

Adverse childhood experiences and medical health risk components among U.S. children: a cross-sectional study of the 2023–2024 National Survey of Children's Health

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Abstract

Background

Adverse childhood experiences (ACEs) are social determinants of child health, but their associations across distinct dimensions of medical health risk in contemporary U.S. children remain incompletely characterized. We estimated associations between cumulative ACE exposure and four medical health risk components and assessed heterogeneity by age.

Methods

We analyzed the 2023 and 2024 National Survey of Children's Health, collected from June 2023 to January 2024 and June 2024 to February 2025. Of 106,537 children aged 0–17 years, 104,838 had a valid 9-item adverse childhood experience count. Survey-weighted modified Poisson models estimated adjusted prevalence ratios; standardization estimated adjusted prevalence differences. Models adjusted for survey year, age, sex, and race/ethnicity.

Results

Prevalence increased across exposure categories for every component. Comparing three or more with no adverse childhood experiences, adjusted prevalence ratios were 2.99 for more-complex special health care needs, 2.63 for two or more conditions, 2.23 for functional difficulty, and 3.63 for fair/poor health; adjusted prevalence differences were 23.61, 24.55, 25.42, and 2.37 percentage points, respectively. Age interaction was supported for more-complex special health care needs and multiple conditions, but not the other components.

Conclusions

Higher cumulative ACE exposure was cross-sectionally associated with each medical health risk component. The consistent gradient identifies a population health burden relevant to prevention and service planning, but the findings do not establish causality or clinical screening thresholds.

Background

Adverse childhood experiences (ACEs), including household mental illness, parental incarceration, economic hardship, and exposure to violence, are associated with adverse health across the life course [1, 2]. Among children, cumulative ACE exposure has been associated with worse general health, chronic conditions, functional limitations, asthma, and allergic conditions in the National Survey of Children's Health (NSCH) [3–6]. Because these outcomes differ in prevalence, severity, and measurement, a single composite may obscure clinically important variation.

The Child and Adolescent Health Measurement Initiative operationalizes a Medical Health Risk (MHR) domain within the Whole Child Risk Index. It comprises four indicators: more-complex special health care needs, two or more current or lifelong conditions, one or more functional difficulties, and fair/poor overall health [7, 8]. Examining these components separately permits comparison of relative and absolute association scales and avoids treating distinct indicators as interchangeable.

Age may modify associations because diagnostic opportunity, the applicability of functional-difficulty items, and caregiver perceptions differ across development. Formal interaction testing is needed to distinguish heterogeneity from descriptive differences. Machine-learning models may additionally characterize internal prediction and model-based feature contributions, but they require strict separation of training and test data and do not estimate causal importance.

We estimated survey-weighted associations between a 9-item cumulative ACE measure and each MHR component in the combined 2023–2024 NSCH. By reporting adjusted prevalence ratios (aPRs) alongside adjusted prevalence differences (APDs), the study compares relative associations with their absolute population burden. We formally tested ACE-by-age interactions, controlled the false discovery rate across primary contrasts, examined sensitivity specifications, and used exploratory gradient-boosted tree models to describe internal predictive performance and feature contributions.

Methods

Study design and population

This cross-sectional study used the Child and Adolescent Health Measurement Initiative combined 2023–2024 NSCH Topical Public Use File [8]. The NSCH is an annual survey of noninstitutionalized U.S. children aged 0–17 years; a parent or guardian reports on one sampled child per household. The 2023 cycle was collected from June 23, 2023, through January 19, 2024, and the 2024 cycle from June 21, 2024, through February 7, 2025. Weighted overall response rates were 35.8% and 36.3%, respectively [9, 10]. The combined file appended, rather than longitudinally followed, 55,162 children from 2023 and 51,375 from 2024 (total $n = 106,537$).

Measures

Exposure. The primary exposure summed nine dichotomized ACE items: difficulty meeting basic family needs (ACE1), parental divorce or separation (ACE3), parental death (ACE4), parental incarceration (ACE5), witnessing domestic violence (ACE6), neighborhood violence (ACE7), living with anyone with mental illness (ACE8), living with anyone with alcohol or drug problems (ACE9), and unfair treatment because of race or ethnicity (ACE10). ACE8 was retained as a household exposure and was not relabeled as caregiver mental illness. Unfair treatment because of a health condition or disability (ACE11) was excluded from the primary count because it overlaps with disease, disability, and functional limitation in the outcomes. The count was categorized as 0, 1, 2, or ≥ 3 . Following the source syntax, an

individual missing item was treated as not endorsed; the score was missing only when all nine items were missing. This yielded 104,838 valid scores; 1,699 records (1.6%) had all nine items missing. A 10-item count including ACE11 was examined in sensitivity analysis.

