

Supplemental Information

SUPPLEMENTAL INFORMATION 1. COHORT DEVELOPMENT

Initial intervention and comparison cohorts were identified among children in Medicaid and HMIS datasets during

the study period. Cohorts were matched based on the traits in Supplemental Information 1, and then further refined to ensure receipt of housing resources and sufficient Medicaid data in the

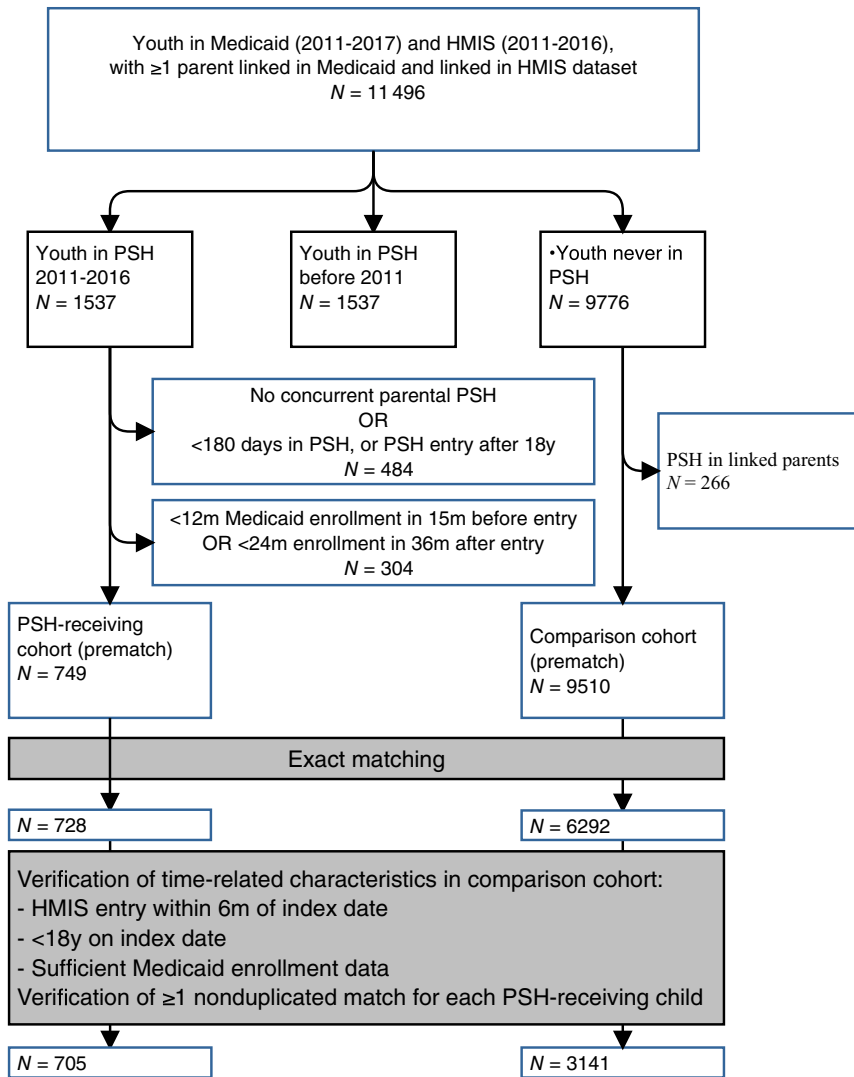
comparison cohort around the time in which the matching PSH-receiving child entered PSH. This process, and the cohort sizes at each step, are shown in Supplemental Figure 2.

