



Exposure to Social Media Racial Discrimination and Mental Health among Adolescents of Color

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Abstract

Offline and online racial discrimination has been associated with mental health problems among adolescents of color. Pandemic shelter-at-home policies and the reignited racial justice movement increased the use of social media among youth of color, potentially exposing them to social media racial discrimination. Yet, it is unclear which aspects of social media significantly contributed to youth exposure to racial discrimination and associated mental health issues during this period. This study assessed the relationships among social media use (hours, racial intergroup contact, and racial justice civic engagement), individual and vicarious social media discrimination (defined as personally directed versus observing discrimination directed at others), and mental health among 115 black, 112 East/Southeast Asian, 79 Indigenous, and 101 Latinx adolescents ($N = 407$, 82.31% female, aged 15–18 years, $M = 16.47$, $SD = 0.93$). Structural equation modeling (SEM) analyses indicate that hours of use and racial justice civic engagement were associated with increased social media racial discrimination, depressive symptoms, anxiety, alcohol use disorder, and drug use problems. Furthermore, individual social media racial discrimination fully mediated the relationship between racial justice civic publication and depressive and alcohol use disorder. Vicarious social media racial discrimination fully mediated the relationship between racial justice activity coordination with depressive symptoms, anxiety, and alcohol use disorder. Alternative SEM models indicate that exposure to individual and vicarious social media racial discrimination increased depressive symptoms and drug use problems among youth of color, further increasing their social media use frequency and racial justice civic publication. The findings call for strategies to mitigate the effects of social media racial discrimination in ways that support adolescents' racial justice civic engagement and mental health.

Keywords Adolescent · Racial discrimination · Social media · COVID-19 · Racial justice · Mental health

Introduction

The ubiquitous use of social networking sites among adolescents of color and increases in usage and racial justice related messaging within the context of pandemic shelter-at-home policies (Croucher et al., 2020) and the reignited racial justice movement (Fowers & Wan, 2020) call for the examination of the potential risk of exposure to social media racial discrimination and the consequences for their mental health

(Koeze & Popper, 2020). Whereas offline civic engagement has been associated with positive development among youth of color (Ballard et al., 2019), online racial justice activities expose youth to anonymous actors who subject them to different forms of social media racial discrimination: individual (directed to them personally) and vicarious (observed to be directed to others of one's race). This study examined the extent to which individual and vicarious social media discrimination mediated the association between racial justice civic engagement and inter-racial group contact and depressive symptoms, anxiety, and substance use problems.

Social media is one of the most popular online platforms for adolescents of color. The most recent surveys found that more than 70% of black and Latinx youth used at least one social media platform, with approximately half reporting they used the internet almost constantly in 2018 (Anderson & Jiang, 2018), and 87% of Indigenous youth had a social media account in 2009 (Rushing & Stephens, 2011). Despite the lack

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of data on Asian American youth, Asian American adults reported the highest frequencies of social media use among all racial groups (Charmaraman et al., 2018). Most social media studies have included majority non-Hispanic white youth and found that social media use frequency is positively associated with mental health problems (Riehm et al., 2019). To date, there has been a paucity of research on several inter-related aspects of social media usage that may contribute to mental health risk among youth of color including involvement in online civic engagement activities, increased inter-racial group contact, and exposure to racially biased messaging directed at youth individually or to other members of their racial identity group. Offline civic engagement, such as voting, volunteering, helping, pro-environmental behavior and charitable giving, has been associated with more positive outcomes with respect to adolescents' wellbeing and lower depressive symptoms (Ballard et al., 2019). Still, risks have also been reported. Queer college activists of color experienced burnout and severe psychological distress due to limited social support and poor self-care (Vaccaro & Mena, 2011). Offline adolescent political activism has also been associated with increased levels of health risk behaviors, e.g., substance use and more hours for TV and video screen time (Ballard et al., 2019). In addition, higher levels of offline school and neighborhood contact with individuals from diverse racial groups (intergroup contact) have been found to be positively related to reports of racial discrimination and depressive symptoms among racial minority youth (Assari & Caldwell, 2018).

Little is known about the relationship between online racial justice activities, intergroup contact, and exposure to social media racial discrimination among youth of color. Social media activity in general, online racial justice civic engagement, and communication with or exposure to posts by individuals from different racial groups may increase a youth's vulnerability to both racially biased messaging and posts by others describing their social media racial discrimination victimization experiences (Hope et al., 2018). More specifically, increasing hours of social media use and viewing/sharing racial justice related news and posts may place youth at greater risk of exposure to vicarious racial discrimination more than individual discrimination (Lim & Alrasheed, 2021), whereas actively engaging in racial justice activities and communicating with nonracial group members may increase risk of individual discrimination (Barlett et al., 2016). Exposure to such individual and vicarious social media racial discrimination places adolescents of color at higher risk of mental health symptoms and negative long-term developmental outcomes. Online (English et al., 2020; Tynes et al., 2020) and offline (Benner et al., 2018; Yip, 2015) individual racial discrimination such as peer harassment and teasing are significant stressors faced by youth of color that cause both physical and psychological responses, which can trigger the onset of depression and anxiety

disorders. Observing racial discrimination directed at peers, family members, and other racial group members is a common form of discrimination experienced by youth of color (Quintana & McKown, 2008), although it has been least studied (Priest et al., 2013). Past research indicates that 10%–25% of adolescents of color have experienced online racial discrimination directed toward them individually, and between 33% and 70% have experienced online racial discrimination vicariously (Duggan, 2017; Rideout et al., 2016). Research involving black and Latinx adolescents found individual online racial discrimination predicted higher levels of depressive and anxiety symptoms, the association between vicarious online discrimination and mental health inconclusive (English et al., 2020; Tynes et al., 2020).

The Current Study

The high prevalence of exposure to social media racial discrimination among adolescents of color calls for examining relationships among different forms of social media engagement, social media racial discrimination, and associated mental health risks in this population. The current study was conducted through fall and winter 2020–2021 during the COVID-19 pandemic, a period in which social media use increased substantially and racial issues figured prominently in online messaging. Associations among social media use (defined as hours of use, social media intergroup contact, and social media civic engagement), individual and vicarious social media racial discrimination, and indices of mental health (depressive and anxiety disorder and substance use disorder) among Asian, black, Indigenous and Latinx adolescents were examined. It was hypothesized that more hours of social media use each week, more social media intergroup contact and higher levels of social media civic engagement would be associated with increased exposure to online individual and vicarious social media racial discrimination among adolescents of color (Hypothesis 1); these forms of social media use would be associated with increased risks of depressive and anxiety symptoms, alcohol use disorder, and illicit drug use problems (Hypothesis 2); and individual and vicarious social media racial discrimination would mediate the association between these forms of social media use and mental health and substance use risks (Hypothesis 3).