Outcomes. Four binary MHR components were reconstructed from the codebook: (1) more-complex children with special health care needs (CSHCNComplex_2324 = 1); (2) two or more current or lifelong conditions, from 22 specified condition indicators; (3) one or more functional difficulties, from 12 specified indicators with age-inapplicable items treated as absent; and (4) fair/poor overall health (ChHlthSt_2324 = 3). The reconstructed component count matched MedRiskct_2324 for all 106,537 records. MedRisk2more_2324 ($MHR \geq 2$) was retained as a secondary overview outcome.

Covariates. Primary models adjusted for survey year (YEAR), age group (age3_2324: 0–5, 6–11, or 12–17 years), sex (sex_2324), and race/ethnicity (race4_2324). Descriptive and exploratory models additionally used poverty level (povlev4_2324), family structure (famstruct5_2324), highest adult education (AdultEduc_2324), insurance type (instype_2324), medical-home status (MedHome_2324), and metropolitan status (METRO_YN). Expanded-adjustment sensitivity models used six continuous poverty implicates (FPL_I1–FPL_I6) with family structure, adult education, insurance type, and medical-home status.

Statistical analysis

The full complex-survey design was created before analytic-domain restrictions. The primary sampling unit was HHID, strata were the interaction of FIPSST and STRATUM, and fwc_2324 was the released two-year final weight. Variance estimation accounted for nesting. Survey-weighted prevalence and 95% confidence intervals (CIs) were estimated within ACE categories. Modified Poisson regression with a log link and design-based robust variance estimated aPRs for 1, 2, and ≥ 3 ACEs versus 0 ACEs. Weighted counterfactual standardization estimated APDs by setting exposure to each comparison level for all eligible records and averaging predicted probabilities with survey weights; delta-method standard errors incorporated model coefficient uncertainty [11].

The four component outcomes and three ACE contrasts formed 12 primary comparisons. The Benjamini–Hochberg procedure controlled the false discovery rate across these tests; the $MHR \geq 2$ overview was excluded. A sensitivity model treated the observed nine-item count as continuous. Secondary models included ACE category, age group, and their interaction, with survey year, sex, and race/ethnicity as covariates; a global design-based Wald test evaluated interaction. Other sensitivity analyses used the 10-item ACE count, unweighted robust models, and expanded adjustment across FPL_I1–FPL_I6, with estimates combined using Rubin’s rules.

For exploratory prediction, XGBoost models used the nine individual ACE items and the extended covariate set; the cumulative count was excluded. Five stratified outer folds generated mutually exclusive out-of-fold predictions. Within each outer training set, a separate 20% validation subset selected the boosting iteration by early stopping; the outer test fold was not used for tuning. Models

were refitted to the full outer training set for the selected iterations. Combined weights were applied as case weights. We report weighted area under the receiver operating characteristic curve (AUROC), area under the precision-recall curve (AUPRC), Brier score, calibration intercept, and calibration slope. A final full-sample model used the median selected iteration; absolute Shapley additive explanations (SHAP) were aggregated from dummy columns to source features and normalized within outcome. These models were not design-based estimators and were not used for threshold selection [12, 13].

Analyses used R version 4.6.1, survey version 4.5, and xgboost version 3.2.1.1 [14]. Reporting followed the STROBE guidance for cross-sectional studies [15]. Tests were two-sided, and inferential decisions used exact software output.

Results

Analytic sample and characteristics

Among 104,838 children with a valid 9-item ACE count, unweighted category counts were 67,988 with 0 ACEs, 20,520 with 1, 7,812 with 2, and 8,518 with ≥ 3 (Table 1). In the ≥ 3 -ACE group, 55.9% were aged 12–17 years, 26.4% were Hispanic, 54.2% had public-only insurance, and 64.2% did not meet medical-home criteria. In the 0-ACE group, 20.1% had public-only insurance and 49.8% did not meet medical-home criteria.

Table 1
Child characteristics by adverse childhood experience category (n = 104838)

Characteristic or level	0 ACEs (n = 67988)	1 ACE (n = 20520)	2 ACEs (n = 7812)	≥ 3 ACEs (n = 8518)
Age	27110 (36.5)	5155 (24.7)	1437 (19.2)	979 (10.7)
0-5 years				
6–11 years	19494 (33.5)	6177 (34.7)	2257 (31.8)	2470 (33.4)
12–17 years	21384 (30.0)	9188 (40.6)	4118 (49.0)	5069 (55.9)
Sex	34802 (51.1)	10544 (51.4)	4079 (52.5)	4415 (51.0)
Male				
Female	33186 (48.9)	9976 (48.6)	3733 (47.5)	4103 (49.0)
Race Ethnicity	9075 (25.8)	3584 (30.2)	1453 (29.8)	1508 (26.4)
Hispanic				
Non-Hispanic White	45864 (50.8)	12329 (41.4)	4658 (41.8)	5129 (44.2)
Non-Hispanic Black	2996 (9.6)	1798 (16.5)	742 (17.3)	763 (17.8)
Non-Hispanic other	10053 (13.7)	2809 (11.9)	959 (11.1)	1118 (11.6)
Poverty	5608 (12.8)	3167 (22.2)	1510 (25.9)	1950 (27.4)
< 100% FPL				
100–199% FPL	7731 (16.0)	3886 (23.1)	1798 (27.3)	2226 (30.4)
200–399% FPL	18596 (28.1)	6583 (28.9)	2469 (27.7)	2764 (28.6)
≥400% FPL	36053 (43.2)	6884 (25.9)	2035 (19.1)	1578 (13.7)
Family Structure	58495 (82.0)	10930 (48.8)	2937 (33.5)	2118 (23.8)
Two parents, married				
Two parents, not married	2739 (5.2)	1704 (9.9)	697 (9.0)	727 (9.4)
Single parent	4649 (10.7)	6902 (37.4)	3657 (49.5)	4150 (49.3)
Grandparent household	597 (1.4)	545 (2.9)	390 (5.7)	1082 (11.1)
Other family type	211 (0.7)	141 (1.0)	92 (2.2)	386 (6.3)
Adult Education	1415 (7.8)	618 (9.5)	256 (8.9)	297 (9.8)
Values are unweighted n (survey-weighted column percentage). ACE, adverse childhood experience; FPL, federal poverty level. Percentages may not total 100 because of rounding or item missingness. Suppressed metropolitan values are excluded from metropolitan-status percentages.				

