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Infant Health and Future Childhood Adversity

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Abstract

Objective: To investigate the extent to which disabling infant health conditions are associated with adverse childhood experiences at age 5.

Methods: We conducted a secondary analysis of data from the Fragile Families and Child Wellbeing Study, a national urban birth cohort. We estimated logistic regression models of associations between the presence of a disabling infant health condition and the child's ACE exposures at age 5, controlling for factors that preceded the child's birth, including the mother's sociodemographic characteristics, physical health, mental illness, and substance abuse and the parents' criminal justice system involvement and domestic violence or sexual abuse. ACEs included 4 categories of child maltreatment (physical, sexual, psychological abuse, neglect) and 5 categories of household dysfunction (father absence, substance use, mental illness, caregiver treated violently, incarceration).

Results: 3.3% of the children were characterized as having a disabling health condition that was likely present at birth. Logistic regression estimates indicate that having a disabling infant health condition was associated with 83% higher odds of the child experiencing 2 or more ACEs (AOR:

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1.83, CI: 1.14–2.94) and 73% higher odds of the child experiencing 3 or more ACEs (AOR: 1.73, CI: 1.07–2.77) at age 5.

Conclusions: The finding of strong links between disabling infant health conditions and ACEs at age 5 suggests that child health and ACEs play intertwining and mutually reinforcing roles during the early lifecourse and highlights the critical importance of investing in systems that simultaneously promote optimal child development and address childhood adversity.

Keywords

ACEs; Adverse childhood experiences; child disability; child health

Introduction

A growing number of studies have linked adverse childhood experiences (ACEs), broadly defined as household dysfunction and abuse, to poor health and developmental outcomes in childhood, adolescence, and adulthood (e.g., Bethell et al. 2014; Felitti et al. 1998, Felitti and Anda 2010; Flaherty et al. 2009, 2013; Jiménez et al. 2016, 2017; Campbell et al. 2016). Less is known about the extent to which children's health might affect the likelihood that they experience ACEs. Young children's poor health and disabilities have been linked to subsequent parental relationship dissolution (Reichman et al. 2004) and paternal incarceration (Corman et al. 2011), and children with disabilities are at increased risk for maltreatment (Hibbard and Desch 2007). As these outcomes fall under the broad umbrella of ACEs as characterized in the seminal Kaiser ACE study (Felitti et al. 1998, Felitti and Anda 2010), poor health of young children plausibly affects their exposure to ACEs as operationalized in the ACEs literature. Studies have found that families of children with special healthcare needs confront significant caregiving challenges and economic hardship (Kuhlthau et al. 2010; Kuo et al. 2011; Schuster et al. 2011) and higher rates of maternal stress and mental illness (Gray et al. 2013; Treyvaud 2014), that economic stress and maternal mental illness are associated with child maltreatment (Brown et al. 1998; Stith et al. 2009; Slack et al. 2011), and that children with disabilities are more likely to have insecure attachment to their caregivers (Howe 2006), suggesting that suboptimal parental stress management and poor parent-infant bonding are potential mechanisms.

In this study, we use rich data from a longitudinal birth cohort study to explore associations between poor infant health—disabling conditions likely present at birth—and ACEs at 5 years, controlling for maternal depression and substance abuse, criminal justice system involvement, and domestic violence before the focal child was born and other potentially confounding factors. Establishing the potential links between poor health and subsequent ACEs in early childhood is important for understanding lifecourse health and developmental trajectories and designing interventions to promote optimal child development.

Methods

Data and sample

We used data from the ongoing longitudinal Fragile Families and Child Wellbeing (FFCWB) birth cohort study (Reichman et al. 2001; Princeton University 2017). Interviews were

conducted with parents of 4898 children born between 1998 and 2000 in 75 hospitals in 20 large U.S. cities while the mothers were still in the hospital after giving birth. Cities were selected from all 77 U.S. cities with >200,000 people, using a stratified random sample. In 18 cities, all hospitals with maternity wards were included. In the two largest cities, hospitals were randomly sampled. Within each hospital, births were randomly sampled from birth logs. Non-marital births were oversampled.

