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Impact of Poverty and Household Food Security on the Use of Preventive Medical Services in the California Health Interview Survey

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Appendix I: Harrison, DiSogra, Manalo-LeClair, Aguayo, Yen. *Over 2.2 Million Low-Income California Adults are Food Insecure; 658,000 Suffer Hunger*. UCLA Health Policy Brief, November 2002.

Appendix II: Multivariate Prediction Models

Introduction and Background

Household Food Insecurity: History and Measurement in the US

The concept of food security originated in the international development literature of the 1970s, and was originally utilized on an aggregate (country or regional) level to refer to the ability of a sociopolitical entity to produce or import sufficient food supply to maintain its population. The term “hunger” has long been used by human rights and public health advocacy groups to refer to inadequate access to food at the individual or household level, but has been variably and usually ill-defined. Beginning in the 1980s, there began to be serious attention paid to the measurement of hunger in the North American context, through two lines of work. The Community Childhood Hunger Identification Project (CCHIP), an advocacy effort, conducted surveys in several states in which direct interview questions about experiences and coping strategies among mothers of young children resulted in some validation of constructs about management strategies in dealing with lack of adequate access to food. At the same time a group centered at Cornell, beginning with Radimer’s dissertation, undertook systematic formative work to explore the “managed process” of hunger – detailed qualitative work undertaken exclusively in the Northeast, focusing on the psychological and experiential precursors to hunger, a domain that has since been labeled “food insecurity.”

In 1990, two events occurred that resulted in moving forward rapidly in the area of measurement of household food insecurity. One was the LSRO/FASEB consensus panel that articulated an operational definition of the concept of food insecurity as *lack of continuous, secure access at all times to a diet adequate to support healthy life and 1) the ready availability of nutritionally adequate and safe foods and 2) the assured ability to acquire personally acceptable foods in socially acceptable ways* (Hamilton 1997). The second was the passage of the National Nutrition Monitoring and Related Research Act of 1990, which mandated that USDA and DHHS develop and validate an appropriate instrument for the epidemiologic measurement and monitoring of the prevalence of food insecurity in the US population.

The United States Food Security Instrument, developed in the early 1990s and used since 1995 to monitor prevalence through the Current Population Survey, consists of 18 questions that deal with various aspects of household food insecurity. The questions represent a range of food insecurity conditions, beginning with questions on the inadequacy of food supplies and money available for food. Worry and concern about having adequate amounts of food are also included in the beginning of the scale. As participants respond to the questionnaire they move to questions that indicate reduced food intake for adults and finally for children (Cohen et al., 1999). The behaviors that the questions refer to generally occur in an ordered sequence as the severity of food insecurity increases. Adults in the household typically worry about having enough food, then stretch household resources and juggle other necessities such as utility bills or rent. They then tend to decrease the quality and variety of household members’ diets, and then decrease the frequency and quantity of adults’ food intake. Finally, a decrease in the frequency and quantity of children’s food intake occurs (Nord, Jemison and Bickel, 1999,

Hamilton et al., 1997). The concept is to be distinguished from *food insufficiency*, a less conservative measure that was used in numerous national surveys prior to the development of the current instrument.

Cutoff points for the US Food Security Survey Instrument have been determined that place respondents into one of four categories:

Food Secure: Households show no or minimal evidence of food insecurity.

Food Insecurity with No Hunger Evident: Food Insecurity is evident in household concern about adequacy of household supply and the adjustments made by the household in managing their supplies, including reducing the quality of food and an increase in unusual coping patterns. There is little or no reduction in household member's intake.

Food Insecurity with Hunger Evident: Adults in the household have reduced their food intake to an extent that implies that they have repeated experiences with the physical sensation of hunger.

Food Insecurity with Severe Hunger Evident: For Households with children, this level implies that the children's food intake has been to an extent that implies that the children have repeated experiences with the physical sensation of hunger. For households without children and for some adults living in households with children, this level implies a more severe level of household hunger. (Cohen et al., 2000)

The US Household Food Security Instrument is now embedded in a number of national surveys including the National Health and Nutrition Examination Survey. A standardized Spanish translation has been developed and published (Harrison et al., 2002); a shortened six-item screener has been validated; and adaptations are being developed and applied in a wide variety of populations in the US and other countries.

Data from 2002 indicate that about 11.1% of US households are food insecure by this measure, including 3.5% who experience hunger (up from 10.7% and 3.3% respectively in 2001 (Nord et al., 2002). The relationship of household food insecurity to poverty measured by per capita income is close but not exact; about one-third of household below the federal poverty line are classified as food insecure, compared to about 8% of households with incomes above the poverty line. While food insecurity is an index of severe economic stress, there is inevitably a management component as well. Subgroups of the population with higher prevalence of food insecurity than the national average are Hispanic and African-American households and households composed of a single woman and children.

Health Consequences of Household Food Insecurity.

Adverse consequences of resource limitations so severe as to result in food insecurity include not only compromised dietary quality and nutritional status but also detrimental outcomes not mediated through nutritional status. It has been demonstrated in several U.S. subpopulations that hunger or risk of hunger is directly linked to poor physical, social, and mental well being and to a decreased quality of life in a variety of populations including adults, adolescents, and young children (Frongillo et al., 1999, Rose, 2000; Alaimo et al. 2001a, 2001b, 2002; Nicholas et al., 2003; Tarasuk 2001, Siebert et al., 2001; Kleinman et al., 1998; Stormer and Harrison 2003).

For the one-third of the adult population that has one or more chronic illnesses that require ongoing management including drugs, diet and lifestyle variables, there are other potential adverse health consequences. Doctor visits, prescription drugs and devices, and special diets all require ongoing monetary outlays and also have indirect costs. Even with health insurance co-payments, child care and transportation costs and opportunity costs for the time required are real expenditures- and for the individual with chronic illness inability to meet these needs due to the more immediate press of putting food on the table may result in poorer disease management, increased complication rates, and adverse outcomes. We and others have shown food insufficiency to be related to poorer disease management, poorer health status and increased health care utilization for low income persons with diabetes (Nelson et al., 1998, Nelson et al., 2001), an observation that produced the impetus for the present analysis.

The Research Questions.

We asked the question of whether, for individuals in low-income households facing food insecurity, a tradeoff between medical care and food could be demonstrated, and if so, what the effects of health insurance and of food assistance program participation (particularly food stamps) might have on that tradeoff. Specifically, we hypothesized that:

- 1) Low-income adults in households that exhibit food insecurity will be more likely than those in food-secure households to report non-use of preventive medical services.
- 2) In the presence of diagnosed chronic disease, adults in food insecure households will be more likely than those in food secure households to report postponement of filling prescriptions for prescribed drugs and failure to follow up or delay in following up on other recommended medical care.
- 3) Participation in food assistance programs will mitigate the hypothesized relationships mentioned above, independent of health insurance status.

