Food Insufficiency and Children's Health Status in the United States: Findings From NHANES III[1]

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This study investigates the association between food insufficiency, poverty, and proxy-reported health status for U.S. school-age children, 6 to 11 years of age. A conceptual model was developed to describe the relationships between poverty, food insufficiency, and other factors to children's health status. Using this model, data were analyzed from the Third National Health and Nutrition Examination Survey (NHANES III), a cross-sectional representative sample of the civilian non-institutionalized U.S. population living in households. Children were classified as food insufficient if a family respondent reported that their family sometimes or often did not get enough food to eat. Health status was coded as an ordinal variable ranging from excellent health to fair or poor health. Ordinal logistic regression was conducted with health status as the outcome variable. Odds ratios for food insufficiency are reported controlling for poverty status, other demographic variables, and other variables potentially related to children's health. The prevalence of fair or poor health was 13.8 percent (standard error: 2.3) for children living in food-insufficient families versus 3.4 percent (standard error: 0.5) for children living in food-sufficient families. Controlling for potential confounders including poverty status, food-insufficient children were significantly more likely to have poorer health than food-sufficient children (odds ratio: 1.60; 95 percent confidence interval: 1.04, 2.46). Food insufficiency is a health concern for U.S. school-age children. Children who live in families that do not get enough food to eat are more likely to have poorer health status than food-sufficient children.

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Introduction

Although a wealthy nation, the United States is not immune to poverty and hunger. In 1994, 38 million Americans lived in poverty, the majority of whom were children (U.S. Bureau of the Census, 1996). Over 20 percent of children were poor, and in 1995, more than 9 million children under the age of 18 lived in food-insecure households—households where there is "limited or uncertain availability of nutritionally adequate or safe foods" (U.S. Department of Agriculture, 1997).

The poverty rate for children in the United States has not always been as high as one in four. From 1970 to 1993, children's poverty increased more than 50 percent and welfare reform has increased the vulnerability of low-income groups to negative income shocks (U.S. Department of Commerce, 1998; Crooks, 1995; Porter, 1998; and Zedlewski, 1996). The child poverty rate is dramatically higher than any other developed country around the world, the closest nations being Australia and Canada at approximately 14 percent (Rainwater and Smeeding, 1995).

But while these numbers demonstrate the magnitude of this social problem, they do not expose the real consequences of poverty and hunger for children. The relationship between poverty and adverse health outcomes in children is well-documented (Newacheck et al., 1994; Starfield, 1982; Montgomery et al., 1996; and Dutton, 1985). Hunger has long been suspected to lead to poor health in children, over and above the effects of poverty, but until recently, empirical studies to test this suspicion have been sparse. One study, the Community Childhood Hunger Identification Project, conducted from 1992-94, found that poor, hungry children were more likely than poor, but not hungry, children to suffer from health problems such as frequent colds, ear infections, anemia, asthma, and frequent headaches (Wehler, 1995).

This paper examines the relationships between poverty, family food insufficiency, and proxy-

reported health status in U.S. children, using data from the Third National Health and Nutrition Examination Survey (NHANES III). It demonstrates once again that there are health consequences to living in poverty for children, and further shows that at least a portion of these consequences are attributable to a lack of food.

Methods

NHANES III Data

Data for children ages 6 to 11 years of age (n = 3,028) were analyzed from NHANES III, a cross-sectional representative sample of the civilian non-institutionalized, non-homeless population living in households. The survey was conducted from 1988-94. Mexican Americans and black Americans were oversampled to provide reliable estimates for these groups. Detailed descriptions of the sample design and operation of the survey have been published elsewhere (National Center for Health Statistics, 1994).

NHANES III included medical examinations and interviews conducted with survey participants and proxies. For this analysis, we used data from the Household Family and Household Youth Questionnaires (proxy interviews) conducted in the home, Youth and Proxy Questionnaires conducted in the Mobile Examination Centers, and blood analysis.

