ORIGINAL ARTICLE
https://doi.org/10.30773/pi.2025.0234
eISSN 1976-3026
OPEN ACCESS

Association of Everyday Discrimination With Drug Use During the COVID-19 Pandemic in the All of Us Research Program

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Objective Recognizing discrimination as a significant public health risk during the coronavirus disease 2019 (COVID-19) pandemic, which coincided with increased drug use and heightened awareness of structural disparities in the United States, we investigated its association with the odds of drug use in a large and diverse cohort from the All of Us Research Program.

Methods In this cross-sectional study, data from 68,976 participants completed the COVID-19 participant experiences (COPE) survey. We applied logistic regression models with propensity score-based overlap weighting to examine associations between everyday discrimination and drug use. Self-reported everyday discrimination score and drug use were the primary exposure and outcome measures, respectively.

Results Of the 67,662 COPE respondents (mean [standard deviation] age, 57.5 [15.9] years; female sex at birth, 43,658 [64.5%]), we identified 15,493 participants with no reported discrimination and 15,493 participants with reported discrimination, after overlap weighting. The odds of drug use in those who reported discrimination was 1.38 (95% confidence interval, 1.32–1.43), with a dose-dependent association based on discrimination score. Participants who experienced discrimination had significantly higher odds of using drugs and this association was particularly pronounced in those under 40 years of age, those assigned female sex at birth, current smokers, individuals undergoing chemotherapy or immunotherapy, and those experiencing unemployment or COVID-19/flu-like symptoms.

Conclusion This relationship was observed across various types of drugs and different reasons for discrimination, and it was particularly pronounced in specific subgroups. These findings provide critical evidence for developing targeted preventive interventions; however, further longitudinal studies for causality are warranted.
Psychiatry Investig 2026;23(1):118-129

Keywords Discrimination; Drug use; COVID-19; All of Us Research Program; COVID-19 participant experiences survey.

Received: July 16, 2025 **Revised:** October 22, 2025 **Accepted:** October 28, 2025

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INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has emerged as a global challenge with widespread health and socioeconomic consequences.[1,2] In the United States, these impacts have not been evenly distributed, disproportionately affecting certain communities, particularly those facing discrimination. During the pandemic, these groups experienced higher rates of unemployment, food insecurity, and housing instability, issues that were exacerbated by social, political, and economic stressors prevalent at the time.[3] These stressors often lead to poor behavioral choices and adverse health outcomes, including mental and physical outcomes.[4]

Xenophobia or racially motivated attacks against Asian Americans and Pacific Islanders (AAPI) have surged across the United States, likely influenced by racially biased misinformation on social media regarding the origins of COVID-19.[5] After the former United States president referred to SARS-CoV-2 as the "Chinese virus" in March 2020, online hatred and racially motivated postings targeting the AAPI community increased.[6] National surveys indicate that over 60% of AAPI individuals reported experiencing discrimination during the pandemic.[5] In addition to the AAPI community, indigenous populations and Black or African American individuals also faced intensified discrimination during the pandemic.[7]

Even before the pandemic, the United States faced significant disparities in education and income, with high poverty rates compared to other high-income countries.[3] The pandemic further intensified these inequalities, especially among Black and Hispanic populations, where 18.3% and 18.9%, respectively, lived in poverty, compared to non-Hispanic Whites.[3] Economic and educational disparities worsened during COVID-19, contributing to heightened discrimination based on socioeconomic status.[8]

The sociopolitical climate during the pandemic, marked by political polarization and narratives of American exceptionalism, likely hindered effective public health policies and exacerbated health inequities.[9] The concurrent rise in hate crimes towards female or Black individuals, such as the murders of George Floyd and Breonna Taylor, highlighted systemic discrimination and inequalities.[5] These groups reported lower healthcare access and higher rates of unmet healthcare needs before and during COVID-19, resulting in adverse health outcomes, including higher infection and mortality rates, admissions to the intensive care unit (ICU), and increased use of intermittent mandatory ventilation. Such factors may contribute to poorer health outcomes and increased drug use.[10-12]

This study hypothesized that everyday discrimination, compared to no discrimination, was associated with higher levels of drug use during the COVID-19 pandemic. We aimed to investigate this relationship by examining various factors such as reasons for discrimination, types of drugs used, levels of discrimination, and self-reported demographics to identify potential modifying factors.

METHODS

Data source and study design

The study used large and diverse data from the COVID-19 participant experiences (COPE) survey, conducted by the All of Us Research Program (AoU).[13,14] The COPE survey was an online-based survey administered to a subset of AoU participants, designed to assess their daily lives, health, and well-being during the pandemic. Initiated in May 2020, the survey included questions on COVID-19 symptoms, physical and mental health, social distancing, and economic impacts.[5] For this study, we analyzed data from AoU Registered Tier, Version R2022Q4R13, comprising 68,976 participants who responded to the survey at least once during the respective periods across three rounds released in May, June, and July 2020, which included data on both exposure and outcomes. Of these participants, 1,314 were excluded due to insufficient baseline characteristic information, resulting in 67,662 participants for the final analysis. In this cross-sectional study, we aimed to investigate whether everyday discrimination measures collected during the survey period were associated with drug use using logistic regression models with overlap-weighting.

The protocol was reviewed by the Institutional Review Board of the AoU (#2016–05-TN-Master). In accordance with regulations and guidance from the national institutes of health Office for Human Research Protections, research conducted through the AoU maintained consistent standards for protecting participants' rights and welfare. For secondary analysis, according to the Mass General Brigham Human Research Committee, the use of this data does not constitute human subjects research and is therefore exempt from Institutional Review Board review. All participants provided informed consent to share their electronic health records, surveys, and other research data with qualified researchers. This study used de-identified data from the AoU (https://www.researchallofus.org/), which is publicly available to registered researchers. In addition, this study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines.