Methods

The first round (2001) of the *California Health Interview Survey* (CHIS) was the data set for the current analysis. CHIS is conducted by the UCLA School of Public Health in cooperation with the California Department of Health Services and the Public Health Institute in Berkeley, and is the largest state health survey conducted in the United States. The first round in 2001 collected information from 55,428 households, drawn from every county in the state. Individual interviews were completed for one adult per household and from one adolescent (aged 12-17) and with a parent on behalf of one child under 11 years when these were present in the household, resulting in 55,428 adult interviews, 5801 adolescents and 12,592 parents about a child under 11 years. CHIS is a telephone-based survey, designed to be implemented every two years, and is conducted in six languages (English, Spanish, Mandarin, Vietnamese, Hmong, and Korean). It includes information on health status, specific conditions and disease management, health behavior, women's health, oral health, mental health, cancer history, health care access and utilization, health insurance, food security, and public program participation. CHIS 2001 was funded by the California Department of Health Services, the California Endowment, the California Children and Families Commission, the National Cancer Institute, the Centers for Disease Control and Prevention, and the Indian Health Service. The second round of CHIS (2003) is now in the data-cleaning process, and planning is underway for CHIS 2005.

Sampling Design. The CHIS sample is designed for two purposes: to produce statewide estimates for California's overall population and its major ethnic groups, including some ethnic subgroups; and to provide local-level estimates for counties with populations of 40,000 or more, for local planning and to enable comparisons among counties. The basic state-wide sample was selected through a random-digit dial process; only residential households with telephones are in the CHIS sample, but results will be statistically adjusted to account for households without telephones. Sample sizes by ethnic group from the random digit dial sample are approximately: 36,729 non-Latino white, 9458 Latino, 2764 African-American, 3956 Asian American/Pacific Islander, 781 Native American, 219 Native Hawaiian or Pacific Islander, and 219 other and mixed. CHIS also incorporates over-samples of some geographic areas and some ethnic groups. The three cities in California with their own health departments were over-sampled to reach a target sample size of 800 per city. Also, because Asian subgroups are different from each other in culture and language, an additional 2100 households were surveyed in five specific Asian subgroups that would otherwise have samples too small for adequate estimates. Finally, American Indian/Alaska Natives were over-sampled to raise their total sample size to at least 800 in order to examine differences between rural and urban areas. All 58 California counties were included in the sample design, arranged into 41 strata. Thirty-three of the 35 counties with a population of 100,000 or more form their own sample strata; two are combined with smaller adjoining counties, and the remaining 23 counties are grouped into six sample strata in a way that is meaningful for health planning purposes. The minimum sample size from any stratum is 800. Within a household, up to three individuals were part of the survey: one adult (18 years or older),

plus in households with adolescents (12-17 years) residing at home one was included, and in households with children 11 years and under, the adult most knowledgeable about the child was interviewed about that child.

Survey methods. CHIS is a telephone-based, computer-assisted survey modeled largely on the National Health Interview Survey, with extensive local adaptation. Extensive pre-survey publicity, extensive call-back protocols, and CHIS' multilingual capability all contributed to a relatively good response rate, with about 60% of sampled phone numbers actually contacted and about 70% complete cooperation (completed interviews) among those who were contacted. The entire interview required between 25 minutes and one hour, depending mostly on household size and partly on language of the interview.

Key variables for the present analysis. Of interest for this analysis, household income was asked in categories and then within the CATI protocol per capita income as percent of the Federal Poverty Level (FPL) calculated and categorized as <100% FPL, 100-199% FPL, 200-299% FPL, and 300% FPL+. In order to examine the effects of food stamp participation, we imputed at cutoff at 130% FPL, the income eligibility criterion in most states for food stamp eligibility. The food security measurement was the six-item screener based on the US Food Security Instrument, and was asked only of adults in households whose per capita income was calculated to be <200% of the FPL. Use of medical care was explored with the questions relating to number of doctor visits in the previous 12 months, time since last dental visit, visits to mental health care providers and to other providers in the previous 12 months, and # of emergency room visits in the last 12 months both generally and for complications of any specific chronic disease. The presence of chronic disease was ascertained by asking "Has a doctor ever told you that you have (name of disease)?" For purposes of the present analyses, we utilized data from adults who responded positively that they had any of five specific conditions, namely arthritis, asthma, heart disease, high blood pressure, and diabetes. These were selected because they make ongoing management demands in terms of compliance with prescribed drug regimens and periodic re-examination. We treated diabetics taking oral drugs separately from diabetics taking insulin because of the differential demands for self-care and the differential tendency for acute complications. Disease management was indexed by a series questions about whether in the last 12 months the individual had failed to follow up or delayed in following up in getting a prescription filled (both in general and for his/her specific condition) and in getting medical tests or other care (including referrals to specialty care and non-medical providers such as physical therapists and dietitians). Positive responses to these questions were followed by a question about "What was the reason for that?" that included "could not afford it" as one of several options. Health insurance was explored in considerable detail in CHIS; in the present analyses we use a simple dichotomous variable (do or do not currently have any health insurance). Data on public program participation are also present in CHIS; for the present analysis we utilized data on food stamp program participation only; the numbers of adults with chronic disease that we could assume were eligible for the WIC program were too small for stable multivariate prediction models.

Analytical methods. SUDAAN was used to account for design effects; sample weights were applied for analyses, which were accomplished in SAS Version 8.0.2. Basic bivariate relationships were examined for key variables; multivariate predictions of dichotomous dependent variables were accomplished through multiple logistic regression analyses. Potential interactions were explored both by the construction of interaction terms and by moving key variables in and out of the models to explore the effects on coefficients of other candidate variables.

Results

Prevalence and Predictors of Household Food Insecurity.

Table 1 shows the prevalence of household food insecurity without and with hunger for the low-income (<200% FPL) portion of the CHIS adult sample. Overall, 28.3% reported food insecurity. As expected, the prevalence of both total food insecurity and the more severe food insecurity with hunger were higher among those in households with incomes below the poverty line than for those at 1 – 2 x the poverty level. The descriptive data on prevalence of food insecurity have been published as a UCLA Health Policy Brief (Harrison et al., 2002), a copy of which is appended to this paper (Appendix 1). Briefly, the population subgroups with the highest prevalences were American Indian and Alaska Natives, Hispanics, and African Americans; households consisting of a single adult with children; and households in California’s Central Valley and the rural northern part of the state. Fewer than 20 percent of income-eligible adults who reported food insecurity with hunger were participating in the food stamp program.

