

# AN EXAMINATION OF EXPOSURE AND VULNERABILITY TO STRESS FROM CHRONIC ILLNESS AND ITS IMPACT ON MENTAL HEALTH AND LONG-TERM DISABILITY AMONG NON-HISPANIC WHITE, AFRICAN AMERICAN, AND LATINX POPULATIONS

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## ABSTRACT

*Purpose: This study examines chronic illness, disability and social inequality within an exposure-vulnerabilities theoretical framework.*

*Methodology/Approach: Using the National Survey of Drug Use and Health (NSDUH), a preeminent source of national behavioral health estimates of chronic medical illness, stress and disability, for selected sample years 2005–2014, we construct and analyze two foundational hypotheses underlying the exposure-vulnerabilities model: (1) greater exposure to stressors (i.e., chronic medical illness) among racial/ethnic minority populations yields higher levels of serious psychological distress, which in turn increases the likelihood of medical disability; (2) greater vulnerability among minority populations to stressors such as chronic medical illness exacerbates the impact of these conditions on mental health as well as the impact of mental health on medical disability.*

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*Findings: Results of our analyses provided mixed support for the vulnerability (moderator) hypothesis, but not for the exposure (mediation) hypothesis. In the exposure models, while Blacks were more likely than Whites to have a long-term disability, the pathway to disability through chronic illness and serious psychological distress did not emerge. Rather, Whites were more likely than Blacks and Latinx to have a chronic illness and to have experienced severe psychological distress (both of which themselves were related to disability). In the vulnerability models, both Blacks and Latinx with chronic medical illness were more likely than Whites to experience serious psychological distress, although Whites with serious psychological distress were more likely than these groups to have a long-term disability.*

*Research Limitations: Several possibilities for understanding the failure to uncover an exposure dynamic in the model turn on the potential intersectional effects of age and gender, as well as several other covariates that seem to confound the linkages in the model (e.g., issues of stigma, social support, education).*

*Originality/Value: This study (1) extends the racial/ethnic disparities in exposure-vulnerability framework by including factors measuring chronic medical illness and disability which: (2) explicitly test exposure and vulnerability hypotheses in minority populations; (3) develop and test the causal linkages in the hypothesized processes, based on innovations in general structural equation models, and lastly; (4) use national population estimates of these conditions which are rarely, if ever, investigated in this kind of causal framework.*

**Keywords:** Stress; exposure-vulnerability; chronic illness; long-term disability; generalized structural equation models; mental health

## BACKGROUND

The aim of this study is to extend research on chronic illness, disability, and social inequality by placing it in the context of an exposure-vulnerabilities theoretical framework, typically employed in areas of disease contagion and environmental health, and more recently in stress process models (see, e.g., [Aneshensel and Mitchell 2014](#); [Cartaxo et al. 2021](#); [Lashley 2004](#); [Turner, Wheaton, and Wheaton 2010](#)). The exposure-vulnerability model provides an explanatory framework for understanding differences, if not disparities, in disability and mental health outcomes between majority and vulnerable populations ([Botha and Frost 2020](#); [Meyer 2003](#)). This framework can be used to examine the relationship between racial/ethnic and socioeconomic status, and disparities-in-medical-health hypotheses to understand the dynamics of chronic illness and disability. The central premise is that systems of stratification (e.g., race/ethnicity, socioeconomic class, gender, age), social institutions fostering those systems, and interpersonal networks place a greater psychological and emotional burden on some groups, those with fewer socioeconomic and cultural resources, relative to

others. The racial/ethnic-minority variant of the framework emphasizes the unique importance of race and ethnicity in social hierarchies, documenting the deleterious effects of stigma and discrimination on health (Hatzenbuehler, Phelan, and Link 2013). Naturally, the intersection of race, health, SES, and social class is complex. Research shows multiple pathways from SES and race/ethnicity to health; one such pathway is through differential exposure to chronic stress and its resulting biological toll (Adler and Rehkopf 2008). Disadvantaged groups (e.g., racial and ethnic minorities) are at greater risk of exposure to disruptive life events, situations and conditions such as trauma, income strain, discrimination which, given socioeconomic and cultural disadvantage, increase the likelihood of psychological stress, and in its severest manifestation, distress and its various disorders, anxiety, and depression (Cronholm et al. 2015; Institute for Safe Families 2013; Luo et al. 2012; Pascoe et al. 2009; Wade et al. 2016; Wang et al. 2020; Williams and Mohammed 2009).

These linkages are part of a broad social-determinants-of-health research framework which investigates mechanisms by which social disadvantage (and its related vulnerabilities) creates psychosocial stress, in turn, shaping health outcomes such as chronic illness and disability (for discussion see, e.g., Stuber, Meyer, and Link 2008; Williams and Williams-Morris 2000). While exposure/-vulnerability-social determinants research frameworks overlap and share an intuitive appeal, the nexus of social status, its stressors, stress and health outcomes remains open to theoretical refinement and empirical investigation.

