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Age trends in rates of substance use disorders across ages 18–90: Differences by gender and race/ethnicity

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Abstract

Background—Although research has documented age differences in substance use, less is known about how prevalence of substance use disorders (SUDs) vary across age and differ by gender and race/ethnicity.

Methods—Time-varying effect models (TVEMs) were estimated on data from the National Epidemiologic Survey of Alcohol and Related Conditions—III (NESARC III; $N = 36,309$), a nationally representative survey of the adult population. The sample was 44% male; 53% White, 21% Black, 19% Hispanic/Latino, 6% other race/ethnicity. Prevalence of four SUDs (alcohol, tobacco, cannabis and opioid use disorders) were flexibly estimated across ages 18–90 by gender and race/ethnicity.

Results—Estimated SUD prevalences were generally higher for men compared to women at most ages until the 70s. However, disparities by race/ethnicity varied with age, such that for most SUDs, estimated prevalences were higher for White participants at younger ages and Black participants at older ages.

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Author Disclosures

Contributors

Sara Vasilenko contributed to the design of the study, conducted analyses, wrote the initial draft of the methods and results sections, and created figures. Stephanie Lanza contributed to the design of the study and provided feedback on analyses. Rebecca-Evans Polce contributed to the design of the study, provided feedback on analyses, and wrote the initial draft of the introduction. All three authors read and provided feedback on the manuscript and approved its content.

Conflict of Interest

No conflict declared

Discussion—Results suggest relatively constant disparities by gender across age, and a crossover effect for Black and White participants. Findings demonstrate that Black individuals in midlife may be an important target of intervention programs for some substances.

Keywords

substance use disorders; age trends; racial/ethnic differences; gender differences; time-varying effects modeling

1. Introduction

Substance use disorders (SUDs) contribute to considerable morbidity and mortality, including premature mortality, infectious disease, and comorbid mental health conditions, as well as societal costs from lost productivity, health care costs, and crime (Center for Behavioral Health Statistics and Quality, 2014; Bouchery et al., 2006; Degenhardt and Hall, 2012). These disorders are not distributed evenly across the population; instead, prevalence varies across age, and by gender and race/ethnicity. A new method, the time-varying effect model (TVEM) can be used to understand age-varying differences in SUDs, and to estimate periods at which health disparities are more pronounced. In this study, we used TVEM to estimate prevalence of four SUDs (alcohol use disorder, tobacco use disorder, cannabis/marijuana use disorder, and opioid use disorder) across ages 18–90 by gender and race/ethnicity in a nationally representative U.S. sample.

In the US, 14% of individuals meet criteria for alcohol use disorder (AUD; Grant et al., 2015), 13% for tobacco use disorder (TUD; Falk et al., 2006); 4% for cannabis use disorder (CUD; Hasin et al., 2015), 1% for opioid use disorder (OUD; Center for Behavioral Health Statistics and Quality, 2014; Saha et al., 2016). Men generally report higher rates of substance use disorders than women (Grant et al., 2015a; 2015b; Schulte et al., 2009). Racial/ethnic differences in SUDs vary by drug. Recent data indicates AUDs are lower among Black and Latino compared to White adults (Grant et al., 2015), and tobacco use and nicotine dependence is lower among Black and Hispanic compared to White individuals (Hu et al., 2006; SAMSHA, 2015; Thomas and Price, 2016). White and Black adults have similar rates of past year CUD, while Latinos have lower rates (Hasin et al., 2015), and OUDs are lower among Black compared to White and Latino adults (SAMSHA, 2015).

However, disparities in SUDs are likely not consistent across the lifespan. Age-varying gender and racial/ethnic differences in substance *use* have been documented in adolescence and young adulthood (Chen and Jacobson, 2012; Evans-Polce et al., 2014; Kandel et al., 2011). For example, a racial/ethnic crossover effect has been found such that Black adolescents have lower rates of use compared to White adolescents; however, in young adulthood this difference reverses such that rates are higher among Black individuals compared to White individuals (Chen and Kandel, 2002; Geronimus, 1993; Kandel et al., 2011; Ensminger et al., 2016). However, less is known about age-varying differences in SUDs, or how disparities in SUDs may extend or weaken for midlife or older adults. Such information can be used to ensure programs target the most at-risk groups of individuals at particular ages or periods of risk.