Exposure

The primary exposure of this study was self-reported everyday discrimination, assessed through a survey.[5] The COPE

study utilized the Everyday Discrimination Scale to evaluate the experiences of participants regarding discrimination over the past month.[15] This scale consists of 9 questionnaires, each measured on a 4-point Likert scale. Participants rated their agreement on each questionnaire, with scores assigned as follows: "never"=0, "a few times a month"=1, "at least once a week"=2, and "almost every day"=3. The discrimination score was calculated by summing the assigned scores across all 9 questionnaires. For participants who completed the survey more than once during the 3 months (May, June, and July 2020), we computed the average score over their multiple survey responses. As a result, the total discrimination score ranged from 0 to 27, with higher scores indicating more frequent experiences of discrimination. All participants who responded to the Everyday Discrimination Scale completed all the items on the questionnaire. In addition, the discrimination score was categorized in two ways to assess study results comprehensively. First, participants were classified into a binary category based on whether their score exceeded 1, indicating they had experienced discrimination at least once. Second, as the discrimination score was not normally distributed, we applied a data-driven cut-off point of 2.5, corresponding to the median score among participants who reported experiencing discrimination at least once, to classify participants into lower and higher discrimination groups.[5]

Furthermore, for additional subgroup analyses, we utilized responses to the question, "What do you think is the main reason for these experiences? Select all that apply." From the 11 possible responses (excluding "skip"), we generated 7 variables by grouping similar categories: 1) age; 2) education or income level; 3) gender or sexual orientation; 4) physical appearance (height, weight, or other aspects of physical appearance); 5) ethnicity or race (ancestry or national origins and race); 6) religion; and 7) other.[5] Among participants who reported experiencing discrimination on the 9-item questionnaire, the response rate for this question exceeded 90% (May, 92.1%; June, 91.6%; July, 100%). For participants who completed the survey multiple times during May, June, and July 2020, all responses from each month were included in the analysis.

Outcome

The outcome of this study was whether participants had used drugs in the past month. We used data from the COPE survey to classify drug use, defining drug use as any instance of using one or more of the following drugs: 1) cannabis (e.g., marijuana, pot, weed, grass, hash, concentrates, etc; excludes the use of CBD or hemp products) and synthetic marijuana or fake weed such as K2 or Spice; 2) cocaine (e.g., coke, crack, free base, coca paste); 3) hallucinogens (e.g., LSD, acid, Molly, mushrooms, PCP, Special K, ecstasy, Peyote, DMT, Foxy, etc.); 4) heroin; 5) inhalants (e.g., nitrous oxide, glue, gas, paint thinner); 6) methamphetamine (e.g., meth, crank, ice, crystal meth, glass); 7) prescription opioids (e.g., fentanyl, oxycodone [e.g., OxyContin, Percocet], hydrocodone [Vicodin], methadone, buprenorphine); 8) prescription sedatives or sleeping pills (e.g., Valium, Ambien, Serepax, Ativan, Xanax, Librium); 9) prescription stimulants (e.g., Ritalin, Concerta, Dexedrine, Adderall, Focalin, Didrex); 10) synthetic stimulants (e.g., bath salts, flakka); and 11) other substances. Participants could report multiple drug types based on their experience, and for those who completed the survey multiple times during May, June, and July 2020, all responses across the 3 months were included in the analysis.

To examine specific drug use, we generated subgroups for each of the 11 drugs and further explored whether drug use related to exposure followed a dose-dependent pattern by assessing usage frequency.[16,17] Based on survey responses about how often each drug was used, participants were categorized as high-dose users (1–5 times per week or daily) and low-dose users (1–3 times per month, only a few times, or those who skipped these items while answering the primary outcome question).[16] Moreover, to better capture changes in drug use, we employed an additional structured survey that provided insights into changes in drug use compared to the previous month. Responses included categories such as "less often than usual," "the same as usual," and "more often than usual."

Covariates

We considered a total of 9 covariates related to participants. For demographic information, these included age (<40, 40–59, and ≥60 years), sex at birth (male, female, and unknown [not male, not female, prefer not to answer, or skipped, and no matching concept]), and race and ethnicity (Hispanic or Latino, non-Hispanic another single population or 1> population, non-Hispanic Asian, non-Hispanic Black or African American, non-Hispanic White, and unknown [prefer not to answer or skipped, and none of these]). Other baseline characteristics included variables for smoking status (non-smoker, past smoker, and current smoker), alcohol consumption (none, moderate [2–4 times a month or monthly or less], and frequent [2 or more times a week]), chemotherapy or immunotherapy (yes and no), employment status (unemployed and employed), health insurance (uninsured and insured), and COVID-19 or flu-like symptoms (yes and no).[2,5]

Statistical analysis

In this study, we aim to investigate associations between everyday discrimination and drug use. To balance demographic characteristics between the two comparison groups based on exposure (no discrimination versus reported dis-

crimination at least once), we implemented propensity score (PS)-based overlap weighting.[2,18] This approach allowed us to adjust for imbalances in the data by applying weights that reflect the distribution.[19] The PS for everyday discrimination was estimated using a multivariable logistic regression model, adjusted for all relevant covariates, as listed in Table 1. Using the estimated PS, weights of 1-PS were assigned to participants in the discrimination group, while the PS value was used as weights for those in the non-discrimination group. The balance between the weighted groups, which were matched at a 1:1 ratio, was assessed through the standardized mean difference (SMD), with an SMD below 0.1 indicating that the groups were well-balanced with respect to the covariates included in the propensity-weighted model.

For the calculation of odds ratio (ORs) with 95% confidence intervals (CIs), a weighted logistic regression model was used. To minimize the impact of potential confounders, an adjusted model was computed, incorporating the following variables: age, sex at birth, race, smoking status, alcohol consumption, chemotherapy or immunotherapy, employment status, health insurance, and COVID-19 or flu-like symptoms. In addition, stratification analyses were conducted to understand the potential differential role of each factor on the association between everyday discrimination and drug use. Statistical significance was established at a two-sided p value<0.05. All analyses in this study were conducted using data from the AoU Registered Tier Version R2022Q4R13, accessed through the cloud-based Researcher Workbench platform. The approved researchers utilized SAS software (version 9.4; SAS Institute Inc.) and R software (version 4.4.1; R Foundation) for data analysis and visualizations.

RESULTS

A total of 67,662 COPE respondents were included in the analysis, with a mean age of 57.5 years (standard deviation [SD], 15.9) (Table 1). The participants were predominantly female sex at birth (43,658 [64.5%]), non-Hispanic White (53,744 [79.4%]), employed (37,543 [55.5%]), and had health insured (67,512 [99.8%]). In addition, the crude probability of reported discrimination was higher among younger participants (<40 years: 69.9%) compared to those aged ≥60 years (48.4%) and among those assigned female sex at birth (female: 59.1% vs. male: 54.7%) (Supplementary Table 1). Non-Hispanic Black or African American participants reported the highest crude probability of discrimination, followed by those self-identifying as non-Hispanic Asian or belonging to multiple racial/ethnic groups (Supplementary Table 1). We also found substantial variations in crude probability of drug use by age, sex at birth, and self-reported race and ethnicity.

After PS-based overlap weighting for a 1:1 ratio based on reported discrimination, we identified 15,493 (mean [SD] age, 58.6 [11.7] years; female sex at birth, 9,885 [63.8%]) participants with no reported discrimination and 15,493 participants (58.6 [9.4] years; female, 9,885 [63.8%]) with reported discrimination at least once, respectively (Table 1). After overlap weighting, the SMD were less than 0.1, indicating no major imbalances in the general characteristics.