Disability and distress have a complex, reciprocal relationship. Drawing from the stress process model, Turner and colleagues have explored the influence of disability on psychological distress and other mental health outcomes (Brown and Turner 2010; Gayman, Turner, and Cui 2008; Turner, Lloyd, and Taylor 2006; Turner and McLean 1989; Turner and Turner 2004). Turner and McLean (1989) found disabled individuals were at significantly higher risk for anxiety, depressive symptoms, and major depressive disorder. They attributed this to the chronic stress experienced by physically disabled individuals. Fewer studies, however, have examined the role of psychological distress in exacerbating disabilities due to chronic illness. For example, although a number of studies have shown that racial and ethnic minorities have higher rates of exposure to some stressors (Boardman et al. 2011), others (e.g., Schieman and Reid 2009) argue that social advantage carries its share of stressors, and stress, as well. The accompanying explanation for continued racial and ethnic disparities in the face of the ubiquity of stress is that while social advantage certainly confers its share of stressors and stress perceptions, those who function at higher ends of the social hierarchy also frequently have more resources to meet the demands of their stressors (e.g., Epel et al. 2018), and are better positioned to manage their stress, with less consequent, perceived and actual, emotional and medical distress (e.g. Marmot et al. 1991; Sapolsky 1994). A review of studies of adverse childhood experiences' (ACE's) as a source of stress indicates that for more resourced (i.e., middle class) Blacks, higher ACE's stress scores were *inversely* related to adult hypertension, contrary to expectations (Henderson et al. 2021). The

question, in a narrow sense, then, hinges on the extent to which types of social conditions constitute “stressors,” and which resources shape those effects, and how do they do so, in order to determine the scope of relevant hypotheses (see, e.g., discussion of exposure in [Turner and Donald 1995](#)).

Given the “multifactorial etiology” of disability, it is important to consider the contributions of chronic illnesses and psychological distress in the development of diagnosed disability ([Manninen et al. 1997](#)). In the first study of its kind, [Manninen and colleagues \(1997\)](#) examined psychological distress and the incidence of disability due to four categories of diseases/disorders— cardiovascular diseases, musculoskeletal disorders, osteoarthritis, and psychiatric disorders. They studied receipt of disability pensions among a group of Finnish farmers and found psychological distress predicted overall disability and particularly, was associated with a 2.5-fold increase in the relative risk of disability for farmers diagnosed with cardiovascular diseases and depression. In a more recent study, [Mojtabai \(2011\)](#) studied disability due to mental health issues and found it to be more pronounced in adults with co-occurring and disabling chronic conditions or significant psychological distress. [Rai et al. \(2011\)](#) examined the relationship between psychological distress and risk of long-term disability among a working age sample of adults in Stockholm County, Sweden. The authors found “over a quarter of disability pensions awarded for a somatic diagnosis, and almost two-thirds awarded for a psychiatric diagnosis, could be attributed to psychological distress” ([Rai et al. 2011:1](#)). Furthermore, a study of Canadian adults found functional disability was higher “in subjects with asthma and comorbid psychological distress than in individuals with either asthma or psychological distress alone,” leading the authors to conclude that detection and management of psychological problems would be beneficial to those experiencing chronic conditions, such as asthma ([Schmitz et al. 2009:42](#)). Taken together, these studies suggest psychological distress is a potential important pathway linking chronic conditions to diagnosed disability.

In contrast to the exposure model, a vulnerability hypothesis suggests that it is not simply exposure to certain social conditions which determines variation in stress between populations, but the extent to which some groups are more susceptible to the corrosive potential of some stressors. In both processes, exposure and vulnerability, the underlying assumption posits material and cultural resource advantage which functions as a buffer between stressors and mental health. Presumably, resource advantages also mitigate the effects of the stress response on other health outcomes, including medical morbidities, such that those at a disadvantage, with fewer resources, are at greater risk to experience the damaging impact of stress on their health and well-being.

Before examining resource interventions, however, we might first return to the question of stressors-stress-outcomes in order to answer the fundamental question whether it is exposure or vulnerability that produces racial/ethnic disparities in health outcomes. To do so, this study examines racial/ethnic variation at the nexus of chronic medical illness, its impact on serious psychological distress and disability. We advocate the use of the National Survey of Drug Use and Health, because it is the chief source of SAMHSA estimates of behavioral health in the US.

With these data, based on prior theory and empirical findings, we develop and test racial/ethnic exposure- and -vulnerability to stress hypotheses.

Prior research has shown that racial/ethnic minority populations are 1.5–2.0 times more likely than Whites to have most of the major chronic diseases (Adler and Rehkopf 2008; *Almanac of Chronic Diseases 2008*), and also more likely to be at greater risk to experience some forms of distress relative to other groups (Williams 2018). Although research shows chronic illness is associated with higher levels of stress (e.g., Swartz and Jantz 2014), it remains for the current study to clarify how race/ethnicity structure the relationship. Alternatively, in light of the failure of early stress research to fully support an exposure hypothesis (Aneshensel and Mitchell 2014), the vulnerability hypothesis remains a viable explanation for (some) observed population differences in mental health outcomes. The claim underlying the vulnerability model is that exposure per se does not necessarily generate population differences in stress responses. Rather, some populations are more vulnerable than others to the impact of stressors which emerge as variation between groups in stress responses. In terms of modeling, the exposure hypothesis suggests a mediation model in which stressors explain differences in racial/ethnic variation in stress which then account for racial/ethnic variation in health outcomes. The vulnerability hypothesis suggests a model in which race/ethnicity exacerbates these relationships. The classic form of this model is to statistically assess the degree to which race/ethnic moderate these relationships.