A new method, the time-varying effect model (TVEM; Tan et al., 2012) can flexibly estimate when disparities are greatest and when crossovers occur. Because TVEM allows for estimation of curves that do not require a specified parametric form, it can identify precise periods of change, such as ages when differences by race/ethnicity are significant. When nationally representative data and weights are used in TVEM, analyses can provide precise estimates of age-varying trends for particular population subgroups. TVEM has been used to understand gender and racial/ethnic differences in substance use among adolescents and young adults (Evans-Polce et al., 2014). The current study applies TVEM to a nationally representative sample of U.S. adults to examine age-varying disparities in SUDs by gender and race/ethnicity across the adult lifespan (ages 18–90).

2. Materials and Methods

2.1. Study Population and Design

This study used data from the National Epidemiologic Survey of Alcohol and Related Conditions–III (NESARC-III), a nationally representative, cross-sectional study of the non-institutionalized adult population in the US collected in 2012–2013 (Grant et al., 2014; 2015). Participants were recruited through a multi-stage sampling plan, with oversamples of ethnic minority respondents. The overall response rate was 60%. The final sample contained 36,309 participants (44% male; 53% White, 21% Black, 19% Hispanic/Latino, 6% other race/ethnicity; $Mage = 45.6$, $SD = 17.5$).

2.2. Measures

Our primary outcomes, measures of *past-year substance use disorders*, were measured using the Alcohol Use Disorder and Associated Disabilities Interview Schedule-5 (AUDADIS-5; Grant et al., 2015). For each substance, participants were asked if they had experienced 11 different symptoms, which were aligned with DSM-V diagnostic criteria (sample item: “Give up or cut down on activities that you were interested in or that gave you pleasure in order to [use substance]”). Consistent with DSM-V cutoffs (American Psychiatric Association, 2013), we coded individuals as having a level of symptoms consistent with SUD if they experienced at least 2 symptoms within the past year. We focus on four different SUDs: AUD, TUD, CUD, and OUD. For AUD, questions referred to alcohol. For TUD, questions referred to “tobacco and nicotine, including cigarettes, cigars, a pipe, snuff, chewing tobacco, or e-cigarettes.” For the other disorders, participants answered questions about whether they experienced symptoms for any drug, then selected which drugs were associated with these symptoms. CUD was coded for symptoms related to marijuana, and OUD was coded for symptoms of prescription opioids or heroin.

2.3. Plan of Analysis

To examine the estimated prevalence of the four SUDs across ages 18–90, we used intercept-only logistic TVEMs using the weighted TVEM macro (Dziak et al., 2017). The weighted TVEM analyses includes options for examining models by group while retaining full sample survey weighting (see Dziak, et al., for additional information). Thus, for each SUD outcome we estimated population-weighted age trends for male and female and White, Black and Latino subgroups (the three largest groups with adequate data for this analysis).

We estimated models with between 1 and 5 knots (splitting points) and the best-fitting models were selected for each group using AIC and BIC. Results were plotted together; non-overlapping confidence intervals indicate ages where the estimated prevalence of a SUD differed by group. Results are presented as figures because the coefficients are estimated as a function of continuous time.

3. Results

Estimated prevalences of SUDs by age and gender are presented in Figure 1. Men had higher prevalence of AUD, TUD and CUD compared to women at most ages. Prevalence of AUD peaked in the twenties (32% for men at age 25 and 24% for women at age 22) and then decreased steadily by age, with very few men or women reporting AUD past age 75. TUD peaked in the mid-twenties for both men (32% at age 27) and women (23% at age 26); rates then decreased until around age 38, increased until about age 46, and then decreased steadily throughout later midlife and older adulthood. For both men and women, rates of CUD were highest at age 18 (13% men; 7% women), declined steeply through age 30, and then remained at a low rate at the remaining ages. For OUD, rates generally declined with age, but a crossover occurred; men had higher prevalence than women in young adulthood (22–28), and women had higher prevalence than men at older ages (68–77).