Characteristic or level	0 ACEs (n = 67988)	1 ACE (n = 20520)	2 ACEs (n = 7812)	≥ 3 ACEs (n = 8518)
Less than high school				
High school or GED	5660 (13.9)	3392 (24.1)	1524 (27.0)	1958 (29.5)
Some college or technical school	10243 (14.7)	5026 (21.8)	2310 (27.1)	2918 (29.0)
College degree or higher	50670 (63.6)	11484 (44.6)	3722 (37.0)	3345 (31.7)
Insurance	8390 (20.1)	5374 (35.4)	2777 (43.1)	4111 (54.2)
Public only				
Private only	53503 (68.9)	12463 (50.0)	3861 (39.9)	2929 (27.8)
Public and private	2252 (4.0)	1252 (6.6)	614 (8.5)	822 (10.4)
Uninsured	2874 (7.0)	1093 (8.0)	437 (8.5)	518 (7.6)
Medical Home	37766 (50.2)	9435 (40.1)	3335 (38.1)	3400 (35.8)
Meets medical home criteria				
Does not meet criteria	30203 (49.8)	11077 (59.9)	4474 (61.9)	5116 (64.2)
Metropolitan	51712 (88.7)	15116 (87.0)	5564 (85.6)	5791 (81.9)
Metropolitan				
Nonmetropolitan	9734 (11.3)	3466 (13.0)	1463 (14.4)	1879 (18.1)
Values are unweighted n (survey-weighted column percentage). ACE, adverse childhood experience; FPL, federal poverty level. Percentages may not total 100 because of rounding or item missingness. Suppressed metropolitan values are excluded from metropolitan-status percentages.				

Prevalence and adjusted associations

Weighted prevalence increased across ACE categories for every MHR component (Table 2). From 0 to ≥ 3 ACEs, prevalence increased from 11.50% to 38.91% for more-complex special health care needs, 14.40% to 45.53% for two or more conditions, 20.62% to 46.66% for functional difficulty, and 0.85% to 3.72% for fair/poor health. The secondary MHR ≥ 2 prevalence increased from 12.32% to 42.88%.

Table 2
Prevalence of medical health risk components by adverse childhood experience category

Outcome	0 ACEs	1 ACE	2 ACEs	≥ 3 ACEs
More-complex CSHCN	9613/67988 11.50 (11.07–11.93)	4598/20520 18.17 (17.17–19.17)	2393/7812 25.30 (23.54–27.06)	3783/8518 38.91 (36.85–40.96)
2 + current or lifelong conditions	11209/67988 14.40 (13.90–14.91)	5589/20520 23.74 (22.61–24.88)	2858/7812 32.42 (30.48–34.36)	4212/8518 45.53 (43.35–47.70)
1 + functional difficulty	14118/67921 20.62 (19.99–21.25)	6341/20491 31.40 (30.03–32.77)	2999/7791 36.06 (34.05–38.08)	4226/8494 46.66 (44.48–48.83)
Fair or poor overall health	484/67832 0.85 (0.71–0.99)	298/20462 1.88 (1.46–2.29)	211/7772 2.80 (2.06–3.55)	309/8485 3.72 (2.94–4.50)
MHR ≥ 2 (overview)	9818/67988 12.32 (11.86–12.79)	5036/20520 21.35 (20.25–22.46)	2667/7812 29.42 (27.53–31.32)	4070/8518 42.88 (40.76–45.00)
Cells show unweighted events/eligible n and survey-weighted prevalence percentage (95% CI). MHR, Medical Health Risk; CSHCN, children with special health care needs.				

