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Food Preferences and Coping Strategies among Diabetic and Nondiabetic Households Served by US Food Pantries

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Abstract

Limited access to healthy food caused by food insecurity makes diabetes mellitus (DM) self-management more challenging. Using data from *Hunger in America 2014* (n = 60,122 US food pantry users), we sought to understand food preferences and coping strategy utilization (e.g. choosing between paying for food and medical care) among households seeking assistance from US food pantries with and without DM members. The prevalence of wanting and not obtaining fruits, vegetables, dairy, and protein was high among all households. After adjusting for sociodemographic characteristics, households with DM members were more likely to want and not obtain fruits, vegetables, and dairy, and were also more likely to use several coping strategies to increase food access, compared to households without DM members. These results highlight the high demand for healthy food items among clients from US food pantries, particularly among households with DM, as well as the extra burden DM may place on food insecure households.

Keywords

food insecurity; food pantries; diabetes mellitus; coping strategies

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Introduction:

Food insecurity is the economic and social condition of limited or uncertain access to adequate food at the household level.[1] During 2016, 12.3 percent of US households experienced food insecurity.[2] Food insecurity has been associated with poor overall health and chronic diseases including hypertension, obesity, and type 2 diabetes mellitus (DM).[3–5] Type 2 DM is more prevalent in food insecure households, and food insecurity is a risk factor for developing type 2 DM.[4,6–7]

Lifestyle modification focused on strict dietary adherence is a cornerstone of DM management and prevention.[8] Numerous large-scale trials, including Look AHEAD and the Diabetes Prevention Program, have shown the importance of a healthy diet for supporting glycemic control among those with DM, and for preventing the progression to type 2 DM among those at risk.[9–10] Food insecurity makes it more challenging to follow through with guidelines set forth in diabetes nutritional education partly because shifting dietary intake to adhere with these recommendations can be cost prohibitive. Indeed, poorer quality diets consisting of lower nutritional value foods often cost less per calorie,[11] and the price for healthier foods such as fruits and vegetables is consistently greater than the price of less healthy foods.[12–13] The gap in cost between healthy and less healthy foods continues to increase.[12–13]

A common coping strategy to increase food access in food insecure households is utilization of food pantries and emergency food services, and studies have shown that a majority of food pantry users report being food insecure.[14–16] Additional coping strategies used include shifting dietary intake towards cheaper and more obesogenic foods, over-consuming in times of food adequacy alternating with reducing intake in times of food inadequacy, and making food budget adjustments (e.g. choosing between paying for food and paying for other essentials such as medical care, housing, or utilities).[6,17] Households with food insecurity often need to employ multiple coping strategies in order to obtain adequate food.[18–19] For individuals with DM living in food insecure households, these tactics may lead to worsening glycemic control and increased risk for diabetes-associated complications over time.[20–21]

Unlike the typical pattern of food pantry utilization of earlier decades, in which pantries were used to meet sporadic and emergency need for food, the rise in chronic food inadequacy has forced many food insecure households to rely on food pantries as a regular strategy to make ends meet. Further, food pantries distribute food to an increased number of clients compared to years past, especially following the 2008-2009 recession.[16] Given these demographic trends suggesting that food pantries are becoming an increasingly important source of food for many households with DM members, we sought to better understand the types of foods that households with and without DM desire from US food pantries, as well as the prevalence of coping strategies utilized in order to obtain adequate food. We hypothesized that, among households utilizing food pantries, those with DM members would be more likely to want healthy foods due to a motivation for glycemic control and increased referrals to nutrition education compared to those without DM members. We further hypothesized that, among households utilizing food pantries, those with DM

members would be more likely to use coping strategies to obtain adequate food due to the expense of having a chronic disease compared to those without DM members.

Methods:

Setting and sample:

Hunger in America 2014 was a national survey of 60,122 households receiving assistance from US food pantries and free meal programs affiliated with the Feeding America network of food banks. Participants were recruited for the survey between April 2013 and August 2013 by trained data collectors who were staff members or volunteers for the participating food banks. The survey was available in 5 languages (English, Spanish, Mandarin Chinese, Russian, and Vietnamese) and performed using a touchscreen tablet with Audio Computer-Assisted Self-Interview (ACASI) technology. The survey could be completed by the respondent independently or with proxy assistance. Only one individual in each household was selected to participate on the household's behalf.

The probability sampling strategy for participant selection used a four-stage approach with the stages of selection including (1) the agency (e.g. site) at which data collection should occur, (2) the programs within the agency (food pantry or free meal program), (3) the day/hours on which data collection should occur, and (4) the individuals asked to complete the survey. Probability sampling allowed one member representing each household a known, positive chance of being selected, making it possible to use the sample for population-level estimates.