Parents were eligible for the study if both parents were >=18 years old (except in hospitals where younger parents were considered emancipated minors) and proficient in English or Spanish, the father of the newborn was living, and the child was not going to be adopted. If eligible, both parents were asked to participate in a national survey about the conditions and capabilities of new parents, their relationships, and their children's well-being. Informed consent was obtained.

Our study used data from the maternal postpartum interviews, interviews with the mothers 1, 3, and 5 years later, and information from the mothers' and infants' medical records from the birth hospitalization. We used data on child disabilities reported by the mother at 1, 3, and 5 years, ACEs reported by the mother in an in-home module of the 5-year survey, and sociodemographic and psychosocial factors, which were used as control variables, from the maternal (almost exclusively, postpartum) interviews and maternal and infant hospital medical records.

Study Population

The sample consisted of children for whom the mother was the primary caregiver at age 5 and mother-reported information on the types of ACEs included in the original ACE study was available from the 5-year interviews, whether or not mothers completed 1- or 3-year interviews or information was available from hospital medical records. Although the FFCWB surveys did not include the exact questions to assess ACEs that were used in the original ACE study, which obtained retrospective reports from adults, the FFCWB study has advantageous features—longitudinal data collection, a population at high risk for adversity, and rich measures of child and family dysfunction and abuse assessed during childhood—that allow for meaningful contributions to the ACE literature. Previous studies of ACE exposures have used these data (Jiménez et al. 2016; Jiménez et al. 2017; Hunt et al. 2017).

Outcomes (ACEs)

ACE measures were created from maternal reports at 5 years, covering all 10 categories in the original ACE study. However, emotional and physical neglect were characterized using a single measure because we were unable to distinguish between the two with our data, and we considered father not present in the household as an ACE. The original ACE study included "not raised by both biological parents" as an ACE, which many studies operationalize as parental divorce or separation (Flaherty et al. 2009; Anda et al. 2002, 2010) However, while divorce may have been relevant for the Kaiser cohort, recent qualitative work does not endorse that ACE for disadvantaged youth who often have parents who were never married (Wade et al. 2014). We consider father absence as an ACE because

a large share of FFCWB births were to parents who were cohabiting, and dissolution of cohabiting partnerships is a common dynamic in children's preschool years that has been associated with poor outcomes (Waldfogel et al. 2010). Overall, our measures of ACEs include 4 categories of child maltreatment (physical, sexual, psychological abuse, neglect) and 5 categories of household dysfunction (father absence, substance use, mental illness, caregiver treated violently, incarceration). Individual ACEs were dichotomized as exposed or not and then summed from 0–9. Programming code used to construct these measures, which are the same or similar to ACE measures used in previous studies using FFCWB data (Jiménez et al. 2016; Jiménez et al. 2017), is available upon request.

Child maltreatment—The mother was asked whether Child Protective Services (CPS) had been contacted for the child regarding physical, sexual abuse or neglect since the child was born, and mothers completed the Conflict Tactics Scale: Parent Child Version (CTS), which screens for psychological aggression, physical assault, and neglect, in reference to their own behavior and that of the child's secondary caregiver (if applicable). The FFCWB study included 5 items about psychological aggression (e.g., threatened), 5 about physical assault (e.g. hit, slapped), and 5 about neglect (e.g. failure to provide supervision). The mother was asked how many times each behavior occurred in the past year; responses were assigned a score of 0 (never), 1 (once), 2 (twice), 4 (3–5 times), 8 (6–10 times), 15 (11–20 times), or 25 (>20 times), and for each domain, scores in the top 10th percentile in our sample were coded as high risk for maltreatment. *Psychological aggression* was considered present based on the CTS score. *Neglect and physical abuse* were considered present based on the CTS score or the mother-reported CPS involvement for the relevant domain. *Sexual abuse* was considered present if the mother reported CPS involvement for sexual abuse.

Household dysfunction

Father absence: Mothers were asked if they and the child's father were currently living together all or most of the time. A "no" response was coded as father absence.

Mental illness: Maternal depressive symptoms were assessed with the Composite International Diagnostic Interview-Short Form, which categorizes respondents as having experienced a depressive episode in the past 12 months.

