Food Spending and Household Health*

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Abstract

Nutrition assistance programs seek to improve Americans' health by increasing their spending on food consumed at home and substituting eating at home for dining out. We assess if higher spending on food at home, in absolute terms or relative to the total food budget, is associated with better health. We analyze data from the 2007-2008 National Health and Nutrition Examination Survey (N=3,583) and the 2004 and 2007 Surveys of Consumer Finances (*N*=7,224). We fit ordinal logistic models to assess the link between food budgets and respondent-rated general health in each sample. A larger food budget predicts better health. This is mediated by higher spending on dining out. Given a fixed food budget, a 10% increase in the portion spent on eating at home predicts lower odds of better individual health (OR=0.93, 95% CI=(0.88-0.99)) and household health (OR=0.95, 95% CI=(0.91-0.99)). Net of income and education, we find no evidence that increased spending on food consumed at home is associated with better health. Higher spending on dining out is not linked to worse general health, and may be associated with better health.

Key words: Food spending; Food away from home; Self-rated health

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Introduction

Nutritional disparities between rich and poor are central to the link between low socioeconomic status and poor health (James et al., 1997). Diet affects present health and life expectancy (Mokdad et al., 2004), and dietary problems such as food insecurity, malnutrition and overeating have motivated a wide range of policy efforts (Barrett, 2002). The theoretical backbone of these efforts is the understanding that, first, nutritious food is expensive (Maillot et al., 2007), and second, food consumed at home is best (Lin et al., 1999). While a large body of research has assessed the link between food expenditures, nutrition, and health risk factors such as overweight and obesity (Drewnowski and Specter, 2004), the ultimate effect of food spending on adults' general health is unknown. Prior research speculates, but does not show, that higher food expenditures and a greater share of the food budget devoted to eating at home predict better health (Beydoun et al., 2009; Drewnowski and Specter, 2004).

Our study links the size and composition of households' food budget to household and individual self-rated health using data from two nationally representative, cross-sectional surveys. Research on disparities in socioeconomic status, nutrition and health anticipates that greater spending on food consumed in the home should lead to better health. We address this by testing the following hypotheses. First, that greater spending on food predicts better health. Second, that greater spending on food consumed at home predicts better health. And third, that spending a greater share of the household food budget on food consumed at home predicts better health.

Literature review

Fundamental cause theory argues that the well-off maintain a health advantage over the poor by using various resources – money, knowledge, social ties – to protect and improve their health (Link and Phelan, 1995). Part of the socioeconomic gradient in health is attributed to a parallel gradient in nutrition: rich people can afford to eat higher quality food than the poor (Darmon and Drewnowski, 2008; Phelan et al., 2010). Food that supplies adequate and appropriate nutrients often costs more than "junk" food, which may provide energy but not essential micronutrients (Maillot et al., 2007). For example, fruits and vegetables cost much more per gram and per calorie than refined grains and sweets (Cassady et al., 2007; Drewnowski and Darmon, 2005). Since nutritious food is relatively expensive, a higher food budget should free households to buy such nutritive foods, and pass over cheap but nutritionally inadequate alternatives (Darmon et al., 2002; Inglis et al., 2009; Monsivais et al., 2010). In consequence, households that spend more on food should enjoy better health.

Further, prior studies suggest this association should be driven by spending on food consumed at home. Restaurants have been criticized for serving ever-increasing portions of high-calorie foods with little nutritional value (Ledikwe et al., 2005; Lin et al., 1999). Households that allocate a higher share of their food budget to dining out are more exposed to expensive, non-nutritive restaurant fare (Beydoun et al., 2009; Mancino et al., 2009). By contrast, households that allocate a higher share of their food budget to food consumed at home should have greater control over nutrient intake and portion sizes (Lin et al., 1999). So net of the size of the household food budget, spending a greater share on food eaten at home should predict better health.

But prior research does not exclude the possibility that dining out simply does not affect health. Nor does it exclude mechanisms by which higher spending on dining out might improve health. First, dining out can increase dietary variety. Restaurants are equipped to quickly and cheaply prepare a wide range of foods consumers either cannot or will not prepare at home (Yoo et al., 2006; You et al., 2009). Second, dining out may limit later snacking, since large restaurant portions displace food consumption at home (Anderson and Matsa, 2011). Third, increased spending on dining out need not mean increased portions of low-quality restaurant food. Rather, increased spending could mean households are trading up to higher quality, more nutritious restaurant food (Drewnowski and Darmon, 2005), and going beyond the fast-food fare associated with eating away from home (Stewart and Yen, 2004).