Estimated proportions of SUDs by age and race/ethnicity are presented in Figure 2. Prevalence of disorders generally declined with age for all three racial/ethnic groups for AUD, TUD, and CUD. Prevalence of AUD peaked in the mid-twenties, with White participants (peak 32%) having higher rates than Black (23%) and Latino (23%) participants. This difference was significant for Latino compared to White participants until about age 60, and for Black compared to White participants until age 33. From ages 33 to 60 there were no significant differences between Black and White participants, and Black participants had higher AUD rates than White participants in late midlife (59–68). TUD peaked around age 27 for White (33%), 34 for Black (24%) and 27 for Latino (15%) participants. Latino participants had lower prevalence of TUD than Black and White participants at all ages. A crossover effect was observed between Black and White participants at around age 60; White participants had significantly higher rates than Black participants until age 56, and Black participants had higher rates than White participants after age 64. Prevalence of CUD was higher for Black compared to White and Latino participants from ages 20 to 66, after which there were very few cases of CUD for any racial/ethnic group. White participants had higher prevalence of OUD than Black participants from ages 27–40, who in turn had a higher rate than Latino participants between ages 28 and 46. However, after age 50 a series of crossovers were observed; between ages 53 and 66, Latinos has higher prevalence than White participants, and between 56 and 78 Black participants had a higher prevalence than White participants.

4. Discussion

This study applied an innovative statistical approach to examine rates of SUDs by gender and race/ethnicity among individuals ages 18–90. Results by gender are generally consistent with prior research (Grant et al., 2015a; 2015b; Schulte et al., 2009) showing higher rates of

substance use and SUDs among men compared to women. In general, rates of SUDs decreased with older ages for both groups, and men had higher rates of AUD, TUD, and CUD up until about eighty years old. However, this pattern was less clear for OUD, for which men and women had similar rates at most ages, and women's rates were even occasionally higher than men's. This may be due to different acceptability of opioids versus more commonly used substances. For example, there is higher social acceptance of heavy drinking for men compared to women, which could contribute to men's higher alcohol use and AUD (Nolen-Hoeksma and Hilt, 2006). Since opioid use is less common and less societally acceptable for both men and women they may have more similar risks for OUD.

In contrast to the relatively age-invariant differences by gender, disparities by race/ethnicity did differ by age. For AUD and TUD, White participants had higher rates than Black participants in young adulthood, but then had similar or lower rates at older ages. A similar crossover was also observed for White versus both Black and Latino participants for OUDs. This is consistent with prior research that has documented a crossover effect in substance use (Chen and Kandel, 2002; Geronimus, 1993; Kandel et al., 2011; Ensminger et al., 2016). However, the ages at which this crossover occurs differ by substance; a clear crossover occurs in midlife for OUD and TUD, whereas AUD is similar for Black and White participants from about ages 30 to 60, with higher rates for Black compared to White participants in older adulthood. Note that these crossovers occur later than those observed for substance use (e.g., Chen and Jacobson, 2012; Chen and Kandel, 2002), for typically occur in the late twenties or early thirties. This may reflect a delay in when use escalates into diagnostic-level problems or differences in access to treatment. Note that a different pattern was found for CUD, which was higher for Black compared to White and Latino participants at all ages up until age 70. This is in contrast to the similar rates of use among Black and White participants (Hasin et al., 2015), suggesting use may escalate into more negative consequences for Black compared to White individuals.

There are a number of limitations. First, the cross-sectional data makes it difficult to disentangle developmental and cohort effects. Although similar age-varying trends in substance use have been documented using longitudinal data (Chen and Jacobson, 2012; Evans-Polce et al., 2015), cohort effects have also been found (Lanza et al., 2015; Johnson et al., 2016). The higher prevalence of NUD among midlife adults and high rates of CUD among young adults may reflect generational differences in the acceptability and use of these substances. Second, the proportion of participants reporting a past-year OUD was small, and we were unable to look at other SUDs due to low prevalence. We were also unable to examine age trends in smaller racial/ethnic groups. Our SUD measures were self-reported symptoms, and thus do not represent clinical diagnoses. In addition, we only examined SUDs, and it is possible that differences by subgroup would differ if other aspects of substance use (e.g., frequency of use) were examined. Future research should examine this possibility.

5. Conclusions

This study provides recent, national age trends in the prevalence of SUDs across adulthood by gender and race/ethnicity. Results show higher rates of SUDs for men compared to

women for most substances, and that a racial/ethnic crossover occurs, with rates higher for Black compared to White participants at later ages. Findings suggest the importance of early prevention and treatments for all subgroups, but that Black adults at older ages may also be at increased risk. In addition, this paper showed the utility of TVEM for examining nuanced periods of disparities in substance use by age and subgroup.

