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Marginalized identities, discrimination burden, and mental health: Empirical exploration of an interpersonal-level approach to modeling intersectionality

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Abstract

Intersectionality is a term used to describe the intersecting effects of race, class, gender, and other marginalizing characteristics that contribute to social identity and affect health. Adverse health effects are thought to occur via social processes including discrimination and structural inequalities (i.e., reduced opportunities for education and income). Although intersectionality has been well-described conceptually, approaches to modeling it in quantitative studies of health outcomes are still emerging. Strategies to date have focused on modeling demographic characteristics as proxies for structural inequality. Our objective was to extend these methodological efforts by modeling intersectionality across three levels: structural, contextual, and interpersonal, consistent with a social-ecological framework. We conducted a secondary analysis of a database that included two components of a widely used survey instrument, the Everyday Discrimination Scale. We operationalized a meso- or interpersonal-level of intersectionality using two variables, the frequency score of discrimination experiences and the sum of characteristics listed as reasons for these (i.e., the person's race, ethnicity, gender, sexual orientation, nationality, religion, disability or pregnancy status, or physical appearance). We controlled for two structural inequality factors (low education, poverty) and three contextual factors (high crime neighborhood, racial minority status, and trauma exposures). The outcome variables we modeled were posttraumatic stress disorder symptoms and a quality of life index score. We used data from 619 women who completed the Everyday Discrimination Scale for a perinatal study in the U.S. state of Michigan. Statistical results indicated that the two interpersonal-level variables (i.e., number of marginalized identities, frequency of discrimination) explained 15% of variance in posttraumatic stress symptoms and 13% of variance in quality of life scores, improving the predictive value of

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the models over those using structural inequality and contextual factors alone. This study's results point to instrument development ideas to improve the statistical modeling of intersectionality in health and social science research.

Keywords

Health disparities; discrimination; intersectionality; methods; mental health; posttraumatic stress disorder; quality of life; United States

Introduction

The negative health consequences of social inequality have been well established in the US (Carpiano et al., 2008; Wilkinson, 2005). However, attempts to explain this inequality that focus only on a single demographic factor, such as sex, race, or immigration status, often fall short of explaining health disparities. For example, suicide among African American men is positively associated with education and wealth (Burr et al., 1999; Joe & Kaplan, 2001; Lester, 1991) presumably because of the interplay between race and a recent and tenuous position in the middle class (Jackson & Williams, 2006). Other authors have shown that while a college education is beneficial, it differentially affects men and women (Meara et al., 2008) and that despite the presumed positive influence of acculturation, immigrant health status worsens with increasing length of US residence (Singh & Siahpush, 2002). The results of these studies indicate that a more nuanced and complete consideration of one's social identity should be incorporated into health outcomes research.

Intersectionality as a Concept to Improve Health Research

The concept of *intersectionality* can be used to explain how multiple aspects of personal identity can impinge on health outcomes. Yet this conceptualization, which arises from the more historical, interpretive, or qualitative perspectives, lacks a comparably rich and nuanced statistical representation. The health science disciplines have yet to specify statistical approaches that can quantitatively mirror the rich theoretical articulation. There is a subjective quality to identity that cannot be captured in models that consider demographic characteristics individually or with cumulative risk index variables. Crenshaw (1989) pointed to this complex subjectivity:

[Black women] sometimes experience discrimination in ways similar to white women's experiences; sometimes they share very similar experiences with Black men. Yet often they experience double discrimination—the combined effects of practices which discriminate on the basis of race, and on the basis of sex. And sometimes, they experience discrimination as Black women—not the sum of race and sex discrimination, but as Black women (p. 149).

Although additive models of demographic characteristics incorporate *multiple jeopardy* (King, 1988), they are not tailored enough to capture particularities or unexpected effects of some combinations of identities, such as the adverse effect of upper class status on Black men described above. This suggests that there are multiple levels at which the effects of intersectionality may impinge on the individual and may be measurable, a consideration consistent with multi-level, social-ecological models of human development (i.e., Bronfenbrenner, 1979) and of social determinants of health (e.g., Marmot & Wilkinson, 2006).

Accordingly, the conceptualization and operationalization of intersectionality we propose here utilizes Bronfenbrenner's model (1979) as an organizing framework. Bronfenbrenner

posited that individual psychological development takes place in interactions within five concentric circles of mutually-influencing, social-ecological systems, moving from the intra-psychic to the familial and ever broader contexts. Although most often used as a psycho-social model, a person's biology can be seen as part of the innermost circle, making the theoretical framework applicable to research on health.

