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Air Quality Awareness and Behaviors of U.S. Adolescents With and Without Asthma

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Abstract

Introduction: Among U.S. adolescents, the knowledge that air pollution can impact health is relatively high and varies by the demographics of the respondents and the places they live, but the influence of asthma status is unknown. This study assesses the role of asthma in U.S. adolescents' awareness, perceptions, and behaviors related to air pollution.

Methods: In 2020, data were analyzed from 817 adolescents aged 12–17 years who responded to the 2020 Porter Novelli Public Services YouthStyles survey, a nationally representative survey of U. S. adolescents. Respondents self-reported having or having had asthma in the past year and their awareness, perceptions, and behaviors related to air pollution. For each aspect of air quality awareness, perception, and behavior, weighted percentages of responses were calculated by asthma status.

Results: Overall, an estimated 11.5% of U.S. adolescents self-reported asthma. Awareness that air pollution can impact health, awareness that respondents can limit their air pollution exposure, and having heard or read about air quality alerts were similar among adolescents with and without asthma, with some differences reported in where they heard or read about air quality alerts. Those with asthma reported discussing with a health professional about ways to limit exposure more frequently than those without asthma.

Conclusions: Despite the well-known risk of asthma exacerbations from air pollution exposure, air quality awareness was similar among adolescents with and without asthma. These findings reveal the areas in which air quality awareness and behaviors to reduce exposure can be improved among adolescents with and without asthma.

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SUPPLEMENTAL MATERIAL

Supplemental materials associated with this article can be found in the online version at <https://doi.org/10.1016/j.amepre.2021.04.030>.

INTRODUCTION

According to a nationally representative survey of adolescents, known as YouthStyles, conducted from 2015 to 2018, a total of 81% of U. S. adolescents aged 12–17 years were aware that air pollution can impact health, 52% thought that there were things they could do to limit their exposure, and 19% were aware of air quality alerts. These indicators of air quality awareness varied by demographic characteristics, such as parental educational attainment and location, but information about respiratory health, including asthma status, was not available.¹

In an adjusted analysis of responses from a 2014–2016 survey of adults, asthma was associated with increased awareness of air quality alerts.² Awareness of and compliance with air quality alerts has been reported to be higher among parents of children with asthma than among parents of children without asthma.³ Together, these results raise the question of whether differences might exist in awareness and behaviors by asthma status among adolescents. Because children with asthma are at risk of exacerbations from air pollution exposure,⁴ understanding their awareness and behaviors is an important step toward the development of effective strategies to reduce their air pollution exposures. The study presented in this paper aims to compare air quality awareness, perceptions, and behaviors of U.S. adolescents with and without asthma.

METHODS

In 2020, survey responses from the Porter Novelli Public Services (Washington, DC) YouthStyles were analyzed. YouthStyles is a nationally representative survey of U.S. adolescents aged 12–17 years. Each YouthStyles survey was conducted following a similar ConsumerStyles survey in which 1 adult in the household participated. The 2020 YouthStyles survey was conducted on June 10–25, 2020. Overall, 817 youth (of 1,700 sampled parents) completed the survey for a response rate of 48%. YouthStyles survey methods implemented in 2020 were similar to those used in 2016–2018, which are described in detail elsewhere.¹

To report asthma status, each adolescent responded to the following: *During the past year, have you had (or do you currently have) asthma?* The adult in the household reported the demographic information used in this analysis (Table 1). Air quality awareness, perceptions, and behaviors were assessed through a series of 8 questions that are shown verbatim in Table 2. As in previous analyses, for all questions about asthma status and air quality, missing and *don't know* responses were categorized as *no*.^{1,2,5}

Procedures for weighted survey data were used with survey weights provided by Porter Novelli Public Services to generate nationally representative weighted percentages of responses. Weighted percentages were generated for responses among all respondents overall and stratified by asthma status. For 2 survey questions, weighted percentages were generated by asthma status and other demographic characteristics, including age, sex, race/ethnicity, parental educational attainment, metropolitan status, and region, using the categories shown in Table 1. Analyses were conducted in SAS, version 9.4. The study

protocol for this analysis was reviewed and determined to be exempt from full IRB review at the Centers for Disease Control and Prevention.

RESULTS

Overall, an estimated 11.5% of U.S. adolescents self-reported asthma. Demographic characteristics of the adolescent respondents overall and among those with asthma are shown in Table 1. Awareness that air pollution can impact health, awareness that respondents can limit their or their family's air pollution exposure, and having heard or read about air quality alerts were similar among U.S. adolescents with and without asthma (Table 2). The most frequently reported ways that respondents had heard or read about air quality alerts were through an application on a mobile phone or device and on TV.