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Highlights

- Substance use disorders (alcohol, tobacco, cannabis, opioid) generally decrease with age.
- Men have higher rates of substance use disorders than women at most ages from 18–90.
- White participants report higher rates of most substance use disorders in young adulthood.
- Black participants report higher or equal rates to white participants in midlife.

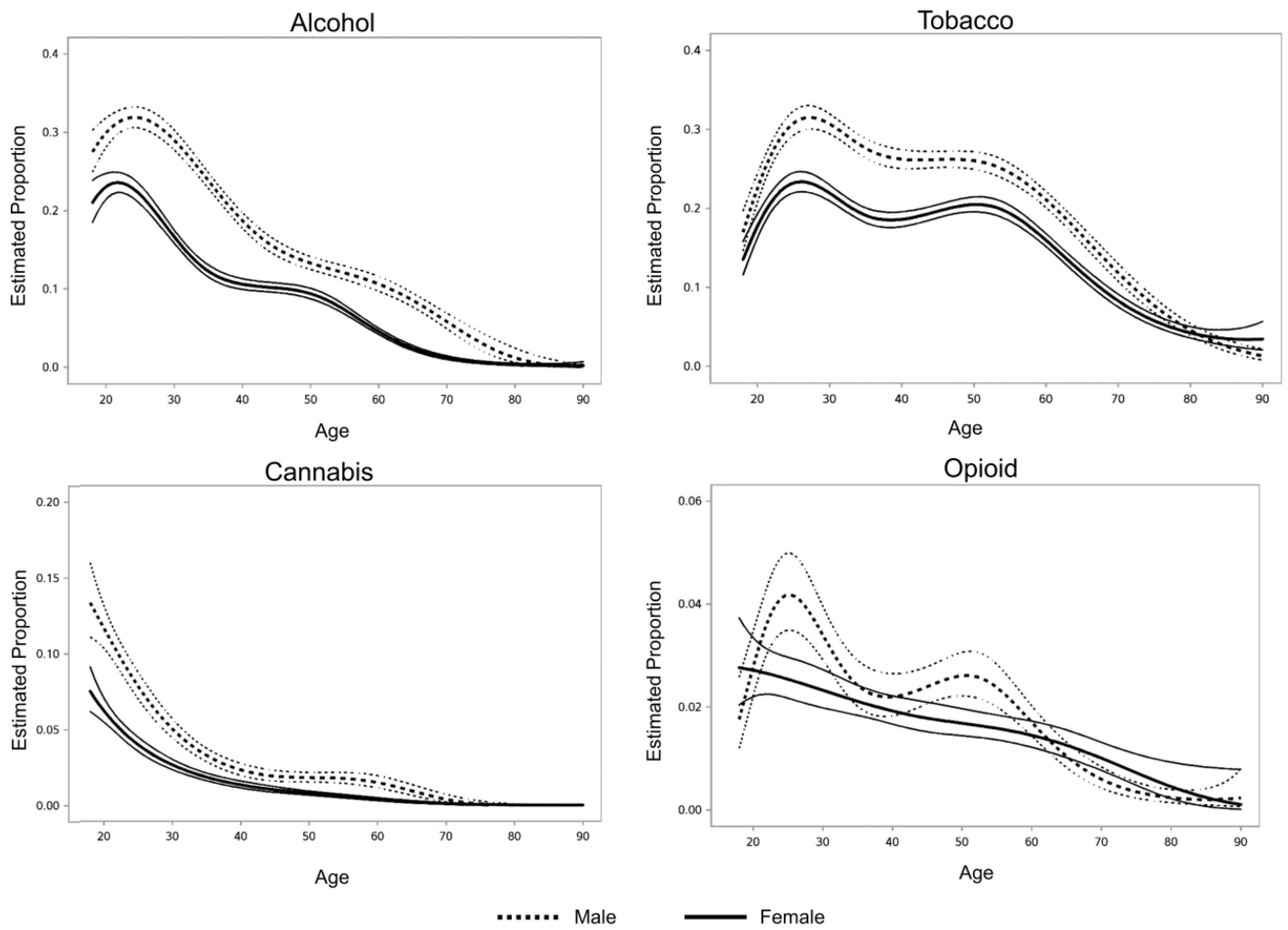


Figure 1. Estimated proportion of substance use disorders across ages 18–90, by gender. Thick black lines represent estimate; thin grey lines represent 95% confidence intervals.

