J.C.). Symptom measures were interviewer-administered in order to reduce patient burden.

The institutional review board at the treatment facility approved this study. Prior to consenting, potential participants were screened and excluded for cognitive impairment. Interested patients were scheduled for subsequent baseline assessment at their hospital of recruitment. They were encouraged to take the consent form home and consider participation if unsure at their initial visit. Consenting was available in Spanish and English, and all participants were asked to repeat back major ideas to ensure that their consent was informed. Safety protocols were in place for baseline exam components (e.g., safety guidelines for suicidality and traumatic event reporting as well as mandatory reporting procedures). Interviewers were experienced research assistants.

Measures

Demographic and Behavioral Characteristics—Participants answered questions about their demographics, including their age, gender, income, education, and relationship status. Additionally, they reported their tobacco and alcohol use.

Traumatic Events—The Lifetime Trauma Exposure from the Composite International Diagnostic Interview PTSD Module (Kessler et al., 1998) is an interviewer-administered 11-item measure evaluating exposure to traumatic stress events. Participants answer yes or no to a list of events, including physical assault, sexual assault, childhood sexual abuse, accidents, natural disasters, and other life-threatening events (excluding health-related events). Because exposure to one trauma does not imply exposure to another, internal consistency was not computed.

PTSD Symptoms—Participants responded to the six-item, interviewer-administered Short Form of the PTSD Checklist - Civilian Version (PCL-SF; Lang and Stein, 2005) by rating the severity of a posttraumatic stress symptom from 1 (not at all) to 5 (extremely). The measure is composed of two items each from the re-experiencing, avoidance, and hyperarousal symptom clusters. Example items are, “Repeated, disturbing memories, thoughts, or images of a stressful experience?”, “Avoiding activities or situations because they reminded you of a stressful experience?”, and “Feeling irritable or having angry outbursts?” The measure displays a sensitivity of 95% and a specificity of 72% (Lang and Stein, 2005). Internal consistency for the six-item measure was good in the current sample (Cronbach’s $\alpha = .85$).

Depression Symptoms—Participants responded to the nine-item, interviewer-administered Patient Health Questionnaire 9 (PHQ-9; Kroenke et al., 2001) by rating the frequency of a depression symptom from 1 (not at all) to 4 (nearly every day) for the two weeks prior to the administration of the measure. Example items are “Little interest or pleasure in doing things” and “Feeling low, depressed or hopeless.” Internal consistency for the nine-item measure was good in the current sample (Cronbach’s $\alpha = .82$). The PHQ-9 has excellent sensitivity (88%) and specificity (88%) at predicting major depression diagnosis

and correlates highly with sick days, functional difficulty, and health care utilization (Kroenke et al., 2001).

Medical History

Medical history was assessed following a confirmatory diagnosis of congestive heart failure by a cardiologist and randomization to either treatment as usual or treatment condition but prior to receiving treatment. Patients provided personal medical histories via a paper questionnaire. To assess CPD burden, patients were asked if a physician had ever given them a diagnosis of a number of health conditions, including a history of myocardial infarction (and age at occurrence), coronary artery disease, hypertension, chronic obstructive pulmonary disease, and early onset heart failure (assessed by asking for age at the time of heart failure diagnosis). Aside from age at heart failure diagnosis and myocardial infarction, participants were not asked to specify the dates or sequences of onset for diagnoses.

Statistical Analysis

All analyses were conducted using the Statistical Package for the Social Sciences (version 20, SPSS, Chicago, Illinois). Descriptive statistics were computed to characterize study variables and screen for violations of statistical assumptions. We first examined the relationships between disease variables of interest and PTSD symptoms and traumatic events. Descriptive data are presented for the entire sample, as well as by subgroups (presence of traumatic events, PTSD, and depression). Independent sample t-tests and chi-squared tests were used to examine differences in demographic and clinical characteristics between subgroups. Next, multivariate analyses were conducted using hierarchical multiple regression for age at heart failure diagnosis, and logistic regression was used for CPD burden outcomes. Those demographic variables that were found to be associated with CPD burden outcomes were entered into the models first. For the hierarchical regression model predicting age at onset of heart failure, the PTSD symptom total was entered in the next step, with the depression symptom total entered into the last step. For the logistic regression model, presence of trauma, probable PTSD diagnosis, and probable depressive disorder diagnosis were coded as 1 (with absence coded as 0). PTSD diagnosis and trauma presence were entered into the second step of separate models. Lastly, depression diagnosis was entered into the model.