The State of the Science in Relation to Statistical Modeling of Intersectionality

Recent methodological papers by US and Canadian sociologists report complex statistical modeling approaches that potentially offer better goodness-of-fit and more explained variance. Veenstra (2011) systematically considered four identities (race/ethnicity, gender, class, and sexual orientation) as additive main effects and then also as interaction terms. He looked for “complicated directionality” implied by other studies where the additive solution was undermined. His results confirmed that interaction terms showed both mitigating and aggravating contributions to health status. The increase in variance explained by the more complex variables approached one percent. Hinze and colleagues (Hinze et al., 2011) also conducted a methodological study to “[provide] a bridge between feminist frameworks and traditional quantitative studies of race, class, and gender effects” (p. 6). They combined stratification and a multiplicative approach, entering race and gender as interaction terms in a set of nine models stratified by socioeconomic status. Their results indicated that the interaction terms were independently predictive and that this association was strengthened when controlling for other factors, such as social support and risk behaviors. The findings from the nine models' coefficients affirm that the answer to the research question changes when interactions within different groups are considered systematically. A methodological study by Warner and Brown (2011) enriched the effort to model intersectionality in two ways: first, they captured the impact of disadvantaged status across the life course via trajectories, and second, they considered race/ethnicity and gender jointly in a series of six dummy variables (e.g., White, Black, and Mexican American men and women).

Each of these three approaches had strengths suited to the research questions used to illustrate the approach. These studies benefitted from large samples well-suited to epidemiological questions (from 3,005 in the Hinze et al. study to 90,310 in the Veenstra study).

A Social Ecological Perspective

So far these approaches have relied on demographic items (e.g., race, income, gender) and have emphasized structural inequalities. The above referenced authors have now all conceptually and statistically linked intersectionality with structural inequality at the level of demographic variables. In reality, intersectionality may be playing out across several levels. However, the conceptual linkages and estimation of the contributions across several levels in modeling have not yet been delineated (Bowleg, 2012). It makes sense to carry this work forward, first by tentatively articulating conceptual linkages between common variables and intersectionality at other social-ecological levels and then estimating the proportion of variance in outcomes potentially attributable to intersectionality at each of these levels. Intersectionality might, conceptually and statistically, be a cross-cutting element that is measurable at all four levels of social-ecological conceptualizations.

There are many potential variables to operationalize this concept within each level; these may vary depending on the research question but could be seen as variations on the definitions in Bronfenbrenner's theory. Starting with Bronfenbrenner's micro-level, we would ideally measure the personal, internalized or *intrapersonal* valence the person assigns

to this identity, including potentially mitigating effects of cherishing the identity (e.g., Mossakowski, 2003). At a meso- or *interpersonal* level, exchanges involving experiences of discrimination or privilege could take place on a daily basis. It would not necessarily be carrying the identities themselves that would adversely affect health, but rather the discriminatory, aversive, stressful interpersonal exchanges that would potentially increase in frequency as the number of marginalized identities increased (e.g., Kessler et al., 1999). Thus these interpersonal experiences—which are amenable to change—would be the mediators between intersecting marginalized identities and health disparities. At the exo- or *contextual* level, ambient factors, such as living as a member of a racial/ethnic or sexual minority or out-group, could impinge as additional stressors (e.g., Klest, 2012). Out-group status could increase risk of victimization in terms of crime, threats to civil liberties, or other identity-based trauma exposures (e.g., rape, hate crimes, arbitrary traffic stops, greater risk of incarceration, forced to leave the family home in adolescence due to queer identity). Finally, at the macro-level, structural inequalities in education and income associated with marginalized status could take their toll. It seems likely that modeling major demographic characteristics (i.e., race, gender, education, income) would explain a large amount of variance if demographics were the only intersectionality-focused predictors. But more total variance might be explained if more levels could be taken into account. Considering several levels could capture more particularity. A less partial, less distorted understanding might emerge (Harding, 1991).

Extending the Effort to Model Intersectionality

The recent engagement with the topic of intersectionality via methods studies indicates a strong desire to bridge the abstract and the numerical. The purpose of this paper is to advance this methodological discussion of approaches to operationalizing intersectionality in quantitative health research. To that end, we focused on three extensions of the above work. First, we delineated the conceptualization in a schematic manner consistent with an eco-social framework to foster systematic analyses within and across studies, going from a conceptual definition, to listing empirical indicators, to finding items in a health research study database to operationalize these indicators (Table 1). Second, we shifted from assessing statistical strategies applied to demographics alone to assessing statistical strategies applied to three levels. We focused on the interpersonal level, taking contextual factors and structural inequality factors into account in our models. Third, we used a database with a sample size more typical of clinical research (n=619).

To accomplish this focus on the interpersonal level, we conducted a secondary analysis of data from a study of posttraumatic stress disorder (PTSD) and childbearing outcomes that included a measure of interpersonal experiences of discrimination. This instrument, the Everyday Discrimination Scale (EDS) (Williams et al., 1997) is an established survey instrument used in a large number of health-related studies. The EDS has two components: it is used to assess the burden of everyday experiences of discrimination and to list the potentially marginalized identities named as the reasons or attributions for these experiences. We refer to the variable quantifying the burden of discrimination as the *EDS frequency score* and to the variable indicating the number of potentially marginalized identities listed as the *sum of attributions*. Although we expect both the number of marginalized identities and the burden of discrimination to be associated with more adverse outcomes, we hypothesize that the relationship of marginalized identities with adverse outcomes will be mediated by discrimination.