Though dining out may be harmless or even beneficial, American policies, from the Food Stamp Act of 1964 to proposed taxes on fast food in the 21st century, lean heavily on the assumption that spending on food consumed at home promotes health. The Supplemental Nutrition Assistance Program, formerly the Food Stamp Program, is based on a Thrifty Food Plan that expects households to buy raw ingredients and "cook from scratch" (Rose, 2007; Stewart and Blisard, 2006). This program and the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) provide vouchers or electronic balance transfer cards that can be used to buy groceries, but not to buy prepared foods or pay for restaurant meals (Barrett, 2002). Adults who report Food Stamp authorization within the past year also report fewer meals away from home compared to income-eligible adults who do not report Food Stamp authorization (Jilcott et al., 2011). Holding household income constant, households that participate in the Food Stamp Program spend more on food consumed at home and less on food

away from home than comparable households that do not participate in the program (Wilde et al., 2009).

Other policies encourage consuming food at home without giving households an in-kind transfer. In many states, groceries are exempt from state or local sales taxes (Federation of Tax Administrators, 2011). Some municipalities have sought more direct ways to discourage consumers from eating out, as by limiting the development of new fast food restaurants (Diller and Graff, 2011; Sturm and Cohen, 2009). Whereas established food assistance programs aim to increase both the amount of money and proportion of the total food budget households spend on food consumed at home, these initiatives are aimed more narrowly at getting consumers to substitute eating at home for dining out.

Although nutrition assistance programs have subsidized food consumption at home, there is surprisingly little evidence on the link between food spending and general health. Several studies assess the effect of food spending on diet composition and nutrient intake. Greater food expenditures correlate with eating foods low in energy and high in recommended nutrients (Drewnowski and Specter, 2004; Inglis et al., 2009). In turn, diets rich in fruits, vegetables, whole grains, and lean protein predict lower risks of mortality, low self-rated health and chronic diseases such as diabetes (Kant, 2004; Montonen et al., 2005; Osler et al., 2001). Other studies address the effect of food insecurity on various health measures. Food insecurity, defined as inadequate or unstable access to food, predicts greater risk of low self-rated health, chronic disease, and depression (Seligman et al., 2010; Stuff et al., 2004; Vozoris and Tarasuk, 2003). But policies aimed at increasing the food expenditures of low-income households may also have detrimental effects on their health (Alston et al., 2009). For example, among women, participation in the Food Stamp Program is linked to higher body weight and a greater risk of

obesity (Chen et al., 2005; Gibson, 2003; Zagorsky and Smith, 2009), which is associated with increased risk of poor health (Billington et al., 2000). Thus the correspondence between food expenditures and general health outcomes remains unclear, particularly among households not at risk for food insecurity.

Methods

Data

We use data from two repeated cross-sectional surveys, the Survey of Consumer Finances (SCF), sponsored by the Federal Reserve Board, and the National Health and Nutrition Examination Survey (NHANES), conducted by the Centers for Disease Control and Prevention. The SCF is conducted every three years with a sample of about 4,500 heads of households. The SCF combines a nationally representative sample of households with an oversample of wealthy households. The data file includes weights to account for this sampling strategy and uses multiple imputation to fill in missing data (Kennickell and Woodburn, 1999). Our SCF sample includes 7,224 SCF respondents age 18-65 interviewed in 2004 or 2007.

Since 1999, the NHANES has interviewed a nationally representative sample of approximately 10,000 persons over two-year periods. NHANES uses a multistage, complex sample design to select participants, and the survey weights adjust for the unequal probabilities of selection and non-response. These weights also adjust for the oversample of African-Americans, Hispanics, and people over 60. Although 4,757 respondents age 18-65 were interviewed in 2007-2008, our NHANES sample includes the 3,583 respondents with complete information on the variables in our analysis.