Socio-Demographic and Family Characteristics

For each child in the survey, information about sex, age, race-ethnicity, health insurance status, family size, and family income, as well as employment status and education of the family head were provided by a responsible adult living in their home. The family head was a person who owned or rented the home where the child lived.

Total family income for the previous 12 months was collected in categories ranging from "less than $1,000" to "$80,000 and over," in $1,000 increments below $19,999, in $5,000 increments between $20,000 and $49,999, and in $10,000 increments between $50,000 and $79,999. A poverty index ratio (PIR) was then calculated, using the mid-point of the category and the child's family size (U.S. Department of Health and Human Services, 1995). These analyses use three income categories: low income, defined as PIR less than or equal to 130 percent of the poverty line, which is the Federal cut-off point for the Food Stamp Program; middle income (131 to 350 percent of the poverty line); and high income (greater than 350 percent of the poverty line). A child was defined as insured if she or he was covered by private health insurance, military health care insurance, or Medicaid, and if the coverage paid for more than accidents.

Controlling for language of interview is important for the analysis of proxy-reported health status. Previous research has demonstrated that due to the translation of the question, Spanish-speakers may answer this question differently than English speakers (Angel and Guarnaccia, 1989; Angel and Worobey, 1988; and Idler and Benyamini, 1997). Therefore, information on race, ethnicity, and the language used during the proxy interview were used to classify children into four race-ethnic categories: (1) all non-Hispanic white children and other children with an interview conducted in English, (2) all non-Hispanic black children, (3) Mexican American children with an interview conducted in English, and (4) Mexican American children or other children with an interview conducted in Spanish.

Location

Metropolitan and non-metropolitan areas were assessed based on the U. S. Department of Agriculture rural and urban continuum codes. Central or fringe counties of metropolitan areas of 1 million people or more were classified as metropolitan and all other areas were classified as non-metropolitan (National Center for Health Statistics, 1996).

Health Care/Environmental Risk

For all children, information was collected on whether they had a regular source of health care,

if they had ever attended a day care center or nursery school where there were six or more children before they were 4 years old, their blood lead level, their mother's age at the child's birth, the presence of birth complications, low birth weight (birth weight below 2,500 g), and if they were exposed to any smoke prenatally.

Food Insufficiency

For the purpose of the NHANES III survey, food insufficiency was defined as "an inadequate amount of food intake due to a lack of resources." A child was classified as food insufficient if the respondent to the family questionnaire reported that the family sometimes or often did not get enough food to eat. This question has undergone cognitive testing and has been shown to be valid (Alaimo, 1997; Alaimo et al., 1998; Alaimo et al., 1999; Briefel and Woteki, 1992; Findlay et al., 1994; and Carlson and Briefel, 1995), and has also been demonstrated to be associated with food expenditure and nutrient intake (Basiotis, 1992; Cristofar and Basiotis, 1992; and Rose and Oliveira, 1997).

Proxy-Reported Health Status

We chose proxy-reported health status as an indicator because it provides a general summary of children's health. Proxies for the household youth questionnaire were asked to describe the child's health as excellent, very good, good, fair, or poor. For this analysis, the categories fair and poor were combined.

Extensive study has shown self-reported health status to be valid and reliable in adult populations (Lundberg and Manderbacka, 1996), and to predict mortality and disability (Idler and Benyamini, 1997). Self-rated health has been found to form a continuum from poor to good health (Manderbacka et al., 1998), and although qualitative studies have revealed that the question is not always interpreted similarly by respondents, "this emerging body of research reaffirms that the global health status item functions largely as intended because it pulls together or summarizes the various components that make up the health status domain" (Krause and Jay, 1994, p. 940).

Research on proxy-reports for children has been much more limited, but comparisons between child health status as reported by their parent and by the child has been shown to be consistent (Theunissen et. al, 1998). One study of pre-term low-birth-weight infants showed that the mother's assessment of her infant's health status was significantly related to outpatient use and behavior problems (Scholle et al., 1995).