The two outcome variables we used for this methods analysis were scores on a quality of life index and symptoms of PTSD. Quality of life and PTSD are outcomes useful for this purpose because both are predicted by factors at several of the eco-social levels. Quality of

life ratings are derived from appraisal of satisfaction with health, partner and family relationships, job, housing, and neighborhood (Frisch et al., 1992). PTSD occurs as a function of genetics, characteristics of the family of origin, exposure to traumatic events, and risk varies by social groups (Koenen et al., 2009). For example, women are twice as likely to develop PTSD as men (Breslau, 2001). African American women are not more likely to develop PTSD but are much less likely to recover from it (Seng et al., 2011). This may potentially be due to the intersecting effects of disparate access to mental health treatment and disparate rates of on-going exposure to crime, accidents, and social network traumas, such as sudden, unexpected death or incarceration of a loved one. Sexual minorities have higher rates of PTSD (e.g., Roberts et al., 2010). Disabled people also have higher rates, often due to the accident or life-threatening condition that caused the disability (e.g., Zatzick et al., 2008). Thus both quality of life and PTSD are particularly useful outcomes for methodological study of intersectionality, since modeling of multiple aspects of identity should, theoretically, explain a larger proportion of variance.

We proceeded through bivariate and multiple variable analyses to answer the following four research questions:

1. Is the sum of marginalized identities associated with greater mental health morbidity (i.e., PTSD) and decreased quality of life?
2. Is this association mediated by the burden of discrimination?
3. How important are contextual factors that might capture meso- and exo-level effects of marginalized status experienced via differential rates of exposure to out-group status, crime, and trauma?
4. To what extent do these multiple levels of intersectionality explain variance in mental health or quality of life beyond that already explained by structural inequalities (i.e., poverty, low education)?

Methods

This methodological study was a cross-sectional, secondary analysis of survey data collected as part of a prospective study of the effect of PTSD on childbearing outcomes in a diverse sample of women expecting their first infant (United States National Institutes of Health Grant R01 NR008767, PI Seng). The perinatal outcomes have been published (Seng et al., 2011), and in-depth description of the recruitment and standardized computer-assisted telephone interview procedures have been presented elsewhere (Seng et al., 2009). We summarized the most pertinent information here.

Procedures

Participants were recruited from 2005 through 2008 via eight maternity clinics at three health systems, one in Ann Arbor, Michigan that serves predominantly privately insured patients and two in Detroit, Michigan that serve predominantly publically insured patients (i.e., Medicaid recipients). The Institutional Review Boards of the three health systems granted approval, including approval for use of verbal informed consent. A confidentiality certificate was obtained from the National Institute of Mental Health. Eligibility criteria included being 18 years or older, expecting a first infant, being less than 28 weeks gestation, and able to speak English. Participants completed the screening interview early in their pregnancy (n=1581), and 1049 were enrolled for the longitudinal aspects of the study. Of these, 647 completed the late-gestation (35-week) interview, which contained the EDS items. Participants were paid \$20.

Measures

Ten variables were used in this analysis: race/ethnicity, education, income, residence in a high crime area, minority racial/ethnic status in relation to living in a postal code located in a Black-majority or White-majority city (i.e., Detroit or Ann Arbor), a sum of trauma exposures, PTSD symptom count, quality of life index score, EDS frequency score, and EDS sum of attributions for discrimination.

The Perinatal Risk Assessment Monitoring Survey (PRAMS), an epidemiological surveillance instrument created by the Centers for Disease Control and Prevention, was used to assess nominal-level demographic characteristics: income, education, and self-reported race/ethnic identity (Beck et al., 2002). We classified participants into six racial/ethnic groups: White, Black or African American, Asian or Pacific Islander, Native American or Alaska Native, Hispanic, and Middle Eastern, an ethnicity we queried due to the large Arab-American community in the region. We classified educational attainment into less than or equal to high school versus greater than high school. We defined poverty as annual household income less than or equal to \$15,000. Participants were characterized as living in a higher or lower crime area based on whether the total crime index number from the 2000 FBI uniform crime report was greater or less than the U.S. average in their residential zip code (SimplyMap, 2012).

A context-specific (i.e., city of residence) minority racial/ethnic status nominal variable was created based on the zip code in which the participant lived. The sample was geographically divided into Detroit and Ann Arbor zip codes. According to U.S. census data (United States Census Bureau, 2012), the population of Ann Arbor is 8.8% African American, and the population of Washtenaw County in which Ann Arbor is located is 12.3% African American. Slightly more than 10% of the Black women in the study resided in the Ann Arbor area and thus were categorized as racial minorities at the context level. The population of Detroit is 81.6% African American, and the population of Wayne County (including suburbs) in which Detroit is located, is 40.9% African American; 50.4% of the residents of Wayne County are in racial/ethnic categories other than non-Hispanic and White. Slightly more than 7% of the White women in the study resided in the Detroit area and thus were categorized as racial minorities at the context level.

