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Intersectional Inequalities and the U.S. Opioid Crisis: Challenging dominant narratives and revealing heterogeneities

Dominant narratives of prescription opioid misuse (POM) in the U.S. have portrayed it as an issue primarily affecting White communities. In this study we explore POM as reported in data from the 2015 National Survey on Drug Use and Health, using an intersectional *multilevel analysis of individual heterogeneity and discriminatory accuracy* (MAIHDA). We map the risk of POM through a series of multilevel models with individuals (N=43,409) nested within strata formed by the intersections of gender, race/ethnicity, income, and age. We find meaningful heterogeneity between and within strata. The ten strata with the greatest risk for POM were comprised of individuals identifying as White, African American, and non-White Hispanic, and included individuals of low, medium, and high income. We uncover intersections of social position with high risk for POM that are often excluded from dominant narratives, including young high-income African American women. Intersectional approaches are essential for advancing our understanding of health inequalities and unfolding epidemics such as that of POM in the U.S.

Background

The ongoing opioid epidemic in the U.S. has drawn considerable attention nationally and internationally, and was declared a “public health emergency” in March 2017 (Davis, 2017). The impact of opioid misuse remains a cause for alarm in the U.S., and though prescribing rates have declined since 2010 (Schuchat, Houry, & Guy Jr., 2017), current rates remain three times higher than in 1999, and opioid-involved deaths are still on the rise (Guy Jr. et al., 2017). In 2017, 67.8% of drug overdose deaths involved an opioid (Scholl, Seth, Kariisa, Wilson, & Baldwin, 2019), and more than 35% of opioid-related mortality involved prescription opioids (CDC, 2018). Opioid misuse accounts for substantial health, social, and economic costs in the U.S. (Bonnie, Kesselheim, & Clark, 2017; Manchikanti et al., 2012; Schuchat, et al., 2017).

Since the early 2000s, much of the rhetoric in the media surrounding the epidemic has framed opioid misuse as a problem affecting primarily middle-class, rural and suburban White individuals (Netherland and Hansen, 2016). This coding of the epidemic as “White” corresponds with marked differences in the perception and handling of POM compared to heroin use, which is historically coded as Black. POM has been met with reduced stigma, a greater willingness to provide resources for treatment and support, and a reduced desire to pursue punitive measures (Hansen and Netherland, 2016; Laguna, 2018; Netherland and Hansen, 2017). While less punitive responses are to be celebrated, their apparent race- and class-based motivations are deeply troubling, particularly given the historic and contemporary criminalization of related substance use under the guise of the ‘War on Drugs’ (Bechteler and Kane-Willis, 2017; Netherland and Hansen, 2016; Provine, 2007).

While in absolute terms the dominant narratives surrounding the “whiteness” of the opioid epidemic appear warranted—according to a recent CDC *Morbidity and*

Mortality Weekly Report (Seth, Scholl, Rudd, & Bacon, 2018) 79% of all opioid-related deaths (33,450 of 42,249 deaths in 2016) were among non-Hispanic White people—this obscures two important points. First, the *rate* of opioid misuse and deaths among non-White individuals is also high; in 2016 there were 17.5 deaths among non-Hispanic White people, 10.3 deaths among non-Hispanic Black people, and 6.1 deaths among Hispanic people per 100,000 in the population. The impact of the epidemic on racial/ethnic minorities has, however, been largely overlooked. Second, findings about the *distribution* of the epidemic across the population tend to be reported in purely additive terms, with comparisons made only by race/ethnicity, or by gender, or by age (Alexander, Kiang, & Barbieri, 2018; Nicholson and Ford, 2018; Seth, et al., 2018). This framing obscures the *intersectional* nature of the epidemic—with perhaps numerous, heavily affected social strata being rendered invisible. As a consequence, the needs of heavily affected populations may be under-recognized and unmet, while the social processes that generate these needs and disparities go unchallenged.

Meanwhile, recent critiques highlight that the dominant narrative of POM in the U.S. as a problem of the White middle-class does not reflect the reality of the phenomenon (Bechteler and Kane-Willis, 2017; Nicholson and Ford, 2018). This is particularly important to investigate as racialized narratives about substance misuse and racial bias in healthcare have implications in terms of access to pain management as well as treatment for substance use disorders (Monnat, 2017; Nicholson and Ford, 2018).