While Aneshensel and Mitchell (2014) call for research to more fully examine mediating and moderating models, their discussion of models focuses on resources as mediators and moderators, rather than the simpler model we propose as a necessary first step in developing more complicated resource-focused frameworks. As support for taking this remedial step, we turn to Williams (2018) and others who have observed that mental health outcomes, whether stress related or not, are not very robust with respect to race and ethnicity. For example, this author (p. 6), citing Pearlman et al. 2005 and others) notes that:

We do not currently have a clear sense of either the determinants of the levels of mental health status for the major racial/ethnic groups in the U.S. or the patterning of the various indicators of mental health status for all of these minority populations. However, there is broad agreement that social contextual factors that reflect exposure to chronic and acute stressors linked to the living and working conditions of these populations play a role in shaping their mental health risk.

This study tries to help clarify those relationships before moving in the direction of more complicated models. The study's key contributions are: (1) to extend the exposure-vulnerability framework by including medical conditions both as precursors/stressors, as well as outcomes (Aneshensel and Mitchell 2014), in order to (2) explicitly test exposure and vulnerability hypotheses in minority populations (Wheaton 2010); (3) develop and test the causal linkages in the hypothesized processes, based on innovations in general structural equation models which foster examination of the simultaneous nature of indirect and direct effects (see Figs. 1 and 3), and the dual role the mediator (stress qua serious

psychological distress) plays as both a cause of health outcomes (disability) and an effect of a class of medical stressors themselves (chronic medical illness); and lastly (4) use national population estimates of these conditions which are rarely, if ever, investigated in this kind of causal framework (see Swartz and Jantz 2014).

We describe how we do so in the next section.

## METHODS

### *Data and Study Population*

To understand how exposure-vulnerability to stress processes function as a consequence of chronic medical illness and as a precursor to long-term disability among nonmajority racial and ethnic populations, we examine medical and mental health data from the NSDUH (2005–2014), a nationally representative sample comprising the US population's behavioral health information (SAMHSA 2018). NSDUH data serve as a preeminent source of yearly US incidence and prevalence estimates of behavioral health, including measures of major depression, anxiety, schizophrenia, substance use disorders and serious psychological distress. The data cover a variety of health conditions as well as socioeconomic and demographic characteristics. Our sample for 2005–2014 consists of 348,901 adult respondents.

Reasons for selecting data from 2002 to 2014 are: (1) since less than 5% of the population has a disability (<https://www.samhsa.gov/data/data-we-collect/nsduh-national-survey-drug-use-and-health> 2002–2019) it was necessary to pool data for as many years as possible to increase the power of our models, which are already constrained by a complex sample design; (2) the full set of variables for the analyses were available only in these years.

Following previous studies, we operationalized racial and ethnic group membership based on self-identified race/ethnicity: Latino/a/Hispanic, White (non-Latino/non-Hispanic), and Black (non-Latino/Non-Hispanic). Since we cannot adequately theorize about stress and disability for other racial/ethnic groups such as Asian Americans, Native Americans, and mixed racial/ethnic groups, and because their sample sizes diminish rapidly, these populations have been excluded from analyses.

### *Measures*

#### *Chronic Illness Scale*

NSDUH asks respondents to indicate from a list of a major illness the medical diagnoses they have ever received during their lifetimes. The selected items comprise our medical morbidities scale cover: heart conditions, diabetes, lung cancer, COPD/bronchitis, cirrhosis, hepatitis A and B, high blood pressure and asthma. To remove temporal confounding with our other measures, only those with a diagnosis, *prior to the past year* were scored as having a prior medical morbidity (i.e., time  $t - 1$ ). Specifically, we are able to distinguish those with a prior chronic illness (or not) from those with a contemporaneously diagnosed

one. In the tables below, we err on the side of making conservative estimates by only counting those with a prior condition. Because there are few individuals with all eight conditions, our count ranges from 0 (none), 1 (at least one condition), 2 (more than one condition).

### *Serious Psychological Distress*

While stress is a physiological or psychological response (with positive or negative valence) to internal or external stressors, affecting biochemical and psychological systems and influencing how people feel and behave, distress is delineated as negative affect and physiological reactivity, sometimes conflated with mental illness (Goldberg 2000). The Kessler 10 and Kessler 6 scales were developed to assess an individual's emotional state with respect to with this affect. As described in detail in Kessler et al. (2003), the scales were designed to be sensitive around the threshold for the clinically significant range of nonspecific distress in an effort to discriminate cases of serious mental illness. The NSDUH uses a version of the K6 scales, asking respondents to imagine their worst month during the past year (i.e., time  $t$ ), then describe how often they felt – restless, nervous, hopeless, no good, burdened by effort, and “couldn't be cheered up.” The SPD scale ranges from 0 (none of the items, none of the time) to 24 (all of the items, all of the time).

### *Disability*

Although the NSDUH survey contains a number of indicators of health (see above), including questions where respondents rank their health status, one clear sign of problematic health is whether or not individuals have been diagnosed with a physical or mental health disability by a health professional. Although an optimal assessment of disability would be to have a record of the respondent's disability status, the NSDUH asks directly about disability only as it pertains to work during the past week. Our disability outcome is therefore derived from a series of three questions that ask about a respondents' occupational status (e.g., reasons for not working, work situation, reason for not having a job) during the past week (i.e., time  $t + 1$ ). The benefit of the measure is that it is definitive in identifying a health/disability diagnosis supported by a legal status. We err on the conservative side in that there could be respondents who did not work during the past week because they were students or retired or did not want to (among other options), and, who were also disabled.