Those who reported discrimination at least once a week over the past month had higher odds of drug use (adjusted OR [aOR], 1.38 [95% CI, 1.32–1.43]) (Table 2). We calculate the discrimination score by utilizing nine survey components reporting everyday discrimination at least once in the past month (Supplementary Table 2). The likelihood of drug use increased significantly with higher levels of everyday discrimination (Figure 1). The odds of drug use increased in a dose-dependent manner according to the discrimination score (<2.5: aOR, 1.27 [95% CI, 1.21–1.33]; ≥2.5: aOR, 1.50 [95% CI, 1.43–1.57]). Stratification analysis revealed that the association between discrimination and drug use was evident in specific variables: individuals with younger age, female sex at birth, current smoking status, chemotherapy or immunotherapy, unemployment, and COVID-19 or flu-like symptoms (Supplementary Table 3).

Compared to participants who reported no discrimination, those who experienced discrimination had significantly higher odds of using several drugs, including cannabis (aOR, 1.23 [95% CI, 1.17–1.30]), cocaine (aOR, 1.44 [95% CI, 1.05–1.95]), hallucinogens (aOR, 1.46 [95% CI, 1.13–1.87]), methamphetamine (aOR, 3.51 [95% CI, 2.18–5.65]), prescription opioids (aOR, 1.51 [95% CI, 1.39–1.64]), prescription sedatives or sleeping pills (aOR, 1.42 [95% CI, 1.34–1.50]), prescription stimulants (aOR, 1.57 [95% CI, 1.41–1.74]), and other drug (aOR, 1.77 [95% CI, 1.55–2.02]), but not heroin, inhalants, and synthetic stimulants (Table 3). The results of a dose-dependent subgroup analysis of the association between discrimination and odds of specific drug use were shown, particularly cannabis use (low dose users, aOR, 1.14 [95% CI, 1.06–1.23] vs. high dose users, aOR, 1.32 [95% CI, 1.23–1.42]) and methamphetamine use (low dose users, aOR, 2.52 [95% CI, 1.38–4.61] vs. high dose users, aOR, 5.39 [95% CI, 2.43–11.94]). Additional analysis of the association between discrimination and changes in drug use over the past month revealed similar dose-dependent patterns, particularly for cocaine, hallucinogens, methamphetamine, and prescription sedatives or sleeping pills (Supplementary Table 4).

As shown in Table 4, compared to respondents who reported no discrimination, the odds of drug use are significantly associated with all specific reasons for discrimination: age (aOR, 1.23 [95% CI, 1.17–1.28]), education or income level

Table 1. Baseline characteristics for the full and overlap-weighted respondents in the COPE survey

	Total (N=67,662)	Propensity score overlap weighting		
		Non-reported (N=15,493)	Reported discrimination at least once (N=15,493)	SMD*
Age (yr)	57.5±15.9	58.6±11.7	58.6±9.4	<0.001
Sex				<0.001
Male	22,348 (33.0)	5,237 (33.8)	5,237 (33.8)	
Female	43,658 (64.5)	9,885 (63.8)	9,885 (63.8)	
Not male, not female; I prefer not to answer, or skipped; no matching concept	1,656 (2.5)	371 (2.4)	371 (2.4)	
Race and ethnicity				<0.001
Hispanic or Latino				
Another single population or >1 population	132 (0.2)	28 (0.2)	30 (0.2)	
Asian	42 (0.1)	8 (0.1)	10 (0.1)	
Black	77 (0.1)	11 (0.1)	15 (0.1)	
Race not indicated	3,227 (4.8)	742 (4.8)	741 (4.8)	
White	945 (1.4)	199 (1.3)	208 (1.3)	
Non-Hispanic				
Another single population or >1 population	1,352 (2.0)	293 (1.9)	292 (1.9)	
Asian	1,927 (2.9)	425 (2.7)	423 (2.7)	
Black or African American	3,684 (5.4)	754 (4.9)	750 (4.8)	
White	53,744 (79.4)	12,466 (80.5)	12,457 (80.4)	
I prefer not to answer; skipped; none of these	2,532 (3.7)	567 (3.7)	567 (3.7)	
Smoking status				<0.001
Non-smoker	49,761 (73.5)	11,615 (75.0)	11,615 (75.0)	
Past smoker	13,254 (19.6)	3,000 (19.4)	3,000 (19.4)	
Current smoker	4,647 (6.9)	878 (5.7)	878 (5.7)	
Alcohol consumption				<0.001
None	17,072 (25.2)	3,940 (25.4)	3,940 (25.4)	
Moderate	24,842 (36.7)	5,585 (36.1)	5,585 (36.1)	
Frequent	25,748 (38.1)	5,967 (38.5)	5,967 (38.5)	
Chemotherapy or immunotherapy				<0.001
No	64,237 (94.9)	14,717 (95.0)	14,717 (95.0)	
Yes	3,425 (5.1)	776 (5.0)	776 (5.0)	
Employment status				<0.001
Unemployed	30,119 (44.5)	7,141 (46.1)	7,141 (46.1)	
Employed	37,543 (55.5)	8,352 (53.9)	8,352 (53.9)	
Health insurance				<0.001
Uninsured	150 (0.2)	35 (0.2)	35 (0.2)	
Insured	67,512 (99.8)	15,458 (99.8)	15,458 (99.8)	
COVID-19 or flu-like symptoms				<0.001
No	60,995 (90.2)	14,136 (91.3)	14,136 (91.3)	
Yes	6,667 (9.9)	1,356 (8.8)	1,356 (8.8)	

Data are presented as mean±standard deviation or number (%). *SMD <0.1 indicates no significant imbalance. COPE, COVID-19 participant experience; SMD, standardized mean difference.

Table 2. Overlap-weighted OR for drug use according to reported discrimination

	Overlap-weighted respondents		
	Events (%)	Crude OR (95% CI)	Adjusted OR (95% CI)‡
Reported discrimination			
None	3,112 (20.09)	1.00 (reference)	1.00 (reference)
At least once	3,939 (25.43)	1.36 (1.31–1.41)*	1.38 (1.32–1.43)*
Discrimination score†			
0	3,112 (20.09)	1.00 (reference)	1.00 (reference)
<2.5	1,873 (22.98)	1.19 (1.13–1.24)*	1.27 (1.21–1.33)*
≥2.5	2,067 (28.15)	1.56 (1.49–1.63)*	1.50 (1.43–1.57)*

*p<0.05; †discrimination score ranges from 0 to 27, with a cut-off based on the median score among those who reported discrimination at least once; ‡adjusted for age, sex (male; female; not male or female, prefer not to answer or skipped, and no matching concept), race (Hispanic or Latino; non-Hispanic another single population or 1> population; non-Hispanic Asian; non-Hispanic Black or African American; non-Hispanic White; and prefer not to answer or skipped, and none of these), smoking status (non-smoker; past smoker; and current smoker), alcohol consumption (yes and no), chemotherapy or immunotherapy (yes and no), employment status (unemployed and employed), health insurance (uninsured and insured), and COVID-19 or flu-like symptoms (yes and no). CI, confidential interval; OR, odds ratio.