Netherland and Hansen (2017) suggest that public health could be an “alternate ideology to a medical or punitive frame – one that may be able to encompass important structural issues, such as race, geography, and class” (p.19). Our present analysis seeks to encompass several of these structures. By grouping individuals within strata

comprised of intersections of gender, race/ethnicity, income, and age, and assessing the variation within and between those strata, we attempt to reframe substance misuse from an individual medical or punitive problem and conceptualize it within structural contexts. Although the included social categorizations are not the only structural factors that could be associated with POM, they do represent major axes of marginalization and inequality in U.S. society and are frequently evaluated in social epidemiology and intersectional scholarship (Berkman and Kawachi, 2000; Collins and Bilge, 2016; Crenshaw, 1989; Krieger, 2011; Schultz and Mullings, 2006). While these axes are often measured individually, in line with critical theories of population health such as ecosocial theory (Krieger 2011), social production, and political economy of health (Conrad and Kern, 1981; Doyal, 1979), we regard these as proxies for social positions within complex, interlocking systems of inequality and the social experiences that these positions likely entail. Observed inequalities in POM across strata are therefore understood to be an end result of intersectional social processes operating at several ecological levels.

We argue that the question of POM in the U.S. is highly suitable for an intersectional approach, which enables us to explore the heterogeneous distribution of the epidemic, to interrogate dominant narratives, and to illuminate intersections of social position that may have been overlooked so far.

Intersectionality in Population Health

Intersectionality theory posits that individuals are positioned within interlocking structures of privilege and marginalization based on power dynamics surrounding social categorizations such as gender, race, and class. This framework was originally articulated in order to account for the ways in which women of colour were discriminated against within a legal system that failed to address the intersection of both

womanhood and blackness (Crenshaw, 1989). In more recent years, intersectionality has been applied as a theoretical framework within social epidemiology (Axelsson Fisk et al., 2018; Bauer, 2014; Evans, 2015; Evans, Williams, Onnela, & Subramanian, 2018; Green, Evans, & Subramanian, 2017; Merlo, 2018; Wemrell, Mulinari, & Merlo, 2017a). In this study, we apply an intersectional framework to position individuals within intersecting social systems that shape lived experiences with implications for population health.

McCall (2005) has famously identified three major approaches within the intersectionality literature: the *anti-categorical*, which critiques the use of social categorizations on the grounds that they fail to recognize the inherent fluidity of such labels and that using (or reproducing) them may serve to reify structural inequity; the *intercategorical*, which provisionally accepts social categorizations in order to identify and act on existing inequities; and the *intracategorical*, which provides a nuanced focus on particular intersections of marginalization. To date, the intercategorical approach has been the one most frequently used in social epidemiological research, with the focus of such studies being the health *effects* of social strata membership (Sen, Iyer, & Mukherjee, 2009; Veenstra, 2013). Anti-categorical research has been used more rarely in population health research because studies of this type, typically qualitative in orientation, tend to focus on the meaning of the social categorizations or identity labels themselves, or on the nature of lived experiences of individuals at particular social locations, rather than their effects on health outcomes.

Recently, however, an expanded view of the anti-categorical approach has been proposed, suggesting an anti-categorical interpretation of health *effects* (Merlo, 2018; Wemrell, Mulinari, & Merlo, 2017b) and using anti-categorical interpretations in conjunction with intercategorical ones to examine population health (Mulinari,

Wemrell, Rönnerstrand, Subramanian, & Merlo, 2018). These studies propose operationalizing intercategory complexity through measures of differences between-group average risk, such as odds ratios (ORs) or risk ratios (RRs), and anti-category complexity through measures of discriminatory accuracy (DA) which gauges the ability of a certain category to correctly discriminate between people with or without the outcome of interest, which we have done (Merlo, 2018; Mulinari, et al., 2018; Wemrell, et al., 2017b). In this study, we apply both intercategory and anti-category approaches, enabling improved discernment of the extent to which the intersectional strata shape the distribution of POM.

Descriptive intersectional scholarship has rightly been critiqued on the grounds that merely describing intersectional patterns in dependent variables without calling attention to the social processes that give rise to inequalities runs the risk of blunting intersectionality's "critical edge and transformative aims" (May, 2015, p. 141). We argue that our approach maintains such a critical edge for two reasons. First, as argued by Evans (2019), the main issue with descriptive intersectional studies is not their descriptive nature per se, but that they tend to be atheoretical in framing and interpretation, and therefore fail to draw attention to (and critique) the social processes that generate observed intersectional patterns. By drawing on critical theories of population health (Conrad and Kern, 1981; Doyal, 1979; Krieger, 2011) and interpreting observed inequalities accordingly, we aim to highlight the underlying social processes driving the POM epidemic. Second, as noted, the dominant narratives about the opioid epidemic affect a form of erasure through which the experiences and needs of minority populations are left under-recognized and unaddressed. Our purpose is to challenge and complicate this simplistic and exclusionary narrative.