To confirm that proxy-reported health status correctly identified children's health status, we ran ordinal logistic regression models with health status as the outcome and selected other measures of health as the determinants. One determinant was included in each model. The results from these analyses are shown in table 1.[2] Proxy-reported health status was significantly related to almost all other health status measures, including physician-reported health status, number of colds in the past 12 months, frequency of stomach aches and head aches, iron deficiency (as measured by transferrin saturation, serum ferritin, and erythrocyte protoporphyrin according to expert panel guidelines) (Looker, 1997), blood lead levels, the presence of a persistent cough in the past 12 months, infections in the past 4 weeks, and the presence of an impairment or health problem that keeps the child from attending school. Proxy-reported health status was not related to the number of ear infections the child had experienced in their lifetime.

Conceptual Model

The conceptual model shown in figure 1 was adapted from Crooks for use with the NHANES III data (Crooks, 1995).[3] Summarizing available research, the model hypothesizes that the environment of poverty, along with certain child, location, and family factors, put children at risk for conditions that can lead to poor health, including food insufficiency and environmental

[2]Tables are at the end of this paper.

[3]Figures follow tables at the end of this paper.

or health care risk. Past health risk can also affect current health status.

Statistical Methods

Weights were created for the NHANES III data to take into account the survey cluster design, oversampling of certain groups, such as black Americans and Mexican Americans, and nonresponse. For these analyses, NHANES III weighted data were analyzed using the *svy* commands available in STATA Statistical Software (Statacorp, 1997). These commands use the weights and complex survey design to calculate point estimates and variance.

Ordinal logistic regression models were created to test the hypothesis that food insufficiency is a predictor of poorer health, independent of 17 other potential confounders. Ordinal logistic regression calculates odds ratios for outcome categories, taking into account the ordering of outcome categories. Odds ratios compare a set of categories of health status with those categories above it: fair or poor health versus good, very good, and excellent; fair or poor and good health versus very good and excellent, and fair or poor, good and very good health versus excellent. The overall odds ratio represents the likelihood that a child had a poorer health status.

Results

Socio-demographic and family characteristics of food-sufficient versus food-insufficient children are shown in table 2. Almost 83 percent of food-insufficient children lived in low-income families, compared with only 29.1 percent of food-sufficient children. As compared with food-sufficient children, food-insufficient were more likely not to be covered by health insurance (19.7 and 10.4 percent, respectively), to have been born to a mother who was younger than 18 years of age (8.9 and 5.4 percent, respectively), and to live in families where the family head did not have a high school diploma, was not married, or was unemployed. Notably, however, the family head was employed for 61 percent of food-insufficient children.

Food-insufficient children also differed from food-sufficient children in relation to some risk factors shown in figure 1. As shown in table 2, food-insufficient children were less likely to have a regular source of health care and to have attended day care before the age of 4 years, and were more likely to have had birth complications. They were not more likely to be low-birthweight or to have been exposed to prenatal smoke.

Figures 2 and 3 show the prevalence of children who were reported to have fair/poor health status for each of the poverty categories and for food-insufficient versus food-sufficient children. Overall, food-insufficient children were more than four times more likely to have fair/poor health than food-sufficient children (13.8 versus 3.4 percent). Low-income children were more likely to have fair/poor health, which was much more prevalent among the food-insufficient—14.4 versus 6.8 percent for low-income children and 9.4 versus 2.3 for middle income children.

Because food insufficiency is closely related to poverty status, ordinal logistic regression analysis was performed to determine whether food-insufficient children had poorer health status when poverty and other potential confounders are taken into account. The results are presented in table 3. Both poverty status and food insufficiency were significantly related to health status. Low-income children were 2.6 times more likely, and middle-income children were 1.7 times more likely than high-income children to have poorer health status. Controlling for other confounders, food-insufficient children were 1.6 times more likely to have poorer health status.

