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Common health problems in safety-net primary care: Modeling the roles of trauma history and mental health

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Abstract

Objective This study described trauma exposure and investigated mediational effects of mental health on the relationships between trauma and pain, sleep, smoking, and general health.

Method Participants were 210 low-income primary care patients. The study used a crosssectional, self-report survey design.

Results Eighty-five percent of the sample reported adult trauma and 54% reported four or more childhood traumas. Moderate or higher depression and anxiety levels were present in 59% and 48% of participants, respectively. Structural equation model fit was good for sleep, pain, and general health, showing that trauma indirectly affected health variables via mental health.

Conclusions Participants endorsed substantial adult and childhood trauma, which likely had cascading effects on mental health and common primary care presenting health issues.

KEYWORDS
primary care psychology, safety net, trauma

1 | INTRODUCTION

Primary care is a critical access point for mental health services, particularly for low-income patients (Satcher, 2001). Research has definitively established a relationship between mental and physical health, underscoring the utility of comprehensive primary care (World Health Organization, 2001). Thus, in traditional primary care clinics,

physicians commonly address both health concerns (e.g., sleep, smoking, and chronic pain), as well as mental disorders (e.g., depression, anxiety, posttraumatic stress disorder [PTSD]). There has been a movement toward integrated care, wherein mental health providers work alongside physicians to address physical and mental health concerns (American Psychiatric Association, 2016). A nuanced understanding of the relationship between presenting physical and mental health issues is critical to informed treatment of both traditional and integrated primary care.

Patients, especially those in safety-net clinics, may have trauma histories that influence the emergence and trajectories of both physical and mental health conditions, necessitating trauma-informed care (Green et al., 2015). However, research indicates that physicians receive little training on how to address trauma and its health effects (Green et al., 2015). Furthermore, limited research exists modeling the relationships between trauma and mental/physical health problems, especially for high-risk patients (Wade et al., 2016). Using a low-income, safety-net primary care clinic sample, the present study explores pathways through which childhood and adult trauma may contribute to several of the most common presenting mental health concerns (e.g., depression and anxiety), as well as prevalent primary care presenting problems, including pain, sleep, smoking, and general health.

2 | TRAUMA EXPOSURE

Childhood trauma is pervasive, with potential cascading consequences on mental and physical health in adulthood. Childhood trauma includes experienced and witnessed physical, sexual, or emotional abuse or neglect, as well as more distal environmental factors (e.g., parental incarceration; Felitti et al., 1998; Finkelhor, Turner, Shattuck, & Hamby, 2013). According to the Adverse Child Events' (ACE) longitudinal study, 58% of children are exposed to at least one traumatic event (Felitti et al., 1998). The ACE study was one of the first and largest studies to track trauma exposure and health outcomes. However, the ACE sample included predominately White, insured patients with average to high income, despite the fact that lower income and racial/ethnic minority children more frequently experience multiple traumas (Felitti et al., 1998). Cumulative violence exposure, such as neighborhood violence, disproportionately affects low income, and racial/ethnic minority children (Devenish, Hooley, & Mellor, 2017). Experiencing multiple traumas has a cumulative effect that contributes to worse health outcomes (e.g., smoking, sleep, pain, general health) than singular trauma exposure (Briere, Kaltman, & Green, 2008; Brown et al., 2009; Felitti et al., 1998; Hodges et al., 2013; Wade et al., 2016). Childhood trauma increases the likelihood of revictimization in adulthood (Finkelhor et al., 2013; Finkelhor, Ormrod, & Turner, 2009; Turner, Finkelhor, & Ormrod, 2010).

Adult trauma exposure is another critical determinant of physical and mental health (Dennis et al., 2009). Adult trauma includes sexual, physical, or verbal abuse, as well as the sudden death of a loved one and accidents. Adult interpersonal trauma exposure is common, as 51%–69% of adults have experienced one or more traumas (Norris & Stone, 2013). Risk varies by socioeconomic status and race/ethnicity: low socioeconomic status and non-White race are associated with increased adult trauma exposure, because of a constellation of factors like increased stress, discrimination, and neighborhood violence (Alim et al., 2006; Gillespie et al., 2009; R. J. Turner & Avison, 2003). For example, 87% of a sample of low-income, Black women had experienced at least one traumatic event, and these events were associated with detriments to mental health (Dailey, Humphreys, Rankin, & Lee, 2011).

2.1 | Mental health

Depression is one of the most common mental health disorders and is partially predicted by exposure to traumatic events. Major depressive disorder (MDD) has a 12-month prevalence of 12.5%, although depressive symptoms are more common (American Psychiatric Association, 2013). Depression is the single largest contributor to the disease

burden in the United States, with an annual healthcare cost of $83.1 billion (Greenberg et al., 2003). Patients of low socioeconomic status are at increased risk of MDD (Hudson, 2005; S. K. Davies et al., 2014). Trauma exposure has a dose–response relationship to depression rates, wherein frequency of traumatic events and childhood trauma specifically predict greater incidence and higher chronicity of depression (Dunn, Nishimi, Powers, & Bradley, 2017; Norman et al., 2012). In addition, continued stress compounds the risk of experiencing depression in trauma-exposed patients (Heim, Newport, Mletzko, & Miller, 2008).

Generalized anxiety disorder (GAD) and other anxiety disorders are also related to trauma exposure. GAD affects 3% of adults in the United States, whereas anxiety disorders more broadly affect 10% of adults over a 12-month period (Kessler et al., 2013). GAD rates are higher for patients presenting in primary care than in the general population, as patients with GAD more frequently seek health services (Wittchen, 2002). Trauma exposure can be a contributing factor to the development and maintenance of GAD (National Institute of Mental Health, 2017). Both depression and anxiety are related to increased primary care visits and are detrimental to physical health.

