Hunger in Midwestern Inner-city Young Children

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Objective: To determine the characteristics of hunger in young children who attend ambulatory pediatric clinics in a midwestern city.

Design: Consecutive sample.

Setting: Ambulatory pediatric clinics of an inner-city teaching hospital.

Participants: English-speaking caregivers of 2578 children younger than 5 years.

Main Outcome Measure: Structured survey measures of hunger, family characteristics, assistance program use, child feeding practices, and anthropometrics.

Results: In this population, 171 (6.6%) were hungry, and 842 (32.7%) were at risk for hunger. Hunger status was associated with increased age (P < .001), decreased maternal education level (P = .013), maternal nonwhite race (P < .002), a history of homelessness (P < .001), and parental unemployment (P < .001). Hunger status was associated with use of Aid to Families with Dependent Children (P < .001) and food stamps (P < .001) but not with participation in The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Results of anthropometrics indicated that mean growth percentiles were no different between hunger categories.

Conclusions: Housing, dietary, and family characteristics are identifiable risk factors for early childhood hunger. Hunger cannot be identified, however, using anthropometrics. It is disconcerting that fewer hungry children and children at risk for hunger participate in WIC compared with other programs. These data suggest the potential for more aggressive identification and intervention at the primary care and social service levels to benefit hungry children.


The United States is the greatest producer of agricultural products in the world, yet estimates of hunger in children and families within the United States paint an ominous picture. The Community Childhood Hunger Identification Project (CCHIP) reported in 1995 that hunger affects 4 million low-income children younger than 12 years within the United States and that an additional 9.6 million children are at risk for hunger.1 In 1983, the Physicians Task Force on Hunger estimated that 20 million Americans were hungry,2 and in 1991, the Breglio poll increased this estimate to 30 million.3 Although the definition and assessment of hunger is not consistent between groups, it is clear that hunger is an overwhelming problem, even in its most conservative estimate.

Although few would argue hunger is benign, the literature yields little information regarding the impact of hunger on children. In the CCHIP sample, hunger in low-income children is associated with a greater incidence of infections such as otitis media and colds, increased school absences, greater fatigue, headaches, and concentration deficits.4 Several studies examining the effect of breakfast found that children who did not have breakfast, especially those who already exhibited signs of malnutrition,5 performed less well on cognitive tasks than their better-fed counterparts.6

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Typical clinical measures of malnutrition are poorly suited to detecting the impact of episodic food insufficiency. By the time overt clinical signs are detectable, significant calorie and other nutrient deficits have been long-standing.7 Chronic, mild malnutrition as measured by anthropometrics has been associated with impaired cognitive development8,9 and visual motor integration.8 Anemia, a marker for malnutrition affecting approximately 20% of children younger than 2 years and approximately 17% of children aged 3 to 4 years in low-income families,10 is associated with increased susceptibility to the toxic effects of lead,11,12 developmental delays,14,17 and behavioral deficits.15,18 Paradoxically, obesity may also occur due to hunger; children who are hungry may respond by eating more or choosing higher-calorie foods when food is available.19

A better understanding of the characteristics of hunger among young children is needed to improve identification,
SUBJECTS AND METHODS

SAMPLE

The sampling frame was 3528 children younger than 5 years consecutively registered in the ambulatory pediatric clinics of Hennepin County Medical Center from February 1 to July 31, 1994; of these, 2578 participated and formed the sample. The ambulatory pediatric clinics serve inner-city children who are predominantly low income and ethnically diverse. Structured surveys of English-speaking parents or caregivers were performed by a team of 6 trained interviewers. The purpose of the study was explained to each parent or caregiver, and informed consent was obtained. Information was collected on hunger, child and family characteristics, and feeding practices.

SURVEY INSTRUMENT

Hunger status was assessed using the Hunger Scale, an 8-item instrument designed to assess food insufficiency during the previous 12 months. Five or more answers of “yes” indicate a serious food shortage; such families were considered to be hungry. Families answering “yes” from 1 to 4 times were experiencing some food shortage problems and were considered to be at risk for hunger. Those answering “no” to all 8 questions were considered to be not hungry. The Hunger Scale has been found to be specific and sensitive to all 8 questions were considered to be not hungry. The Hunger Scale was found to be specific and sensitive for detecting hunger when validated through comparison with 24-hour dietary recall interviews, household food store inventories, and other food security measures.

