Lifetime Asthma Prevalence and Correlates Among US Youths by Sexual Identity and Race/Ethnicity, 2009–2017

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Objectives. To comprehensively assess asthma disparities and identify correlates in youths at the intersections of sex, sexual identity, and race/ethnicity in the United States.

Methods. We obtained a diverse sample of youths (n = 307 073) from the Centers for Disease Control and Prevention's Youth Risk Behavior Survey. We pooled data across 107 jurisdiction-years (2009–2017). We calculated lifetime asthma prevalence by sexual identity, race/ethnicity, and their intersections—stratified by sex. We developed multivariable weighted logistic regression models to examine the impact of selected correlates on lifetime asthma prevalence.

Results. Lesbian, gay, and bisexual youths have significant disparities in asthma prevalence compared with heterosexual peers. Moreover, across sex, higher prevalence of lifetime asthma was seen for most sexual identity and race/ethnicity subpopulations (27 of 30) when compared with White heterosexual sex-matched participants. Selected traditional risk factors (overweight, obese, and smoking) and bullying tended to attenuate odds among groups, especially those with a minority sexual identity.

Conclusions. Asthma inequities at the intersection of sexual identity and race/ethnicity are substantive. Future studies should investigate the mechanisms contributing to these disparities to promote health equity among vulnerable youth populations. (*Am J Public Health.* 2020;110:1076–1083. doi:10.2105/AJPH.2020.305664)

According to the 2017 National Health Interview Survey, 25.2 million people in the United States live with asthma.[1] Asthma costs the United States $81 billion each year and is the leading cause of physical activity limitation in adults.[2] Moreover, people with asthma are at higher risk for developing other chronic diseases, including diabetes and coronary heart disease.[3] Asthma is the most common chronic disease in children with onset occurring at a median age of 10 years.[1,4,5] Asthma control issues lead to more than 10 million missed school days annually and frequent youth hospitalization.[2]

Given the deleterious health effects of asthma, understanding and combating youth asthma are key health priorities.[6] Hence, many studies have investigated asthma disparities. For instance, male youths are more likely to have asthma than females (9.5% vs 7.3%).[1] By race/ethnicity in the United States, Black youths have the highest burden of asthma.[7,8]

Among adults, a growing number of studies have found asthma prevalence disparities by sexual identity. Sexual identity refers to the labels individuals use to describe their romantic attractions, sexual attractions, or both. Commonly, individuals who describe themselves as gay, lesbian, or bisexual are termed sexual minorities (SMs). One regional study found SM adults to be significantly more likely to indicate clinician-diagnosed asthma than heterosexual adults.[9] Similar reports are frequent across single-site and national studies.[10–15] Despite findings in adult populations, analyses of asthma prevalence in SM youths (SMYs) are limited.[7] Data are found only in national Youth Risk Behavior Survey (YRBS) reports, which have found lifetime asthma prevalence among SM students to be 7 percentage points greater than among heterosexual students.[7] Our present study is, to our knowledge, the first examination of asthma disparities among youths by both sexual identity and race/ethnicity (SI/RE). We leveraged a pooled data set of geographically varied state and local administrations of the YRBS, resulting in a larger sample and more statistical power than previous analyses of the YRBS national data set have allowed.

Although asthma disparities among both SI/RE adult and race/ethnicity youth minority populations are well-studied, the factors contributing to these disparities and their manifestation in SMYs remain underexplored. The American Lung Association has identified several asthma risk factors affecting the general population: family history, viral respiratory infections, allergies, occupational exposures, smoking, air pollution, and obesity.[16] In addition, the literature has identified stress as an independent risk factor for asthma.[17–19] Previous work has shown associations between discrimination and asthma: Black children reporting discrimination are 78% more likely to report an asthma

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diagnosis than those not reporting discrimination.[17] Importantly, biological, individual, familial, and community facets of stress act to have a collective impact on asthma risk.[18] For example, posttraumatic stress disorder (individual-level) and psychosocial stress (individual-, familial-, and community-level) have been associated with biological-level changes in the immune system that could partially explain the association of stress with increased asthma prevalence.[18]

Whereas general stressors affect everyone, minority stress theory (MST) hypothesizes that stigmatization contributes to a higher stress burden that disparately affects the health of minority populations.[20,21] Within the application of MST to SM populations, Meyer describes how distal minority stressors like discrimination and bullying and proximal minority stressors like internalized homophobia contribute to poor mental health among minority populations.[20] Furthermore, minority stress processes result in a heightened overall stress burden, a risk factor for engaging in potentially harmful coping behaviors.[20] As described by Lick et al. in their extension of Meyer's model, MST-linked coping can manifest as changes across health behaviors that can contribute to both poor mental and physical health.[21] Literature supports this with the high prevalence of health-risk behaviors among SMYs, including smoking and behaviors that have an impact on weight (risk factors for asthma).[7] MST also captures the negative effects of persistent stress physiologically.[20,21]