Social Processes and Inequalities in the Opioid Epidemic

Both pain management and substance use are complex, related phenomena influenced by a variety of social processes. In the case of POM, it is necessary to consider a variety of factors, including: (1) the likelihood of individuals becoming patients requiring pain management, (2) factors influencing physician assessment of pain in their patients (which can affect prescribing rates and dosages), (3) contextual influences in the lives of individuals relying on opioids for pain management that may determine, through stress and coping pathways (Crutchfield and Gove, 1984), their likelihood of developing POM, (4) individuals' agency and ability to negotiate with their physicians for adequate pain management, (5) micro-contextual factors such as group norms, perceptions of drug-related risks, effects and behaviours and local drug availability (Stanistreet, 2005; Yedinak et al., 2016) and (6) macro-environmental factors such as state drug policy (Yedinak, et al., 2016) and interests and practices of pharmaceutical companies. Importantly, social processes such as these will operate differently across intersectional social strata. We would expect, as a consequence, that this would result in substantial inequalities in POM across the population. In this study, we aim to establish the extent of such inequalities, while identifying intersectional social locations which are particularly exposed to social processes needing to be further elucidated and addressed.

Following the work of Jones, Johnston, & Manley (2016) and as recently described in explicitly intersectional terms by Evans (2015), Evans, et al. (2018), Axelsson Fisk, et al. (2018) and Hernández-Yumar et al. (2018), we carry out an *intersectional multilevel analysis of individual heterogeneity and discriminatory accuracy* (MAIHDA) (Merlo, 2018). This methodological approach enables an improved mapping of the possible heterogeneity of the opioid epidemic in the U.S.

population, with regards to the social categorizations of gender, race/ethnicity, income, and age. This multilevel approach conceptualizes individuals (at level-1) as nested within intersections of social position (level-2) and therefore treats social strata labels as analogous to other social contexts (such as schools or neighbourhoods) (Evans, et al., 2018). Treating strata labels as contexts rather than as individual-level characteristics addresses the critiqued tendency in quantitative intersectional scholarship (Choo and Ferree, 2010; Ferree and Hall, 1996), as well as in social epidemiology at large (Krieger, 2011; O'Campo and Dunn, 2012; Wemrell, Merlo, Mulinari, & Hornborg, 2016), to locate the cause(s) of interest within individuals rather than at a structural and processual level. We believe that examining the opioid epidemic in explicitly intersectional terms through a multilevel model will enable us to more suitably capture the complexity of POM in the U.S.

Aims

Using a large, nationally representative data set and applying an intersectional MAIHDA approach we examine the intersections of gender, race/ethnicity, income, and age in order to provide a nuanced mapping of POM in the adult U.S. population. In doing so, we challenge the dominant narrative that characterizes POM as a White, middle-class rural/suburban problem.

Methods

Data

This study was based on the public use dataset from the 2015 National Survey on Drug Use and Health (NSDUH-2015), a cross-sectional interview survey conducted annually by the Substance Abuse and Mental Health Services Administration. The public use file containing 57,146 individuals, representative of the U.S. non-

institutionalized civilian population, was subsampled using the statistical disclosure limitation method Micro Agglomeration, optimal probabilistic Substitution, optimal probabilistic Subsampling, and optimal sampling weight Calibration (MASSC) from the full survey sample of 68,073 individuals, aged 12 and above at the time of the survey (Center for Behavioral Health Statistics and Quality, 2016). The survey was based on an independent multistage area probability sample from all 50 states and the District of Columbia, and included household populations as well as residents of non-institutional group quarters and individuals without permanent residence, accounting for approximately 97% of the total U.S. population (Center for Behavioral Health Statistics and Quality, 2016). The characteristics of the survey are explained in detail elsewhere (Center for Behavioral Health Statistics and Quality, 2016). After excluding those with a missing outcome (N=342) and those under age 18 (N=13,395), the study sample includes 43,409 individuals.