Methods

Participants and Recruitment

Data were collected between October 2020 and January 2021. To ensure racial/ethnic diversity of the sample and achieve adequate power ($=0.80$) for a structural equation

model (SEM) analysis with degrees of freedom (df) = 25–60 (MacCallum et al., 1996), the study aimed to recruit 100 participants from each of four racial/ethnic groups. Eligible participants identified as black, East/Southeast Asian, Indigenous, or Latinx; 15–18 years old; in grades 10–12; had used social media at least 5 days a week (regardless of hours of use per day) in the past month; resided in the US and had English language competency at the 8th-grade level.

Recruitment was conducted via Qualtrics XM, an aggregator of survey panel websites to recruit individuals who have signed up to take paid surveys across multiple sites. Qualtrics XM posted advertisements on panel websites, sent emails to adolescents who had signed up through various survey websites, and offered compensation worth \$6 converted into the survey panel's point system. Eligible individuals who had provided informed consent were given a unique identification number and were directed to the main survey, which took 27.37 min on average ($SD = 28.05$; excluding four participants who took 5 h or more to complete the survey). Qualtrics included a speed check to exclude participants who responded in less than half the time of the median survey response. Manual data validation protocols were established to exclude fraudulent or repeat participants by analyzing consistency between age and date of birth, the reported city in which the survey was taken and zip code, and responses with identical IP addresses. Participants were able to quit the survey at any time by closing the survey window, and their data were not included in analyses. The identity of participants and their contact information were unknown to the investigator. Participants received the agreed number of points determined by their survey panel 7 days after completing the survey to allow for data quality checks. Since research has shown that answering anonymous survey questions associated with substance use, sexual behavior, and other socially sensitive topics among youth does not exceed the federal definition of minimal risk and youth are less likely to agree to participate in health risk surveys if guardian permission is required (Fisher et al., 2016), a waiver of guardian permission was obtained. Approval for all study procedures was obtained by the University IRB. A total of 2,603 participants clicked on the email survey link, 1764 took the screener, and 494 adolescents of color met eligibility requirements. Of those 407 (82.39%) who completed the survey and passed the validation check comprised the final sample for the current study ($N = 112$ Asian, 115 black, 79 Indigenous, and 101 Latinx).

Measures

Demographic items

Participants self-reported age, grade, gender, race and ethnicity, sex at birth, who youth were sexually/romantically

attracted to, and state and zip code of current residence. Socioeconomic status was assessed through three variables: (1) Highest education level of primary guardians, (2) Employment status of primary guardians, and (3) Financial security with response options (a) My family can't make ends meet, (b) My family has just enough money, and (c) My family is financially comfortable. Several items were included to consider the potential effects of the COVID-19 pandemic during the data collection period. Participants reported remote learning status, personal and family members' COVID-19 health status, whether they have seen friends outside the home in the past month, worry associated with COVID-19 infections, and COVID-19 health risks (i.e., an existing health condition that the CDC (2021) has been listed as at higher risk for the coronavirus infection).

Hours of social media use

Two questions on hours of social media use asked the following: (1) "In the past month, on average, approximately how many days in each week have you spent time on social media (e.g., Instagram, Snapchat, Facebook, Twitter, Tumblr, Reddit)?" with response options ranging from 0 days per week to 7 days per week; and (2) "In the past month, on average, approximately how many hours in each day have you spent time on social media (e.g., Instagram, Snapchat, Facebook, Twitter, Tumblr, Reddit)?" The average hours of social media use per week were calculated by multiplying the number of hours of social media use a day (0–24) with days of social use per week (0–7).

Social media intergroup contact

This scale adapted from the Developmental Intergroup Contact Measure (DICM; Crystal et al., 2008; Park, 2015) was originally based on the 10-item Diversity Attitudes Questionnaire (DAQ; Kurlaender & Yun, 2001). DICM includes eight items assessing intergroup contact in online settings and has been administered to adolescents and young adults (Park, 2015). For this study, the word "online" was replaced by "social media" for the current study. Sample items included "How many of your social media friends are a different racial or ethnic group than you?" with response options "None," "One or two," "A few," and "Many." The original DICM measuring offline intergroup contact had an internal consistency among diverse adolescents aged 9–16 years old (Cronbach's $\alpha = 0.79$; Crystal et al., 2008). For the current study, Cronbach's $\alpha = 0.69$ for the total sample, 0.66 for Asian, 0.68 for black, 0.72 for Indigenous, 0.67 for Latinx.

Social media racial justice civic engagement

The Online Civic Engagement Behavior Construct (Warren et al., 2014) assesses social media civic publication and coordination of activities associated with racial issues in the past month. Two subscales assessed overall time spent in racial justice civic engagement, including posting or sharing information and organizing activities. The civic publication subscale included four items: (1) “Post/share links on racial issues on social media,” (2) “Post/share photos/videos/images of racial issues on social media,” (3) “Post/share news on racial issues on social media,” and (4) “Post/share personal stories on racial issues on social media.” The activity coordination subscale included three items: (1) “Plan activities that address racial issues on social media,” (2) “Invite people for racial issues related event on social media,” and (3) “Confirm assistance with others on racial issue events on social media.” Response options range from (0) “Never” to (6) “very often, more than 70% of the time.” Inter-item reliability was not reported by the scale authors. In the current study, for the civic publication subscale, Cronbach’s $\alpha = 0.94$ for the total sample, 0.95 for Asian, 0.94 for black, 0.94 for Indigenous, 0.98 for Latinx; For activity coordination subscale, Cronbach’s $\alpha = 0.87$ for the total sample, 0.84 for Asian, 0.90 for black, 0.89 for Indigenous, 0.87 for Latinx).

Social media racial discrimination

The past month’s experiences with individual and vicarious social media racial discrimination were assessed using the Online Victimization Scale (Tynes et al., 2010). In the current study, “online” was substituted with “on social media” for all items. The scale includes four items on perceived individual social media racial discrimination (e.g., “People have said mean or rude things about me because of my race or ethnic group on social media;” “People have shown me a racist image on social media”), and three items on perceived vicarious social media racial discrimination (e.g., “People have cracked jokes about people of my race or ethnic group on social media;” “People have said things that were untrue about people in my race or ethnic group on social media”). Responses range from (0) “never” to (4) “almost daily” based on a 5-point Likert scale. This scale has been found to be reliable among Asian, black, and Latinx adolescent samples, with Cronbach’s α ranging from 0.66 to 0.92 (Tynes et al., 2010, 2020). In the current study, for individual social media racial discrimination subscale, Cronbach’s $\alpha = 0.85$ for total sample, 0.81 for Asian, 0.83 for black, 0.81 for Indigenous, 0.79 for Latinx; For vicarious social media racial discrimination subscale, Cronbach’s $\alpha = 0.81$ for the total sample, 0.86 for Asian, 0.84 for black, 0.86 for Indigenous, 0.77 for Latinx).