Adjusted associations were graded on relative and absolute scales (Table 3; Figs. 1 and 3). Comparing ≥ 3 with 0 ACEs, aPRs were 2.99 (95% CI, 2.80–3.20) for more-complex special health care needs, 2.63 (2.47–2.80) for two or more conditions, 2.23 (2.10–2.36) for functional difficulty, and 3.63 (2.71–4.86) for fair/poor health. Corresponding APDs were 23.61 (95% CI, 21.63–25.58), 24.55 (22.49–26.62), 25.42 (23.08–27.77), and 2.37 (1.63–3.11) percentage points. Fair/poor health therefore had the largest relative association but the smallest absolute difference because baseline prevalence was low. All 12 primary contrasts remained significant after false-discovery-rate control (all $q < 0.001$).

Table 3

Adjusted associations between adverse childhood experiences and medical health risk components

Outcome	ACE contrast	aPR (95% CI)	APD, percentage points (95% CI)	False-discovery-rate q value
More-complex CSHCN	1 vs 0	1.50 (1.41–1.60)	5.94 (4.89–7.00)	< 0.001
More-complex CSHCN	2 vs 0	2.03 (1.87–2.20)	12.20 (10.44–13.96)	< 0.001
More-complex CSHCN	3 + vs 0	2.99 (2.80–3.20)	23.61 (21.63–25.58)	< 0.001
2 + current or lifelong conditions	1 vs 0	1.52 (1.44–1.61)	7.86 (6.68–9.04)	< 0.001
2 + current or lifelong conditions	2 vs 0	1.98 (1.85–2.13)	14.79 (12.88–16.70)	< 0.001
2 + current or lifelong conditions	3 + vs 0	2.63 (2.47–2.80)	24.55 (22.49–26.62)	< 0.001
1 + functional difficulty	1 vs 0	1.50 (1.42–1.58)	10.36 (8.83–11.88)	< 0.001
1 + functional difficulty	2 vs 0	1.72 (1.61–1.83)	14.88 (12.77–17.00)	< 0.001
1 + functional difficulty	3 + vs 0	2.23 (2.10–2.36)	25.42 (23.08–27.77)	< 0.001
Fair or poor overall health	1 vs 0	1.95 (1.46–2.61)	0.85 (0.43–1.28)	< 0.001
Fair or poor overall health	2 vs 0	2.82 (2.02–3.95)	1.64 (0.92–2.37)	< 0.001
Fair or poor overall health	3 + vs 0	3.63 (2.71–4.86)	2.37 (1.63–3.11)	< 0.001
MHR $\geq$ 2 (overview)	1 vs 0	1.62 (1.52–1.73)	7.92 (6.76–9.07)	Not included
MHR $\geq$ 2 (overview)	2 vs 0	2.15 (1.99–2.33)	14.74 (12.86–16.62)	Not included
MHR $\geq$ 2 (overview)	3 + vs 0	3.00 (2.81–3.20)	25.53 (23.50–27.55)	Not included
Models adjusted for survey year, age group, sex, and race/ethnicity. Adjusted prevalence differences use survey-weighted counterfactual standardization. False-discovery-rate q values cover the 12 contrasts for the four component outcomes; the MHR $\geq$ 2 overview was excluded. ACE, adverse childhood experience; aPR, adjusted prevalence ratio; APD, adjusted prevalence difference; CI, confidence interval; MHR, Medical Health Risk.				

Per additional observed ACE, aPRs were 1.27 for more-complex special health care needs, 1.24 for two or more conditions, 1.20 for functional difficulty, and 1.34 for fair/poor health [see Additional file 1: Table S2]. This secondary specification assumed a log-linear association per additional ACE.

Age interaction and sensitivity analyses

Age-specific category estimates are shown in Fig. 2. Associations between ≥ 3 and 0 ACEs were present in each age group, but global interaction tests supported heterogeneity only for selected outcomes (Table 4). For more-complex special health care needs, aPRs were 4.77 (95% CI, 3.98–5.71) at ages 0–5 years, 3.04 (2.73–3.40) at ages 6–11 years, and 2.64 (2.41–2.89) at ages 12–17 years (interaction $P < 0.001$). Corresponding aPRs for two or more conditions were 5.01 (4.18–6.00), 2.65 (2.38–2.96), and 2.32 (2.15–2.51) ($P < 0.001$). Interaction was not supported for functional difficulty ($P = 0.415$) or fair/poor health ($P = 0.224$).

Table 4

Age-specific associations between adverse childhood experiences and medical health risk components

Outcome	0–5 years	6–11 years	12–17 years	Global interaction P
More-complex CSHCN	4.77 (3.98–5.71)	3.04 (2.73–3.40)	2.64 (2.41–2.89)	< 0.001
2 + current or lifelong conditions	5.01 (4.18–6.00)	2.65 (2.38–2.96)	2.32 (2.15–2.51)	< 0.001
1 + functional difficulty	1.96 (1.69–2.27)	2.19 (1.97–2.43)	2.31 (2.14–2.50)	0.415
Fair or poor overall health	5.16 (2.56–10.41)	3.86 (2.37–6.28)	3.05 (2.06–4.53)	0.224
MHR ≥ 2 (overview)	4.81 (4.00–5.78)	2.90 (2.60–3.23)	2.78 (2.55–3.02)	< 0.001

Age-specific estimates compare ≥ 3 with 0 adverse childhood experiences. Models included adverse childhood experience category, age group, their interaction, survey year, sex, and race/ethnicity. P values are global design-based Wald tests of all exposure-category-by-age interaction terms. aPR, adjusted prevalence ratio; CI, confidence interval; CSHCN, children with special health care needs; MHR, Medical Health Risk.