Discussion

Contrary to popular belief, most food-insufficient children in the United States are non-Hispanic white, live in two-parent families, have at least one parent who is working, and are not more likely to live in a metropolitan area. Food-insufficient children are more likely than food-sufficient children to live in low-income families, and to be without health insurance and a regular

source of health care. Above and beyond these social characteristics, however, this research demonstrates that food insufficiency is independently related to children's health status.

Proxy-reported health status has been used as a general assessment of children's health in other studies. Results from several National Health Interview Surveys conducted since 1978 have consistently shown a higher prevalence of fair or poor health status for poor children as compared with nonpoor children (Newacheck, 1989; Newachek et al., 1994; Starfield, 1982; and Montgomery et al., 1996). Montgomery et al. found that from 1989 to 1991, poor children were almost three times more likely to be reported in fair or poor health status, controlling for race and family structure (Montgomery et al., 1996).

The use of proxy-reported health status is not without limitations, however, particularly when assessing its relationship to another proxy-reported variable, such as food insufficiency. For each child in the NHANES III survey, health status and food insufficiency were assessed by the same proxy, often the mother. It is possible that part or all of the association found was due to a tendency of the proxy to over-report bad outcomes. Confidence in the use of proxy-reported health status is strengthened, however, by its association with child health indicators from other sources, as shown in table 1.

Testing of the child health model shown in figure 1 is hindered by other limitations in the NHANES III data. In the regression analyses, we were unable to include other important characteristics found to be related to children's health status such as poverty status at earlier stages of the child's life, or quality of health care received. In addition, because the data are cross-sectional, it is impossible to determine if the relationship found between food insufficiency and health is causal or even if the relationship exists because children's poor health status (by necessitating high expenditures on health care) contributes to their families' inability to acquire adequate food (reverse causality). However, cross-sectional studies are important for the determination of associations when experimental designs are not possible and longitudinal studies are not available.

Demonstration of an association between food insufficiency and children's poor health status, regardless of the causal direction, once again highlights the harmful risks that poor American children face. A wise society nurtures and protects its future generations. Ensuring that all American children are adequately fed is an action that should be taken to improve the health of our Nation's children.

References

Alaimo, K. "Food Insecurity, Hunger, and Food Insufficiency in the United States: Cognitive Testing of Questionnaire Items and Prevalence Estimates From the Third National Health and Nutrition Examination Survey." Thesis. Cornell University, Ithaca, NY. 1997.

Alaimo, K., R.R. Briefel, E.A. Frongillo, and C.M. Olson. "Food Insufficiency Exists in the United States: Results From the Third National Health and Nutrition Examination Survey (NHANES III)," *American Journal of Public Health*. Vol. 88. pp. 419-426. 1998.

Alaimo, K., C.M. Olson, and E.A. Frongillo, Jr. "Importance of Cognitive Testing For Survey Items: An Example From Food Security Questionnaires," *Journal of Nutrition Education*. Vol. 31, No. 5. pp. 269-275.

Angel, R., and P.J. Guarnaccia. "Mind, Body, and Culture: Somatization Among Hispanics," *Social Science and Medicine*. Vol. 28, No. 12. pp. 1,229-1,238. 1989.

Angel, R., and J.L. Worobey. "Acculturation and Maternal Reports of Children's Health: Evidence from the Hispanic Health and Nutrition Examination Survey," *Social Science Quarterly*. Vol. 69. pp. 707-721. 1988.

Basiotis, P.P. "Validity of the Self-Reported Food Sufficiency Status Item in the U.S. Department of Agriculture Food Consumption

Surveys." Proceedings, 1992 Annual Meeting of the American Council in the Consumer Interest. March 25-28, 1992.

Briefel, R.R., and C.E. Woteki. "Development of the Food Sufficiency Questions for the Third National Health and Nutrition Examination Survey," *Journal of Nutrition Education*. Vol. 24., pp. 24S-28S. 1992.