Results

Table 1 lists demographic characteristics of the sample. Participants were primarily Black (88%), with approximately equal percentages of men and women (57% and 43%, respectively). Participants ranged in age from 26 to 86, averaging 57.36 years (SD 12.00). Sixty-one percent of the sample reported a household income of less than $10,000. A total of forty-three percent of participants reported exposure to at least one traumatic event, with 31% of these reporting exposures to at least two traumatic events. Twenty-one percent of those reporting exposure experienced more than three traumatic events. The most commonly endorsed traumatic event was “seeing someone seriously injured or violently killed” (23%), followed by “being attacked with a gun, knife or some other weapon” (19%) and “a serious accident at work, in a car or somewhere else” (18%). The mean reported PTSD score was

8.45 (SD=1.76). Based on the suggested clinical cut-off of 14 (Lang and Stein, 2005), 10% reported probable PTSD. Individuals with any traumatic event were more likely to have been past tobacco users (χ^2 =27.71, p < .001), to have less than a high school education (χ^2 =28.27, p < .001), and more likely to be living with a spouse or to be separated or divorced (χ^2 =20.01, p < .001). Individuals earning less than $5000 were more likely to have no past traumatic events, and individuals earning $25,000 to 29,999 were more likely to report past traumatic events (χ^2 =13.68, p < .05). Individuals with a probable depressive disorder were less likely to be widowed (χ^2 =10.12, p < .05).

The mean reported depression score was 4.95 (SD = 4.87), corresponding to mild levels of depression. Seventeen percent of the sample reported at least moderate symptoms of depression based on the suggested clinical cut-off score of 10 (Kroenke et al., 2001). The most commonly endorsed condition was hypertension (77%). As expected, those with one or more traumatic events were also more likely to meet criteria for probable depression (χ^2 =5.10, p < .05) and probable PTSD (χ^2 = 29.11, p < .001). Those with probable PTSD were more likely than those without probable PTSD to drink alcohol (χ^2 = 8.33, p < .01) and to meet criteria for probable depression (χ^2 = 57.50, p < .001).

Table 2 shows CPD burden in individuals with any traumatic events, probable PTSD, and probable depression. Individuals who had experienced any traumatic event were significantly more likely than others to have a history of cardiac arrest (χ2= 6.14, p < .05), coronary artery disease (χ2=7.33, p < .01), myocardial infarction (χ2=5.50, p < .05), and chronic obstructive pulmonary disease (χ2=10.37, p < .001). Additionally, those with chronic obstructive pulmonary disease (F = 25.15, p < .001), myocardial infarction (F=12.83, p < .001), coronary artery disease (F=19.27, p = .001), and cardiac arrest (F=6.30, p < .05) had significantly higher numbers of traumatic events compared to those without each condition. Individuals who experienced any traumatic event also had a significantly earlier onset of heart failure (t=3.03, p < .05). The total number of traumatic events experienced, however, was not correlated with the age of heart failure onset. Individuals with probable PTSD were more likely than those without PTSD to have a history of coronary artery disease (χ2=7.31; p < .01), stroke (χ2=6.11; p < .05), and chronic obstructive pulmonary disease (χ2=29.47; p < .001). Additionally, PTSD symptoms were significantly higher in those with chronic obstructive pulmonary disease (F=33.09, p < .001), stroke (F=8.56, p < .001), and coronary artery disease (F=8.33, p < .01).

Individuals with probable depression were at an increased risk for stroke (χ2=12.23; p < .001) and chronic obstructive pulmonary disease (χ2=9.27; p < .01). Depression symptoms were significantly higher in those with chronic obstructive pulmonary disease (F=9.62, p < .01), myocardial infarction (F=4.05, p < .05), stroke (F=12.21, p < .01), and coronary artery disease (F=4.41, p < .05) compared to those without each condition. Onset of heart failure was significantly correlated with depressive symptoms, such that higher numbers of depressive symptoms were associated with earlier onset of heart failure (r=−.20, p < .01).

Table 2 also presents odds ratios from a series of logistic regressions examining the relative associations of traumatic events, PTSD symptoms, and depression with CPD burden. Results indicated that traumatic events were associated with myocardial infarction (adjusted

odds=1.27, p<.05), coronary artery disease (adjusted odds=1.33, p<.05), hypertension (adjusted odds=1.28, p<.05), chronic obstructive pulmonary disease (adjusted odds=1.52, p<.01), and history of cardiac arrest (adjusted odds=1.27, p<.05). PTSD symptoms were also associated with chronic obstructive pulmonary disease (adjusted odds=1.22, p<.05).

