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# Health care transition rates and associated factors for adolescents with asthma



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**Background:** Adolescents and young adults with asthma face increased risks during the health care transition (HCT) from pediatric to adult care. Despite guidelines advocating for more HCT preparedness, this does not consistently occur in clinical practice. The rates of exposure to transition preparation in adolescents with asthma are unknown.

**Objectives:** Our goal was to understand the rates of HCT exposure among adolescents with asthma in the United States, along with predictive characteristics associated with receiving HCT exposure, as determined by using data from a nationally representative survey.

**Methods:** We studied adolescents aged 12 to 17 years with asthma in the 2020-2021 National Survey of Children's Health data set. We explored associations between sociodemographic, health-related, and provider practice-related variables and HCT exposure through univariate analysis and multivariable logistic regression.

**Results:** Only 19% of adolescents with asthma from this cohort met criteria indicating that they had received HCT exposure. In our multivariable analysis, being older, being female, having a provider actively work with the child to make positive choices about health, having a written care plan addressing transition, having routine preventive care visits, and having a caregiver who has someone with whom to discuss health insurance into adulthood were associated with higher odds of HCT exposure. Hispanic ethnicity, lack of insurance, and residence in a metropolitan area were associated with lower odds of receiving preparation for transitional care but were not significant in the multivariable model.

**Conclusions:** Our findings underscore the need to improve transitional care preparation for adolescents with asthma, with attention needed to address disparities based on sociodemographic factors, including health care access. (*J Allergy Clin Immunol Global* 2025;4:100363.)

**Key words:** Health care transition, pediatric asthma, asthma, adolescent, transitional care management

## Abbreviations used

aOR: Adjusted odds ratio

AYA: Adolescent and young adult

COVID-19: Coronavirus disease 2019

EAACI: European Academy of Allergy and Clinical Immunology

HCT: Health care transition

NSCH: National Survey of Children's Health

Asthma affects more than 24 million people in the United States.<sup>1</sup> The adolescent and young adult (AYA) years are associated with increased rates of asthma-associated morbidity and mortality<sup>2-4</sup> attributed to less adherence, less self-efficacy, and delays in care.<sup>5-7</sup> Less self-efficacy observed in young adults with a chronic condition can be related to less education about transition plans from the pediatrician to the adult health care provider.<sup>8</sup> It is estimated that only a quarter of adolescents with chronic conditions receive adequate counseling from parents and health care providers about transition of care.<sup>2,7,9-14</sup> This can potentially contribute to less self-efficacy, which is one of the factors thought to be potentially relevant to the ability of AYAs with chronic medical conditions to care for themselves independently. In recent years, the American Academy of Pediatrics and American Academy of Family Physicians<sup>15,16</sup> and beyond have called for increased transition of care preparedness for AYAs with chronic conditions, including asthma. Unfortunately, increasing preparedness for the transition is not widely practiced, and the rate of implementation in clinical practice is low.<sup>10,17</sup>

In addition, the National Institutes of Health's National Asthma Education and Prevention Program guidelines suggest involving patients as young as age 10 years in their own care.<sup>18</sup> In 2020, the European Academy of Allergy and Clinical Immunology (EAACI) published guidelines about transitional care for patients with asthma from age 11 years to age 25 years.<sup>19</sup> This EAACI guideline was informed largely through expert opinion, indicating a need for more research in this domain. Currently, the rate of exposure to preparation for transitional care in adolescents with asthma is unknown. In this study, our primary goal was to analyze a large data set representative of the US population, the National Survey of Children's Health (NSCH), to understand the rates of exposure to transitional care preparation in this population. Our secondary goal was to explore descriptive and predictive characteristics associated with receiving that exposure.

## METHODS

The NSCH is a large national survey in the United States that is completed by parents or primary caregivers of children aged 0 to 17 years by mail or on the Internet; it has previously been used to estimate exposure to health care transition (HCT) in the general pediatric population.<sup>10,17,20</sup> The survey is supported by the Health Resources and Services Administration within the

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US Department of Health and Human Services (under grant U59MC27866). We studied the most current combined data set available (2020-2021) at the start of our work; it consists of data collected from July 27, 2020, to January 22, 2021 (the 2020 data set), and from June 25, 2021, to January 14, 2022 (the 2021 data set). For comparison, we also ran our analysis on the NSCH 2018-2019 data set because the 2020-2021 was compiled at the start of the coronavirus disease 2019 (COVID-19) pandemic. These data were collected from June 2018 to January 2019 (the 2018 data set) and from June 28, 2019, to January 17, 2020 (the 2019 data set). The survey design elements, including sampling weights, strata, and clusters, were provided by the NSCH and incorporated into all analyses.

### Asthma diagnosis and severity

An asthma case was defined by an affirmative answer to the health condition question Does this child have current or lifelong health condition? in reference to asthma and by whether the question How severe is this child's condition (mild or moderate-to-severe)? was answered.