Outcomes

Our outcomes are household and individual adult health, as rated by the respondent. Self-rated health reliably predicts mortality and morbidity (Idler and Benyamini, 1997; Idler et al., 2000). In the SCF, heads of household rate their own health on a four-point scale: Poor, Fair, Good or Very Good. If married, they also rate their spouse's health on the same scale. Previous work shows spouse-rated health predicts mortality equally well compared to self-rated health (Ayalon and Covinsky, 2009). We construct a three-point household health index, distinguishing among households where both adults are in poor or fair health; households where one adult is in poor or fair health but the other one is not; and households where neither the head nor the spouse are in poor or fair health. Households where the head is not married can only fall into the first or third category. In the NHANES, respondents rate their own health on a five-point scale, with an Excellent category added to the SCF scale. We use this as a measure of individual health.

Predictors

Our main predictors are the size and composition of the household food budget. The household food budget is self reported and is decomposed into home, carry out or delivery, and eating out food expenditures. In the SCF, respondents report how much they spent on food in each category over a time period of their choice, from one day to a full year. In the NHANES, respondents report their food expenditures for carry out or delivery and eating out over the last 30 days. Rather than directly estimating their home food expenditures, respondents report their grocery store expenses for food and non-food items, as well as their food expenditures at other stores, over the last 30 days. Therefore, for the NHANES sample, we define home food expenditure as the sum of grocery store expenditures and food spending at other stores, less money spent at

grocery stores on non-food items. We standardize self-reported household food expenditures to dollars per person per week, adjusted for inflation in the case of 2004 SCF respondents. In our regression models, we use the log of food expenditures to correct for skew. We also divide home food expenditure by total food expenditure to obtain a percent of the household food budget spent on food consumed at home.

In both surveys, we control for age, sex, race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, or other race), marital status (married vs. all others) and household size. To adjust for education, we derive a binary measure of ever having completed a bachelor's or higher degree. In the SCF, we control for total household income, logged to correct for skew. In the NHANES, we control for household income as a percent of the federal poverty line. This variable is top-coded at 500%.

Plan of analysis

We begin by describing the demographic characteristics, socioeconomic status, food expenditures and general health of our two samples. Using the household and individual health scales as the outcomes, we fit three ordinal logistic regression models to test our hypotheses in each sample. In a first model, we estimate the association between total food expenditure and general health, net of demographic controls. In a second model, we decompose total food expenditure into expenditures on eating at home, carry out or delivery, and eating out. In a third model, we test the effect of spending a greater share of the food budget on eating at home, holding total food expenditures constant. We also fit all three models while adjusting for income and educational attainment, which are likely confounders of any relationship between food expenditure and health. All models include survey weights, and the SCF models use multiply

imputed data. For the NHANES sample, we also account for the survey stratification and clustering in the variance estimates. We do not use this technique with the SCF sample, as the necessary variables are not publicly available. All statistical analyses are performed in STATA 11.2 (Stata Corp. 2009, College Station, TX).

Results

Table 1 presents descriptive statistics for both data sets. Since the NHANES samples persons and the SCF samples households, the samples differ on key demographic variables. The SCF sample is older, predominantly male, better educated and more affluent. The average household income in the SCF is $83,600, while the mean household income in the NHANES corresponds to 313% of the federal poverty line, or $53,700 for a family of three (Social Security Administration, 2011). As SCF respondents tend to have more income, they also spend more money on food: $65 per person per week, on average, as opposed to $53 per person per week in the NHANES. In both samples, households spend most of their food budget on food consumed at home. In the NHANES, about 90% of households spend 50% or more of their food budget on food at home, and one in four households spends at least 90% on food consumed at home. In the SCF, about 85% of households spend at least half of their food budget on food at home, while 15% spend at least 90% of that budget on food at home.

[Table 1 about here]

Fifteen percent of NHANES respondents and 21% of SCF respondents report fair or poor self-rated health. In the SCF, heads of household also rate their spouse's health; out of 4,848 married respondents, 16% report their spouse to be in fair or poor health. In the following analyses, we use the original NHANES five-point scale as a measure of individual self-rated

health. We combine SCF respondents' ratings of their own and their spouse's health into a three point scale measuring household health.