Next, linear regression analysis was used to evaluate the relationship between PTSD symptoms and depression with onset of heart failure (correlations and regressions, Tables 3 and 4). Because the correlation between heart failure onset and traumatic events was not significant, traumatic events were not included in the linear regression model. Collinearity statistics were within the acceptable range. PTSD symptoms were significantly associated with an earlier onset of heart failure (β=−.12, p =.01). The addition of depression symptoms did not account for significant change in variance in heart failure (ΔR^2 = .005, p = .12). Although depression symptoms did not account for additional variance, neither PTSD nor depression symptoms were significantly associated with onset of heart failure in the regression final model. This pattern of results and the high correlation and comorbidity between PTSD and depression symptoms suggested that PTSD and associated depression symptoms may reflect an underlying dimension of more general traumatic stress symptoms that erode heart health. Principal axis factoring was used to extract a single factor of general traumatic stress symptoms from PTSD and depression symptoms and this factor accounted for significant variance in age of heart failure onset when included in place of PTSD and depression symptoms scores (r^2 = .02, p=.014). Likewise the regression coefficient for this general traumatic stress symptoms factor was statistically significant (B=−1.65, SE=.67, β= −.12 p=.014).

Discussion

Traumatic events were associated with CPD burden in the present low-income, primarily Black sample diagnosed with congestive heart failure. Within this sample, 43% endorsed experiencing one or more traumatic events, and 10% met symptom criteria for current PTSD, indicating a moderate degree of trauma and a high PTSD risk. Trauma exposure may have been lower in this sample than in similar samples (e.g., 65% Alim et al., 2006; 88%, Gillespie et al., 2009) due to the higher age of our participants, which is likely due to the inclusion criterion of having heart failure. In particular, more highly traumatized older individuals may be more likely to have been deceased than were their less-traumatized counterparts. Additionally, when our definition of traumatic events was expanded slightly to include potentially traumatic experiences such as serious illness and death in family members, estimated trauma exposure rates in this sample increased to 83%; these experiences were positively associated with posttraumatic stress in our sample, supporting their traumatic nature. Unexpectedly, individuals in the lowest income bracket (household income of less than $5000) were less likely to have experienced any traumatic event. However, this association did not remain significant when controlling for other demographic variables. PTSD was also associated with an earlier onset of heart failure, potentially increasing the cumulative burden of the disease over time. Depression was examined for its independent effect on CPD burden. The analyses suggest that, within this sample, traumatic events appeared to be more strongly associated with CPD burden than were current PTSD or depression. Our results lend support to the generalizability of studies conducted with

primarily White, male veterans, and provide increased support for the importance of traumatic events and PTSD among other general risk factors for CPD burden (Dedert et al., 2010; Edmondson et al., 2013; Gander and von Kanel, 2006; Kubzansky et al., 2009; Kubzansky et al., 2007; Qureshi et al., 2009).

Presence of traumatic events may generally reflect an unsafe, discriminatory, or negligent environment in which the combination of trauma and repeated, low-grade, chronic stress impacts disease processes and increases bodily wear and tear, termed allostatic load (Geronimus et al., 2006; McEwen, 1998). For instance, lack of perceived neighborhood safety is associated with increased CPD burden, even after controlling for SES and health behaviors (Clark et al., 2013). Traumatic events may also be associated with lifetime diagnosis of PTSD that may have contributed to neuroendocrine, immune, or inflammatory dysfunction across decades (Wentworth et al., 2013), even in the absence of a current PTSD diagnosis. Our results, linking traumatic events to greater CPD burden, argue for increased attention to rates of violence and other traumatic events in metropolitan areas, where health disparities are most pronounced.

Our results also suggest the need for early screening of risk factors and posttraumatic symptoms following interpersonal violence and traumatic physical injury and in medical settings more generally (a need recognized by many previous researchers and the Affordable Care Act; e.g., Dobie et al., 2002; Lang and Stein, 2005; Patient Protection and Affordable Care Act, 2010; Walker et al., 2002). Such screening efforts conducted within urban, medical trauma centers have yielded rates of posttraumatic stress symptoms as high as 30 to 43% (Reese et al., 2012; Zatzick et al., 2013). Because rates of PTSD increase with repeated trauma, early screening and treatments aimed at building resilience in individuals with subclinical posttraumatic stress symptoms may prove effective in reducing incidence of future PTSD as well as CPD. Alternatively, specific deficits in cardiac functioning may actually predispose individuals to developing PTSD following traumatic stress exposure (Bryant et al., 2004; O'Donnell et al., 2007), rendering screening and early treatment of traumatic stress exposure insufficient to prevent development subsequent cardiopulmonary disease.

The current study is qualified by its reliance on a cross-sectional design, which limits interpretations regarding causality. Participants were seeking medical treatment at the time of recruitment, which may limit generalizability to non-treatment-seeking samples. The potential for loss spirals between trauma and CPD are possible, such that trauma may increase CPD, and cardiopulmonary incidents (i.e. myocardial infarction, stroke) may elicit or exacerbate PTSD symptoms or depression (e.g., Edmondson, 2014; Ginzburg, 2006). The study also relies upon self-report data for medical and psychological symptoms and diagnoses. However, both the PCL-SF and the PHQ-9 have excellent sensitivity and specificity (Lang and Stein, 2005; Kroenke et al., 2001), and self-report of medical symptoms is highly correlated with conditions formally diagnosed by a physician (Bergmann et al., 2004). It will be important for future studies to use more thorough diagnostic tools and to ensure that diagnosis of probable PTSD includes anchoring of symptoms to an index event. Similarly, future work should examine the relationships

between traumatic events, PTSD, and CPD prospectively while measuring potential cardiac mechanisms associated with both PTSD and heart disease.