### Dependent variables

In the NSCH, parental caregivers of children and adolescents aged 12 to 17 years were asked questions about exposure to transitional care. To represent the Maternal and Child Health Bureau criteria to determine whether a youth received necessary services for transition to adulthood, the NSCH created a binary (yes/no) composite variable requiring an affirmative response to all of the following questions: (1) Did the child have time alone with health care provider at last medical visit? (2) Did the health care provider work with youth to understand health care changes that happen at age 18 years?, which was a composite variable of (a) Did the health care provider work with youth to understand health care changes that happen at age 18 years? and (b) Did the health care provider discuss the shift to adult health care providers (if needed); and (3) Did the health care provider actively work with the child to help him or her gain skills to manage his or her health and health care?

### Independent variables

From the survey data, we included independent variables with potential to be related to adolescents receiving necessary services for transition to adulthood in various domains that could reflect innate individual characteristics or potential systemic biases. The sociodemographic variables included were age, sex, race and ethnicity, primary language, residence in a metropolitan area, parental education, and economic status (represented by the child's federal poverty level). We also included the health-related variables of asthma severity, health status, comorbidities, consistent health insurance coverage, insurance type, and preventive care visits. In addition, we included provider practice-related variables that may be associated with HCT exposure (but were not included in the NSCH composite variable to determine whether a child received necessary services for transition to adulthood [the dependent variable]). These variables were as follows: whether the child's caregiver had someone with whom to discuss how to obtain or keep health insurance coverage into adulthood, whether the child had access to his or her care plan, whether the care plan specifically

addressed the transition to an adult health care provider, and whether the child's health care provider actively worked with the child to make positive choices about his or her health. We included variables related to social interactions that may potentially have a relationship to self-image and independence; these variables included whether the child has been bullied by or bullied others, has a caregiver who attends their events, is engaged in school, lives in a household that demonstrates resilience, has an adult on whom he or she can rely for advice and guidance, is reported to be flourishing, lives in a supportive neighborhood, participates in community service, or has worked for pay. For details regarding NSCH variable name and content, see [Table E1](#) (available in the Online Repository at [www.jaci-global.org](http://www.jaci-global.org)).

### Analysis

We included children and adolescents aged 12 to 17 years with a diagnosis of asthma. We excluded those reported to have developmental or intellectual delay, as such children may be less likely to manage their own care. Univariate analysis was performed with *t* tests and chi-square tests. We also performed a multivariable logistic regression model to identify associations with receiving necessary services for adolescent transition in case. To build our model, we selected all variables with a *P* value less than .10 on univariate analysis as well as common sociodemographic variables (age, sex, race, language, and insurance type). Some predictors may not be statistically significant in the univariate analysis but become statistically significant in the multivariable analysis because of confounding factors; therefore, in the univariate analysis we considered all predictors with a *P* value less than .10. With regard to any variable with more than 5% missing values, we included them by using the missing indicator method in the multivariable logistic regression model.<sup>21</sup> If 2 variables were highly collinear with one another, the variables with more clinical relevance (as determined by the authors) was included. *P* values less than .05 were considered statistically significant. All analyses were performed in R v4.2.3 (R Foundation for Statistical Computing, Vienna, Austria). This secondary analysis of deidentified data was exempt from institutional review board review.

## RESULTS

A total of 2,665 adolescents with asthma were included in our analysis (with a weighted sample of 1,887,969 [Table I]).

Overall, only 19.3% of the adolescents with asthma in our cohort met criteria for receiving necessary services for transition to adult health care. Our univariate analysis demonstrated that compared with the adolescents who were receiving HCT exposure, those adolescents who did receive such exposure were significantly more likely to be older (be in the age category 16-17 years), be female, have health insurance, not reside in a metropolitan area, report living in a safe neighborhood, have moderate-to-severe asthma, have special health care needs, have a health care provider who worked with them to make positive choices about their health, have a written health care plan that meets health care goals, have a written health care plan that addresses transition to an adult health care provider, have had someone discuss how to obtain or keep health insurance coverage into adulthood, and have preventive care visits. Those who were significantly less likely to receive HCT exposure were of Hispanic ethnicity, were uninsured, and lived in a metropolitan area (Table II).

**TABLE I.** Baseline characteristics of the adolescents with asthma in the 2020-2021 NSCH who were included in the study

| Variable                     | Unweighted sample, No. | Weighted sample, No. (%) |
|------------------------------|------------------------|--------------------------|
| All patients                 | 2,665                  | 1,887,969 (100%)         |
| Age category                 |                        |                          |
| 12-13 y                      | 786                    | 600,641 (31.8%)          |
| 14-15 y                      | 906                    | 677,373 (35.9%)          |
| 16-17 y                      | 973                    | 609,955 (32.3%)          |
| Sex                          |                        |                          |
| Female                       | 1,284                  | 853,150 (45.2%)          |
| Male                         | 1,381                  | 1,034,819 (54.8%)        |
| Insurance                    |                        |                          |
| Private                      | 1,864                  | 1026,789 (55.5%)         |
| Public                       | 639                    | 671,667 (36.3%)          |
| Uninsured                    | 126                    | 151,772 (8.2%)           |
| Race and ethnicity           |                        |                          |
| Asian, non-Hispanic          | 102                    | 48,227 (2.6%)            |
| Black, non-Hispanic          | 295                    | 463,725 (24.6%)          |
| Hispanic                     | 401                    | 468,870 (24.8%)          |
| Multiple races, non-Hispanic | 197                    | 86,823 (4.6%)            |
| Others, non-Hispanic         | 31                     | 6,590 (0.3%)             |
| White, non-Hispanic          | 1,639                  | 813,733 (43.1%)          |
| Asthma                       |                        |                          |
| Mild                         | 1955                   | 1,364,867 (72.8%)        |
| Moderate-to-severe           | 690                    | 510,373 (27.2%)          |