Ethical Considerations

NSDUH-2015 data have been de-identified and are publicly available. The NSDUH-2015 was approved by the Research Triangle Institute's Institutional Review Board.

Prescription Opioid Misuse

The binary outcome *prescription opioid misuse* (yes vs. no) was based on the respondent's answer to a survey question asking them to indicate which, if any, prescription opioid was used most recently in a way not directed by a physician in the past year. Respondents who did not indicate misuse of any of the prescription opioids listed were coded as "no". Indication of misusing any of the listed opioids was coded as

“yes.” Heroin and other non-prescription opioids and opiates were not included in the outcome variable.

Intersectional Social Strata

Sociodemographic proxies of social identity and social process were used to construct intersectional strata. These were gender, race/ethnicity, income and age.

Gender was categorized as male or female. While the absence of a non-binary or other gender category is a limitation, male and female were the only categories included in the survey.

Race/ethnicity was self-identified according to the following NSDUH categories: Non-Hispanic White, Non-Hispanic Black/African American, Hispanic, and those with other identities (“Other racial/ethnic minorities”), which included Non-Hispanic Native American or Alaska Native, Native Hawaiian or Pacific Islander, Asian, or more than one race/ethnicity. Further stratification of this final category would have yielded strata with an insufficient number of individuals for analysis.

Income was divided into three categories: high, medium and low. These were defined using the federal poverty thresholds for 2015 (U.S. Bureau of the Census, 2015) for different household compositions and defined as high income (400% and greater of poverty threshold), medium income (200%-399% of poverty threshold) and low income (less than 200% of poverty threshold).

Age was recoded from the survey categories into three groups: 18-29, 30-49 and 50+ years. These capture three distinct life phases: early adulthood, mid-adulthood, and older adulthood.

The study includes 72 intersectional social strata constructed through the matrix of all combinations of the above defined categories of each social identity/process

variable: *gender* (2 categories), *race/ethnicity* (4 categories), *income* (3 categories) and *age* (3 categories).

Analysis

Multilevel Logistic Regression Models

As described in detail previously (Axelsson Fisk, et al., 2018; Evans, et al., 2018; Hernández-Yumar, et al., 2018), an intersectional MAIHDA analysis models two-level hierarchical data with individuals at level 1 nested within intersectional strata at level 2. We modelled the risk of POM using three two-level random-intercept logistic regression models, described below. We estimated each model using Markov chain Monte Carlo (MCMC) methods. For a complete summary of the statistical methods, see the online Supplement.

Model 1: Simple Intersectional

Model 1 included a random intercept for the intersectional strata, but no covariates, which can be written as

$$\text{logit}(\pi_j) \equiv \log\left(\frac{\pi_j}{1-\pi_j}\right) = \beta_0 + u_j \quad (1)$$

where π_j denotes the probability of opioid misuse for individuals in stratum j ($j = 1, \dots, J$), β_0 denotes the intercept, and u_j denotes the stratum-specific random effect. We then calculated the absolute risk (AR) of POM for each stratum by transforming the predicted logit or log-odds of POM into the corresponding predicted probability.

$$\pi_j = \text{logit}^{-1}(\beta_0 + u_j) \equiv \frac{\exp(\beta_0 + u_j)}{1 + \exp(\beta_0 + u_j)} \quad (2)$$

The AR values allow us to ascertain the risk of POM for each stratum, in absolute terms. We used the MCMC chains for β_0 and u_j to construct 95% credible intervals

(CI) for these probabilities to summarize the statistical uncertainty surrounding these predictions.

As this is a logistic model, we used a latent response approach to calculate the Variance Partition Coefficient (VPC) (Goldstein, Browne, & Rashbash, 2002).

$$\text{VPC} = \frac{\sigma_u^2}{\sigma_u^2 + 3.29} \times 100 \quad (3)$$

In the context of our study, the VPC is defined as the proportion of variation in the probability of POM that can be attributed to differences between strata, and is a measure of DA. A low VPC indicates that little of the observed variation in POM can be attributed to the strata level, meaning that the DA of the intersectional strata is low, while a high VPC indicates that the DA of the intersectional strata is high. We further plotted a receiver operating characteristic curve (ROC) and report the area under the curve (AUC) as a complementary assessment of DA (see Supplement).