[Table 2 about here]

Table 2 presents odds ratios and 95% confidence intervals from ordinal logistic models of respondent-rated general health. The odds ratios are adjusted for age, gender, race, marital status and household size. In Model 1, we find a unit increase in log total food expenditure predicts 45% greater odds of having better individual health and 79% greater odds of having better household health. Model 1 shows higher total food expenditures are associated with better health. In Model 2, we decompose food expenditures into food consumed at home, carry out or delivery food, and food consumed in restaurants. Expenditures on food at home predict better household health but not better individual health. Expenditures on dining out predict both better individual and household health, and show a stronger association with either outcome than other types of food spending. Model 3 provides further evidence that the association between total food spending and better health is driven by eating out and not by eating at home: holding the total food budget constant, a 10% increase in the portion of the food budget going towards eating at home predicts a 12% decrease in the odds of better individual health and a 10% decrease in the odds of better household health.

[Table 3 about here]

We find total food spending predicts better health through greater spending on dining out, and increased spending on eating at home predicts worse health, holding the total food budget constant. These findings may be confounded by household socioeconomic status. More affluent households enjoy better health, spend more on food, and are more likely to eat out. In Table 3, we fit the same models as in Table 2, now adjusting for respondent's education and household

income. Both education and income strongly predict better health. In Model 1, log total food expenditures now exhibit a weaker, but still significant association with better household health. Model 2 shows that this association is now driven solely by spending on dining out. And in Model 3, we find that net of income and education, each 10% increase in the portion of the food budget spent at home still predicts a 7% decrease in the odds of better individual health and a 5% decrease in the odds of better household health. Holding income and education constant, spending more on food consumed at home seems to have no association with health, and a negative association holding the size of the total food budget constant.

We test the robustness of our findings in several ways. First, we consider the possibility that spending on food at home may be more important to the health of poor households. Among households with an annual income below $20,000, the association between food budget and household health is the same as in the main analysis. But in the NHANES data, neither total food spending nor the share spent on food at home is significantly associated with individual health. Second, we consider reverse causality, where poor health precludes people from dining out. We restrict the NHANES sample to people reporting zero days in the past month where they were inactive due to health problems or where pain interfered with their usual activities. Under this condition, income and education fully explain the association between food budgets and individual health.

We also repeat our analyses after imputing missing NHANES data and recoding the outcome variables. We use multiple imputation to recover missing data on the independent variables, increasing the number of NHANES cases to 4,219. Results from the imputed NHANES data set match our main analysis. We collapse the two health scales into binary indicators of the respondent (or spouse, if applicable) being in fair or poor health. Logistic

regressions using these measures agree with our main analysis. Separate analyses of respondents'

and spouses' health in the SCF also match our main findings. In our main analysis and these

sensitivity checks, the association between total food spending and health, when significant, is

driven by spending on dining out. Net of the total food budget, the association between the share

spent on food at home and health is either negative or not significant. Regression results from all

sensitivity checks are not shown, but available on request.

Discussion and conclusions

We illustrate our findings with predicted probabilities of fair or poor general health for

individuals (NHANES) and for households (SCF) in Figure 1. The figure predicts individual and

household health for an average family on a fixed income, varying the amount of money they

spend on food and the proportion of their food budget they spend on food consumed at home. In

the case of household health, a household spending $30 per person per week on food and

spending no money on eating out has a 0.25 probability of either adult being in fair or poor

health. If this household devotes an additional $30 per person per week to food at home, this

probability decreases to 0.22. But this probability could decrease even further, to 0.18, if the

extra $30 were spent on food outside the home. In the case of individual health, increasing the

food budget does not affect the probability of a respondent being in fair or poor health, net of

income. But spending 50% rather than 100% of the total food budget on eating at home still

predicts a reduction in this probability, from 0.21 to 0.14.

[Figure 1 about here]

Contemporary food policy expects that spending more money on food consumed at home

is linked to better health. Our study tests if food expenditures, particularly on food consumed at

home, are associated with better individual and household health as rated by survey respondents. Our first hypothesis is that higher total food expenditures predict better health. We find this is true, but largely explained by the higher income and educational attainment of households that spend more money on all food. Our second hypothesis is that higher expenditures on food consumed at home are associated with better health, and our third hypothesis predicts that a greater share of a given food budget spent on food at home is associated with better health. Net of education and income, we find no support for either hypothesis. On the contrary, we find that greater spending on eating out – in absolute and proportional terms – is associated with better health.