Cumulative trauma exposure, defined as total childhood and adult trauma experiences, is a potent risk factor for the development of PTSD. In the overall adult population, approximately 5% met PTSD criteria over a 12-month period; however, rates were 19%–30% for high-risk, urban populations with more violence exposure, including patients of low socioeconomic status (Alim et al., 2006; Greene, Neria, & Gross, 2016; Kilpatrick et al., 2013). Depression and PTSD are two of the most common mental disorders in trauma-exposed patients (Gillespie et al., 2009). PTSD, as well as depression and anxiety, may contribute to the onset or maintenance of physical health concerns, including sleep disruption, pain, smoking, and general physical health, as well as greater healthcare utilization and functional impairment (e.g., Dennis et al., 2009; Fu et al., 2007; Germain, 2013; Kartha et al., 2008; Ohayon & Schatzberg, 2003; Westphal et al., 2011).

2.2 | Physical health

Sleep difficulties are some of the most time-consuming and persistent health concerns in primary care. According to the National Institutes of Health, sleep disorders affect 50–70 million Americans and show low natural remittance rates (Altevogt & Colten, 2006). Sleep concerns have been consistently linked to childhood trauma (Kajeepeta, Gelaye, Jackson, & Williams, 2015), as well as adult interpersonal trauma (Lind et al., 2017; Steine et al., 2012). Sleep difficulties are core features of many mental health issues, particularly depression and PTSD (Taylor, Lichstein, Durrence, Reidel, & Bush, 2005). Sleep is linked to important long-term physical health outcomes, including hypertension, diabetes, and mortality (Cappuccio, D'Elia, Strazzullo, & Miller, 2010; S. K. Davies et al., 2014). In addition to burdening the patient, sleep-related concerns are taxing on physicians' time and costly to the healthcare system (Ozminkowski, Wang, & Walsh, 2007).

Chronic pain is another common presenting health problem that is related to both mental health and trauma exposure. An estimated 22%–43% of Americans (Gureje et al., 2008; Simon, 2012) experience chronic pain, and their visits account for approximately 50% of all physician visits. Chronic pain is the source of considerable public policy debate in the United States and costs $600 billion in annual healthcare costs and lost productivity (Simon, 2012; Turk & Melzack, 2001). Patients of low socioeconomic status are more likely to experience both acute and chronic pain, although some studies suggest that this link is better explained by psychological factors than by poverty-related environmental risks (K. A. Davies et al., 2009). The link between mental health and chronic pain is well-established throughout the literature: anxiety and depression increase the likelihood of chronic pain (Currie & Wang, 2004; Ohayon & Schatzberg, 2003; Zale, Maisto, & Ditre, 2016) and are associated with worse pain management (Bair, Robinson, Katon, & Kroenke, 2003; Dersh, Polatin, & Gatchel, 2002). Trauma exposure is a less-established risk factor for chronic pain, as research findings have been mixed. Some studies have found no relationship (Jones, Power, & Macfarlane, 2009) between trauma and chronic pain, whereas others have found a heightened sensitivity to pain among those with trauma histories (You & Meagher, 2016).

Smoking is another common health sequela related to both trauma history and mental health. Currently, 15% of the overall population smokes regularly, and smoking accounts for 40% of all premature deaths, as well as $180 billion in medical expenses and lost productivity (Center for Disease Control & Prevention, 2008; Jamal et al., 2016). Low-income individuals are disproportionately affected by smoking and its health consequences. They are more likely be smokers (e.g., 26% of individuals below the poverty line smoke), smoke more heavily, and have less successful quit attempts (Barbeau, Krieger, & Soobader, 2004; Jamal et al., 2016). Trauma exposure is another risk factor for smoking. Patients with childhood trauma history are two to four times more likely to smoke (Felitti et al., 1998). Smoking may be a coping strategy, wherein nicotine can ameliorate the symptoms of depression, anxiety, or PTSD, after trauma (Williams, Stroup, Brunette, & Raney, 2014). Thus, it is unsurprising that both mental health issues are linked with increased smoking, as well as more difficulty quitting smoking (Carmody, 1992; Lombardero et al., 2014; Zale et al., 2016).

More broadly, patients' perceived general health is an important consideration for primary care settings and is affected by trauma exposure and mental health (Adler & Rehkopf, 2008). Self-reported general health is predictive of disease and life expectancy (Lee et al., 2007). Patients reporting poor general health are more likely to frequent primary care offices and spend longer on their visits (George et al., 2012). A majority of Americans (84%) endorse "good" or better health, whereas a considerable minority rates their health as "poor" or "fair," including 12.9% of White Americans and 21.1% of Black Americans (Center for Disease Control, 2008). There are stark self-reported health disparities according to socioeconomic status and race/ethnicity, which have been well-documented because of a confluence of factors (Adler & Rehkopf, 2008; Cohen, Janicki-Deverts, Chen, & Matthews, 2010). Even after controlling for demographic and neighborhood factors, one study linked childhood trauma exposure to the number of annual sick days as well as general health (Salinas-Miranda et al., 2015). Research has found a dose–response relationship between childhood trauma and general health, such that patients with high trauma exposure lived 20 years fewer than those lower levels (Brown et al., 2009).

