

Double Jeopardy: What Social Risk Adds to Biomedical Risk in Understanding Child Health and Health Care Utilization

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Objective.—The aim of this study was to test the hypothesis that children with both social and biomedical risk factors are more likely to be in poorer health and utilize more health services than those with either type of risk alone.

Methods.—Variables were identified using the 1998 National Health Interview Survey and tested here on 2002 data. Dependent variables were health (poorer health rating) and service use (hospitalization or greater than 2 emergency services). High social risk was defined as greater than 2 risk factors (parental education less than high school, family income <200% of federal poverty level, and non-2-parent family). High biomedical risk was defined as having a chronic condition or birth weight <2500 grams.

Results.—Children with either high social or biomedical risk were significantly more likely to be in poorer health (odds ratio [OR] 3.1–3.4) and to have higher utilization (OR 1.7–2.1) than children at low risk on both dimensions. Children with high risk

on both dimensions were significantly more likely to be in poorer health (OR 7.8–7.9) and have higher utilization (OR 3.5–3.7) on both social and biomedical risks and those children rated high risk on either dimension alone. Overall, social risk was as powerful as biomedical risk in these models and added substantially to biomedical risk. Findings were stable using different cut points for social risk and health ratings, and different definitions of chronic condition.

Conclusions.—These findings have implications for health care planners and insurers in estimating the burdens on clinicians and potential costs of delivering care to those with high social risks.

KEY WORDS: biomedical risk; health rating; social risk; utilization

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In recent decades, researchers have paid increasing attention to the short- and long-term effects of risk factors on child health and development.^{1–4} Several major reports^{2–4} have documented that child health is affected by interactions among diverse risk factors. Although some previous studies^{5–7} have included both biomedical and social risks, data analyses generally focus on the effects of *either* biomedical or social risk on an outcome and usually control for the effect of the other risk factor on child health and utilization. That is, studies focusing on biomedical and health risk usually control for social factors, whereas studies focusing on social risk factors often control for biomedical risk factors. The potential cumulative effect of biomedical and social factors on health and utilization has been relatively understudied.

The most studied social risk factor is poverty; its association with child morbidity and mortality is one of the most replicated findings in epidemiology.^{8–10} Like poor adults, poor children are more likely to become ill, and when they do, they experience higher morbidity and mortality rates than nonpoor children.^{11–13} They are more likely to be inadequately immunized,¹¹ have higher rates of asthma,¹⁴ obesity,¹⁵ developmental delay, learning disability, and behavioral disorders;^{16,17} have more health problems overall,¹⁸ and have more functional limitations from their conditions.^{13,19,20} Children's health is better among those with higher incomes, and this disparity becomes more pronounced with age.^{20,21} Low parental education and residing in a single parent household are also associated with poorer child physical and mental health.^{21–24}

The most commonly studied biomedical risks are previous history of illness and utilization as predictors of future illness and service use. Evidence shows that birth weight <2500 grams²⁵ and the presence of a congenital anomaly, chronic physical health condition, or disability all have important long-term consequences for health,^{26,27} and are correlated with different patterns of service use and associated costs.^{25,26} Patterns of use of health care services show a tendency to be consistent within families over time.²⁸

Recently, cross-sectional research on risk factors has moved from individual to cumulative effects of disadvantage on child health.²⁴ Bauman and colleagues²⁹ demonstrated

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that having several kinds of social disadvantages has a strong cumulative relationship with measures of child health, including being in good, fair, or poor health, having a chronic condition, and having an activity limitation. Stevens³⁰ demonstrated a dose-response relationship between the number of social risk factors and both poor health status and developmental delays among preschool children. However, we found no studies that assessed the combined effects of concurrent social *and* biomedical risks on the overall health and service utilization of children except for studies that examined the combined effects of these risk factors on specific diseases (ie, Koinis-Mitchell and colleagues³¹), or in relatively small clinical samples.^{32,33} Despite what seems like an extensive literature examining social and biomedical risk,^{1,5,6} we could not locate any population-based studies that deal with these risks simultaneously in examining the outcomes in this study. Therefore, questions remain about whether the combination of social and biomedical risks has a cumulative relationship with child health or with utilization of services in a national sample.

This question has important practical implications for health care delivery. Provider patient panels and insurance plans in the United States rarely consider either social or biomedical risks in setting productivity standards and reimbursement, or if they do, they tend to focus only on biomedical risk. However providers who care for vulnerable children report complex challenges and intense resource use in caring for those with high social and biomedical risks.³⁴ If poor health status and high utilization are more prevalent among children with more risks, it would provide a strong argument for weighting panel size and capitation reimbursement. Biomedical factors have been shown to predict costs and are used in the National Association of Children's Hospitals and Related Institutions' classification system,³⁵ and for risk adjustment for children and adults.^{36,37} Some European countries also use social risk adjustment,³⁸ but we did not find examples in the United States that combined social and biomedical risks in designing programs for children, except for Early Intervention program eligibility.³⁹

The purpose of this study was to assess whether high biomedical and social risks, separately and together, are associated with systematic differences in child health status and utilization of care. We hypothesize that the presence of both types of risk is associated with greater likelihood of poorer health status and high utilization than having either type of risk alone. We used a nationally representative sample of children to answer this question to assure generalizability of our findings.

METHODS

Data Sets

Data come from the 2002 National Health Interview Survey (NHIS), a nationally representative survey of noninstitutionalized civilians in US households.⁴⁰ The basic module consists of 3 cores: family, sample adult, and sample child. The family core includes household-, family- and person-level files. Data from the Household

File were used to adjust analytic results for stratification and clustering. The Person File contained information on parental rating of child health, nights in hospital, components of a composite chronic condition measure, and caretaker education (used when parental education was missing). The Sample Child File contained data on one randomly selected child per household; we used data on birth weight, components of the Children with Special Health Care Needs Screener (CSHCN), and a composite chronic condition measure, health care service use, parent education, family poverty status, family structure, and emergency department use.

We used the 1998 NHIS dataset to identify the variables and the model, and tested it on the 2002 data. Although these are not the most recent datasets available, they contained the variables needed for a test of concept, and the 2002 dataset was unique in providing an additional way to test one of the constructs.

Sample

The sample was children aged ≤ 12 years. This cutoff was used because adolescents begin to seek care on their own and parental reporting is considered less reliable for adolescents than for children.⁴¹ Of the 8860 children aged ≤ 12 years in the 2002 Sample Child files, 8174 had useable data, after deleting 686 cases with missing data and 22 cases because procedures to adjust for clustering required at least 2 observations per primary sampling unit, and in these cases there were only one per unit.

Measures

Dependent Measures

The dependent measures were parental rating of child health and utilization of health care. The parental rating of child health question was "Would you say [name's] health is in general excellent, very good, good, fair or poor?" Responses were heavily skewed toward the high end. We recoded the data 2 ways: excellent or very good health versus good, fair or poor health, and also excellent, very good, or good health versus fair or poor health. Results were similar for both versions, but cell sizes for fair or poor health were very small. Therefore, we classified good, fair, or poor health ratings as having poorer health in the data presented below. *High utilization* was defined as either a hospitalization (other than at birth) or ≥ 2 emergency department visits within the past year. The dataset did not contain sufficient information to determine the actual number of primary care visits or to adjust for recommended age-appropriate health care utilization.

Biomedical Risk Measures

A child was categorized as having high biomedical risk if birth weight was < 2500 grams or if a chronic condition was present. This birth weight was chosen because of the many studies that document the association of low birth weight with both poorer health status and higher utilization.²⁵ In both the 1998 and 2002 data sets, the presence

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