Substance abuse: Mothers were asked if drinking or being hung over interfered with their work or home life in the past year and whether they used sedatives, tranquilizers, stimulants, pain killers, inhalants, marijuana/hashish, cocaine, LSD, or heroin during the past twelve months without a doctor's prescription, in larger amounts than prescribed, or for a longer period than prescribed. Mothers were also asked whether the biological father and current partner (if applicable) had problems keeping a job or getting along with family and friends because of alcohol or drug use. An affirmative response to any of these questions was considered an exposure.

Incarceration: Incarceration was assessed by maternal reports of whether the child's father had spent time in prison or jail in the past 2 years, a current live-in partner spent most of the prior week in prison or jail, and she had been convicted of a crime during the past 2

years. Although conviction does not always result in incarceration, it still may cause family turbulence. An affirmative response to any of these questions was considered an exposure.

Caregiver treated violently: We used information from the Conflict Tactics Scale, which asks about physical and sexual violence by the biological father or current partner in the past year (e.g. slaps or kicks, hits with fist, forces sex). We also considered the mother's report of whether she had physical fight with the biological father or current partner in front of the child and whether she had been seriously hurt in a fight with the father or current partner (both in the past 2 years). A response of "sometimes" or "often" (versus "never") to any item on the CTS or an affirmative response to either of the two other questions was considered an exposure.

Disabling infant health condition (DIHC)

Our broad objective was to explore the extent to which a child's poor health is associated with his or her subsequent ACE exposures. We thus focused on conditions, physical or cognitive, that were likely to be present at birth (to establish that child health preceded the ACEs) and likely to present with severe impairment (to identify a strong "treatment").

The developmental pediatrician on our team coded DIHCs based on the mother's reports at the 1, 3, or 5 year interviews about disabilities of the child. In the 1- and 3-year interviews, she was asked if her child had any physical disabilities; if the answer was affirmative, she was asked to indicate the type(s) of conditions from a set of explicit response choices or to name conditions not specified. At 5 years, the mother was asked whether a doctor or health professional had ever told her that the child has any of an explicit set of specific health conditions (not limited to physical health conditions). Although the question at 1 and 3 years referred to physical disabilities, assessment of cognitive disabilities is generally not reliable before age 5 (Moeschler et al. 2014), and the question at year 5 appropriately captured a broader range of disabilities.

We coded the child as having a DIHC if the mother reported at the 1-, 3-, or 5-year interview that the child had any condition that was likely present at birth and severe, such as sickle cell anemia, cerebral palsy, Down syndrome, or congenital heart conditions. We included autism, which was assessed at 5 years, because it can present with severe impairment, can be very demanding on families, and is known to have a strong genetic component (Colvert et al. 2015). To the extent that environmental causes of autism exist and occurred postnatally, the condition would not have been present at birth. However, many of the environmental factors hypothesized to cause autism occur in the prenatal or perinatal periods (Gardener et al. 2009; Guinchat et al. 2012). We assessed sensitivity of our findings to the exclusion of autism as a DIHC, and to a broader measure that included conditions, such as "developmental delay," that may not have been severe or likely present at birth.

In our sample, 3.3% (92) of children were characterized as having a disabling health condition using our main measure (see Appendix Table 1 for list of conditions). Estimates of the number of disabled children in the U.S. are in the 6–18% range for children ages 0–18 years, depending on definition and data source (Stein 2005); the lower rate in our sample

reflects our focus on severe disabilities and young age range, and possibly differential attrition from the longitudinal study based on child disability.

Covariates

In order to establish links between DIHCs and children's future adverse experiences and minimize potential confounding of those associations, we controlled for child, maternal and couple characteristics—all measured immediately after the child was born (from the postpartum survey or newborn medical record), before the child was born (from the prenatal medical record), or, in one case (the infant's father's involvement with the criminal justice system), from follow-up surveys but pertaining to before the birth. Sociodemographic controls included the child's sex and multiple birth, plus the following maternal factors from the postpartum interviews: Age, race/ethnicity, foreign born, education, marital birth, cohabitation status, first birth, Medicaid birth (indicator of being poor or near-poor), and less than very good (versus very good or excellent) self-rated health.