We measured lifetime trauma history with the Life Stressor Checklist (LSC) (Norris & Hamblen, 2004; Wolfe & Kimerling, 1997), which assesses 29 types of trauma exposures. The LSC is designed for use with women and asks about such potentially traumatic events as disasters, war zone experience, medical trauma, incarceration, accidents, and abuse. We created an interval-level variable that is the sum of types of trauma exposures reported by each participant.

We measured symptoms of PTSD with the National Women's Study PTSD Module (NWS-PTSD). This standardized telephone diagnostic interview instrument attained a sensitivity of 0.99 and specificity of 0.79 in diagnosing PTSD in comparison with the face-to-face, clinician-administered Structured Clinical Interview for DSM-III-R (SCID) in the DSM-IV field trial for PTSD (Resnick et al., 1993). This measure yields a symptom count (0 to 17) and diagnosis per DSM-IV symptom clusters. We used the interval-level symptom count. In this sample, the internal consistency coefficient for the symptom count (Cronbach's alpha) was .91.

We measured quality of life with the Quality of Life Inventory (QoLi) (Frisch et al., 1992), which assesses satisfaction with nine domains including housing, health, love relationship, extended family, community, job, leisure, health, and standard of living, providing an interval-level score. The internal consistency coefficient in this sample was .79.

We used the nine-item Everyday Discrimination Scale (EDS) (Williams et al., 1997) to assess experiences of discrimination in relation to multiple marginalized identities. The measure includes the question, “How often on a day-to-day basis do you experience each of the following types of discrimination?” with responses ranging from *never* to *almost every day* on a five-point scale. Items include experiences such as being made to feel inferior, receiving poor service in a restaurant or store, being called names, and being insulted. We used the sum of these scores as an interval-level indicator of burden of discrimination, with a higher score indicating that the participant experienced discrimination more frequently in everyday life.

We then used the second component of the EDS to learn which of several identities the participant considers to be the cause or reason for these experiences of discrimination. The measure includes the question, “What do you think are the main reasons for these experiences?” The list of identities to which the discrimination can be attributed includes race, ethnicity/nationality, religion, sex, sexual orientation, disability, physical appearance, age, and/or something else (not specified). We added pregnancy status as another possible attribution for purposes of our study. Thus, we use the interval-level count of the number of memberships or identities that a participant considered to be reasons for discrimination and consider these identities as marginalizing because they generate (according to the participant) discrimination. The internal consistency (Cronbach’s alpha coefficient) for the 598 of 619 who answered all items was .86. Because reliability can differ across more homogenous subgroups, we assessed Cronbach’s alpha within the subgroup of Black women, where it was also .86.

Analysis Plan

Analyses were conducted using SPSS version 17. Missing data affected one variable. Some individuals declined to answer individual items within the EDS frequency score section, and some who reported discrimination declined to name an identity as an attribution. These missing data affected the frequency score and the sample size, as explained below. Data were assessed for fit with the assumptions for linear modeling. The distributions for the two outcome variables departed from normal; however, the standardized residuals of the regression models approached a normal distribution. Thus, assumptions were not entirely met, but sample size and the robustness of the procedure compensated for these deviations.

We then conducted the analyses in relation to our research questions. First, we described demographic characteristics, contextual factors, posttraumatic stress symptoms, and quality of life scores for the race/ethnicity groups using chi squared analysis and t-tests to compare each group with all others. We then described the experiences of discrimination using EDS frequency scores and the sum of attributions, again contrasting each group with all others. We used two sets of regression models to estimate the variance explained (via R^2) of each intersectionality level (interpersonal, contextual, and structural inequalities) individually in relation to both the PTSD and quality of life outcomes. In the interpersonal-level regressions we modeled alternatively the sum of attributions (an additive approach) and an interaction term (a multiplicative approach), following the methods of Veenstra (2011) and Hinze and colleagues (2011) respectively. Finally, we used two stepwise linear regression models (one for PTSD and one for quality of life) to assess the relative contributions of the three levels of intersectionality factors within the same model. We started with the interpersonal level, entering first the sum of attributions and then the EDS frequency score. This provided a means to assess the extent to which the burden of discrimination experiences mediated the effect of multiple marginalized identities, using Baron and Kenney’s procedure for testing mediation (1986). We then continued adding steps for the context level variables, adding the structural inequality level variables as a last step.

Results

Sample

All 647 participants who completed the EDS answered items about the frequency with which they experienced discrimination. For women who declined to answer or gave a *don't know* response for individual items, we calculated their frequency scores from the number of items they did answer. Twenty-six women who reported discrimination did not attribute the experience to any category of marginalized identity and were hence deleted from the analysis resulting in a final sample size of 619. Slightly more than half (55.3%) of the participants were White and one third (33.9%) were Black.

Structural Inequality Level Factors

At the structural inequality level, White, Black, and Asian groups were statistically significantly different, with Blacks consistently most disadvantaged in terms of both education and income (Table 2).