Though MST explains how minority stress negatively affects minority health, it does not specifically consider this impact on individuals with multiple minority identities. Scholars have begun to apply intersectionality along with MST to examine how differences in social power affect the health of multiply marginalized populations.[22,23] As described by leading intersectionality scholar Crenshaw, intersectionality posits that experiences of marginalization occur at the intersections of multiply held marginalized identities: a Black woman experiences oppression not as a Black person and a woman but as a Black woman.[24] Informed by MST, unique relations to systems of power would lead to disparate health outcomes. Marginalized minority groups lack access to social power and are subject to oppression from dominant social systems. It is important to draw from intersectionality to make clear that poor health outcomes are caused by larger structures of discrimination rather than individual behaviors. In regard to asthma, many of the general risk factors are beyond the control of the individual. Still, existing discriminatory structures subject marginalized populations to risk factors through systematic limited access to care, poorer working conditions, and environmental racism.[25,26] Structures also include societal rhetoric and actions (e.g., bullying), which, in alignment with MST, can also drive health outcomes.[20,26]

As outlined, MST and intersectionality are imperative to studying disparities in marginalized populations. These frameworks form the basis for this study. Our objectives aimed to fill 4 gaps in the literature: (1) to identify the magnitude of lifetime asthma prevalence disparities between SMYs and heterosexual peers, (2) to describe lifetime asthma disparities at the intersection of SI/RE, (3) to test whether SI/RE minority disparities in lifetime asthma persist after controlling for traditional asthma risk factors (overweight, obesity, and smoking), and (4) to analyze an external stressor (bullying) as a potential mediator of SI/RE minority stress and asthma-related outcomes. On the basis of MST and intersectionality frameworks, we hypothesized that there would be higher rates of asthma in SMY populations; moreover, we hypothesized that SI/RE minority subpopulations would have elevated and differential asthma prevalences compared with their White heterosexual peers. When adjusting for traditional asthma correlates, we would expect an attenuation of odds. Within minority populations, we would expect odds of asthma and traditional asthma correlates to decrease further in models adjusted for bullying.

METHODS

The YRBS is a biennial, national survey conducted by the Centers for Disease Control and Prevention (CDC) to collect health data on students in grades 9 through 12.[27] We used data from local versions of the YRBS, which are administered to high schools on a state, territorial, tribal, and large urban school district level by departments of education or health. We pooled data across states and large, urban school districts, allowing us to access a larger sample size. Jurisdictions use a 2-stage cluster sample design to identify a representative sample of students. The YRBS is administered at different sites each year.[27]

Measures

Demographics. Sex was assessed by asking participants, "What is your sex?" The response options were male or female.

Sexual identity was assessed by asking participants, "Which of the following best describes you?" The response options were heterosexual (straight), gay or lesbian, bisexual, and not sure.

Race/ethnicity was assessed by asking participants if they identified as Hispanic or Latino (yes or no). Participants were then asked to select all races applying to them: American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, and White. For our analyses, these were combined into 4 race/ethnicity groups: White, Black, Hispanic/Latinx (regardless of reported race), and additional races (including Native Hawaiian or other Pacific Islander, American Indian or Alaska Native, Asian, or multiple races).

Participants who responded to both SI/RE questions were placed into 1 of 16 intersectional categories—a combination of (1) heterosexual, (2) gay or lesbian, (3) bisexual, and (4) not sure with (1) White, (2) Black, (3) Hispanic/Latinx, and (4) additional races.

Age was assessed by asking participants, "How old are you?" Response options included ages 12 to 18 years or older. Because of small sample size, students selecting an age of 12, 13, or 14 years were collapsed into "14 years old or younger."

Region was assessed by grouping jurisdictions on the basis of the 4 US Census regions: Northeast, Midwest, South, and West.

Traditional asthma risk factors. Smoking was assessed by asking participants, "Have you ever tried cigarette smoking, even one or two puffs?" Response options were yes and no.

Respondents were classified as normal, overweight, or obese based on body mass index (BMI) calculated by using participant-reported age, sex, height, and weight.[28] Individuals with a BMI less than 85th percentile were classified as normal; individuals with a BMI between 85th

percentile and less than 95th percentile were classified as overweight. Individuals with a BMI greater than or equal to 95th percentile were classified as obese.

Potential mediator. The MST-related variable, bullying, was assessed by asking participants, "During the past 12 months, have you ever been bullied on school property?" The response options were yes and no.

Primary outcome. The primary outcome, lifetime asthma, was assessed by asking participants, "Has a doctor or nurse ever told you that you have asthma?" Response options were yes, no, and not sure. "Not sure" respondents (4.73% [n = 15 152]) were dropped from all models.

Analytic Sample

We pooled local YRBS data across jurisdictions and years (biennially, 2009–2017). The data set consists of 56 jurisdictions across 5 time points and 523 829 youths. The current sample consists only of jurisdiction-years including both sexual identity and lifetime asthma measures (n = 107), representing 329 627 students. Students were excluded if they were missing any of the primary variables of interest (sexual identity: 3.28% [n = 10 824]; sex: 0.70% [n = 2296]; race/ethnicity: 3.21% [n = 10 569]; age: 0.27% [n = 884], not mutually exclusive), resulting in the final analytic sample of 307 073 participants.

