An examination of chronic illness, distress, and long-term disability among Non-Hispanic White, African American, and Latinx populations

An extended abstract submitted to the Conference on Social Stress Research

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Extended abstract

Objectives/ Summary:

The aim of this study is to extend the social stress model, testing a simplified stress-related racial/ethnic disparities-in-medical-health outcomes framework with the National Survey of Drug Use and Health, a preeminent source of national behavioral health estimates. We examine two foundational hypotheses underlying the model: 1) that greater exposure to stressors (i.e., chronic medical illness) among racial/ethnic minority populations results in higher levels of serious psychological distress, which in turn increases the likelihood of medical disability; 2) that 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. Using NSDUH population estimates of chronic medical illness, stress and disability, for selected sample years 2005-2014, we constructed and analyzed several models, the results of which provided mixed support for the vulnerability (moderator) hypothesis, but not for the exposure (mediation) hypothesis. For example, 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 disability. Ongoing development of the paper will involve specifying and, if possible, analyzing reasons underpinning these results. The study's key contributions are: 1) extend the social stress framework by including medical conditions both as stressors and outcomes (Aneshensel and Mitchell, 2014), in order to: 2) 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, and the dual role the mediator (stress) plays as both a cause for the health outcome (disability) and an effect of stressors (chronic medical illness) (See Figures 1 and 2, below), 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)

Background:

The social stress model provides an explanatory framework for understanding differences, if not disparities, in mental health outcomes between majority and vulnerable populations (Botha and Frost, 2020; Meyer 2003). 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 stress variant of the framework

emphasizes the unique importance of race and ethnicity in social hierarchies, documenting the deleterious effects of stigma and discrimination on mental health (Hatzenbuehler, Phelan and Link, 2013) as well as socioeconomic disadvantage. 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). Vulnerable 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 (Luo et al., 2012; Wang et al., 2020; Pascoe et al., 2009; Williams and Mohammed, 2009; Cronholm et al., 2015; Wade et al., 2016; Institute for Safe Families, 2013).

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 (for discussion see e.g., Stuber, Meyer and Link 2008; Williams and Williams-Morris, 2000). While social stress/ minority stress/ 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.

For example, although a number of studies have shown that racial and ethnic minorities have higher rates of exposure to some stressors (Boardman, 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. Sapolsky, 1994; Marmot et al., 1991). The question, in a narrow sense, then, hinges on the extent to which types of social conditions constitute a "stressor," and which resources impact their effects, in order to determine the scope of relevant hypotheses (see e.g., discussion of exposure in Turner et al., 1995). In contrast, 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 with at a disadvantage, with fewer resources, are at greater risk to experience the damaging impact of stress on their health and wellbeing.

Before examining resource interventions, however, we might first return to the question of stressors-stress-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 minority stress -exposure and -vulnerability hypotheses.

Prior research has shown that racial/ethnic minority populations are 1.5 to 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 this 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. This study tries to help clarify those relationships before moving in the direction of more complicated models.

Methods:

Data and study population

To understand how minority stress functions as a consequence of chronic medical illness and as a precursor to long-term disability among non-majority racial and ethnic populations, we examine medical and mental health data from the NSDUH (2005-2014)[2], a nationally representative sample comprising the US population's behavioral health information (SAMHSA 2019). 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. 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 excluded from analyses.

Measures

Chronic illness. 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 comprising our medical morbidities scale covered: 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. In subsequent analyses were able to contrast disability outcomes for those with a prior condition and those with a contemporaneous 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 (gleaned from other measures(?). The NSDUH uses a version of the K6 scales, asking respondents to imagine their worst month during the year, 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.

Covariates. We include in our models a number of covariates that may influence the relationships between race/ethnicity, stressors, stress and disability. These are: age, gender, ses, and marital status. Although the tables below do not show estimates for these covariates, all models have been adjusted for them.

Table 1 goes here

Analytic Strategy

A review of the statistical methods commonly used to identify the relationships identified in the minority stress framework 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 1984 for discussion of non-normality in SEMs). These are generalized structural equation models (GSEM).

[2] We discuss the reasons for selecting these particular years in a more extended version of this document.

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 simultaneous mediation model constructed for GSEM analysis can be described by:

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

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

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

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

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 $\Sigma_k e_k m_k$ are the covariates and error terms. We ran two versions of the model: a constrained version and an unconstrained one. A potential causal (indirect) mediation effect was 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 causal mediation effects without requiring the assumption of normality (Preacher & Hayes, 2008). With a bias-corrected bootstrap technique, the total, direct and indirect (mediation) effects and their 95% CIs were estimated.
We ran the same 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. 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 (further details will be incorporated in later version- not shown).

