Income Inequality and the Differential Effect of Adverse Childhood Experiences in US Children

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ABSTRACT

OBJECTIVE: Adverse childhood experiences (ACEs) can affect health and development across the life course. Despite a general understanding that adversity is associated with lower income, we know less about how ACEs manifest at different income levels and how these income-related patterns affect children's health and development.

METHODS: Data from the 2011 to 2012 National Survey of Children's Health were used to examine the prevalence of 9 ACEs in US children, across 4 levels of household income, and in relationship to 5 parent-reported measures of child health. Bivariate analyses and multivariable logistic regression models were used to examine the associations between number of ACEs and children's health outcomes on the basis of the 4 income groups.

RESULTS: When partitioned according to income strata, the proportion of children who experienced ACEs showed a steep income gradient, particularly for children who experienced ≥4 ACEs. The linear gradient across income groups was less pronounced for each specific ACE, with several ACEs (experience of divorce, drug and alcohol exposure, parental mental illness) showing high reported prevalence in all but the highest income group. Multivariate analysis showed a consistent income-related gradient for each of the health outcomes. However, higher income was not necessarily found to be a protective factor against ACEs.

CONCLUSIONS: ACEs are distributed across the income ladder and not just concentrated below the poverty level. This suggests that a more comprehensive policy strategy that includes targeted as well as universal interventions is warranted.

KEYWORDS: adverse childhood experiences; child health; childhood trauma; income inequality

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ADVERSE CHILDHOOD EXPERIENCES, or ACEs, has become a shorthand designation for a set of childhood traumatic events that have been empirically linked to adult health behaviors and leading causes of morbidity and mortality. A series of retrospective studies conducted over the past 20 years have shown a consistent and strong relationship between the cumulative number of ACEs and several common chronic medical and behavioral health conditions including cardiovascular disease, depression, and substance abuse.[1–5] This cumulative model of risk is consistent with evidence showing how multiple risks, experienced during childhood, result in a range of adverse child health and developmental outcomes.[6–11]

A growing and wide-ranging body of research on the neurobiology of stress and the developing role of allostatic load, has provided biologically plausible mechanisms to explain how different forms of social adversity can lead to stress-induced patterns of physiologic dysregulation across multiple systems including immune and inflammatory response patterns and metabolic pathways that are associated with a number of chronic health problems.[12–14] Life course health development research has also helped explain how time-specific biological conditioning during sensitive periods of development along with time-dependent cumulative exposures to adversity, can combine and interact to magnify the association of any one particular risk factor.[15] Recent analysis of the Abecedarian preschool intervention has also shown that children from low-income families who receive an educationally enhancing and risk-reducing intervention from age 3 to 5 years, can significantly decrease the prevalence of cardiovascular and metabolic disease risk factors by their mid-30s, indicating the potential of modifying risk-related health development trajectories by appropriately timed and targeted interventions.[16]

Building on the adult ACE study noted previously, more recent studies show that ACEs are prevalent among US children and that their associations with chronic illness status start early in life and can have a range of effects on

development during childhood, including engagement in school and other factors important to health across the life course.[17–19] Adversity is often associated with different levels of income. Because income and wealth inequality has become more pronounced in the United States over the past 30 years, dichotomous classifications of social adversity solely on the basis of the federal poverty level (FPL; ie, poor vs nonpoor) have been supplemented by assessments of inequality measured according to gradients in income. The shape and steepness of the income gradient indicates how exposures are distributed and can be useful in understanding their relative association.[20–22] Recent work by the World Health Organization Commission on Social Determinants of Health as well as the Robert Wood Johnson Foundation Commission to Build a Healthier America have highlighted how the distribution of health disparities and income inequality are inextricably linked and how important that causal link can be early in the life course.[23,24]

The National Survey of Children's Health (NSCH) provides a unique source of representative data to examine the prevalence of ACEs in US children and how ACEs are distributed across socioeconomic status measured according to different levels of household income. The 2011 to 2012 NSCH was designed to better measure ACEs[25] by adding a series of questions intended to represent measures that were similar to the ones used by Felitti et al in the original ACE study on adults.[1] In this analysis, we examined the patterning of ACEs according to household income and how that is associated with children's health and developmental outcomes.

METHODS

POPULATION AND DATA

The 2011 to 2012 NSCH was designed and sponsored by the federal Maternal and Child Health Bureau. Data were collected by the National Center for Health Statistics as a module of the State and Local Area Integrated Telephone Survey. The NSCH used a stratified random digit-dial sampling design to achieve a nationally representative sample of 95,677 parents of children 0 to 17 years of age. One child was randomly selected from each household and a detailed telephone interview was conducted with the parent or guardian who knew the most about the child's health and development. Interviews of approximately 30 minutes were conducted in English, Spanish, Mandarin, Cantonese, Korean, and Vietnamese. The interview completion rate for the survey, which is a measure of the response rate indicating the percentage of completed interviews among known households with a child younger than the age of 18 years, was 54.1% for the land line sample and 41.2% for the cell phone sample.

A total of 94,520 children had information available for at least 1 ACE measure. For analyses on the association of the number of ACEs with child health outcomes across income groups, the study sample was further restricted to individuals with no missing data on the outcome or the study covariates. Missing data on family income were multiply imputed by National Center for Health Statistics researchers and applied to our analysis.

To produce population-based estimates, data records were assigned a sampling weight. NSCH weights were designed to minimize bias by incorporating adjustments for various forms of survey nonresponse including raking so the sample matched population control totals on key demographic variables obtained from the American Community Survey. Further details on the design and operation of the survey are reported elsewhere.[26]

MEASURES

ACEs

The 2011 to 2012 NSCH included 9 items to capture ACEs. Parents reported if the child had ever had the following exposures: 1) financial hardship, 2) parental divorce/separation, 3) parental death, 4) parental imprisonment, 5) witness to domestic violence, 6) victim or witness of neighborhood violence, 7) lived with a mentally ill or suicidal person, 8) lived with someone with an alcohol or drug problem, and 9) treated unfairly because of race/ethnicity. These items were selected and tested for the NSCH on the basis of and adding to those used in the original adult ACE study, with modifications made through an extensive Technical Expert Panel process and review.[27] We created a cumulative ACEs score on the basis of the sum of these 9 items.

Family Income

Survey participants reported total combined household income during the calendar year before the survey. Income to household size measures were computed by the National Center for Health Statistics researchers and compared with the Department of Health and Human Services Federal Poverty Guidelines. The resulting income variable was then categorized into 4 levels: poor (<100% of the FPL), which included 22.5% of the population; low-income (100%–199% of the FPL), which included 21.6% of the population; middle-income (200%–399% of the FPL), which included 28.2% of the population; and high-income (≥400% of the FPL), which included 27.7% of the population.

Child Health

We selected 5 measures of child health for our analysis: 1) overall child health status (excellent/very good vs good/fair/poor) as reported by parents for children aged 0 to 17 years; 2) overall condition of teeth (excellent/very good vs good/fair/poor) as reported by parents for children aged 1 to 17 years; 3) body mass index at or above the 85th percentile classifying children (aged 10 and older) as overweight or obese on the basis of parent-reported height/weight; 4) asthma status (ages 0–17 years) identified by parent report that the child has a diagnosis from a health care professional and currently has the condition; and 5) parent report of whether the child has any emotional, developmental, or behavioral problems that require treatment or counselling (ages 0–17 years). An indicator of emotional, developmental, or behavioral problems was identified by a response of "yes" or if the parent reported