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Household Hardships, Public Programs, and Their Associations with the Health and Development of Very Young Children: Insights from Children's HealthWatch

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Evaluating Food Insecurity and Household Hardships

Food insecurity, a household-level economic and social condition of limited or uncertain access to adequate food for all household members to live an active and healthy life, is a serious public health problem in the US. This problem waxes and wanes with fluctuations in public policies and economic climate. While the prevalence of household food insecurity has remained fairly stable over the past 2 years, the increase in 2008, the first full year of the recession, was the largest since the national food security survey began in 1995¹ and has not returned to pre-2008 levels.

The most recent US Department of Agriculture (USDA) assessment of food security in the US reported that overall food insecurity numbers (measured by the 18-item US Food Security Scale [FSS]²) were relatively unchanged from 2009 to 2010, with 14.5% of households (17.2 million) considered food insecure; most of those who were food insecure lived inside metropolitan areas.³ That same year, 21.6% of all US children (16.2 million) lived in food-insecure households. Pediatric clinicians have observed that not only food insecurity but also other material hardships, such as energy and housing insecurity (respectively, inadequate home energy availability due to economic constraints and overcrowded living situations or frequent moves), exert a cumulative negative effect on child health.⁴

Many research and advocacy groups use econometrics and/or biostatistics to explore the health and educational effects of food insecurity.^{5,6} Children's HealthWatch (formerly known as the Children's Sentinel Nutrition Assessment Program or C-SNAP) is one such group. Children's HealthWatch was founded in 1998 to bring evidence and analysis from the front lines of pediatric care to policy makers and the public. The goal of Children's HealthWatch was to develop a continuous dataset that could monitor child health in real time as economic conditions and government assistance programs changed. At the time, other researchers collected young children's anthropometric data primarily from datasets of children already receiving benefits from the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) or Headstart and reflected conditions from 1 to several years before publication.⁷

Some national data collection efforts obtained health information but not data on family hardship or safety-net program participation, while still others that collected program participation data lacked information on children's health, growth, and development. At present, several important longitudinal studies include the FSS but mostly focus on older children. To our knowledge, the Children's HealthWatch dataset is the oldest and

largest of children ages 0 to 4 year olds that includes other material hardships, such as energy insecurity.⁸⁻¹¹

From its inception, the study has focused on a sentinel populationⁱ of very young children. The rationale for this focus is both scientific and sociological. From a scientific perspective, during the developmental window from birth to preschool, the rapidly increasing size and function of the developing brain demands consistently high levels of nutritional substrate. Deficits in the growth of brain and body following nutritional deprivation or other hardships during this sensitive period, when the foundations of future health and cognitive development are largely determined, are difficult to remediate later in life. Paradoxically, this sensitive period is also the developmental epoch during which children in the US are most likely to live in poverty¹² and least likely to participate in formal child care or educational settings.¹³ Thus, children of this age are typically “visible” only to their family members and health care providers.

As a result, the needs of very young children are often not addressed in important policy debates. Consistent with the medical model, Children’s HealthWatch focuses on two broad phenomena: 1) the association of one or more exposures (material hardships) to each other and to health outcomes; and 2) the effect of population-level interventions (such as food assistance programs) on reducing the severity or prevalence of the exposure or reducing the negative health impact of the exposure. Monitoring and reporting on the association of these factors with the well-being of the youngest children lends this constituency a voice in matters of policy that will eventually impact their potential to be healthy and productive adults.

Children’s HealthWatch monitors the impact of food insecurity alone and in conjunction with other hardships common to low-income families; these hardships include energy insecurity, housing insecurity, and constrained access to health care. Such research evaluates systematically the common-sense notion that ready access to sufficient healthful food, safe and stable housing, and adequate household energy resources can position young children on a trajectory for health and success in school and, later, in the workforce.

ⁱ Sentinel samples are subpopulations in which occurrence of a disease indicates or predicts rates in the general population or subpopulations that may be especially vulnerable to a disease and experience higher disease rates before the general population is affected (the “canaries in the coal mine”). They are also subpopulations in which occurrence of or exposure to disease at one age or life-cycle phase may reliably predict disease at later ages or life-cycle phases.

This paper explores Children’s HealthWatch’s research methods, selected findings, and examples of diverse approaches to dissemination of these findings in professional settings, national and local reports and briefs, and legislative testimony. An exhaustive list of this work can be found at www.childrenshealthwatch.org.

Children’s HealthWatch—Analytic Focus

Though the 18 items that comprise the FSS are essentially unchanged, the category in which an individual fits according to how he or she scores on the scale has varied over time; these variations have resulted in several possible classifications describing a household’s or individual’s experience with access to food.¹⁴ The FSS also includes 8 child-focused items to measure food security specifically among children.¹⁵ The terms “food insecure” and “food secure” are the broad categories used to describe experience with food as determined by the FSS and are described in Table 1.

