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Cumulative Social Disadvantage and Child Health

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ABSTRACT

CONTEXT. Disparities in child health are a major public health concern. However, it is unclear whether these are predominantly the result of low income, race, or other social risk factors that may contribute to their health disadvantage. Although others have examined the effects of the accumulation of risk factors, this methodology has not been applied to child health.

OBJECTIVE. We tested 4 social risk factors (poverty, minority race/ethnicity, low parental education, and not living with both biological parents) to assess whether they have cumulative effects on child health and examined whether access to health care reduced health disparities.

DESIGN. We analyzed data on 57,553 children <18 years from the 1994 and 1995 National Health Interview Survey Disability Supplement. Of the 4 risk factors, 3 (poverty, low parental education, and single-parent household) were consistently associated with child health. These were summed, generating the Social Disadvantage Index (range: 0–3).

RESULTS. A total of 43.6% of children had no social disadvantages, 30.8% had 1, 15.6% had 2, and 10.0% had all 3. Compared with those with no social disadvantages, the odds ratios (ORs) of being in “good, fair, or poor health” (versus “excellent or very good”) were 1.95 for 1 risk, 3.22 for 2 risks, and 4.06 for 3 risks. ORs of having a chronic condition increased from 1.25 (1 risk) to 1.60 (2 risks) to 2.11 (3 risks). ORs for activity limitation were 1.51 (1 risk) to 2.14 (2 risks) and 2.88 (3 risks). Controlling for health insurance did not affect these findings.

CONCLUSIONS. The accumulation of social disadvantage among children was strongly associated with poorer child health and having insurance did not reduce the observed health disparities.
Evidence is incontrovertible that poverty is related to poor health, and the vast majority of the literature indicates that the association is causal. Poverty is associated with poor health over time, across demographic groups, and regardless of the way social class is measured. In adults, poverty is associated with lower life expectancy and higher mortality rates. Although not perfectly linear, there seems to be a graded relationship between socioeconomic status and health, such that the more economically advantaged someone is, the better his or her health is likely to be.

Poverty affects children’s health as well. Some research has suggested that the gradient of socioeconomic status on health found in adults also occurs among children. Poor children are almost twice as likely to be in fair or poor health, are 1.7 times more likely to be born low birth weight, are 3.5 times more likely to suffer from lead poisoning, are twice as likely to experience stunting, and are more likely to be diagnosed with severe chronic health conditions. Poor children are 1.7 times more likely to die in infancy and 1.5 times more likely in childhood.

There are several possible pathways through which poverty may affect child health such as poor nutrition, dangerous physical/environmental home or neighborhood conditions, or poor parental mental health. Health policy analysts have identified inadequate access to health care as another possible reason for social class discrepancies in child health. For example, poor and near-poor children are more likely to have an unmet health need and more likely to be uninsured; many lack a usual source of health care.

Several social factors associated with poverty are also related to poor child health, specifically low parental education, minority race/ethnic status, and single-parent household. For example, death rates are higher for black than white children throughout most of childhood and particularly in adolescence. Life expectancy is higher among white than black infants and children. Specific health conditions that demonstrate race/ethnic differences include asthma and low birth weight. Black children are 2.4 times more likely to be born low birth weight than white children, even when social class is controlled. However, recent analyses suggest that race differences in rates of disability among children are explained completely by poverty.

Education is associated with health as well. Better-educated adults are healthier than those with less education. Despite declining overall mortality, over a 26-year period, the disparity in adult mortality by educational level has increased in both whites and blacks. Children of parents who did not graduate from high school were less likely to have any physician visit and more likely to have unmet health needs. At all income levels, children of more highly educated mothers are more likely to be in excellent or very good health. Similar to income, there seems to be somewhat of a gradient in the relationship of parent education to child health. Children whose mothers have a high school degree are reported to be in better health than those whose mothers have not finished high school, whereas children whose mothers have more than a high school degree are reported to be in even better health. It has also been shown that school-aged children of more educated parents were less likely to have limitations in mobility and in activities of daily living such as eating, dressing, and bathing.

Children in families headed by single mothers are less likely to be in fair or poor health, less likely to use preventive and illness-related health services regardless of insurance coverage, less likely to be insured, and are more likely to have a disability.