The direction of the ≥ 3 -versus-0 association was unchanged when ACE11 was included, in unweighted robust models, and after expanded adjustment using the six poverty implicates [see Additional file 1: Table S1]. Expanded-adjustment aPRs were 2.64 for more-complex special health care needs, 2.46 for two or more conditions, 2.00 for functional difficulty, and 2.60 for fair/poor health. These specifications are robustness checks, not uniquely correct causal models.

Exploratory prediction

Leakage-free out-of-fold weighted AUROCs ranged from 0.65 to 0.75 [see Additional file 1: Table S3]. The AUPRC for fair/poor health was 0.04, reflecting outcome rarity despite an AUROC of 0.75. Calibration slopes ranged from 1.00 to 1.08, with intercepts near zero in internally cross-validated data. Age group, insurance type, and medical-home status were prominent non-ACE contributors to absolute SHAP magnitude; household mental illness and income hardship were frequently among the higher-ranked ACE items [see Additional file 1: Figure S1]. These results represent internal prediction, not exposure effects, mechanisms, or intervention priorities.

Discussion

Principal findings

In this nationally representative repeated cross-sectional sample, higher cumulative ACE exposure was associated with higher prevalence of each MHR component on relative and absolute scales. Absolute differences for more-complex special health care needs, multiple conditions, and functional difficulty were approximately 24–25 percentage points for ≥ 3 versus 0 ACEs. Fair/poor health had a larger relative ratio but an absolute difference of approximately 2 percentage points. This contrast shows why relative and absolute measures should be interpreted together.

The graded pattern is consistent with earlier NSCH studies of cumulative ACEs and child health [3–6]. This analysis extends that evidence by separating four dimensions within the MHR domain in the recent combined 2023–2024 release and by quantifying absolute differences relevant to population health planning. It does not establish that ACEs caused these outcomes or that reducing a specific item would produce the modeled contrast.

Age heterogeneity and exploratory prediction

Relative associations for more-complex special health care needs and multiple conditions were largest at ages 0–5 years and decreased across age groups. Children with both high ACE exposure and recognized medical complexity at young ages may constitute a selected high-risk group; diagnoses accumulate with age, increasing baseline prevalence in older children; and measurement may vary developmentally. Because exposure and outcome were reported at the same survey occasion, temporal ordering cannot distinguish these explanations. The absence of interaction for the other components cautions against claiming that all ACE–MHR associations are strongest in early childhood.

The exploratory models showed moderate internal discrimination rather than performance sufficient for deployment. The low AUPRC for fair/poor health is important because AUROC can appear favorable for a rare outcome while positive predictions remain imprecise. Correlated social and health-care variables can redistribute SHAP contributions. No external or temporal validation, clinical threshold analysis, decision-curve analysis, or implementation evaluation was performed; the models should not be framed as screening tools.

Strengths and limitations

Strengths include the large recent sample, use of the released two-year weight and full survey design before domain restriction, exact reconstruction of the official MHR component count, reporting of aPRs and APDs, formal interaction testing, false-discovery-rate control, and multiple sensitivity analyses. The exploratory workflow protected outer test folds from early-stopping decisions and assessed calibration and discrimination.

This study also has limitations. First, the cross-sectional design precludes causal, incidence, prognosis, and treatment-effect interpretations. Second, ACEs and outcomes were caregiver reported at the same occasion, allowing recall, reporting, and common-method bias. Sensitive adversities may be underreported, and some adversities, including maltreatment, are not measured. Third, treating isolated missing ACE items as not endorsed may attenuate counts; 1.6% with all nine items missing were excluded. Fourth, residual confounding remains, and expanded adjustment may include variables related to health-care recognition. Fifth, fair/poor health was rare, limiting subgroup precision and predictive precision. Sixth, weighting may not fully remove nonresponse bias. Finally, weighted machine learning was not full design-based estimation, validation was internal only, and correlated predictors may destabilize SHAP rankings.

Conclusions

Cumulative ACE exposure was cross-sectionally associated with higher prevalence of each medical health risk component among U.S. children in the 2023–2024 NSCH. Age heterogeneity was supported for more-complex special health care needs and multiple conditions, but not every component. These population patterns support continued attention to childhood adversity in prevention and service planning while warranting longitudinal study and external validation; they do not establish causality or a clinical screening recommendation.