SUPPLEMENTAL TABLE 3 Matching Criteria

Exact Match Criteria	Propensity Score Weighting Criteria
Date of birth within 12 mo	Date of birth within 12 mo
Gender	Gender
Pennsylvania managed care region ^a	Pennsylvania managed care region ^a
Documented parental or guardian diagnosis of mental illness at any time during the study period	Documented parental or guardian diagnosis of mental illness at any time during the study period
Documented parental or guardian diagnosis of disability linked to Medicaid enrollment	Documented parental or guardian diagnosis of disability linked to Medicaid enrollment
	Urbanicity
	Lived in Pittsburgh or surrounding county on index date
	Medical complexity ^b

^a Managed care regions are regional divisions in Medicaid claims data included in matching to minimize differences in health utilization related to location.

^b The Pediatric Medical Complexity Algorithm (PMCA) uses diagnoses in claims-based data to categorize children according to Center of Excellence on Quality of Care Measures for Children with Complex Needs consensus definitions. These definitions establish three levels of medical complexity: children with complex chronic disease (ie, with significant chronic conditions in ≥ 2 body systems, a progressive condition that is associated with deteriorating health with a decreased life expectancy, continuous dependence on technology for at least 6 mo, or malignancies), children with noncomplex chronic disease (chronic conditions that last at least 1 y), and children without chronic disease.³⁵ The PMCA exists in different forms optimized to analyze medical complexity in different data settings. We used the "conservative" definitions and algorithm v3.2.⁴⁹



SUPPLEMENTAL FIGURE 2

Cohort selection and matching. “Sufficient Medicaid data”: enrollment in Medicaid in 12 of the 15 months before PSH entry (or index date in the comparison cohort), and 24 of the 36 months immediately after PSH entry or index date. “≥1 parent linked in Medicaid”: Medicaid data includes a family ID variable. We inferred that adults >18 sharing a family ID with children were likely parents or guardians. To select for child-adult pairs that experienced risk of homelessness together, we included only child-adult pairs who were both present in HMIS and included in our intervention-receiving cohort only those child-adult pairs that entered PSH within 30 days of each other.

SUPPLEMENTAL INFORMATION 2. OUTCOME MEASURE DEFINITIONS

Because claims data may contain multiple records of a single encounter, we counted only the first encounter of a given type per person-day. We defined care of the following types:

Dental visits were as the union of treatment and preventive visits.

- Preventive dental visits were defined based on the CDT codes D0120, D0145, D0150, D0210, D0220, D0230, D0240, D0270, D0272, D0273, D0274, D1110, D1120, D1201, D1203, D1206, D1208, D1351, D1353. These include diagnostic services such as radiography, since this may be an important component in primary prevention.
- Treatment-related dental visits were defined based on the CDT codes D2-D9.

Preventive medicine visits were defined using CPT codes 99391-99395 and 99381-99385.

Inpatient visits were defined using claims from Medicaid inpatient files, which include admissions to short-stay acute care hospitals.

Emergency room visits were defined as visits using 1 of the procedure

codes '0450' '0451' '0452' '0456' '0459' and '0981', and 1 of the revenue codes '99281' '99282' '99283' '99284' '99285' 'G0380' 'G0381' 'G0382' 'G0383' 'G0384' 'G0385.' We included only visits which were not immediately followed by an inpatient admission to a short-stay acute care hospital and did not result in death.

SUPPLEMENTAL INFORMATION 3. COMPARING COUNTS AND MEAN AGES OF STUDY COHORTS BY YEAR (SENSITIVITY ANALYSES)

Differential attrition from our cohorts could affect our analyses in 2 ways:

1. Unmeasured differences between the 2 cohorts might drive different rates of attrition from Medicaid enrollment, resulting in poorer cohort matching over time.
2. Since utilization is closely linked to age, as shown in Supplemental Table 4, if the 2 cohorts exhibited patterns of attrition that differed by age, this would result in poorer age matching over time, potentially introducing differences in utilization trends that are not attributable to PSH.