A 75-question structured interview was used to collect self-reported demographic, socioeconomic, dietary, and public assistance program information. Homelessness was defined as not having a regular nighttime residence at any time during the past year (eg, having to sleep in a park, car, abandoned building, public shelter, or welfare hotel; on the street; or temporarily at the home of friends or relatives). Consumption of juice and carbonated and noncarbonated beverages was determined by asking the parents or caregivers to estimate how many ounces of each beverage their child drank each day. Different sizes of cups, glasses, and bottles were used to assist the caregivers in estimation of fluid volume.

Anthropometric measurements were obtained by trained staff members. Children were asked to remove shoes, coats, heavy clothing, and any other articles that could influence the measurements. Weight was measured for all children using a calibrated table-top or standing digital scale. Recumbent length was measured for children younger than 2 years on a table using a fixed headboard and a movable foot board that were perpendicular to the table surface. The height of children 2 years or older was measured using a standard height board attached to the wall, according to established procedures.

ANALYSIS

All data forms were transferred into an electronic database via a double-key data-entry method to ensure minimal data error. All analyses were completed using commercially available software (SPSS Version 6.0 for Windows; SPSS Inc, Chicago, Ill, 1994, and EpInfo Version 3.01b; Centers for Disease Control and Prevention, Atlanta, Ga, 1991). Growth percentiles were computed using additional software (Anthro, Version 1.01; Centers for Disease Control and Prevention and Prevention, 1990) that is based on data from the National Center for Health Statistics, Hyattsville, Md.

Descriptive statistics were generated for variables of interest to characterize the sample and to ensure that all statistical assumptions were met where necessary before analysis.

To determine differences between groups of children who were hungry, at risk for hunger, and not hungry according to the Hunger Scale, categorical comparisons were made using $\chi^2$ analysis. Analysis of variance was used for continuous variables. Arc-sine transformations were computed for all percentile growth data before group comparisons were performed. For the dependent variables of consumption of juice and carbonated and noncarbonated beverages, analysis of covariance was completed. As consumption of most foods increases with age in young children, it was necessary to control for the effects of age in these analyses.

RESULTS

INTRODUCTION

intervention, and prevention of hunger-related morbidity. Our study links hunger status to selected demographic, growth, and dietary characteristics and use of public assistance programs by children younger than 5 years within an inner-city teaching hospital population. Hunger, which was measured using the Hunger Scale developed by CCHIP (Figure 1), refers to the occurrence of food insufficiency during the previous 12 months.

Table 1 shows the reasons for excluding children and caregivers from the study. All Tables and Figures are based on this sample or samples with no more than 30 missing responses.

Table 2 shows several factors that were statistically associated with hunger status. Hungry children were more likely to have mothers who were nonwhite and did not have a postsecondary education, to come from households where no adults were employed, and to have a history of homelessness in the past year. Parents of children who were not hungry were more likely to be currently married. For use of assistance programs, all programs with the exception of the WIC were more likely to be used by the hungry and at-risk groups (Figure 3). Hunger status increased significantly with age (Mantel-Haenszel test for linear association, $13.58; P<.001$).
For the beverage consumption data (Figure 4), no differences were observed among the 3 groups ($\chi^2 = 3.62; P = .16$) in the proportion of children who consumed juice. For carbonated beverages, almost 2 times as many hungry children drank carbonated beverages (29.2%) than those who were not hungry (15.5%; $\chi^2 = 20.67; P < .001$) or at risk for hunger (18.1%; $\chi^2 = 11.04; P < .001$). For noncarbonated beverages (eg, Kool-Aid), there was a statistically linear trend for increased consumption by increased hunger status (Mantel-Haenszel test for linear association, 23.85; $P < .001$) (26.9% for children who were not hungry; 33.3% for children who were at risk for hunger; and 42.7% for hungry children). Table 4 shows the mean number of milliliters of each beverage consumed per day for those children who drank that beverage. After adjusting for age, there was no difference in actual amount of carbonated beverages consumed ($F = 0.24; P = .79$) and a trend for increasing consumption of juice among children who were at risk for hunger or hungry ($F = 2.94; P = .05$). However, hungry children drank larger quantities of the noncarbonated beverages than those who were not hungry after adjusting for age ($F = 4.35; P = .01$).