Depressive symptoms

The 20-item Center for Epidemiologic Studies Depression Scale (CES-D) was used to assess the frequency of past-month experiences with depressive symptoms (Radloff, 1977). The CES-D scale taps depressed affect (e.g., I felt depressed), somatic complaints (e.g., I could not get “going”), interpersonal difficulties (e.g., People were unfriendly), and positive affect (e.g., I enjoyed life). Responses were provided on a 4-point scale, anchored by (0) “rarely or none of the time” and (3) “most or all of the time.” Composite scale scores were computed by the sum of the responses to the items. The scale shows good internal consistency (Cronbach’s $\alpha = 0.90$) among black adolescents, and a meta-analysis found the same factor structure of the CES-D across Indigenous, black, Latinx, Asian and non-Hispanic white, aged 12–102 years old (Kim et al., 2011; Lu et al., 2017). The scale had good inter-item reliability (Cronbach’s $\alpha = 0.91$ for the total sample, 0.91 for Asian, 0.87 for black, 0.91 for Indigenous, 0.92 for Latinx) for the current study.

Anxiety symptoms

The 7-item Generalized Anxiety Disorder Screener (GAD-7; Spitzer et al., 2006) was used to assess participants’ experience of anxiety symptoms in the past month. Sample items include “Being so restless that it is hard to sit still” and “Feeling afraid as if something awful might happen.” Responses will be provided on a 4-point scale, anchored by (0) “not at all” and (3) “nearly every day.” Composite scale scores were computed by the sum of responses to the items. The reliability (Cronbach’s $\alpha = 0.91$) and validity of GAD-7 among adolescents aged 12–18 years old from diverse racial/ethnic backgrounds have been demonstrated (Mossman et al., 2017; Tiirikainen et al., 2019). The scale had good inter-item reliability (Cronbach’s $\alpha = 0.89$ for the total sample, 0.89 for Asian, 0.87 for black, 0.93 for Indigenous, 0.89 for Latinx) for the current study.

Alcohol use disorder

Alcohol Use Disorders Identification Test (AUDIT; Babor et al., 2001) is a 10-item screening tool developed by the World Health Organization (WHO) to assess alcohol use and related problems, e.g., “How often during the past year have you had a feeling of guilt or remorse after drinking?” Response options ranged from 0 “never” to 4 “4 or more times a week” and were added up for final score calculation. For adolescents, a final score of 4 is a cutoff for alcohol abuse or dependence (Knight et al., 2003). Reliability of AUDIT has been supported by research on adolescents aged 12–18 years old self-identified as black (70%), Latinx

(15%), multiracial (12%), and Indigenous (3%) (Cronbach's alpha = 0.91; Banks et al., 2019). The scale had good inter-item reliability (Cronbach's alpha = 0.87 for the total sample, 0.82 for Asian, 0.92 for black, 0.91 for Indigenous, 0.88 for Latinx) for the current study.

Illicit drug use and problems

Two items were used to identify illicit drug use and problems. The first item assessed "During the past month, how often have you used one or more of the drugs listed above?" Drugs listed included Cannabis, Cocaine, prescription stimulants, Methamphetamine, inhalants, sedatives or sleeping pills, hallucinogens, street opioids, and prescription opioids. Response options ranged from (0) "Never" to (3) "Daily or almost daily." The second item was drawn from the NIDA ASSIST scale (NIDA, 2012; Oga et al., 2020) to assess drug use problems by asking, "During the past month, how often has your use of the drugs listed below led to health, social, legal or financial problems?" The same types of drugs as item one were listed, and responses also ranged from (0) "Never" to (3) "Daily or almost daily."

Data Analysis

Descriptive statistics were calculated to describe the sample demographics, social media use, social media racial discrimination experiences, and mental health indices. χ^2 and analysis of variance (ANOVA) tests with Tukey's post hoc

comparison were conducted to examine racial differences on demographics and all studied variables. As a prerequisite of structural equation modeling (SEM) analysis, bivariate correlations among demographics and all studied variables were calculated, and Bonferroni correction was applied to adjust significance levels of Pearson's correlations. To examine the research hypotheses, SEM with the maximum likelihood (ML) method was adopted with R-4.0.1 and the package "lavaan" (R Core Team, 2020; Rosseel et al., 2017). Two SEM analyses were conducted to examine the indirect paths of social media use on mental health through the endogenous latent variables of individual social media racial discrimination (Fig. 1) and vicarious social media racial discrimination (Fig. 2). Both analyses included: (a) the same exogenous variables: hours of social media use, social media intergroup contact and social media racial justice civic engagement (with the exception of hours of social media use, all were exogenous latent variables predicted by scale (subscale) items); (b) four outcome variables including depressive symptoms, anxiety, alcohol use disorder, and illicit drug use problems. An alternative SEM model was then adopted to examine the mediating effect of mental health and substance use on the relationship between social media racial discrimination with social media use. Covariates included in SEM analyses were chosen based on previous research and significant associations between those variables and mental health indices. The goodness of fit indices for both primary and alternative SEM analyses included the comparative fit index (CFI), Tucker-Lewis

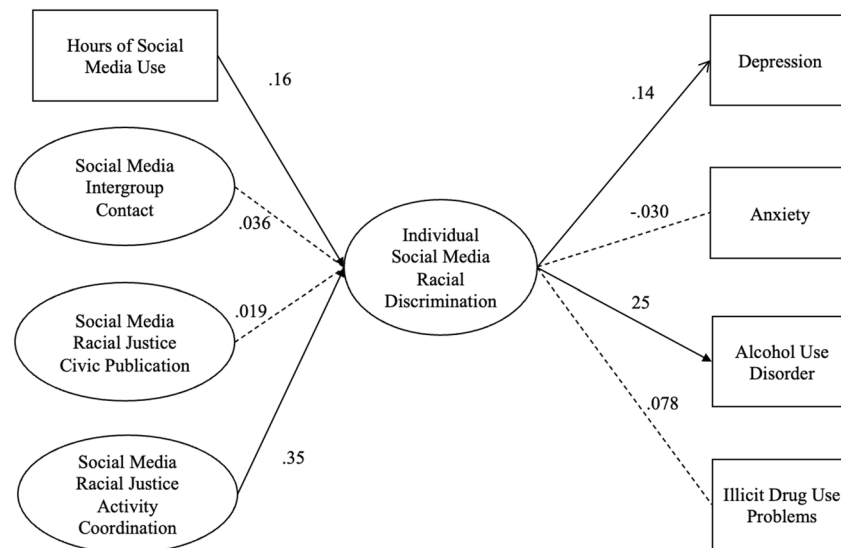


Fig. 1 Standardized results for structural equation model with bootstrapping approach testing the mediating effect of individual social media racial discrimination on the association between social media use with mental health. Results were statistically significant based on the 95% confidence interval. Covariates included race/ethnicity, age, financial insecurity, COVID-19-related worry and frequency of seeing