Table 1
Prevalence (%) of Household Food Insecurity among Low-Income California Adults
(<200% of Federal Poverty Line), 2001

<u>Food Security Status</u>	<u>Household Income</u>	
	<u>0-99% Poverty</u>	<u>100-199% Poverty</u>
Food Secure	63.8	77.3
Food Insecure without Hunger	25.2	16.4
Food Insecure with Hunger	11.5	6.4

We explored in multivariate models several potential predictors of household food insecurity (Appendix II-i) and of food insecurity with hunger (Appendix II-ii). Briefly, food insecurity was predicted by income within the low-income range, with lower risk for individuals in households above than below the poverty level, with the exception of those above the income-eligibility cutoff for MediCal (185% FPL) whose risk was equal to those below the poverty level. Individuals ages 36-54 were more likely to be food

insecure than those below 35 years; adults older than 65 were significantly less likely to report food insecurity than younger adults, consistent with our earlier bivariate observations (Appendix I). Latinos, African Americans and American Indian/Alaska Natives were more likely than white or AAPI adults to be food insecure. Adults in families with children, particularly when headed by a single adult, and those without health insurance were more likely than others to be food insecure. The presence of a chronic illness did not independently predict food insecurity; on the contrary, a single chronic illness for some reason was negatively predictive. Prediction of food insecurity with hunger showed similar relationships with age, household income, family type and chronic illness. The relationships were ethnicity were different, with Latino and AAPI adults significantly less likely than those of other ethnicities to report household-level hunger. There was no relationship between health insurance status and food insecurity with hunger in the multivariate model. Additionally we ran models with additional indicators of ill health (general self-rated health as fair or poor, functional limitations due to health reasons, overnight hospital stay in last year, taking medications); none had significant predictive value for food insecurity or food insecurity with hunger.

Relationships between household food insecurity and use of preventive medical services.

Table 2 shows the percentage of low-income adults reporting utilization of various types of preventive health services, by food security status. There was essentially no relationship for several services, including having had a flu shot in the last year, cancer screening (mammograms, Pap smears) for women, and having had fecal occult blood testing as screening for colon cancer. There was also very little effect on the probability of having a “medical home” – i.e., a place to which the individual reports usually going when needing medical care or health advice. Only about 60 percent of low-income individuals reported having a “medical home” regardless of food security status. There were slight differences (lower section of Table 2) in prevalence of ever having had a bone density test for older women, ever having had a PSA test for prostate cancer screening for men >40, ever having had an endoscopic colorectal cancer screening, ever having had a blood cholesterol check (although most individuals did report having had this at some time), and in having had more than five years elapse since the last dental visit.

Table 2
 Percentage of Low-Income Adults Who Reported Use of Various Preventive Health Services, by Household Food Security Status

	<u>Food Secure</u>	<u>Food Insecure</u> <u>w/o hunger</u>	<u>Food Insecure</u> <u>with hunger</u>
Have a medical home	59.6	57.5	65.0
Had a flu shot in the last year	65.2	60.5	63.2
Ever did a stool blood test	46.5	37.5	41.2
Ever had a mammogram (women 40+)	86.1	82.3	83.9
Most recent mammogram >5 yrs ago	6.1	5.0	7.8
Ever had a Pap smear (women 18+)	89.1	90.2	94.6
Ever had bone density test (women 50+)	29.4	22.8	22.9
Ever had a colon/rectal exam	47.7	38.9	37.8
Ever had a PSA test (men 40+)	56.3	36.5	49.1
Ever had a blood cholesterol check	96.1	99.9	79.4
Last dental visit >5 years ago	11.3	13.1	17.6

Use of medical care by food security status

Examination of the data on number of physician encounters and use of emergency rooms over the year prior to the survey, as well as use of mental health care providers, showed greater utilization by individuals in severely food insecure households (with hunger) than by others. Adults in households reporting food insecurity with hunger were approximately twice as likely as food-secure low-income adults to have had seven or more doctor visits in the previous year and to have visited an emergency room for care in the same period. They were more than twice as likely to have seen a mental health care provider. There was a mild apparent effect of milder levels of food insecurity (without hunger) (see Table 3). For individuals in food-secure low-income households, utilization was not different from those in higher-income (>200% FPL) households (data not shown).

Table 3
Utilization of Physician Care, Emergency Room care, and Mental Health Care
in 12 Months Prior to the Survey

	<u>≥7 doctor visits in previous yr</u>	<u>≥1 ER visit in previous yr</u>	<u>Visited mental health provider in previous yr</u>
Food Secure	13.7	14.4	3.8
Food Insecure without Hunger	16.7	17.8	6.3
Food Insecure with Hunger	26.8	26.6	9.8

Among adults with chronic diseases, risk of foregoing or postponing needed care by food security status

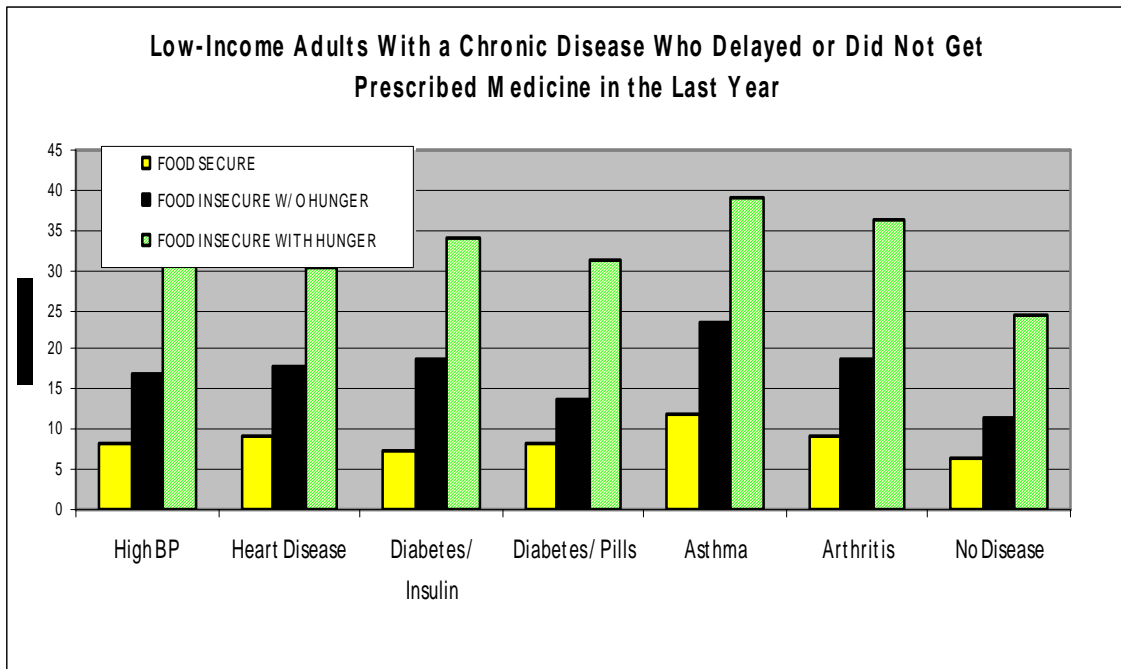
Almost one-third of all adults report having one or more of the chronic diseases we identified as candidates for this analysis. The proportion for most conditions was marginally higher in the low-income population than in the overall sample, particularly for women (see Table 4).