Poverty, minority race/ethnicity, low parental education, and single-parent household all seem to be associated with increased risk of childhood chronic illness and disability, but it is unclear if these all reflect the same underlying social disadvantage. A good deal of the ethnic-specific disparity identified in morbidity and mortality seems to be the result of low income. However, social epidemiology and a long sociologic tradition suggest that social disadvantage may be cumulative. Evans has argued recently that poverty results in cumulative psychosocial and environmental exposures that explain the physical, psychologic, and developmental disadvantages that poor children experience. If interrelated risk factors are merely different indicators of the same underlying construct such as poverty, they would not result in incrementally poorer health. However, if these are independent risks for poor child health, then together they will increase risk additively or exponentially. In this article, we tested whether social risk factors had cumulative effects on health status measures in children: overall health, rates of chronic conditions, and presence of an activity limitation. In addition, we examined whether disparities in health related to these social disadvantages were reduced or eliminated when children were insured. This analysis addressed the hypothesis that providing access to medical care would reduce disparities rooted in social inequality.

The gradient in child health with socioeconomic status is well documented, but it is still unclear whether the disparity is the result of parental education, family composition, family income, or some combination. In this study, we examine whether there is a gradient with regard to the number of markers for low socioeconomic status.
DESIGN/METHODS

Sample
We analyzed data from the 1994 and 1995 National Health Interview Survey (NHIS). We selected this data set because in addition to the NHIS Core Interview, the NHIS Disability Supplement (NHIS-D) was added to collect data on health-related characteristics and problems. The National Center for Health Statistics (NCHS) used a complex multistage probability sampling design to select respondents from the civilian noninstitutionalized population of the United States, and statistical weighting procedures are used to generate population-based estimates of their health. The overall response rate for the NHIS Core and the NHIS-D together was 87%. There are data on 57,553 children <18 years of age in the database.

Measure of Social Disadvantage
The measure was created by identifying which indicators of social disadvantage were consistently related to child health and summing these into a measure of cumulative disadvantage. There is a precedent for using cumulative indices in research examining risk factors for child outcomes such as mental health, behavior problems, and cognitive development. Perhaps the most well-known example is Rutter’s 1979 Isle of Wight study, which showed that an increasing number of risk factors for childhood psychiatric disorder was directly associated with greater odds of having a clinical problem. These studies taken together suggest that it is not the particular risk factor, but the number of factors in one’s background that potentially influences development. However, as far as we can determine, this risk-index approach has not been applied to child health as an outcome.

Four kinds of social disadvantage were examined in our study: poverty, low parental education, does not live in a 2-parent family, and minority status (black or Hispanic). Bivariate analyses of each risk factor with health indicators showed that 3 were consistently associated with poorer health status in this population, but minority status was not (see Table 2 and “Results”).

To address the hypothesis that more markers of social disadvantage would be associated with worse health, we formed an index that is a count of the number of risk factors each child has. The 3 factors that were consistently related to health were recoded into dichotomies, with “not at risk” coded zero and “at risk” coded 1 for each. The cutoff points for these variables were identified by iterative testing, and we chose the cut point for each that resulted in the strongest relationship to the outcome. For family structure, the category considered at risk was all those not living with 2 biological parents, including single-, step-, and no-parent families; this was coded “1” and 2 biological parent families were coded “0.” (We refer to this category as “single parent” for simplicity; 92% of families coded “1” are single-parent households.) For respondent education, the risk category coded “1” was high school graduate or below; whereas having a parent who was a college graduate was coded “0.” Family income was coded “1” if below the federal poverty line and “0” if at or above poverty. The scores on these 3 variables were summed, generating the Social Disadvantage Index, with its possible values ranging from zero to 3. Percentages within categories are reported in Table 1.

Measures of Health Status
We examined the effects of the social risk factors on the 3 health parameters. The first, overall health status, was measured using a single item from the NHIS core, “Would you say that (child’s) health in general is excellent, very good, good, fair or poor?” The second was whether the child had a chronic condition, defined by Stein et al as a physiological, behavioral, or cognitive disorder lasting 1 year with a consequence in functioning, reliance on compensatory mechanism or assistance, or increased service use/need. This definition of chronic
conditions is noncategorical (it does not use diagnostic labels), inclusive (it identifies children with diverse medical, behavioral, and cognitive disorders), theoretically derived, and consequence-based. We operationalized this definition in the NHIS data set using Stein and Silver’s65 algorithm, which reflects the Questionnaire for Identifying Children With Chronic Conditions (QuICCC),66 a 39-item measure based on the Stein et al definition.67 The algorithm generates a “yes/no” categorical determination of whether the child meets the definitional criteria for a chronic condition.