friends outside the home. For presentation purpose, direct effects of hours of social media use on depressive symptoms ($\beta = 0.15$, 95% CI [0.014, 0.065]) and anxiety ($\beta = 0.14$, 95% CI [0.005, 0.020]), and direct effects of social media racial justice civic publication on depressive symptoms ($\beta = 0.14$, 95% CI [0.096, 3.66]) and anxiety ($\beta = 0.16$, 95% CI [0.16, 1.86]) were omitted

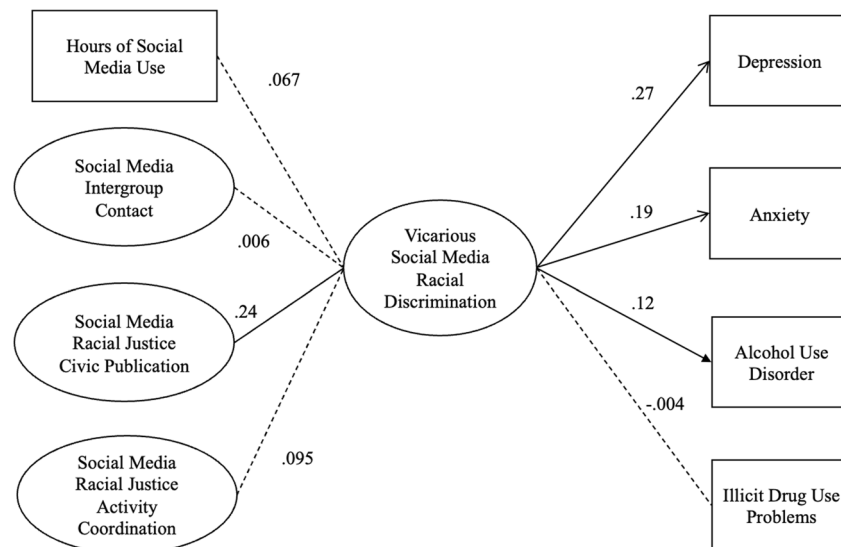


Fig. 2 Standardized results for structural equation model with bootstrapping approach testing the mediating effect of vicarious social media racial discrimination on the association between social media use with mental health. Results were statistically significant based on the 95% confidence interval. Covariates included race/ethnicity, age, financial insecurity, COVID-19-related worry and frequency of seeing

friends outside the home. For presentation purpose, direct effects of hours of social media use on depressive symptoms ($\beta = 0.16$, 95% CI [0.015, 0.065]) and anxiety ($\beta = 0.13$, 95% CI [0.003, 0.027]), and direct effects of social media racial justice activity coordination on illicit drug use ($\beta = 0.22$, 95% CI [0.047, 0.26]) and alcohol use disorder ($\beta = 0.18$, 95% CI [0.019, 0.21]) were omitted

Index (TLI), and the root-mean-square error of approximation (RMSEA). A fit of >0.90 (0.95) for the CFI and TLI and <0.06 for RMSEA were considered to indicate adequate fit (Hu & Bentler, 1999). To test the indirect effects for statistical significance, we adopted the bias-corrected bootstrapping approach as the normal distribution assumption of data for the conventional Delta test was violated (MacKinnon & Luecken, 2008). One thousand re-samples were drawn to estimate the standard errors of the indirect effects and their 95% confidence intervals.

Results

Demographic Data

Frequency, percentages, and χ^2 analyses for differences among racial/ethnic groups for demographic data are provided in Table 1. There were 407 participants aged 15–18 years ($M = 16.47$, $SD = 0.93$), self-identified as East or Southeast Asian (27.52%), black (28.26%), Indigenous (19.41%), and Latinx (24.82%). For the total sample, the majority were girls ($N = 335$, 82.31%). Few ($N = 19$, 4.67%) youth identified as gender or sexual minority. Participants were from different geographical regions (35.63% of South; 29.73% of West; 17.94% of Midwest; and 16.71% of Northeast). Although the majority were taking all their classes online and were either unemployed or worked at home fully online, approximately 70% reported

having seen friends outside the home during the past month (mean number of days = 7.48, $SD = 8.49$, range = 0–28). The majority had a primary guardian who was full- or part-time employed and reported their families were financially “comfortable” or had “just enough.” For subsequent analyses, “My family has just enough money,” and “My family is financially comfortable” were combined as “financially secure” and compared with youth who responded, “My family can’t make ends meet” (“financially insecure”). About one-third of primary guardians had not finished high school. Missing data on primary guardian employment status ($N = 24$) and education levels ($N = 31$) were not included in later bivariate analyses involving these two variables. Ten percent reported they or a family member had had COVID-19 during the past month. On average, participants sometimes worried they might become infected ($M = 1.83$, $SD = 1.19$, range = 0–4). The majority indicated they had none of the 8 CDC-identified COVID-19 preexisting health risks ($M = 0.49$, $SD = 1.12$, range = 0–8); the most common were asthma (17.94%), obesity (8.35%) and a heart condition (6.79%). As indicated in Table 1, χ^2 tests indicated that the distribution of geographic regions of each racial/ethnic group was different, Asians and Latinx were more likely to be recruited from the South, blacks were more likely to reside in South, and only 6.33% Indigenous youth resided in Northeast. Compared with other groups, Indigenous adolescents were less likely to be taking classes fully online and to report lower rates of financial security. Asian respondents, compared to other

Table 1 Frequency, percentages, and χ^2 test results for demographic items and mental health based on race/ethnicity