The raw (unweighted) and weighted numbers representing US population are represented. The sample was weighted to be nationally representative of the population of children. Non-Hispanic others include American Indian, Alaska Native, Native Hawaiian, and Pacific Islander.

Our multivariable analysis demonstrated that those with significantly higher odds of receiving transition in care planning were older (adjusted odds ratio [aOR] = 1.36 [95% CI = 1.22-1.52]), were female (aOR = 1.60 [95% CI = 1.13-2.25]), had a provider actively work with them to make positive choices about health (aOR = 6.62 [95% CI 2.77-15.82]), had a written plan of care that addressed transition to an adult health care provider (aOR = 5.47 [95% CI = 2.88-10.41]), had routine preventive care (aOR = 6.99 [95% CI 3.26-14.98]), or had a caregiver who had someone with whom to discuss how to obtain or keep health insurance into adulthood (aOR = 1.55 [95% CI = 1.07-2.24 [Table III]). Hispanic ethnicity, lack of insurance, and residence in a metropolitan area were no longer associated with lower odds of receiving transitional care preparation after adjustment for sociodemographic and health-related factors in the multivariable regression.

Our results were similar for the 2018-2019 data set except for the fact that the number of comorbidities was associated with higher odds of HCT exposure. Lower odds were associated with being of versus non-Hispanic White race (aOR = 0.35 [95% CI = 0.13-0.96]), having special health care needs (aOR = 1.66 [95% CI = 1.05-2.63]), or having a caregiver who attends the child's events (aOR = 0.33 [95% CI = 0.17-0.61]). For details, see Tables E2-E4 (available in the Online Repository at [www.jaci-global.org](http://www.jaci-global.org)).

## DISCUSSION

We found that in a nationally representative survey of US adolescents with asthma who were aged 12 to 17 years, only 19%

received necessary transition to adult care services. From mid-2020 to early 2022, factors associated with higher odds of receiving these services were being older, being female, having a health care provider who actively worked with the adolescent to make positive health choices, have a written care plan that included information about transition, or have routine preventive care visits.

Our findings that exposure to HCT preparation is low in adolescents with asthma is consistent with the low rates of HCT preparation for all adolescents regardless of chronic condition.<sup>22</sup> In addition, 2 studies using NSCH data spanning from 2016 to 2020 reported that the rates of transitional care for all adolescents increased by only 6% (from 14% to 20%).<sup>10,17</sup> Because the most recent data sets available at the time of our analysis were compiled during the COVID-19 pandemic, we also applied our analysis to data from 2 years prior and found similar rates of HCT exposure for adolescents with asthma. However, with the more recent attention on the importance of adolescent transitional care by the medical community, there is hope that these rates will increase. The 2018 American Academy of Pediatrics/American Academy of Family Physicians joint report on transitional care has raised awareness at a system-level about the need to improve transitional care for adolescents and the need for reimbursement models to cover HCT management.<sup>15</sup> In addition, statements such as the EAACI guideline on the effective transition of adolescents and young adults with allergy and asthma have similar recommendations and highlight the need for development of technological solutions to assist with HCT preparation.<sup>19</sup>

Although the NSCH is a large data set, there are limitations to our findings; for example, the data set may extrapolate only to those living in the United States. The survey is answered by parents or guardians rather than by the adolescents themselves. It is a cross-sectional study with extrapolated weighting to be nationally representative of the population. In addition, our study took place during the COVID-19 pandemic. To address this, we performed the same analysis of the previous 2 years of the NSCH, which demonstrated consistent rates across years, although some independent variables in our multivariable analysis had differing results, which suggest further investigation and trending over time. Another potential limitation is the measure used for HCT exposure in the NSCH. Although this variable has been accepted to estimate HCT exposure in the US pediatric population,<sup>10,17</sup> there is still a need for more study in this area and for development of validated tools.<sup>23</sup> Currently, the NSCH composite variable is reviewed by expert panels and designed to reflect the Health Resources and Services Administration Maternal and Child Health Bureau's performance measures used by Title V Maternal and Child Health Block Grant programs. In addition, we could not analyze whether HCT exposure was associated with asthma outcomes such as exacerbations because the questions about emergency room or hospital visits did not specify reason for visit. We did, however, analyze rates of emergency room or hospital visits for any reason between those with and without HCT exposure in our cohort, which did not find significant differences.