Statistical Analyses

We analyzed data in 2019. We conducted all data cleaning and recoding in SAS version 9.4 (SAS Institute, Cary, NC). We used SAS-callable SUDAAN version 11.0.1 (RTI International, Research Triangle Park, NC) to appropriately weight estimates and account for the YRBS design.[27] The YRBS data weights adjust for student nonresponse and distribution of students by grade, sex, and race/ethnicity in each jurisdiction.

We calculated descriptive statistics for lifetime asthma and all other variables stratified by sex. We examined prevalence of lifetime asthma at the intersection of SI/RE by sex. We used multivariable weighted logistic regressions to estimate the adjusted odds of lifetime asthma at the intersection of SI/RE, by sex. The first model included demographic variables and survey year, and the subsequent models sequentially added

TABLE 1—Participant Demographics and Lifetime Asthma Among High School Youths: Youth Risk Behavior Survey, United States, 2009–2017

	Total, No. (%)	Male, No. (%)	Female, No. (%)
Overall	307 073 (100)	145 552 (49.97)	161 521 (50.03)
Demographics			
Sexual identity			
Heterosexual	266 411 (87.19)	132 782 (91.61)	133 629 (82.77)
Lesbian or gay	7 524 (2.34)	3 682 (2.52)	3 842 (2.16)
Bisexual	20 245 (6.60)	4 049 (2.99)	16 196 (10.22)
Not sure	12 893 (3.87)	5 039 (2.88)	7 854 (4.85)
Race/ethnicity			
White	113 617 (44.48)	54 730 (44.50)	58 887 (44.45)
Black	51 937 (15.12)	23 704 (14.70)	28 233 (15.54)
Hispanic/Latinx	93 209 (30.44)	43 701 (30.37)	49 508 (30.51)
Additional races	48 310 (9.96)	23 417 (10.42)	24 893 (9.50)
Age, y			
≤ 14	44 901 (11.80)	20 036 (11.03)	24 865 (12.57)
15	79 074 (25.55)	26 590 (25.50)	42 484 (25.60)
16	79 715 (25.30)	37 772 (25.35)	41 943 (25.25)
17	70 631 (23.58)	33 880 (23.47)	36 751 (23.70)
≥ 18	32 752 (13.76)	17 274 (14.65)	15 478 (12.87)
Region			
Northeast	116 799 (17.01)	54 344 (16.79)	62 455 (17.24)
Midwest	42 036 (17.89)	19 960 (17.95)	22 076 (17.84)
South	85 355 (40.52)	40 523 (40.49)	44 832 (40.56)
West	62 883 (24.57)	30 725 (24.78)	32 158 (24.36)
Sexual identity and race/ethnicity intersections			
Heterosexual			
White	101 094 (39.37)	50 673 (41.06)	50 421 (37.69)
Black	44 565 (12.89)	21 617 (13.35)	22 948 (12.44)
Hispanic/Latinx	79 365 (26.36)	39 489 (27.72)	39 876 (25.00)
Additional races	41 387 (8.56)	21 003 (9.49)	20 384 (7.64)
Lesbian or gay			
White	2 196 (0.87)	1 099 (0.89)	1 097 (0.84)
Black	1 718 (0.53)	709 (0.51)	1 009 (0.54)
Hispanic/Latinx	2 475 (0.74)	1 227 (0.83)	1 248 (0.65)
Additional races	1 135 (0.21)	647 (0.29)	488 (0.13)
Bisexual			
White	6 550 (2.72)	1 417 (1.38)	5 133 (4.07)
Black	3 559 (1.13)	609 (0.47)	2 950 (1.79)
Hispanic/Latinx	7 081 (2.13)	1 326 (0.86)	5 755 (3.40)
Additional races	3 055 (0.62)	697 (0.28)	2 358 (0.96)
Not sure			
White	3 777 (1.51)	1 541 (1.18)	2 236 (1.85)
Black	2 095 (0.57)	769 (0.37)	1 326 (0.77)
Hispanic/Latinx	4 288 (1.21)	1 659 (0.97)	2 629 (1.46)
Additional races	2 733 (0.57)	1 070 (0.36)	1 663 (0.78)

Continued

TABLE 1—*Continued*

	Total, No. (%)	Male, No. (%)	Female, No. (%)
Outcome			
Lifetime asthma			
Yes	74 228 (23.11)	36 572 (23.21)	37 656 (23.02)
No	217 693 (72.16)	100 892 (71.44)	116 801 (72.88)
Not sure	15 152 (4.73)	8 088 (5.35)	7 064 (4.10)
Correlates			
Body mass index[a]			
Normal	201 637 (69.39)	92 763 (67.31)	108 874 (71.47)
Overweight	45 243 (16.04)	20 440 (15.15)	24 803 (16.94)
Obese	37 769 (14.57)	22 390 (17.54)	15 379 (11.59)
Lifetime smoking			
Yes	69 909 (29.71)	34 195 (30.79)	35 714 (28.66)
No	159 881 (70.29)	73 266 (69.21)	86 615 (71.34)
Bullied at school			
Yes	52 294 (18.7)	21 713 (15.87)	30 581 (21.51)
No	249 910 (81.3)	121 115 (84.13)	128 795 (78.49)

[a]Body mass index (BMI) calculated by using participant-reported age, sex, height, and weight[28]: BMI < 85th percentile: normal; BMI = 85th percentile to < 95th percentile: overweight; BMI ≥ 95th percentile: obese.

covariates: overweight, obesity, smoking, and then bullying. Given their relative social privilege compared with SI/RE minority groups, we used White heterosexual males and females as the reference group within analyses.