Model 2: Partially-adjusted Intersectional

In a series of intermediate models, we made separate adjustments for each of the four identity/process variables used to construct the strata. We calculated the Proportional Change in Variance (PCV) between each of the versions of model 2 and model 1. The PCV indicates the share of the overall variation in POM across strata that can be accounted for by the given variable included in the model.

$$\text{PCV} = \frac{\sigma_{u(1)}^2 - \sigma_{u(2)}^2}{\sigma_{u(1)}^2} \quad (4)$$

A low PCV value indicates that the identity/process variable in question does not have a substantial impact on the variation in POM across the strata, and thus that the incremental DA is small.

Model 3: Intersectional Interaction

The final model serves two purposes. First, it provides us with an assessment of interaction effects beyond the additive effects of the four identity/process variables included in the strata, thus allowing us to identify strata with higher or lower risk than would be expected based on the additive effects of the variables. Second, the inclusion of each of the variables as covariates allows us to obtain mutually adjusted ORs for the main effects of gender, race/ethnicity, income, and age.

This model simultaneously included all four identity/process variables as covariates with fixed-effect regression coefficients but with no interaction variables between them. Following the methods outlined by Axelsson Fisk, et al. (2018), we decomposed the probability of POM for each stratum into the part due to main effects of the covariates, and that due to interactions between the covariates. If there were no interactions between the four variables, the inclusion of the covariates as main effects would explain all between-stratum variance; the stratum-level random effects would be 0. If this were not the case, the residual stratum-level random effects could be interpreted as the result of two- and higher-way interaction effects between the variables of the intersectional strata, assuming no relevant variables were omitted from the model.

By subtracting the main effects probability from the total probability for each stratum, we obtained the probability of POM accounted for by two-way and higher interactions between the variables. We interpret this value as the *absolute risk due to interaction* (ARI). A positive ARI means that individuals in that stratum have a *higher* risk than expected based on the simple addition of the risks conveyed by the variables that define the stratum (i.e., hazardous or synergistic interaction), while a negative ARI means a *lower* risk than expected (i.e., protective or antagonistic interaction). We also calculated 95% CIs for all model 3 ARs as well as ARIs (see Appendix Table A1).

Software

All models were run in MLwiN 3.02 (Charlton, Rashbash, Browne, Healy, & Cameron, 2017; Rasbash, Steele, Browne, & Goldstein, 2017) called from Stata 14.1 using the *runmlwin* command (Leckie and Charlton, 2013). Estimation was performed using MCMC methods (Browne, 2017), with diffuse prior distributions for all parameters. Quasilikelihood methods were used to provide starting values for all parameters. For each model, the burn-in length was 10,000 iterations and the monitoring chain length was 50,000 iterations, with thinning every 10 iterations. The code used for the models is provided in the Supplement.

Results

Summaries of models 1 (*Simple Intersectional*), 2 (*Partially-adjusted Intersectional*), and 3 (*Intersectional Interaction*) are presented in Table 1, including the VPC (expressed as a %), the PCV (expressed as a %), and the regression coefficients (expressed as ORs).

[Table 1 about here]

Figure 1 maps the ARs and 95% CIs for all intersectional strata in model 1. Table 2 presents these predicted percentages side-by-side with the observed percentages of POM. We found that the three strata with the highest *predicted* absolute risk (AR) for POM were White men with low income aged 18-29 (stratum 7: AR 13.04%, 95% CI 11.59-14.53%); African American women with high income aged 18-29 (stratum 46: AR 10.24%, 95% CI 5.04-17.56%); and White men with medium income, aged 30-49 (stratum 8: AR 9.56, 95% CI 7.77-11.50). The highest *observed* percentage of opioid misuse pertained to stratum 46 (16%). This stratum included a small number of individuals (N=50) compared to most other strata, thus its predicted probability is

shrunk towards the population average (Steele, 2008) to a greater extent than that of larger strata.

[Figure 1 about here]

We found that the lowest predicted ARs for POM pertained to White women with high income, aged 50 and above (stratum 39: AR 1.81%, 95% CI 1.17-2.63%); White women with medium income, aged 50 and above (stratum 42: AR 2.16%, 95% CI 1.50-2.94%); and White men with high income, aged 50 and above (stratum 3: AR 2.23%, 95% CI 1.48-3.12%).

Model 1 had a VPC of 7.54% (Table 1), with an AUC value of 0.64 (Figure 2), suggesting moderate clustering of individual risk by stratum and thus a low DA of these strata. While the moderate VPC indicates meaningful variation (i.e. inequalities) between strata with respect to POM, the low AUC indicates that the intersectional categorizations are not sufficient to discriminate with particularly strong accuracy between those who misuse prescription opioids and those who do not. Together, these measures indicate that while substantial within-strata heterogeneities exist, the intersectional strata meaningfully capture variation in POM, which calls for a theoretical exploration of the possible social processes underlying the observed distribution.