Our study is the first to analyze how total food expenditures and the composition of the food budget are related to adult respondent-rated general health. In doing so, we add to previous studies of food expenditures and diet quality or health risk factors such as obesity. We combine recent survey data on individuals and households to show better general health is linked to greater expenditures on dining out, and not to greater expenditures on food consumed at home. Despite differences in study design and outcome measurement, we find greater spending on food consumed at home is not associated with better health net of socioeconomic status, and is even associated with worse health given a fixed food budget. This important finding is limited by the design of our study. In our cross-sectional samples, we cannot assess if higher food expenditures cause better health. We also cannot distinguish how food spending breaks down into spending on quantity and spending on quality. Despite these limitations, our findings suggest that even if interventions improve household health by encouraging greater spending on food, they will not improve health by encouraging households to spend more of a fixed food budget on food consumed at home.

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Table 1. Means and standard errors[a]

	NHANES 2007-2008 N=3583		SCF 2004 and 2007 N=7224	
	Mean	S.E.	Mean	S.E.
Individual health				
Scale 1-5	3.42	(0.04)	-	
Respondent in fair or poor health	14.74%		-	
Household health				
Scale 1-3	-		2.59	(0.01)
Respondent in fair or poor health	-		21.19%	
Spouse in fair or poor health	-		15.55%[c]	
Food expenditure per person per week[b]				
Total	53.10	(2.10)	65.23	(0.65)
At home	34.84	(1.08)	43.91	(0.39)
Carry out or delivery	2.32	(0.20)	1.78	(0.10)
Dining out	15.94	(1.21)	19.54	(0.41)
% spent on food at home	71.09%	(0.09)	72.38%	(0.26)
Age (years)	40.96	(0.40)	43.24	(0.17)
Female	42.85%		24.84%	
Black	11.45%		14.06%	
Hispanic	13.80%		10.57%	
Other race	5.50%		4.47%	
Married	61.86%		51.99%	
Household size	3.17	(0.06)	2.77	(0.02)
Bachelor's or higher degree	26.22%		31.67%	
Household income[b]				
Continuous (in $1,000s)	-		83.60	(1.27)
% of poverty line	312.92	(10.39)	-	

[a] Survey weights applied. SCF means adjusted for multiple imputation.

[b] In 2007 dollars.

[c] Out of 4,848 households where head is married

Table 2. Odds ratios and 95% CI from ordinal logistic models of respondent-rated general health[a]

	Individual health scale (NHANES 2007-2008)			Household health scale (SCF 2004 and 2007)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Food expenditure per person per week[b]						
Log total	1.45* (1.19-1.78)	-	1.24* (1.03-1.49)	1.79* (1.57-2.05)	-	1.69* (1.49-1.93)
Log at home	-	0.96 (0.81-1.13)	-	-	1.27* (1.11-1.45)	-
Log carry out/delivery	-	1.13 (0.99-1.29)	-	-	1.02 (0.94-1.11)	-
Log dining out	-	1.29* (1.13-1.48)	-	-	1.39* (1.31-1.48)	-
% spent on food at home[c]	-	-	0.88* (0.82-0.94)	-	-	0.90* (0.87-0.94)

* $p < .05$, two-tailed test

[a] Survey weights applied. SCF models use multiply imputed data. Odds ratios adjusted for age, gender, race, marital status and household size.

[b] In 2007 dollars.

[c] In increments of 10%

Table 3. Odds ratios and 95% CI from ordinal logistic models of respondent-rated general health, adjusted for education and income[a]