The percentage of U.S. adolescents who did something differently when they thought air quality was bad was higher for adolescents with asthma (75.3%, 95% CI=48.0, 100.0) than those without asthma (42.9%, 95% CI=31.0, 54.8), but CIs overlapped. Most frequently, adolescents both with and without asthma reported spending less time outdoors when they thought or were informed that air quality was bad. Those with asthma reported discussing with a health professional about how to limit exposure to air pollution (12.5%, 95% CI=3.1, 21.9) more frequently than those without asthma (2.1%, 95% CI=1.1, 3.1). Air quality awareness and perceptions among adolescents with and without asthma by demographic characteristics are shown in Appendix Table 1 (available online). Some differences were observed by asthma status when stratified by demographic variables. Small sample sizes resulted in limited precision, and in most cases, CIs overlapped.

DISCUSSION

Overall, differences in awareness that air pollution can impact health, in thinking that there were ways to limit their or their family's exposure, and in having heard or read about air quality alerts between U.S. adolescents with and those without asthma were modest. Awareness that air pollution can impact health was relatively high compared with that other measures, but room for improvement remains. In a 2014–2016 study, unadjusted percentages of U.S. adults with and without asthma reporting awareness of air quality alerts were also similar (51.9% and 49.0%, respectively); in adjusted analyses, asthma was associated with an increased prevalence of awareness of air quality alerts, although the difference in adjusted percentages was also modest (54.4% and 48.8%). In this study, the percentage of U.S. adolescents with asthma who had talked to a health professional was higher than the percentage among those without asthma, although both percentages were relatively low. These findings are similar to the findings from the 2014–2016 study of U.S. adults that found that 11.8% of U.S. adults with asthma had talked to a health professional compared with 2.3% of adults without asthma (unadjusted and adjusted percentages=11.3% and 2.3%, respectively).²

Combined with information about where adolescents access information about air quality alerts, these results can be used to develop effective interventions to reach adolescents. For example, among adolescents with asthma who had ever heard or read about air quality alerts

where they live, nearly 65% reported accessing information about air quality alerts through an application on a mobile phone or device. If adolescents with asthma are proactively seeking information through mobile applications about environmental conditions that affect their asthma, this result suggests that increasing awareness of such applications through patients' primary care providers or school health professionals might be an effective way to increase air quality awareness among adolescents, especially among those with asthma.

Limitations

YouthStyles data do not include information about indoor air quality or health conditions other than asthma. Adolescent respondents self-reported asthma status, and in light of the small number of respondents in some demographic categories, any misclassification of asthma status might have affected the results presented in this report. The small YouthStyles sample size undoubtedly impacted the precision of the presented estimates. In 2020, the YouthStyles survey response rate was 48%. Although the extent to which adolescent responders differed from nonresponders is unknown, responses were weighted by several demographic characteristics to make them representative of U.S. adolescents. Other limitations of this survey and the type of analysis were discussed previously.¹

CONCLUSIONS

Despite the well-known risk of asthma exacerbations from air pollution exposure,⁴ air quality awareness was similar among adolescents with and without asthma. However, a higher percentage of adolescents with asthma reported speaking with a health professional about limiting exposure, although percentages remained low. Overall, these findings reveal the areas in which communication about air quality and its associated health risks can be improved among adolescents with and without asthma.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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Table 1. Characteristics of YouthStyles Survey Respondents, Aged 12–17 Years, Overall and With Asthma

Characteristics	All respondents N=817			With asthma n=85		
	n ^a	Weighted column % ^b (95% CI)	n ^a	Weighted row % ^c (95% CI)	n ^a	Weighted row % ^c (95% CI)
Age, years						
12–13	296	32.8 (29.1, 36.6)	31	10.1 (6.4, 13.8)		
14–15	263	32.3 (28.5, 36.2)	32	14.8 (9.2, 20.3)		
16–17	258	34.8 (30.9, 38.8)	22	9.9 (5.2, 14.6)		
Sex						
Female	407	48.9 (44.8, 53.0)	42	11.8 (7.8, 15.8)		
Male	410	51.1 (47.0, 55.2)	43	11.3 (7.5, 15.0)		
Race/ethnicity						
White, non-Hispanic	514	51.6 (47.5, 55.8)	42	9.1 (6.1, 12.1)		
Black, non-Hispanic	63	13.4 (10.1, 16.8)	10	16.0 (5.7, 26.2)		
Other, non-Hispanic ^d	56	6.6 (4.7, 8.5)	5	9.4 (0.3, 18.5)		
Hispanic	136	24.6 (20.7, 28.5)	18	12.6 (6.4, 18.7)		
2 races, non-Hispanic	48	3.7 (2.5, 5.0)	10	25.9 (9.7, 42.1)		
Parental educational attainment						
High school or less	166	27.1 (23.2, 31.1)	26	16.9 (10.0, 23.9)		
Some college	259	33.1 (29.3, 37.0)	26	9.8 (5.8, 13.8)		
Bachelors or higher	392	39.7 (35.9, 43.6)	33	9.3 (5.7, 12.9)		
Region						
Northeast	148	16.0 (13.2, 18.8)	16	13.6 (6.3, 20.9)		
Midwest	196	22.0 (18.8, 25.2)	17	8.1 (4.1, 12.1)		
South	289	37.6 (33.6, 41.7)	33	12.8 (7.9, 17.6)		
West	184	24.3 (20.7, 27.9)	19	11.4 (5.7, 17.1)		
Metropolitan status						
Metropolitan area	698	86.5 (83.9, 89.2)	69	10.6 (7.8, 13.5)		
Nonmetropolitan area	119	13.5 (10.8, 16.1)	16	17.4 (8.7, 26.2)		