[Figure 2 about here]

Among the strata with the ten highest predicted AR values, six included White race/ethnicity, three included African American race/ethnicity, and one included non-White Hispanic race/ethnicity. Seven strata included men. Five strata included low income, three included medium income, and two included high income. Eight included ages 18-29, and two included ages 30-49. This is indicative of a complexity that was not

evident through the presentation of ORs for each of the intersectional variables alone (Table 1).

In the four different versions of model 2, we adjusted for each of the four variables separately. While the PCV values indicate the proportion of the between-stratum variance that is explained by each of the respective sets of covariates, only one model yielded a PCV value greater than 10%: the age-adjusted model (2D), which explained 69.8% of the between-stratum variance (Table 1). Thus, among the four variables, age has by far the strongest DA with regards to the outcome. Indeed, we see that in the unadjusted model (model 1) eight out of the ten strata with the highest ARs included those aged 18-29, while among the ten strata with the lowest ARs, none included those aged 18-29, and nine of ten included those aged 50 and above (Table 2).

[Table 2 about here]

In the other three versions of model 2 (Table 1), when adjusted for gender, race/ethnicity, and income, the VPC values changed minimally from that of model 1 (7.54%), to 7.04%, 8.02%, and 7.04%, respectively. This is consistent with the stratum-specific findings in which we observed greater variation among categories of gender, race/ethnicity, and income than in that of age among the ten strata with the highest AR and similarly in the ten strata with the lowest AR.

Model 3 showed a VPC of 0.48%, indicating very small residual interaction effects, with a PCV of 94% indicating that nearly all between-strata variation was explained by adjusting for the main effects of the four identity/process variables (Table 1). This suggests that 94% of the variation between the ARs of different strata was due to additive effects of gender, race/ethnicity, income and age and that only 6% was due to two-way or higher-order interaction effects between these variables. The main effects of each variable are presented as ORs (Table 1), and indicate lower risk for women,

higher risk for White individuals, and higher risk for low income individuals and those aged 18-24. However, as discussed above, greater complexity was evident among the intersectional, stratum-specific results.

By decomposing the model 3 predicted probabilities, we were able to isolate interaction effects of the identity/process variables. The CIs of all 72 stratum-specific interaction effects included 0, so none of the predicted probabilities deviated significantly from what one would expect based only on the main effects of the four variables. The three most positive and most negative interaction effects with 95% CIs are presented in Table 3.

[Table 3 about here]

Of the three strata with the most positive (hazardous) interaction effects, all were low income and White. Of the three strata with the most negative (protective) interaction effects, all were low income, aged 18-29, and non-White. The complete results of model 3 are presented in the appendix (Table A1).

Discussion

Applying an intersectional MAIHDA approach enabled us to provide a more nuanced description of the distribution of POM in the adult U.S. population. Our findings add complexity to the narrative of the opioid epidemic as primarily White and male by illuminating other intersections of social identity and position where POM is common.

By carrying out a descriptive analysis of POM within an explicitly contextual, intersectional framework, we seek to counter the trend in epidemiology to focus on individual *risk factors* rather than underlying mechanisms (Lofters and O'Campo, 2012) or *fundamental causes* of particular health outcomes (Krieger, 2011; Link and Phelan,

1995). We have operationalized this by nesting individuals within intersectional strata, allowing for an assessment of the risk attributable to variation between and within strata. By recognizing the high degree of heterogeneity of risk *within* social strata we seek to counteract the potential stigmatization or stereotyping (Olofsson et al., 2014) conveyed by current intercategorical approaches.

Complicating Current Narratives

Previous studies have found White race/ethnicity (Han et al., 2017; Seth, et al., 2018) and younger age (Kolodny et al., 2015) to be associated with higher risk of opioid misuse, though there is substantial heterogeneity of risk factors (King, Fraser, Boikos, Richardson, & Harper, 2014) and overlap between categorizations (Han, et al., 2017). We found that White men and women had both the highest and the lowest AR for POM, while the differentiating factor was age (with those aged 18-29 having higher AR). Meanwhile, of the ten social strata with highest risk, four included non-White identities.

