APHA abstract 2022

National and State-level Prevalence of Adverse Childhood Experiences in the US: National Survey of Children’s Health 2016-2020

Background

Adverse childhood experiences (ACEs) are traumatic events such as abuse, neglect, or violence exposure that one experiences during childhood. Prior studies have used single year survey data to estimate ACEs prevalence. We expand on this prior work to provide more accurate and reliable estimates of the prevalence of ACEs exposure in the US and across states.

Objectives

To (i) estimate the prevalence of ACEs exposure among US children, overall and by age, sex, and racial/ethnic groups, and (ii) assess state-level prevalence of ACEs exposure

Methods

We used 5-year combined data from National Survey of Children’s Health (NSCH) from 2016-2020 (Unweighted N = 174,551; Weighted N = 73,222,987). Nine ACEs (parental divorce, parental death, economic hardship, household incarceration, household substance abuse, household mental illness, domestic violence witness, neighborhood violence witness, and racial/ethnic discrimination) were studied. The prevalence estimates of 4+ ACEs exposure were calculated and compared across subgroups and states.

Results

The national prevalence of 4+ ACEs was 5.41% [95% CI: 5.17%, 5.65%]. There was an age gradient with higher prevalence among older children. The prevalence did not differ by sex. Non-Hispanic Blacks and non-Hispanic others had the highest prevalence of ACEs, followed by Hispanics, non-Hispanic Whites, and non-Hispanic Asians. States with the highest prevalence included Arkansas, Montana, New Mexico, and states with the lowest prevalence included New York, New Jersey, Massachusetts. Parental divorce and economic hardship were the most common types of ACEs.

Conclusion

The study provides updated national and state-level prevalence of ACEs exposure among US children.

National and State-level Prevalence of Adverse Childhood Experiences in the US: National Survey of Children’s Health 2016-2020

Target journal: JAMA Pediatrics

**Introduction**

[ACEs introduction and importance]

[ACEs burden/prevalence from past studies]

[ACEs risk groups/determinants from past studies]

[Rationale and study objectives]

In this paper we aim to (i) assess prevalence of the adverse childhood experiences in the US, overall and by age, sex, and racial/ethnic groups, and (ii) assess state-level prevalence of the ACEs

**Methods**

**Data**

We used data from the National Survey of Children's Health (NSCH). The NSCH is a mail-based and web-based nationally representative sample survey of civilian, non-institutionalized children aged 0-17 years by the US Census Bureau and sponsored by the Maternal and Child Health Bureau of the Health Resources and Services Administration (MCHB HRSA). The NSCH collects data on health and well-being of children and adolescents including access to care, and family and neighborhood/community characteristics from all 50 states and the District of Columbia (DC). The NSCH uses a complex weighted survey design to allow for representative sample of US children. A child is randomly selected from a household after household screener (which identifies household with at least one child between the ages of 0–17), and a parent/adult caregiver with knowledge of the child’s health and health care fills out the topical questionnaire. The survey has been used to provide national-level estimates of several child health indicators. By combining multiple years of data (2 or 3 years), the survey can be used to provide reliable state-level estimates. Since 2016, the NSCH has been conducted yearly. Additional information regarding the survey and sample methodology can be found on the Data Resource Center for Child & Adolescent Health website (DRC) (<http://www.childhealthdata.org/learn/NSCH>). We combined five years of survey data from 2016 to 2020 for this study. The unweighted sample size and the population represented by the sample for each NSCH survey year is shown in Table 1.

**ACEs measures**

The NSCH collects information on nine types of ACEs. This includes the five items that make up the conventional household dysfunction domain of the ACEs from the original ACE study – household mental illness, household substance abuse, household incarceration, witnessing domestic violence, and parental divorce. The four additional items include parental death, economic hardship, racial/ethnic mistreatment, and witnessing neighborhood violence. These additional items were developed by a Technical Expert Panel based on a review of life course stressors on children’s lives ([27](https://www.sciencedirect.com/science/article/pii/S1876285916304971" \l "bib27)). Over the course of years, the literature on ACEs have expanded to capture the community contexts and social stressors which has been described as expanded ACEs (). The specific questions in the NSCH are available in the Appendix Table 1. All ACEs items except economic hardship have a ‘Yes/No’ dichotomous response options, and the measures/wording of questions were consistent across the study years. For economic hardship item, there was changes in the wording of the question from 2018 (Appendix Table 1); however, the response options were the same --. never, rarely, somewhat often, and very often. A response of ‘somewhat often’ or ‘very often’ were coded as having an ACE. In 2020 NSCH, a new item was included under ACEs that asks whether children aged 6-17 years were treated or judged unfairly due to sexual orientation or gender identity. This item is not included in this study. The NSCH also does not collect information on two conventional domains of ACEs – experience of abuse (physical, sexual, or psychological) and experience of neglect (physical or emotional).