Previous studies of HCT from adolescent to adult care in the NSCH found that those who were Hispanic, whose primary household language was not English, or who did not have insurance were at risk of lower rates of transition care planning. Our study had similar findings, the only exception being non-English primary household language; however, this may also be due to potential oversampling of English speakers in the original

**TABLE II.** Univariate analysis of the sociodemographic, health-related, and provider practice-related factors associated with receiving necessary services for adolescents with asthma for transitional care in the 2020-2021 NSCH that are potentially related to transition care management

| Variable  | Weighted No. of subjects who received HCT services | Weighted total, No. | Weighted % | Unadjusted OR | 95% CI    | P value |
|---|--|---------------------|------------|---------------|-----------|---------|
| All patients  | 364,993  | 1,887,969           | 19.3%      | —             |           |         |
| Sociodemographic variable   |  |                     |            |               |           |         |
| Age category  |  |                     |            |               |           |         |
| 12-13 y   | 80,089   | 600,641             | 13.3%      | 1 (Ref)       |           |         |
| 14-15 y   | 107,604  | 677,373             | 15.9%      | 1.23          | 0.81-1.86 | .33     |
| 16-17 y   | 177,300  | 609,955             | 29.1%      | 2.66          | 1.72-4.13 | <.001   |
| Sex   |  |                     |            |               |           |         |
| Female  | 192,522  | 853,150             | 22.6%      | 1.46          | 1.04-2.04 | .03     |
| Male  | 172,471  | 1,034,819           | 16.7%      | 1 (Ref)       |           |         |
| Race and ethnicity  |  |                     |            |               |           |         |
| Asian, non-Hispanic   | 12,358   | 48,227              | 25.6%      | 1.20          | 0.65-2.20 | .31     |
| Black, non-Hispanic   | 86,291   | 463,725             | 18.6%      | 0.80          | 0.50-1.26 | .33     |
| Hispanic  | 63,409   | 468,870             | 13.5%      | 0.54          | 0.33-0.89 | .01     |
| Multiple races, non-Hispanic  | 20,209   | 86,823              | 23.3%      | 1.06          | 0.55-2.03 | .87     |
| Other, non-Hispanic   | 1,127  | 6,590               | 17.1%      | 0.72          | 0.27-1.93 | .51     |
| White, non-Hispanic   | 181,598  | 813,733             | 22.3%      | 1 (Ref)       |           |         |
| Caregiver's education level   |  |                     |            |               |           |         |
| <High school  | 22,566   | 197,286             | 11.4%      | 0.50          | 0.21-1.17 | .11     |
| High school or GED  | 74,937   | 426,836             | 17.6%      | 0.82          | 0.53-1.27 | .37     |
| Some college or technical school  | 100,021  | 453,614             | 22.0%      | 1.09          | 0.75-1.56 | .66     |
| College degree or higher  | 167,469  | 810,233             | 20.7%      | 1 (Ref)       |           |         |
| Income level  |  |                     |            |               |           |         |
| 0%-99% of FPL   | 68,068   | 382,539             | 17.8%      | 1 (Ref)       |           |         |
| 100%-199% of FPL  | 89,791   | 391,263             | 22.9%      | 1.38          | 0.79-2.40 | .26     |
| 200%-399% of FPL  | 111,117  | 583,118             | 19.1%      | 1.09          | 0.65-1.82 | .75     |
| ≥400% of FPL  | 96,018   | 531,049             | 18.1%      | 1.02          | 0.63-1.65 | .94     |
| Insurance   |  |                     |            |               |           |         |
| Private   | 203,905  | 1,026,789           | 19.9%      | 1 (Ref)       |           |         |
| Public  | 148,209  | 671,667             | 22.1%      | 1.14          | 0.80-1.63 | .46     |
| Uninsured   | 9,351  | 151,772             | 6.2%       | 0.27          | 0.11-0.64 | .003    |
| Household language  |  |                     |            |               |           |         |
| English   | 346,684  | 1,745,554           | 19.9%      | 1 (Ref)       |           |         |
| Spanish or others   | 13,970   | 110,734             | 12.6%      | 0.58          | 0.22-1.56 | .28     |
| Place of residence  |  |                     |            |               |           |         |
| Metropolitan area   | 269,349  | 1,483,853           | 18.2%      | 0.63          | 0.40-0.99 | .04     |
| Nonmetropolitan area  | 54,799   | 211,474             | 25.9%      | 1 (Ref)       |           |         |
| States not reported   | 40,845   | 192,641             | 21.2%      | 0.77          | 0.44-1.35 | .36     |
| Health-related factor   |  |                     |            |               |           |         |
| Asthma  |  |                     |            |               |           |         |
| Mild  | 238,075  | 1,364,867           | 17.4%      | 1 (Ref)       |           |         |
| Moderate-to-severe  | 124,574  | 510,373             | 24.4%      | 1.53          | 1.08-2.17 | .02     |
| Child's overall health status   |  |                     |            |               |           |         |
| Excellent or very good  | 246,017  | 1,438,393           | 17.1%      | 0.60          | 0.21-1.71 | .34     |
| Good  | 94,490   | 355,735             | 26.6%      | 1.04          | 0.35-3.11 | .94     |
| Fair or poor  | 23,780   | 92,316              | 25.8%      | 1 (Ref)       |           |         |
| Comorbidities, no.  |  |                     |            |               |           |         |
| 0   | 53,579   | 320,114             | 16.7%      | 1 (Ref)       |           |         |
| 1   | 127,131  | 776,823             | 16.4%      | 0.97          | 0.91-2.51 | .92     |
| ≥2  | 184,284  | 791,031             | 23.3%      | 1.51          | 0.57-1.6) | .11     |
| Special health care needs   |  |                     |            |               |           |         |
| Non-CSHCN   | 110,608  | 741,969             | 14.9%      | 1 (Ref)       |           |         |
| CSHCN, functional limitations   | 45,375   | 171,733             | 26.4%      | 2.05          | 1.15-3.65 | .01     |
| CSHCN, prescription medication  | 114,142  | 588,612             | 19.4%      | 1.37          | 0.92-2.06 | .12     |
| CSHCN, greater than routine use of services                             | 8,020  | 80,926              | 9.9%       | 0.63          | 0.21-1.87 | .40     |
| CSHCN, prescription medication and greater than routine use of services | 86,848   | 304,728             | 28.5%      | 2.28          | 1.50-3.45 | <.001   |