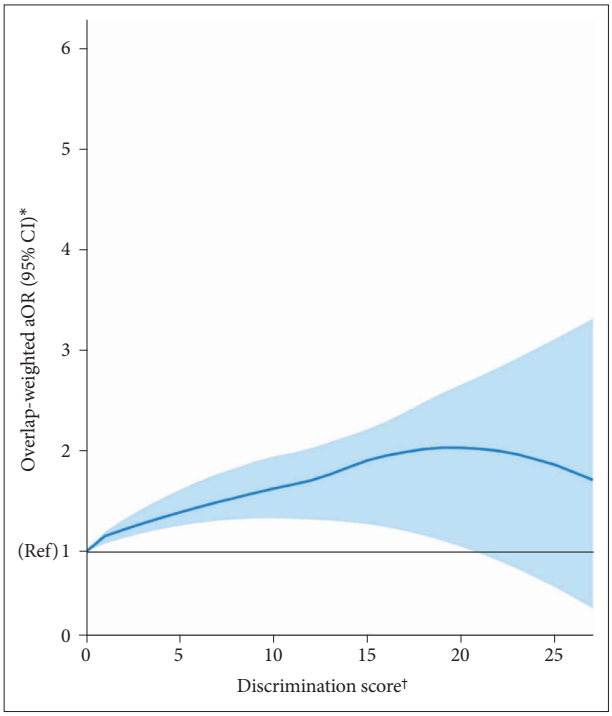


Figure 1. Overlap-weighted aOR for the association between discrimination score and drug use. *adjusted for age, sex (male; female; not male or female, prefer not to answer or skipped, and no matching concept), race (Hispanic or Latino; non-Hispanic another single population or 1> population; non-Hispanic Asian; non-Hispanic Black or African American; non-Hispanic White; and prefer not to answer or skipped, and none of these), smoking status (non-smoker; past smoker; and current smoker), alcohol consumption (yes and no), chemotherapy or immunotherapy (yes and no), employment status (unemployed and employed), health insurance (uninsured and insured), and COVID-19 or flu-like symptoms (yes and no); †discrimination score ranges from 0 to 27. aOR, adjusted odds ratio; CI, confidence interval.

(aOR, 1.24 [95% CI, 1.17–1.31]), gender or sexual orientation (aOR, 1.31 [95% CI, 1.25–1.37]), physical appearance (aOR, 1.46 [95% CI, 1.40–1.53]), race or ethnicity (aOR, 1.17 [95% CI, 1.10–1.23]), religion (aOR, 1.13 [95% CI, 1.02–1.26]), and other reasons (aOR, 1.37 [95% CI, 1.31–1.44]).

DISCUSSION

Findings and explanation

Herein, we investigated associations between everyday discrimination and the odds of drug use, along with potential modifying factors, using a large and diverse cohort from the AoU. Several key findings emerged from our analysis. First, younger participants (<40 years) and those assigned female sex at birth reported higher crude probabilities of discrimination compared to older participants (≥60 years) and males, respectively. Second, non-Hispanic Black or African American participants showed the highest crude probability of discrimination, followed by non-Hispanic Asian and multiple racial/ethnic groups. Third, everyday discrimination was significantly associated with increased drug use during the pandemic. Participants reporting discrimination at least once a week had a 38% higher risk of drug use, indicating that frequent discrimination is a significant risk factor for drug use. Fourth, a dose-dependent relationship was observed between everyday discrimination and drug use, with higher discrimination scores corresponding to greater odds of drug use. Fifth, everyday discrimination was associated with elevated odds of using specific drugs, including methamphetamine (aOR, 3.51), prescription opioids (aOR, 1.51), prescription stimulants (aOR, 1.57), cannabis (aOR, 1.23), cocaine (aOR, 1.44), hallucinogens (aOR, 1.46), prescription sedatives or sleeping pills (aOR, 1.42), and other drugs (aOR, 1.77). Sixth, the association between everyday discrimination and drug use was particularly pronounced in specific subgroups, including younger individuals, those assigned female sex at birth, current smokers, individuals undergoing chemotherapy or immunotherapy, and those experiencing unemployment or COVID-19/flu-like symptoms. Lastly, compared to respondents who reported no discrimination, the odds of drug use are significantly associated with all specific reasons for discrimination, including age, education or income level, gender or sexual orientation, physical appearance, race or ethnicity, religion, and other reasons.

Table 3. Overlap-weighted OR for the dose-dependence between the reported discrimination and drug use by drugs

Reported discrimination by drugs	Overall		Low dose users		High dose users	
	Crude OR (95% CI)	Adjusted OR (95% CI)†	Crude OR (95% CI)	Adjusted OR (95% CI)†	Crude OR (95% CI)	Adjusted OR (95% CI)†
Cannabis use						
Non-reported	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Reported discrimination at least once	1.21 (1.15–1.27)*	1.23 (1.17–1.30)*	1.11 (1.04–1.20)*	1.14 (1.06–1.23)*	1.30 (1.21–1.40)*	1.32 (1.23–1.42)*
Cocaine use						
Non-reported	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Reported discrimination at least once	1.43 (1.05–1.93)*	1.44 (1.05–1.95)*	1.32 (0.95–1.84)	1.34 (0.96–1.87)	2.04 (0.94–4.46)	1.97 (0.89–4.36)
Hallucinogens use						
Non-reported	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Reported discrimination at least once	1.37 (1.07–1.76)*	1.46 (1.13–1.87)*	1.31 (1.02–1.69)*	1.40 (1.09–1.81)*	3.96 (0.89–17.52)	3.93 (0.87–17.70)
Heroin use						
Non-reported	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Reported discrimination at least once	1.34 (0.48–3.72)	1.26 (0.46–3.46)	1.63 (0.34–7.92)	1.50 (0.29–7.72)	1.17 (0.31–4.47)	1.13 (0.31–4.10)
Inhalants use						
Non-reported	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Reported discrimination at least once	1.20 (0.79–1.83)	1.27 (0.83–1.93)	1.45 (0.87–2.43)	1.51 (0.91–2.53)	0.75 (0.34–1.62)	0.81 (0.38–1.74)
Methamphetamine use						
Non-reported	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Reported discrimination at least once	3.69 (2.30–5.92)*	3.51 (2.18–5.65)*	2.55 (1.40–4.66)*	2.52 (1.38–4.61)*	5.92 (2.70–12.97)*	5.39 (2.43–11.94)*
Prescription opioids use						
Non-reported	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Reported discrimination at least once	1.51 (1.40–1.64)*	1.51 (1.39–1.64)*	1.45 (1.28–1.64)*	1.45 (1.28–1.64)*	1.56 (1.41–1.74)*	1.56 (1.40–1.74)*
Prescription sedatives or prescription sleeping pills use						
Non-reported	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Reported discrimination at least once	1.41 (1.33–1.49)*	1.42 (1.34–1.50)*	1.30 (1.19–1.42)*	1.31 (1.20–1.43)*	1.48 (1.38–1.59)*	1.49 (1.39–1.60)*
Prescription stimulants use						
Non-reported	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Reported discrimination at least once	1.54 (1.39–1.70)*	1.57 (1.41–1.74)*	1.52 (1.16–2.00)*	1.55 (1.18–2.03)*	1.54 (1.38–1.72)*	1.57 (1.40–1.75)*
Synthetic stimulants use						
Non-reported	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Reported discrimination at least once	1.81 (0.84–3.91)	1.83 (0.84–3.99)	1.43 (0.61–3.33)	1.46 (0.61–3.49)	5.80 (0.70–47.94)	5.55 (0.66–46.34)
Other drug use						
Non-reported	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Reported discrimination at least once	1.77 (1.55–2.02)*	1.77 (1.55–2.02)*	1.94 (1.49–2.52)*	1.93 (1.48–2.52)*	1.71 (1.47–2.00)*	1.72 (1.47–2.00)*