	Individual health scale (NHANES 2007-2008)			Household health scale (SCF 2004 and 2007)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Food expenditure per person per week[b]						
Log total	1.05 (0.86-1.29)	-	0.97 (0.80-1.18)	1.33* (1.14-1.55)	-	1.33* (1.14-1.54)
Log at home	-	0.89 (0.75-1.04)	-	-	1.14 (1.00-1.31)	-
Log carry out/delivery	-	1.05 (0.92-1.21)	-	-	0.99 (0.91-1.08)	-
Log dining out	-	1.10 (0.97-1.25)	-	-	1.23* (1.15-1.32)	-
% spent on food at home[c]	-	-	0.93* (0.88-0.99)	-	-	0.95* (0.91-0.99)
Bachelor's degree	1.82* (1.48-2.24)	1.77* (1.45-2.16)	1.77* (1.46-2.15)	2.24* (1.88-2.68)	2.19* (1.83-2.61)	2.22* (1.86-2.65)
Household income[b]						
Log continuous	-	-	-	1.43* (1.26-1.63)	1.38* (1.22-1.55)	1.40* (1.24-1.59)
% of poverty line[d]	1.05* (1.04-1.07)	1.05* (1.03-1.07)	1.05* (1.03-1.07)	-	-	-

* $p < .05$, two-tailed test

[a] Survey weights applied. SCF models use multiply imputed data. Odds ratios adjusted for age, gender, race, marital status and household size.
[b] In 2007 dollars.
[c] In increments of 10%
[d] In increments of 20%

Figure 1. Predicted probabilities of fair or poor health vs. total food budget and proportion spent on eating at home.
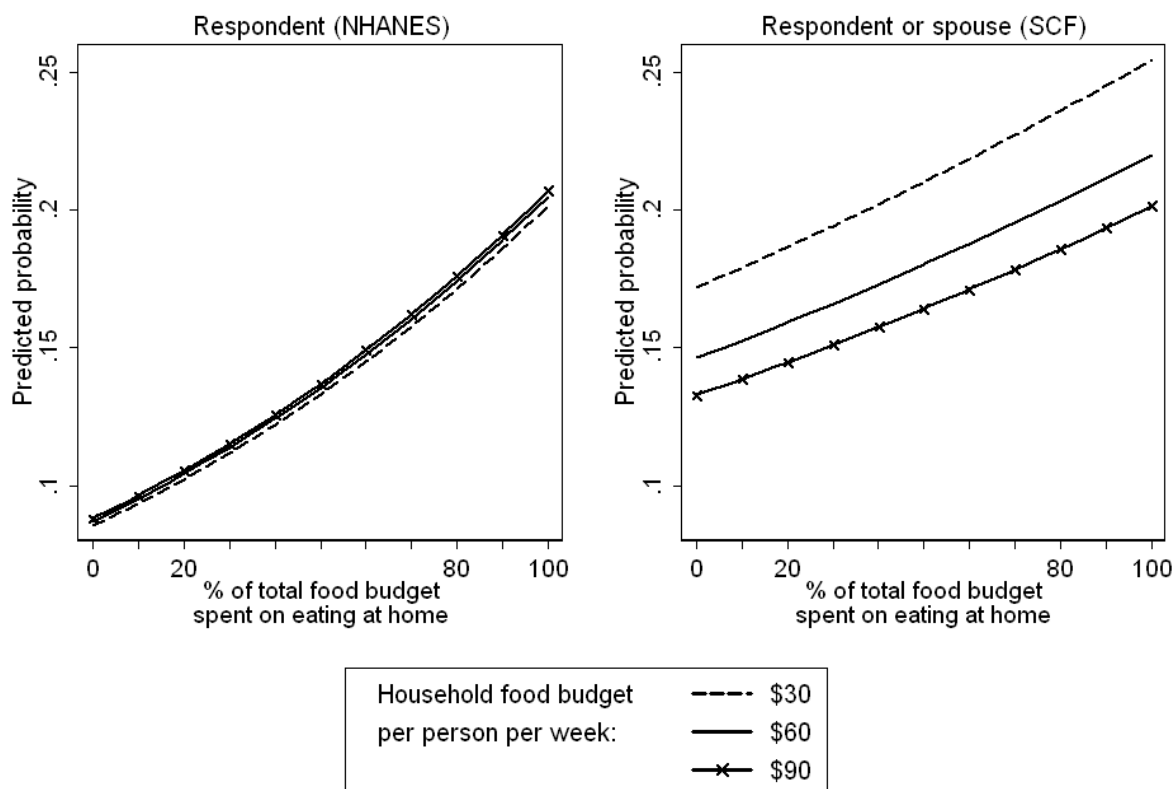
* Predicted probabilities from logistic regressions adjusting for age, sex, race, marital status, household size, education and income