Carlson, S., and R.R. Briefel. *The USDA and NHANES Food Sufficiency Question as an Indicator of Hunger and Food Insecurity*. Conference on Food Security Measurement and Research: Papers and Proceedings. U.S. Department of Agriculture, Food and Consumer Service (currently Food and Nutrition Service). Alexandria, VA. 1995.

Cristofar, S.P., and P.P. Basiotis. "Dietary Intakes and Selected Characteristics of Women Ages 19-50 Years and Their Children Ages 1-5 Years By Reported Perception of Food Sufficiency," *Journal of Nutrition Education*. Vol. 24, pp. 53-58. 1992.

Crooks, D.L. *American Children at Risk: Poverty and its Consequences for Children's Health, Growth, and School Achievement, Yearbook of Physical Anthropology*. Vol. 38, pp. 57-86. 1995.

Dutton, D.B. "Socioeconomic Status and Children's Health," *Medical Care*. Vol. 23, pp. 142-156. 1985.

Egbuonu, L., and B. Starfield. "Child Health and Social Status," *Pediatrics*. Vol. 69, pp. 550-557. 1982.

Findlay, J., B. Greene, C. Petty-Martin, A. Ostchega, and G. Pinder. *NHANES III Interviewer Debriefing*. Bethesda, MD: National Center for Health Statistics. October 19-20, 1994.

Idler, E.L., and Y. Benyamini. "Self-Rated Health and Mortality: A Review of Twenty-Seven Community Studies," *Journal of Health and Social Behavior*. Vol. 38, pp. 21-37. 1997.

Krause, N.M., and G.M. Jay. "What Do Global Self-Rated Health Items Measure?" *Medical Care*. Vol. 32. pp. 930-942. 1994.

Looker, A.C., P.R. Dallman, M.D. Carroll, et al. "Prevalence of Iron Deficiency in the United States," *Journal of the American Medical Association*. Vol. 277, No. 12. pp. 973-976. 1997.

Lundberg, O., and K. Manderbacka. "Assessing Reliability of a Measure of Self-Rated Health," *Scandinavian Journal of Social Medicine*. Vol. 3, pp. 218-224. 1996.

Manderbacka, K., E. Lahelma, and P. Martikainen. "Examining the Continuity of Self-Rated Health," *International Journal of Epidemiology*. Vol. 27. pp. 208-213. 1998.

Montgomery, L.E., J.L. Kiely, and G. Pappas. "The Effects of Poverty, Race, and Family Structure on U.S. Children's Health: Data From the NHIS, 1978 Through 1980 and 1989 Through 1991," *American Journal of Public Health*. Vol. 86. pp. 1,401-1,405. 1996.

National Center for Health Statistics. *NHANES III Household Youth Data File Documentation*. Catalogue No. 77550. December 1996.

National Center for Health Statistics. "Plan and Operation of the Third National Health and Nutrition Examination Survey, 1988-1994," *Vital Health Statistics*. Vol. 1, No. 32. July 1994.

Newacheck, P.W. "Improving Access to Health Services for Adolescents From Economically Disadvantaged Families," *Pediatrics*. Vol. 84. pp. 1,056-1,063. 1989.

Newacheck, P.W., W.J. Jameson, and N. Halfon. "Health Status and Income: The Impact of Poverty on Child Health," *Journal of School Health*. Vol. 64, No. 6. pp. 229-233. 1994.

Porter, K. "Improvements in Poverty and Income in 1995 Tempered By Troubling Long-Term Trends," *International Journal of Health Services*. Vol. 28, No. 1. pp. 1-12. 1998.

Rainwater, L., and T.M. Smeeding. "Doing Poorly: The Real Income of American Children in Comparative Perspective." Unpublished manuscript. Luxemburg Income Study. August 1995.

Rose, D., and V. Oliveira. "Nutrient Intakes of Individuals From Food-Insufficient Households in the United States," *American Journal of Public Health*. Vol. 87, pp. 1,956-1,961. 1997.