Abbreviations

ACE
adverse childhood experience
APD
adjusted prevalence difference
aPR
adjusted prevalence ratio
AUPRC
area under the precision-recall curve
AUROC
area under the receiver operating characteristic curve
CI
confidence interval
CSHCN

children with special health care needs

FPL

federal poverty level

MHR

Medical Health Risk

NSCH

National Survey of Children's Health

PSU

primary sampling unit

SHAP

Shapley additive explanations.

Declarations

Ethics approval and consent to participate

This secondary analysis used the deidentified, publicly available 2023–2024 National Survey of Children's Health public-use dataset. The authors had no contact with participants and no access to direct identifiers or identifiable private information. Because the analysis was limited to deidentified public-use data and involved no participant interaction or intervention, institutional review board approval and additional informed consent were not required. The original survey was administered by the U.S. Census Bureau on behalf of the Health Resources and Services Administration Maternal and Child Health Bureau under federal confidentiality protections. The released files underwent disclosure review and were used solely for statistical analysis in accordance with the data-use requirements.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

CQ contributed to conceptualization, methodology, formal analysis, software, visualization, and writing the original draft. YS and QC contributed to investigation, interpretation, and review and editing. JX and YF contributed to the literature review, interpretation, and review and editing. GC and MW contributed to data curation, visualization, and review and editing. CY contributed to supervision, conceptualization, methodology, project administration, and review and editing. All authors read and approved the final manuscript.

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Availability of data and materials

The deidentified 2023–2024 National Survey of Children’s Health combined topical public-use dataset and documentation used in this study are available from the Child and Adolescent Health Measurement Initiative Data Resource Center after completion of its data request [17]. Annual public-use files are also available from the U.S. Census Bureau [16]. This study generated no new data and did not use restricted, linked, or individually identifiable data.

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Figures

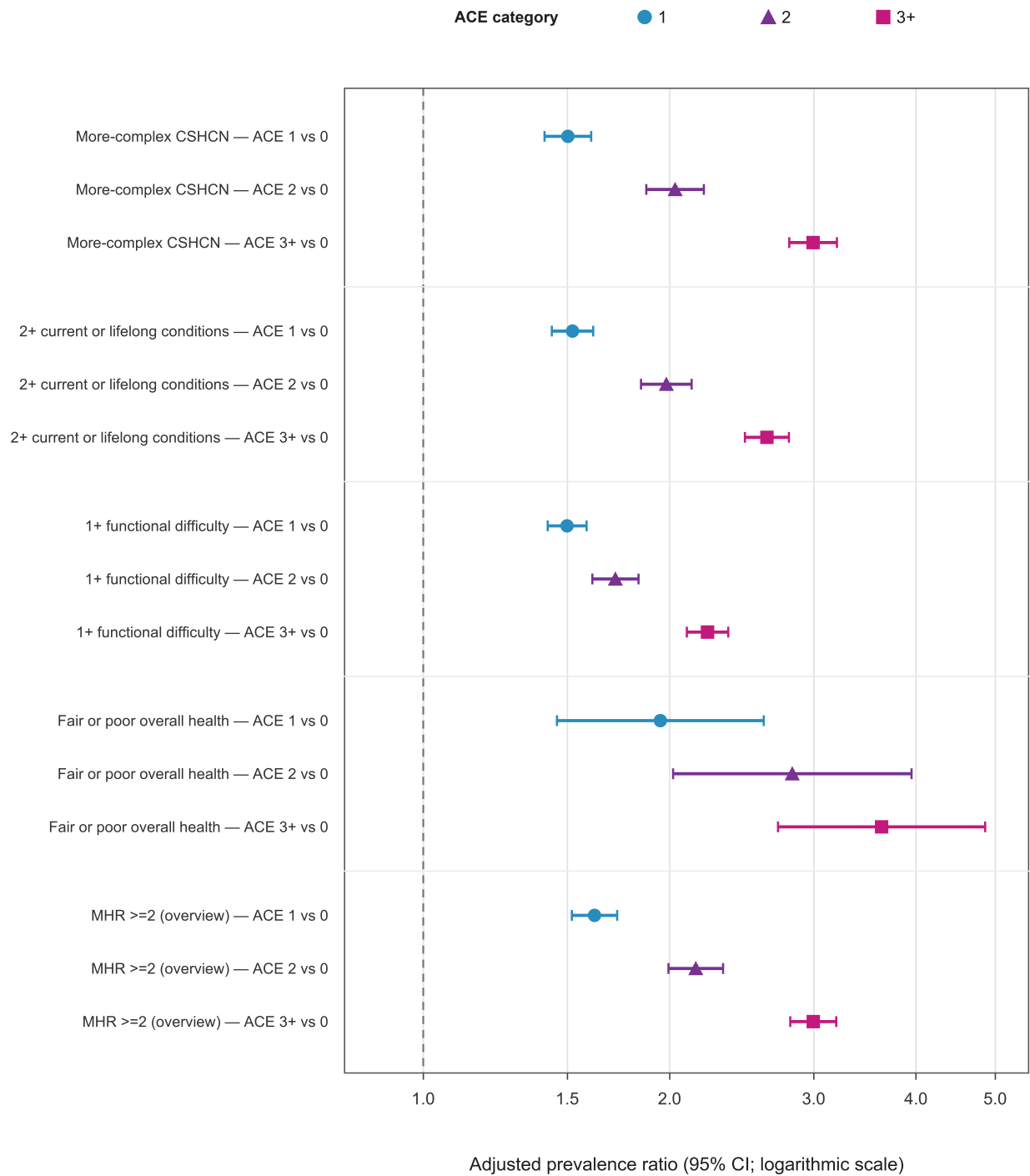


Figure 1

Adjusted prevalence ratios for medical health risk components by adverse childhood experience category