### *Covariates*

We include in our models several covariates that may influence the relationships between race/ethnicity, stressors, stress and disability. These are: age, gender, income, and marital status. We limit our analyses to these variables because the degrees of freedom in the GSEMs (described below) get small very fast, reducing the power of the analyses. Although the analytic tables below do not show estimates for these covariates, all models have been adjusted for them. We ran models separately for gender and age (not shown), along with race/ethnicity but

found that interpretation of second-order interactions obscured rather than clarified relationships, given the limits of exposure-vulnerability hypotheses. That is to say, exposure-vulnerability theory is not developed enough to predict intersectional effects on disability, a priori. Any differences we found along the dimensions of age or gender (x race/ethnicity), were a posteriori. We instead focus on a simpler model.

### *Analytic Strategy*

A review of the statistical methods commonly used to identify the relationships identified in the exposure-vulnerability-to-stress process shows a mix of linear models as well as structural/simultaneous equation models (SEMs). Researchers use SEMs because the former can be problematic with regard to establishing cause-effect relationships due to endogeneity, multi-collinearity among explanatory variables, and erroneous handling of non-normal and non-continuous distributions of response variables. Except for multi-collinearity, our data share all of these challenges. NSDUH data are culled from the population through a complex stratified sampling scheme further taxing the assumption of normality that underlies least squares analyses (see discussion NSDUH Methodological Resource Book 2018). To meet this condition, we propose an approach based on modification of SEMs for non-normal variables (see [Muthen and Satorra 1995](#) for discussion of non-normality in SEMs). These are generalized structural equation models (GSEM). GSEMs combine the power and flexibility of both SEM and linear models based on the principles of general linear models, a unified modeling framework. The variables in the following analyses are observed, not latent, and therefore the standard simultaneous equation reduces to an econometric-type path model. That is, there are several variables the serve as predictors of some variables, yet are predicted by others. This holds for both the mediation and moderation models. The (constrained) simultaneous mediation model constructed for GSEM analysis can be described by:

$$x' = a'_0 + a'x'' + \sum_k e_k m_k \quad [\text{path } a']$$

$$z = a''_0 + a''x' + \sum_k e_k m_k \quad [\text{path } a'']$$

$$y = b'_0 + bz + \sum_k e_k m_k \quad [\text{path } b]$$

$$y = b''_0 + c'x'' + b_1x' + b_2z + b_3y + \sum_k e_k m_k \quad [\text{path } c']$$

where each path,  $a'$ ,  $a''$ ,  $b$  and  $c'$  are linked to coefficient estimates ( $b''$ ,  $c'$ ,  $b_1$ ,  $b_2$ ,  $b_3$ ) based on the specific type of distribution for each  $x'$ ,  $z$ ,  $y$ , (i.e., Gaussian,



Bernoulli and Bernoulli, respectively). The  $\sum_k e_k m_k$  are the covariates and error terms. The unconstrained model in Fig. 2 adds a path  $a'''$  and  $b''$  while relabeling  $b$  in Figs. 1 and 2' to accommodate the new  $b''$  path from chronic illness directly to disability (rather than solely via serious psychological distress).

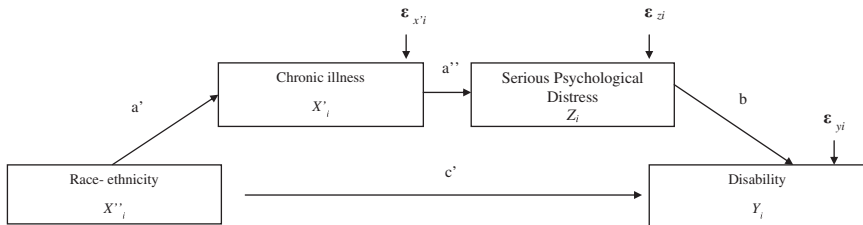


Fig. 1. Exposure to Stress Process Mediation Model (Constrained).

Figs. 1 and 2 present the exposure/mediation model. We ran two versions of the model: a constrained version (Fig. 1) and an unconstrained one (Fig. 2). Fig. 1 shows the constrained model in which race and ethnicity are expected to influence disability by way of prior health conditions which impact serious stress. The bottom-most horizontal arrow between race/ethnicity and disability indicates that the direct effect of minority group membership is constrained to operate through chronic illness. In the unconstrained model, race and ethnicity are freed to impact all three factors in the model. Hence, in the unconstrained model there are estimates for two additional parameters:  $a'''$  (from race/ethnicity to serious psychological distress) and  $b''$  (from chronic illness to disability). Potential causal (indirect) mediation effects were then estimated using the product of coefficients method (MacKinnon, Fairchild, and Fritz 2007). A bootstrap analysis with 1,000 replications was applied to estimate the average of the causal mediation effects without requiring the assumption of normality (Preacher and Hayes 2008). With a bias-corrected bootstrap technique, the total, direct and indirect (mediation) effects and their 95% CIs were estimated.

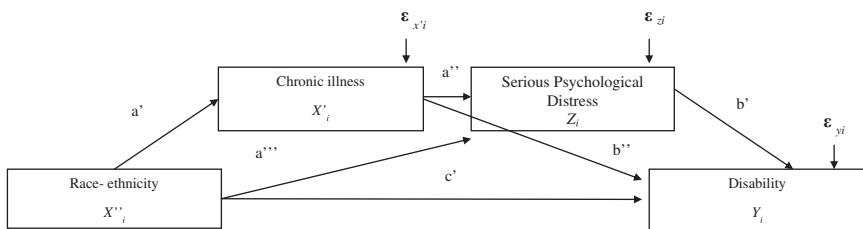


Fig. 2. Exposure to Stress Process Mediation Model (Unconstrained).