Other recent studies have found that rates of prescription opioid use (Harrison, Lagisetty, Sites, Guo, & Davis, 2018) and misuse (Nicholson and Ford, 2018) have become more similar between Black and White individuals. Our intersectional approach deepens our understanding of the demographic patterning of POM and reveals intersections of social position with high AR of that would otherwise have been concealed. For example, among the strata with the ten highest ARs for POM were high-income African American women, aged 18-29, and as well as Hispanic and African American men with low and medium income, aged 18-29. Thus, simple racial and economic categorizations erase the complexity of the distribution of POM in the U.S., and could potentially contribute to mistargeted interventions, unequal distribution of resources, and unjust racialized narratives surrounding substance use.

While the variable to which the greatest between-strata variation can be attributed was age (as indicated by the PCV in model 2), we found significant heterogeneity within the strata (as demonstrated by the moderate VPC of model 1). This further indicates a need for caution when making categorical statements about the nature of POM. Thus, the intersectional MAIHDA approach allows us to highlight interlocking dimensions of social position that have an increased risk for POM, while subverting dominant narratives about the face of the epidemic.

Embodiment of Social Conditions

The ecosocial theory of disease distribution posits that we come to embody, biologically, our societal and ecological circumstances, and that this explains observed distributions of health outcomes at the population level (Krieger, 2011). With regards to POM, we have observed high AR within social strata comprised by different intersections of gender, race/ethnicity, income, and age, though age accounted for the largest share of between-stratum variation.

Young, high-income, African American women were found to have the second highest AR, yet individuals within this stratum have not been included in the mainstream narrative surrounding the opioid epidemic. This leads us to consider what mechanisms may be driving this pattern. As outlined previously, such factors may include physician assessment of pain and micro- and macro-contextual factors. For instance, racism has been identified as a fundamental cause of health inequity (Phelan and Link, 2015), and Feagin and Bennefield (2014) articulate the ways in which systemic racism can shape the relationship between physicians and patients of colour, leading to unjust differences in health. Studies have shown that there is under-treatment of pain in people of colour (Green et al., 2003), and racial disparities in opioid prescriptions (Singhal, Tien, & Hsia, 2016). One potential explanation for why young,

high-income African American women have high POM rates is that as physicians become more aware of their own racial biases and seek to reduce this under-management of pain in minority populations, they will be more likely to select young and high SES minority women as the recipients of this increase in pain management. Alternatively, the under-treatment of pain and under-prescribing of opioids to minority populations could provide motivation for some individuals to self-medicate for pain, which would be categorized as misuse of a prescription opioid even if it is not problematic use in the conventional sense. Young, high-income African American women, therefore, may be more comfortable disregarding directives for use that will be insufficient for management of pain. These are merely possible explanations for the observed patterns. Results from these descriptive analyses invite deeper, qualitative investigations of the uncovered patterns in order to improve our understanding of the lived experiences of individuals occupying particular social positions.

Race/ethnicity and Class – Narratives of Substance Use

Historically, substance use has been met by either criminalization/vilification or empathy/therapeutic support, depending on the narrative surrounding the identity of those using the substance. From opium in the late 1800s to crack cocaine in the 1970s, dominant narratives have often framed a particular social group as the scapegoat for social decay associated with drug use (Laguna, 2018; Murakawa, 2011; Provine, 2007). However, when a substance has been associated with the White middle class, it is deemed more acceptable, and individuals with substance use disorders are seen as deserving of empathy and treatment rather than criminalization (Laguna, 2018; Provine, 2007; Reinerman, 1994). POM follows this trend, with the current framing of a public health crisis differing markedly from the rhetoric of criminality that surrounded heroin use in communities of colour (Bechteler and Kane-Willis, 2017; Netherland and

Hansen, 2016). The differential treatment of substance use when a particular substance is associated with a privileged position can be used to uphold systems of power, and in the case of opioids, to preserve whiteness (Netherland and Hansen, 2017). The heterogeneity we have observed in the risk for POM complicates this narrative of whiteness. While unidimensional analysis is not only insufficient to fully map patterns of disease distribution, in cases such as that of POM, it may also serve to uphold systems of inequity.