In order to examine for differing rates of attrition, we (1) examined the number of children who remained enrolled in Medicaid in each of the three years before and after the PSH move-in date (intervention cohort) or index date (comparison cohort). In order to assess for different patterns of attrition by age in the cohorts, we (2) examined the mean age of the 2 cohorts over the same period. Because we follow the same children over time, we expect a mean increase in age by year. However, we expect these mean increases to be similar across the intervention and comparison cohorts, such that age differences between the cohorts remain constant. Differential changes in age (implying non-constant age differences between the cohorts over time) would raise concern about bias from compositional changes across the cohorts.

Because the number of children and mean age of the children showed similar patterns in the 2 cohorts, we conclude that different rates of attrition and differential age-related patterns of attrition were unlikely to be significant drivers of the different changes in health utilization we found in our cohorts.

SUPPLEMENTAL TABLE 4 Mean Age in PSH and Comparison Cohorts in Each Study Year

Year to Index	Intervention Cohort (Received PSH)			Comparison Cohort		
	Age, Mean	Age, SD	Number of Children	Age, Mean	Age, SD	Number of Children
-3	5.90	4.45	608	5.84	4.46	2688
-2	6.21	4.75	688	6.17	4.74	3073
-1	6.97	4.87	705	6.97	4.84	3141
0	7.97	4.87	705	7.97	4.84	3140
1	8.97	4.87	705	8.97	4.84	3141
2	9.94	4.87	697	9.94	4.84	3078

**SUPPLEMENTAL INFORMATION 4.
FULL REGRESSION ESTIMATES**

The difference-in-difference analysis was performed as a linear regression between matched, propensity-score weighted intervention and comparison

cohorts. Independent variables included an indicator for the intervention cohort (“PSH receipt”), post-PSH entry (or index) date, an interaction between the intervention and post-PSH entry indicators, and all variables

included in matching. The regression coefficient on the interaction term is our difference-in-differences estimate. Both year of entry and age were included as covariates and were treated as categorical variables.

SUPPLEMENTAL TABLE 5 Full Regression Estimates From Difference-in-Difference Models