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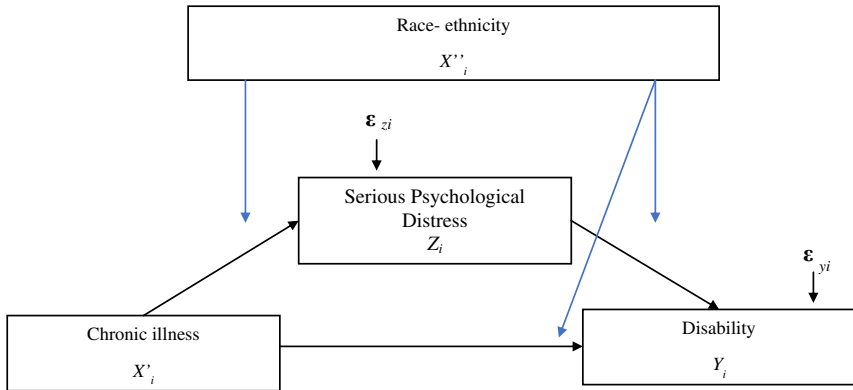


Fig. 3. Vulnerability to Stress Process Moderation Model (Conditional Process).

We ran a similar model for the moderation analysis, except that instead of  $x''$  (race/ethnicity), the first term in the model was  $x'$ , chronic illness (stressor) and the model varied by subpopulation (Fig. 3). Again, we examined direct and indirect effects for each of the subpopulations and tested whether or not the paths,  $a$ ,  $b$  and  $c'$  differed significantly between our sub groups.

The program we use to estimate the equations is Stata 17 as well as Mplus (Muthen and Muthen 1998).

## RESULTS

Table 1 provides descriptive statistics for the variables in subsequent analyses, including the three main endogenous variables: chronic illness, serious psychological distress and disability. Roughly 5% of the population were disabled (at time  $t$ ; during the past year) while 16% reported a chronic illness (at time  $t - 1$ ; prior to the last year). The average level of psychological distress was almost 5 on a scale of 0–24. Design- and weight-corrected estimates of differences between racial and ethnic groups are included in the table. As expected, given our theoretical framework, Blacks were more likely than Whites (but not Latinx) to have a disability but (contrary to expectations) not more likely to have a chronic illness or to be in distress.

Table 2 contains estimates of the parameters in the constrained exposure/mediation model. As Table 2 indicates, the exposure model did not find much support in these data. As expected, Blacks were more likely than Whites to have a disability (OR 1.40  $p < 0.000$ ) while Latinx were less likely than Whites to have a disability (OR 0.798  $p < 0.000$ ). However, both Blacks and Latinx were significantly less likely than Whites to have chronic illness (OR 0.706 and 0.521, relative to Whites, respectively,  $p < 0.000$ ).

**Table 1.** Descriptive Statistics National Survey of Drug Use and Health; NSDUH 2005–2014.

	Pooled Sample Adult Respondents 2005–2014 <sup>a</sup>				Adjusted <i>t</i> -tests <sup>b</sup>		
	Total ( <i>N</i> = 348,901)	Whites ( <i>N</i> = 243,547)	Blacks ( <i>N</i> = 46,896)	Latinx ( <i>N</i> = 59,478)	Wh v. Bl	Wh v. Lat	Bl v. Lat
	Percent/SE	Percent/SE	Percent/SE	Percent/SE			
<i>Model variables</i>							
Disability (past week time <i>t</i> + 1)							
Disabled (disabled = 1)	5.3 (0.001)	4.8 (0.001)	9.1 (0.002)	4.6 (0.002)	0.000	0.485	0.000
Serious psychological distress (past year time <i>t</i> ) (0–24)	4.9 (0.015)	5.0 (0.020)	4.8 (0.038)	4.6 (0.037)	0.002	0.000	0.000
Chronic illness (prior past year time <i>t</i> – 1) (0,1,2)							
No chronic illness (0)	83.3 (0.001)	81.4 (0.001)	86.1 (0.003)	89.7 (0.002)	0.000	0.000	0.000
One reported illness (1)	13.2 (0.001)	14.5 (0.001)	11.5 (0.003)	8.4 (0.002)	0.000	0.000	0.000
Two or more illness (2)	3.5 (0.000)	4.0 (0.001)	2.3 (0.001)	1.9 (0.001)	0.000	0.000	0.004
<i>Covariates</i>							
Race/ethnicity							
White (=1)	72.6 (0.002)	–	–	–	–	–	–
Black (=1)	12.4 (0.001)	–	–	–	–	–	–
Latinx (=1)	15.0 (0.001)	–	–	–	–	–	–
Age (0,1,2)							
Age 18–25	14.6 (0.001)	12.9 (0.001)	17.9 (0.002)	20.2 (0.003)	0.000	0.000	0.000
Age 26–35	15.6 (0.001)	13.7 (0.001)	17.3 (0.003)	22.9 (0.003)	0.000	0.000	0.000
Age 36 and older	69.8 (0.001)	73.4 (0.002)	64.7 (0.003)	56.9 (0.004)	0.000	0.000	0.000
Gender (0,1)							
Male (=1)	48.3 (0.001)	48.4 (0.002)	44.8 (0.004)	50.7 (0.004)	0.000	0.000	0.000
Family income (0,1,2,3,4)							
<\$20,000	18.5 (0.001)	14.5 (0.002)	32.5 (0.004)	26.4 (0.004)	0.000	0.000	0.000
\$20,000–49,999	33.2 (0.001)	30.9 (0.002)	36.5 (0.004)	41.9 (0.004)	0.000	0.000	0.000
\$50,000–74,999	17.4 (0.001)	18.8 (0.001)	14.0 (0.004)	13.9 (0.003)	0.000	0.000	0.834
\$75,000 plus	30.8 (0.002)	35.9 (0.002)	17.0 (0.003)	17.8 (0.003)	0.000	0.000	0.079
Marital status (0,1)							
Married (=1)	53.6 (0.002)	57.7 (0.002)	33.3 (0.004)	50.6 (0.004)	0.000	0.000	0.000

<sup>a</sup>Samples weight- and design-adjusted; see series NSDUH releases 2005–2014 as well as later versions: <https://www.samhsa.gov/data/data-we-collect/nsduh-national-survey-drug-use-and-health>.