*$p<0.05$; †adjusted for age, sex (male; female; not male or female, prefer not to answer or skipped, and no matching concept), race (Hispanic or Latino; non-Hispanic another single population or 1> population; non-Hispanic Asian; non-Hispanic Black or African American; non-Hispanic White; and prefer not to answer or skipped, and none of these), smoking status (non-smoker; past smoker; and current smoker), alcohol consumption (yes and no), chemotherapy or immunotherapy (yes and no), employment status (unemployed and employed), health insurance (uninsured and insured), and COVID-19 or flu-like symptoms (yes and no). CI, confidential interval; OR, odds ratio.

Table 4. Overlap-weighted OR for the association between reported main reasons for discrimination and drug use

	Overlap-weighted		
	Events (%)	Crude OR (95% CI)	Adjusted OR (95% CI)†
Age			
No reported	5,408 (22.2)	1.00 (reference)	1.00 (reference)
Reported at least once	1,644 (24.8)	1.15 (1.11–1.20)*	1.23 (1.17–1.28)*
Education or income level			
No reported	6,125 (22.3)	1.00 (reference)	1.00 (reference)
Reported at least once	927 (26.7)	1.27 (1.21–1.34)*	1.24 (1.17–1.31)*
Gender or sexual orientation			
No reported	5,406 (21.6)	1.00 (reference)	1.00 (reference)
Reported at least once	1,646 (27.4)	1.37 (1.31–1.42)*	1.31 (1.25–1.37)*
Physical appearance			
No reported	5,696 (21.5)	1.00 (reference)	1.00 (reference)
Reported at least once	1,356 (30.2)	1.58 (1.51–1.65)*	1.46 (1.40–1.53)*
Race or ethnicity			
No reported	6,166 (22.6)	1.00 (reference)	1.00 (reference)
Reported at least once	885 (23.7)	1.06 (1.01–1.12)*	1.17 (1.10–1.23)*
Religion			
No reported	6,840 (22.7)	1.00 (reference)	1.00 (reference)
Reported at least once	212 (23.8)	1.06 (0.96–1.18)	1.13 (1.02–1.26)*
Other			
No reported	5,787 (21.8)	1.00 (reference)	1.00 (reference)
Reported at least once	1,264 (28.7)	1.45 (1.38–1.52)*	1.37 (1.31–1.44)*

*p<0.05; †adjusted for age, sex (male; female; not male or female, prefer not to answer or skipped, and no matching concept), race (Hispanic or Latino; non-Hispanic another single population or 1> population; non-Hispanic Asian; non-Hispanic Black or African American; non-Hispanic White; and prefer not to answer or skipped, and none of these), smoking status (non-smoker; past smoker; and current smoker), alcohol consumption (yes and no), chemotherapy or immunotherapy (yes and no), employment status (unemployed and employed), health insurance (uninsured and insured), and COVID-19 or flu-like symptoms (yes and no). CI, confidential interval; OR, odds ratio.

Comparison with other studies

Previous studies have rarely explored and acknowledged the critical role of discrimination in influencing health outcomes, including both mental and physical health.[20] However, recent studies have evolved to focus on discrimination as one of the risk factors for public health and health inequality.[21,22] For example, the English Longitudinal Study of Ageing, which included 7,731 participants with a mean age of 67 years from 2010 to 2011, found that approximately 25% of respondents experienced age-related discrimination.[23] Even after adjusting for demographics, individuals who reported poor health conditions were more likely to experience discrimination, and those who experienced age-related discrimination reported more frequent mental or physical illness.[23] Six years of follow-up, participants reported experiences of discrimination also had higher odds of reporting new onset chronic diseases, including stroke, coronary heart disease, chronic lung disease, and depressive symptoms.[23]

In addition to age-related discrimination, several studies suggested that racial/ethnic minorities are more likely to have adverse health outcomes, including hepatocellular carcinoma, nonalcoholic fatty liver disease, and psychotic experiences.[24-30] A systemic review reported that racial discrimination is linked to adverse mental (average weighted effect size r=-0.23 [95% CI, -0.24– -0.21]) and physical health outcomes (r=-0.09, [95% CI, -0.12– -0.06]).[22,31] These disparities have been exacerbated during the COVID-19 pandemic. For instance, during the second wave of COVID-19 in the United Kingdom, Bangladeshi women had a 4.11-fold higher risk of COVID-19 mortality rates compared to White British women, and Bangladeshi men had a 4.96-fold higher risk.[32] Similarly, in the United States, racial and ethnic minorities experienced higher infection and mortality rates.[33] In addition, economic disparities were evident, as individuals with lower incomes were more likely to require ICU admission or mechanical ventilation during the COVID-19 pandemic.[34]

While these studies offer important insights into the impacts of discrimination on health, they often focus on exclusively specific forms of discrimination and have limited smaller cohort sizes and less diverse cohorts to generalize the results. In contrast, our study utilized a large, diverse dataset derived from the AoU and is the first to examine the association between everyday discrimination and drug use. Our study allowed a more detailed understanding of the complex relationship between everyday discrimination and drug use across various demographic groups.