Figure 1 goes here

Results:
Figures 1 presents the exposure/ mediation model. We tested two versions of the model. The first is a constrained model in which race and ethnicity are expected to influence disability by way of prior health

conditions which impact serious stress. The broken line between race/ethnicity and disability indicates that the direct effect of minority group membership is constrained to operate through chronic illness (results not shown). In the unconstrained model, race and ethnicity are freed to impact all three factors in the model. Estimates of the direct and indirect effects are the obtained (results shown in Table 2).

The advantage of structural models is that they estimate parameters simultaneously rather than piecemeal. Moreover, in this system of equations, the size of direct and indirect effects of the parameters can be estimated. Overall, while the system of relationships between chronic illness->stress->disability was supported with these data, its function explaining why racial and ethnic minorities have higher rates of disability was not supported.

Table 2 goes here

As Table 2 indicates, the exposure model did not find support in these data. Blacks were more likely than other groups to have a disability (OR 1.43 p<.000) while Latinx were less likely (OR .818 p<.000) relative to Whites. However, both Blacks and Latinx were less likely than Whites to experience serious distress (OR .479 and .439, respectively, p<.000), and, similarly, less likely than Whites to have chronic illness (OR .706 and .521, respectively, p<.000). As the stress literature indicates, they may be a number of reasons that higher status groups are more likely to experience stress (see e.g., Schieman and Reid 2009). Further exploration of these relationships is now underway with these data in order to determine why a very simple exposure model failed to show racial/ethnic differences is stressors and stress.

Figure 2 goes here

Figure 2 presents the vulnerability/moderation model. The basic idea is that to the extent that race and ethnicity structure the relationships in the system, they should reveal a greater vulnerability to the effects of chronic illness (even if they are less likely than Whites to have a diagnosis) and stress (even if their level of stress is lower than Whites).

Table 3 goes here

Table 3 provides two sets of statistics to assess this model. We look to see whether the parameter estimates of factor effects are significant for each of the three groups. Then we constrain the parameters and evaluate whether they are significantly different (greater or less) than one another. We can also

decompose those effects into direct and indirect effects in order to determine whether the model operates the same for each group. Unlike the mediation hypothesis, there is some support for expectations of vulnerability, particularly, it turns out, for Latinx.

In brief, with regard to the impact of stress on disability, Whites had greater odds of having a disability (OR 1.05 p<.000) as a result of stress than Blacks (OR 1.02 p<.000) and Latinx (OR 1.03 p<.000), although Latinx themselves were more likely than Blacks to see their stress result in a disability (Wald adjusted F for equality of estimates: 38.56 p<.000, 5.85 p<.02, 4.0 p<.05). On the other hand, Latinx were more likely to experience stress as a result of their chronic conditions (OR 4.60 p<.000) than Blacks (OR 3.00 p<.000) and Whites (OR 2.501). Here the vulnerability hypothesis finds its strongest support.

With respect to the path from chronic illness to disability, 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 translated into disability.

As for decomposing the effects of each path across the three populations, percentages in Table 3 indicate how much of the total impact of chronic illness on disability operates via serious psychological distress. Although the pattern is similar for Whites and Blacks (e.g., about half of the effect for those with no chronic illness, whether White – 58.1 percent or Black- 54.5 percent, operates through serious psychological distress), for Latinx, only 36.8 percent of the effect of chronic illness on disability operates via distress. Importantly, for Latinx with at least one chronic illness and those with 2 or more, more of the total impact of their illnesses impacts levels of stress and then disability (21.3 percent for Latinx versus 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 for Whites and Blacks. Again, as with the exposure model, analyses are currently underway to expand our understanding of these relationships, including tests of the impact of resources (e.g., access to healthcare diagnoses) on the relationships.

Conclusions:

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. The underlying premise of the stress process framework is that stress is 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, 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 (so far). 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 and disability.