Table 1. Changes in Description of Food Security¹⁶

USDA Pre-2006 Label	USDA Current Label	Description of Conditions in the Household, per Food Security Survey
Food security	High food security	No reported indications of food-access problems or limitations
	Marginal food security	One or two reported indications—typically of anxiety over food sufficiency or shortage of food in the house; little or no indication of changes in diets or food intake
Food insecurity without hunger	Low food security	Reports of reduced quality, variety, or desirability of diet; little or no indication of reduced food intake
Food insecurity with hunger	Very low food security	Reports of multiple indications of disrupted eating patterns and reduced food intake

Most frontline providers continue to use the common-sense pre-2006 terms rather than low and very low food security. Children’s HealthWatch analyses use the conservative approach of 3 endorsed items on the FSS to refer to a family as “food insecure” while some groups

interpret food insecurity at the marginal food secure level or use alternate scoring systems.¹⁷

Children’s HealthWatch uses the scoring system of the USDA’s Economic Research Service (ERS) to divide households into 3 mutually exclusive categories: 1) food secure on the 18-item FSS; 2) food insecure on the household scale but food secure on the child scale; and 3) food insecure on the household scale *and* the child scale. (See Table 2)

Table 2. Levels of Food Security and Insecurity¹⁸

Level of Food Insecurity	Assessing Status Using the FSS
Food secure on the household and child scale	Household reports 0 to 2 indications of food insecurity to the entire set of 18 questions
Food insecure on the household scale but food secure on the child scale	Household reports 3 or more indications of food insecurity in response to the entire set of 18-questions
Food insecure on the household scale <i>and</i> the child scale	Household reports 2 or more of the child-referenced questions (11-18) of the FSS

Children’s HealthWatch Study Sample Composition

Children’s HealthWatch currently collects data through one-on-one surveys between trained interviewers and caregivers of patients under the age of 4 in emergency departments or primary care clinics in 5 US cities. Since 1998, over 42,000 households have completed the survey at one of the 7 research sites listed below. Each of the sites is located in a predominantly low-income area and has an affiliated multidisciplinary clinic to provide care to underweight young children, including those identified in the course of research procedures. Each site has approval for human subjects research from its Institutional Review Board (IRB), and all studies have been conducted with IRB approval in place.

Data collection sites are:

- University of Maryland School of Medicine, *Baltimore, Maryland*
- Boston Medical Center, *Boston, Massachusetts*
- Arkansas Children’s Hospital, *Little Rock, Arkansas*
- Hennepin County Medical Center, *Minneapolis, Minnesota*
- St. Christopher’s Hospital for Children, *Philadelphia, Pennsylvania*

Inactive sites (due to insufficient funding) are:

- Harbor UCLA Medical Center Torrance, *Los Angeles, California* (inactive as of 2001)
- Mary's Center for Maternal and Child Care, *Washington, DC* (inactive as of 2000)

Caregivers interviewed by Children's HealthWatch comprise a sentinel cross-sectional convenience sample. Interviewers survey caregiver-child dyads consenting to participation in the survey and meeting the following inclusion criteria: 1) patient is <48 months of age and seeking care at acute or primary care clinics or hospital emergency departments; 2) caregiver lives in the state where the interview is being conducted; 3) the interview can be conducted verbally in English, Spanish, or (Minneapolis only) Somali; 4) the household has not participated in the Children's HealthWatch survey in the previous 6 months; and 5) the caregiver lives with the child and has full knowledge of the child's life. Caregivers of critically ill or injured children are not approached.

In early 2011, the eligible child age range was broadened from 0 to 36 months to 0 to 48 months in an effort to expand the sample to an age group where the risk of obesity increases and developmental findings better predict school readiness.

The Children's HealthWatch Survey

Each caregiver completes one full survey during his or her child's visit to the emergency department or primary care center. While the survey has been modified slightly over time to accommodate changes in policy and research questions, the areas of focus generally include the following:

Data acquired through medical record review and/or anthropometric measurement:

- Child's dehydration and hospital admission status on the day of interview
- Child's current height and weight (at some sites, measurements are taken by clinical staff; at others, the interviewers use standardized protocols to measure children)

Data acquired through caregiver report:

- Developmental assessment (Parents' Evaluation of Development Status¹⁹) and use of Early Intervention services
- Demographic background
- Caregiver and household employment status, income, and use of child care

- Child's health history, including lifetime hospitalizations and health insurance coverage
- Household access to medical care and healthcare trade-offs
- Caregiver health questions, including the Kemper Depression Screener²⁰ (female caregivers only), and maternal/paternal anthropometric measurements
- Evaluation of housing security
- Evaluation of energy security
- The USDA FSS¹⁵
- Participation in public assistance programs including Supplemental Nutrition Assistance Program (SNAP, formerly The Food Stamp Program), WIC, Temporary Assistance for Needy Families (TANF), energy assistance such as Low-Income Home Energy Assistance Program (LIHEAP), and housing subsidies, such as Section 8 and public housing.

At the end of every interview, the caregiver is offered outreach services that differ by site, ranging from a list of community resources and WIC offices to follow-up from an outreach worker. Caregivers are also offered the chance to be contacted for media or legislative testimony opportunities. Small incentives—for example, supermarket gift cards or a toy for the child—are provided.

Survey Analysis

All data from the Children's HealthWatch survey are maintained and analyzed at the Boston University School of Public Health's Data Coordinating Center. Every 6 months, a new batch of clean data is added to the dataset. There is no "typical" data analysis in Children's HealthWatch. Each analysis includes (at a minimum) descriptive statistics, bivariate associational measures, and multivariate analyses adjusted for potential confounding factors. Propensity score matching may also be used. Because the study is ongoing, with some measures being added or omitted over time and sites joining and leaving the project, different publications from different periods described below have varying sample sizes depending on how many participants had been interviewed at the time of the analysis. In addition, some papers focus only on subsamples selected from the overall sample to answer specific questions.

Monitoring Children's Health on the Front Lines of Care

Federal and state programs exist to support households struggling with the costs of basic needs, but there can be logistical and bureaucratic barriers to program participation. Moreover, some discretionary programs

lack funding to support all those who are eligible.ⁱⁱ Children’s HealthWatch examines the health effects of nutrition assistance programs, including SNAP, WIC, and programs that indirectly fight food insecurity, such as energy assistance programs and subsidized housing, described in Table 3. Of these programs, only SNAP is an entitlement program, designed to serve all eligible people who apply. Discretionary programs, on the other hand, are vulnerable to budget cuts year to year. When funding for discretionary programs is cut at the federal level, individual states create criteria to determine which families will receive assistance. Some states use their own budgets to supplement the needs of programs so that every eligible family receives assistance. In other cases, assistance may be provided on a first-come, first-served basis.