Table 4
Prevalence of Having Been Told by a Doctor Have Specific Chronic Conditions

	<u>General Population</u>		<u><200% FPL</u>	
	<u>Men</u>	<u>Women</u>	<u>Men</u>	<u>Women</u>
Arthritis	20%	28%	21%	32%
Asthma	10%	14%	10%	15%
Diabetes	7%	5%	9%	10%
High Blood Pressure	26%	26%	26%	31%
Heart Disease	9%	8%	10%	11%
Two or more conditions	19%	22%	19%	28%

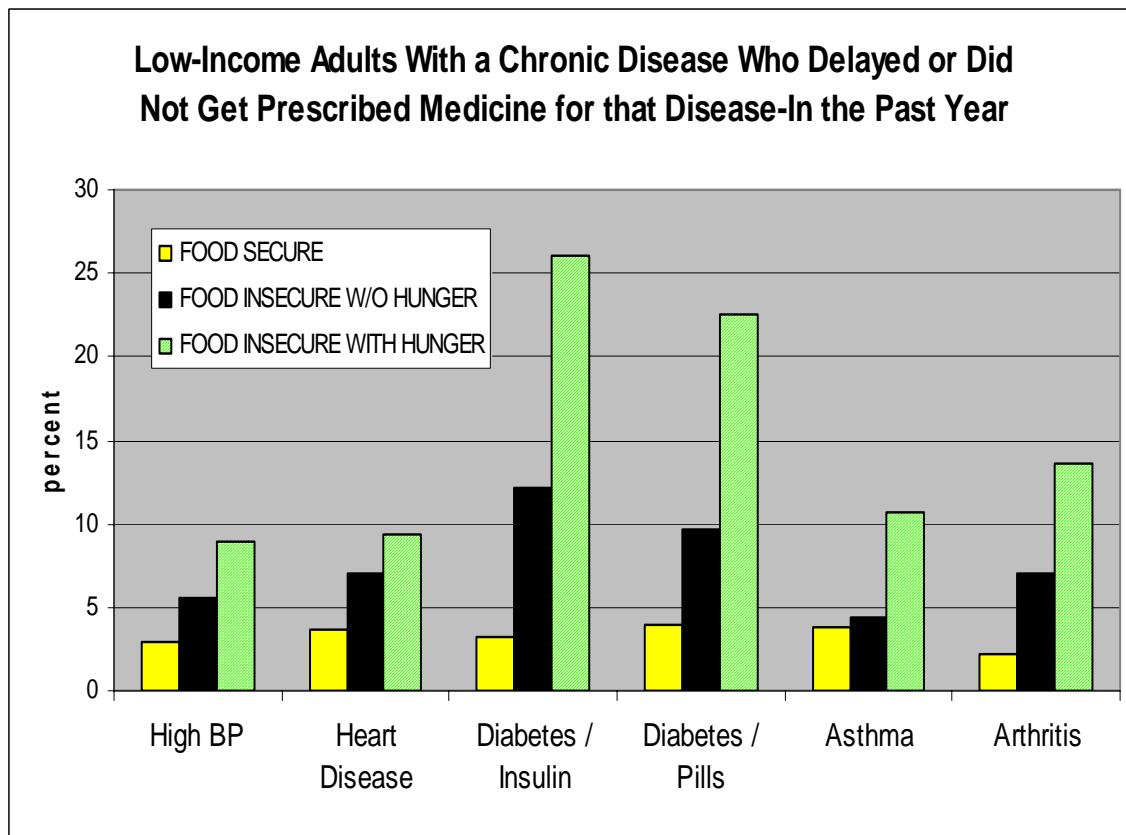
The proportion of low-income adults who reported delaying or not getting a prescription filled for medication during the previous year by food security status is shown in Figure 1, within each category of chronic disease and for those with no reported chronic condition. The relationship of food insecurity, particularly with hunger, with this index of disease management is striking and consistent across all disease categories, as well as for those without these illnesses.

Figure 1



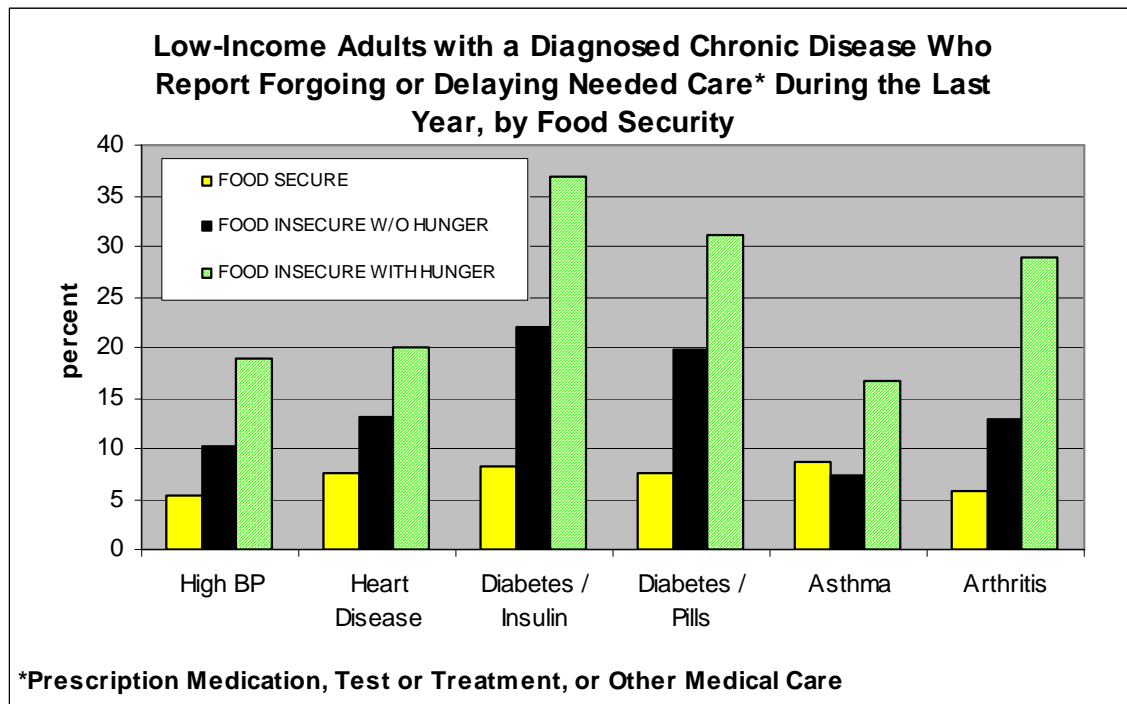
When delaying or failing to get a prescription filled is examined only in relationship to drugs or devices prescribed specifically for that condition, the relationship remains and is consistent, and is particularly striking for individuals with diabetes (Figure 2).

Figure 2



We decided to construct a variable that included not only delay/failure to get prescriptions filled, but delay and failure to get other recommended types of medical care. Questions were asked about delay or failure to follow up on getting medical tests or treatments, and medical referrals to specialty care and to non-medical providers that would include physical therapists, dietitians, and visiting nurses. Figure 3 shows a similar presentation for the “delay or did not get care” variable by chronic disease status. Similar to the prescription variable, food security status was significantly associated with this failure to get care variable, particularly at the level of food insecurity with hunger. We therefore used the “delay or did not get care” variable as the dependent variable in the multivariate analyses.