2.3 | Present study

The current literature has established that physical health concerns in primary care are costly and disproportionately burden low-income individuals. Research details high rates of trauma exposure in these individuals, as well as the effect that trauma has on physical or mental health overall. However, the existing evidence for these relationships is often piecemeal, looking at each construct individually, rather than as a comprehensive model. For example, ample research has connected trauma exposure to physical health outcomes via one mental health outcome, such as PTSD (e.g., Gabert-Quillen, Selya, & Delahanty, 2015; Powers et al., 2014). To date, there has been limited research connecting trauma exposure to common primary care physical health concerns via possible mediational effects of mental health more broadly. Research on impoverished patients who are at the greatest risk of trauma exposure and poor health outcomes remains limited.

Using a high-risk, low-income sample from a safety-net primary care clinic, the present study aims to provide a trauma-informed perspective on several of the most common presenting health problems in primary care. First, the current study aims to describe trauma exposure, mental health issues, and physical health concerns in an understudied and at-risk sample. Next, the study aims to generate structural equation models (SEMs) to investigate the relationships among trauma history, mental health, and common presenting primary care concerns, including separate models for smoking, pain, sleep, and general health.

3 | METHOD

3.1 | Participants

Participants ($N = 210$) were adults recruited from an urban, safety-net primary care clinic. Participants were 60% women, 40% men, with the following racial/ethnic composition: 64% Black/African American, 27%

White/European-American, 4% Multiracial, 2% Latino/Hispanic, and 2% other, which is consistent with the clinic's general patient population. Of the participants, 70% reported total personal income (including public assistance) of less than $5,000 annually, and 63% reported living currently without permanent housing; 66% were unemployed, 16% on disability assistance, 9% worked part-time, and 4% worked full-time.

3.2 | Measures

Participants completed a set of questionnaires assessing experiences of trauma, mental and physical health, and smoking, as well as a researcher-generated demographic form.

3.2.1 | Demographics

Demographic characteristics assessed included: gender, race/ethnicity, personal annual income (including any public assistance), current employment status (including part-time work or disability), and whether the participant had permanent housing currently.

3.2.2 | Brief Trauma Questionnaire

Adult trauma exposure was assessed with the 10-item self-report Brief Trauma Questionnaire (BTQ; Schnurr, Vielhauer, Weathers, & Findler, 1999). This measure queries about events such as experiencing combat, natural or technical disaster, unwanted sexual contact, or the sudden death of a close friend or family member. A total score was calculated as the total number of endorsed items. The BTQ has demonstrated good convergent validity with a clinical interview (Schnurr, Spiro, Vielhauer, Findler, & Hamblen, 2002), and criterion validity has been demonstrated by associations with PTSD severity (Lancaster, Melka, & Rodriguez, 2009). Kappa coefficients for the existence of a history of traumatic events ranged from 0.60 to 1.00. Reliability in the current sample was adequate (α = .70).

3.2.3 | Adverse Childhood Experiences Questionnaire

Exposure to childhood trauma was assessed with the 10-item Adverse Childhood Experiences (ACE) Questionnaire (Anda et al., 1999). The measure is designed to assess the presence of 10 ACE categories of childhood trauma; five are personal (e.g., victim of physical or sexual abuse) and five are associated with family members (e.g., living with a family member who is an alcoholic, having a family member go to prison). The summed number of adverse childhood experiences was used to create an "ACE score" that ranged from 0 to 10. The ACE score has been shown to have a robust association with various poor health outcomes, including smoking (Anda et al., 1999), suicidality (Dube et al., 2001), and a number of leading causes of death (e.g., cancer, cardiovascular disease; Felitti et al., 1998). Reliability in the current study was good (α = 0.83).

3.2.4 | Patient Health Questionnaire-9

The Patient Health Questionnaire-9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001) is a 9-item self-report scale that measures depressive symptoms. Respondents indicate the frequency with which each item has bothered them over the prior 2 weeks (e.g., "Little interest or pleasure in doing things") using a scale from 0 (*Not at all*) to 3 (*Nearly every day*). Total scores range from 0 to 27, with higher scores indicating greater depressive symptomology (0–4 = none, 5–9 = mild, 10–14 = moderate, 15–19 = moderately severe, 20–27 = severe depressive symptoms). The PHQ-9 has been shown to have good internal consistency (Kroenke et al., 2001) and is highly correlated with diagnosis of depression by a mental health professional in the general population (Henkel et al., 2004). The reliability in the current sample was good (α = 0.88).

3.2.5 | Generalized Anxiety Disorder-7

The Generalized Anxiety Disorder-7 (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006) is a 7-item scale used to measure symptoms of anxiety. Respondents rate the degree to which various items have bothered them over the past 2 weeks (e.g., "Worrying too much about different things") using a Likert-type scale ranging from 0 (*Not at all*) to 3 (*Nearly every day*). Total scores range from 0 to 21 with higher scores suggesting more severe anxiety symptoms (0–4 = minimal, 5–9 = mild, 10–14 = moderate, 15–21 = severe anxiety symptoms). The GAD-7 has shown good internal consistency (α = 0.92), test–retest reliability, and convergent validity (Spitzer et al., 2006). The consistency was excellent in the current sample (α = 0.93).

3.2.6 | Posttraumatic Stress Disorder-8

The PTSD-8 (Hansen et al., 2010) is a diagnostic measure of PTSD, according to Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) criteria. The scale is composed of eight items that ask respondents to indicate the extent to which PTSD symptoms (e.g., "Recurrent nightmares about the event") have bothered them since the traumatic event using a 4-point Likert-type response scale ranging from 1 (*A little*) to 4 (*All the time*). The scale is divided into intrusion, avoidance, and hypervigilance subscales, wherein participants must have at least one item with a score ≥3 for each subscale to meet the dichotomous PTSD diagnostic criteria. The scale was validated by expected relationships with the Harvard Trauma Questionnaire (Mollica et al. 1992). The scale has demonstrated good internal consistency (range, 0.83–0.85) and has been validated in samples of rape survivors, whiplash patients, and survivors of disasters (Hansen et al., 2010). The reliability in the current sample was excellent (α = .94). The scale was treated dichotomously (PTSD diagnosis vs. no PTSD diagnosis) for the descriptive statistics but was treated continuously for hypothesis testing.