Our study most likely underestimates PTSD's lifetime impact due to symptoms being assessed only for the two weeks prior to study enrollment. This likely accounts for the lower rates of PTSD found in our sample than in comparable past samples (e.g., Alim et al., 2006; Gillespie et al., 2009), which have reported on lifetime diagnoses. More research is also needed to address possible transdiagnostic processes that may explain the association and comorbidity of PTSD and depression symptoms. Our exploratory analysis suggests that PTSD and depression symptoms may operate in unison to increase allostatic load. Follow-up with more comprehensive psychosocial evaluations is therefore warranted to determine how lifetime development of PTSD influences CPD burden in low-income populations. Lastly, the small number of Hispanic and White participants precludes between-groups comparisons of racial differences. Thus, the analyses cannot definitely establish racial differences in the associations between trauma and CPD. However, rates of probable PTSD in our sample (10%) were higher than those in general epidemiology studies (3.5%), supporting the higher prevalence of PTSD in this sample of low-income, urban, mostly Black residents. Our sample establishes strong associations between trauma, probable PTSD, and CPD burden in a population that is underrepresented in the literature.

Black residents of disadvantaged urban areas are at increased risk of traumatic events and PTSD. Trauma, by nature, is life-altering to the extent that it fosters chronic emotional distress, impairs or ends relationships, and may result in immediate and long-term disability. Our results suggest that the burden of trauma includes associations to a broad range of CPD risk factors, complications, and comorbidities, including hypertension, chronic obstructive pulmonary disease, coronary artery disease, and myocardial infarction, which may contribute to understanding Black-White cardiopulmonary health disparities. These results suggest that clinicians and researchers should be attentive to the presence of traumatic events and PTSD when evaluating risk for CPD.

Acknowledgments

This research is supported by a grant from the NIH-NHLBI 1P50HL105189 Rush Center for Urban Health Equity. The authors would like to thank Jennifer Siedjak for her help with manuscript preparation.

References

Ahmadi N, Hajsadeghi F, Mirshkarlo HB, Budoff M, Yehuda R, Ebrahimi R. Post-traumatic stress disorder, coronary atherosclerosis, and mortality. Am J Cardiol. 2011; 108(1):29–33. [PubMed: 21530936]

Alim TN, Graves E, Mellman TA, Aigbogun N, Gray E, Lawson W, Charney DS. Trauma exposure, posttraumatic stress disorder and depression in an African-American primary care population. J Natl Med Assoc. 2006; 98(10):1630–1636. [PubMed: 17052054]

Asnaani A, Richey JA, Dimaite R, Hinton DE, Hofmann SG. A cross-ethnic comparison of lifetime prevalence rates of anxiety disorders. J Nerv Ment Dis. 2010; 198(8):551–555. [PubMed: 20699719]

Barrick CB. Sad, glad, or mad hearts? epidemiological evidence for a causal relationship between mood disorders and coronary artery disease. J Affect Disord. 1999; 53(2):193–201. [PubMed: 10360415]

Boscarino JA. Diseases among men 20 years after exposure to severe stress: implications for clinical research and medical care. Psychosom Med. 1997; 59(6):605–614. [PubMed: 9407579]

Boscarino JA. A prospective study of PTSD and early-age heart disease mortality among Vietnam veterans: implications for surveillance and prevention. Psychosom Med. 2008; 70(6):668–676. [PubMed: 18596248]

Boscarino JA, Chang J. Electrocardiogram abnormalities among men with stress-related psychiatric disorders: implications for coronary heart disease and clinical research. Ann Behav Med. 1999; 21(3):227–234. [PubMed: 10626030]

Breslau N. Trauma and mental health in US inner-city populations. Gen Hosp Psychiatry. 2009; 31(6): 501–502. [PubMed: 19892206]

Brown AD, Barton DA, Lambert GW. Cardiovascular abnormalities in patients with major depressive disorder. CNS Drugs. 2009; 23(7):583–602. [PubMed: 19552486]

Bryant RA, Marosszeky JE, Crooks J, Gurka JA. Elevated resting heart rate as a predictor of posttrauamtic stress disorder after severe traumatic brain injury. Psychosom Med. 2004; 66(5): 760–761. [PubMed: 15385703]