The third health status measure was the presence of activity limitations, measured using a summary variable from the NHIS core interview that indicates whether the child is unable to perform usual activities or is limited in the amount or kind of activities he or she can do. Because of the way having a chronic condition was defined by the algorithm, all children with activity limitations also had a chronic condition, but the converse is not the case, with 56% of children with a chronic condition in this data set having no activity restriction.

**Statistical Analyses**

Analyses were conducted by using both SPSS 10.0 for Windows68 and SUDAAN 7.0.69 SUDAAN is used to adjust for design effects inherent in the complex cluster sampling used by NHIS. All analyses were conducted on weighted data, which were adjusted to reflect the age/gender/race distribution of the total U.S. population. We examined bivariate relationships between variables using cross tabulations with χ² tests used to determine statistical significance and with logistic regression. Logistic regression also was used to generate odds ratios (ORs) for levels of accumulated social disadvantage with each of the 3 health status variables used as an outcome. To assess whether health disparities were smaller or disappeared when children were insured, we classified children as having health insurance or not by adapting Newacheck et al’s70 definition that includes private insurance, Medicaid, other public-assistance programs, or other programs such as Medicare, the Indian Health Service, and the Civilian Health and Medical Program of the Uniformed Services. We then examined the relationship of social disadvantage to the 3 health status outcomes through logistic regression controlling for insurance status.

**RESULTS**

**Sample Description**

The average age of children in the sample was 8.3 years (SD: 5.3) and 51.2% were male. The background characteristics of parents and the health status of children are reported in Table 1. More than one fifth (21.9%) lived in families who had household incomes under the poverty line, one third (35%) of children were of minority status, 46% of their parents had a high school education or less, and 24.4% lived in families that did not include both parents. On the overall health status measure, 20% of children were rated as being in “good,” “fair,” or “poor” health; 14.6% of children met the criteria for having a chronic condition; and 6.4% were reported to have an activity limitation, with 0.7% unable to perform a major activity, 4.0% limited in a major activity, and 1.8% limited in an “other” activity.

**Relationship of Individual Social Disadvantage Indicators to Overall Health Status**

Each of the 4 social disadvantage factors was related to ratings of child’s overall child health (Table 2, column 1). Children living in poverty had poorer health than those at or above the poverty line. Black children, Hispanic children, and children of other race/ethnicities were more likely than white children to be rated as being in good, fair, or poor health. The lower the parental education level, the poorer the rating of child health, and those not living in 2-parent families were in poorer health than those in 2-parent families.

However, only 3 social disadvantage factors were related as hypothesized to having a chronic condition (Table 2, column 2) and to having an activity restriction (Table 2, column 3). As expected, children living in households below the poverty line compared with those above the poverty line were more likely to have a chronic condition and more likely to have an activity restriction. Lower respondent education was related to increased rates of chronic conditions and activity restrictions, and children not living with both parents were more likely than those living with 2 parents to have a

**TABLE 2 Social Disadvantage According to Health Status**

<table>
<thead>
<tr>
<th></th>
<th>In Good, Fair, or Poor Health (%)</th>
<th>Has a Chronic Condition (%)</th>
<th>Has an Activity Limitation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poverty</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below poverty line</td>
<td>34.9</td>
<td>18.1</td>
<td>9.3</td>
</tr>
<tr>
<td>At/above poverty line</td>
<td>15.5</td>
<td>13.9</td>
<td>7.3</td>
</tr>
<tr>
<td>Minority status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>15.2</td>
<td>15.6</td>
<td>6.3</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>30.4</td>
<td>14.8</td>
<td>8.2</td>
</tr>
<tr>
<td>Hispanic (any race)</td>
<td>30.9</td>
<td>11.8</td>
<td>5.8</td>
</tr>
<tr>
<td>Other</td>
<td>21.2</td>
<td>9.6</td>
<td>4.2</td>
</tr>
<tr>
<td>Respondent education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school</td>
<td>38.1</td>
<td>16.0</td>
<td>8.8</td>
</tr>
<tr>
<td>High school graduate</td>
<td>24.6</td>
<td>15.6</td>
<td>7.5</td>
</tr>
<tr>
<td>1–3 y of college</td>
<td>16.5</td>
<td>15.2</td>
<td>6.5</td>
</tr>
<tr>
<td>College graduate or more</td>
<td>10.0</td>
<td>12.3</td>
<td>4.3</td>
</tr>
<tr>
<td>Family composition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-parent family</td>
<td>17.1</td>
<td>13.2</td>
<td>5.5</td>
</tr>
<tr>
<td>Other</td>
<td>28.7</td>
<td>18.5</td>
<td>9.3</td>
</tr>
</tbody>
</table>

Original sources of data are the combined 1994 and 1995 NHIS. Estimates are based on weighted data adjusted by age/gender/race categories to reflect the U.S. civilian noninstitutionalized population.
chronic condition or an activity restriction. However, contrary to the social disadvantage hypothesis, black and Hispanic children were not at increased risk. Because minority status was not consistently documented to be a social disadvantage for child health, we created a 3-factor index of cumulative social disadvantage that summed poverty, low education, and single parent together.