Figure 3

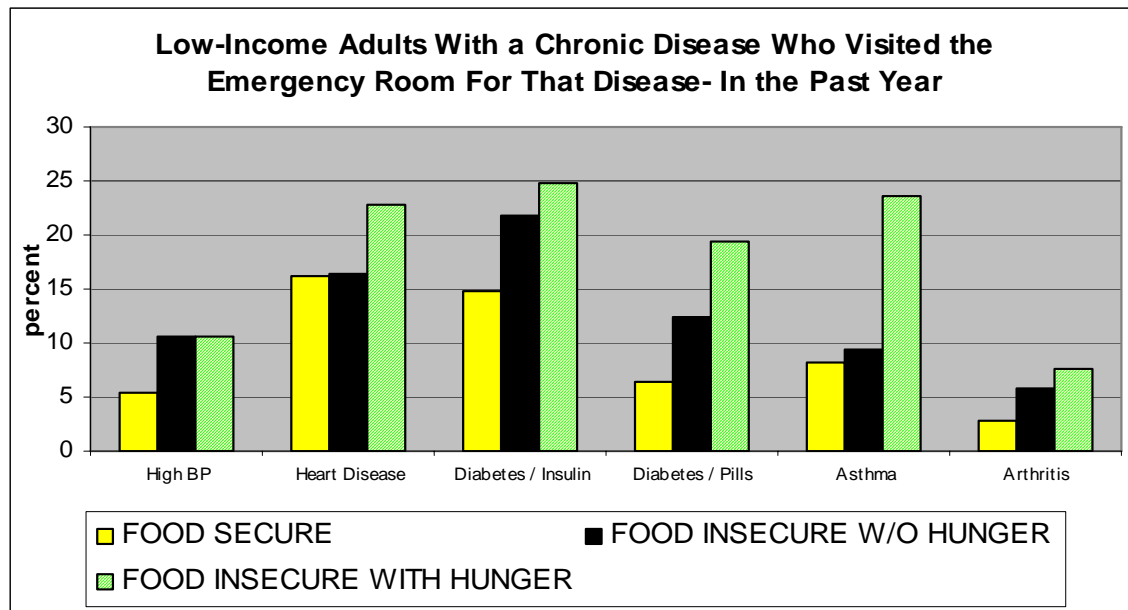


Evidence for adverse health outcomes

The only variable in CHIS that gives a reasonably direct measure of adverse health outcomes in chronic disease is a report of whether the individual visited an emergency room for care within the last year specifically for complications of their specific chronic disease. Figure 4 shows the prevalence of having used an emergency room for complications of the specific condition by food security status; again, there is a consistent relationship across all chronic diseases examined. Since earlier analysis showed that food insecure individuals were not less likely to have a “medical home” than

those in food-secure low-income households, we cannot attribute this finding to a higher proportion of individuals using emergency care as primary or only medical care among the food insecure. The association with food insecurity, particularly at the level of hunger, is most striking for those conditions for which poor management is likely to result in acute complications (diabetes, asthma, and heart disease).

Figure 4



Multivariate predictors of delaying or failing to get needed care for a chronic disease

The tables in Appendix II–iii through II–vi summarize multivariate logistic regression models predicting the variable “delaying or failing to get needed care for a chronic disease in the last year,” for each of the chronic conditions examined. All models included (i.e., were controlled for) age, gender, ethnicity, household income expressed as 0-99% FPL vs 100-199% FPL, current health insurance (yes or no), family type, and food security status. Food insecurity, and food insecurity with hunger, are strong and consistent independent predictors of failure to get/postponing care; these variables are significant in all models, with odds ratios of approximately 2 to 5 compared to food secure individuals. Health insurance, age (middle aged adults at greatest risk), and family type also appear in the model for high blood pressure; income and age (middle-aged adults at greatest risk) for diabetes; ethnicity is significant only for arthritis, with American Indian/Alaska Native adults significantly more likely to forego or delay care. Interaction terms (food security status * health insurance, and food security status * income) did not add significantly to any of the models. We moved both health insurance and income variables in and out of the models (Appendix II–vii through II–xi); the coefficients on these and the food security variables remained remarkably stable.

Puzzled by the apparently weaker role of health insurance compared to food security status in these models, we pursued another series of models in which the dependent variable was constructed as “delaying or failing to get needed for a chronic disease in the last year because couldn’t afford it,” incorporating the information from the question as to why a prescription was not filled or other recommended care sought. Although this strategy reduced the numbers of available cases for analysis (below the viability of the model for one group, diabetics on insulin), it did shed light on the relative role of health insurance. The tables in Appendix II, xii-xv show these models. Lack of health insurance is a strong and consistent predictor of not following through with needed care because of not being able to afford it, with odds ratios ranging from 1.5 for high blood pressure to more than 10 for heart disease. However, food security status remains in all models, indicating an independent effect, with odds ratios remaining fairly close to the earlier models at 2 to 5 times higher risk for food-insecure individuals failing to get or delaying needed care.

Consideration of food assistance. The only food assistance program with sufficient numbers to consider in these analyses was food stamp program participation. The numbers of pregnant women, and even of adults with children under five years who could be assumed to have someone in the family WIC-eligible and had one of the examined chronic diseases, were relatively small owing to the association of many of these chronic diseases with age among adults. We will in the future pursue appropriate analyses for these small groups. In the meantime, however, we selected from the database adults with household incomes <130% FPL (the food stamp eligibility cutoff) and re-ran all the models for delaying or failing to get needed care (both in general and “because couldn’t afford it”) with a food stamp participation variable in the model. The food stamp participation variable was non-significant in all models.

Discussion

Contrary to our original hypothesis, there was not a striking association of food insecurity with lack of use of effective preventive medical services, with the exception of a predictable higher likelihood of having gone more than five years since the last dental care and less likelihood of having had colorectal and prostate cancer screening tests, compared to low-income adults in food secure households. Having had a flu shot in the last year, having participated in effective screening for breast and cervical cancer for women were equally common across food security categories, and ever having had a blood cholesterol check was greater than 85% for all. Neither were adults in food-insecure households less likely to report having a “medical home” than those in food-secure households. However, adults in food insecure households were significantly greater users of medical care, measured as number of doctor visits in the previous year and history of having used an emergency room in the previous year, as well as likelihood of having visited a mental health care provider.

Food insecurity was a strong, consistent and independent predictor of failing to get or delay in getting prescriptions filled and following up on recommended medical

tests and medical and other-provider referrals, even when controlled for household income (within this low-income sample) and for health insurance. When predictions were restricted to failure to get or postponement of needed care because of inability to afford it, food insecurity remained significant in all models, second to and independent of health insurance in its effect. These finds were true across all the disease categories examined (arthritis, asthma, heart disease, high blood pressure, diabetes). All of these are conditions whose effective management requires ongoing medical supervision and pharmacologic management, and some (diabetes, heart disease) require dietary management as well. However, they vary widely in the risk of acute or life-threatening complications when management fails, and likely in the increased medical care costs associated with poor self-management.

One might ask the question as to whether reverse causality may be operating here; i.e., does being chronically ill predispose one to food insecurity, other things being equal? Our earlier analyses of the predictors of food insecurity, while based on cross-sectional data with all the limitations implied by that constraint, suggest that this is probably not the case. Prevalence of food insecurity is highest among the lowest-income households, among Latina, American Indian/Alaska Native and African American households, among households consisting of a single adult and children; but not in households in which the index adult reported having one or more of the examined chronic conditions.