**Analysis**

We present 5-year estimates of the prevalence of adverse childhood experiences in the US and 50 states, overall and by age, sex, and race/ethnicity. Multi-year data were used to improve precision of state-level estimates and subgroup analyses (). To adjust for gender and race/ethnicity distributions of children in the United States, as well as to adjust for nonresponses, all analyses used survey sampling weights, cluster, and [stratum](https://www.sciencedirect.com/topics/social-sciences/stratum) as instructed by the NSCH codebook. A combined 2016-2020 survey weight was created by dividing each individual survey weight by number of years combined so that the estimates are based on average midpoint population (). Additional information on the analysis of multiple years of NSCH data is available on the DRC website ().

We first summarized the age, sex, and race/ethnicity distribution of respondents for each year and combined. Then, using the combined 2016-2020 data, we calculated weighted proportion for all individual ACEs. By summing the dichotomous responses of nine ACEs items, we created a cumulative ACEs score. ACEs scores range from 0 to 9, with higher scores indicating exposure to greater number of adversities. Based on the ACEs literature, we present weighted proportion of children with ACEs scores of ≥1, ≥2 and ≥4 (). [25](https://www.sciencedirect.com/science/article/pii/S0022347620307484#bib25), [26](https://www.sciencedirect.com/science/article/pii/S0022347620307484" \l "bib26), [27](https://www.sciencedirect.com/science/article/pii/S0022347620307484#bib27) We then presented mean ACEs score, and weighted proportion of 1+, 2+ and 4+ ACEs along with corresponding 95% confidence intervals by respondent characteristics. We used forest plot to visualize prevalence of 4+ ACEs in each of the 50 states and DC. To infer significant differences in means and proportions between groups, we use rule of eye and compare 95% CIs of two coefficients to see if they overlap. If the CIs do not overlap, then the p-value comparing the two groups is at least below the level of significance i.e., ≤0.01 (). This method is sufficiently accurate when sample size for each group is at least 10, and when the two intervals do not differ in width by more than a factor of 2. [[30](https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-020-09411-z#ref-CR30)]

All analyses were conducted using R v4.0.3 software. This study was designated as exempt by the [name] institutional review board.

In addition to age, sex, and race/ethnicity, we also present estimated weighted proportions of 4+ ACEs by annual household income, employment status, educational attainment, sexual orientation, and four geographical regions- classified by the U.S. Census Bureau as our supplementary analyses.

**Results**

The distribution of age, sex and race/ethnicity were similar across survey years. A total of 174,551 children and adolescents (weighted N = 73,222,987) were analyzed. Across all survey years and combined 2016-2020 period, the mean age of the participants was approximately 8.6 years (SD=5.1). About 32% were five years or younger, 49% were females, 51% were non-Hispanic White, 25% Hispanic, 13% non-Hispanic Black, and 4% non-Hispanic Asian.

Table 1: Age, sex, and race/ethnicity distribution of the participants by year of survey