3.2.7 | PROMIS Sleep Disturbance-Short Form 4a

The Patient-Reported Outcomes Measurement Information System (PROMIS) Sleep Disturbance-Short Form assesses respondents' perceptions of aspects of sleep (e.g., quality, ease of falling asleep) in the prior 7 days. Currently, four PROMIS Sleep Disturbance fixed-item short-forms are available that vary in the number of items; the 4-item version was used for this study (Cella et al., 2010). Each item has five response options that vary depending on the item but that maintain the same range in values (1–5). A total score (ranging from 1 to 20) was calculated by summing the values of the response for each item, with greater values indicating greater sleep disturbance. The measure has demonstrated excellent internal consistency (range, 0.88–0.95) and construct validity in ethnically diverse community sample (Jensen et al., 2016). The scale demonstrated good internal consistency in the current sample (α = 0.87).

3.2.8 | Short Form-12 Health Survey

The Short Form-12 (SF-12) Health Survey is a multipurpose short form generic measure of health status (Ware, Kosinski, & Keller, 1996). The measure is used to assess mental and physical health across eight different domains composed of either one or two items depending on the health concept. Only two domains were used in the current study: general health ("In general, would you say your health is excellent, very good, good, fair, or poor?") and pain ("During the past 4 weeks, how much did PAIN interfere with your normal work [including both work outside the home and housework]?"). The response scale for the pain item ranges from 1 (*Not at all*) to 5 (*Extremely*), with higher scores representing worse pain. The SF-12 has evidenced good reliability and validity (Ware et al., 1996).

3.2.9 | Smoking

Respondents were asked about their current smoking status by approximating the number of cigarettes smoked per day. This was assessed from a single-item measure of the number of cigarettes smoked per day. Respondents were asked to select one of five possible responses for cigarettes smoked per day (0, 1–10, 11–20, 21–30, and 31 or more); scores ranged from 1 to 5.

3.3 | Procedure

Over the course of 6 months, participants were recruited from the waiting area of a safety-net primary care clinic as they waited for their medical appointment. Interested patients were told that the purpose of the study was to better understand the current needs of the patients as well as additional experiences that might be important for their health. Individuals completed paper surveys while they waited for their appointment were asked to stop if they were called for their appointment so as not to disrupt their health services. They were allowed to bring their survey into the appointment with them and then resume the survey once they returned to the waiting room after their appointment. All participants completed the survey on-site, and no missing data was due to stopping for a medical appointment. All participants provided informed consent and were compensated with $10 cash.

3.4 | Data analysis

The means and standard deviations as well as bivariate correlations were analyzed for all observed variables, including adult trauma, childhood trauma, depression, anxiety, PTSD, sleep disturbance, pain, general health, and smoking. A measurement model was run to determine whether latent constructs were operating as expected or if any adjustments should be made before proceeding with the structural models. In the measurement model, the manifest variables assessing trauma history were adult trauma and childhood trauma, and the manifest variables assessing mental health were depression, anxiety, and PTSD. Trauma history and mental health were specified as latent variables to correlate with each other. After finalizing the indices of latent variables, SEMs with 2,000 bootstrap samples were run which speak to the fit of a model of hypothesized patterns of relationships between observed (manifest) and unobserved (latent) variables; significance for indirect effects was assessed by calculating *p* values via bootstrap approximation obtained by constructing two-sided bias-corrected confidence intervals. Four SEMs in the current study were used to examine theoretical relationships among trauma history, mental health, and four primary care outcomes (all measured as manifest variables): sleep disturbance, pain, general health, and smoking. AMOS software was used for the SEMs (Arbuckle, 2014).

Given previously established relationships between trauma history and mental health (Dunn et al., 2017; Edwards, Holden, & Felitti, 2003), it was hypothesized that trauma history would have a direct effect on mental health. Similarly, given research linking mental health and primary care outcomes including sleep disturbance (Taylor et al., 2005), pain (Currie & Wang, 2004; Ohayon & Schatzberg, 2003), general health (Adler & Rehkopf, 2008), and smoking (Lombardero et al., 2014; Zale et al., 2016), it was hypothesized that mental health would have a direct effect on these four outcomes. Finally, it was hypothesized that there would be an indirect effect from trauma history to each of the four primary health outcomes through mental health, suggesting mental health as a mediator in the relationship between trauma history and health behaviors and outcomes.

4 | RESULTS

4.1 | Missing data

Missing data were addressed using the expectation maximization algorithm in SPSS 24 (IBM Corp., 2016). Between <1% and 10% of variables had missing data; childhood trauma was the only variable to have higher than 3% missing.