RESULTS

The analytic sample had nearly equal proportions of males and females (Table 1). The majority identified as heterosexual (87.19%), with 2.34% identifying as gay or lesbian, 6.60% as bisexual, and 3.87% as not sure. The sample was diverse in race/ethnicity with 44.48% identifying as White, 15.12% as Black, 30.44% as Hispanic/Latinx, and 9.96% as additional races. These distributions align with previous literature.[29] In total, 23.11% of participants indicated lifetime asthma, which is higher than some estimates.[1] The sample was regionally diverse.

Lifetime Asthma Disparities by Sexual Identity

In unadjusted models, all SM males—gay (odds ratio [OR] = 1.33; 95% confidence interval [CI] = 1.07, 1.66), bisexual (OR = 1.34; 95% CI = 1.05, 1.70), and not sure (OR = 1.24; 95% CI = 1.02, 1.50)—were significantly more likely to report asthma compared with heterosexual males (Table 2). Gay or lesbian (OR = 1.99; 95% CI = 1.52, 2.61) and bisexual (OR = 1.56; 95% CI= 1.38, 1.75) females were significantly more likely to report asthma compared with heterosexual females.

Lifetime Asthma Disparities by Race/Ethnicity

Black males (OR = 1.54; 95% CI = 1.39, 1.70) and females (OR = 1.17; 95% CI = 1.06, 1.30) were significantly more likely to have been diagnosed with asthma compared with their White peers (Table 2). Hispanic/Latinx (OR = 0.82; 95% CI = 0.73, 0.91) and additional-race (OR = 0.84; 95% CI = 0.76, 0.94) females were less likely than were White females to report asthma.

Lifetime Asthma Disparities at the Intersections

Between unadjusted models (Table 2) and models adjusted for selected demographics (Tables 3 and Tables 4, model 1), there were no changes in OR significance. Among males, there were statistically significant associations between SI/RE subpopulations and asthma prevalence (Table 2; Table 3, model 1). Compared with White heterosexual males, Black heterosexual (adjusted OR [AOR] = 1.58; 95% CI = 1.43, 1.76), White gay (AOR = 1.71; 95% CI = 1.21, 2.43), Black bisexual (AOR = 2.52; 95% CI = 1.37, 4.64), and Black not sure (AOR = 1.55; 95% CI = 1.06, 2.26) males were all significantly more likely to report asthma, even after we controlled for demographics (Table 3, model 1).

More subpopulations were statistically significant for females (Table 2; Table 4, model 1). Black lesbian females were more than 2 times as likely to report asthma as White heterosexual females (AOR = 2.31; 95% CI= 1.45, 3.69), after we controlled for demographics (Table 4, model 1). Nearly all other SI/RE subpopulations were significantly more likely to report asthma when compared with White heterosexual females. However, 2 female SI/RE subpopulations were significantly less likely than White heterosexual females to report asthma: Hispanic/Latinx heterosexual (AOR = 0.73; 95% CI = 0.64, 0.83) and additional-races heterosexual (AOR = 0.84; 95% CI = 0.73, 0.97).

Lifetime Asthma Models With Known Correlates

Within the male model (Table 3, model 2), overweight (AOR = 1.21; 95% CI = 1.08, 1.35), obesity (AOR = 1.31; 95% CI = 1.18, 1.46), and ever smoking (AOR = 1.14; 95% CI = 1.02, 1.27) were all significantly associated with greater odds of asthma. After their inclusion, most SI/RE subpopulations remained significantly associated with asthma when compared with model 1. However, Black not-sure males were no longer significantly more likely to report asthma than were White heterosexual males (AOR = 1.45; 95% CI = 0.87, 2.43). Moreover, Hispanic/Latinx heterosexual (AOR = 1.17; 95% CI = 1.02, 1.35) and White not-sure (AOR = 1.49; 95% CI = 1.07, 2.06) males were significantly more likely to report asthma compared with White heterosexual males in the adjusted model.