Psychosocial factors included the mother not living with both of her own parents when she was age 16 (a proxy for the absence of her father, from the postpartum survey), diagnosed mental illness (from the prenatal medical record), and prenatal illicit drug use, alcohol consumption, criminal justice system involvement, and domestic violence or sexual abuse (all of which combined information from the surveys and medical records). Illicit drug use was coded as positive if the mother reported in her postpartum interview that she used drugs during the pregnancy or indication of such was recorded in the medical records (e.g., from testing of mother or newborn). The measure of alcohol consumption was constructed the same way. These measures have been used in previous research (Reichman et al. 2009). For the infant's parents' criminal justice system involvement and domestic violence or sexual abuse, we similarly used any mention of the relevant factor in the medical records in conjunction with the mother's survey reports of corresponding factors. Medical record data were available for ~80% of the 4,898 mothers in the FFCWB study. Indicators for missing medical record information and the postpartum survey taking place in either of 2 cities in which the survey did not ask about domestic violence were included in adjusted logistic regression models.

Statistical Analysis

First, we present summary statistics on ACEs in the analysis sample. Then we present sample characteristics by the presence of a DIHC. Statistically significant differences between cases with and without a DIHC were ascertained using 2-tailed *t* tests for comparisons of means and $\chi 2$ tests for categorical variables. Finally, we present results from unadjusted and adjusted logistic regression models of associations between the presence of a DIHC and the child's adverse exposures at age 5 (separate models for any ACE, 2+ ACEs, and 3+ ACEs), controlling for all of the covariates described above. By focusing on health conditions that were likely present at birth, we can be confident that the infant's health status preceded any ACEs that he or she may have experienced.

Unadjusted (OR) and adjusted odds ratios (AOR) and 95% confidence intervals (CI) are presented for the logistic regression models. We refer to values outside the 95% CIs

as statistically significant. Stata version 14.1 statistical software (StataCorp LP, College Station, TX) was used to conduct all analyses. The Rutgers Biomedical Health Sciences Institutional Review Board determined that this study was exempt.

Results

Of the 4898 mothers who completed postpartum interviews, 3004 completed the 5-year interviews in which ACEs were assessed. From these cases, we excluded 99 observations because the mother was not the primary caregiver. Of the remaining 2905 cases, we excluded 86 owing to missing information on one or more ACEs and another 27 because of missing covariate data, resulting in an analysis sample of 2792 cases. A comparison of the 2792 cases in our sample to the cases (of the 4898) not in our sample, indicated no significant or substantive differences by marital or cohabitation status, first birth, and maternal health. Mothers in the analysis sample were more likely to be non-Hispanic black, less likely to be Hispanic, less likely to be foreign born, and more educated than mothers not in the analysis sample (not shown). Overall, little evidence of systematic sample selection based on observed characteristics is apparent.

About 26% of the children in the sample experienced no ACEs, 32% experienced 1 ACE, 20% experienced 2 ACEs, 12% experienced 3 ACEs, 10% experienced 4–7 ACEs, and no children experienced 8 or 9 ACEs. Approximately 40% experienced 2+ ACEs, and approximately 20% experienced 3+ ACEs (Table 1). The most common ACE was father absence (56%), followed by incarceration (18%). Considering a broad range of characteristics, the only statistically significant difference ($p<.05$) between cases with and without a disabling infant health condition was for male child (Table 2). Differences in the mothers' racial/ethnic distributions and physical health status were close to being statistically significant ($p < .10$); mothers who were white and had suboptimal physical health were more likely than their non-white or healthier peers to have a child with a disabling health condition. These differences may have been statistically significant had we had a larger sample with more power to detect differences that exist in the population.

Logistic regression estimates indicate that having a DIHC was significantly associated with experiencing 2+ ACEs and 3+ ACEs, but not of experiencing any ACEs, at age 5 (Table 3; see Appendix Table 2 for proportions of children with and without DIHCs that had any, 2+, and 3+ ACEs.). In unadjusted models, the presence of a DIHC increased the odds of 2+ ACEs by 99% (OR: 1.99, CI: 1.30–3.03) and 3+ ACEs by 92% (OR: .92, CI: 1.24–2.98). Addition of the covariates attenuated the associations somewhat. The estimates were insensitive to excluding autism as a DIHC, using other alternative measures of DIHCs, and not considering father absence an ACE (results available upon request). Because we considered only potentially severe conditions and thus coded children with moderate conditions as not having DIHCs, these figures may represent conservative estimates of the effects of DIHCs.