Burt VL, Whelton P, Roccella EJ, Brown C, Cutler JA, Higgins M, Horan MJ, Labarthe D. Prevalence of hypertension in the US adult population results from the Third National Health and Nutrition Examination Survey, 1988–1991. Hypertension. 1995; 25(3):305–313. [PubMed: 7875754]

Centers of Disease Control and Prevention. [Accessed 1 April, 2015] Health disparities experienced by Black or African Americans United States. Morbidity and Mortality Weekly Report. 2005. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5401a1.htm

Clark CR, Ommerborn MJ, Hickson DA, Grooms KN, Sims M, Taylor HA, Albert MA. Neighborhood disadvantage, neighborhood safety and cardiometabolic risk factors in African Americans: biosocial associations in the Jackson heart study. PLOS ONE. 2013; 8(5):e63254. [PubMed: 23691005]

Davis RG, Ressler KJ, Schwartz AC, Stephens KJ, Bradley RG. Treatment barriers for low-income, urban African Americans with undiagnosed posttraumatic stress disorder. J Trauma Stress. 2008; 21(2):218–222. [PubMed: 18404649]

Dedert EA, Calhoun PS, Watkins LL, Sherwood A, Beckham JC. Posttraumatic stress disorder, cardiovascular, and metabolic disease: a review of the evidence. Ann Behav Med. 2010; 39(1):61–78. [PubMed: 20174903]

Dedert EA, Harper LA, Calhoun PS, Dennis MF, Beckham JC. The impact of race on metabolic disease risk factors in women with and without posttraumatic stress disorder. J Clin Psychol Med S. 2013; 20(1):46–55.

Dobie DJ, Kivlahan DR, Maynard C, Bush KR, McFall M, Epler AJ, Bradley KA. Screening for post-traumatic stress disorder in female Veteran's Affairs patients: validation of the PTSD checklist. Gen Hosp Psychiatry. 2002; 24(6):367–374. [PubMed: 12490337]

Edmondson D. An enduring somatic threat model of posttraumatic stress disorder due to acute life–threatening medical events. Soc Personal Psychol Compass. 2014; 8(3):118–134. [PubMed: 24920956]

Edmondson D, Kronish IM, Shaffer JA, Falzon L, Burg MM. Posttraumatic stress disorder and risk for coronary heart disease: a meta-analytic review. Am Heart J. 2013; 166(5):806–814. [PubMed: 24176435]

Flood AM, Boyle SH, Calhoun PS, Dennis MF, Barefoot JC, Moore SD, Beckham JC. Prospective study of externalizing and internalizing subtypes of posttraumatic stress disorder and their relationship to mortality among Vietnam veterans. Compr Psychiat. 2010; 51(3):236–242. [PubMed: 20399332]

Gander ML, von Kanel R. Myocardial infarction and post-traumatic stress disorder: frequency, outcome, and atherosclerotic mechanisms. Eur J Cardiovasc Prev Rehabil. 2006; 13(2):165–172. [PubMed: 16575268]

Gapen M, Cross D, Ortigo K, Graham A, Johnson E, Evces M, Ressler KJ, Bradley B. Perceived neighborhood disorder, community cohesion, and PTSD symptoms among low-income African Americans in an urban health setting. Am J Orthopsychiatr. 2011; 81(1):31–37.

Geronimus AT. To mitigate, resist, or undo: addressing structural influences on the health of urban populations. Am J Public Health. 2000; 90(6):867–872. [PubMed: 10846503]

Geronimus AT, Hicken M, Keene D, Bound J. "Weathering" and age patterns of allostatic load scores among blacks and whites in the United States. Am J Public Health. 2006; 96(5):826–833. [PubMed: 16380565]

Gillespie CF, Bradley B, Mercer K, Smith AK, Conneely K, Gapen M, Weiss T, Schwartz AC, Cubells JF, Ressler KJ. Trauma exposure and stress-related disorders in inner city primary care patients. Gen Hosp Psychiatry. 2009; 31(6):505–514. [PubMed: 19892208]

Ginzburg K. Comorbidity of PTSD and depression following myocardial infarction. J Affect Disord. 2006; 94(1):135–143. [PubMed: 16720050]

Hien D, Ruglass L. Interpersonal partner violence and women in the United States: an overview of prevalence rates, psychiatric correlates and consequences and barriers to help seeking. Int J Law Psychiat. 2009; 32(1):48–55.