	Dental Visits	Preventive Dental Visits	Treatment Dental Visits	Preventive Medicine Visits	Hospitalization	Emergency Department Visits
PSH receipt	0.90 (−6.39 to 8.20)	0.86 (−3.59 to 5.32)	1.19 (−4.29 to 6.67)	−2.07 (−6.97 to 2.83)	−0.83 (−3.00 to 1.34)	−1.61 (−8.94 to 5.73)
Postindex date	10.10** (3.13 to 17.08)	5.10* (1.01 to 9.20)	6.68* (1.43 to 11.94)	−30.23*** (−34.00 to −26.46)	−2.84 (−6.55 to 0.88)	−8.30** (−14.59 to −2.02)
PSH receipt and Postindex date interaction	12.70** (3.72 to 21.67)	7.65** (2.02 to 13.28)	4.52 (−2.22 to 11.25)	2.49 (−4.03 to 9.00)	−2.02 (−6.35 to 2.31)	−4.55 (−13.35 to 4.25)
Age, y						
<1	Reference	Reference	Reference	Reference	Reference	Reference
1–2	14.17 (−4.59 to 32.93)	16.05* (1.04 to 31.05)	1.34 (−5.76 to 8.44)	−33.90* (−64.98 to −2.81)	−12.44*** (−18.37 to −6.52)	−51.57* (−95.30 to −7.84)
3–5	42.92*** (24.01 to 61.83)	40.37*** (25.31 to 55.43)	12.40*** (5.06 to 19.74)	−102.36*** (−133.12 to −71.61)	−26.30*** (−32.34 to −20.25)	−69.04** (−112.48 to −25.59)
6–11	59.11*** (40.13 to 78.10)	45.73*** (30.69 to 60.76)	26.85*** (19.28 to 34.41)	−127.85*** (−158.55 to −97.16)	−27.74*** (−33.51 to −21.97)	−96.20*** (−139.43 to −52.96)
12–18	71.91*** (51.65 to 92.17)	32.21*** (17.10 to 47.31)	51.22*** (41.39 to 61.05)	−135.01*** (−165.77 to −104.26)	−20.31*** (−28.06 to −12.55)	−76.82*** (−120.69 to −32.95)
Female	11.02*** (4.72 to 17.32)	6.05** (2.37 to 9.72)	5.20* (0.61 to 9.80)	0.81 (−2.00 to 3.63)	−0.83 (−3.52 to 1.86)	7.58* (1.53 to 13.63)
Race						
Non-Hispanic white	Reference	Reference	Reference	Reference	Reference	Reference
Non-Hispanic Black	−0.24 (−7.59 to 7.11)	−1.91 (−6.03 to 2.21)	−1.22 (−6.83 to 4.40)	−7.87*** (−10.92 to −4.81)	1.03 (−2.33 to 4.40)	−2.77 (−9.33 to 3.79)
Hispanic	−13.02 (−29.74 to 3.70)	−3.33 (−14.25 to 7.60)	−9.45 (−20.17 to 1.27)	4.86 (−3.90 to 13.62)	−1.39 (−5.43 to 2.65)	15.57 (−1.43 to 32.56)
Others	15.98 (−5.67 to 37.62)	9.12 (−0.79 to 19.02)	4.86 (−11.54 to 21.27)	9.14* (0.04 to 18.24)	−1.28 (−4.19 to 1.62)	2.36 (−14.34 to 19.07)
Nonurban	−4.01 (−16.57 to 8.54)	−2.81 (−10.60 to 4.98)	−2.19 (−10.07 to 5.70)	−8.07* (−14.71 to −1.43)	0.13 (−3.29 to 3.55)	8.63 (−7.21 to 24.46)
Resided in Pittsburgh or surrounding county	−4.19 (−14.48 to 6.10)	−1.27 (−7.86 to 5.32)	0.09 (−6.33 to 6.50)	−2.48 (−7.22 to 2.27)	−1.14 (−3.77 to 1.49)	−10.40 (−23.66 to 2.86)
Medical complexity						
No chronic disease	Reference	Reference	Reference	Reference	Reference	Reference
Complex chronic disease	9.93 (−0.65 to 20.51)	10.33** (3.81 to 16.86)	0.20 (−7.81 to 8.22)	14.86*** (9.89 to 19.84)	25.47*** (12.28 to 38.67)	57.06*** (41.79 to 72.34)
Noncomplex chronic disease	10.31** (2.67 to 17.96)	8.05*** (3.80 to 12.31)	4.98 (−0.70 to 10.67)	5.16** (2.05 to 8.27)	5.56*** (3.68 to 7.44)	27.06*** (19.83 to 34.29)
Pennsylvania managed care region						
Southwest	Reference	Reference	Reference	Reference	Reference	Reference
New West	−6.59 (−22.74 to 9.57)	−5.07 (−15.24 to 5.11)	−0.64 (−10.57 to 9.29)	−1.37 (−10.98 to 8.23)	1.18 (−2.71 to 5.07)	−5.29 (−23.82 to 13.24)
New East	−4.10 (−36.49 to 28.30)	−0.88 (−26.03 to 24.28)	−1.84 (−17.97 to 14.30)	−3.79 (−13.70 to 6.12)	4.14 (−8.64 to 16.92)	0.76 (−42.92 to 44.43)
Lehigh Capital	16.26 (−10.79 to 43.30)	4.16 (−7.43 to 15.76)	11.82 (−9.31 to 32.95)	−9.39* (−18.27 to −0.52)	−0.28 (−6.80 to 6.25)	−2.09 (−19.44 to 15.26)
Southeast	14.23 (−8.98 to 37.44)	13.71 (−4.36 to 31.78)	3.80 (−6.02 to 13.62)	2.71 (−13.71 to 19.13)	1.49 (−2.34 to 5.31)	−25.58 (−56.14 to 4.99)
Parental mental illness	−3.12 (−28.03 to 21.78)	2.87 (−7.58 to 13.35)	−7.34 (−26.05 to 11.36)	6.29* (0.59 to 11.99)	1.38 (−1.26 to 4.03)	17.71** (6.74 to 28.69)
Parental SUD	−9.48* (−16.84 to −2.12)	−7.91*** (−12.23 to −3.60)	−1.83 (−7.13 to 3.46)	−2.93 (−5.93 to 0.06)	1.58 (−1.11 to 4.27)	−7.36* (−14.32 to −0.39)
Parent enrolled in both Medicaid and Medicare	5.72 (−4.70 to 16.13)	1.62 (−3.76 to 6.99)	3.50 (−4.28 to 11.28)	−0.56 (−4.59 to 3.46)	2.76 (−2.92 to 8.44)	−4.50 (−14.95 to 5.94)
Parent with disability	4.76 (−3.88 to 13.40)	2.36 (−1.98 to 6.69)	3.18 (−3.36 to 9.71)	1.51 (−1.87 to 4.90)	1.61 (−0.66 to 3.89)	12.15** (3.81 to 20.48)
Quarter of entry						
January–March	−2.08 (−7.07 to 2.92)	−1.97 (−6.07 to 2.14)	−0.00 (−3.03 to 3.02)	3.07 (−0.97 to 7.12)	0.25 (−1.15 to 1.65)	1.17 (−3.44 to 5.79)
April–June	−3.94 (−8.20 to 0.32)	−3.98* (−7.24 to −0.74)	−0.46 (−3.32 to 2.40)	1.20 (−2.74 to 5.14)	−1.59* (−3.07 to −0.10)	1.91 (−2.57 to 6.40)
July–September	−1.97 (−6.73 to 2.80)	−0.72 (−4.82 to 3.38)	−1.86 (−4.64 to 0.92)	8.55*** (4.36 to 12.74)	−1.27 (−2.75 to 0.21)	−1.64 (−6.11 to 2.83)
October–December	Reference	Reference	Reference	Reference	Reference	Reference