Survey-weighted modified Poisson models adjusted for survey year, age group, sex, and race/ethnicity. Points are adjusted prevalence ratios and horizontal bars are 95% confidence intervals on a logarithmic scale; 0 adverse childhood experiences is the reference. The MHR ≥ 2 overview is secondary. MHR, Medical Health Risk.

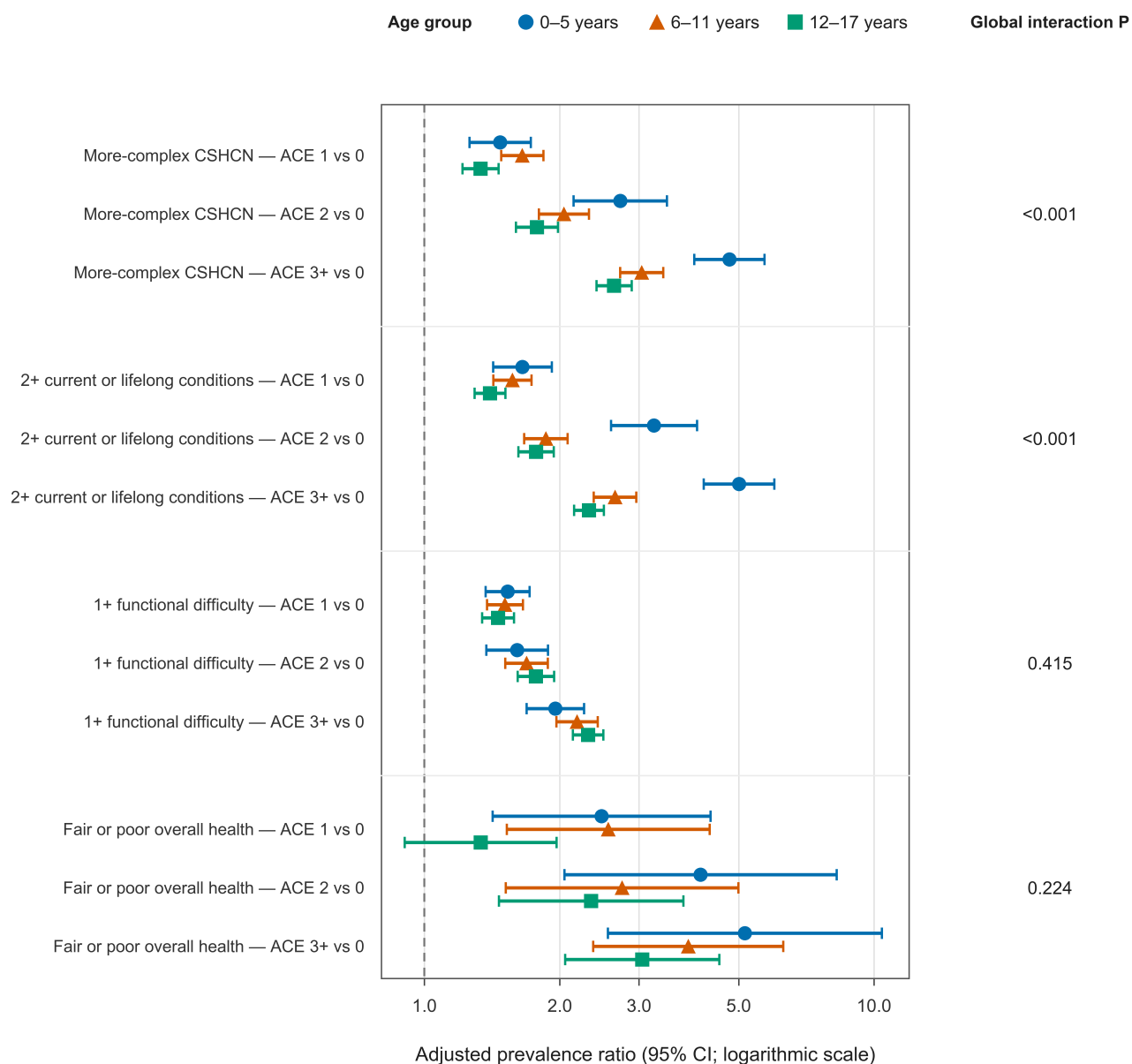


Figure 2

Age-specific adjusted prevalence ratios for medical health risk components by adverse childhood experience category

Survey-weighted modified Poisson models included adverse childhood experience category, age group, their interaction, survey year, sex, and race/ethnicity. Points are adjusted prevalence ratios and horizontal bars are 95% confidence intervals on a logarithmic scale; no adverse childhood experiences is the reference. P values are global design-based Wald tests of all ACE-category-by-age interaction terms. ACE, adverse childhood experience; CSHCN, children with special health care needs.