Scholle, S.H., L. Whiteside, K. Kelleher, et al. "Health Status of Preterm Low-Birth-Weight Infants," *Archives of Pediatric and Adolescent Medicine*. Vol. 149, pp. 1,351-1,357. 1995.

Starfield, B. "Family Income, Ill Health, and Medical Care in U.S. Children," *Journal of Public Health Policy*. Vol. 3, No. 3, pp. 244-259. September 1982.

Starfield, B. "Childhood Morbidity: Comparisons, Clusters, and Trends," *Pediatrics*. Vol. 88, pp. 519-526. 1991.

Statacorp. Stata Statistical Software: Release 5.0. College Station, TX: Stata Corporation. 1997.

Theunissen, N.C.M, T.G.C. Vogels, H.M. Koopman et al. "The Proxy Problem: Child Report Versus Parent Report in Health-Related Quality of Life Research," *Quality of Life Research*. Vol. 7, pp. 387-397. 1998.

U.S. Bureau of the Census. *Income, Poverty, and Valuation of Non-Cash Benefits, 1994*. Series P-60. No. 189. April 1996.

U.S. Department of Agriculture. *Household Food Security in the United States in 1995: Summary Report of the Food Security Measurement Project*. Abt Associates, Inc. September 1997.

U.S. Department of Commerce, Bureau of the Census. *1988 and 1997, Statistical Abstract of the United States: 1988 and 1997*. (108th and 117th eds.) as cited in "Federal Statistics: Children and Family Composition," *Family Economics and Nutrition Review*. Vol. 11, No. 3, pp. 74-75. 1998.

U.S. Department of Health and Human Services. "Poverty Income Guidelines; Annual Revision," *Federal Register*. Vol. 60, No. 27, pp. 7,772-7,774. 1995.

Vogels, T., G.H.W. Verrips, S.P. Verloove-Vanhorick et al. "Measuring Health-Related Quality of Life in Children: The Development of the TACQOL Parent Form," *Quality of Life Research*. Vol. 7, pp. 457-465. 1998.

Wehler, C.A., R.I. Scott, and J.J. Anderson. *Community Childhood Hunger Identification Project.* Washington, DC: Food Research and Action Center. July 1995.

Zedlewski, S. et al. *Potential Effects of Congressional Welfare Reform Legislation On Family Incomes*. Urban Institute, Washington, DC. July 26, 1996.

Table 1—Proxy-reported health status: Associations with other health indicators

Variable	Coefficient	P-value
Physician-reported health status	0.19	0.05
Colds	-.13	.01
Stomach aches	-.25	0
Headaches	-.21	.01
Ear infections	.03	.40
Problem cough	-.66	0
Iron deficiency	-.62	0
Blood lead level	-.12	0
Infections	-.31	.01
School-restricting impairment	-3.27	.08

Source: NHANES III, 1988-94, children ages 6-11 years.

Table 2—Socio-demographic characteristics, health, and environmental risk factors of children, by food sufficiency status

Item	Food-sufficient children		Food-insufficient children	
	Percent (standard error)			
Poverty index ratio:				
<130	29.1	(2.1)	82.9	(6.0)
130 - 350	49.5	(2.1)	17.1	(6.0)
>350	21.4	(1.8)	0	(0)
No health insurance	10.4	(.01)	19.7	(4.6)
Race-ethnicity:				
Non-Hispanic white	75.4	(1.7)	42.2	(7.7)
Non-Hispanic black	14.9	(1.3)	26.5	(5.2)
Mexican American, English	4.6	(.6)	11.8	(2.9)
Mexican American, Spanish	5.1	(1.0)	19.4	(4.1)
Mean age	8.5	(.1)	8.5	(.1)
Gender:				
Female	48.7	(1.3)	49.3	(4.5)
Male	51.3	(1.3)	50.7	(4.5)
Metropolitan area	48.5	(5.3)	39.3	(6.9)
Age of mother at child's birth:				
<=18 years	5.4	(.6)	8.9	(2.3)
Family head education:				
< High school	21.1	(1.5)	57.3	(6.3)
High school graduate	34.9	(1.9)	35.3	(6.6)
> High school	43.9	(2.0)	7.3	(2.6)
Family head marital status:				
Not married	20.1	(1.6)	42.3	(5.6)
Family head employed	82.7	(1.6)	61.2	(6.1)
Mean family size	4.6	(.05)	5.2	(.2)
Regular source of health care	91.8	(.9)	84.6	(3.7)
Birth complications	11.4	(1.0)	17.9	(3.0)
Prenatal smoke exposure	24.5	(1.8)	24.6	(5.3)
Day care before age 4 years	51.5	(1.8)	34.2	(3.5)
Low birth weight	5.9	(.6)	5.7	(1.4)