Kang HK, Bullman TA, Taylor JW. Risk of selected cardiovascular diseases and posttraumatic stress disorder among former World War II prisoners of war. Ann Epidemiol. 2006; 16(5):381–386. [PubMed: 15994096]

Keppel KG, Pearcy JN, Heron MP. Is there progress toward eliminating racial/ethnic disparities in the leading causes of death? Public Health Rep. 2010; 125(5):689. [PubMed: 20873285]

Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiat. 2005; 62(6):593–602. [PubMed: 15939837]

Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001; 16(9):606–613. [PubMed: 11556941]

Kubzansky LD, Koenen KC, Jones C, Eaton WW. A prospective study of posttraumatic stress disorder symptoms and coronary heart disease in women. Health Psychol. 2009; 28(1):125–130. [PubMed: 19210026]

Kubzansky LD, Koenen KC, Spiro A 3rd, Vokonas PS, Sparrow D. Prospective study of posttraumatic stress disorder symptoms and coronary heart disease in the Normative Aging Study. Arch Gen Psychiat. 2007; 64(1):109–116. [PubMed: 17199060]

Kupper N, Widdershoven JW, Pedersen SS. Cognitive/affective and somatic/affective symptom dimensions of depression are associated with current and future inflammation in heart failure patients. J Affect Disord. 2012; 136(3):567–576. [PubMed: 22134045]

Lang AJ, Stein MB. An abbreviated PTSD checklist for use as a screening instrument in primary care. Behav Res Ther. 2005; 43(5):585–594. [PubMed: 15865914]

Lauterbach D, Vora R, Rakow M. The relationship between posttraumatic stress disorder and self-reported health problems. Psychosom Med. 2005; 67(6):939–947. [PubMed: 16314599]

Liebschutz J, Saitz R, Brower V, Keane TM, Lloyd-Travaglini C, Averbuch T, Samet JH. PTSD in urban primary care: high prevalence and low physician recognition. J Gen Intern Med. 2007; 22(6):719–726. [PubMed: 17503105]

Lillie-Blanton M, Parsons PE, Gayle H, Dievler A. Racial differences in health: not just black and white, but shades of gray. Annu Rev Publ Health. 1996; 17(1):411–448.

McEwen BS. Protective and damaging effects of stress mediators. New Engl J Med. 1998; 338(3): 171–179. [PubMed: 9428819]

O'Donnell ML, Creamer M, Elliott P, Bryant R. Tonic and phasic heart rate as predictors of posttraumatic stress disorder. Psychosom Med. 2007; 69(3):256–261. [PubMed: 17420442]

O'Toole BI, Catts SV. Trauma, PTSD, and physical health: an epidemiological study of Australian Vietnam veterans. J Psychosom Res. 2008; 64(1):33–40. [PubMed: 18157997]

Orsi JM, Margellos-Anast H, Whitman S. Black-White health disparities in the United States and Chicago: a 15-year progress analysis. Am J Public Health. 2010; 100(2):349–356. [PubMed: 20019299]

Pacella ML, Hruska B, Delahanty DL. The physical health consequences of PTSD and PTSD symptoms: a meta-analytic review. J Anxiety Disord. 2013; 27(1):33–46. [PubMed: 23247200]

Pistelli R, Lange P, Miller DL. Determinants of prognosis of COPD in the elderly: mucus hypersecretion, infections, cardiovascular comorbidity. Eur Respir J. 2003; 40(Suppl):10s–14s.

Patient Protection and Affordable Care Act, 2010. Public Law, 111–148.

Qureshi SU, Pyne JM, Magruder KM, Schulz PE, Kunik ME. The link between post-traumatic stress disorder and physical comorbidities: a systematic review. Psychiat Quart. 2009; 80(2):87–97. [PubMed: 19291401]

Reese C, Pederson T, Avila S, Joseph K, Nagy K, Dennis A, Wiley D, Starr F, Bokhari F. Screening for traumatic stress among survivors of urban trauma. J Trauma Acute Care Surg. 2012; 73(2): 462–468. [PubMed: 22846957]

Sawchuk CN, Roy-Byrne P, Goldberg J, Manson S, Noonan C, Beals J, Buchwald D. The relationship between post-traumatic stress disorder, depression and cardiovascular disease in an American Indian tribe. Psychol Med. 2005; 35(12):1785–1794. [PubMed: 16300692]

Schwartz AC, Bradley RL, Sexton M, Sherry A, Ressler KJ. Posttraumatic stress disorder among African Americans in an inner city mental health clinic. Psychiatr Serv. 2005; 56(2):212–215. [PubMed: 15703352]

Seng JS, Clark MK, McCarthy AM, Ronis DL. PTSD and physical comorbidity among women receiving Medicaid: results from service-use data. J Trauma Stress. 2006; 19(1):45–56. [PubMed: 16568470]

Shanmugam G, Bhutani S, Khan DA, Brown ES. Psychiatric considerations in pulmonary disease. Psychiatr Clin North Am. 2007; 30(4):761–780. [PubMed: 17938044]

Sidney S, Sorel M, Quesenberry CP Jr, DeLuise C, Lanes S, Eisner MD. COPD and incident cardiovascular disease hospitalizations and mortality: Kaiser Permanente Medical Care Program. Chest. 2005; 128(4):2068–2075. [PubMed: 16236856]

Spitzer C, Barnow S, Volzke H, John U, Freyberger HJ, Grabe HJ. Trauma, posttraumatic stress disorder, and physical illness: findings from the general population. Psychosom Med. 2009; 71(9): 1012–1017. [PubMed: 19834051]

Taylor-Clift A, Hobfoll SE, Gerhart JI, Richardson D, Calvin JE, Powell LH. Posttraumatic stress and depression: Potential pathways to disease burden among heart failure patients. Anxiety Stress Copin (just-accepted). 2015:1–29.