(Continued)

TABLE II. (Continued)

| Variable   | Weighted No. of subjects who received HCT services | Weighted total, No. | Weighted % | Unadjusted OR | 95% CI     | P value |
|--|--|---------------------|------------|---------------|------------|---------|
| The provider actively worked with the youth to make positive choices about his or her health         |  |                     |            |               |            |         |
| No   | 10,717   | 297,502             | 3.6%       | 1 (Ref)       |            |         |
| Yes  | 320,605  | 1,384,564           | 23.2%      | 8.06          | 3.65-17.80 | <.001   |
| Does not know  | 31,814   | 191,849             | 16.6%      | 5.31          | 2.06-13.72 | <.001   |
| The youth has a written care plan to meet the his or her health goals and needs                      |  |                     |            |               |            |         |
| Yes  | 170,612  | 684,061             | 24.9%      | 1.73          | 1.24-2.41  | .001    |
| No   | 194,381  | 1,203,907           | 16.1%      | 1 (Ref)       |            |         |
| The child has access to plan of care   |  |                     |            |               |            |         |
| Yes  | 153,512  | 610,156             | 25.2%      | 1.38          | 0.53-3.60  | .51     |
| No   | 10,239   | 52,177              | 19.6%      | 1 (Ref)       |            |         |
| The child has a written plan of care that addresses transition to adult health care provider         |  |                     |            |               |            |         |
| Yes  | 54,405   | 367,803             | 35.3%      | 3.14          | 1.74-5.65  | <.001   |
| No   | 69,751   | 197,740             | 14.8%      | 1 (Ref)       |            |         |
| The caregiver had someone with whom to discuss how to obtain or keep health insurance into adulthood |  |                     |            |               |            |         |
| Yes  | 234,168  | 1,016,703           | 23.0%      | 1.65          | 1.17-2.32  | .004    |
| No   | 129,315  | 841,717             | 15.4%      | 1 (Ref)       |            |         |
| Preventive care visit  |  |                     |            |               |            |         |
| Yes  | 348,094  | 1,507,796           | 23.1%      | 7.48          | 3.49-16.04 | <.001   |
| No   | 14,532   | 376,676             | 3.9%       | 1 (Ref)       |            |         |
| Social interactions  |  |                     |            |               |            |         |
| Has been bullied   |  |                     |            |               |            |         |
| Yes  | 130,375  | 647,862             | 20.1%      | 1.07          | 0.77-1.49  | .70     |
| No   | 230,868  | 1,210,081           | 19.1%      | 1 (Ref)       |            |         |
| Has bullied others   |  |                     |            |               |            |         |
| Yes  | 51,303   | 256,727             | 20.0%      | 1.04          | 0.64-1.69  | .88     |
| No   | 309,940  | 1,602,562           | 19.3%      | 1 (Ref)       |            |         |
| The caregiver attends the child's events   |  |                     |            |               |            |         |
| Yes  | 315,761  | 1,578,378           | 20.0%      | 1.29          | 0.76-2.19  | .34     |
| No   | 47,779   | 294,712             | 16.2%      | 1 (Ref)       |            |         |
| The child is engaged in school   |  |                     |            |               |            |         |
| Yes  | 283,467  | 1,437,464           | 19.7%      | 1.09          | 0.71-1.67  | .71     |
| No   | 79,283   | 429,694             | 18.5%      | 1 (Ref)       |            |         |
| The child's family is resilient  |  |                     |            |               |            |         |
| Yes  | 284,332  | 1,462,568           | 19.4%      | 1.09          | 0.67-1.77  | .73     |
| No   | 64,246   | 353,901             | 18.2%      | 1 (Ref)       |            |         |
| The child is flourishing   |  |                     |            |               |            |         |
| Yes  | 191,482  | 1,059,558           | 18.1%      | 0.82          | 0.59-1.14  | .82     |
| No   | 171,267  | 807,643             | 21.2%      | 1 (Ref)       |            |         |
| The child has an adult mentor  |  |                     |            |               |            |         |
| Yes  | 318,651  | 1,583,029           | 20.1%      | 1.64          | 0.95-2.81  | .07     |
| No   | 28,958   | 216,976             | 13.3%      | 1 (Ref)       |            |         |
| The child volunteers   |  |                     |            |               |            |         |
| Yes  | 155,784  | 761,283             | 20.5%      | 1.13          | 0.81-1.56  | .47     |
| No   | 205,662  | 1,106,642           | 18.6%      | 1 (Ref)       |            |         |
| The child works  |  |                     |            |               |            |         |
| Yes  | 148,676  | 666,331             | 22.3%      | 1.32          | 0.94-1.87  | .11     |
| No   | 213,775  | 1,199,603           | 17.8%      | 1 (Ref)       |            |         |
| The child lives in a supportive neighborhood   |  |                     |            |               |            |         |
| Yes  | 176,639  | 950,360             | 18.6%      | 0.87          | 0.63-1.22  | .42     |
| No   | 174,842  | 842,114             | 20.8%      | 1 (Ref)       |            |         |
| The child lives in a safe neighborhood   |  |                     |            |               |            |         |
| Yes  | 255,220  | 1,197,770           | 21.3%      | 1.45          | 1.02-2.06  | .04     |
| No   | 99,384   | 631,827             | 15.7%      | 1 (Ref)       |            |         |