Discussion:

There are a number of limitations that may explain some of our findings. We are in the process of addressing these as we revise this study. Resources and access to care are two central processes linking the elements of the stress model. To what extent did caregiver or close family support for minority respondents mitigate the stress response? In addition, to what extent does the stigma – especially in minority communities - associated with mental health issues cause underreporting of stress? We posited that perhaps the higher minority disability rate is due to higher vulnerability in the development of chronic illness. Our results indicate that Blacks and Latinx experience less stress compared to Whites, yet are more vulnerable to disability. These results are paradoxical. It is likely there are differences in risk/protective variables among Blacks and Latinx when compared to Whites. Our next step is to focus on the unique factors among Blacks and Latinx that impact the relationship between chronic stress and health. Factors such as coping style and social support have been found to be important variables in the context of health and stress (Cwikel 2010; Cohen and Garth, 1984). Additional analyses with these data will help bring a greater understanding of Blacks and Latinx resilience and coping. There are multiple variables that may lead to greater vulnerability to disability (Lustig and Strauser, 2007), and our study highlights the need for

further study examining the causal factors that are behind the greater vulnerability to disability among Black and Latinx groups. Finally, a key consideration is to explore to what degree barriers to healthcare access may have contributed to underdiagnosis (if that is the case) of chronic medical conditions in out two non-majority populations. Similarly, with distress. Our goal is to provide as thorough an explanation to these findings. Some of these analyses (of resources primarily) are being developed for the next version of this paper.

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Figure 1: Minority stress mediation model (constrain)

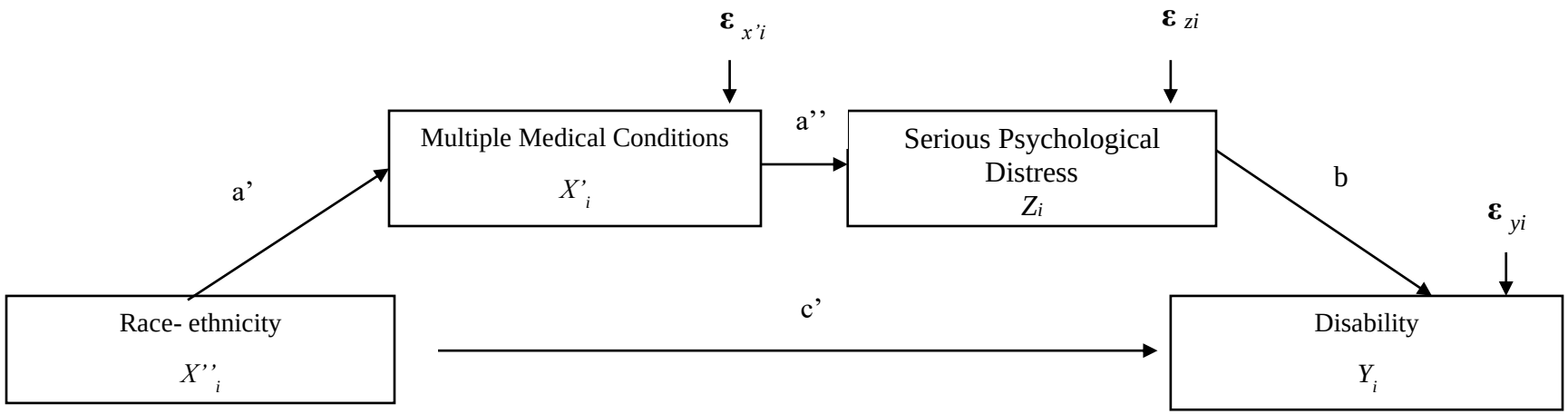

Figure 2: Minority stress moderation model (conditional process)