<sup>b</sup>Rao-Scott adjusted contrasts df. 110.

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**Table 2.** Constrained Model (Fig. 1): Generalized Structural Equation Models; Adjusted Odds Ratios<sup>a</sup> and Standard Errors for Chronic Illness Time  $t - 1$ , Serious Psychological Distress Time  $t$ , and Disability Time  $t + 1$ . NSDUH 2005–2014<sup>b</sup>.

Constrained Exposure/Mediation Model			
Endogenous	Exogenous	Odds Ratio (SE)	Prob
Disability (0,1)	← Serious psychological distress (0 thru 24) <sup>c</sup>	1.10 (0.003)	0.000
	← Race/ethnicity (Wh (ref), Bl, L)		
	Bl	1.40 (0.057)	0.000
	L	0.798 (0.042)	0.000
Serious psychological distress	← Chronic illness (0, 1, 2+)	2.14 (0.064)	0.000
	← Race/ethnicity (Wh (ref), Bl, L)		
Chronic illness	Bl	0.706 (0.019)	0.000
	L	0.521 (0.011)	0.000
Model fit – Adjusted Wald (2, 109 df)			1,526.9 0.000
Number of cases			348,901

<sup>a</sup>Odds ratio adjusted for age, socioeconomic status, marital status, gender.

<sup>b</sup>Samples weight- and design-adjusted: see series NSDUH releases 2005–2014.

<sup>c</sup>Kessler 6-item distress instrument. Frequency of condition during worst month time  $t$  - past year. Includes feeling nervous, hopeless, restless, no good, burdened by effort, and couldn't be cheered up.

<sup>d</sup>chronic illness includes cancer, diabetes, heart condition, high blood pressure, COPD, hepatitis b and c, kidney disease and asthma.

Table 3 confirms Table 2 findings. The exposure model does not find support in these data because although Blacks were more likely than other groups to have a long-term disability (Table 1), they were less likely to report a chronic illness than Whites and less likely to report serious distress than Whites (OR 0.474  $p < 0.000$ ). Latinx showed a similar pattern relative to Whites, and, in Table 1, relative to Blacks as well. As the stress process literature indicates, there may be a number of reasons that higher status groups such as Whites are more likely to report serious psychological distress (see e.g., Schieman and Reid 2009), as well as to report a chronic illness. We discuss these findings below.

Our final table, Table 4, provides two sets of statistics to assess the vulnerability-moderation model. We examine both the parameter estimates and significance level for each of the three groups. Then we constrain the parameters and evaluate whether they are significantly different (greater or lesser) than one another. We also decompose those relationships into direct and indirect effects in order to determine whether the model operates the same for each group. While this appears to be a form of mediation-moderation model, it only partially reveals how race-ethnicity exacerbates or suppresses the effect of chronic illness on serious psychological distress on disability, and not how all paths operate with

**Table 3.** Unconstrained Model (Fig. 2): Generalized Structural Equation Models; Adjusted Odds Ratios<sup>a</sup> and Standard Errors for Chronic Illness Time  $t - 1$ , Serious Psychological Distress Time  $t$ , and Disability Time  $t + 1$ . NSDUH 2005–2014<sup>b</sup>.

Unconstrained Exposure/Mediation Model			
Endogenous	Exogenous	Odds Ratio (SE)	Prob
Disability (0,1)	← Serious psychological distress (0 thru 24) <sup>c</sup>	1.10 (0.003)	0.000
	← Chronic illness (0, 1, 2+) <sup>d</sup>	1.21 (0.030)	0.000
	← Race/ethnicity (Wh (ref), Bl, L)		0.000
	Bl	1.43 (0.058)	0.000
Serious psychological distress	L	0.818 (0.043)	0.000
	← Chronic illness (0, 1, 2+)	2.03 (0.059)	0.000
	← Race/ethnicity (Wh (ref), Bl, L)		
Chronic illness	Bl	0.474 (0.019)	0.000
	L	0.439 (0.019)	0.000
	← Race/ethnicity (Wh (ref), Bl, L)		
Model fit – Adjusted Wald (3, 108 df)	Bl	0.706 (0.019)	0.000
	L	0.521 (0.011)	0.000
Number of cases			1,009.6 0.000 348,901

<sup>a</sup>Odds ratio adjusted for age, socioeconomic status, marital status, gender.

<sup>b</sup>Samples weight- and design-adjusted: see series NSDUH releases 2005–2014.

<sup>c</sup>Kessler 6-item distress instrument. Frequency of condition during worst month time  $t$  - past year. Includes feeling nervous, hopeless, restless, no good, burdened by effort, and couldn't be cheered up.