^aUnweighted frequency.

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^bPercentage of all respondents in each demographic category.

^cPercentage with asthma within each demographic category.

^dIncludes American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, or some other race.

Table 2. Air Quality Awareness, Perceptions, and Behaviors Among 817 U.S. Youth With and Without Asthma

Survey questions	All respondents N=817			With asthma n=85			Without asthma n=732		
	n ^a	Weighted % (95% CI) ^b	n ^a	Weighted % (95% CI) ^b	n ^a	Weighted % (95% CI) ^b	n ^a	Weighted % (95% CI) ^b	
Do you think air pollution can impact a person's health in any way?	713	86.4 (83.5, 89.3)	73	85.3 (75.9, 94.6)	640	86.6 (83.6, 89.6)			
Do you think there are things you can do to limit your or your family's exposure to air pollution?	519	62.1 (58.1, 66.1)	49	55.6 (43.0, 68.3)	470	63.0 (58.8, 67.2)			
Have you ever heard or read about the Air Quality Index or air quality alerts where you live?	197	23.4 (19.9, 26.8)	22	29.5 (17.6, 41.3)	175	22.6 (19.0, 26.2)			
Where did you hear or read about air quality alerts? ^c									
TV	78	37.5 (29.4, 45.6)	11	48.2 (23.7, 72.7)	67	35.7 (27.2, 44.2)			
App on mobile phone or device	74	37.8 (29.6, 46.0)	11	64.6 (43.3, 86.0)	63	33.2 (25.0, 41.4)			
Internet or social media	59	29.0 (21.6, 36.5)	5	22.9 (3.8, 41.9)	54	30.1 (22.0, 38.2)			
Radio	28	13.9 (7.8, 20.0)	3	10.0 (0.0, 22.0)	25	14.6 (7.8, 21.3)			
Newspaper	13	7.7 (2.9, 12.6)	2	10.5 (0.0, 24.6)	11	7.3 (2.2, 12.4)			
Doctor's office	8	4.5 (0.9, 8.1)	0	—	8	5.3 (1.1, 9.5)			
During the past 12 months, was there any time you thought or you were informed that air quality where you live was bad?	104	12.6 (9.9, 15.3)	11	17.1 (6.8, 27.4)	93	12.0 (9.2, 14.7)			
Did you do anything differently when you thought or were informed that air quality where you live was bad? ^d	48	48.0 (36.5, 59.6)	8	75.3 (48.0, 100.0)	40	42.9 (31.0, 54.8)			
Which of these did you do differently when you thought air quality was bad? ^e									
Spent less time outdoors	40	87.7 (78.8, 96.7)	7	92.2 (76.8, 100.0)	33	86.3 (75.6, 96.9)			
Closed windows of house	22	41.4 (25.5, 57.4)	4	33.6 (0.4, 66.8)	18	44.0 (26.4, 61.6)			
Exercised indoors instead of outside	20	37.3 (21.8, 52.8)	2	13.8 (0.0, 34.2)	18	45.0 (27.4, 62.6)			
Did less strenuous activity	11	23.1 (8.6, 37.6)	3	35.8 (0.0, 73.6)	8	19.0 (4.5, 33.5)			
Exercised on a different day/time	8	17.3 (4.5, 30.1)	1	9.2 (0.0, 27.2)	7	19.9 (4.4, 35.4)			
Have you and your doctor, nurse, or other health professional ever talked about how to limit your exposure to air pollution?	29	3.3 (1.9, 4.8)	8	12.5 (3.1, 21.9)	21	2.1 (1.1, 3.1)			

^aUnweighted frequency.

^bColumn %, unless otherwise indicated.

^cAmong 197 respondents (22 with asthma, 175 without asthma) who had heard or read about the Air Quality Index or air quality alerts.

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^d Among 104 respondents (11 with asthma, 93 without asthma) who thought or were informed that air quality was bad.

^e Among 48 respondents (8 with asthma, 40 without asthma) who reported doing something differently when they thought or were informed that air quality was bad.