	Asian <i>N</i> = 112	Black <i>N</i> = 115	Indigenous <i>N</i> = 79	Latinx <i>N</i> = 101	Total <i>N</i> = 407	χ^2 (df)	<i>p</i>
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)		
<i>Age</i>						15.01 (9)	0.08
15	22 (19.64)	22 (19.13)	13 (16.46)	9 (8.91)	66 (16.22)		
16	39 (34.82)	41 (35.65)	22 (27.85)	40 (39.60)	142 (34.89)		
17	42 (37.50)	34 (29.57)	26 (32.91)	38 (37.62)	140 (34.40)		
18	9 (8.04)	18 (15.65)	18 (22.78)	14 (13.86)	59 (14.50)		
<i>Grade</i>						32.31 (9)	<0.001
10th or less	28 (25.00)	30 (26.09)	21 (26.58)	16 (15.84)	95 (23.34)		
11th	35 (31.25)	35 (30.43)	26 (32.91)	42 (41.58)	138 (33.91)		
12th	49 (43.75)	50 (43.48)	26 (32.91)	43 (42.57)	168 (41.28)		
Not in school/college	0 (0.00)	0 (0.00)	6 (7.59)	0 (0.00)	6 (1.47)		
<i>Geographical region</i>						73.08 (9)	<0.001
Northeast	30 (26.79)	14 (12.17)	5 (6.33)	19 (18.81)	68 (16.71)		
Midwest	12 (10.71)	26 (22.61)	19 (24.05)	16 (15.84)	73 (17.94)		
South	23 (20.54)	66 (57.39)	30 (37.97)	26 (25.74)	145 (35.63)		
West	47 (41.96)	9 (7.83)	25 (31.65)	40 (39.60)	121 (29.73)		
<i>Remote learning status</i>						21.00 (6)	0.002
In person	7 (6.25)	9 (7.83)	16 (20.25)	9 (8.91)	41 (10.07)		
Hybrid	19 (16.96)	11 (9.57)	16 (20.25)	9 (8.91)	55 (13.51)		
Online	86 (76.79)	95 (82.61)	47 (59.49)	83 (82.18)	311 (76.41)		
<i>Youth employment status</i>						18.49 (9)	0.03
Unemployed	103 (91.96)	93 (80.87)	57 (72.15)	84 (83.17)	337 (82.80)		
Work at home fully online	4 (3.57)	8 (6.96)	4 (5.06)	4 (3.96)	20 (4.91)		
Hybrid working	0 (0.00)	3 (2.61)	5 (6.33)	5 (4.95)	13 (3.19)		
Work outside the home	5 (4.46)	11 (9.57)	13 (16.46)	8 (7.92)	37 (9.09)		
<i>Have seen friends outside the home during the past month</i>	80 (71.43)	85 (73.91)	66 (83.54)	72 (71.29)	303 (74.45)	0.80 (3)	0.85
<i>Primary guardian education level (valid N = 376)</i>						32.62 (9)	<0.001
High school graduate or less	37 (38.14)	54 (50.00)	42 (56.76)	69 (71.13)	202 (53.72)		
Some college (at least one year)	21 (21.65)	24 (22.22)	14 (18.92)	15 (15.46)	74 (19.68)		
Graduate degree	39 (40.21)	30 (27.78)	18 (24.32)	13 (13.40)	100 (26.60)		
<i>Primary guardian employment status (valid N = 383)</i>						22.12 (6)	0.001
Unemployed	12 (10.71)	17 (14.78)	22 (27.85)	20 (19.80)	71 (17.44)		
Employed	96 (85.71)	86 (74.78)	50 (63.29)	80 (79.21)	312 (76.66)		
I don't know	4 (3.57)	12 (10.43)	7 (8.86)	1 (0.99)	24 (5.90)		
<i>Financial insecurity</i>						17.83 (6)	0.007
We can't make ends meet	4 (3.57)	9 (7.83)	12 (15.19)	10 (9.90)	35 (8.60)		
We have just enough	49 (43.75)	59 (51.30)	37 (46.84)	61 (60.40)	206 (50.61)		
We are comfortable	59 (52.68)	47 (40.87)	30 (37.97)	30 (29.70)	166 (40.79)		
<i>Self/family members have had COVID-19 in the past month</i>	5 (4.46)	11 (9.57)	10 (12.66)	15 (14.85)	41 (10.07)	7.05 (3)	0.07
<i>Preexisting COVID-19 health risks</i>							
Asthma or chronic lung disease	12 (10.71)	27 (23.48)	24 (30.38)	10 (9.90)	73 (17.94)	19.11 (3)	<0.001
Obesity	4 (3.57)	8 (6.96)	15 (18.99)	7 (6.93)	34 (8.35)	15.58 (3)	0.001
Heart condition	7 (6.25)	9 (7.83)	8 (10.13)	2 (1.98)	26 (6.39)	5.53 (3)	0.14

Table 1 (continued)

	Asian N = 112 Frequency (%)	Black N = 115 Frequency (%)	Indigenous N = 79 Frequency (%)	Latinx N = 101 Frequency (%)	Total N = 407 Frequency (%)	χ^2 (df)	p
<i>Clinical cutoff score for depression (CES-D > 22)</i>	23 (20.54)	19 (16.52)	31 (39.24)	32 (31.68)	105 (25.80)	16.07 (3)	0.001
<i>Severe anxiety score (GAD-7 > 14)</i>	22 (19.64)	23 (20.00)	27 (34.18)	31 (30.69)	103 (25.31)	8.45 (3)	0.038
<i>Alcohol use disorder (AUDIT)</i>						22.77 (6)	0.001
Low risk (=0)	97 (86.61)	93 (80.87)	47 (59.49)	72 (71.29)	309 (75.92)		
Moderate risk (1–4)	12 (10.71)	15 (13.04)	20 (25.32)	20 (19.80)	67 (16.46)		
High risk (>4)	3 (2.68)	7 (6.09)	12 (15.19)	9 (8.91)	31 (7.62)		
<i>Illicit drug use problems</i>						21.83 (6)	0.001
Have not been used drugs	92 (82.14)	81 (70.43)	45 (56.96)	73 (72.28)	291 (71.50)		
Have used drugs but without problems	15 (13.39)	18 (15.65)	20 (25.32)	23 (22.77)	76 (18.67)		
Drug use has led to any health, social, legal, or financial problem	5 (4.46)	16 (13.91)	14 (17.72)	5 (4.95)	40 (9.83)		

groups, reported significantly higher rates of financial security and a primary guardian with a graduate degree. Latinx youth reported their primary guardians had significantly lower education levels than that reported by other groups, while Asian youth reported the highest primary guardian education levels. Black and Indigenous participants reported the highest rates of asthma; Indigenous reported higher rates of obesity, while Asians reported the lowest rates of obesity. No other racial/ethnic group differences emerged.