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Year of survey | | | | |  |
| 2016 | 2017 | 2018 | 2019 | 2020 | 2016-2020 |
| N, unweighted | 50,212 | 21,599 | 30,530 | 29,433 | 42,777 | 174,551 |
| N, weighted | 73,350,040 | 73,424,383 | 73,433,138 | 73,133,076 | 72,774,300 | 73,222,987 |
| Age in years, mean (SD) | 8.60 (5.15) | 8.61 (5.16) | 8.64 (5.16) | 8.66 (5.15) | 8.69 (5.14) | 8.64 (5.15] |
| Age <= 5 years | 32.32% | 32.27% | 32.12% | 32.10% | 31.98% | 32.20% |
| Age 6 to 11 years | 33.85% | 33.87% | 33.81% | 33.57% | 33.37% | 33.70% |
| Age 12 to 17 years | 33.83% | 33.86% | 34.07% | 34.33% | 34.65% | 34.10% |
| Female | 48.94% | 48.87% | 48.89% | 48.87% | 48.89% | 48.90% |
| Male | 51.06% | 51.13% | 51.11% | 51.13% | 51.11% | 51.10% |
| Hispanic | 24.54% | 24.94% | 25.24% | 25.64% | 25.67% | 25.20% |
| Non-Hispanic White | 51.89% | 50.96% | 50.51% | 50.21% | 50.06% | 50.73% |
| Non-Hispanic Black | 12.71% | 13.40% | 13.37% | 13.29% | 13.29% | 13.21% |
| Non-Hispanic Asian | 4.52% | 4.65% | 4.75% | 4.52% | 4.62% | 4.61% |
| Non-Hispanic Other | 6.34% | 6.05% | 6.14% | 6.34% | 6.36% | 6.24% |

Note: Percentages presented in the table are weighted percentages.

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Figure 1: Prevalence of different ACEs among US children and adolescents, 2016-2020

Table 2 shows the mean number of ACEs, and the prevalence of one, two, or four and more ACEs for overall, by age group, sex, and race/ethnicity.

Table 2: Prevalence of 1+, 2+ and 4+ ACEs among US children and adolescents, 2016-2020

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Mean ACEs score [95% CI] | 1+ ACEs  [95% CI] | 2+ ACEs  [95% CI] | 4+ ACEs  [95% CI] |
| All | 0.81 [0.80, 0.82] | 43.2 [42.7, 43.7] | 18.9 [18.5, 19.3] | 5.41 [5.17, 5.65] |
| Age <= 5 years | 0.48 [0.46, 0.50] | 35.7 [34.7, 36.6] | 9.95 [9.35, 10.58] | 2.11 [1.86, 2.39] |
| Age 6 to 11 years | 0.85 [0.82, 0.88] | 44.0 [43.1, 45.0] | 20.1 [19.4, 20.9] | 5.82 [5.38, 6.30] |
| Age 12 to 17 years | 1.08 [1.05, 1.11] | 49.4 [48.5, 50.3] | 26.1 [25.3, 26.8] | 8.08 [7.61, 8.57] |
| Female | 0.81 [0.79, 0.83] | 43.4 [42.6, 44.2] | 19.0 [18.4, 19.6] | 5.42 [5.08, 5.78] |
| Male | 0.81 [0.79, 0.83] | 43.0 [42.2, 43.7] | 18.8 [18.2, 19.3] | 5.39 [5.06, 5.73] |
| Hispanic | 0.84 [0.80, 0.88] | 44.7 [43.2, 46.2] | 19.3 [18.2, 20.5] | 5.24 [4.63, 5.88] |
| Non-Hispanic White | 0.72 [0.71, 0.73] | 41.0 [40.4, 41.5] | 16.7 [16.3, 17.2] | 4.80 [4.56, 5.04] |
| Non-Hispanic Black | 1.14 [1.10, 1.19] | 51.2 [49.6, 52.9] | 27.8 [26.4, 29.3] | 7.92 [7.04, 8.87] |
| Non-Hispanic Asian | 0.32 [0.28, 0.35] | 31.7 [29.7, 33.7] | 6.02 [5.02, 7.13] | 0.92 [0.48, 1.58] |
| Non-Hispanic Other | 1.08 [1.02, 1.14] | 46.9 [45.2, 48.6] | 25.5 [24.0, 27.0] | 9.07 [8.03, 10.19] |

Figure 2: Proportion of children and adolescents with 4 or more ACEs in the US States (forest plot)

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Discussion

[Summary and interpretation of main findings]

[Comparison to prevalence from past studies]

[Implications of the findings]

[What this study adds]

[Limitations]

Sensitivity Analysis for Missing ACE Data

Respondents were allowed to decline to answer any ACE question. Missing ACE data were not missing at random. A higher proportion of children with missing ACE data were black, Hispanic, or other race/ethnicity and were more likely to be from low-income households. More children with arthritis were missing ACE data than healthy children (20% vs 9%; *P* = .02) and children with OCPD (7%; *P* = .003). The majority of children with missing ACE data were missing data for one ACE question and each ACE question had a similar number of missing responses (3%-4% missing). There were no missing data in the NSCH dataset for the sociodemographic variables because multiple imputation was used in the design of the dataset. For all demographic variables, <1% of respondents had imputed data, with the exception of income, for which 17% of healthy and OCPD classified children had imputed values and 20% of children with arthritis. No significant differences in proportions of imputed data were found across health status groups. Two sensitivity analyses were performed (counting each unanswered ACE question as no exposure and counting each unanswered ACE question as a positive exposure) to assess for any differences from the main results.