TABLE 1 Means and standard deviations of observed variables

Mean (*SD*) or *n*		Percentage or descriptor
Number of adult traumas	3.31 (2.32)	Higher than average
Number of childhood traumas	3.93 (3.04)	Higher than average
4 or more childhood traumas	106	51.0%
1 or more adult traumas	177	84.7%
PTSD		
PTSD criteria met	96	45.7%
PTSD criteria not met	114	54.3%
Depression symptoms		
No symptoms	37	18.0%
Mild	47	22.8%
Moderate	60	29.1%
Moderately severe	34	16.5%
Severe	28	13.6%
Anxiety symptoms		
No symptoms	53	25.5%
Mild	56	26.9%
Moderate	42	20.2%
Severe	57	27.4%
Sleep disturbance	13.52 (4.20)	Slightly worse than average
Pain level	3.17 (1.43)	Moderate pain
General health level	2.45 (0.99)	Good to very good
Cigarettes per day	2.08 (0.89)	11–20 cigarettes on average
Smokers	154	74.0%

Percentages may not be based on the full sample because of missing data.
Note. PTSD: posttraumatic stress disorder.

To ensure that data were missing completely at random (MCAR), Little's MCAR tests were used. Each test was nonsignificant (all p values > 0.191), suggesting that the data were MCAR.

4.2 | Descriptives and bivariate correlations

Means, standard deviations, and descriptive statistics of all observed variables are presented in Table 1. Bivariate correlations between all observed variables are presented in Table 2.

4.2.1 | Structural equation models

To assess how well the models fit the data, the following indices were used: comparative fit index (CFI) values >0.95, a root mean square error of approximation (RMSEA) value of <0.10 (Byrne, 1994; Hu & Bentler, 1995; Meyers, Gamst, & Guarino, 2006), and a standardized root mean square residual (SRMR) value of <0.10 (Kline, 2016). The CFI analyzes the fit of the model by assessing the discrepancy between the hypothesized model and the data, while also adjusting for issues relating to sample size that are seen in the χ^2 statistic. The RMSEA assesses the discrepancy between the hypothesized model and the covariance matrix with optimally selected

TABLE 2 Bivariate correlations of observed variables

	1	2	3	4	5	6	7	8
1. Adult trauma								
2. Childhood trauma	0.556*							
3. Depression	0.425**	0.377**						
4. Anxiety	0.405**	0.438**	0.809**					
5. PTSD	0.541**	0.537**	0.439**	0.505**				
6. Sleep disturbance	0.350**	0.275**	0.566**	0.527**	0.396**			
7. Pain	−0.314**	−0.240**	−0.444**	−0.447**	−0.357**	−0.394**		
8. General health	−0.301**	−0.143*	−0.399**	−0.382**	−0.239**	−0.298**	0.360**	
9. Smoking	0.106	0.195**	0.092	0.203**	0.248**	0.094	0.001	0.105

*$p < .05$; **$p < .01$.

parameter estimates. The SRMR is a badness of fit statistic, which measures the overall difference between predicted and observed correlations.

4.2.2 | Measurement model

To examine whether the latent variables themselves were operating as expected, a measurement model was run first in which the latent variable of trauma history (specified by manifest variables of childhood trauma and adult trauma) and mental health (specified by manifest variables of depression, anxiety, and PTSD) were correlated. The χ^2 value was statistically significant ($\chi^2 = 13.231$, $p < 0.001$), suggesting poor model fit. Other fit indices also generally supported the poor fit of the model: CFI = 0.895, SRMR = 0.100, and RMSEA = 0.243 (CI, 0.187, 0.303). When the standardized path loadings were examined, PTSD had the lowest loading on mental health ($\beta = 0.560$) of any loading in the model. A second measurement model was run in the same manner, but dropping PTSD as a manifest index of mental health. The resulting fit indices were substantially improved. The χ^2 value was just statistically significant ($\chi^2 = 4.063$, $p = 0.044$), suggesting adequate model fit given the study's sample size. Other fit indices also generally supported the adequate fit of the model (CFI = 0.991, SRMR = 0.013), despite the slightly high RMSEA value of 0.122 (CI, 0.017, 0.254). As a result, all successive structural models were run with depression and anxiety as manifest indices of mental health. Fit indices for structural models are presented in Figures 1–4.

4.2.3 | Sleep disturbance structural model

Figure 1 shows a visual representation of the model. The χ^2 value was not statistically significant, suggesting good model fit, $\chi^2 = (3, N = 210) = 6.751$, $p = 0.080$. Other fit indices also supported the goodness of fit of the model: CFI = 0.991, SRMR = 0.018, and RMSEA = 0.078 (CI, 0.000, 0.158). There were significant direct effects from trauma history to mental health ($\beta = 0.608$, $p < 0.001$) and from mental health to sleep disturbance ($\beta = 0.557$, $p < 0.001$). The direct effect between trauma history and sleep disturbance was not significant ($\beta = 0.084$, $p = 0.377$), yet there was a significant indirect effect from trauma history to sleep disturbance through mental health ($\beta = 0.339$, $p < 0.001$), indicating a full mediation. This model explained 37.5% of the variance in sleep disturbance.

4.2.4 | Pain structural model

Figure 2 shows a visual representation of the model. The χ^2 value was not statistically significant, χ^2 $(3, N = 210) = 6.055$, $p = 0.109$. Other fit indices also supported the goodness of fit of the model: CFI = 0.992,

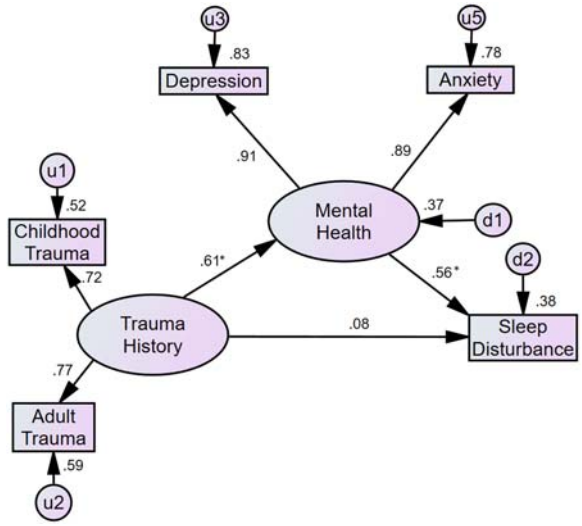

FIGURE 1 Sleep disturbance structural model [Color figure can be viewed at wileyonlinelibrary.com]