Table 3. Selection of Federal Assistance Programs

Federal Program	Description
Supplemental Nutrition Assistance Program (SNAP)	Formerly called the Food Stamp Program, SNAP is an entitlement program; households are provided a monthly allotment for food purchases on an Electronic Benefits Transfer card.
Temporary Assistance for Needy Families (TANF)	Program that provides monthly cash benefits to very low-income families based on eligibility standards established by the state within federal guidelines. Recipient families must fulfill ongoing work and other requirements, and there is a time limit on benefits.
Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)	Discretionary program that provides nutrient-dense foods to income-eligible pregnant, postpartum, and lactating women and children up to the age of 5.
Low Income Home Energy Assistance Program (LIHEAP)	Energy assistance program that provides funds for heating costs, often on a first-come, first-served basis.
Section 8 and Public Housing	Two of the types of housing subsidies available to individuals at low-income levels; eligible families sometimes spend multiple years on waiting lists before receiving the subsidy.

ⁱⁱ Discretionary programs are funded year to year and are not obligated to serve all those who are eligible; TANF, WIC, LIHEAP, and housing subsidies fall into this category.

Overview of Findings

Children's HealthWatch and others have found that, while food insecurity at both the household and child levels has a negative impact on child health outcomes, other hardships also come into play. These hardships, such as food insecurity, may be modified by participation in public assistance programs. All families, but particularly those who have limited incomes and young children, are constantly juggling the costs of paying for basic needs like food, shelter, household utilities, and medical care. A change in one affects the others; parents, despite the best of intentions, have to make difficult decisions whether to pay for a child's prescription, buy nutrient-dense food, or allocate scarce financial resources to rent or utility bills. Supports—including housing subsidies, WIC, and energy assistance—can offset some costs and free resources for other needs, in turn allowing parents to do more to promote their children's food security and health.

Examination of Food Insecurity in Children's HealthWatch Populations

Children's HealthWatch and others have concluded that household and child food insecurity have negative impacts on child health.^{21,22} Analysis by other groups suggests that the threshold for adverse health or developmental effects may actually be lower than previously thought (i.e., even a marginal score on the FSS may correlate with poor outcomes).^{23,24} As outlined in more detail in the following sections, Children's HealthWatch analyses have found that food insecurity puts children at a higher risk for iron-deficiency and iron-deficiency anemia, lifetime hospitalizations, fair or poor health, and developmental concerns. It should be noted that Gundersen and Kreider²⁵ observed that in samples like those of Children's HealthWatch, it is more likely that the negative health impacts of food insecurity have been underreported rather than overreported.

History of Hospitalizations and Report of Fair/Poor Health Related to Food Insecurity

The survey includes questions about the child's hospitalizations since birth and the caregiver's rating of his or her child's health status.ⁱⁱⁱ In a variety of analyses using the Children's HealthWatch dataset, children living in food insecure households are more likely to have been hospitalized and to have their health reported as fair or poor (versus excellent or good) than

ⁱⁱⁱ This question is asked in the National Health Assessment Needs Education Survey III with 5 response alternatives instead of 4. In that version, "very good" is also an option.

their counterparts living in food secure households. A 2004 study aimed to determine whether household food insecurity is associated with adverse health outcomes in the Children's HealthWatch sample.²¹ In the sample of 11,539 children under 36 months old, interviewed between 1998 and 2002, 21.4% were food insecure. Although household SNAP benefit receipt attenuated associations between food insecurity and the child's fair or poor health status, the odds of fair or poor health in children living in food insecure households remained almost twice that of children in food secure households [AOR=1.90, 95% CI=1.66-2.18]^{iv} even after controlling for SNAP participation. The odds of hospitalization since birth among the children in food insecure homes were more than 30% higher than those of the children in food secure homes [AOR =1.31 95% CI=1.16-1.48] and not modified by SNAP participation.

In 2006, further analyses addressed child as well as household food insecurity. In a sample of 17,158 child-caregiver dyads, 10% reported only household-level food insecurity, and 12% reported child food insecurity in addition to household-level food insecurity. Adjusted analyses revealed child-level food insecurity increased the adjusted odds of negative child health outcomes compared to household food insecurity with children food secure [AOR 1.51 v AOR 1.99-2.00].¹⁸

While data specific to the reason for prior hospitalizations are not collected, these findings suggest that an increase in food insecurity is correlated with an increased likelihood of history of hospitalization for young children. The average charge^v in 2009 of a single hospitalization for a child under 1 for any reason was \$13,300. The average charge for a single hospitalization for a child aged 1-4 was \$21,045.²⁶ Hospital fees are paid through a number of streams, including the individual, insurance (i.e., public and private), or at times, the hospital that provided the care. None of these figures, however, include rehabilitation, follow-up care, or home care costs.²⁷

Iron-Deficiency Anemia and Food Insecurity

Iron-deficiency anemia has been correlated with impaired cognitive, mental and psychomotor development and diminished immune response in children.^{29,30} Children's HealthWatch wanted to determine if a relationship exists between anemia and food insecurity in the study population. Two independent analyses at Children's HealthWatch sites

^{iv} We have only included Adjusted Odds Ratios for peer-reviewed publications.