**Table 1. Sample Recruitment and Reasons for Exclusions**

<table>
<thead>
<tr>
<th>Reason for Exclusion</th>
<th>No. (%) of Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non–English-speaking caregiver</td>
<td>443 (17.0)</td>
</tr>
<tr>
<td>Unavailability of interviewer caused</td>
<td>292 (11.3)</td>
</tr>
<tr>
<td>by patient volume</td>
<td></td>
</tr>
<tr>
<td>Caregiver refusal of interview</td>
<td>80 (3.1)</td>
</tr>
<tr>
<td>Incomplete study form†</td>
<td>71 (2.7)</td>
</tr>
<tr>
<td>Patient had emergent health needs</td>
<td>32 (1.2)</td>
</tr>
<tr>
<td>Patient not accompanied by primary caregiver</td>
<td>28 (1.1)</td>
</tr>
<tr>
<td>Unknown</td>
<td>4 (0.1)</td>
</tr>
<tr>
<td>Sample Total</td>
<td>2578 (73.1)</td>
</tr>
</tbody>
</table>

* Percentages have been rounded and may not total 100.

For the beverage consumption data (Figure 4), no differences were observed among the 3 groups ($\chi^2 = 3.62; P = .16$) in the proportion of children who consumed juice. For carbonated beverages, almost 2 times as many hungry children drank carbonated beverages (29.2%) than those who were not hungry (15.5%; $\chi^2 = 20.67; P < .001$) or at risk for hunger (18.1%; $\chi^2 = 11.04; P < .001$). For noncarbonated beverages (eg, Kool-Aid), there was a statistically linear trend for increased consumption by increased hunger status (Mantel-Haenszel test for linear association, 23.85; $P < .001$) (26.9% for children who were not hungry; 33.3% for children who were at risk for hunger; and 42.7% for hungry children). Table 4 shows the mean number of milliliters of each beverage consumed per day for those children who drank that beverage. After adjusting for age, there was no difference in actual amount of carbonated beverages consumed ($F = 0.24; P = .79$) and a trend for increasing consumption of juice among children who were at risk for hunger or hungry ($F = 2.94; P = .05$). However, hungry children drank larger quantities of the noncarbonated beverages than those who were not hungry after adjusting for age ($F = 4.35; P = .01$).
for age that is shorter than expected according to the national norms, hungry children tended to be taller for their age. The average weight for height was greater than expected for all children regardless of hunger, consistent with previous findings, in which low-income populations were found to be heavier.22-25 Some investigators have suggested that the link between episodic food shortages and overeating might reflect an adaptive process; calories are consumed in excess when they are available.26,27

HOMELESSNESS AND FAMILY CHARACTERISTICS

The strongest predictor of hunger was reporting an episode of homelessness in the previous year. Of the 1559 children classified as not hungry, only 8.3% had a history of recent homelessness. This prevalence increased almost 3-fold (24.8%) in the at-risk families and to almost 5-fold (40.9%) in the hungry families.

Our data showed that nearly 1 in 6 children were homeless in the preceding year, suggesting that the estimates of more than 100,000 homeless children nationally27 may be quite conservative. Our study provided local data demonstrating the large numbers of families with children who are homeless.

Hunger is not just a problem of lack of food but may indicate that families have fewer resources to cope with food insufficiency. When a report of homelessness in the previous year and hunger coexist, as they do in 40.9% of our hungry population, the combined magnitude of these problems becomes more overwhelming.

Other risk factors associated with economic and social instability were also associated with hunger, although to a lesser extent. Unemployment was more prevalent in the at-risk and hungry families compared with families who were not hungry. However, 38.8% of the hungry families in our population and the CCHIP project had at least 1 employed adult. These statistics suggest that, under present domestic economic policies, it is difficult for some workers to provide adequately for their families.

Along with homelessness and unemployment, other risk factors for hunger included marital status, maternal education level, mother's race, and child's age. In this population, whereas marriage conferred a protection against hunger, being divorced or separated conferred the highest risk. As with homelessness, a family environment in flux appears to limit the resources available for food. Maternal education level was significantly associated with hunger status. The protective effect of education was most evident in those women with at least some postsecondary education, indicating that the high school diploma alone is in-