Walker EA, Newman E, Dobie DJ, Ciechanowski P, Katon W. Validation of the PTSD checklist in an HMO sample of women. Gen Hosp Psychiatry. 2002; 24(6):375–380. [PubMed: 12490338]

Wentworth BA, Stein MB, Redwine LS, Xue Y, Taub PR, Clopton P, Nayak KR, Maisel AS. Post-traumatic stress disorder: a fast track to premature cardiovascular disease? Cardiol Rev. 2013; 21(1):16–22. [PubMed: 22717656]

Zatzick D, Jurkovich G, Rivara F, Russo J, Wagner A, Wang J, Dunn C, Lord SP, Petrie M, O'Connor SS, Katon W. A randomized stepped care intervention trial targeting posttraumatic stress disorder for surgically hospitalized injury survivors. Ann Surg. 2013; 257(3):390–399. [PubMed: 23222034]

Highlights

- We studied trauma and cardiopulmonary disease burden in a vulnerable population.
- Cardiopulmonary disease burden offers an indication of disease severity.
- Trauma and PTSD are associated with greater cardiopulmonary disease burden.
- Depression is more weakly associated with cardiopulmonary disease burden.
- PTSD screening should occur routinely in medical settings, especially after trauma.
- Trauma and PTSD may contribute to disparities in cardiopulmonary health.

Table 1

Demographic characteristics of 251 congestive heart failure patients

	Sample n = 251		Trauma Present n = 107		Probable PTSD† n = 23		Probable MDD‡ n = 43	
	n	%	n	%	n	%	n	%
Gender								
Female	108	43.0	40	37.4	11	47.8	23	53.5
Male	142	56.6	66	61.7	12	52.2	20	46.5
Transgender	1	0.0	1	0.0	0	0	0	0
Ethnicity								
Non-Hispanic White	17	6.8	6	5.6	1	3.8	2	4.7
Black	220	87.6	93	86.9	24	92.3	40	93.0
Other	14	5.6	8	7.5	0	0	1	0.4
Hispanic Origin	21	8.4	8	7.5	0	0	1	0
Education								
<High School	88	35.1	26	24.3*	4	15.4	16	37.2
High School or GED	105	41.8	39	36.4	12	46.2	18	41.9
Some College	33	13.1	25	23.4*	5	19.2	6	14.0
College	11	4.4	6	5.6	2	7.7	2	4.7
Marital Status								
Single	131	52.2	45	42.1*	12	46.2	22	51.2
Domestic Partner	40	15.9	12	11.2*	4	15.4	4	9.3
Married	23	9.2	16	15.0	1	3.8	1	2.3
Divorced	23	9.2	14	13.1*	2	7.7	4	9.3
Widowed	23	9.2	13	12.1	5	19.2	8	18.6
Household Income								
<5000	70	28.0	22	20.6*	6	23.1	10	23.8
5000–9999	82	32.8	31	29.0	9	34.6	17	40.5
10000–14999	31	12.4	17	15.9	4	15.4	7	16.7
15000–19999	22	8.8	11	10.3	4	15.4	4	9.5
20000–29999	44	17.6	26	24.3*	3	11.5	4	9.5

	Sample n = 251		Trauma Present n = 107		Probable PTSD† n = 23		Probable MDD‡ n = 43	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Smoking Status								
Current	48	19.2	22	20.6	7	26.9	11	25.6
Former	110	43.8	43	50.6*	6	31.6	14	43.8
Alcohol Use	59	23.5	37	34.6*	12	46.2*	12	27.9
Psychometric Properties	M	SD	M	SD	M	SD	M	SD
Traumatic Events	1.19	1.76	2.79	1.68	3.39	2.11	1.93	1.99
PCL-SF	8.45	3.73	10.12	0.44	17.3	0.83	13.12	0.84
PHQ-9	4.95	4.87	6.16	0.46	11.74	1.00	13.4	0.49

Note:

*indicates significant difference between those with and those without condition.

†Probable Posttraumatic Stress Disorder (PTSD) = Posttraumatic Checklist-Short Form (PCL-SF) ≥14

‡Probable Major Depressive Disorder = Patient Health Questionnaire-9 item version (PHQ-9) ≥10

J Affect Disord. Author manuscript; available in PMC 2017 January 15.