Possible mechanisms

Our findings align with previous research indicating that the COVID-19 pandemic has exacerbated health disparities linked to discrimination.[4] Younger individuals (<40 years) and those assigned female sex at birth were more likely to report experiences of discrimination. This demographic, being more socially active and vulnerable to stressors such as unstable employment and social uncertainty during the pandemic, may have faced increased exposure to discrimination, negatively impacting their health behaviors.[4] The disproportionate bur-

den of job losses and caregiving responsibilities on younger populations and women has further heightened their vulnerability.[35]

Previous studies have shown that a significant proportion of Asian adults in the United States experienced various forms of discrimination, including microaggressions and hate crimes, during the early months of the pandemic.[5,36] About 30% reported related adverse outcomes.[36] Other studies have found that racial and ethnic minorities, including Black and African American individuals, were more vulnerable to both SARS-CoV-2 infection and severe outcomes.[37] For example, a cross-sectional study of children tested at a diagnostic center found that children from racial/ethnic minority and low-income backgrounds had higher rates of COVID-19 positivity compared to non-Hispanic White and higher-income children.[38] Consistent findings indicate that Black individuals not only had higher incidence of SARS-CoV-2 infection and mortality rates but also faced more severe clinical outcomes compared to White individuals.[37,39] Similarly, the American Indigenous population (e.g. American Indian Alaska Native populations) had a 1.7-fold higher risk of SARS-CoV-2 infection, 3.4 times higher risk of hospitalization, and 2.4 times higher mortality rate from COVID-19 compared to White individuals.[40] Data from the Centers for Disease Control and Prevention further support these trends, showing higher case rates, hospitalizations, and mortality among racial/ethnic minorities, including Black or Asian populations.[3] Moreover, racial and ethnic minorities have experienced a significant decline in life expectancy compared to non-Hispanic White individuals during the pandemic.[41]

These patterns are mirrored in our study, which observed similar disparities in the association between discrimination and adverse health behaviors, such as drug use. The coincided sociopolitical climate during the pandemic, marked by political polarization and narratives of American exceptionalism, likely impeded effective public health policies against COVID-19 and intensified discrimination and health inequities. This context may have exacerbated the adverse effects of discrimination of marginalized groups, as evidenced by the significantly higher odds of drug use among those experiencing discrimination.[9]

Previous research suggests that discrimination can increase drug use as individuals attempt to cope with heightened stress and anxiety.[5,42] Discrimination-induced stress disrupts physiological and emotional regulation, making individuals more susceptible to substance use disorders.[43] Moreover, discrimination is known to contribute to depression and loneliness, which are significantly associated with substance use.[4] Our study found that the odds of drug use increased in a dose-dependent manner with higher discrimination scores, consistent with prior findings indicating that frequent discrimination can lead to long-term health issues, including substance abuse, due to impaired emotional regulation and stress response.[44]

Subgroup analyses revealed that the association between discrimination and drug use was particularly pronounced in specific subgroups, including younger individuals, those assigned female sex at birth, current smokers, individuals undergoing chemotherapy or immunotherapy, and those experiencing unemployment or COVID-19/flu-like symptoms. The significant association between drug use and loneliness in younger populations and women suggests that social isolation resulting from discrimination may elevate the odds of drug use in these groups.[4] Individuals facing additional stressors, such as those undergoing chemotherapy or experiencing job loss, are especially vulnerable to the adverse effects of discrimination on drug use behaviors due to compounded risk factors.[2]

Moreover, the high cost of health insurance in the United States, often tied to employment status, may reduce healthcare access for unemployed individuals.[45] Barriers to adequate healthcare, including socioeconomic status, historical mistrust in the healthcare system, and language barriers, disproportionately affect socioeconomic minorities, increasing the likelihood of drug use.[45] The opposition of 13 U.S. states to Medicaid expansion under the Affordable Care Act in early 2020 may have further exacerbated these inequities, limiting access to healthcare and potentially increasing drug use among vulnerable populations.[3]

Policy implications

During the pandemic, discrimination and inequities were exacerbated in numerous areas, from the unequal distribution of preventive measures such as vaccines and personal protective equipment to disparities in healthcare accessibility and unmet healthcare needs.[46] Social distancing measures disproportionately affected specific socioeconomic minorities, and digital healthcare tools, such as online appointment scheduling, further marginalized populations with limited access to technology, transportation, and language support.[3] These underrepresented groups, already socioeconomically disadvantaged, require targeted public health policies that address their unique vulnerabilities. The refusal by 13 U.S. states to expand Medicaid under the Affordable Care Act in early 2020 further accelerated healthcare disparities during the pandemic.[3] Expanding Medicaid, particularly in states that have resisted its implementation, could reduce these disparities and improve access to preventive care and mental health services. Strengthening anti-discrimination policies in the healthcare, employment, and housing sectors is critical. This includes expanding protections under civil rights legislation and increasing ac-

countability for hate crimes, particularly those targeting Black, African American, Asian, and Hispanic communities.

Public health campaigns aimed at reducing stigma and racial bias are crucial, particularly in times of crisis. These campaigns should focus on correcting misinformation and promoting inclusive and supportive environments. Social media platforms, where misinformation can be produced and exaggerated, should be included in these efforts.[5] In addition, expanding mental health counseling and services within primary healthcare, particularly for those vulnerable to discrimination, can heighten thresholds of developing into drug use and prevent the psychological triggers leading to drug use.[47] Integrating mental healthcare into routine services is essential to addressing the potential or long-term impacts of discrimination on health, including drug use.

Strengths and limitations of the study

To the best of our knowledge, this is the largest and most diverse study to examine the impact of everyday discrimination on drug use during the COVID-19 pandemic in the United States. We aimed to comprehensively assess various sources of discrimination by creating a discrimination score and analyzing its association with overall and specific drug use across 11 categories. Additionally, we employed PS-based overlap weighting in adjusted models to minimize potential confounding factors, such as discrimination related to SARS-CoV-2 infection, thereby enhancing the robustness of our findings.