Social Media Use and Social Media Racial Discrimination

Means, SDs, percentages, and results of statistical comparison tests for social media use, individual and vicarious social media racial discrimination are shown in Table 2. On average youth spent 57.93 (SD = 47.89) hours per week on social media. Most youth had experienced at least one individual (79.12%) and at least one vicarious (94.35%) form of social media racial discrimination. Results of ANOVA with Tukey's post hoc comparison found that black respondents reported more hours of social media use per week than Asian and Latinx respondents. Asian respondents reported significantly higher levels of social media intergroup contact than black and Latinx youth. Asian and Indigenous youth reported significantly lower levels of civic participation than Latinx youth and lower levels of activity coordination than black youth. The only racial/ethnic difference in social media racial discrimination composite scores was between black and Latinx adolescents, with black youth reported significantly higher frequencies of vicarious social media racial discrimination than their Latinx peers.

Mental Health Indices

Overall, respondents had higher prevalence rates on all mental health indices than prior nationally representative adolescent population surveys (see Table 1). For depressive symptoms, 25.80% of respondents met screening criteria for clinical depression on the CES-D compared to 15.7% in the general adolescent population in 2019 (Cuijpers et al., 2008; SAMSHA, 2020). The percent meeting screening criteria for severe anxiety on the GAD-7 in the current sample (25.31%) was also higher than the national anxiety diagnosis rate (10.5%) among adolescents (Ghandour et al., 2019; Spitzer et al., 2006). The AUDIT score was converted into three levels: 0 = low risk (score 0), 1 = moderate risk (score 1–4), and 2 = high risk (score > 4). Even though the majority (75.92%) of respondents scored 0 on AUDIT, the alcohol use disorder prevalence rate (7.62%) based on the AUDIT cutoff score of 4 was also higher than the 1.7% among adolescents in 2019 (Liskola et al., 2018; SAMSHA, 2020). Past month illicit drug use among the current sample (29.50%) was also higher than the overall illicit drug use rate (17.2%) among adolescents in 2019 (SAMSHA, 2020). Among those using illicit drugs, around 35% had experienced a health, social, legal, or financial problem in the past month. Means, SDs, percentages, and results of statistical comparison tests for mental health indices are shown in Table 2. Both χ^2 analyses and MANOVA on mental health indices indicated Indigenous youth reported significantly higher risks of depressive and anxiety symptoms and AUD than black and Asian participants and higher rates of illicit drug use problems than Asian and Latinx participants (see Tables 1 and 2). No other racial/ethnic differences emerged.

Table 2 Means, SDs, percentages, and comparison test results for social media use, social media racial discrimination, and mental health based on race/ethnicity

	Asian N = 112 M (SD)	Black N = 115 M (SD)	Indigenous N = 79 M (SD)	Latinx N = 101 M (SD)	Total N = 407 M (SD)	F(3, 403)	p
Hours of social media use per week ^a	48.06 (42.44)	68.98 (56.4)	65.87 (51.33)	50.07 (35.6)	57.93 (47.89)	5.43	0.001
Intergroup contact ^b	2.15 (0.64)	1.76 (0.69)	1.88 (0.67)	1.75 (0.65)	1.89 (0.68)	8.8	<0.001
Racial justice civic publication ^c	1.78 (1.72)	2.38 (1.88)	1.73 (1.76)	2.48 (2.12)	2.11 (1.90)	4.28	0.005
Racial justice activity coordination ^d	0.99 (1.28)	1.6 (1.66)	1.01 (1.32)	1.39 (1.58)	1.27 (1.50)	4.23	0.006
Individual social media racial discrimination ^e	0.7 (0.79)	0.92 (1.01)	0.97 (0.95)	0.72 (0.79)	0.82 (0.89)	2.4	0.068
Vicarious social media racial discrimination ^f	1.84 (1.12)	2.11 (1.23)	1.92 (1.17)	1.64 (1.03)	1.88 (1.15)	3.03	0.029
Depression (CES-D) ^g	15.31 (9.16)	15.20 (8.06)	20.28 (10.47)	16.98 (10.42)	16.66 (9.63)	5.54	0.001
Anxiety (GAD-7) ^h	8.77 (5.25)	8.41 (5.52)	11.11 (6.29)	10.15 (5.72)	9.5 (5.73)	4.64	0.003
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	χ^2 (df)	p
At least one type of individual social media racial discrimination	88 (78.57)	93 (80.87)	63 (79.75)	78 (77.23)	322 (79.12)	0.47 (3)	0.92
At least one type of vicarious social media racial discrimination	108 (96.43)	112 (97.39)	70 (88.61)	94 (93.07)	384 (94.35)	8.10 (3)	0.044

^aRange = 6–192 for each racial/ethnic group

^bRange = 0.4–3 for Asian, 0.2–3 for black and Latinx, 0–3 for Indigenous

^cRange = 0–6 for each racial/ethnic group

^dRange = 0–5.33 for Asian, 0–6 other racial/ethnic groups

^eRange = 0–3.5 for Asian, 0–4 for other racial/ethnic groups

^fRange = 0–4 for each racial/ethnic group

^gRange = 0–39 for Asian and black, 4–42 for Indigenous, 0–47 for Latinx

^hRange = 0–21 for each racial/ethnic group

Main SEM Analyses

Since prior research did not suggest differences in the hypothesized relationships among variables for the four different racial/ethnic groups, and youth of color from different racial/ethnic groups indicate modest differences in terms of social media use, social media racial discrimination, and mental health and substance use, all four groups were collapsed for the SEM analyses. Prior to the SEM analyses, bivariate correlation analyses were examined to identify significant statistical associations between potential covariates and mental health indices (see Table 3). In addition to the hypothesized predictors, the following covariates were included in the SEM: (a) for all four mental health and substance use indices: race/ethnicity and financial insecurity; (b) worry about COVID-19 infection for depressive symptoms and anxiety; (c) age and frequency of seeing friends outside the home for alcohol use disorder and illicit drug use problems. Discriminant validity of latent constructs (i.e., racial justice civic publication, activity coordination, intergroup contact, and individual and vicarious racial discrimination) was supported by average variance extracted (AVE) ranged from 0.50 to 0.87 (>0.50;

Fornell & Larcker, 1981). The first SEM model (Fig. 1), which posited individual social media racial discrimination as the mediator of the effect of three types of social media use on depressive and anxiety symptoms, alcohol use disorder, and illicit drug use problems, showed a good fit (CFI = 0.96, TLI = 0.94, and RMSEA = 0.041, 90% CI [0.034, 0.047]). The second SEM model (Fig. 2) examining whether vicarious social media racial discrimination mediated the effect of three types of social media use on depressive symptoms, anxiety, alcohol use disorder, and illicit drug use problems yielded a good fit (CFI (0.95), TLI (0.94), and RMSEA (0.043, 90% CI [0.036, 0.050]).