^v Hospital charges reflect the amount the hospital billed for the entire hospital stay and do not include professional (physician) fees. Costs tend to reflect the actual costs to produce hospital services, while charges represent what the hospital billed for the care.²⁸

combined survey results with hematological data collected in retrospective chart reviews to explore iron-deficiency, iron-deficiency anemia, and food insecurity in the study population. Children eligible for both analyses received primary care at the respective medical centers and had appropriate lab values available in their medical records.

Researchers examined the association between child-level food insecurity and iron status among the Boston sample. Though interviews at Boston Medical Center were conducted exclusively in the Emergency Department, many of these patients used Boston Medical Center as their medical home for primary care. As a result, researchers were able to collect retrospectively appropriate lab measures for 626 children over the age of 6 months at the time of their interview between June 1996 and May 2001.

Key Findings: Iron-deficiency Anemia and Food Insecurity

- Food insecure young children were at 2.4 times greater risk of having iron-deficiency anemia compared to their food secure peers

In the final sample (n=626), 7% had iron deficiency without anemia, and 11% had iron-deficiency anemia. Adjusting for confounding variables, food insecure children had 2.4 greater odds of having iron-deficiency anemia [AOR, 2.4; 95% CI, 1.1-5.2, p=0.02] compared to food secure children.³¹ In other words, food insecure children were at 2.4 times greater risk for irreversible pathophysiologic effects of iron deficiency that might leave them more developmentally at-risk than their food secure peers—all by 3 years of age. The threshold for this effect was child food insecurity, not household food insecurity alone, suggesting a dose response of nutritional deprivation.

The second study examined a sample of 2,853 children in Minneapolis and focused on the relationship between anemia and household (as opposed to child) food security. In this study, levels of food insecurity were divided into 3 renamed categories (as explained above): high/marginal food security, low food security, and very low food security (which encompasses child food insecurity). Children younger than 36 months old living in households with very low food security were almost twice as likely to have iron-deficiency anemia compared with those in food secure households, independent of age, gender, WIC participation, race/ethnicity, US-born status, breast feeding, health insurance type, and plasma lead concentration [AOR=1.98, 95% CI 1.11, 3.53].³²

Child Development and Food Insecurity

Children's HealthWatch research found that young children from food insecure households are more likely to be at developmental risk in early childhood. Such risk is an early warning sign for lack of readiness for school. The Parents' Evaluation of Developmental Status (PEDS)¹⁹ used to evaluate children from birth to 8 years of age was introduced to the survey in 2004 and is administered to all caregivers with children who are at least 4 months old, the age at which the screen becomes more readily interpretable. In addition, caregivers are asked about their children's current or past enrollment in Early Intervention programs, regardless of age. To assist detection of developmental disabilities, the PEDS consists of 10 questions that assess cognition, expressive and receptive language, fine and gross motor behavior, socioemotional development, self-help, and learning.³³ Even after excluding families reporting food insecurity with hunger and controlling for multiple potential confounders, analysis showed children in food insecure families were significantly more likely than those in food secure households to screen positive on the PEDS [AOR 1.77, 95% CI 1.23-2.56].³⁴ The effects of food insecurity on early childhood development may be explained through both nutritive and non-nutritive pathways. Families experiencing food insecurity and constrained by finances often choose less expensive, calorie-dense but nutrient-poor foods to maximize satiety for all household members. This compromise can result in a deficiency of micronutrients (as suggested by the association of food insecurity and anemia described above), a deficiency which may alter children's developing neurotransmitters.³⁵

Maternal depression is prevalent in our data set and is among the important non-nutritive pathways by which food insecurity impacts child development. Among 5,306 mothers in Children's HealthWatch data who completed the maternal depression screen from 2000 to 2001, 35% had positive reports of depressive symptoms.³⁶ Mothers with depressive symptoms were more likely to report household food insecurity [AOR: 2.69; 95% CI: 2.33–3.11] than mothers without depressive symptoms. Mothers with depressive symptoms were also more likely to have had their TANF benefits reduced [AOR: 1.52; 95% CI: 1.03–2.25] and to have lost SNAP benefits [AOR: 1.56; 95% CI: 1.06 –2.30] but not WIC than mothers who did not report depressive symptoms. Lastly, mothers with depressive symptoms were more likely to report that their children were at developmental risk on the PEDS, but the association of food insecurity with the child's developmental risk was robust after controlling for the mother's depressive symptoms.³⁴ Other literature reports strong links between maternal depression and adverse child development outcomes.

For example, both maternal depression and paternal depression have been shown to have negative impacts on child development.³⁷ However, whether family hardships such as food insecurity caused depressive symptoms or depressive symptoms caused hardships cannot be answered by cross-sectional datasets like Children's HealthWatch.

SNAP and WIC Decrease Food Insecurity and Attenuate Its Impact on Children's Outcomes

Multiple research groups conclude that governmental assistance programs reduce food insecurity and support children's health.³⁸⁻⁴⁰ Using data from the longitudinal Three-City Study where at least one child had to be 0 to 4 years old or 10 to 14 years old, DePolt et al⁴¹ concluded that participation in SNAP is likely associated with fewer food hardships. Though governmental assistance programs do not entirely eliminate food insecurity, they may attenuate the negative impacts. Knowing that food insecurity leads to fair/poor health outcomes, Children's HealthWatch researchers investigated whether or not SNAP receipt—a logical remedy for food insecurity—modified effects of food insecurity among a sample of 11,539 caregivers, 21.4% of whom reported household food insecurity.²¹ A dose-response relation appeared between fair/poor health status and severity of food insecurity. Looking at food insecurity as a dichotomous predictor (food-secure v food-insecure), children living in food-insecure households had nearly twice as great odds of having their health status reported as "fair/poor" as those for similar children in food-secure households [AOR 1.90, 95% CI: 1.66–2.18]. When the sample was analyzed by severity of food insecurity, children in households categorized as food insecure without hunger had odds of health being reported fair/poor greater than those in food-secure households [AOR 1.73, 95% CI: 1.48-2.02] and children in households that were food insecure with hunger were even more likely to be reported as being in fair/poor health compared to children in food-secure households [AOR 2.31, 95% CI 1.89-2.82]. Sub-analysis showed that being in food insecure household increased the odds of fair/poor health by 2.11 times among children in households eligible for but not receiving SNAP benefit. In comparison, those children living in food insecure families who received SNAP benefits had increased odds of fair/poor health 1.52 times greater than those in food secure families—a much lower level of risk.²¹ In the Children's HealthWatch sample, receipt of SNAP has an especially powerful positive effect for children of immigrants—a group whose level of poverty and food insecurity is consistently higher than the general population. Children of immigrant parents who receive SNAP benefits are 32% less likely to be in