Appendix

A

|  |  |  |
| --- | --- | --- |
| **ACE item** | **NSCH question** | **Response options** |
| Parental divorce | To the best of your knowledge, has this child EVER experienced any of the following? *Parent or guardian divorced or separated* | * Yes * No |
| Parental death | To the best of your knowledge, has this child EVER experienced any of the following? *Parent or guardian died* | * Yes * No |
| Household incarceration | To the best of your knowledge, has this child EVER experienced any of the following? *Parent or guardian served time in jail* | * Yes * No |
| Witnessing domestic violence | To the best of your knowledge, has this child EVER experienced any of the following? *Saw or heard parents or adults slap, hit, kick, punch one another in the home* | * Yes * No |
| Witnessing neighborhood violence | To the best of your knowledge, has this child EVER experienced any of the following? *Was a victim of violence or witnessed violence in their neighborhood* | * Yes * No |
| Household mental illness | To the best of your knowledge, has this child EVER experienced any of the following? *Lived with anyone who was mentally ill, suicidal, or severely depressed* | * Yes * No |
| Household substance abuse | To the best of your knowledge, has this child EVER experienced any of the following? *Lived with anyone who had a problem with alcohol or drugs* | * Yes * No |
| Racial mistreatment | To the best of your knowledge, has this child EVER experienced any of the following? *Treated or judged unfairly because of their race or ethnic group* | * Yes * No |
| Economic hardship | SINCE THIS CHILD WAS BORN, how often has it been very hard to cover the basics, like food or housing, on your family’s income?\* | * Never * Rarely * Somewhat often * Very often |

\* The wording of the item prior to NSCH 2018 was as follows ‘SINCE THIS CHILD WAS BORN, how often has it been very hard to get by on your family’s income – hard to cover the basics like food or housing?’

B

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~~I: Proportion of children and adolescents with 4 or more ACEs from 2016 to 2020 in the US States by (a) age group (150 figs), (c) by sex (100 figs), (d) by race/ethnicity (250 figs)~~

II: Proportion of children and adolescents with different ACEs by age by year (first check to see if the proportion changes over time, if no change then present 5-year estimates (same for IV and V below))

III: Age vs cumulative #ACEs

IV: Proportion of children and adolescents with different ACEs by sex by year (table?)

V: Proportion of children and adolescents with different ACEs by race/ethnicity by year (table?)

VI: Proportion of children and adolescents with different ACEs by State by year

Figure 1: (a) Proportion of children and adolescents with 4 or more ACEs in the US (1 fig), (b) by age group (3 figs), (c) by sex (2 figs), (d) by race/ethnicity (5 figs)

Five bars with confidence intervals connected by time (year 2016, 2017, 2018, 2019, 2020), p-value for trend test/mantel-Haenszel test