SUPPLEMENTAL TABLE 5 Continued

Year fixed effects (year outcomes are measured)	Dental Visits		Preventive Dental Visits		Treatment Dental Visits		Preventive Medicine Visits		Hospitalization		Emergency Department Visits	
	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
2008	9.61 (-21.70 to 40.92)	3.33 (-19.89 to 26.54)	6.04 (-15.36 to 27.44)	13.74 (-8.87 to 36.34)	3.07 (-7.19 to 13.32)	5.95 (-24.77 to 36.67)						
2009	23.80 (-6.95 to 54.56)	7.90 (-13.77 to 29.58)	16.21 (-5.53 to 37.96)	2.57 (-18.61 to 23.75)	2.53 (-6.65 to 11.71)	2.53 (-27.60 to 32.65)						
2010	18.46 (-11.49 to 48.41)	7.27 (-14.35 to 28.89)	11.28 (-9.02 to 31.58)	0.24 (-21.14 to 21.63)	3.55 (-5.62 to 12.72)	4.63 (-24.40 to 33.65)						
2011	17.57 (-11.33 to 46.47)	11.40 (-9.93 to 32.74)	7.29 (-12.10 to 26.67)	-4.91 (-25.79 to 15.97)	1.18 (-7.69 to 10.05)	9.39 (-19.50 to 38.27)						
2012	25.78 (-3.51 to 55.07)	18.24 (-3.12 to 39.60)	9.05 (-10.59 to 28.68)	-7.10 (-27.95 to 13.75)	-1.09 (-9.77 to 7.58)	17.00 (-12.05 to 46.04)						
2013	32.49* (2.94 to 62.04)	22.00* (0.55 to 43.45)	14.09 (-5.97 to 34.15)	-7.53 (-28.21 to 13.16)	-1.09 (-9.75 to 7.57)	9.59 (-19.58 to 38.77)						
2014	33.02* (3.19 to 62.85)	21.49 (-0.01 to 43.00)	13.85 (-6.46 to 34.16)	-12.78 (-33.49 to 7.93)	-1.52 (-10.40 to 7.36)	5.30 (-24.27 to 34.88)						
2015	37.13* (7.00 to 67.26)	25.35* (3.52 to 47.17)	16.53 (-3.81 to 36.87)	-16.15 (-36.93 to 4.63)	-1.00 (-9.92 to 7.92)	1.61 (-28.33 to 31.56)						
2016	35.24* (4.32 to 66.15)	24.32* (2.27 to 46.37)	13.05 (-7.96 to 34.05)	-11.05 (-31.92 to 9.81)	0.16 (-8.78 to 9.11)	0.34 (-30.21 to 30.90)						
2017	41.06* (8.64 to 73.47)	27.49* (4.90 to 50.09)	14.11 (-8.09 to 36.31)	-18.90 (-39.92 to 2.12)	-1.29 (-10.51 to 7.92)	-3.63 (-35.19 to 27.94)						
2018												