poor health than children of immigrant parents whose families do not receive them.⁴²

Barriers to Accessing Assistance Programs Associated with Poor Household and Child Outcomes

Although SNAP is an entitlement program, there are families who may be eligible for SNAP but do not receive the benefit due to access barriers. Barriers to SNAP participation reported by Children's HealthWatch families included not having information about the program, being too young to be head of household for SNAP benefits, having concerns about the bureaucratic hassle of applying for SNAP, administrative issues like missing deadlines, and immigration concerns. Those families who were eligible for but did not receive SNAP because of one or more of these access barriers were found to have a greater likelihood of experiencing food insecurity at the household and child levels, experiencing housing insecurity, and needing to make trade-offs between medical care and basic needs like paying for rent, utilities, or food.⁴³ Children were not the only ones who felt the ill effects of barriers to the program. Female caregivers in families who experienced access barriers to SNAP were more likely to report having depressive symptoms.

Even when a family receives SNAP, the maximum level of benefits is rarely enough to purchase sufficient healthful food each month. The maximum SNAP benefit is calculated on the basis of the cost of the Thrifty Food Plan, established by USDA scientists as a nutritionally adequate diet at the lowest possible cost.⁴⁴ The 2008 report, *Coming Up Short: High Food Costs Outstrip Food Stamp Benefits*⁴⁵ (based on a pilot study in Boston⁴⁶), examined the accessibility and affordability of food items on the Thrifty Food Plan shopping list and more healthy food items in corner stores, medium-sized stores, and supermarkets in Boston and Philadelphia. In November 2011, the study was updated with data from Philadelphia in a report entitled *The Real Cost of a Healthy Diet: 2011*.⁴⁷ In all versions of this study and at both sites, we found that the maximum SNAP allotment for a family of 4 was not sufficient to purchase the items on the Thrifty Food Plan^{vi} market basket shopping list in any size store.

Unlike SNAP, WIC is not an entitlement program. WIC serves 53% of all babies born in the US. Despite the program's wide reach among infants and health and development benefits for young children, nationally only 57% of all eligible children and women received WIC from 1994 to 2003.⁴⁸ A number of studies⁴⁹⁻⁵¹ have demonstrated the positive effect of

^{vi} Details of the USDA "Thrifty Food Plan" and other food plans are available at www.cnpp.usda.gov/usdafoodplanscostoffood.htm.

WIC participation during pregnancy on infant outcomes. Less is known about postnatal participation. Children's HealthWatch found that receipt of WIC for children under 3 is associated with a greater likelihood of the children being in good health, being food secure, and having a healthy weight and height for their age compared to peers who were eligible for but did not receive WIC due to access barriers. In addition, receipt of WIC was associated with decreased risk of developmental delay among children under the age of 3 when compared to children whose mothers reported access barriers to WIC. Mothers in the Children's HealthWatch sample reported that the most common barriers were limited WIC office hours, problems with transportation, difficulty getting to the WIC office to pick up vouchers, and the lack of a permanent address.⁵²

Housing Insecurity:

Child Health Outcomes and Housing Subsidy Programs

The work of Children's HealthWatch is often guided by the experience of our clinicians. Our pediatricians heard over and over from patient families in clinic that housing stability was having a direct impact on their young children. Thus, evaluation of "housing security" was introduced into the Children's HealthWatch survey. There is no simple, widely used federal definition of "housing instability" or "housing insecurity." The US Department of Health and Human Services defines "housing insecurity" as "high housing costs in proportion to income, poor housing quality, unstable neighborhoods, overcrowding, or homelessness." Children's HealthWatch, however, operationalizes the concept as 3 conditions short of outright homelessness: crowded, doubled up, and multiple moves in the past year.⁵³ A relatively small proportion of the Children's HealthWatch sample (approximately 5%) report that they are homeless or do not have a steady place to sleep at night. However, almost half fit the more inclusive term of "housing insecurity." Of an overall sample of non-homeless eligible caregiver-child dyads (n=22,069), 46% experienced "housing insecurity." Within the definition of housing insecurity, we define 2 groups: crowding (more than 2 people per bedroom) or doubling up (living temporarily with other families because of economic difficulties), referred to collectively as "crowding," and multiple moves (2 or more moves in past year). In this cohort, 9% of families with secure housing reported household food insecurity, compared to 12% of overcrowded families and 16% of those with multiple moves. After considering multiple potential confounding characteristics, children living in overcrowded housing were more likely than housing secure children to experience household and child food insecurity; those in households that had multiple moves had increased

risks of household and child food insecurity as well as fair/poor child health and developmental delays. While neither household nor child food insecurity alone predicted poor anthropometric outcomes in previous studies, in these analyses multiple moves were associated with lower weight for age z scores [AOR= -0.082 vs. -0.013, p=.02].⁵³ Children living with both housing and food insecurity face a dual threat to their health and development.