Few maternal characteristics had independent associations with 2+ or 3+ ACEs (Appendix Table 3). The strongest associations were for male child, marital birth, and foreign-born mother. Cohabitation and Medicaid birth had independent associations with 2+ ACEs, as did

suboptimal maternal health with 3+ ACEs. Most psychosocial controls were significant risk factors for 2+ and 3+ ACEs; exceptions were prenatal drug use (for 3+ ACEs) and prenatal mental illness.

Conclusions

This study found that disabling infant health conditions were associated with future childhood adversity. The findings contribute to a more nuanced understanding of health and developmental trajectories in regard to ACEs, and suggest that poor health and ACEs play intertwining and mutually-reinforcing roles early in the lifecourse. Disentangling pieces of this process, as we have attempted to do in this study, can facilitate effective content, timing, and targeting of interventions. The strong associations between disabling infant health conditions and subsequent ACEs suggest a role for pediatricians, who treat children with such conditions and interact with their families, to work collaboratively with other professionals to support children and families through early identification of at-risk children and linkage to community resources.

More generally, the findings from this study highlight the critical importance of supporting children and their families and investing in systems that simultaneously promote optimal child development and address ACEs. *Strengthening Families–A Protective Factors Framework* provides a useful research-informed model that focuses on parental resilience, social connections, material supports, parenting knowledge, and social-emotional competence of children (Center for the Study of Social Policy 2017). *Systems of Care* is another example of an approach that addresses the developmental and physical needs of vulnerable children at elevated risk for abuse and neglect through partnerships and coordinated systems designed to support families (USDHHS 2017).

The findings also underscore the importance of establishing the timing of adversities relative to poor health in studies of ACEs and subsequent health, as in a recent study that used the longitudinal FFCWB data to investigate associations between children's ACEs at one time point and ADHD diagnosis at a subsequent time point, controlling for ADHD diagnosis at the earlier time point (Jiménez et al. 2017). Studies that use cross-sectional data cannot follow this approach but may have available measures of earlier health status that would be useful controls when attempting to isolate links between ACEs and subsequent health.

Strengths of this study include the use of rich longitudinal data that allowed us to establish the temporal ordering of events, control for important potentially confounding factors, use measures of disabling infant health conditions that were most likely present at birth (before the child could have been exposed to ACEs), and consider father absence in a broader fashion than a married/divorced-separated dichotomy. A limitation is that unmeasured factors could account for the observed associations between disabling infant health conditions and children's subsequent ACEs. Other limitations, which represent important directions for future research, are that we were unable to characterize intensity or duration of ACEs or explore potential mediating factors, such as parents' stress management and parent-infant bonding, and did not have adequate sample to stratify by type of condition.

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APPENDIX

APPENDIX TABLE 1

Disabling infant health conditions (primary measure)

- **Explicit response choices (1, 3 or 5 years)** *
  - Sickle cell anemia (5 years only)
  - Cerebral palsy
  - Deaf—total or partial
  - Blind—total or partial
  - Autism (5 years only)
  - Down syndrome
- **Verbatim responses (1 or 3 years)**
  - Born without ear canal
  - Brachial plexus injury left arm
  - Breathing problem, laryngomalacia
  - Chronic lung disease
  - Cleft lip and palate
  - Club foot
  - Encephalitis
  - Epilepsy
  - Eye impairment
  - Fingers not developed on left hand
  - Hole in heart
  - Leukomalacia, will walk late, trouble with right arm
  - Mass tumor on spine
  - Metabolic problem
  - Microtia with torn ear
  - Neurological disorder
  - Open heart surgery
  - Pain in shins and knees (possible spina bifida)
  - Problem with the hips (go out)
  - Severe brain damage
  - Tumor in airway

* The survey question that was asked at 1 and 3 years was “Does (CHILD) have any physical disabilities?” If the mother responded “yes” to that question she was then asked “What type(s) of physical disability does (he/she) have?” For the

second question, the mother was read a list of specific conditions (explicit response choices) and was also given an "other (specify)" option. When the "other (specify)" option was used, the mother's verbatim responses were recorded. The survey question at 5 years was somewhat different; the mother was asked whether a doctor or health professional had ever told her that the child has any of an explicit set of specific health conditions, with no opportunity to name conditions not listed. Children whose mothers reported that they had any of the conditions listed above were coded as having a disabling infant health condition.