The medical conditions were developmental delay or intellectual disability were excluded. Comorbidities include allergies, arthritis, blood disorders, cerebral palsy, cystic fibrosis, diabetes, seizures, genetic conditions, heart conditions, severe headache, Tourette syndrome, anxiety, depression, behavioral problems, speech or language disorders, autism spectrum disorder, attention deficit disorder/attention-deficit/hyperactivity disorder, deafness, and blindness. The states (or counties) not reporting metropolitan areas include Alaska, Arkansas, Connecticut, Hawaii, Maine, Maryland, Montana, Nevada, New Hampshire, North Dakota, South Dakota, Utah, Vermont, West Virginia, and Wyoming. Questions regarding access to plan of care and plan of care addressing the transition to adult health care provider were based on the participants who currently have a plan of care. Unadjusted ORs and 95% CIs are based on the univariate logistic regression model. Boldface indicates statistical significance.

CSHCN, Child has special health care needs; FPL, federal poverty level; GED, General Educational Development (certificate); OR, odds ratio; Ref, reference.

**TABLE III.** Multivariable logistic regression analysis of predictors associated with adolescent receipt of necessary services for transition to adulthood from our included cohort (2,486 adolescents, with a weighted sample representing 1,721,508 adolescents) within the 2020-2021 NSCH

| Predictor  | Adjusted OR | 95% CI     | P value         |
|--|-------------|------------|-----------------|
| Age (y)  | 1.36        | 1.22-1.52  | <b>&lt;.001</b> |
| Sex  |             |            |                 |
| Female   | 1.60        | 1.13-2.25  | <b>.007</b>     |
| Male   | 1 (Ref)     |            |                 |
| Race and ethnicity   |             |            |                 |
| Asian, non-Hispanic  | 2.07        | 0.84-5.10  | .11             |
| Black, non-Hispanic  | 0.79        | 0.46-1.34  | .38             |
| Hispanic   | 0.65        | 0.37-1.12  | .12             |
| Multiple races, non-Hispanic   | 1.51        | 0.73-3.13  | .27             |
| Others, non-Hispanic   | 0.90        | 0.26-3.11  | .86             |
| White, non-Hispanic  | 1 (Ref)     |            |                 |
| Income level   |             |            |                 |
| 0%-99% of FPL  | 1 (Ref)     |            |                 |
| 100-199% of FPL  | 1.37        | 0.75-2.49  | .31             |
| 200-399% of FPL  | 1.04        | 0.59-1.85  | .89             |
| ≥ 400% of FPL  | 0.67        | 0.37-1.23  | .20             |
| Insurance  |             |            |                 |
| Private  | 1 (Ref)     |            |                 |
| Public   | 1.21        | 0.75-1.94  | .44             |
| Uninsured  | 0.46        | 0.15-1.34  | .15             |
| Household language   |             |            |                 |
| English  | 1 (Ref)     |            |                 |
| Non-English  | 0.63        | 0.18-2.22  | .47             |
| Metropolitan area  |             |            |                 |
| Metropolitan area  | 0.71        | 0.42-1.20  | .50             |
| Nonmetropolitan  | 1 (Ref)     |            |                 |
| States not reported  | 0.67        | 0.36-1.26  | .64             |
| The provider actively worked with the child to make positive choices about his or her health         |             |            |                 |
| Yes  | 6.62        | 2.77-15.82 | <b>&lt;.001</b> |
| No   | 1 (Ref)     |            |                 |
| The written plan of care addresses the transition to adult health care providers                     |             |            |                 |
| Yes  | 5.47        | 2.88-10.41 | <b>&lt;.001</b> |
| No   | 1 (Ref)     |            |                 |
| The child has preventive care visits   |             |            |                 |
| Yes  | 6.99        | 3.26-14.98 | <b>&lt;.001</b> |
| No   | 1 (Ref)     |            |                 |
| The caregiver had someone with whom to discuss how to obtain or keep health insurance into adulthood |             |            |                 |
| Yes  | 1.55        | 1.07-2.24  | <b>.02</b>      |
| No   | 1 (Ref)     |            |                 |
| Asthma severity  |             |            |                 |
| Mild   | 1 (Ref)     |            |                 |
| Moderate-to-severe   | 1.38        | 0.84-2.01  | .12             |
| No. of comorbidities   | 1.08        | 0.95-1.22  | .15             |
| The child's overall health status  |             |            |                 |
| Fair or poor   | 1 (Ref)     |            |                 |
| Good   | 0.92        | 0.32-2.64  | .88             |
| Excellent or very good   | 0.55        | 0.19-1.57  | .26             |
| Special health care needs  |             |            |                 |
| Non-CSHCN  | 1 (Ref)     |            |                 |
| CSHCN, functional limitations  | 1.13        | 0.57-2.23  | .73             |