However, our study has several limitations. First, as a cross-sectional study, discrimination and drug use were measured concurrently, preventing the understanding of the causal relationship. To supplement this limitation, we conducted additional analyses by using other structured questions regarding changes in drug use compared to the past month and indirectly suggested that discrimination might contribute to increased use of specific drugs. Second, both discrimination and drug use were assessed using self-reported data from the COPE survey, which may be subject to recall or self-report bias. Third, the AoU cohort, particularly the COPE respondents, does not fully represent the United States population. With 79.4% of participants being non-Hispanic White, 55.5% employed, and 99.8% having health insurance, the sample underrepresents groups that may be more vulnerable to discrimination. This may lead to an underestimation of the impact of discrimination on drug use. Fourth, the COPE survey was conducted online in English or Spanish, potentially excluding participants with limited digital accessibility or language proficiency.[5] This could result in the underrepresentation of populations who experience higher levels of discrimination and drug use. Therefore, the COPE survey was conducted online in English or Spanish, potentially excluding participants with limited digital access or language proficiency. This could result in the underrepresentation of populations who experience higher levels of discrimination and drug use. Therefore, caution is needed when generalizing the findings to the broader United States population. Overall, while this study provides valuable insights into the relationship between discrimination and drug use, particularly during the COVID-19 pandemic, future research should aim to include more diverse and representative samples to better capture the experiences of all demographic groups.

Conclusion

In this large-scale cross-sectional study, discrimination was associated with a substantial increase in the odds of drug use during the COVID-19 pandemic. Our findings highlight variations in the association between discrimination and specific drug use, including methamphetamine, prescription opioids, prescription stimulants, cannabis, cocaine, hallucinogens, prescription sedatives or sleeping pills, and other drug use. Notably, the association between everyday discrimination and drug use exhibited dose-dependent manners and pronounced in specific subgroups. Moreover, drug use was strongly associated with all specific reasons for discrimination, such as age, education or income level, gender or sexual orientation, physical appearance, race or ethnicity, and religion. In summary, this study provides empirical evidence of the complex and dynamic relationship between discrimination and drug use across a large-scale, diverse United States dataset. It underscores how the pandemic has intensified the impact of discrimination on drug use, particularly among marginalized populations, and highlights the need for targeted public health interventions to address these disparities.

Supplementary Materials

The Supplement is available with this article at https://doi.org/10.30773/pi.2025.0234.

Availability of Data and Material

Dr. JK had full access to the All of Us Research Program dataset in the study and took responsibility for the integrity of the data and the accuracy of the data analysis.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

Author Contributions

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Funding Statement

This research was supported by the Ministry of Science and ICT (RS-2024-00509257 and IITP-2024-RS-2024-00438239 to DKY) and the Ministry of Health & Welfare (RS-2025-02220492 to DKY), Republic of Korea. This work was supported by the United States of America National Institutes of Health National Institute on Aging (R01AG076704 to CJN).

Acknowledgments

None

REFERENCES

1. GBD 2021 Demographics Collaborators. Global age-sex-specific mortality, life expectancy, and population estimates in 204 countries and territories and 811 subnational locations, 1950-2021, and the impact of the COVID-19 pandemic: a comprehensive demographic analysis for the Global Burden of Disease Study 2021. Lancet 2024;403:1989-2056.
2. Choi Y, Kim HJ, Park J, Lee M, Kim S, Koyanagi A, et al. Acute and post-acute respiratory complications of SARS-CoV-2 infection: population-based cohort study in South Korea and Japan. Nat Commun 2024;15:4499.
3. Parolin Z, Lee EK. The role of poverty and racial discrimination in exacerbating the health consequences of COVID-19. Lancet Reg Health Am 2022;7:100178.
4. Brandt L, Liu S, Heim C, Heinz A. The effects of social isolation stress and discrimination on mental health. Transl Psychiatry 2022;12:398.
5. Lee YH, Liu Z, Fatori D, Bauermeister JR, Luh RA, Clark CR, et al. Association of everyday discrimination with depressive symptoms and suicidal ideation during the COVID-19 pandemic in the all of us research program. JAMA Psychiatry 2022;79:898-906.
6. Wang P, Catalano T. Social media, right-wing populism, and COVID-19: a multimodal critical discourse analysis of reactions to the 'Chinese virus' discourse. In: Musolff A, Breeze R, Kondo K, Vilar-Lluch S, editors. Pandemic and crisis discourse: communicating COVID-19 and public health strategy. London: Bloomsbury Publishing, 2022, p.323-337.
7. Njoroge WFM, White LK, Waller R, Forkpa M, Himes MM, Morgan K, et al. Association of COVID-19 and endemic systemic racism with postpartum anxiety and depression among black birthing individuals. JAMA Psychiatry 2022;79:600-609.
8. Faiz J, Essien UR, Washington DL, Ly DP. Racial and ethnic differences in barriers faced by medical college admission test examinees and their association with medical school application and matriculation. JAMA Health Forum 2023;4:e230498.
9. Flores A, Cole JC, Dickert S, Eom K, Jiga-Boy GM, Kogut T, et al. Politicians polarize and experts depolarize public support for COVID-19 management policies across countries. Proc Natl Acad Sci U S A 2022;119:e2117543119.
10. Yehia BR, Winegar A, Fogel R, Fakih M, Ottenbacher A, Jesser C, et al. Association of race with mortality among patients hospitalized with coronavirus disease 2019 (COVID-19) at 92 US hospitals. JAMA Netw Open 2020;3:e2018039.
11. Muñoz-Price LS, Nattinger AB, Rivera F, Hanson R, Gmehlin CG, Perez A, et al. Racial disparities in incidence and outcomes among patients with COVID-19. JAMA Netw Open 2020;3:e2021892.
12. Kabarriti R, Brodin NP, Maron MI, Guha C, Kalnicki S, Garg MK, et al. Association of race and ethnicity with comorbidities and survival among patients with COVID-19 at an urban medical center in New York. JAMA Netw Open 2020;3:e2019795.
13. All of Us Research Program Investigators. The "All of Us" Research Program. N Engl J Med 2019;381:668-676.
14. Schulkey CE, Litwin TR, Ellsworth G, Sansbury H, Ahmedani BK, Choi KW, et al. Design and implementation of the All of Us Research Program COVID-19 participant experience (COPE) survey. Am J Epidemiol 2023;192:972-986.
15. Williams DR, Yan Yu, Jackson JS, Anderson NB. Racial differences in physical and mental health: socio-economic status, stress and discrimination. J Health Psychol 1997;2:335-351.
16. Kang J, Kim HJ, Kim T, Lee H, Kim M, Lee SW, et al. Prenatal opioid exposure and subsequent risk of neuropsychiatric disorders in children: nationwide birth cohort study in South Korea. BMJ 2024;385:e077664.
17. Axeen S, Pacula RL, Merlin JS, Gordon AJ, Stein BD. Association of daily doses of buprenorphine with urgent health care utilization. JAMA Netw Open 2024;7:e2435478.
18. Thomas LE, Li F, Pencina MJ. Overlap weighting: a propensity score method that mimics attributes of a randomized clinical trial. JAMA 2020;323:2417-2418.
19. Li F, Thomas LE, Li F. Addressing extreme propensity scores via the overlap weights. Am J Epidemiol 2019;188:250-257.
20. Krieger N. Discrimination and health inequities. Int J Health Serv 2014;44:643-710.
21. Deivanayagam TA, English S, Hickel J, Bonifacio J, Guinto RR, Hill KX, et al. Envisioning environmental equity: climate change, health, and racial justice. Lancet 2023;402:64-78.
22. Devakumar D, Selvarajah S, Abubakar I, Kim SS, McKee M, Sabharwal NS, et al. Racism, xenophobia, discrimination, and the determination of health. Lancet 2022;400:2097-2108.
23. Jackson SE, Hackett RA, Steptoe A. Associations between age discrimination and health and wellbeing: cross-sectional and prospective analysis of the English Longitudinal Study of Ageing. Lancet Public Health 2019;4:e200-e208.
24. Bardol O, Grot S, Oh H, Poulet E, Zeroug-Vial H, Brunelin J, et al. Perceived ethnic discrimination as a risk factor for psychotic symptoms: a systematic review and meta-analysis. Psychol Med 2020;50:1077-1089.
25. Rich NE, Carr C, Yopp AC, Marrero JA, Singal AG. Racial and ethnic disparities in survival among patients with hepatocellular carcinoma in the United States: a systematic review and meta-analysis. Clin Gastroenterol Hepatol 2022;20:e267-e288.
26. Du XL, Meyer TE, Franzini L. Meta-analysis of racial disparities in survival in association with socioeconomic status among men and women with colon cancer. Cancer 2007;109:2161-2170.
27. Larik MO, Shiraz MI, Shah ST, Shiraz SA, Shiraz M. Racial disparity in outcomes of out-of-hospital cardiac arrest (OHCA): a systematic review and meta-analysis. Curr Probl Cardiol 2023;48:101794.
28. Jaiswal V, Hanif M, Ang SP, Bisht H, Tripathi A, Khan S, et al. Racial disparity between the post-procedural outcomes among patients with peripheral artery disease: a systematic review and meta-analysis. Curr Probl Cardiol 2023;48:101595.