The first hypothesis was partially supported (see Figs. 1 and 2). Hours of social media use and racial justice activity coordination were positively associated with individual social media racial discrimination, but not vicarious discrimination. Racial justice civic publication was positively associated with vicarious racial discrimination, but not individual discrimination. Social media intergroup contact was unrelated to both types of racial discrimination. For the second and third hypotheses, hours of social media use had direct effects on depressive symptoms and anxiety. Neither individual nor vicarious racial discrimination mediated the

Table 3 Correlations among study variables and covariates

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Hour of social media use	1														
2. Social media intergroup contact	-0.02	1													
3. Social media civic engagement civic publication	0.08	0.11*	1												
4. Social media civic engagement activity coordination	0.06	0.08	0.68***	1											
5. Individual social media racial discrimination	0.19***	0.05	0.30***	0.39***	1										
6. Vicarious social media racial discrimination	0.16**	0.03	0.30***	0.27***	0.60***	1									
7. Depression	0.24***	0.05	0.23***	0.22***	0.32***	0.52***	1								
8. Anxiety	0.20***	0.07	0.22***	0.21***	0.20***	0.23***	0.75***	1							
9. Alcohol use disorder	0.13*	0.00	0.12*	0.22***	0.30***	0.15**	0.24***	0.16**	1						
10. Illicit drug use problems	0.12*	0.01	0.16**	0.22***	0.20***	0.076	0.23***	0.16***	0.41***	1					
11. Financial insecurity	0.10*	0.09	0.061	0.07	0.09	0.021	0.15**	0.14***	0.12*	0.16***	1				
12. Worry associated with COVID-19 infection	-0.02	0.01	0.17***	0.18***	0.20***	0.033	0.20***	0.17**	0.06	0.02	-0.01	1			
13. Seen friends outside the home frequency	0.02	0.08	-0.02	0.04	0.09	-0.03	0.00	0.01	0.18***	0.20***	-0.00	0.0	1		
14. Age	0.02	0.00	-0.02	0.05	0.10*	0.10*	0.08	0.01	0.19***	0.16**	0.02	0.12*	-0.00	1	
15. Geographical region	-0.03	-0.02	-0.003	-0.03	0.01	0.07	0.001	-0.03	-0.02	0.007	0.03	0.04	-0.03	0.02	1

* $p < 0.05$, ** $p < 0.003$, *** $p < 0.001$

effect of hours of social media use on mental health indices. Social media racial justice civic publication had significant indirect effects on depressive symptoms ($\beta = 0.065$, 95% CI [0.14, 1.58]), anxiety ($\beta = 0.044$, 95% CI [0.036, 0.55]), and alcohol use disorder ($\beta = 0.027$, 95% CI [0.001, 0.037]), which were mediated by vicarious racial discrimination in model 2. Social media racial justice activity coordination had a significant direct effect on illicit drug use. It also had significant indirect effects on depressive symptoms ($\beta = 0.048$, 95% CI [0.063, 1.37]) and alcohol use disorder ($\beta = 0.087$, 95% CI [0.014, 0.11]) through individual social media racial discrimination without direct effects. Intergroup contact had no effects on depressive symptoms, anxiety, alcohol use disorder, or illicit drug use problems.

Alternative SEM Analyses

Since the association between social media use with mental health and substance use among youth of color may be bi-directional, two exploratory SEM analyses were adopted to examine whether individual and vicarious social media racial discrimination increase mental health risk among youth of color, which in turn further increase their social media use. Due to the strong association between depressive symptoms and anxiety ($r = 0.75$), only depressive symptom was included in the model as one of the mediators. Same covariates were included as in the main models to predict mental health indices. The first model with individual racial discrimination as the exogenous variable showed a good fit (CFI = 0.93, TLI = 0.91, and RMSEA = 0.050, 90% CI [0.044, 0.056]). Individual racial discrimination had significant direct effects racial justice civic publication ($\beta = 0.15$, 95% CI [0.003, 0.023]) and activity coordination ($\beta = 0.33$, 95% CI [0.20, 0.57]), but not hours of social media use nor intergroup contact. Depressive symptoms fully mediated the effect of individual racial discrimination on hours of social media use ($\beta = 0.038$, 95% CI [0.53, 3.94]) and partially mediated the effect on racial justice civic publication ($\beta = 0.038$, 95% CI [0.010, 0.079]). Illicit drug use problems partially mediated the effect of individual racial discrimination on racial justice activity coordination ($\beta = 0.34$, 95% CI [0.005, 0.08]). None of the other mediating effects were significant.

The second model with vicarious racial discrimination as the exogenous variable also showed a good fit (CFI = 0.92, TLI = 0.90, and RMSEA = 0.054, 90% CI [0.048, 0.060]). Vicarious racial discrimination had significant direct effects on racial justice civic publication ($\beta = 0.27$, 95% CI [0.16, 0.44]) and activity coordination ($\beta = 0.22$, 95% CI [0.16, 0.36]), but not hours of social media use nor intergroup contact. Depressive symptoms fully mediated the effect of vicarious racial discrimination on hours of social media use

($\beta = 0.058$, 95% CI [0.97, 4.70]) and partially mediated the effect on racial justice civic publication ($\beta = 0.040$, 95% CI [0.001, 0.094]). None of the other mediating effects were significant. Alternative SEM models thus indicate that depressive symptoms mediated the effect of individual and vicarious social media racial discrimination on hours of social media use and racial justice civic publication, and illicit drug use problems mediated the effect of individual social media racial discrimination on racial justice activity coordination.

Discussion

Although the negative impact of offline racial discrimination on Asian, black, Indigenous and Latinx youth development has been documented (Benner et al., 2018), to date, most studies on social media have been conducted with non-Hispanic white youth. The present study begins to address the current gap in our understanding of how social media racial discrimination may be impacting the psychological wellbeing of youth of color. Prior studies have also uncovered both the benefits and risks of adolescent offline civic engagement (Ballard et al., 2019). The present study contributes to this literature by examining how online civic engagement in issues of social justice is associated with exposure to social media racial discrimination with consequences for mental health and substance use among youth of color.

The present study provided evidence on the extent to which youth of color are experiencing social media racial discrimination and online activities most associated with those experiences. Most (94%) adolescents in the sample have experienced vicarious social media racial discrimination, and 79% have experienced individual social media racial discrimination, that were higher than most previous reports (e.g., Tynes et al., 2020). Although all racial groups reported high levels of social media racial discrimination, reports were significantly higher among black youth. The extent to which vulnerability to social media racial discrimination among black adolescents is specific to an increase in racial biases emerging during the COVID-19 and racial justice movement or are indicative of longer-term trends is a critical subject for future studies.