SRMR = 0.016, and RMSEA = 0.070 (CI, 0.000, 0.152). There was a significant direct effect from trauma history to mental health (β = 0.612, $p < 0.001$). There was also a significant direct effect from mental health to pain ($\beta = -0.425$, $p < 0.001$). There was a significant indirect effect from trauma history to pain through mental health ($\beta = -0.260$, $p < 0.001$), although there was not a significant direct effect from trauma history to pain ($\beta = -0.113$, $p = 0.277$), reflecting a full mediation. This model explained 25.2% of the variance in pain.

4.2.5 | General health structural model

Figure 3 shows a visual representation of the model. The χ^2 value was not statistically significant, χ^2 (3, $N = 210$) = 11.049, $p = 0.011$. Other fit indices also supported the goodness of fit of the model: CFI = 0.980, SRMR = 0.029, apart from the RMSEA = 0.114 (CI, 0.047, 0.189). There was a significant direct effect from trauma

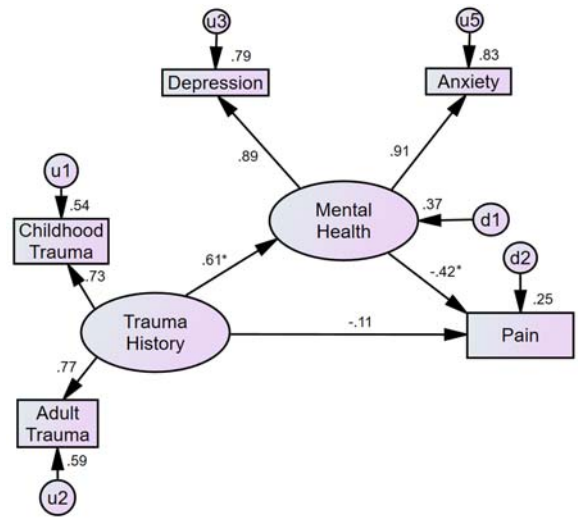

FIGURE 2 Pain structural model [Color figure can be viewed at wileyonlinelibrary.com]

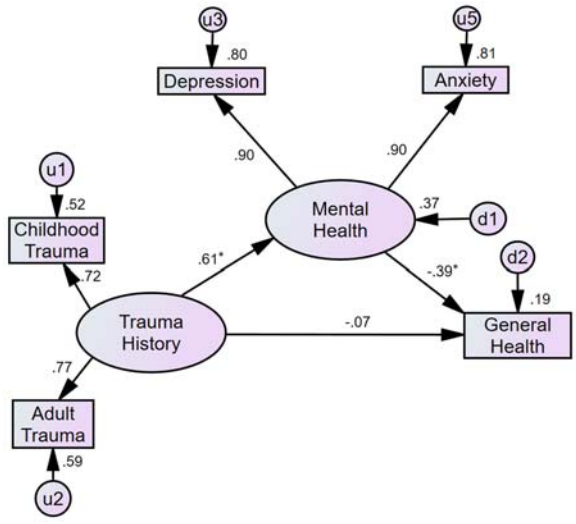

FIGURE 3 General health structural model [Color figure can be viewed at wileyonlinelibrary.com]

history to mental health ($\beta = 0.611$, $p < 0.001$) and from mental health to general health ($\beta = -0.391$, $p < 0.001$). The combination of a significant indirect effect from trauma history to general health through mental health ($\beta = -0.239$, $p < 0.001$) and no significant direct effect from trauma history to general health ($\beta = -0.070$, $p = 0.537$) suggested a full mediation. This model explained 19.1% of the variance in general health.

4.2.6 | Smoking structural model

The χ^2 value was not statistically significant, χ^2 (3, $N = 210$) = 10.707, $p = 0.013$. Other fit indices supported the model's goodness of fit: CFI = 0.979, SRMR = 0.028, apart from the RMSEA (0.112; CI, 0.045, 0.188). There was a significant direct effect from trauma history to mental health ($\beta = 0.601$, $p < 0.001$). However, there were not significant direct effects from mental health to smoking ($\beta = 0.102$, $p = 0.333$), or from trauma history to smoking

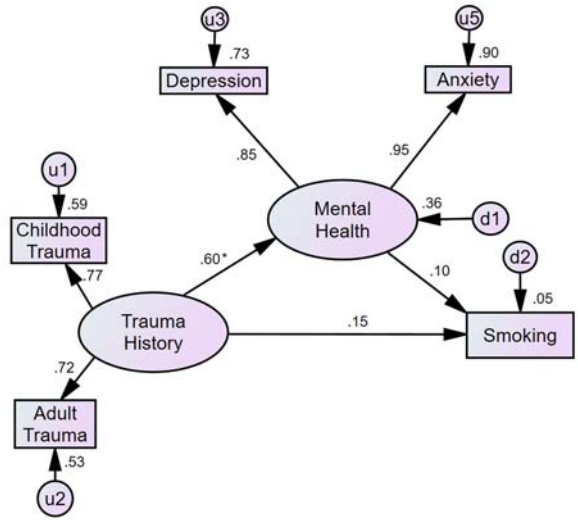

FIGURE 4 Smoking structural model [Color figure can be viewed at wileyonlinelibrary.com]

($\beta = 0.146$, $p = 0.193$). There was also not a significant indirect effect from trauma history to smoking through mental health ($\beta = 0.061$, $p = 0.438$). Because of the general lack of significant direct and indirect effects in the model, the model was not retained. Figure 4 shows a visual representation of the model.