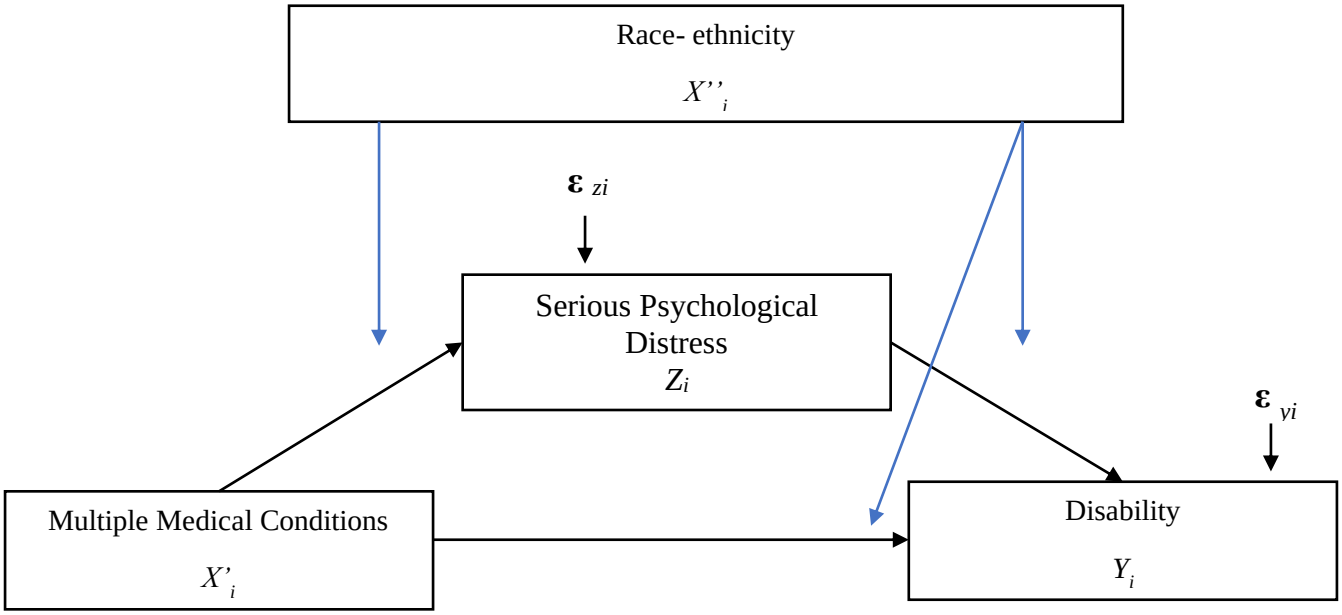

Table 2: Generalized structural equation models; adjusted odds ratios [a] and standard errors for multiple medical conditions time t-1, serious psychological distress time t, and long-term disability time t. NSDUH 2005-2014 [b]

	Unconstrained Mediation Model				
Endogenous	Exogenous	Odds ratio (SE)	Prob	Wald F	Prob
Disability (0,1)	← Serious psychological distress (0 thru 24) [c]	1.10(.003)	.000		
	← Multiple medical conditions (0, 1, 2+) [d]	1.21(.030)	.000		
	← Race/ ethnicity (Wh (ref), Bl, L)		.000		
	Bl	1.43(.058)	.000		
	L	.818(.043)	.000		
Serious psychological distress	← Multiple medical conditions (0, 1, 2+)	2.03(.059)	.000		
	← Race/ ethnicity (Wh (ref), Bl, L)				
	Bl	.474(.019)	.000		
	L	.439(.019)	.000		
Multiple medical conditions	← Race/ ethnicity (Wh (ref), Bl, L)				
	Bl	,706(.019)			
	L	.521(.011)			
Model Fit – Adjusted Wald (3, 108 df)				1009.6	.000
Number of Cases (unweighted)					

[a] Odds ratio adjusted for age, socioeconomic status, marital status, gender. [b] Samples weight- and design- adjusted: see series NSDUH releases 2002-2014, 2015-2019 [c] 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 .[d] Multiple medical conditions include cancer, diabetes, heart condition, high blood pressure, CODP, hepatitis b and c, kidney disease and asthma.

Table 3: Generalized structural equation models; adjusted odds ratios [a] and standard errors for multiple medical conditions time t-1, serious psychological distress time t, and long-term disability time t. NSDUH 2005-2014 [b]

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) [c]	1.10(.003)	1.05(.002)	1.02(.005)	1.03(.006)	Wh v Bl	38.56	.000
						Wh v L	5.85	.017
						Bl v L	4.00	.048
	← Multiple medical conditions (0, 1, 2+) [d]	1.21(.030)	1.16(.033)	1.11(.070)	1.14(.112)	Wh v Bl	0.28	.598
						Wh v L	0.01	.905
						Bl v L	0.04	.835
Serious psychological distress	← Multiple medical conditions (0, 1, 2+)	2.03(.059)	2.51(.083)	3.00(.293)	4.60(.633)	Wh v Bl	3.07	.083
						Wh v L	18.34	.000
						Bl v L	6.34	.013

Percent of total effect of multiple medical conditions on disability mediated by SPD for each level of multiple medical

		Entire Sample	Wh	Bl	L
Disability (0,1) ←	SPD ← Multiple medical conditions				
	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

[a] Odds ratio adjusted for age, socioeconomic status, marital status, gender. [b] Samples weight- and design- adjusted: see series NSDUH releases 2002-2014, 2015-2019 [c] 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 .[d] Multiple medical conditions include cancer, diabetes, heart condition, high blood pressure, CODP, hepatitis b and c, kidney disease and asthma.