Contextual Level Factors

At the contextual level, the pattern was similar. Most women had racial identities congruent with the majority group in their cities, but 7.1% of White and 10.5% of Black women were in the minority where they lived. Eighty percent of the Black women lived in zip codes with crime rates greater than the U.S. average. Black women experienced the greatest number of types of trauma exposure (mean of 5.6 out of 29 types of exposure). Compared with all other women, Black women had a significantly higher mean number of PTSD symptoms (3.2, $SD = 4.1$, $p < .001$) and significantly lower Quality of Life scores (39.9, $SD = 5.0$, $p = .003$).

Interpersonal Level Factors

Table 3 presents mean EDS scores (with higher scores indicating greater burden of discrimination). The distribution is skewed to the left, with the mode of 9, since one-third of the sample reported never experiencing discrimination. There were no statistically significant differences across groups in either the mean frequency of experiences of discrimination (ranging from a mean score of 13.5 to 15.8) or in the rate of experiencing *any* discrimination (ranging from 62.9% to 70.0%). The survey contains a logical skip pattern in that if the woman reported no instance of discrimination, she was not asked to attribute discrimination to any of the nine possible marginalized identities. Therefore, we do not have reports of any identities that are reasons for discrimination for roughly one third of the women.

Table 3 also presents ranking of attributions for the discrimination experiences. Gender was the highest-ranked attribution in the overall sample and for White and Hispanic women. Race was the highest-ranked attribution for Black and Asian/Pacific Islander women. In this perinatal sample, participants also attributed discrimination due to their status as a pregnant woman, with Whites and Blacks ranking pregnancy as the third and fourth most frequent attribution, respectively.

Relationship of Discrimination to Outcomes

Greater burden of discrimination, as indicated by higher EDS frequency scores, was negatively correlated with quality of life ($r = -.352$, $p < .001$). The EDS frequency score was positively correlated with PTSD symptom level ($r = .334$, $p < .001$).

Predictive Value of Each Intersectionality Level in Isolation

The first set of six regressions (Table 4) answers the question of the extent to which each level of intersectionality by itself is predictive of PTSD symptoms or QoLi score. Each of the eight individual variables is significant on its own (data not shown), but when combined into levels, the shared variance results in loss of independent significance for the sum of attributions, crime rate, and minority status variables. When each level of intersectionality factors is considered as a pair or trio of variables, all three levels are significantly predictive of both outcomes. The interpersonal level alone explains 15% of variance in PTSD symptoms and 13% of variance in QoLi score. The contextual level alone explains 45% of variance in PTSD symptoms and 13% of variance in QoLi score. The structural inequalities level alone explains 5% and 4% respectively.

Assessment of Interaction Terms

Since both the Veenstra (2011) and Hinze and colleagues (Hinze et al., 2011) approaches to modeling intersectionality used interactions terms, we also tried this approach as an alternative to the additive approach implicit in the sum of attributions variable. The model statistics provided as a footnote to Table 4 indicated that the interaction product from multiplying EDS frequency score and the sum of attributions when used alone (per Veenstra) explain less variance in relation to both PTSD symptoms and QoLi score than use of the pair of EDS frequency score and sum of attributions variables. When the interaction product is used in addition to these component variables (per Hinze et al.), it does not increase variance explained in relation to PTSD. It does add 3.3% explained variance in relation to QoLi score, but the interaction term itself is not independently predictive. Thus, for the final models, we used the two variables without the interaction term.

Variance Explained and Mediating Relationship

Finally, we constructed two stepwise linear regressions to see the effects of modeling all three levels together (Table 5) and to determine whether the burden of discrimination mediates the association of marginalized identities with more adverse outcomes. In relation to the PTSD symptom outcome, the sum of attributions variable alone (Step 1) was significantly independently associated and explained 8% of variance. In step 2 the EDS frequency score mediated the relationship of marginalized identities with PTSD (see footnote to Table 5) and added 7% more explained variance. Adding the contextual factors in Step 3 added 33% more explained variance. The structural inequalities variables, when added as the last step, were not significantly associated with PTSD and did not increase explained variance. In relation to the QoLi score outcome, the pattern was similar. The sum of attributions alone (Step 1) explained 7% variance in quality of life scores. The EDS frequency score again mediated this relationship and explained an additional 6% of variance. The contextual factors added 6% more explained variance. Structural inequalities factors were independently significantly associated with the QoLi score, even when added last, explaining an additional 1% of variance. Altogether the three levels of intersectionality factors explained 48% of variance in relation to PTSD symptoms and 21% of variance in relation to QoLi score.

Discussion

Our objective was to contribute to the dialogue in the health sciences literature on how to operationalize the concept of intersectionality. The contributions we aimed to make via this secondary analysis were (1) to suggest that intersectionality is a construct that could be examined at four levels, mirroring the levels of Bronfenbrenner's social ecological model: structural, contextual, interpersonal, intrapersonal; (2) to focus on an approach that utilizes an instrument already in widespread use to measure and model the interpersonal-level

indicator; and (3) to consider the relative amount of variance explained by these three levels within a medium-sized sample from a clinical study.