Table 3. Selected Parental Characteristics by Child’s Hunger Status

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Hungry (n = 1559)</th>
<th>At Risk (n = 842)</th>
<th>Hungry (n = 171)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother’s education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;12 y</td>
<td>36.3</td>
<td>36.6</td>
<td>33.8</td>
<td>.79</td>
</tr>
<tr>
<td>High school graduate</td>
<td>46.8</td>
<td>38.7</td>
<td>38.1</td>
<td>.53</td>
</tr>
<tr>
<td>Postsecondary education</td>
<td>17.0</td>
<td>24.7</td>
<td>28.1</td>
<td>.02</td>
</tr>
<tr>
<td>Employment</td>
<td>38.8</td>
<td>44.3</td>
<td>54.8</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>History of homelessness</td>
<td>40.9</td>
<td>24.8</td>
<td>8.5</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>19.5</td>
<td>18.5</td>
<td>25.0</td>
<td>.001‡</td>
</tr>
<tr>
<td>Single</td>
<td>69.8</td>
<td>70.0</td>
<td>68.8</td>
<td>&lt;.01‡</td>
</tr>
<tr>
<td>Divorced or separated</td>
<td>10.7</td>
<td>11.5</td>
<td>6.2</td>
<td>.001‡</td>
</tr>
<tr>
<td>Mother’s race (nonwhite)</td>
<td>82.6</td>
<td>76.2</td>
<td>71.8</td>
<td>.002</td>
</tr>
</tbody>
</table>

*Ellipses indicate comparison not made.
†Compared with children whose mothers have less than 12 years of education.
‡Compared with children with married parents.

Table 4. Beverages Children Consumed by Hunger Scale Status

<table>
<thead>
<tr>
<th>Beverage</th>
<th>Hungry (n = 1559)</th>
<th>At Risk (n = 842)</th>
<th>Hungry (n = 171)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juice</td>
<td>467.7 (372.0)</td>
<td>431.1 (357.0)</td>
<td>395.1 (301.8)</td>
<td>.05</td>
</tr>
<tr>
<td>Noncarbonated</td>
<td>477.9 (414.9)</td>
<td>374.7 (297.3)</td>
<td>358.5 (284.7)</td>
<td>.01</td>
</tr>
<tr>
<td>Carbonated</td>
<td>300.6 (232.2)</td>
<td>274.5 (233.7)</td>
<td>273.6 (284.4)</td>
<td>.79</td>
</tr>
</tbody>
</table>

*Comparisons are age adjusted.

Not contain measures of the emotional impact of hunger on children and did not provide an estimate of family income.

GROWTH

Typically, children at risk for malnutrition are identified by growth patterns. Our data, however, suggest that growth measures are not related to hunger status. Clearly, for our population, hunger is not synonymous with the thin, waif-like child. Although the children in this study have a height
sufficient to allow some single parents to obtain employment at a livable wage. Nonwhite children were significantly more likely to be hungry or at risk for hunger. These racial differences are likely related to the disproportionate prevalence of poverty among children of minority groups.26

DIETARY BEHAVIORS

In addition to family characteristics, some self-reported behaviors were associated with hunger status. More hungry children consumed calories with little nutritional value than did their less-hungry counterparts (ie, carbonated and non-carbonated soft drinks). These beverages may promote early satiety and decrease consumption of more nutritious foods; in the case of fruit juice, excess consumption has been associated with short stature and obesity in young children.29 Although total calories may meet or exceed daily needs, malnutrition from low intakes of needed nutrients may result from dietary adaptation to episodic food insufficiency.

USE OF PUBLIC PROGRAMS

As might be expected, hungry and at-risk families were more likely to use assistance programs such as Aid to Families with Dependent Children, food stamps, and food shelves. Thus, while potentially conferring some protection against hunger, program participation also becomes a marker for risk. Therefore, there is some question whether the Hunger Scale and other characteristics of hunger serve as a proxy for poverty. Since poverty level is established based on estimated minimum family food budget costs,30 the association between hunger and poverty is inevitable.

Surprisingly, the WIC program was not used to any greater extent by any group. The WIC program requires that participants keep regular appointments, which may prove overwhelming for some hard-to-reach populations such as the homeless. The economic benefits of the WIC program, especially for older toddlers, may not be readily apparent to the caregiver, despite the many nutritional benefits. Because the WIC program provides foods and nutrition education that help ensure adequate intake of essential nutrients, the number of hungry children not benefiting from this program is of concern. Additional data need to be collected to determine how to increase use among all eligible children.

Identification of hunger and risk for hunger is an important part of pediatric care, as hunger can be a marker for malnutrition long before clinical signs are evident. The characteristics of hunger in these families are more likely to be linked to other forms of stress and poverty, such as homelessness and single parenting, and less likely to be overt signs of impaired growth. Pediatricians also need to be aware that families who have inadequate food resources may rely on nutritionally empty calories to achieve satiety and underuse the resources of the WIC program. More research is needed to monitor the prevalence and effects of childhood hunger, especially in view of welfare reform.

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REFERENCES