95% confidence intervals are presented in parentheses. Medical complexity determined using the Pediatric Medical Complexity Algorithm, which is based on Center of Excellence on Quality of Care Measures for Children with Complex Needs consensus definitions. SUD, substance use disorder.

* $P < .05$, ** $P < .01$, *** $P < .001$.

**SUPPLEMENTAL INFORMATION 5.
DIFFERENCE-IN-DIFFERENCE
CALCULATIONS BY TYPE OF DENTAL
CARE (SENSITIVITY ANALYSIS)**

SUPPLEMENTAL TABLE 6 Change in Different Types of Dental Care Utilization

Outcome (Visits per 1000 Person-Months)	Intervention Cohort (Received PSH)			Comparison Cohort			DID (95% CI)	P for DID	P for Baseline Differences
	Baseline	Y1-3	Difference (95% CI)	Baseline	Y1-3	Difference (95% CI)			
All dental visits	71.01	100.62	22.80* (14.43 to 31.17)	75.48	94.25	10.10* (3.13 to 17.08)	12.70* (3.72 to 21.67)	.006	.808
Preventive dental visits	51.65	71.63	12.75* (7.38 to 18.12)	54.63	67.24	5.10* (1.01 to 9.20)	7.65* (2.02 to 13.28)	.008	.705
Treatment dental visits	28.29	39.94	11.20* (5.16 to 17.24)	28.94	36.88	6.68* (1.43 to 11.94)	4.52 (-2.22 to 11.25)	.189	.671

Preventive and Treatment visits sum to more than "all dental visits" because preventive and treatment dental care may have occurred on the same day.

* $P < .05$.

**SUPPLEMENTAL INFORMATION 6.
DIFFERENCE-IN-DIFFERENCE ANALYSIS
STRATIFIED BY AGE AND MEDICAL
COMPLEXITY**

Because healthcare utilization varies greatly by age and

medical complexity, we ran stratified regressions for age groupings commonly used in pediatric literature, and for patients with and without chronic conditions.

SUPPLEMENTAL TABLE 7 Change in Utilization Associated With PSH Entry Among Age and Medical Complexity Subgroups