From models of each level alone, we concluded that the interpersonal-level intersectionality variables explain more variance in relation to the mental health and quality of life outcomes than structural inequality-level intersectionality variables. The variable created from the sum of marginalized social identities is independently predictive of our two outcomes. This association was mediated by a second interpersonal-level variable, the frequency score reflecting the burden of everyday discrimination experiences.

The exploration of contextual level factors showed that aggregated variables (e.g., minority or out-group status, crime rate by zip code) may have less impact than individually specific indicators, such as individually experienced trauma exposures. Trauma exposure is an example of a variable used to operationalize the contextual level of intersectionality that is probably study-specific because it is a necessary antecedent to the outcome of PTSD. This is a logical explanation of the strong independent association (standardized beta = .666) and high proportion of variance explained by this level in the PTSD model (45%). But the contextual level variables also explained 13% of the variance in quality of life, where trauma exposure (beta = -.346) makes sense as a contextual factor but is not a necessary predictor.

Appraisal of This Approach

Results of this analysis permit appraisal from a statistical perspective. We suggested that operationalizing intersectionality in quantitative health outcomes research is difficult because it is a social phenomenon operating at multiple levels. The approach we used here falls short of the ideal largely because the key interpersonal-level variable is mathematically simplistic, relying on a sum of identities that were named as attributions for discrimination. Additive, multiplicative, or combination variables that come into play at the analysis phase of a research project and that apply the same mathematical or statistical procedure for all individuals will not be as finely specific as variables that could capture positive and negative *valences* and relative *weights* of identities. These likely are factors that could be better captured at the data collection phase with yet-to-be-created instruments aiming to measure the intrapersonal level. For example, a lesbian whose family of origin embraces her partner might experience much less negative impact of her identity compared to a lesbian estranged from her family. A Black woman with a strong African American cultural heritage may be more resilient than some of her counterparts. From this study we cannot know if such intrapersonal-level factors are independently significant predictors nor if they would explain additional variance. Including this level in models awaits improvements in measurement.

Our analysis of interaction terms to capture the intersection of identities and discrimination was an attempt to capture this potential individuality of effects of discrimination. The interaction terms did not improve the models. Ultimately the product of the discrimination frequency score and the sum of attributions (identities) is still based on an additive approach because the data were limited to the sum of identities causing discrimination. We do not have any numerical representation of identities that are protective, privileging, or cherished, neither as a simple subtraction within the interpersonal level nor via a system of weighting the identities relative to each other. Thus we recommend that future analyses continue to assess the benefits of using interaction terms, especially if and when valence and weight information is available for the calculations.

Modeling three of the four posited levels at which intersectionality may be operating may compensate to some extent for the simple, additive approach because the multiple regression allows each factor to influence the strength of association with the outcome of each of the others. We chose to enter the structural inequality factors last in the two final models

because we wanted to estimate the importance of the novel interpersonal-level factors alone and then to apply a test of mediation. The models likely underestimate the importance of the interpersonal level of intersectionality for two reasons. First, the sum of attributions only captures the negative valence (i.e., marginalizing identities). Second, the one-third participants who reported no discrimination contributed little variance, since theoretically measureable experiences of protection or privilege do not enter into this equation. Although these models allow us to see the relative contributions of each level to explaining variance in the outcomes, the database used included only pregnant women, so there was less variance than would be expected in studies including more variance in gender and age.

For a more qualitative appraisal of this effort, we turn to three questions suggested by Cole (2009) for improving consideration of intersectionality in research. First, we ask, “Who is included” in the data set? Although the sample we used is diverse, it is a limitation of this secondary analysis approach that we did not ask every participant about identities, regardless of whether they also reported discrimination. This could be easily amended in future data collection. Second, we ask, “What similarities exist within the sample?” Female gender appears to be an “equal opportunity” risk factor for discrimination. Gender-based problems (e.g., sexual trauma) and gender-specific variance (e.g., higher conditional PTSD risk for women) affected this whole sample equally. So focusing on a third question, “What role do inequalities play?” would likely be fruitful and indicate areas among women where race, class, or other identities lead to differential outcomes (e.g., access to mental health treatment to improve PTSD symptoms or opportunities to move to safer neighborhoods to improve quality of life).

Our effort to operationalize intersectionality is offered in the spirit of continuing a dialogue and a dialectical process among health outcomes researchers to move toward a less partial, less distorted (Harding, 1991) estimation of the adverse impact of social inequalities on health across multiple social ecological levels, including the macro level where their impact has so far been most thoroughly studied. Several of the shortcomings of this analysis could be easily addressed with minimal effort at the data collection phase by augmenting the initial demographic assessment to include more questions about belonging to marginalized minority groups and other social identities of theoretical interest to the study. A next step would be to ask participants to indicate the relative positive or negative valence of each identity and to weigh or rank the perceived importance of each identity relative to the others. The addition of attention to contextual, interpersonal-level, and intrapersonal-level variables could inform clinical and epidemiological research. Other ideas that emerge across methodological discussions may significantly increase our ability to explain the impact of particular social standpoints or our ability to understand why some individuals fare so much worse than others who on the surface seem similar. Ultimately the goal of producing such knowledge would be to affect social change and improve the health of those who experience marginalization at many levels.