<sup>d</sup>chronic illness includes cancer, diabetes, heart condition, high blood pressure, CODP, hepatitis b and c, kidney disease and asthma.

moderators. Unlike the exposure hypothesis, there is some support for expectations of vulnerability, particularly, it turns out, for Latinx groups.

In brief, with regard to the impact of serious psychological distress on disability for each group, Whites had greater odds of having a disability (OR 1.05  $p < 0.000$ ) as a result of serious psychological distress than Blacks (OR 1.02  $p < 0.000$ ) and Latinx (OR 1.03  $p < 0.000$ ), although Latinx themselves were more slightly likely than Blacks to see their stress result in a disability (Wald adjusted F test Table 4 column 8: equality of estimates: 38.56  $p < 0.000$ , 5.85  $p < 0.02$ , 4.0  $p < 0.05$ ). On the other hand, Latinx were more likely to experience serious psychological distress as a result of their chronic conditions (OR 4.60  $p < 0.000$ ) than Blacks (OR 3.00  $p < 0.000$ ) and Whites (OR 2.501). Here, the vulnerability hypothesis finds its strongest support.

With respect to the path from chronic illness to disability (the middle row in Table 4), there were no differences between racial and ethnic groups. That is, Whites were no more likely than Blacks or Latinx to see their chronic conditions

**Table 4.** Generalized Structural Equation Models; Adjusted Odds Ratios<sup>a</sup> and Standard Errors for Chronic Illness Time  $t - 1$ , Serious Psychological Distress Time  $t$ , and Long-Term Disability Time  $t + 1$ . NSDUH 2005–2014<sup>b</sup>.

		Vulnerability Model			Race/Ethnicity			
Endogenous	Exogenous	Entire Sample	Non Hispanic (Wh)	African American (Bl)	Latinx (L)	Contrast	F test (1, 110)	Prob F
Disability (0,1)	← Serious psychological distress (0 thru 24) <sup>c</sup>	1.10 (0.003)	1.05 (0.002)	1.02 (0.005)	1.03 (0.006)	Wh v Bl	38.56	0.000
						Wh v L	5.85	0.017
						Bl v L	4.00	0.048
	← Chronic illness (0, 1, 2+) <sup>d</sup>	1.21 (0.030)	1.16 (0.033)	1.11 (0.070)	1.14 (0.112)	Wh v Bl	0.28	0.598
					Wh v L	0.01	0.905	
					Bl v L	0.04	0.835	
Serious psychological distress	← Chronic illness (0, 1, 2+)	2.03 (0.059)	2.51 (0.083)	3.00 (0.293)	4.60 (0.633)	Wh v Bl	3.07	0.083
						Wh v L	18.34	0.000
						Bl v L	6.34	0.013
Percent of Total Effect of Chronic Illness on Disability Operating Though SPD and Moderated by Race Ethnicity for Each Level of Chronic Illness								
		Entire Sample	Wh	Bl	L			
Disability (0,1) ←	SPD ← Chronic illness							
	None	53.3	58.1	54.5	36.8			
	One	23.4	22.7	20.4	27.2			
	More than one	14.4	13.6	13.4	21.3			
Number of Cases (unweighted)		348,901	242,527	46,896	59,478			

<sup>a</sup>Odds ratio adjusted for age, socioeconomic status, marital status, gender.

<sup>b</sup>Samples weight- and design-adjusted: see series NSDUH releases 2005–2014.

<sup>c</sup>Kessler 6-item distress instrument. Frequency of condition during worst month time  $t$  - past year. Includes feeling nervous, hopeless, restless, no good, burdened by effort, and couldn't be cheered up.

<sup>d</sup>Chronic illness include cancer, diabetes, heart condition, high blood pressure, CODP, hepatitis b and c, kidney disease and asthma.

translated into disability. However, a closer look at how pathways (i.e., from chronic-illness to stress to disability) moderate the effects for each group, reveals greater overall vulnerability among Latinx than the other groups. Access to healthcare may be a likely explanation for the relationship which we explore in the discussion section.

In the bottom section of [Table 4](#), we decompose the effects of each path across the three populations. Percentages in [Table 4](#) indicate how much of the total impact of chronic illness on disability operates via serious psychological distress for each group. For Latinx with at least one chronic illness, and especially those with 2 or more chronic illnesses, more of the total impact of their illnesses impacts disability through serious psychological distress than the same pathway for Blacks and Whites (21.3% for Latinx vs. 13.4 and 13.6 for Blacks and Whites). The implication is that Latinx who are chronically ill experience a level of stress that unfolds in disability to a greater extent than it does for Whites and Blacks. That is, Latinx are more vulnerable than Blacks and Whites to the effects of illness and stress on the risk of having a disability, all else being equal.

Note that the decomposition at the bottom of [Table 4](#) is a pseudo mediated-moderation model (see [Fairchild and McKinnon 2009](#)) since it does not examine all paths and interaction. While Latinx are least likely to experience disability, serious psychological distress and chronic illness, the model does show that coming from a Latinx population exacerbates the impact of chronic illness on disability via stress.

## CONCLUSION

Individuals with disabilities are among various groups in the United States with significant health disparities. Individuals with disabilities have poorer access to healthcare, worsened health outcomes, and are frequently marginalized even within the healthcare system. This leads to a cycle of continued poor health; superimposing acute on chronic disability and injury (Krahn, Walker, and Correa de Araujo 2015). To understand disability, this study explored two simplified hypotheses related to racial and ethnic minority health outcomes: greater exposure to stressors and stress leads to more psychological distress, and greater vulnerability to stress exacerbates the impact of stress on both physical and psychological well-being. As noted earlier, given the complexities of disability, it is important to consider the unique and combined contributions of chronic illnesses and psychological distress in the development of diagnosed disability ([Manninen et al. 1997](#)).