APPENDIX TABLE 2

ACE Outcomes by Presence of Disabling Infant Health Condition

Outcome	Disabling Infant Health Condition (n=92)	No Disabling Infant Health Condition (n=2700)	P-value
Any ACEs	83 (76)	74 (1985)	.05
Two or More ACEs	59 (54)	42 (1125)	< .01
Three or More ACEs	35 (32)	22 (587)	< .01

Notes: All figures are column percentages and counts, with the latter in parentheses. P-values are for differences between cases with a disabling infant health condition and without a disabling health condition, based on two-tailed t tests.

APPENDIX TABLE 3

Logistic Regression Estimates of Associations Between Disabling Infant Health Condition and Two or More ACE at Age 5 and Between Disabling Infant Health Condition and Three or More ACEs at Age 5 (n = 2792)

	2+ ACEs		3+ ACEs	
	AOR	CI	AOR	CI
Disabling infant health condition	1.83	[1.14,2.94]	1.73	[1.07,2.77]
Male child	1.24	[1.05,1.45]	1.37	[1.13,1.66]
Multiple birth	1.28	[0.71,2.30]	1.62	[0.87,3.01]
Maternal characteristics [a]				
Age, years	0.93	[0.82,1.05]	0.91	[0.77,1.06]
Race/ethnicity (ref = Non-Hispanic white)				
Non-Hispanic black	1.04	[0.82,1.31]	1.00	[0.76,1.33]
Hispanic	0.78	[0.59,1.04]	0.74	[0.53,1.03]
Other	1.20	[0.68,2.10]	1.28	[0.68,2.42]
Foreign born	0.49	[0.36,0.68]	0.63	[0.42,0.95]
Education (ref = < high school graduate)				
High school graduate	1.06	[0.86,1.30]	1.11	[0.88,1.41]
Any college	0.96	[0.76,1.21]	1.00	[0.76,1.33]
Relationship with child's father (ref = neither married nor cohabiting)				
Married	0.43	[0.33,0.57]	0.58	[0.40,0.83]
Cohabiting	0.69	[0.57,0.83]	0.99	[0.80,1.23]
First birth	1.02	[0.84,1.23]	0.93	[0.75,1.17]
Medicaid birth	1.29	[1.07,1.57]	1.21	[0.96,1.53]
Good, fair or poor self-rated health (vs. excellent or very good)	1.08	[0.90,1.28]	1.26	[1.03,1.54]
Psychosocial factors				
Mother did not live w/ both biological parents at age 16[a]	1.31	[1.10,1.56]	1.36	[1.10,1.69]
Prenatal diagnosed mental illness[b]	0.90	[0.67,1.21]	1.07	[0.77,1.48]
Illicit drug use during pregnancy[c]	1.42	[1.02,1.98]	1.26	[0.90,1.78]

	2+ ACEs		3+ ACEs	
	AOR	CI	AOR	CI
Alcohol consumption during pregnancy[c]	1.54	[1.19,1.98]	1.97	[1.50,2.59]
Criminal justice system involvement (child's mother or father)[d]	1.56	[1.22,1.99]	1.79	[1.38,2.32]
Domestic violence or sexual abuse[c]	1.95	[1.42,2.68]	1.93	[1.40,2.65]

Notes: AOR = adjusted odds ratio. CI = 95% confidence interval. Models include a quadratic term for maternal age, an indicator for missing medical records data, and an indicator for the postpartum survey taking place in either of 2 cities in which that survey did not ask about domestic violence (estimates not shown). All maternal characteristics and psychosocial factors are measured before the birth of the child or while the mother was still in the hospital after giving birth. Variables are based on information from: [a]postpartum interview; [b]maternal or newborn medical record from birth; [c]maternal or newborn medical record from birth hospitalization or postpartum interview; [d]maternal or newborn medical record from birth hospitalization or any maternal interview with data on whether the father had ever been incarcerated prior to the child's birth.