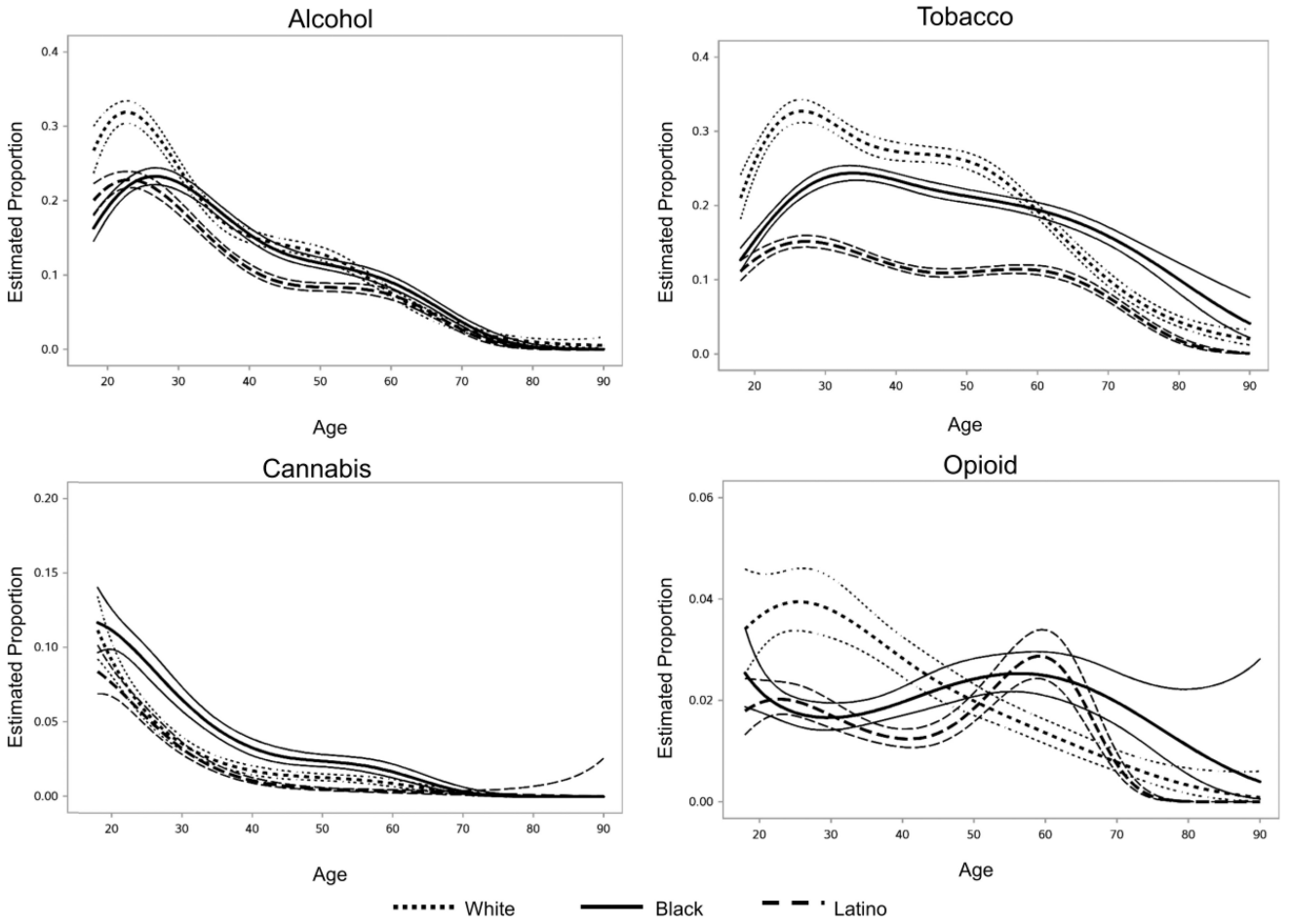


Figure 2. Estimated proportion of substance use disorders across ages 18–90, by race/ethnicity. Thick black lines represent estimate; thin grey lines represent 95% confidence intervals.

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