Children's HealthWatch has begun to explore, but not yet published in peer-reviewed journals, an alternate indicator of housing stress not covered by the housing insecurity definition delineated above. Compared to families who have not reported problems paying the rent or mortgage on time in the last year, families who were behind on rent or mortgage more frequently experienced food and/or energy insecurity and made more trade-offs between housing, utilities, food, or other expenses to pay medical bills.

Children's HealthWatch twice evaluated the impact of subsidized housing as a treatment for the adverse health effects associated with housing insecurity. Housing subsidies limit the amount paid by families for rent to 30% of their income with the remainder made up by the subsidy. *Subsidized Housing and Children's Nutritional Status*,⁵⁴ published in June 2005, examined the relationship between food security and child health among children living in subsidized housing compared to children in families renting apartments at market rates, but whose eligibility for subsidized housing was indicated by their acceptance onto a waiting list for such housing. Children living in families on the wait list for subsidized housing had lower weight-for-age scores than children living in subsidized housing. More recently, *Rx for Hunger: Affordable Housing*⁵⁵ focused on solutions to the findings that children living in subsidized housing were more likely to be food secure and less likely to be seriously underweight (<5th percentile weight-for-age according to Centers for Disease Control/National Center for Health Statistics growth criteria) than children whose families were on the wait list for subsidized housing.

Energy Insecurity:

Child Health Outcomes and Energy Assistance Programs

Proper heating or cooling in a child's environment is particularly important to the youngest children whose high surface area to mass ratio creates poor thermoregulation abilities and thus makes them extraordinarily vulnerable to extreme heat and cold. Such young children may not be able to express verbally when they are hot or cold. A Boston study, which was a precursor to Children's HealthWatch, reported a lower weight-for-age in

children seeking emergency hospital care within 3 months following the coldest month of the year than all children seeking care the rest of the year.⁵⁶ Contributing to these physiological processes is the “heat or eat” dilemma—a - quandary well known to families and their physicians in resource-poor areas. Low-income families must often decide between paying to heat their home during the winter or buying food for their family. Even if heat is not the particular issue, other utilities may be—affecting refrigeration for food, electricity to plug in a nebulizer for an asthmatic child, or a phone line to receive calls about job interviews. If a family must choose between keeping a warm house and lights on or eating a nutritious meal, sometimes nutrition suffers.

To measure this phenomenon, the Children’s HealthWatch research team empirically developed and published a research indicator for household energy security defined as a household experiencing at least 1 of the following conditions within the previous year: moderate energy insecurity (a threatened utility shut-off or refusal to deliver heating fuel) and severe energy insecurity (an actual utility shut-off or refused delivery of heating fuel, an unheated or uncooled day because of the inability to pay utility bills, or the use of a cooking stove as a source of heat). Findings showed that household energy insecurity strongly correlated with household and child food insecurity, with the relationship intensifying with the severity of the energy insecurity. Those in households with severe energy insecurity had odds of household food insecurity 3 times as great as those in energy secure households [AOR=3.06 95% CI: 2.46–3.81]. Even moderate energy insecurity (threatened but not actually shut-off) was associated with greater odds of household food insecurity, child food insecurity, child fair/poor health, and hospitalization since birth.⁵⁷

Children’s HealthWatch also assessed the potential policy “treatment” for energy insecurity—the federal program, LIHEAP—which assists households with home energy expenses. In the 2006 article, “Heat or Eat: The Low Income Home Energy Assistance Program and Nutritional and Health Risks Among Children Less Than 3 Years of Age,”⁵⁸ researchers looked at the growth measurements and health of children living in families receiving and not receiving LIHEAP. Covariate adjusted analyses indicated fewer children living in households receiving energy assistance were underweight (p-value=.01) or were admitted from the emergency room visit compared to those living in similar households not receiving energy assistance [AOR=1.32; 95% CI=1.00–1.74]. However, there was no increase in overweight among children in households receiving versus not receiving energy assistance. More recent findings

have shown that families who received energy assistance were also 14% more likely to be housing secure than those without assistance from LIHEAP.⁵⁹

Receipt or Loss of Benefits and Impact on Food Insecurity and Children's Outcomes

SNAP and WIC are not the only programs that modulate the odds of experiencing food insecurity or the effects of food insecurity. A report prepared by Children's HealthWatch for the Joint Center on Political and Economic Studies in 2006, *The Impact of Food Insecurity on the Development of Young Low-Income Black and Latino Children*⁶⁰, indicated that TANF, WIC, subsidized housing, SNAP, and energy assistance mitigated the effect of food insecurity on the health and growth of low-income black children. Similarly, low-income Latino children whose families received TANF, WIC, subsidized housing, or SNAP were more likely to be food secure than their low-income peers who did not receive these benefits. WIC receipt, in particular, was linked to healthy weight- and height-for-age in both black and Latino children.⁶⁰ Conversely, for black children, reductions in TANF left children 56% more likely to be food insecure while sanctions made them 78% more likely to be food insecure, when compared to black children in families that had not had benefits reduced or sanctioned. Similar results in benefit reduction or sanctions were seen in SNAP; for black children in families with a reduction in benefits, infants and toddlers were 33% more likely to be food insecure, while those children in families with sanctioned benefits were 84% more likely to be food insecure. For Latino children, the effects were more severe. Latino children whose caregivers experienced sanctions in SNAP or reductions in TANF were twice as likely to be food insecure than Latino children who did not experience such changes to household benefits. Latino children whose family TANF benefit was sanctioned were 63% more likely to be food insecure.