There are several aspects of food insecurity in the North American context that are relevant to interpreting these results as a coherent whole. First, food insecurity in this environment is most frequent an intermittent, often recurring phenomenon rather than a consistently persistent condition. This is particularly true for individuals in households that could be contacted by a telephone-based survey. Thus it may not be surprising that food insecurity does not appear to interfere with established, one-time or infrequent behaviors that are health-protective – including having a primary care home, getting a flu shot, and obtaining mammograms and Pap smears. These results set the context for arguing that the effects seen in relation to increased medical care use and poorer disease management (indexed by delay or failure to follow through on recommended care including prescription drugs, and on increased likelihood of emergency room care for the specific chronic disease) are not due to more disorganized medical care for individuals who classify as food-insecure, but rather from personal management decisions made day by day in the short run, and in the face of severe resource constraint. Postponing a prescription, and either interrupting or diluting the dose, has less immediate consequences than not feeding one's children a meal – the consequences may be quite real and serious a little bit later, but harder to foresee for the individual.

Secondly, it appears from these analyses that the food insecurity variable is indexing a very fundamental aspect of economic stress, perhaps more generalizable across domains of resource-requiring needs than other resources. Health insurance is a powerful predictor of follow-up and management of chronic disease; but even when health insurance is present, if money is so tight that food security is threatened, health-protective actions suffer. The obvious policy conclusion is that if food security is not present, other resources (such as health insurance) are less effectively used.

Another aspect of the measurement of food insecurity is that it identifies a condition characterized most often by both economic constraint and a failure of management at some level. Poorer mental and emotional health has been identified among adults, adolescents and young children in food-insecure households. One might argue that poor mental health in adults might predispose to food insecurity, and indeed in the CHIS data we find that food insecure adults score worse on all of the mental health variables in the data set than do food-secure low-income adults (data not shown). However, the findings in other data sets of poorer mental and emotional health in children and adolescents in food-insecure households can less logically be attributed to other than the anxiety, uncertainty and chaotic environment that derives from economic stress severe enough to threaten to compromise food security. Further, investigation into the characteristics of the 20% of food insecure households who are not low-income indicates that the greatest part of these are characterized by uneven income, changes in household composition over the previous year, or more than one economic unit within the household (Nord and Brent, 2002).

The fact that ethnicity does not figure prominently in the models predicting delaying or not getting needed medical care (only a slight advantage for African-Americans for heart disease and a disadvantage for American Indian/Alaska Natives for arthritis were demonstrated) is of interest, since ethnicity is clearly correlated with risk of household food insecurity in the first place.

Finally, it is appropriate to comment on the lack of influence of food stamp participation on the delay-or-failure-to-get-care variables. Food stamp coverage is relatively low in this population (fewer than 20% of CHIS adult respondents who reported food insecurity with hunger participated in the food stamp program). It has been repeatedly shown that food stamp recipients are more likely to be food insecure than non-recipients; the present analysis does not add to that observation but only notes that the adverse consequences of food insecurity for health are not mitigated by food stamp participation as it currently affects this population.

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References Cited

Alaimo K, C Olson, E Frongillo, R Briefel. Food insufficiency, family income and health in US preschool and school-aged children. *Am J Public Health* 91: 781-786. 2001b.

Alaimo K, CM Olson, EA Frongillo Jr. Family food insufficiency, but not low family income, is positively associated with dysthymia and suicidal symptoms in adolescents. *J Nutrition* 132: 719-725, 2002.

Alaimo K, CM Olson, EA Frongillo Jr. Food insufficiency and American school-aged children's cognitive, academic and psycho-social development *Pediatrics* 108: 44-53, 2001a.

Cohen B, Ohls J, Andrews M, Ponza M, Moreno L, Zambrowski A, Cohen R. Food Stamp Participants' Food Security and Nutrient Availability. 1999. Mathematica Policy Research, Inc. 1-119. Alexandria, VA Food and Nutrition Service, USDA.

Hamilton W, Cook JT, Thompson WW, Buron LF, Frongillo EA, Olson CM, Wehler CA. Household Food Security in the United States in 1995. Summary Report of the Food Security Measurement Project. September 1997, prepared by Abt Associates, Inc.

Harrison GG, A Stormer, DR Herman, DM Winham. Development of a Spanish-language version of the US Household Food Security Survey Instrument. *J Nutrition* 133:1192-1197, 2003.

Kleinman RE, M Murphy, M Little, M Pagaso, CA Wehler, K Regal, M Jellinek. Relationship between hunger and psychosocial functioning in low-income American children. *J American Acad Child Adoles Psychiatry* 37: 163-170, 1998.

Nelson, K., Brown, M.E. Brown, Lurie, N. Hunger in an Adult Patient Population. *Journal of the American Medical Association*. 1998; 279:1211-1214.

Nelson K, Cunningham W, Andersen R, Harrison G, Gelberg L. Is food insufficiency associated with health status and health care utilization among adults with diabetes? *Journal of General Internal Medicine*. 2001;16:1-8.

Nicholas T, Vozoris, VS Tarasuk. Household food insufficiency is associated with poorer health. *J Nutrition* 133: 120-126, 2003.

Nord M and CP Brent. Food Insecurity in Higher Income Households. ERS E-FAN Report No. 02016, 50 pp, 2003. <http://www.ers.usda.gov/publications/efan02016/>, accessed July 2004.

Nord M, Jemison K, Bickel G. Prevalence of Food Insecurity and Hunger by State, 1996-1998. An Economic Research Service Report. ERS/USDA. Sep. 1999

Harrison GG
July 20, 2004

Draft: Not for citation or circulation

Nord M, M Andrews and S Carlson. Household Food Security in the United States, 2002. FANRR Report 335, 58 pages. Washington DC: USDA/ERS, 2002.

Rose D, and Oliveira V. Nutrient intakes of individuals from food-insufficient households in the United States. Am J Public Health 87: 1956-1961, 1997.

Rose, D. Economic Determinants and Dietary Consequences of Food Insecurity in the United States. Journal of Nutrition. 2000; 129 Supplement 2s: 517s-520s.

Siebert K, Heflin C, Corcoran ME, Williams DR. Food insufficiency and the physical and mental health of low-income women. Women's Health 59: 159-177, 2001.

Storner A and GG Harrison. Does household food insecurity predict social and cognitive development in US kindergartners? Institute for Research on Poverty, University of Wisconsin Working Paper # DP 1276-03, 2003. Available at: <http://www.ssc.wisc.edu/irp/>

Tarasuk VS. Household food insecurity with hunger is associated with women's food intakes, health and household circumstances. J Nutrition 131: 2670-2676, 2001.