Intercategorical and Anti-categorical Approaches

Inherent tensions arise when attempting to identify health inequities based on social position while preventing stigmatization and stereotyping of population groups. As many scholars have noted, simplistic categorizations in public health, and racial categorizations in particular (Gravlee, 2009; Kaufman and Cooper, 2010; Krieger, 2003; Valles, 2012) may be ethically problematic and are insufficient to account for social complexity. Additionally, measures of difference between group averages typically used in epidemiology do not account for the variance within and overlaps between categorizations (Merlo, Mulinari, Wemrell, Subramanian, & Hedblad, 2017; Mulinari, et al., 2018). We believe that by using an intercategorical intersectional approach alongside an anti-categorical one, operationalized through measurement of differences in average between strata as well as of the DA of those strata, epidemiological inquiry can resolve some of the existing tensions between needing to uncover health inequity and to avoid perpetuating stigma and stereotypes about presumably risky identities (Olofsson, et al., 2014). Thus, measures of DA combined with assessments of group averages can provide insight into how an intercategorical approach should be weighed against an anti-categorical one, in relation to the given outcome (Merlo, 2018; Wemrell, et al., 2017b). In this case, we found evidence supporting an intercategorical approach

based on the intersections of gender, race/ethnicity, income, and age, to insufficiently capture POM in the adult U.S. population. Evoking Marmot's concept of proportionate universalism (Carey, Crammond, & De Leeuw, 2015; Marmot and Bell, 2012), and the related argument that health actions should be universal rather than targeted, but be of a scale and intensity that is proportionate to the level of disadvantage, our results suggest that while a population level approach appears appropriate to curb opioid misuse, the scale and intensity of efforts should be balanced with attention toward of the cross-sections of the population with the greatest risk.

Limitations

This study has several limitations. Although the survey data were nationally representative, we do not account for geographical regional variation in POM patterns, as further stratification would have made the sample too small, though there have been noted differences in the distribution of opioid risk in different regions and cities (Bechteler and Kane-Willis, 2017) and between urban and rural environments (Rigg and Monnat, 2015). Another significant limitation is that due to our sample size, we were not able to stratify the 'other racial/ethnic minorities' category further. Native American and Alaska Native communities have been heavily impacted by the opioid epidemic (Seth, et al., 2018). Categorizations of race/ethnicity are problematic in and of themselves, as some respondents may have trouble identifying which category they belong to, definitions are not historically constant, and some racial/ethnic categories may not be mutually exclusive (Kaplan, 2014). Additionally, the data do not capture high-risk groups such as incarcerated individuals and homeless individuals. Due to the racial disparity in the U.S. prison population, and the fact that racialized health disparities have been identified in those populations, risk for POM may not be represented by these data (Nowotny, Rogers, & Boardman, 2017). Furthermore,

estimates used for income level are based on a single poverty scale for all individuals, which may have overestimated the effective income class for some states, as we did not have access to data about which state each respondent was from. Finally, the NSDUH-2015 survey relies on self-reported drug use, and thus self-reporting bias could lead to under- or over-reporting.

Conclusions

Addressing the opioid epidemic necessarily involves careful consideration of complex social issues. For instance, reporters (Cronrath, 2018; Peterson and Armour, 2018) and researchers (Netherland and Hansen, 2016) alike have noted the differential framings of the opioid epidemic (coded as White) and the heroin epidemic (coded as Black/minority), and consequently the inequitable treatment of those affected (the former being treated as a health issue deserving of treatment and compassion, the latter as a form of social deviance deserving of criminalization). Similarly, the relationship between equitable pain management and opioid over-prescription—one of the main drivers of the current epidemic—takes on thorny racial overtones. There is a substantial and persistent treatment gap between White individuals and non-White minorities, with Black individuals being significantly less likely to receive prescriptions for pain management even after adjustment for severity of pain (Ezenwa, Ameringer, Ward, & Serlin, 2006; Monnat, 2017; Mossey, 2011; Pletcher, Kertesz, Kohn, & Gonzales, 2008; Singhal, et al., 2016). In tension with calls for equitable treatment and the framing of pain management as a health justice issue are the high rates of POM and death that result from opioid over-prescription.

By taking an intersectional perspective on the opioid epidemic we highlight gaps in the dominant narrative and identify both social strata whose experience with the epidemic have thus far been rendered invisible, and the extent to which this epidemic is

patterned complexly across society according to fundamental social determinants. It is our hope that as solutions are sought, these will continue to be framed in terms of addiction treatment, and that marginalized populations will not be overlooked when it comes to the allocation of treatment resources. Similarly, we hope that these solutions will be mindful of the roles of race/ethnicity, gender, class and age in shaping provision of pain management care in health care settings.

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