We performed a logistic regression controlling for minority status to assess whether the 3 risk factors had independent relationships to the 3 health status measures. Table 3 demonstrates that each risk factor had a significant independent relationship with each outcome controlling for the others.

### Social Disadvantage Index

On the Social Disadvantage Index, 43.6% of children had no social disadvantages (26.8 million U.S. children), 30.8% had 1 (18.9 million children), 15.6% had 2 (9.6 million), and 10.0% had all 3 (6.2 million). Table 4 column 1 shows the results of logistic regressions on the relationship of the Social Disadvantage Index to the 3 indicators of child health controlling for age and minority status.

There was a strong and significant gradient in the percentage of children with poorer health as a function of the number of social risks, from 10.8% (no risks) to 38.4% (all 3 risks). With age and race/ethnicity controlled, the odds of being in good, fair, or poor health, compared with those with no social disadvantages, were 1.95 for 1 risk, 3.22 for 2 risks, and 4.06 for 3 risks. The increase in odds for each additional social disadvantage was statistically significant.

Prevalence of chronic conditions also increased with number of risk factors (Table 4, column 2). Among children with no risk factors, 12.8% had a chronic condition versus 19.6% of children with all 3. Compared with children with no risk factors, the ORs of having a chronic condition increased from 1.25 (1 risk) to 1.60 (2 risks) to 2.11 (3 risks) \((P < .0001\)). The stepwise increase of each additional social disadvantage was statistically significant.

The Social Disadvantage Index was also related to the presence of activity limitations (Table 4, column 3), with 4.6% of children with no social risk factors having an activity limitation compared with 10.7% of children with all 3 risks. ORs of having an activity restriction (compared with those with no risks) increased from 1.51 (1 risk) to 2.14 (2 risks) to 2.88 (3 risks) \((P < .0001)\). Again, the stepwise increase in odds as the number of social disadvantages increased was statistically significant.

### Does Access to Care Attenuate Disparities on the Social Disadvantage Index?

We examined whether health disparities among children might be smaller if children had access to health care measured by having health insurance. Overall, 13.8% of children had no health insurance. For all 3 health outcomes, controlling for insurance status did not change the relationship of social disadvantage to health (Table 5).

### Are Some Combinations of Risk Factors Particularly Problematic?

We performed logistic regressions to assess how every combination of social disadvantage was related to the 3

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**TABLE 3** Logistic Regression, Social Risk Factors, and Child Health

<table>
<thead>
<tr>
<th>Social Risk Factor</th>
<th>In Good, Fair, or Poor Health</th>
<th>Has a Chronic Condition</th>
<th>Has an Activity Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poverty</td>
<td>1.83 1.33 1.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not 2-parent family</td>
<td>1.20 1.50 1.55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than college education</td>
<td>1.93 1.08 1.27</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Original sources of data are the combined 1994 and 1995 NHIS. Estimates are based on weighted data adjusted by age/gender/race categories to reflect the US civilian noninstitutionalized population. Logistic regression controlled for age and race/ethnicity. Significance of ORs was calculated by comparing each OR to the resident category (“none”). All ORs were significantly different at \(P \leq .001\).

**TABLE 4** Relationship of Cumulative Social Disadvantage to Child Health

<table>
<thead>
<tr>
<th>Social Disadvantage Index</th>
<th>In Good, Fair, or Poor Health</th>
<th>Has a Chronic Condition</th>
<th>Has an Activity Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>1</td>
<td>1.93</td>
<td>1.29</td>
<td>1.55</td>
</tr>
<tr>
<td>2</td>
<td>3.21</td>
<td>1.68</td>
<td>2.25</td>
</tr>
<tr>
<td>3</td>
<td>4.08</td>
<td>2.20</td>
<td>2.99</td>
</tr>
</tbody>
</table>