4.2.7 | Alternative directionality

To investigate potential alternative directionality in the three retained models (sleep, pain, and general health), three exploratory SEMs were run such that mental health was the outcome and the physical health variable was the mediator. A comparison of model fit with the alternative models would not be fruitful because reversal of directionality in an SEM with the same parameter specifications does not change model fit. All three alternative models did show significant indirect effects, but these were only partial in nature. The path between trauma history and mental health was still very significant for all three models at $p < 0.001$. This is in comparison to full mediations operating in the retained models. As a result, the directionality in the three original structural models was retained.

5 | DISCUSSION

The present study aimed to describe trauma exposure and its relationships with mental health and common primary care presenting health problems in an at-risk, community sample. Trauma exposure, both in childhood and adulthood, was common in this population. The study used SEM to examine how childhood and adult trauma collectively mapped onto mental health (depression, anxiety, and PTSD) and (a) sleep disturbance, (b) pain, (c) general health, and (d) smoking. PTSD was dropped because of poor model fit. The resulting models for sleep, pain, and general health showed good fit; mental health fully mediated the relationships between trauma exposure and these three health outcomes. However, the model fit was poor for smoking. The trauma history to smoking model showed a significant direct effect of trauma history on mental health, but no other effects were significant.

5.1 | Trauma and mental health

Trauma exposure was ubiquitous in the present study, which is likely attributed to the fact that this was an at-risk sample. The majority of participants in the present study were low income, with 70% reporting income or public assistance of $5,000 or less per year and an additional 14% earning less than $10,000 per year. The racial/ethnic composition of the population was diverse, with nearly three quarters being of a racial/ethnic minority background. To date, research on trauma exposure in low socioeconomic status and racially/ethnically diverse samples is scarce, even though these populations are at increased risk for trauma exposure and negative health sequelae (Alim et al., 2006; Gillespie et al., 2009; R.J. Turner & Avison, 2003). The present sample reported higher rates of cumulative trauma compared with studies with higher income samples. For example, in a landmark study of childhood trauma and outcomes, 12.5% of participants endorsed four or more traumatic events in childhood (Centers for Disease Control & Prevention, 2016). Comparatively, 51% of patients in the present sample endorsed four or more childhood traumas using the same scale. This finding is particularly disconcerting in light of research evidence showing that the presence of four or more childhood traumas marks a tipping point, wherein negative physical and mental health outcomes become exponentially worse (Edwards, Holden, Felitti, & Anda, 2003). The present sample also showed elevated levels of adult trauma exposure, including 85% reporting one or more traumas, compared with 51%–69% in the overall population (Norris & Stone, 2013).

Depression and anxiety symptoms were also widespread and directly connected to trauma exposure. In the present study, 59% of patients reported clinically significant symptoms of depression and 48% clinically significant symptoms anxiety (Kroenke et al., 2001; Spitzer et al., 2006). These symptoms were elevated from the general population rates of 12.5% for a 12-month prevalence for depression and 10% for a 12-month prevalence for

anxiety, underscoring the present sample's high rate of mental health conditions (Kessler et al., 2013). As hypothesized in the present study and outlined by a host of studies in the research literature, these symptoms of depression/anxiety were predicted by increased trauma exposure. The majority of the research literature parses out trauma exposure by age/subtype and separates mental health by disorder. By creating latent variables, with trauma encompassing child/adult trauma and mental health encompassing depression/anxiety, the present study provides a more holistic approach that may capture cumulative trauma and encompass transdiagnostic mood disorder symptoms.

In contrast to the study's hypotheses, PTSD contributed to poor fit in the measurement model. There are several potential explanations for PTSD's low factor loading, including that trauma exposure was requisite for PTSD diagnosis or that symptoms of PTSD may be too dissimilar to depression/anxiety to be included in a latent construct. Further, PTSD had an extremely high prevalence rate (45.7%) in this sample, which may be attributable in part to measurement issues and instrument selection, as the PTSD-8 does not specify either a specific timeframe in which symptoms had to have occurred or whether a specific index trauma meeting DSM-IV criterion A for PTSD needs to be considered in responding. The PTSD diagnostic rate in the current study is not appreciably different in comparison to the scale's validation samples of people with a whiplash (33%), who have experienced rape (54%), or who witnessed a firework factory explosion (21.7%; Hansen et al., 2010). Moreover, some of the PTSD-8's items (e.g., "Feeling on guard") may be more normative and legitimate experiences for participants in the current sample given the reality of their lives and therefore may or may not necessarily reflect discrete PTSD symptoms. Furthermore, one study postulated that posttraumatic somatic symptoms may be better explained by depression/anxiety than by PTSD (McCall-Hosenfeld, Winter, Heeren, & Liebschutz, 2014). Finally, cumulative, community-based trauma, especially when experienced in childhood, may present differently from PTSD, resulting from more discrete, adult events (Stolbach et al., 2013).

5.2 | Trauma, mental health, and primary care models

Of the models investigated, sleep, pain, and general health were found to have adequate fit, suggesting that trauma exposure may exert an influence on sleep disturbances, pain, and general health through mental health. Previous literature has established each of these pathways individually, but this is the first study to our knowledge to propose comprehensive models. Further, the three models involved full mediations, which highlight the pivotal role of mental health in explaining the connection between trauma and health behaviors and outcomes. These models may be helpful in providing a framework to understand the etiology of pain, sleep disorders, and general health problems in trauma-exposed populations.