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | ACEincome2 | ACEdivorce | ACEdeath | ACEjail | ACEdomviol | ACE6 | ACE7 | ACE8 |
| All | 18.5 [18.0, 18.9] | 23.6 [23.2, 24.1] | 3.2 [3.0, 3.4] | 7.4 [7.1, 7.7] |  |  |  |  |
| Age <= 5 years | 17.2 [16.4, 18.0] | 11.6 [11.0, 12.3] | 1.2 [0.9, 1.5] | 3.9 [3.6, 4.3] |  |  |  |  |
| Age 6 to 11 years | 18.7 [17.9, 19.4] | 25.9 [25.1, 26.8] | 2.8 [2.5, 3.1] | 8.5 [8.0, 9.0] |  |  |  |  |
| Age 12 to 17 years | 19.4 [18.7, 20.2] | 32.7 [31.9, 33.5] | 5.4 [5.0, 5.8] | 9.7 [9.2, 10.2] |  |  |  |  |
| Female | 18.4 [17.7, 19.0] | 23.8 [23.1, 24.5] | 3.2 [2.9, 3.5] | 7.4 [7.0, 7.8] |  |  |  |  |
| Male | 18.6 [17.9, 19.2] | 23.5 [22.8, 24.1] | 3.2 [2.9, 3.4] | 7.4 [7.1, 7.8] |  |  |  |  |
| Hispanic | 21.6 [20.4, 22.9] | 25.2 [23.9, 26.5] | 3.0 [2.5, 3.5] | 6.6 [6.0, 7.3] |  |  |  |  |
| Non-Hispanic White | 15.5 [15.1, 15.9] | 21.9 [21.4, 22.4] | 2.6 [2.4, 2.7] | 6.3 [5.9, 6.6] |  |  |  |  |
| Non-Hispanic Black | 25.3 [23.9, 26.8] | 32.1 [30.6, 33.7] | 6.3 [5.6, 7.2] | 13.8 [12.7, 15.0] |  |  |  |  |
| Non-Hispanic Asian | 9.1 [7.7, 10.7] | 7.5 [6.4, 8.7] | 2.1 [1.6, 2.6] | 0.9 [0.5, 1.5] |  |  |  |  |
| Non-Hispanic Other | 22.7 [21.3, 24.3] | 25.8 [24.3, 27.4] | 3.2 [2.7, 3.8] | 11.7 [10.5, 13.0] |  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | Proportion of children and adolescents with 4 or more ACEs | | |
|  | **2016/17** | **2018/19** | **2020** |
| AL | 6.37 | 5.2 | 5.61 |
| AK | 8.21 | 8.81 | 6.09 |
| AZ | 9.26 | 6.88 | 7.39 |
| AR | 10.22 | 9.35 | 9.67 |
| CA | 3.23 | 3.86 | 4.94 |
| CO | 7.36 | 6.54 | 5.21 |
| CT | 4.77 | 3.93 | 3.84 |
| DE | 7.03 | 5.76 | 5.7 |
| DC | 5.87 | 6.09 | 4.33 |
| FL | 6.07 | 5.65 | 2.73 |
| GA | 7.38 | 5.32 | 4.77 |
| HI | 4.11 | 4.22 | 3.11 |
| ID | 6.94 | 7.82 | 4.42 |
| IL | 4.83 | 6.25 | 4.05 |
| IN | 7.12 | 7.05 | 4.62 |
| IA | 5.83 | 5.67 | 3.71 |
| KS | 6.88 | 6.86 | 5.85 |
| KY | 6.76 | 7.62 | 7.56 |
| LA | 5.57 | 5.77 | 4.56 |
| ME | 7.78 | 7.06 | 6.61 |
| MD | 2.37 | 5.38 | 3.49 |
| MA | 3.33 | 3.59 | 3.09 |
| MI | 6.55 | 6.54 | 6.79 |
| MN | 5.23 | 4.88 | 3.6 |
| MS | 9.55 | 6.6 | 6.02 |
| MO | 8.44 | 4.92 | 6.6 |
| MT | 9.38 | 10.51 | 7.34 |
| NE | 5.4 | 5.73 | 3.75 |
| NV | 7.35 | 5.59 | 4.95 |
| NH | 3.4 | 4.18 | 5.13 |
| NJ | 2.54 | 2.37 | 2.14 |
| NM | 7.45 | 10.18 | 9.28 |
| NY | 2.38 | 2.49 | 2.46 |
| NC | 6.94 | 5.11 | 5.11 |
| ND | 4.49 | 8.03 | 4.9 |
| OH | 7.62 | 7.04 | 6.8 |
| OK | 9.89 | 8.03 | 6.6 |
| OR | 6.17 | 5.94 | 5.17 |
| PA | 5.29 | 6.08 | 4.04 |
| RI | 5.48 | 4.91 | 3.77 |
| SC | 6.04 | 5.37 | 6.49 |
| SD | 5.52 | 8.01 | 7.96 |
| TN | 6.89 | 6.59 | 6.41 |
| TX | 5.59 | 6.54 | 4.01 |
| UT | 5.27 | 5.47 | 3.28 |
| VT | 5.76 | 5.93 | 5.31 |
| VA | 5.69 | 3.28 | 3.98 |
| WA | 5.56 | 5.78 | 4.84 |
| WV | 8.69 | 8.61 | 6.77 |
| WI | 8.42 | 5.62 | 7.22 |
| WY | 7.12 | 11.21 | 8.76 |