Known asthma correlates were similarly associated with asthma among females (Table 4, model 2). Females who were overweight (AOR = 1.16; 95% CI = 1.05, 1.29), obese (AOR = 1.30; 95% CI = 1.15, 1.48), or had ever smoked (AOR = 1.31; 95% CI = 1.20, 1.42) were significantly more likely to report

TABLE 2—Prevalence and Unadjusted Odds Ratios for Lifetime Asthma by Sexual Identity and Race/Ethnicity and Their Intersections: Youth Risk Behavior Survey, United States, 2009–2017

	Male Lifetime Asthma		Female Lifetime Asthma	
	%	OR (95% CI)	%	OR (95% CI)
Selected demographics				
Sexual identity				
Heterosexual	24.11	1 (Ref)	22.70	1 (Ref)
Lesbian or gay	29.76	1.33 (1.07, 1.66)	36.90	1.99 (1.52, 2.61)
Bisexual	29.82	1.34 (1.05, 1.70)	31.37	1.56 (1.38, 1.75)
Not sure	28.22	1.24 (1.02, 1.50)	25.56	1.17 (0.92, 1.48)
Race/ethnicity				
White	22.87	1 (Ref)	24.88	1 (Ref)
Black	31.33	1.54 (1.39, 1.70)	27.97	1.17 (1.06, 1.30)
Hispanic/Latinx	24.07	1.07 (0.97, 1.18)	21.33	0.82 (0.73, 0.91)
Additional races	23.36	1.03 (0.88, 1.21)	21.87	0.84 (0.76, 0.94)
Sexual identity and race/ethnicity intersections				
Heterosexual				
White	22.45	1 (Ref)	24.05	1 (Ref)
Black	31.24	1.57 (1.41, 1.74)	26.44	1.14 (1.02, 1.27)
Hispanic/Latinx	23.61	1.07 (0.96, 1.18)	19.12	0.75 (0.66, 0.85)
Additional races	22.81	1.02 (0.87, 1.20)	21.62	0.87 (0.77, 0.99)
Lesbian or gay				
White	33.17	1.71 (1.21, 2.43)	37.10	1.86 (1.23, 2.81)
Black	23.77	1.08 (0.66, 1.76)	41.88	2.28 (1.44, 3.61)
Hispanic/Latinx	28.16	1.35 (0.84, 2.18)	33.96	1.62 (1.05, 2.52)
Additional races	34.25	1.80 (0.84, 3.87)	29.58	1.33 (0.85, 2.08)
Bisexual				
White	25.68	1.19 (0.85, 1.67)	30.08	1.36 (1.14, 1.62)
Black	42.02	2.50 (1.35, 4.64)	33.55	1.60 (1.21, 2.10)
Hispanic/Latinx	31.17	1.56 (0.94, 2.60)	32.93	1.55 (1.28, 1.89)
Additional races	25.56	1.19 (0.68, 2.07)	26.92	1.16 (0.80, 1.70)
Not sure				
White	27.53	1.31 (0.99, 1.75)	25.52	1.08 (0.81, 1.45)
Black	30.94	1.55 (1.05, 2.29)	30.29	1.37 (0.88, 2.15)
Hispanic/Latinx	28.01	1.34 (0.93, 1.94)	27.54	1.20 (0.84, 1.72)
Additional races	28.20	1.36 (0.85, 2.16)	16.76	0.64 (0.38, 1.06)

Note. CI = confidence interval; OR = odds ratio.

asthma. These correlates were associated with a large reduction in odds of asthma in adjusted models. Only 3 subpopulations remained significantly more likely to have asthma than were White heterosexual females: Black heterosexual (AOR = 1.14; 95% CI = 1.02, 1.28), lesbian (AOR = 2.27; 95% CI = 1.52, 3.39), and bisexual (AOR = 1.27; 95% CI = 1.02, 1.57) female students. Two SI/RE subpopulations were significantly less likely than were White heterosexual females to have asthma (Table 4, model 2).

Adjusting for Minority Stress Theory–Related Variables

Among males (AOR = 1.15; 95% CI = 1.02, 1.30) and females (AOR = 1.46; 95% CI = 1.32, 1.62), those who had experienced bullying in the last 12 months were more likely to report asthma than were those not bullied (Tables 3 and 4, model 3). Bullying had a more differential effect on the associations of asthma prevalence across SI/RE subpopulations. No associations changed in significance when we compared with models adjusted for correlates and models adjusted for correlates and bullying, although the magnitude of these associations—regardless of significance—tended to decrease in SI/RE subpopulations where a SM identity was also held. In fact, 17 of 24 SM subpopulations experienced a decrease in odds of lifetime asthma in the model adjusted for bullying.

DISCUSSION

Consistent with previous literature on asthma in adults, we found significant disparities within our sample.[9–13] As expected, Black students had the highest odds of lifetime asthma.[8] Hispanic/Latinx individuals did not experience statistically significant higher odds of asthma; in fact, Hispanic/Latinx females were significantly less likely to report asthma than were White females. This finding is also congruent with previous literature, which has shown that Hispanic populations as a whole (with intergroup variation), tend to have lower odds of asthma compared with non-Hispanic White populations.[30]

Odds of asthma among SI/RE minority youths tended to be higher than among White heterosexual students. All but 3 SI/RE minority subpopulations (Table 2; Tables 3 and 4, model 1) had higher odds of lifetime asthma with many reaching statistical significance. Among SI/RE subpopulations, not-sure youths were least affected by asthma disparities. Because of the wording of the sexual identity question, the general lower odds of asthma among not-sure youths are difficult to interpret. Depending on how youths understood the question, their response may indicate that they were unsure of their sexual identity, did not understand the question, or identified with an unlisted term. About his MST model, Meyer writes that individuals with lower identity salience may be less likely to experience the harmful effects of minority stress on their health.[20] Assuming "not-sure" individuals find their sexual identity less salient than SMY counterparts, Meyer's rationale may explain the lack of asthma disparities within this group.