Appendix II. Multivariate prediction models

- i. Predictors of household food insecurity
- ii. Predictors of household food insecurity with hunger
- iii. Significant predictors of postponing or not getting needed care for high blood pressure
- iv. Significant predictors of postponing or not getting needed care for diabetes
- v. Significant predictors of postponing or not getting needed care for arthritis
- vi. Significant predictors of postponing or not getting needed care for heart disease and asthma
- vii. Income, insurance and food security as predictors of delaying or not getting care for high blood pressure
- viii. Income, insurance and food security as predictors of delaying or not getting care for diabetes, among patients taking oral hypoglycemic agents
- ix. Income, insurance and food security as predictors of delaying or not getting care for diabetes, among patients taking insulin
- x. Income, insurance and food security as predictors of delaying or not getting care for asthma
- xi. Income, insurance and food security as predictors of delaying or not getting care for arthritis
- xii. Predictors of delaying or not getting care for high blood pressure because could not afford it
- xiii. Predictors of delaying or not getting care for diabetes, among patients taking oral hypoglycemic agents, because could not afford it
- xiv. Predictors of delaying or not getting care for arthritis, because could not afford it
- xv. Predictors of delaying or not getting care for heart disease and asthma, because could not afford it

II – i. Predictors of Food Insecurity among Low-Income California Adults

<u>Variable</u>	<u>Beta</u>	<u>p</u>	<u>Odds Ratio</u>	<u>95% Confidence Interval</u>
Household Income				
<100% FPL	Referent			
100-130% FPL	-0.84	<.00001	0.43	0.37-0.51
131-185% FPL	-0.56	<.00001	0.57	0.51-0.65
186-199% FPL	-0.15	n.s.	0.86	0.72-1.02
Gender				
Male	Referent			
Female	0.02	n.s.	1.02	0.92-1.14
Age (years)				
18-35	Referent			
36-50	0.39	<.00001	1.48	1.31-1.67
51-64	0.24	<.005	1.27	1.09-1.49
65+	-0.57	<.00001	0.57	0.48-0.68
Ethnicity				
White	Referent			
Latino	0.16	<.05	1.17	1.03-1.33
African American	0.29	<.005	1.33	1.10-1.61
AIAN	0.46	<.05	1.59	1.10-2.28
AAPI/Other	0.04	n.s.	1.04	0.87-1.24
Family Type				
Married no children	Referent			
Married w/ children	0.35	.0001	1.41	1.19-1.68
Single no children	0.24	<.005	1.27	1.09-1.49
Single w/ children	0.71	<.00001	2.03	1.66-2.49
Current health insurance				
Yes	Referent			
No	0.21	<.0005	1.23	1.10-1.39
Chronic illnesses				
None	Referent			
One	-0.23	<.05	0.79	0.66-0.95
More than one	0.17	n.s.	1.19	0.99-1.43

Wald Chi-Square for Model: 2060.24, $p < .00001$; Minus intercept: 629.84, $p < .00001$

II-ii. Predictors of Food Insecurity with Hunger among Low-Income California Adults

<u>Variable</u>	<u>Beta</u>	<u>p</u>	<u>Odds Ratio</u>	<u>95% Confidence Interval</u>
Household Income				
<100% FPL	Referent			
100-130% FPL	-0.88	<.00001	0.41	0.33-0.53
131-185% FPL	-0.65	<.00001	0.52	0.43-0.63
186-199% FPL	-0.00	ns	1.00	0.79-1.26
Gender				
Male	Referent			
Female	0.11	ns	1.11	0.95-1.31
Age (years)				
18-35	Referent			
36-50	0.67	<.00001	1.95	1.62-2.33
51-64	0.52	<.00001	1.67	1.33-2.11
65+	-0.78	<.00001	0.46	0.34-0.62
Ethnicity				
White	Referent			
Latino	-0.50	<.00001	0.60	0.51-0.72
African American	0.14	ns	1.15	0.89-1.49
AIAN	0.38	ns	1.46	0.97-2.21
AAPI/Other	-0.67	<.00001	0.51	0.39-0.67
Family Type				
Married no children	Referent			
Married w/ children	0.25	ns	1.28	0.96-1.71
Single no children	0.37	<.005	1.45	1.12-1.88
Single w/ children	0.58	.0001	1.79	1.33-2.42
Current health insurance				
Yes	Referent			
No	0.16	ns	1.17	0.99-1.38
Chronic illnesses				
None	Referent			
One	-0.57	<.00001	0.56	0.43-0.73
More than one	-0.11	ns	0.90	0.69-1.17

Wald Chi-Square for Model: 4076.98, p<.0000; Minus intercept: 420.79, p<.0001

Table II-iii. Significant Predictors of Postponing or Not Getting Needed Care for High Blood Pressure*
 (“Care” refers to filling prescription for medicine, getting recommended medical tests, and/or following through on referrals to medical or other health care providers)

	<u>Coefficient</u>	<u>Odds Ratio</u>	<u>Significance</u>	<u>95% Confidence Intervals</u>
No health insurance	.58	1.8	<.01	1.2-2.8
Age 36-50 years¹	1.21	3.3	<.0001	1.9-5.8
Age 50-64 years¹	.76	2.1	.01	1.2-3.9
Single without children²	-.37	0.7	<.05	.4-.99
Food insecure without hunger³	.54	1.7	<.01	1.2-2.8
Food insecure with hunger³	1.2	3.3	<.00001	2.2-5.0

¹Referent is 18-35 years.

²Referent is married with children.

³Referent is food secure.

*Model also includes gender, ethnicity, household income as % of poverty.

Number of cases in the analysis: 5153

Table II-iv. Significant Predictors of Postponing or Not Getting Needed Care for Diabetes*
 (“Care” refers to filling prescription for medicine, getting recommended medical tests, and/or following through on referrals to medical or other health care providers)

	<u>Coefficient</u>	<u>Odds Ratio</u>	<u>Significance</u>	<u>95% Confidence Intervals</u>
<u>Taking insulin</u>				
Food insecure without hunger	1.17	3.2	<.05	1.01-10.2
Food insecure with hunger	1.46	4.3	.005	1.6-11.9
<u>Taking oral drugs</u>				
Age 36-50 years ¹	1.50	4.5	<.05	1.2-17.2
Household income <100% poverty ²	-.58	0.6	.05	0.3-1.0
Food insecure without hunger	1.14	3.1	.001	1.6-6.2
Food insecure with hunger	1.56	4.8	<.00001	2.5-9.1

¹Referent is 18-35 years.

²Referent is 100-199% poverty.

*Models also include gender, ethnicity, health insurance, family type.

Number of cases in the models: 401 for diabetics taking insulin, 1072 for diabetics taking oral drugs.

Table II-v. . Significant Predictors of Postponing or Not Getting Needed Care for Arthritis*
 (“Care” refers to filling prescription for medicine, getting recommended medical tests, and/or following through on referrals to medical or other health care providers)

	<u>Coefficient</u>	<u>Odds Ratio</u>	<u>Significance</u>	<u>95% Confidence Interval</u>
American Indian/ Alaska Native ¹	.89	2.4	<.01	1.3-4.6
Food insecure without hunger ²	.70	2.0	.0001	1.4-2.8
Food insecure with hunger ²	1.56	4.8	<.00001	3.4-6.7

¹Referent is white.

²Referent is food secure.