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Research Highlights

- *Intersectionality* is an important lens for understanding health outcomes in relation to marginalized identities.
- This methods paper conceptualizes four social ecological levels of intersectionality.
- The two-part Everyday Discrimination Scale is a good interpersonal-level indicator.
- Interpersonal-level variables explained three times as much variance as the structural inequality level variables.
- Findings suggest improvements for future measures to capture both marginalized and privileged intersecting identities.

Table 1

Delineation of the levels of conceptualizing intersectionality

Conceptual Definition	Eco-Social Theory Levels	Empirical Indicators	Operationalization in Database
Intersectionality is a methodology of studying “the relationships among multiple dimensions and modalities of social relationships and subject formations” (McCall, 2005).	Macro-system	Structural inequality	Low education, low income
	Exo-system	Contextual factors	Living as a member of a racial minority, crime rate, and trauma exposures
	Meso-system	Interpersonal cost of the identity	Burden of discrimination experiences via the EDS frequency score and sum of attributions for discrimination out of nine identities
	Micro-system	Intrapersonal valence of the identity*	Personal appraisal of the positive or negative valence of identities*

* Not available in the database and so not modeled. EDS = Everyday Discrimination Scale

Table 2

Descriptions by race and ethnicity group^a

	White n=342 (55.3%)	Black n=210 (33.9%)	Asian or Pacific Islander n=47 (7.6%)	Native American/ Alaska Native n=9 (1.5%)	Hispanic n=30 (4.8%)	Middle Eastern n=18 (2.9%)
Structural inequality factors						
High school education or less, %	14.9***	78.1***	6.4***	66.7	33.3	50.0
Household income <\$15,000, %	4.7***	39.6***	2.1**	22.2	10.0	22.2
Contextual factors						
Crime rate > US average, %	5.3***	80.5***	8.5***	66.7	3.0	27.8
Sum of trauma types, mean (SD)	3.5 (3.1)	5.6 (4.1)***	2.7 (2.5)***	6.6 (6.9)	4.3 (3.7)	5.6 (3.9)
Outcomes						
PTSD symptoms, mean (SD)	1.1 (2.3)***	3.2 (4.1)***	68 (1.4)***	.5.9 (7.2)	1.7 (3.2)	3.4 (4.1)
Quality of life score, mean (SD)	41.3 (3.6)***	39.9 (5.0)**	40.1 (4.3)	38.9 (8.8)	40.1 (4.0)	39.5 (4.0)

* Note: $p < .05$ ** $p < .01$ *** $p < .001$. PTSD = post-traumatic stress disorder. SD = standard deviation.^a Compares each group with all others.

Table 3Everyday Discrimination Scale (EDS) scores and rates and ranking of reasons discrimination by group^a

	White n=342 (55.3%)	Black n=210 (33.9%)	Asian or Pacific Islander n=47 (7.6%)	Hispanic n=30 (4.8%)
Mean discrimination frequency score (SD)	14.1 (5.4)	14.3 (6.9)	13.5 (6.0)	15.4 (6.2)
Rate of <i>any</i> discrimination	67.5%	62.9%	63.8%	70.0%
Specific attribution rates				
Race	3.5***	43.6***	58.1***	52.4**
Ethnicity/Nationality	3.5***	21.1**	54.8***	38.1**
Religion	9.1	9.8	6.5	0
Gender	65.8***	42.1***	45.2	57.1
Sexual Orientation	1.7	5.3	0	4.8
Disability	3.0	3.8	0	0
Physical Appearance	16.9	21.8	16.1	19.0
Age	35.5	38.3	25.8	47.6
Pregnancy	22.9	33.1**	0***	19.0
Refused	0.4	1.5	0	0
Other Reason	26.0	21.8	12.9	4.8
Ranking				
1	Gender***	Race***	Race***	Gender
2	Age	Gender***	Eth/Nation***	Race**
3	Pregnancy	Age	Gender	Age
4	Appearance	Pregnancy**	Age	Eth/Nation**
5	Religion	Appearance	Appearance	Appearance
6	Race***	Eth/Nation**	Pregnancy***	Pregnancy
7	Eth/Nation***	Religion		Sexuality
8	Disability	Sexuality		
9	Sexuality	Disability		

Note: Eth/Nation = ethnicity or nationality, Sexuality = sexual orientation. Empty cells indicate that this group had no other attributions for discrimination.

*
p < .05,

**
p < .01,

p < .001.