Of the SI/RE subpopulations, notice should be drawn to SM Hispanic/Latinx females. Hispanic/Latinx heterosexual females had significantly lower odds of asthma compared with White heterosexual females, while SM Hispanic/Latinx females had significantly higher odds of asthma. These results

TABLE 3—Adjusted Odds Ratios for Lifetime Asthma by Sexual Identity and Race/Ethnicity Intersections Among Males: Youth Risk Behavior Survey, United States, 2009–2017

	Model 1: Demographics (n = 137 464)		Model 2: Model 1 + Correlates (n = 95 853)		Model 3: Model 2 + Bullying (n = 94 573)	
	No.	AOR (95% CI)	No.	AOR (95% CI)	No.	AOR (95% CI)
Sexual identity and race/ethnicity intersections						
Heterosexual						
White	48 584	1 (Ref)	33 583	1 (Ref)	33 215	1 (Ref)
Black	20 518	1.58 (1.43, 1.76)	14 282	1.54 (1.38, 1.71)	14 121	1.56 (1.40, 1.74)
Hispanic/Latinx	37 330	1.11 (0.99, 1.24)	28 331	1.17 (1.02, 1.35)	27 865	1.20 (1.04, 1.38)
Additional races	19 705	1.05 (0.89, 1.24)	12 612	1.08 (0.89, 1.31)	12 492	1.10 (0.90, 1.33)
Gay						
White	1 040	1.71 (1.21, 2.43)	689	1.63 (1.18, 2.24)	673	1.56 (1.12, 2.17)
Black	632	1.09 (0.67, 1.77)	340	1.29 (0.80, 2.06)	324	1.17 (0.72, 1.90)
Hispanic/Latinx	1 088	1.40 (0.87, 2.26)	724	1.14 (0.71, 1.83)	695	1.13 (0.69, 1.85)
Additional races	581	1.87 (0.88, 4.01)	284	1.03 (0.57, 1.87)	275	0.96 (0.52, 1.80)
Bisexual						
White	1 312	1.19 (0.85, 1.66)	918	1.13 (0.79, 1.61)	905	1.10 (0.77, 1.58)
Black	535	2.52 (1.37, 4.64)	306	1.72 (1.05, 2.84)	301	1.71 (1.03, 2.84)
Hispanic/Latinx	1 203	1.62 (0.97, 2.70)	830	1.14 (0.70, 1.88)	811	1.14 (0.68, 1.90)
Additional races	600	1.22 (0.70, 2.12)	333	1.15 (0.68, 1.94)	330	1.16 (0.68, 1.96)
Not sure						
White	1 337	1.30 (0.98, 1.73)	845	1.49 (1.07, 2.06)	830	1.46 (1.05, 2.04)
Black	661	1.55 (1.06, 2.26)	405	1.45 (0.87, 2.43)	396	1.46 (0.88, 2.44)
Hispanic/Latinx	1 433	1.37 (0.96, 1.98)	873	1.23 (0.75, 2.03)	849	1.24 (0.74, 2.06)
Additional races	905	1.36 (0.85, 2.16)	498	1.11 (0.59, 2.09)	491	1.13 (0.61, 2.12)
Selected demographics[a]						
Region						
Northeast	51 450	1 (Ref)	38 362	1 (Ref)	37 996	1 (Ref)
Midwest	18 890	0.87 (0.79, 0.95)	17 195	0.86 (0.77, 0.95)	17 060	0.86 (0.78, 0.96)
South	38 302	0.87 (0.79, 0.96)	20 687	0.92 (0.83, 1.02)	20 575	0.93 (0.84, 1.03)
West	28 822	0.81 (0.70, 0.93)	19 609	0.79 (0.66, 0.94)	18 942	0.78 (0.65, 0.93)
Traditional risk factors						
Ever smoked						
No	. . .	. . .	65 588	1 (Ref)	64 918	1 (Ref)
Yes	. . .	. . .	30 265	1.14 (1.03, 1.27)	29 655	1.11 (1.00, 1.24)
Body mass index[b]						
Normal	. . .	. . .	65 776	1 (Ref)	64 876	1 (Ref)
Overweight	. . .	. . .	14 440	1.21 (1.08,1.35)	14 264	1.21 (1.08,1.36)
Obese	. . .	. . .	15 637	1.31 (1.18, 1.46)	15 433	1.32 (1.18, 1.47)
MST-related variable (potential mediator)						
Bullied						
No	. . .	. . .	. . .	. . .	81 385	1 (Ref)
Yes	. . .	. . .	. . .	. . .	13 188	1.15 (1.02, 1.30)

Note. AOR = adjusted odds ratio; CI = confidence interval; MST = minority stress theory.

[a]Models were also adjusted for year of survey administration and age of respondent.