In contrast to the study's hypotheses, the smoking model did not fit well with the data and was not retained. Several factors may have contributed to the lack of statistically significant effects within this model. First, smoking was higher in this sample than the general population. In the present sample, 74% of those who responded to the item were smokers, as compared with 15% of the general population and 26% of adults below the poverty level (Centers for Disease Control & Prevention, 2016). Because of its high rate in this population, smoking may have been better understood as a normative behavior rather than a coping mechanism for trauma or mental health concerns. In addition, smoking was assessed with a single-item question assessing smoking behavior. A more nuanced measurement of smoking may have contributed to more meaningful results.

5.3 | Clinical implications

Results of the present study reinforced the relationship between physical and mental health while underscoring the high patient needs—and the opportunity for intervention—in low-income, safety-net primary care clinics. As hypothesized, the present sample reported elevated rates of trauma exposure, which have been associated with higher physical healthcare utilization, functional impairment, and low physician detection in the existing literature

(Kartha et al., 2008; Liebschutz et al., 2007; Westphal et al., 2011). The present study also demonstrated that trauma exposure may have influenced depression and anxiety, which in turn may have influenced sleep, pain, and general health. Unfortunately, low-income patients are among the least likely to access mental health services, despite their increased need (Saxena, Thornicroft, Knapp, & Whiteford, 2007). Common barriers for racial/ethnic minority and low socioeconomic status patients include stigma related to mental illness and treatment, as well as substantial financial barriers, such as insurance limitations, transportation concerns, and availability of low-cost mental health services (Williams, 1999). Integrated care, particularly in safety-net clinics, may help improve patient access, as patients can be identified during routine visits without having to present specifically for mental health treatment (American Psychiatric Association, 2016). The present study highlights the importance of integrated care to address mental health issues and potentially mitigate the influence of these issues on key physical health outcomes.

The study's findings that trauma was widespread and connected to possibly cascading negative consequences on physical and mental health suggest that trauma-sensitive treatment is warranted. These implications are congruent with current best practice recommendations by the American Academy of Medicine and American Psychological Association. Unfortunately, clinical practices lag behind these recommendations: trauma screening (particularly for nonrecent exposure) is uncommon, providers report little training in screening and care, and many evidence-based treatments for depression and anxiety do not specifically address trauma exposure. This study adds to the body of literature calling for increased training of healthcare providers in trauma-informed care and trauma-informed clinical interventions. Indeed, preliminary studies indicate that it may be fruitful to evaluate trauma exposure in patients with anxiety and depression to guide treatment modality decisions and to tailor interventions. For example, one study on antidepressants found that persons with a trauma history were less responsive to antidepressants alone and benefit from concurrent therapy, compared with patients without a trauma history (Nemeroff et al., 2003). Evidence for universal screenings of trauma exposure for all patients is still mixed, and opportunity cost associated with screening time and intervention should also be weighed (McLennan & MacMillan, 2016). Further research on trauma-informed treatments for depression/anxiety, particularly those which can be adapted to primary care settings, is necessary to improve mental health and reduce somatization.

5.4 | Limitations and future directions

The study makes a valuable contribution to the understanding of trauma and its relationships with mental and physical health but is limited by several factors. First, the study is cross-sectional and thus cannot conclusively speak to directionality, temporal relationships, or causality among the variables. The study was also limited by self-report as well as retrospective reporting, which are both subject to bias. In addition, health behaviors (e.g., frequency of medical visits) and/or substance use (e.g., drugs or alcohol) were not assessed in the present study but may have contributed to both mental and physical health outcomes. Furthermore, resilience was not assessed and may have played a key role in which trauma-exposed patients developed mental health concerns, as has been found in previous research. Future research could incorporate these potential mechanisms to expand upon the models proposed in this study and adapt a strength-based approach. Furthermore, the present study broadly categorized adult and childhood trauma exposure, so it was not possible to evaluate discrepancies in contribution by trauma subtype (e.g., sexual vs. physical, witnessed vs. experienced trauma) or by developmental age of experience. Moreover, mood state bias may have altered recall of traumatic events. Finally, some physical health symptoms (e.g., sleep disturbances) were assessed continuously, rather than as discrete diagnostic categories, limiting conclusions on prevalence of specific disorders.

Despite its limitations, the present study provides a novel framework for understanding mental and physical health in trauma-exposed, low-income primary care patients. Substantial research has demonstrated the close relationship between depression/anxiety and physical health, but research evaluating the contribution of trauma was limited. Future research could build on the present study by fleshing out potential behavioral mechanisms that

may mediate or moderate the relationship between trauma exposure and mental health. In addition, future research could explore differences between types of trauma experienced, developmental stage during first trauma exposure, and cumulative trauma to better understand differences in contributing to mental health issues and subsequent sleep, pain, and general health. Moreover, future research could focus on applying the present model to evidence-based treatments for depression/anxiety in primary care. For example, additional studies could assess whether trauma exposure influences depression/anxiety treatment responses as well as determine if particular existing treatments are better suited to certain trauma histories. Such research would better enable clinicians to select the most appropriate therapy for their patients.

6 | CONCLUSION

The present study modeled relations among trauma exposure, mental health, and common presenting problems in a low-income, high-risk community sample. There is a paucity of research with housing-insecure, low-income samples, and these findings highlight the substantial mental health needs and high trauma exposure rates for these patients. These high rates of trauma and mental health concerns were demonstrated to predict common and costly physical health concerns. These findings suggest a need for trauma-informed, integrated treatment of depression/anxiety in primary care.

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