The loss of governmental program benefits, whether due to sanctions or to losing eligibility because of higher incomes, can also be associated with increased levels of child food insecurity and, in turn, poor child health outcomes. Young children whose families lost SNAP or TANF benefits because their incomes increased above the maximum level of income eligibility more frequently experienced food insecurity than those who remained on SNAP or TANF. The phenomenon of being worse off after marginally gaining income but losing benefits is called the "cliff effect." In the September 2010 Policy Action Brief *Earning More, Receiving Less: Loss of Benefits and Child Hunger*,⁶¹ Children's

HealthWatch reported that, within the Children's HealthWatch sample, the rate of child food insecurity among those currently receiving SNAP was 6.9%, while among families that had lost SNAP benefits due to an increase in income, the rate was 8.9%. Similarly, those who lost TANF benefits due to an increase in income had higher rates of child food insecurity than those currently receiving benefits.

Cumulative Material Hardships

Growing out of the understanding that material hardships are interrelated, the Cumulative Hardship Index (see graphic) was developed by the Children's HealthWatch research group, along with an analogous composite indicator of child wellness. The 3 included hardships are food, housing, and energy insecurity. The index was developed by examining a subset of our larger sample (7,141 participants at the 5 active study sites between July 2004 and December 2007).⁴ The composite indicator of child wellness synthesizes measures of growth, health, and developmental risk. Findings were replicated in a yet unpublished analysis of a Children's Healthwatch Cohort recruited after 2007.

A "well child" was defined by caregiver report and medical record review as:

- Good to excellent health
- No hospitalizations since birth
- Not identified as developmentally "at risk" on the PEDS
- Weight-for-age > 5th percentile < 95th percentile
- Weight-for-height > 10th percentile < 95th percentile
- BMI < 85th percentile for children > 24 months of age

Children's HealthWatch concluded, "increasing levels of a composite measure of remediable adverse material conditions correlated with decreasing adjusted odds of wellness among young US children."⁴ In other words, children who experience more than 1 of these hardships suffer greater health and developmental risks than children who

Calculating a Family Hardship Score

Step 1: Families are assigned a score of 0, 1 or 2 for each component (food, energy and housing insecurity) depending on how they respond to a set of questions. They receive a score of 0 if they do not experience insecurity for that component, a score of 1 if they experience moderate insecurity for that component and a score of 2 if they experience it at a severe level.

Step 2: Their scores are summed across the three components to arrive at a total hardship score. A family's level of hardship is then characterized by their total score.

A total score of 0 No Hardship
A total score of 1-3 Moderate Hardship
A total score of 4-6 Severe Hardship

Example: A family could be moderately food insecure (score = 1), severely housing insecure (score = 2) and moderately energy insecure (score = 1) for a total score of 4. This score would place them in the Severe Hardship category.

experience only 1 hardship. After this work was published,⁴ findings were presented in the report *Healthy Families in Hard Times: Solutions for Multiple Family Hardships*⁶² to make these results accessible to and useful for policy and advocacy audiences.

We turn now from summarizing various print methods of dissemination of Children's HealthWatch findings (peer-reviewed journal articles for other scientists and reports and briefs for advocates, policy makers, and the general public) to an example of how the work can be synthesized with clinical anecdote and used in the setting of policy formation from legislative hearings to assessment of the effects of a policy change.

Evidence-Based Congressional Testimony from Children's HealthWatch, Example July 2008

The scientific evidence produced by Children's HealthWatch is disseminated in a wide variety of settings, including legislative hearings. In at least one instance, once a policy suggested by this research was adopted, subsequent research efforts permitted rapid evaluation of its effectiveness.

On July 23, 2008,⁶³ Congressman Joe Baca of California called to order the hearing of the House of Representatives Subcommittee on Department Operations, Oversight, Nutrition, and Forestry to review the short- and long-term costs of hunger in America. He stated:

Good morning to all of you. And thank you for being here with the Subcommittee to examine the short and long term costs of hunger and that is a very important subject now as we look at what is going on in our country. I am especially grateful to our outstanding witnesses for making the effort to be here today. I appreciate your willingness to educate us. And I state to "educate us" on the result of various studies you have conducted. And the more education we receive, the better, more knowledgeable we are in dealing with the problem.⁶⁴

Included on the panel of policy and public health experts was Dr Diana B. Cutts, a pediatrician at Hennepin County Medical Center in Minneapolis, MN, and Co-Principal Investigator for Children's HealthWatch. By representing our work, she spoke on behalf of the thousands of families who participated in this survey and informed Congress—in accessible but scientific terms—about the direct, positive impact of the nutrition assistance programs under legislative consideration on the bodies and brains of babies and toddlers in the US. Other witnesses included representatives from the Food Research and Action Center, the USDA, California Food Policy Advocates, the Harvard

University School of Public Health, and the Schneider Institutes for Health Policy at Brandeis University.

Synthesizing Children's HealthWatch findings and her personal experience as a pediatrician, Dr Cutts elucidated the relationship between food insecurity, its harmful health effects, and the protective buffer that nutrition assistance programs can provide. Dr Cutts also described the clinical manifestations of hunger. By describing the increased vulnerability to chronic illness and infection in one particular patient and citing Children's HealthWatch findings on thousands of food insecure households with young children, she illuminated for the committee how science was very real in the lives of her patients. Children's HealthWatch research findings were used to make clear this connection was not only the anecdotal experience of a single pediatrician. She stated:

Children from food insecure households are 30% more likely to be hospitalized because of their diminished reserve and vulnerability in the face of typical childhood illness. . . .these kids can't just bounce back because their immune systems are so depressed from inadequate nutrition that they often begin a cycle of weight loss and recurrent infections that then perpetuate each other.