[b]Body mass index (BMI) calculated by using participant-reported age, sex, height, and weight[28]: BMI < 85th percentile: normal; BMI = 85th percentile to < 95th percentile: overweight; BMI ≥ 95th percentile: obese.

indicate the significant impact of multiple minority stress on asthma outcomes and demonstrate the value of these intersectional analyses, as these greater disparities were not seen by race/ethnicity alone but only upon examination by SI/RE.

To determine the robustness of SI/RE minority disparities in lifetime asthma, we included several traditional correlates. We found that some disparities persisted, although many ORs decreased and lost statistical significance. The statistical impact of these traditional risk factors could indicate their role in explaining observed disparities. Thus, research on the role these risk factors play in magnifying the disparities for SI/RE minorities is needed.

In fully adjusted models, we included bullying as an indicator of minority stress.[31] In alignment with MST, bullying was significantly associated with increased odds of asthma across sex. Its inclusion in models resulted in reduced odds of asthma among the majority of SI/RE subpopulations compared with models only adjusted for demographics. Notably, once we adjusted for known correlates and bullying, SM populations tended to experience a further reduction in asthma odds when compared with models adjusted for demographics and traditional risk factors. This indicates the potential of bullying as a MST-linked mediator of asthma outcomes and that antibullying interventions may be especially efficacious at reducing asthma prevalence among SMYs. Interpreted in light of intersectionality and MST, the ability of bullying to mediate asthma disparities in fully adjusted models supports our hypothesis that minority stress plays a significant role in shaping minority health. Furthermore, in line with existing literature, the differential magnitudes we observed at the intersections of SI/RE point to unique intersectional relationships to systems of social power and oppression.[20,21,24,32]

A recent review of primary prevention strategies for asthma showed interventions to be largely ineffective, calling for innovative research into other approaches.[19] This general ineffectiveness may be attributable to the overarching focus on behavioral-level interventions (e.g., dietary changes and smoking cessation) that fail to account for the underlying structural issues (e.g., discriminatory systems, physician interaction, and embedded societal rhetoric or actions) contributing to

TABLE 4—Adjusted Odds Ratios for Lifetime Asthma by Sexual Identity and Race/Ethnicity Intersections Among Females: Youth Risk Behavior Survey, United States, 2009–2017

	Model 1: Demographics (n = 154 457)		Model 2: Model 1 + Correlates (n = 109 005)		Model 3: Model 2 + Bullying (n = 107 756)	
	No.	AOR (95% CI)	No.	AOR (95% CI)	No.	AOR (95% CI)
Sexual identity and race/ethnicity intersections						
Heterosexual						
White	48 857	1 (Ref)	33 621	1 (Ref)	33 229	1 (Ref)
Black	22 106	1.16 (1.04, 1.30)	15 861	1.14 (1.02, 1.28)	15 749	1.19 (1.06, 1.33)
Hispanic/Latinx	38 276	0.73 (0.64, 0.83)	28 938	0.72 (0.62, 0.84)	28 517	0.74 (0.63, 0.86)
Additional races	19 305	0.84 (0.73, 0.97)	12 316	0.87 (0.73, 1.02)	12 193	0.88 (0.74, 1.04)
Lesbian or gay						
White	1 037	1.87 (1.23, 2.84)	713	1.36 (0.93, 1.99)	704	1.28 (0.87, 1.88)
Black	957	2.31 (1.45, 3.69)	616	2.27 (1.52, 3.39)	608	2.37 (1.56, 3.60)
Hispanic/Latinx	1 158	1.58 (1.03, 2.43)	808	1.36 (0.81, 2.30)	796	1.30 (0.76, 2.23)
Additional races	455	1.32 (0.84, 2.07)	258	1.08 (0.58, 2.03)	254	0.97 (0.49, 1.91)
Bisexual						
White	4 803	1.35 (1.13, 1.60)	3 381	1.20 (0.99, 1.46)	3 346	1.12 (0.91, 1.37)
Black	2 782	1.61 (1.22, 2.13)	1 958	1.27 (1.02, 1.57)	1 940	1.30 (1.04, 1.62)
Hispanic/Latinx	5 398	1.51 (1.23, 1.85)	4 135	1.30 (0.99, 1.71)	4 079	1.33 (1.00, 1.75)
Additional races	2 174	1.13 (0.77, 1.66)	1 398	1.09 (0.76, 1.58)	1 384	1.03 (0.71, 1.51)
Not sure						
White	2 080	1.07 (0.80, 1.43)	1 463	0.96 (0.72, 1.28)	1 442	0.92 (0.68, 1.23)
Black	1 217	1.38 (0.88, 2.15)	870	1.26 (0.88, 1.82)	861	1.22 (0.83, 1.78)
Hispanic/Latinx	2 377	1.18 (0.81, 1.70)	1 716	0.99 (0.67, 1.47)	1 707	0.97 (0.65, 1.46)
Additional races	1 475	0.62 (0.37, 1.03)	953	0.53 (0.28, 0.98)	947	0.47 (0.26, 0.85)
Selected demographics[a]						
Region						
Northeast	59 779	1 (Ref)	45 192	1 (Ref)	44 858	1 (Ref)
Midwest	21 242	0.95 (0.87, 1.03)	19 522	0.95 (0.86, 1.04)	19 421	0.94 (0.85, 1.03)
South	42 861	0.92 (0.83, 1.01)	23 641	0.94 (0.86, 1.03)	23 547	0.94 (0.86, 1.03)
West	30 575	1.06 (0.92, 1.22)	20 650	1.10 (0.92, 1.31)	19 930	1.11 (0.92, 1.33)
Traditional risk factors						
Ever smoked						
No	. . .	. . .	77 251	1 (Ref)	76 501	1 (Ref)
Yes	. . .	. . .	31 754	1.31 (1.20, 1.42)	31 255	1.26 (1.16, 1.37)
Body mass index[b]						
Normal	. . .	. . .	79 332	1 (Ref)	78 365	1 (Ref)
Overweight	. . .	. . .	18 269	1.16 (1.05, 1.29)	18 100	1.16 (1.04, 1.28)
Obese	. . .	. . .	11 404	1.30 (1.15, 1.48)	11 291	1.28 (1.12, 1.46)
MST-related variable (potential mediator)						
Bullied						
No	. . .	. . .	. . .	. . .	88 008	1 (Ref)
Yes	. . .	. . .	. . .	. . .	19 748	1.46 (1.32, 1.62)