*Model includes age group, gender, household income as % of poverty, family type, health insurance.
 Number of cases in the analysis: 4996

Table II-vi. Significant Predictors of Postponing or Not Getting Needed Care for Heart Disease and Asthma*
 (“Care” refers to filling prescription for medicine, getting recommended medical tests, and/or following through on referrals to medical or other health care providers)

	<u>Coefficient</u>	<u>Odds Ratio</u>	<u>Significance</u>	<u>95% Confidence Interval</u>
<u>Heart Disease</u>				
Food insecure with hunger ¹	.82	2.3	<.01	1.2-4.7
<u>Asthma</u>				
Food insecure with hunger	.60	1.8	<.01	1.2-2.9

*Models include gender, age group, ethnicity, household income as % of poverty, family type, health insurance.
 Number of cases in the analysis: 1937 for heart disease, 2295 for asthma.

Table II-vii. Income, Insurance and Food Security as Predictors of Delay or Not Getting Care for High Blood Pressure
 (Models adjusted for gender, age, ethnicity, and family type)

	<u>Full Model</u>		<u>-Income</u>		<u>-Insurance</u>		<u>-Food Security</u>	
	OR	p	OR	p	OR	p	OR	p
Income <poverty ¹	0.92	ns	0.95	ns	1.02	ns		
No health insurance ²	1.74	.01	1.73	.01			1.70	.01
Food insecure ³								
no hunger	1.71	<.01	1.69	<.01	1.73	.005		
with hunger	3.28	<.00001	3.24	<.00001	3.21	<.00001		

¹ Referent is 100-199% poverty level

² Referent is any health insurance

³ Referent is food secure

**Table II-viii. Income, Insurance and Food Security as Predictors of Delay or Not Getting Care for Diabetes
Among Patients Taking Oral Hypoglycemic Agents**
(Models adjusted for gender, age, ethnicity and family type)

	<u>Full Model</u>		<u>-Income</u>		<u>-Insurance</u>		<u>-Food Security</u>	
	OR	p	OR	p	OR	p	OR	p
Income <poverty ¹	.57	.05			.57	.05	.64	ns
No health insurance	2.89	ns	.88	ns			.78	ns
Food insecure ³								
no hunger	3.13	.001	2.73	<.005	3.14	<.005		
with hunger	4.73	<.00001	4.47	<.00001	4.75	<.00001		

¹ Referent is 100-199% poverty level

² Referent is any health insurance

³ Referent is food secure

Table II-ix. Income, Insurance and Food Security as Predictors of Delay or Not Getting Care for Diabetes Among Patients Taking Insulin
(Models adjusted for gender, age, ethnicity, and family type)

	Full Model		-Income		-Insurance		-Food Security	
	OR	p	OR	p	OR	p	OR	p
Income <poverty ¹	.62	ns			.61	ns	.67	ns
No health insurance ²	1.49	ns	1.53	ns			1.81	ns
Food insecure ³								
no hunger	3.17	.05	2.84	ns	3.22	<.05		
with hunger	4.35	<.005	4.04	<.005	4.45	<.005		

¹ Referent is 100-199% poverty level

² Referent is any health insurance

³ Referent is food secure

Table II-x. Income, Insurance and Food Security as Predictors of Delay or Not Getting Care for Asthma
 (Model adjusted for gender, age, ethnicity, family type)

	Full Model		-Income		-Insurance		-Food Security	
	OR	p	OR	p	OR	p	OR	p
Income <poverty ¹	0.97	ns			-0.02	ns	-0.01	ns
No health insurance ²	1.36	ns	1.36	ns			1.34	ns
Food insecure ³								
no hunger	0.77	ns	0.77	ns	0.78	ns		
with hunger	1.82	<.01	1.81	<.01	1.82	<.01		

¹ Referent is 100-199% poverty level

² Referent is any health insurance

³ Referent is food secure

Table II-xi. Income, Insurance and Food Security as Predictors of Delay or Not Getting Care for Arthritis
 (Model adjusted for gender, age, ethnicity, family type)

	Full Model		-Income		-Insurance		-Food Security	
	OR	p	OR	p	OR	p	OR	p
Income <poverty ¹	0.86	ns			0.86	ns	0.98	ns
No health insurance ²	1.39	ns	1.38	ns			1.36	ns
Food insecure ³								
no hunger	2.02	.0001	1.99	.0001	2.03	.0001		
with hunger	4.81	<.0001	4.68	<.0001	4.79	<.0001		

¹ Referent is 100-199% poverty level

² Referent is any health insurance

³ Referent is food secure

Table II-xii. Predictors of Delaying or Not Getting Care for High Blood Pressure because Could Not Afford It
 (Model adjusted for gender, age, ethnicity, family type)

	<u>Coefficient</u>	<u>Significance</u>	<u>Odds Ratio</u>	<u>95% CI</u>
No health insurance ¹	1.56	<.00001	4.8	3.1-7.4
Household income <poverty level ²	-.58	.001	0.6	0.5-0.8
Food insecure w/o hunger ³	.60	<.01	1.8	1.2-2.8
Food insecure w/ hunger ³	.87	.0001	2.4	1.5-3.7

Reference categories:

¹currently insured

²100-199% poverty

³food secure.

Table II-xiii. Predictors of Delaying or Not Getting Care for Diabetes, among Patients Taking Oral Hypoglycemic Agents, because Could Not Afford It

(Model adjusted for gender, age, ethnicity, household income as % of poverty, family type)

	<u>Coefficient</u>	<u>Significance</u>	<u>Odds Ratio</u>	<u>95% CI</u>
No health insurance ¹	1.99	<.0005	7.3	2.5-21.2
Food insecure with hunger ²	1.62	<.0005	5.1	2.0-12.7

¹Referent is insured.

²Referent is food secure.

Table II-xiv. Predictors of Delaying or Not Getting Care for Arthritis, because Could Not Afford It
 (Model adjusted for gender, age, family type)

	<u>Coefficient</u>	<u>Significance</u>	<u>Odds Ratio</u>	<u>95% CI</u>
No health insurance ¹	1.28	<.00001	3.6	2.3-5.5
African-American ²	-.78	.01	.45	.25-.83
Household income < poverty level ³	-.38	<.05	.69	.48-.97
Food insecure without hunger ⁴	.64	<.005	1.9	1.2-2.9
with hunger ⁴	1.03	<.00001	2.8	1.9-4.2

¹Reference is insured

²Reference is white

³Reference is 100-199% poverty

⁴Reference is food secure.

Table II-xv. Predictors of Delaying or Not Getting care for Heart Disease and Asthma, because Could Not Afford It
 (Models adjusted for age, gender, ethnicity household income as % of poverty, and family type)

	<u>Coefficient</u>	<u>Significance</u>	<u>Odds Ratio</u>	<u>95% CI</u>
<u>Heart disease</u>				
No health insurance ¹	1.33	<.00001	10.3	4.6-23.0
African-American ²	-.71	.01	.51	.27-.97
Food insecure with hunger ³	.87	<.05	2.4	1.2-4.8
<u>Asthma</u>				
No health insurance ¹	1.17	<.00001	3.2	1.9-5.5
Food insecure without hunger ³	.64	<.05	1.9	1.1-3.3
with hunger ³	.86	<.005	2.4	1.3-4.2

¹Referent is insured

²Referent is white

³Referent is food secure.