Original sources of data are the combined 1994 and 1995 NHIS. Estimates are based on weighted data adjusted by age/gender/race categories to reflect the US civilian noninstitutionalized population. Logistic regression controlled for age and race/ethnicity. Significance of ORs was calculated by comparing each OR with the residual category (“0”). All ORs were significantly different at \(P \leq .001\) \((N = 47,979)\).
health outcomes. These analyses were intended to identify combinations of risk factors that were particularly likely to increase risk. Several observations could be made from these analyses. First, every social disadvantage, alone or in combination, significantly increased risk over having none of these social disadvantages. Second, most of the time, adding the social disadvantages together increased risk for poor health on all 3 outcomes. Third, in general, all the 1-risk only combinations were less risky than all 2-risk combinations, which were less risky than combining all 3 risks with 1 exception: low education was an inconsistent risk factor. Sometimes, it added significantly to risk and sometimes it did not. Poverty was a particularly potent risk factor for overall health; most combinations that included poverty status had much higher ORs than those not including it. In contrast, for both chronic condition and activity limitation, single parent proved a particularly potent disadvantage; combinations of social disadvantage that included this factor tended to be higher than those not including it. It should be noted that some combinations of social disadvantage are statistically rare (eg, poor college-educated 2-parent families; nonpoor single parent low education) and that estimates for these combinations may be unstable. Overall, however, it was clear that no specific combination of social disadvantage was especially related to child health indicators.

CONCLUSIONS
The accumulation of social disadvantage among children was strongly associated with the odds of being in poorer overall health, having a chronic condition, and having a limitation of activity. Of the 4 kinds of social disadvantage examined, minority race/ethnicity was not consistently related to poor child health outcomes, a finding reported by others as well.17,31,66,71 It seems that ethnic-specific disparities in child morbidity and mortality are associated with low income.72 Furthermore, inspection of combinations of risk factors showed that low education was a risk factor alone and in some combinations but not others.

There are several limitations that should be noted. First, the measures of health were all parental report; therefore, replicating this study with data from another source would be warranted. Second, the analysis is cross-sectional and we cannot be sure of the causal connection. Others have clearly demonstrated that there is a causal relationship between poverty and ill health, and we accept this interpretation as a legitimate one for these data. However, it is possible that there is a 2-way causal relationship between poor health in children and single-parent status such that when children are chronically ill, marriages dissolve at a higher rate. Also, it is possible that having a sick child might interfere with mothers’ educational opportunities. We reviewed the literature but found no empiric data to support these possibilities. Similarly, there may be a 2-way causal relationship between child health and a control variable, insurance. Children in worse health are more likely to be insured, particularly by public programs, after they are diagnosed. We recommend that our analyses be repeated on a longitudinal data set. Third, we have taken a macro look at the issue of the accumulation of social disadvantage and did not focus on fine-grained inquiry. That is, we did not ask whether findings would vary depending, for example, on whether those living in a single-parent family also lived with another adult or whether father’s rather than mother’s education was examined. It is tempting to pull apart the categories of disadvantage into smaller and smaller subgroups in the hopes of better understanding the phenomenon, and this could be a fruitful analysis. However, House72 warns against this approach, which he termed “the indiscriminate expanding smorgasbord of psychosocial risk factors,” each with small to moderate effects. This is especially so when the degree that they are distinct from one another is questionable. In our view, the larger point should be made and emphasized—that social disadvantage, however measured, has a cumulative effect on child health.

These data support the position that social structural factors have a cumulative effect on child health status. Poverty, low parental education, and single-parent family structure are not simply proxies for a single underlying disadvantage, but have additive effects on the life chances of children. It is important for clinicians to appreciate that children with more than 1 risk factor may in fact have more likelihood of experiencing poor outcomes so that they can assess more thoroughly and provide more aggressive preventive measures when available. Our society is structured in ways that facilitate accumulation of advantage for some and accumulation of disadvantage for others.54,73–76 The effects of cumulative disadvantage percolate throughout the age spectrum and are as true of children as they are of adults. More research is needed to address whether the timing of the accumulation of disadvantage (the age at which children experience multiple risks) and the length of time children experience accumulated risk are related to health status.

Finally, the health disparities we documented in children as a function of added social disadvantage were not attenuated among children with insurance. Policy initiatives tend to focus on providing insurance to poor children, who are more likely to be uninsured, to lack access to regular preventive care, and to have unmet health needs.17,28 However, lack of access accounts for a relatively small part of the socioeconomic gradient in health,77 and insurance is not the only barrier to accessing care.78–80 Although universal access will deliver much needed medical services to the nation’s children, it has been suggested that it will do little to reduce the effect of
cumulative social disadvantage on child health. Our data support this conclusion.

ACKNOWLEDGMENT
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