Table 2

CPD burden of 251 heart failure patients with traumatic stress exposure, probable PTSD, and probable depressive disorder

Condition	Trauma (n = 107)			PTSD (n = 23)			Depression (n = 43)			Trauma	PTSD	Depression
	n	%	χ^2	n	%	χ^2	n	%	χ^2	OR	OR	OR
Cardiac Arrest	17	15.9	6.14*	3	13.0	0.20	4	9.3	0.06	1.27*	.99	1.04
CAD	36	38.7	7.33*	11	55.0	7.31*	14	34.1	0.69	1.33*	1.04	1.01
Previous MI	48	45.3	5.50*	12	52.2	2.52	21	48.8	3.15	1.27*	.99	1.04
High BP	89	83.2	3.68	16	69.6	0.86	33	76.7	0.01	1.28*	.93	1.02
Stroke	17	15.9	0.36	7	30.4	6.11*	13	30.2	12.23*	1.24	2.76‡	3.43**
COPD	12	80.0	10.37*	7	35.0	29.47*	7	17.1	9.27*	1.52*	1.22*	.98
	M	SD	t	M	SD	t	M	SD	t			
HF Age	49	12.7	3.03*	45	10.0	1.27	46	13.9	0.05			

*p < .05,

**p < .01,

‡p = .06

Note: Percentages calculated represent total sample, including those with no response. Abbreviations. CAD = Coronary Artery Disease. MI = Myocardial Infarction. BP = Blood Pressure. COPD = Chronic Obstructive Pulmonary Disease. HF = Heart Failure.

Table 3

Correlations of Predictor Variables and Age at Heart Failure Diagnosis

Variable	1	2	3	4	5	6	7	8	M	SD
1. Age at Heart Failure Diagnosis	-								50.55	13.22
2. Age	0.72**	-							57.36	12.00
3. Years of Education	−0.05	−0.22**	-						11.44	3.62
4. Relationship Status[a]	0.09	0.08	−0.02	-					0.25	0.43
5. Never Smoked[b]	0.01	0.02	<0.01	−0.08	-				0.56	0.50
6. Alcohol Use[c]	−0.08	−0.15**	0.10	−0.04	−0.21**	-			0.24	0.43
7. PCL-SF	−0.15**	−0.06	0.01	−0.06	−0.11*	0.18**	-		8.45	3.73
8. PHQ-9	−0.20**	−0.09	−0.10	−0.11*	−0.14*	0.01	0.63**	-	4.95	4.87

[a] Relationship Status is coded dichotomously, with 0 representing unpartnered status (e.g., single, divorced, widowed) and 1 representing partnered status (married, cohabiting).

[b] Never Smoked is coded dichotomously, with 0 representing a former or current smoker and 1 representing someone who has never smoked.

[c] Alcohol Use is coded dichotomously, with 0 representing a non-drinker and 1 representing someone who drinks alcohol.

* $p < .01$

** $p < .001$

J Affect Disord. Author manuscript; available in PMC 2017 January 15.

J Affect Disord. Author manuscript; available in PMC 2017 January 15.

Table 4

Linear Regression of Psychological Predictors on Heart Failure Age of Onset

Model	B	SE B	β	p	R^2
Model 1				.000	.54
Age	0.82	0.05	0.74	.00	
Education Years	0.39	0.17	0.11	.02	
Relationship	0.92	1.38	0.03	.50	
Status[a]					
Income	0.28	0.43	0.03	.51	
Never Smoked	0.17	1.21	0.01	.89	
Alcohol Use	0.72	1.43	0.02	.62	
Model 2				.011	.55
Age	0.81	0.05	0.73	<.001	
Education Years	0.38	0.17	0.11	.02	
Relationship Status	0.68	1.36	0.02	.62	
Income	0.34	0.43	0.04	.42	
Never Smoked	−0.06	1.19	<.001	.96	
Alcohol Use	1.25	1.43	0.04	.38	
PCL-SF	−0.41	0.16	−0.12	.01	
Model3				.120	.55
Age	0.80	0.05	0.73	<.001	
Education Years	0.35	0.17	0.10	.04	
Relationship Status	0.46	1.37	0.02	.74	
Income	0.35	0.42	0.04	.41	
Never Smoked	−0.31	1.20	−0.01	.80	
Alcohol Use	0.89	1.44	0.03	.54	
PCL-SF	−0.21	0.20	−0.06	.31	
PHQ-9	−0.25	0.16	−0.09	.12	

Note. PCL-SF = Posttraumatic Checklist-Short Form; PHQ-9 = Patient Health Questionnaire-9 item version

[a]Relationship status is coded dichotomously, with 0 representing unpartnered status (e.g., single, divorced, widowed) and 1 representing partnered status (married, cohabiting).