Outcome (Visits per 1000 Person-Months)	Intervention Cohort (Received PSH)			Comparison Cohort			DID (95% CI)
	Baseline	Y1–3	Difference (95% CI)	Baseline	Y1–3	Difference (95% CI)	
Dental visits							
Children aged 0–5	35.12	88.38	40.34* (31.13 to 49.56)	40.27	84.37	32.75* (25.58 to 39.92)	7.6 (–1.78 to 16.97)
Children aged 6–11	92.22	103.68	1.9 (–11.61 to 15.42)	83.67	97.11	1.97 (–8.32 to 12.26)	–0.07 (–14.40 to 14.26)
Children aged 12–17	98.07	118.54	18.52 (–2.66 to 39.71)	115.17	107.28	–15.61 (–35.20 to 3.97)	34.13* (9.30 to 58.97)
Children with noncomplex or complex chronic condition	79.37	103.72	26.56* (12.21 to 40.91)	89.18	105.76	14.23* (2.20 to 26.26)	12.33 (–2.02 to 26.68)
Children without chronic condition	65.72	98.66	20.35* (9.94 to 30.77)	68.55	88.64	7.45 (–0.98 to 15.89)	12.90* (1.39 to 24.41)
Preventive medicine visits							
Children aged 0–5	137.49	61.92	–60.33* (–72.3 to –48.36)	138.78	60.21	–66.95* (–75.34 to –58.56)	6.62 (–5.86 to 19.10)
Children aged 6–11	43.77	43.48	–0.66 (–6.45 to 5.12)	43.70	40.80	–3.81* (–7.57 to –0.06)	3.15 (–2.58 to 8.88)
Children aged 12–17	37.36	35.17	–0.01 (–6.75 to 6.72)	41.06	35.81	–5.67* (–10.54 to –0.80)	5.66 (–1.60 to 12.91)
Children with noncomplex or complex chronic condition	83.45	53.12	–24.21* (–33.47 to –14.95)	78.39	49.08	–26.42* (–32.66 to –20.18)	2.21 (–8.83 to 13.25)
Children without chronic condition	76.86	47.26	–29.02* (–36.38 to –21.67)	78.63	46.97	–32.41* (–37.10 to –27.71)	3.38 (–4.63 to 11.40)
Hospitalizations							
Children aged 0–5	20.21	3.90	–10.82* (–15.17 to –6.47)	16.02	2.19	–11.70* (–14.36 to –9.04)	0.88 (–4.09 to 5.84)
Children aged 6–11	3.39	2.22	0.31 (–3.07 to 3.68)	2.75	3.97	3.01 (–0.23 to 6.26)	–2.71 (–6.10 to 0.68)
Children aged 12–17	6.34	10.57	–0.61 (–6.44 to 5.21)	10.44	15.88	3.63 (–8.33 to 15.59)	–4.24 (–19.13 to 10.64)
Children with noncomplex or complex chronic condition	19.73	8.52	–10.56* (–16.55 to –4.57)	16.19	12.77	–2.21 (–11.47 to 7.05)	–8.35 (–19.05 to 2.36)
Children without chronic condition	5.25	2.80	–1.25 (–3.07 to 0.56)	6.37	2.80	–3.46* (–5.10 to –1.82)	2.21 (–0.28 to 4.70)
Emergency department visits							
Children aged 0–5	113.64	69.44	–33.25* (–46.95 to –19.54)	112.71	75.31	–20.08* (–29.77 to –10.39)	–13.16* (–26.23 to –0.10)
Children aged 6–11	59.14	51.32	–6.18 (–16.64 to 4.29)	63.04	53.73	–6.27 (–15.52 to 2.97)	0.1 (–11.73 to 11.92)
Children aged 12–17	68.21	95.92	16.38 (–3.98 to 36.73)	72.14	85.87	9.16 (–5.66 to 23.98)	7.22 (–13.66 to 28.10)
Children with noncomplex or complex chronic condition	106.24	83.74	–27.06* (–43.26 to –10.86)	110.59	93.69	–13.22* (–25.19 to –1.25)	–13.84 (–29.55 to 1.88)
Children without chronic condition	68.67	61.81	–4.15 (–13.82 to 5.52)	70.44	58.94	–5.39 (–12.41 to 1.64)	1.24 (–9.13 to 11.61)

95% confidence intervals. Medical complexity determined using the Pediatric Medical Complexity Algorithm, which is based on Center of Excellence on Quality of Care Measures for Children with Complex Needs consensus definitions.

* $P < .05$, ** $P < .01$, *** $P < .001$.