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Significance

A growing number of studies have linked adverse childhood experiences (ACEs), broadly defined as household dysfunction and abuse, to poor health and developmental outcomes in childhood, adolescence, and across the lifecourse. Much less is known about the extent to which young children's health is associated with future childhood adversity. This study addresses that gap by investigating the extent to which disabling infant health conditions are associated with ACEs at age 5. The findings have implications for understanding children's health and developmental trajectories and designing interventions to promote optimal child development.

TABLE 1

Adverse Childhood Experiences (n = 2792)

Variable	% (No.)
Child maltreatment	
Psychological abuse	14 (382)
Neglect	14 (401)
Physical abuse	14 (396)
Sexual abuse	0.6 (16)
Household dysfunction	
Father absence	56 (1557)
Maternal depression	11 (308)
Substance use	14 (385)
Incarceration	18 (509)
Violence toward caregiver	12 (339)
Total ACES	
0	26 (731)
1	32 (882)
2	20 (560)
3	12 (345)
4	6 (165)
5	2 (69)
6	1 (29)
7	<1 (11)

TABLE 2

Sample Characteristics by Presence of Disabling Infant Health Condition

Variables	Disabling Infant Health Condition (*n* = 92)	No Disabling Infant Health Condition (*n* = 2700)	P-value
Male child	65 (60)	52 (1401)	.01
Multiple birth	3 (3)	2 (53)	.38
Maternal characteristics [a]			
Age, years (mean)	24.91	25.12	.98
Race/Ethnicity			.08
Non-Hispanic white	32 (29)	21 (563)	
Non-Hispanic black	48 (44)	51 (1368)	
Hispanic	18 (17)	26 (691)	
Other	2 (2)	3 (78)	
Foreign born	10 (9)	13 (363)	.32
Education			.47
< High School	29 (27)	33 (893)	
High school graduate	37 (34)	31 (838)	
Any college	34 (31)	36 (969)	
Relationship to child's father			.32
Married	17 (16)	24 (654)	
Cohabiting	38 (35)	36 (961)	
Neither married nor cohabiting	45 (41)	40 (1084)	
First birth	35 (32)	39 (1044)	.45
Medicaid birth	71 (65)	63 (1703)	.14
Good, fair or poor self-rated health (vs. excellent or very good)	43 (40)	34 (931)	.07
Psychosocial factors			
Mother did not live w/ both biological parents at age 16[a]	59 (54)	58 (1576)	.95
Prenatal diagnosed mental illness[b]	10 (9)	9 (248)	.85
Illicit drug use during pregnancy[c]	11 (10)	8 (210)	.28
Alcohol consumption during pregnancy[c]	15 (14)	13 (351)	.54
Criminal justice system involvement (child's mother or father)[d]	15 (14)	13 (341)	.46
Domestic violence or sexual abuse[c]	8 (7)	7 (201)	.95

Notes: Unless indicated otherwise, all figures are column percentages and counts, with the latter in parentheses. P-values are for differences between cases with a disabling infant health condition and without a disabling health condition, based on two-tailed t tests for comparison of means for binary variables or $\chi 2$ tests for categorical variables. All maternal characteristics and psychosocial factors are measured before the birth of the child or while the mother was still in the hospital after giving birth. Variables are based on information from [a]postpartum interview; [b]maternal or newborn medical record from birth; [c]maternal or newborn medical record from birth hospitalization or postpartum interview; [d]maternal or newborn medical record from birth hospitalization or any maternal interview with data on whether the father had ever been incarcerated prior to the child's birth.

TABLE 3

Associations Between Disabling Infant Health Condition and Any, Two or More, and Three or More ACEs at Age 5 (n = 2792)

Outcome	OR	CI	AOR*	CI
Any ACEs	1.71	[0.99,2.95]	1.54	[0.83,2.87]
Two or More ACEs	1.99	[1.30,3.03]	1.83	[1.14,2.94]
Three or More ACEs	1.92	[1.24,2.98]	1.73	[1.07,2.77]

AOR = adjusted odds ratio. CI = 95% confidence interval. *Adjusted for all variables listed in Table 2, plus a quadratic term for maternal age, an indicator for missing medical records data, and an indicator for the postpartum survey taking place in either of 2 cities in which that survey did not ask about domestic violence.