(Continued)

**TABLE III.** (Continued)

| Predictor   | Adjusted OR | 95% CI    | P value |
|---|-------------|-----------|---------|
| CSHCN, prescription medication only                                     | 1.25        | 0.79-1.97 | .34     |
| CSHCN, greater than routine use of services                             | 0.39        | 0.12-1.24 | .11     |
| CSHCN, prescription medication and greater than routine use of services | 1.33        | 0.75-2.14 | .38     |
| The child has an adult mentor   |             |           |         |
| Yes   | 1.66        | 0.93-2.95 | .08     |
| No  | 1 (Ref)     |           |         |
| Neighbor safety   |             |           |         |
| Yes   | 1.23        | 0.83-1.82 | .30     |
| No  | 1 (Ref)     |           |         |

Adjusted ORs and 95% CIs are based on the multivariable logistic regression model. The missing indicator method was applied to the variable metropolitan area (as states not reported). Adjusted OR for the written plan of care addressing transition to adult health care provider was based on the separate multivariable regression models among participants who have a plan of care and adjusted for age, sex, race and ethnicity, income level, insurance, household language, metropolitan area, provider actively worked with child to make positive choices, preventive care visits, caregiver had discuss health insurance, asthma severity, number of comorbidities, health status, CSHCN, adult mentor, and neighbor safety. Boldface indicates statistical significance. CSHCN, Child has special health care needs; FPL, federal poverty level; OR, odds ratio.

sample (95% of the subjects reported English as their primary language). When HCT exposure increases, the distribution of exposure will likely face disparities. These findings highlight the fact that implicit bias, lack of health care access, or understanding of health care processes by patients continue to play a role in disparities within transitional care management.

Continued efforts are needed to address health care access, overt and subconscious bias, and systemic racism in medicine.<sup>10</sup> Provider education about disparate care and acknowledgment of subconscious bias are among the first steps needed in these efforts to increase self-awareness. Also, integration of standardized assessment questions for transitional management, such as the Transition Readiness Assessment Questionnaire (TRAQ),<sup>24</sup> into routine clinical care may be helpful. In addition, our study demonstrated that a written health care plan directly addressing HCT has a high positive association with receiving the necessary exposure to transitional care; thus, such a plan is a simple approach to be implemented in practice.

Along with increased awareness of the need for improved transitional care, more time and assistance are needed for health care providers to integrate all needed care into a visit. Continued focus on shortened visit times owing to financial priorities is prohibitive to quality care. In addition, multidisciplinary teams for adolescents, consisting of providers such as social workers, financial planners, and psychologists, are also critical to help assess baseline knowledge and resources and assist the adolescent population. Although policymakers work on providing health care access for all children and health care systems work on supporting health care providers with resources to allow for delivery of optimal care for patients, more immediate approaches are needed.

One such approach is to develop technological advances in the areas of electronic health records and patient portals. For

example, our group is working on collection of patient-reported data before visits via the patient portal to incorporate relevant asthma care data into the electronic health record and visit workflow to manage pediatric asthma at the point of care and involve adolescents in their own care. Finally, educating adolescents and their families about the importance of transitional care management as well as continuing to encourage adolescents to engage in their own care, asthma or otherwise, are key steps.