Note. AOR = adjusted odds ratio; CI = confidence interval; MST = minority stress theory.

[a]Models were also adjusted for year of survey administration and age of respondent.

[b]Body mass index (BMI) calculated by using participant-reported age, sex, height, and weight[28]: BMI < 85th percentile: normal; BMI = 85th percentile to < 95th percentile: overweight; BMI ≥ 95th percentile: obese.

asthma disparities.[26] Accordingly, we call for an increase in structural competence of researchers and clinicians, adopting the definitions provided by Metzl and Hansen.[26] They define structural competence as the ability to discern how health outcomes are influenced by upstream decisions, such as "health care and food delivery systems, zoning laws, urban and rural infrastructures, medicalization, or even . . . the very definitions of illness and health." [26(p128)] It could also prove efficacious for researchers and clinicians to ask youths about sexual identity, other sociodemographic characteristics, and experiences with discrimination. By asking about sexual identity and stressors, a better understanding of asthma disparities could emerge based on additional data with precise subpopulations.

Limitations

Our study was not without limitations. All data were self-reported, and our study was based on secondary analyses. In addition, there were only 4 stated options for sexual identity. Some SM students may not identify with this limited terminology, which could lead to an underestimation of the number of SMYs. Furthermore, adjusting for all American Lung Association risk factors such as exposure to pollution was not possible. Though some factors could be minimally controlled for by adjusting for region, this method is imprecise given the diversity in US census regions.[16] Moreover, clinician-diagnosed asthma required participants to visit a clinician; engagement with physicians is less likely among both SI/RE minority populations, which could have led to an underestimation of these disparities.[33,34] The temporalities of the included traditional risk factors and MST-related variable were incongruent with the temporality of lifetime asthma; however, their associations were still statistically significant. Future work should address questions of temporality. In addition, we could not assess intersectional oppression itself, only the subpopulations that may experience this oppression. Moreover, the additional-races group is in itself heterogeneous but could not be stratified further because of sample size issues of smaller intersectional groups. Despite these, our study utilized one of the largest and most geographically diverse data sets of high school–aged youths to comprehensively explore lifetime

asthma prevalence disparities at the intersections of SI/RE and based on sexual identity alone. We also examined the association of traditional asthma risk factors (overweight, obese, smoking) and bullying for the first time, to our knowledge, in these populations.

Public Health Implications

Among US youths, prominent disparities in asthma prevalence exist—nearly all SI/RE minority subpopulations experience higher odds of lifetime asthma relative to White heterosexual peers. With few exceptions, disparities were higher among sexual minorities compared with race-matched heterosexual peers. Our study points to the need to more robustly examine asthma disparities among youths, particularly SMYs. Given the observed disparities, future research needs to focus on creating successful asthma management strategies for marginalized populations. The differential results observed by SI/RE subpopulations highlight the value of intersectional approaches to population-level health research. We call for an increase in structural interventions related to asthma, offering specific evidence supporting the impact that antibullying initiatives could have on asthma disparities. Structural competence, as defined previously, must be a priority for researchers and clinicians pursuing health equity, and future work should prioritize accounting for the discrimination perpetrated against SI/RE minorities. AJPH

CONTRIBUTORS

C. W. Curry originated and led the study. C. W. Curry and D. Felt initiated the study design. L. B. Beach further developed the study design. M. M. Ruprecht provided significant revisions. X. Wang and G. L. Phillips II conducted all statistical analyses. Each author equally contributed to critical analyses, interpretation, and all other aspects of the article. All authors drafted and approved the final version of this article.

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CONFLICTS OF INTEREST

We declare no competing interests.

HUMAN PARTICIPANT PROTECTION

All current study activities were classified as non–human participant research by the institutional review board at Northwestern University.

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