Source: NHANES III, 1988-94, children ages 6-11 years.

Table 3—Relationship of proxy-reported health status to socio-demograhic characteristics and risk factors in children

Item	Odds ratio	95% CI
Poverty index ratio:		
<130	2.61	(1.67, 4.14)
130 - 350	1.72	(1.51, 1.99)
No health insurance	1.34	(.87, 2.05)
Race-ethnicity:		
Non-Hispanic black	1.51	(.99, 2.31)
Mexican American, English	1.55	(1.00, 2.42)
Mexican American, Spanish	4.52	(2.92, 6.98)
Age	1.03	(.95, 1.11)
Male	1.03	(.75, 1.26)
Metropolitan area	1.04	(.76, 1.43)
Age of mother at child's birth <18y	.70	(.45, 1.11)
Family head education:		
< High school	1.87	(1.31, 2.67)
High school graduate	1.42	(.98, 2.05)
Single parent	1.11	(.82, 1.51)
Family size	1.02	(.92, 1.12)
Family head unemployed	.67	(.48, .95)
No regular source of health care	1.27	(.81, 1.99)
Blood lead level (mg/dl)	1.04	(.97, 1.11)
Birth complications	1.40	(.87, 2.25)
Prenatal smoke exposure	1.41	(.97, 2.05)
No day care before 4 years	1.61	(.83, 2.17)
Low birth weight	1.37	(.81, 2.32)
Food insufficient	1.60	(1.04, .46)

CI = confidence interval.
Note: Odds ratios are adjusted for all other variables for which odds ratios are reported.

Source: NHANES III, 1988-94, children ages 6-11 years (n = 2,274).