## DISCLOSURE STATEMENT

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**Clinical implications: The findings of this study indicate that adolescents with asthma in a nationally representative survey of the United States have low rates of exposure to adequate preparation to transition from pediatric to adult medical care.**

## REFERENCES

1. US Centers for Disease Control. Most recent national asthma data. Available at: [https://www.cdc.gov/asthma/most\\_recent\\_national\\_asthma\\_data.htm](https://www.cdc.gov/asthma/most_recent_national_asthma_data.htm). Accessed November 11, 2024.
2. Nanzer AM, Lawton A, D'Ancona G, Gupta A. Transitioning asthma care from adolescents to adults: severe asthma series. *Chest* 2021;160:1192-9.
3. Sears MR, Greene JM, Willan AR, Wiecek EM, Taylor DR, Flannery EM, et al. A longitudinal, population-based, cohort study of childhood asthma followed to adulthood. *N Engl J Med* 2003;349:1414-22.
4. Sears MR. Predicting asthma outcomes. *J Allergy Clin Immunol* 2015;136:829-36, quiz 37.
5. Stroud C, Walker LR, Davis M, Irwin CE Jr. Investing in the health and well-being of young adults. *J Adolesc Health* 2015;56:127-9.
6. White PH, McManus M. Investing in the health and well-being of young adults. *J Adolesc Health* 2015;57:126.
7. Odling M, Jonsson M, Janson C, Melen E, Bergstrom A, Kull I. Lost in the transition from pediatric to adult healthcare? Experiences of young adults with severe asthma. *J Asthma* 2020;57:1119-27.
8. Johnson MA, Javalkar K, van Tilburg M, Haberman C, Rak E, Ferris ME. The relationship of transition readiness, self-efficacy, and adherence to preferred health learning method by youths with chronic conditions. *J Pediatr Nurs* 2015;30:e83-90.
9. Khaleva E, Vazquez-Ortiz M, Comberlati P, DunnGalvin A, Pite H, Blumchen K, et al. Current transition management of adolescents and young adults with allergy and asthma: a European survey. *Clin Transl Allergy* 2020;10:40.
10. Javalkar K, Nazareth M, Diaz-Gonzalez de Ferris ME. Trends and disparities in health care transition preparation from 2016 to 2019: findings from the US National Survey of Children's Health. *J Pediatr* 2022;247:95-101.
11. Leeb RT, Danielson ML, Bitsko RH, Cree RA, Godfred-Cato S, Hughes MM, et al. Support for transition from adolescent to adult health care among adolescents with and without mental, behavioral, and developmental disorders - United States, 2016-2017. *MMWR Morb Mortal Wkly Rep* 2020;69:1156-60.
12. Toomey SL, Chien AT, Elliott MN, Ratner J, Schuster MA. Disparities in unmet need for care coordination: the national survey of children's health. *Pediatrics* 2013;131:217-24.
13. Lebrun-Harris LA, McManus MA, Ilango SM, Cyr M, McLellan SB, Mann MY, et al. Transition planning among US youth with and without special health care needs. *Pediatrics* 2018;142:e20180194.
14. McKenzie RB, Sanders L, Bhattacharya J, Bundorf MK. Health care system factors associated with transition preparation in youth with special health care needs. *Popul Health Manag* 2019;22:63-73.
15. White PH, Cooley WC. Transitions Clinical Report Authoring Group, American Academy of Pediatrics, American Academy of Family Physicians. American College of Physicians. Supporting the health care transition from adolescence to adulthood in the medical home. *Pediatrics* 2018;142:e20182587.
16. American Academy of Pediatrics, American Academy of Family Physicians, American College of Physicians, Transitions Clinical Report Authoring Group, Cooley WC, Sagerman PJ. Supporting the health care transition from adolescence to adulthood in the medical home. *Pediatrics* 2011;128:182-200.
17. Mulkey M, Baggett AB, Tumin D. Readiness for transition to adult health care among US adolescents, 2016-2020. *Child Care Health Dev* 2023;49:321-31.
18. National Asthma Education and Prevention Program. Expert panel report 3 (EPR-3): guidelines for the diagnosis and management of asthma-summary report 2007. *J Allergy Clin Immunol* 2007;120(suppl 5):S94-138.
19. Roberts G, Vazquez-Ortiz M, Knibb R, Khaleva E, Alviani C, Angier E, et al. EAACI Guidelines on the effective transition of adolescents and young adults with allergy and asthma. *Allergy* 2020;75:2734-52.
20. van Dyck P, Kogan MD, Heppel D, Blumberg SJ, Cynamon ML, Newacheck PW. The National Survey of Children's Health: a new data resource. *Matern Child Health J* 2004;8:183-8.
21. Rosner B. Fundamentals of biostatistics. 7th ed. Boston, MA: Brooks/Cole, Cengage Learning; 2011; xvii. 859 p.
22. Meyers MJ, Irwin CE. Health care transitions for adolescents. *Pediatrics* 2023; 151(suppl 1):37010403.
23. Cheak-Zamora N, Betz C, Mandy T. Measuring health care transition: across time and into the future. *J Pediatr Nurs* 2022;64:91-101.
24. Johnson K, McBee M, Reiss J, Livingood W, Wood D. TRAQ changes: improving the measurement of transition readiness by the Transition Readiness Assessment Questionnaire. *J Pediatr Nurs* 2021;59:188-95.