Across racial groups, overall social media use frequency was associated with individual social media racial discrimination, but not vicarious discrimination, which is inconsistent with the intuition that the more time youth spent on social media, the more they will be exposed to racial discrimination against their racial group members through news/posts. However, it is possible that as long as youth open the social media platforms once a day, they would be pushed racial justice related news/posts by

platforms because those were daily hit topics (Teixeira da Silva, 2020; Dixon & Dundes, 2020). Since the minimum days of social media use in the current sample was 5 days per week, there may be no significant differences of exposure between 5 and 7 days a week. This is supported by the high rate (94%) of exposure to vicarious racial discrimination in the current sample. On the other hand, the association between frequency of social use and individual social media racial discrimination relies on the active interaction between social media users. Those who spent more time on social media had higher chances of interacting with other users, subjecting them to individual discrimination.

Youth of color who engaged in more racial justice civic publication only reported significantly higher risk of vicarious social media racial discrimination, and reversely, those who engaged more in racial justice activity coordination only reported higher risk of individual social media racial discrimination. These findings are inconsistent with studies evidencing positive effects of offline civic engagement among non-Hispanic white youth (Ballard et al., 2019). However, past research on social media algorithm prioritization provides insight into the association between social media racial justice civic publication and social media racial discrimination. Youth of color who are interested in racial justice news are more likely to view, search, and been recommended both positive and negative racial messaging on social media (Lim & Alrasheed, 2021). Yet viewing and sharing racial justice news/posts may not place them at higher risk of individual social media racial discrimination due to the lack of personally directed information and active communication with other users in their viewing/sharing behaviors. On the contrary, actively coordinating racial justice activities on social media exposed youth of color's personal identities to the public and required active interactions with anonymous users, which may not further increase their exposure to vicarious discrimination but provide an opportunity for racially motivated individual cyberbullying (Barlett et al., 2016). Inconsistent with data on the positive association between offline neighborhood racial intergroup diversity and discrimination, online intergroup contact was unrelated to social media racial discrimination (Assari & Caldwell, 2018). A potential explanation is that, unlike offline neighborhood diversity, online social media contact is more flexible and controlled by users who can block unfriendly outgroup members.

Adolescents have been found to be especially vulnerable to mental health impacts of racism (Benner et al., 2018). Prior research has shown that exposure to racial discrimination during adolescence period led to onset of mental health and substance use problems during young adulthood, further compromising life quality during mid-adulthood (Yang et al., 2019). This study identifies social

media racial discrimination as a contributor to mental health risk among youth of color (Tynes et al., 2020). Social media racial discrimination, both individual and vicarious, was significantly associated with depressive symptoms, anxiety, and alcohol use disorder. Individual and vicarious social media racial discrimination fully explained the associations between different forms of online racial justice activities and mental health indices, although slight differences in these associations emerged. However, our exploratory analysis provided a possible alternative explanation for the positive association between social media civic engagement and mental health indices. Exposure to individual and vicarious social media racial discrimination placed youth of color at higher risks of depressive symptoms or illicit drug use problems, which increased their social media racial justice civic publication or activity coordination as coping mechanism. Although no causal interpretation can be made for this cross-sectional study, such results highlight the potential detrimental impact of social media racial discrimination on mental health among youth of color, which may reverse the previous identified protective effect of civic engagement on youth development (Ballard et al., 2019).

Consistent with previous research, more hours spent on social media were related to more depressive symptoms, anxiety, and substance use (Riehm et al., 2019). Social media racial discrimination did not explain the significant association between hours spent on social media and these mental health indices. The alternative model in this study provides a potential explanation for such association: those who have experienced more individual and vicarious social media racial discrimination were more likely to have mental health problems, which in turn increased their social media use frequency as coping for such distress.

A strength of the present study is the effort to disentangle the influence on mental health of three different components of social media usage: racial justice civic publication, activity coordination, and intergroup contact that have not been examined by prior literature on adolescent mental health. To our knowledge, this is the first study to identify positive associations among these different aspects of social media use, individual and vicarious social media racial discrimination, and mental health problems among youth of color. Another strength of this study is its representation of diverse groups of adolescents of color, especially Asian and Indigenous youth who have been notably absent from previous research on online racial discrimination. The anonymous nature of online studies and national reach enables recruitment of geographically diverse participants. However, a limitation of all online surveys is that despite our rigorous validation checks, identity cannot be verified. In addition, for this study recruitment was limited to youth who had previously registered for taking online surveys and thus may be different from adolescents who are not

registered with these recruitment sites. Future research may extend the sample to represent more adolescents of color using recruitment strategies that focus on more difficult to reach online populations. The majority of the current sample were females, which also limits the extent to which the results generalize to male and gender minority youth. SEM has increasingly been applied to cross-sectional studies (Girouard et al., 2021); however, interpretations regarding directionality are limited. Assumptions regarding directionality are also challenged by the main models and the alternative models tested with different directions of the effect that both explained the positive association between social media use and mental health indices among youth of color. Future research will benefit from longitudinal studies to examine the short and long-term effects of online social justice civic engagement on youth mental health development through increased exposure to social media racial discrimination, and the potential coping roles of social media civic engagement toward social media racial discrimination associated negative mental health outcomes. Finally, this study does not make assumptions that participants have or have not previously engaged in social media social justice civic engagement. The study is a snapshot taken during a specific period in time describing how social media civic engagement, social media racial discrimination, and mental health interacted with each other to influence mental health.

Conclusion

Social media is part of everyday life for most Asian, black, Indigenous, and Latinx adolescents. This study contributes to the small but growing body of research on the extent to which social media engagement has exposed youth of color to more racial discrimination messaging, and how such exposure may impact the mental health of this generation. Results indicate that individual social media racial discrimination fully mediated the relationship between racial justice civic publication and depressive and alcohol use disorder, and vicarious social media racial discrimination fully mediated the relationship between racial justice activity coordination with depressive symptoms, anxiety, and alcohol use disorder. Alternatively, depressive symptoms and illicit drug use mediated the relationship between individual or vicarious racial discrimination with social media use frequency and racial justice civic engagement. The findings underscore the mental health vulnerabilities of adolescent social media users of color when being exposed to individual and vicarious social media racial discrimination while actively engaging in online social justice activities. It also raises intriguing questions regarding the extent to which youth seek solace in racial justice civic

engagement in response to symptoms of depression, anxiety or substance use disorder due to perceived online racial discrimination. These findings call for strategies to mitigate the negative effects of social media racial discrimination on mental health in ways that support and not undermine adolescents' racial justice civic engagement. The present study also highlights the potential relevance of current public discourse on whether social media algorithms are amplifying exposure to racial bias in ways that jeopardize psychological wellbeing of adolescents of color.

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Compliance with Ethical Standards

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