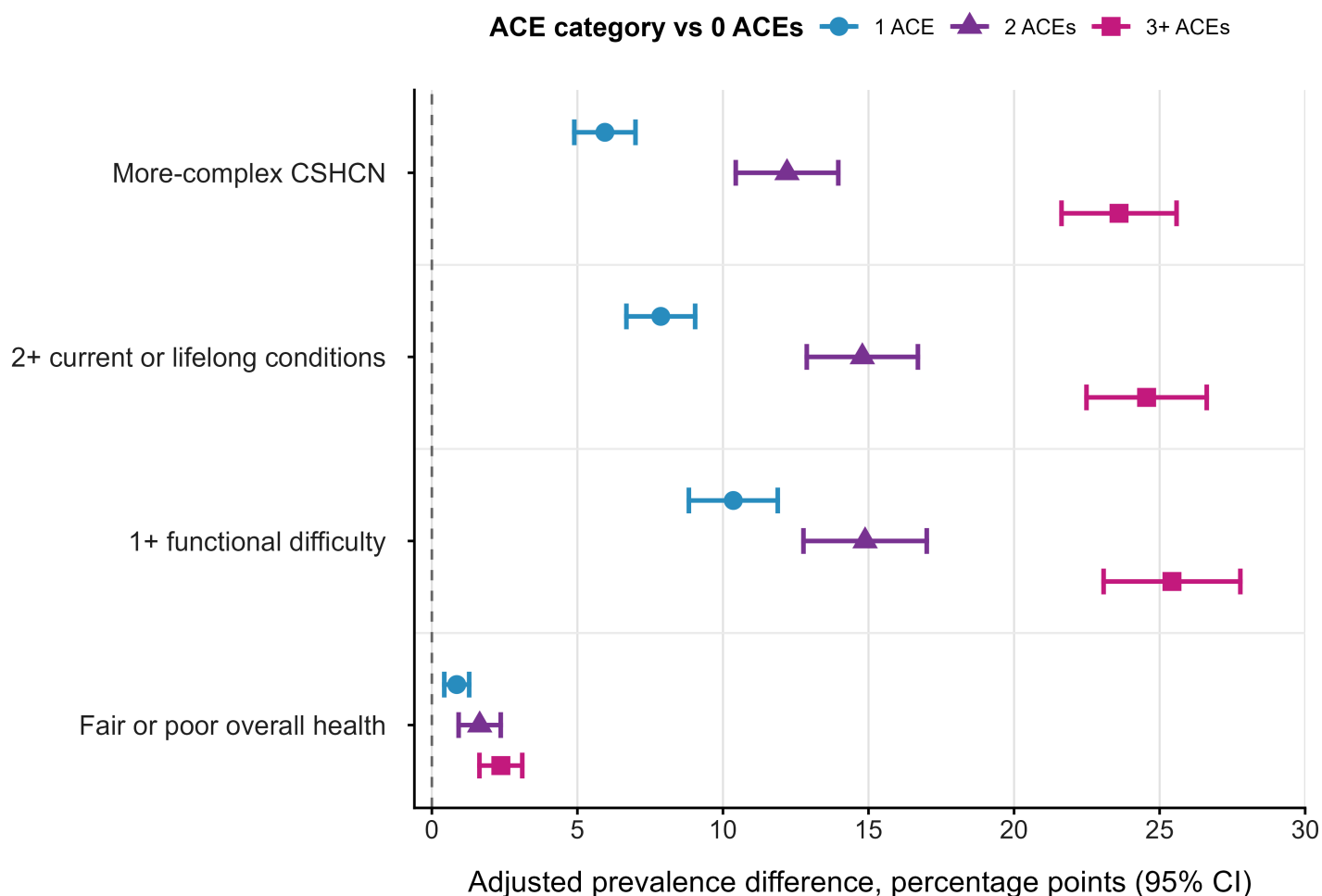


Figure 3

Adjusted prevalence differences in medical health risk components by adverse childhood experience category

The analytic sample included 104,838 children with a valid 9-item adverse childhood experience count; outcome-specific denominators varied because of item missingness. Survey-weighted modified Poisson models adjusted for survey year, age group, sex, and race/ethnicity. Points are adjusted prevalence differences in percentage points and horizontal bars are 95% confidence intervals from delta-method standard errors after weighted counterfactual standardization; no adverse childhood experiences is the reference. ACE, adverse childhood experience; CSHCN, children with special health care needs.

Supplementary Files

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