The underlying premise of the exposure-vulnerability to stress process framework is that stress serves as a major social determinant of health, with direct and indirect effects on it. The direct relationship between stress and health outcomes is the effect of stress on human physiology. The long-term stress hormone, cortisol, is believed to be the key driver in this relationship. Chronic stress is significantly associated with chronic low-grade inflammation, slower wound healing, increased susceptibility to infections, and poorer responses to vaccines

(Gouin 2011; Miller, Chen, and Zhou 2007). Stress also has an indirect effect on health status, by way of strain on material and psychological resources.

As we have shown, serious psychological distress increases the odds of negative health outcomes such as disability. While any number of traumatic life events may create the conditions for a disability, in this study we examined prior chronic illness and its impact on stress. Individuals with chronic illnesses such as diabetes, cancer, high blood pressure and so on, experience greater levels of stress when compared to those with better health. Our expectation that this mediation model would hold for non-majority racial and ethnic groups, relative to Whites was not supported by our results. In fact, Whites were more likely to report higher levels of chronic illness and greater levels of stress than Blacks and Latinx, although they had significantly lower odds of having a disability.

This suggested, alternatively, that perhaps the explanation for greater minority disability is that minority populations are more vulnerable to stressors such as chronic illness. Moderation analysis showed that this was in part the case. Although stress was less likely to translate into poor health outcomes for Blacks and Latinx relative to Whites, Blacks and Latinx who had prior chronic illnesses were at significantly greater risk to experience serious psychological distress. For Latinx, the path from chronic illness was more likely to pass through serious psychological distress than for the other two groups, indicative of greater vulnerability.

Several possibilities for understanding the failure to find an exposure dynamic in the model turns on the potential intersectional effects of age and gender, as well as several other covariates that seem to confound the linkages in the model (e.g., issues of stigma, social support, education). These linkages await investigation in future research: (1) when more is known about intersectionality and its effects (see discussion in e.g., Monk 2022), and (2) when methodological dilemmas surrounding complex-survey-with-multiple-nonnormal-variables are ironed out (Muthen and Satorra 1995).

What remains is a workable model with some gaps that future studies should address. We turn to a discussion of some possible factors which might improve our understanding of racial and ethnic disparities in disability.

## DISCUSSION

Researchers interested in exposure-vulnerabilities models argue that resources and access to healthcare are two essential processes linking the elements of stress models. To what extent does caregiver or close family support for minority respondents mitigate health outcomes, and: to what extent does the stigma – especially in minority communities – associated with mental health issues, cause underreporting of distress, multiple morbidities and disability status (Hatzenbueler, Phelan, and Link 2013), thereby limiting opportunities for treatment and care?

We posited that the higher minority disability rate was a consequence of higher minority exposure and vulnerability to development of chronic illness



(which should exacerbate distress and lead to poorer outcomes). Our results, though, indicate that Blacks and Latinx experienced fewer chronic conditions and less stress compared to Whites, yet were more vulnerable to disability. These findings are not without precedent in the literature on disabilities. For example, while that literature has historically identified racial-ethnic disparities in disabilities, Thorpe et al. (2014) found that after adjusting for socioeconomic status, health behaviors, and comorbidities, African American men and women had a statistically significant functional *advantage* over their White counterparts, contrary to expectations. Moreover, Brenner and Clarke (2018) found that while African Americans and Hispanics demonstrated worsened status compared to their White counterparts, older adults with disabilities show a much more complex pattern: the impact of race and ethnicity on outcomes varies across neighborhood and individual characteristics in unexpected ways. Similarly, the adverse childhood experiences literature shows that for more resourced (i.e., middle class) Blacks, higher greater adverse childhood experiences scores were *inversely* related to adult hypertension, contrary to expectations (Henderson et al. 2021).

Of our own study we might ask: Why less stress among Blacks (and Latinx)? The finding contravenes the minority-stress hypothesis (Botha and Frost 2020), and seems paradoxical, until we consider the likelihood of differences in risk – protective factors operant among Blacks and Latinx when compared to Whites. For example, the literature on resilience (e.g., so-called John Henryism; Robinson and Thomas Tobin 2021) indicates that both poor physical health and an active coping style can so-exist in such a way as to reduce Black-White mental health disparities. This would account for the lower levels of serious psychological distress in our models between Blacks and Whites. Yet, it is unclear whether other minority groups share this cultural response. Future studies should examine factors such as coping style and social support in the context of health and stress (see e.g., Cohen and Garth 1984; Cwikel et al. 2010). Additional analyses with national survey data will help bring a greater understanding of Black and Latinx populations' resilience and coping, as well as deficits and weaknesses. That chronic illness rates were higher among Whites than Blacks and Latinx may indicate greater physical problems, but also may indicate underreporting among minority populations and underdiagnosis as a consequence of limited access to healthcare providers. A key consideration in future research will be to explore to what degree barriers to healthcare access may have contributed to underdiagnosis (if that is the case) of chronic medical conditions in our two non-majority populations. In the end, there are multiple paths that lead to greater vulnerability to disability (Lustig and Strauser 2007), and our study highlights the importance of examination of causal factors and linkages that are behind the greater vulnerability to disability among Black and Latinx groups.

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