^aCompares via chi squared test each group with all others. Samples sizes for Native American (n=9) and Middle Eastern (n=18) groups are too small to provide stable estimates and therefore are not presented. These participants are, however, included in the samples that contrasts with the White, Black, Asian/Pacific Islander, and Hispanic groups.

Table 4

Linear regressions with each level's intersectionality variable predicting outcomes

Post-Traumatic Stress Disorder (PTSD) symptom count		Quality of Life Index score	
Interpersonal (Meso-system) level		Interpersonal (Meso-system) level	
Model statistics: $R^2 = .151$, $F = 54.6$, $p < .001$		Model statistics: $R^2 = .128$, $F = 45.0$, $p < .001$	
Sum of attributions ^a	$\beta = .090$ $p = .051$	Sum of attributions ^b	$\beta = -.076$ $p = .104$
Discrimination frequency ^a	$\beta = .328$ $p < .001$	Discrimination frequency ^b	$\beta = -.307$ $p < .001$
Contextual (Exo-system) level		Contextual (Exo-system) level	
Model statistics: $R^2 = .453$, $F = 170.4$, $p < .001$		Model statistics: $R^2 = .128$, $F = 30.2$, $p < .001$	
Crime rate	$\beta = .018$ $p = .564$	Crime rate	$\beta = -.041$ $p = .288$
Minority status	$\beta = .024$ $p = .431$	Minority status	$\beta = -.009$ $p = .808$
Trauma exposures	$\beta = .666$ $p < .001$	Trauma exposures	$\beta = -.346$ $p < .001$
Structural Inequalities (Macro-system) level		Structural Inequalities (Macro-system) level	
Model statistics: $R^2 = .046$, $F = 14.8$, $p < .001$		Model statistics: $R^2 = .042$, $F = 13.6$, $p < .001$	
Low education	$\beta = .139$ $p = .001$	Low education	$\beta = -.108$ $p = .012$
Poverty	$\beta = .117$ $p = .007$	Poverty	$\beta = -.137$ $p = .002$

^aWhen an interaction term is used *instead*, prediction does not improve; $R^2 = .107$, $F = 74.3$, interaction term $\beta = .328$, model $p < .001$. When it is used *in addition* to the frequency and sum variables, it does not add to the prediction of PTSD symptoms; $R^2 = .151$, $F = 36.3$, interaction term $\beta = .006$, coefficient $p = .960$.

^bWhen an interaction term is used *instead*, prediction does not improve; $R^2 = .096$, $F = 65.5$, interaction term $\beta = -.310$, model $p < .001$. When it is used *in addition* to the frequency and sum variables, it does add 3.3% to the prediction of the QoLi score, but the independent association is not significant; $R^2 = .129$, $F = 30.3$, interaction term $\beta = -.096$, coefficient $p = .388$.

Table 5

Step-wise regression models of effect of levels of intersectionality on the outcomes, with test of mediation

	PTSD Symptom Level		Quality of Life Score	
Cost of attributions, Step 1				
Variance explained, Model sig,	R ² =.081, p<.001		R ² =.066, p<.001	
	β	p	β	p
Sum of attributions *	.284	<.001	-.257	<.001
Frequency of discrimination, Step 2				
Variance explained, Model sig,	ΔR ² =.070, R ² =.151, p<.001		ΔR ² =.061, R ² =.128, p<.001	
	β	p	β	p
Sum of attributions *	.090	.051	-.076	.104
EDS frequency score *	.328	<.001	-.307	<.001
Contextual factors, Step 3				
Variance explained, Model sig,	ΔR ² =.327, R ² =.478, p<.001		ΔR ² =.064, R ² =.192, p<.001	
	β	p	β	p
Sum of attributions	.037	.314	-.050	.268
EDS frequency score	.141	<.001	-.240	<.001
Crime rate	.036	.238	.070	.061
Minority status	.009	.758	-.015	.698
Trauma exposures	.603	<.001	-.244	<.001
Structural inequalities factor, Step 4				
Variance explained, Model sig,	ΔR ² =.002, R ² =.480, p<.308		ΔR ² =.014, R ² =.206, p=.004	
	β	p	β	p
Sum of attributions	.037	.307	-.051	.256
EDS frequency score	.144	<.001	-.239	<.001
Crime rate	.009	.805	.016	.734
Minority status	.008	.785	.019	.598
Trauma exposures	.597	<.001	-.225	<.001
Low education	.012	.751	-.077	.097
Poverty	.047	.157	-.102	.013

Note: PTSD = post-traumatic stress disorder.

* Step 1 tests the predictor to outcome (A to C) relationship per Baron and Kenney's procedure for testing mediation (1986). The predictor to mediator relationship (A to B), which is the same across models, was tested with a bivariate regression of sum of attributions/identities and the dependent variable of the burden of discrimination score, $R^2 = .350$, Model $p < .001$, $\beta = .591$, coefficient $p < .001$. The mediator to outcome test (B to C) is the last coefficient in the second step. We conclude that burden of discrimination score mediates the association of sum of attributions/identities with PTSD symptoms and quality of life score.