Dr Cutts also described the personal stories of several children living in food insecure households, some of whom have conditions illustrated in Children's HealthWatch publications, including anemia and developmental delays. Dr Cutts described how household hardships compound medical problems as she told the story of the family of a recently hospitalized 5-year-old asthmatic child who could not afford the child's medications because they needed to pay for food, utilities, and rent. After connecting the dots between policy and child health for the committee, Dr Cutts suggested a practical application of Children's HealthWatch's findings through federal policy. She stated:

Do all of my patients' ills stem from food insecurity? Of course not. But, my reality is that for more than a third of them, food insecurity is a constant companion to their health, directly and indirectly influencing it in both immediate and distant ways. . . . But my reach as their doctor is typically one child, one family at a time. Your reach spans the country and I urge you to think of our time together in clinic and boldly work to create programs and policies that promote healthy and bright futures for all children. For example, I know that Congress is considering another economic stimulus package; I encourage you to make a temporarily increased food stamp benefit part of the package, as it would do so much to directly help the children I've just told you about. . . . Other programs that assist low-income families with basic needs that compete with the food budget, such as housing, energy, and childcare assistance, are equally vital, particularly in our current economic climate of rising food and energy prices.

Although the Children's HealthWatch dataset has many strengths, there are certainly limitations. Interviewers are trained to be as professional as possible, properly describe consent procedures, assure the participant of confidentiality, and administer the survey to each participant equally and without bias. However, it is possible that a participant may respond to the survey differently because he or she is in a clinical setting. As with any study, there are also eligible individuals who choose not to participate for their own reasons and other individuals who are not eligible for the study as previously described. Accurate income data other than that based on broad categories of eligibility for public health insurance and other public benefits is difficult to elicit; as a result, the child's insurance status is typically used as a proxy for low-income in Children's HealthWatch analyses (private insurance is used as an exclusion criteria for the analytic dataset).

As with any cross-sectional study design, one cannot determine causal relationships from the findings in any of the studies mentioned. At this time, the Children's HealthWatch sample is not representative of rural populations and no longer collects data from institutions in the western parts of the country. As in many sentinel systems designed for timeliness and early identification of trends, the survey assesses families in emergency departments and hospital-based clinics serving predominantly lower income populations.⁶⁶ Therefore, the children represent a group at elevated risk for negative health outcomes and/or developmental risk rather than a random sample of all children in the US. Because the research group is primarily comprised of health professionals rather than economists, the statistical techniques used are derived from public health practice rather than those more commonly used by economists who study hardship and public assistance programs.⁵

Key Points and Children's HealthWatch Recommendations for Policy Action

The body of work by Children's HealthWatch underscores the importance of food security in ensuring healthy growth and development for young children. Funding of SNAP and discretionary programs, like WIC and housing subsidies, targeted to poor families is currently politically contentious. Children's HealthWatch often tries to reframe the discussion by pointing out that the programs should not be viewed as ideological footballs but as effective methods of health promotion; whether or not a family receives assistance from these programs can be the determining factor in a child's overall health and development. While there are other

findings not presented here due to space considerations, the research summarized in this paper provides evidence-based support for:

- Maximized and sustained funding for programs like SNAP, WIC, TANF, LIHEAP, and housing subsidy programs.
- Maintenance of program structure for SNAP and other key entitlement programs. Changes to the fundamental structure of these programs would remove their ability to expand in tough economic times and would leave many eligible people without benefits when they need them most.
- Re-evaluation of the use of the Thrifty Food Plan as the basis for SNAP benefit calculations in order to better gauge the true cost of purchasing foods that form a healthy diet; the Low Cost Food Plan is a more realistic reflection of costs in urban communities. This will likely result in an increase in SNAP benefits.
- Reduction or elimination of barriers to key public assistance programs for those who are eligible and want to apply, including legal permanent residents.
- Careful consideration of the impacts of legislation dealing with greenhouse gas emissions and global climate disruption to ensure energy price increases do not fall disproportionately on low-income families.

Discussion

Children's HealthWatch provides one model of how the clinical and research expertise of pediatric health professionals can be utilized, as the American Academy of Pediatrics urges, to "stand up, speak up, and step up for children."⁶⁷ Other leading researchers focus on school-age children, adolescents, and children with special needs and employ a variety of methodologies to assess hardship.⁸⁻¹¹ The pediatric surveillance model is different from those of equally important efforts from other disciplines. Although open to criticism from an econometric perspective, such a model leverages the credibility of pediatricians to gain the attention of policy makers and the public for the youngest, poorest, and most invisible Americans—our young children.

For such children, early deprivation of basic needs may result in poor health and developmental delays that may or may not be remediated later in life. These children struggle in the classroom and, as a result, may incur long-term costs for school and health care systems and later difficulties participating in a competitive global workforce. As we illustrated with the example of Dr Cutts's 2008 testimony before Congress, 2009 increase in SNAP benefit, and our recent 2011 Policy Action Brief linking

the increase to positive child health outcomes, good science makes good policy when shared effectively. Scientists can generate credible evidence for other scientists. The challenge is to translate the findings into useful formats for advocates, funders, and policy makers so that accurate information is disseminated, effective policy is proposed, resources are focused, and decision makers understand the impact of their choices based on data rather than ideology. With empirically sound evidence, advocates can bring their concerns to policy makers and educate them about programs that have been shown to decrease America's families' material hardships and suggest budget priorities that might best allocate critical resources to key assistance programs. Working alone, no group will solve children's poverty and multiple hardships. However, working collaboratively each group has a role to play in protecting the health and well-being of young children and their families.

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