Figure 1
Child health model

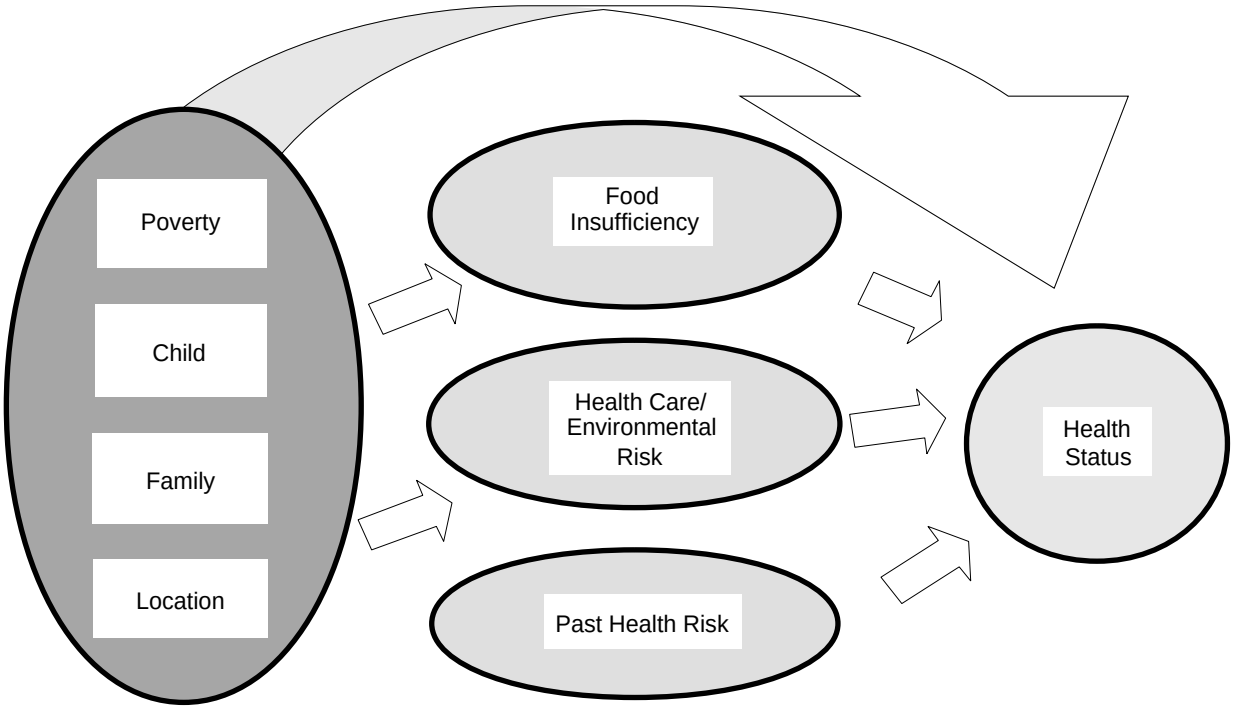
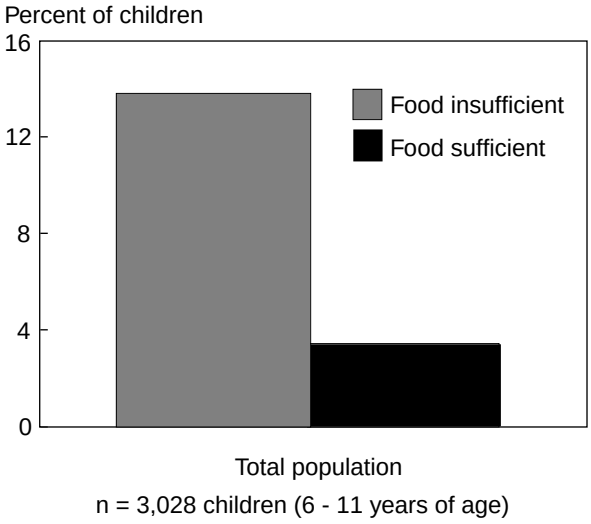


Figure 2

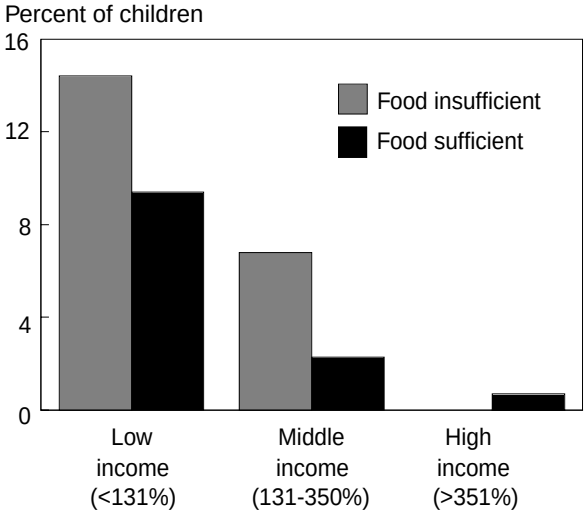
Prevalence of fair or poor health status by food sufficiency status: NHANES III



n = 3,028 children (6 - 11 years of age)

Figure 3

Prevalence of fair or poor health status by income and food sufficiency status: NHANES III



n = 3,028 children (6 - 11 years of age)