29. Shahid I, Usman MS, Dadabhoy R, Shurjeel Q, Kumar P, Siddiqi TJ. Meta-analysis of racial disparity in outcomes of acute myocardial infarction. Am J Cardiol 2022;176:139-141.
30. Rich NE, Oji S, Mufti AR, Browning JD, Parikh ND, Odewole M, et al. Racial and ethnic disparities in nonalcoholic fatty liver disease prevalence, severity, and outcomes in the United States: a systematic review and meta-analysis. Clin Gastroenterol Hepatol 2018;16:198-210.e2.
31. Paradies Y, Ben J, Denson N, Elias A, Priest N, Pieterse A, et al. Racism as a determinant of health: a systematic review and meta-analysis. PLoS One 2015;10:e0138511.
32. Larsen T, Bosworth M, Nafilyan V. Updating ethnic contrasts in deaths involvin g the coronavirus (COVID-19), England: 24 January 2020 to 31 March 2021. Newport, England: Office for National Statistics; 2021.
33. Burningham O, Chen A, Genovesi E, Belay W, Ahmed I, Ayele M, et al. Inclusive education for children with developmental disabilities in Ethiopia: stakeholder views on benefits, disadvantages and priorities for action. J Autism Dev Disord 2024 Sep 26 [Epub]. https://doi.org/10.1007/s10803-024-06549-2.
34. Quan D, Luna Wong L, Shallal A, Madan R, Hamdan A, Ahdi H, et al. Impact of race and socioeconomic status on outcomes in patients hospitalized with COVID-19. J Gen Intern Med 2021;36:1302-1309.
35. Wade M, Prime H, Johnson D, May SS, Jenkins JM, Browne DT. The disparate impact of COVID-19 on the mental health of female and male caregivers. Soc Sci Med 2021;275:113801.
36. Lee S, Waters SF. Asians and Asian Americans' experiences of racial discrimination during the COVID-19 pandemic: Impacts on health outcomes and the buffering role of social support. Stigma and Health 2021;6:70-78.
37. Mathur R, Rentsch CT, Morton CE, Hulme WJ, Schultze A, MacKenna B, et al. Ethnic differences in SARS-CoV-2 infection and COVID-19-related hospitalisation, intensive care unit admission, and death in 17 million adults in England: an observational cohort study using the OpenSAFELY platform. Lancet 2021;397:1711-1724.
38. Goyal MK, Simpson JN, Boyle MD, Badolato GM, Delaney M, McCarter R, et al. Racial and/or ethnic and socioeconomic disparities of SARS-CoV-2 infection among children. Pediatrics 2020;146:e2020009951.
39. Pan D, Sze S, Minhas JS, Bangash MN, Pareek N, Divall P, et al. The impact of ethnicity on clinical outcomes in COVID-19: a systematic review. EClinicalMedicine 2020;23:100404.
40. Gross CP, Essien UR, Pasha S, Gross JR, Wang SY, Nunez-Smith M. Racial and ethnic disparities in population-level Covid-19 mortality. J Gen Intern Med 2020;35:3097-3099.
41. Andrasfay T, Goldman N. Reductions in 2020 US life expectancy due to COVID-19 and the disproportionate impact on the Black and Latino populations. Proc Natl Acad Sci U S A 2021;118:e2014746118.
42. Cooke A, Castellanos S, Koenders S, Joshi N, Enriquez C, Olsen P, et al. The intersection of drug use discrimination and racial discrimination in the management of chronic non-cancer pain in United States primary care safety-net clinics: implications for healthcare system and clinic-level changes. Drug Alcohol Depend 2023;250:110893.
43. Kearney MD, Barg FK, Alexis D, Higginbotham E, Aysola J. Employee health and wellness outcomes associated with perceived discrimination in academic medicine: a qualitative analysis. JAMA Netw Open 2022;5:e2145243.
44. Lei Y, Shah V, Biely C, Jackson N, Dudovitz R, Barnert E, et al. Discrimination and subsequent mental health, substance use, and well-being in young adults. Pediatrics 2021;148:e2021051378.
45. Wray CM, Khare M, Keyhani S. Access to care, cost of care, and satisfaction with care among adults with private and public health insurance in the US. JAMA Netw Open 2021;4:e2110275.
46. Press VG, Huisingh-Scheetz M, Arora VM. Inequities in technology contribute to disparities in COVID-19 vaccine distribution. JAMA Health Forum 2021;2:e210264.
47. Kim S, Hwang J, Lee JH, Park J, Kim HJ, Son Y, et al. Psychosocial alterations during the COVID-19 pandemic and the global burden of anxiety and major depressive disorders in adolescents, 1990-2021: challenges in mental health amid socioeconomic disparities. World J Pediatr 2024;20:1003-1016.