Children less than 18 years old and adults with severe cognitive and mental health disabilities were excluded from participating in the survey. Of the 60,122 individuals completing the survey (overall response rate 61.9%), the 86.8% (n = 52,213) receiving assistance from food pantries (rather than other meal programs, such as congregate meal sites or free dining rooms) were included in this analysis. We excluded participants who did not respond to the question on household history of DM and those who did not know their household DM status (4.7%), for a total sample of 49,751 individuals (Figure 1).

Measures:

Our primary predictor was a household history of DM, assessed by self-report (yes/no/don't know) to the following question: "Have you or anyone living in your household ever been told by a doctor or other health professional that they have diabetes?" Our primary outcome, types of food wanted and unable to be obtained, was assessed with the following question: "What type of food or products do you want but do not usually get from this program?" Participants could select multiple options including fruits/vegetables, proteins, grains, dairy, and non-food items (i.e. soap, diapers).

Our secondary outcome was coping strategies households utilized in order to get enough food. We included all coping strategies queried in the survey: (1) buying the cheapest food available knowing it was not the healthiest option, (2) receiving help from family or friends, (3) selling or pawning personal property, (4) growing food in a home or community garden, (5) buying food in dented or damaged packages to save money, (6) consuming food after its

expiration date, and (7) watering down food or drinks to make them last longer. Participants were asked in a series of 7 questions whether they or others in their households had to use these coping strategies in the past 12 months (yes/no). Spending trade-offs assessed included having to choose between paying for food and paying for (1) medications/medical care, (2) utilities, (3) rent or mortgage (housing), (4) transportation, and (5) education. Participants were asked in a series of 5 questions if, over the preceding 12 months, they or anyone in their household had to choose between paying for food and paying for one of these essentials (every month, some months during the year, 1 or 2 times a year, or never). We collapsed the 4 possible responses into a dichotomous outcome representing any use versus no use in the preceding 12 months. We assessed each coping strategy utilized individually and also calculated the total number of coping strategies utilized.

Characteristics of the primary survey respondents assessed included age, sex, race/ethnicity (White, Black or African, Hispanic/Latino, Asian, American Indian or Alaska Native, Native Hawaiian or other Pacific Islander, or other race or origin), and educational level (less than high school, high school or equivalent, some college/2 year degree, and college graduate or higher). Household sociodemographic characteristics included size, annual income, insurance status, and food security status. Annual household income was examined across 4 categories (less than $10,000; $10,000-20,000; $20,000-30,000; and greater than $30,000) and used to determine percentage of the federal poverty line (FPL). For health insurance status, participants were asked “Do you or anyone in your household currently have any kind of health insurance?” Food security status was evaluated using the short-form of the Core Food Security Module, a 6-item scale created by the US Department of Agriculture.[22] This module allows for categorization of households as food secure, having access at all times to enough food for a healthy lifestyle, or food insecure, having limited or uncertain access to adequate food due to a lack of money or other resources. By established convention, participants providing affirmative answers to 2 or more of the 6 food security items were considered food insecure.[22] Missing data for all food preference questions was 5.6%, for each individual coping strategy utilized ranged from 3.4% - 8.0%, and for adjusted model covariates, described below, less than 2.5% except household size (4.2%) and annual income (16.8%). 70% of participants completed all 12 coping strategy utilization questions.

Data analysis:

Weights accounting for the likelihood of being selected at each stage of sampling were computed prior to analysis. All analyses accounted for these sampling weights using the SVY commands in STATA 14.1 (StataCorp, College Station, TX). Statistical significance was based on a type I error rate of 0.05. Categorical variables were summarized by prevalence and continuous variables were represented by means. The characteristics of the primary survey respondents representing households with and without DM, as well as household-level sociodemographic characteristics, were compared using X^2 tests for categorical variables and t-tests for continuous variables.

We evaluated the unadjusted association between a household history of DM and the outcomes of food preferences, individual coping strategies utilized, and total number of coping strategies utilized with X^2 tests. We next used logistic regression models to examine

adjusted associations between a household history of DM and the outcomes of food preferences and coping strategy utilizations. The logistic regression models calculated adjusted odds ratios (ORs), 95% confidence intervals (CIs), and statistical significance (p-values) after adjusting for the household-level covariates of household size, annual household income, and health insurance status. All covariates were chosen given their potential role as confounders in the association between the predictor and outcomes.[23–25] In a sensitivity analysis, we included respondent race/ethnicity and education level into the regression models because these are generally correlated within a household. These covariates were not included in the main analysis because they were asked at the individual-level, while the other variables were assessed at the household-level. Model adequacy was assessed both graphically, plotting expected probabilities versus observed outcomes in deciles and assessing fit along the diagonal, and via goodness-of-fit testing for logistic regression models fitted from survey sample data.[26]

Results:

Respondent and household sociodemographic characteristics:

The total sample included 17,472 participants representing households with DM members (34.2%) and 32,279 representing households without DM members (65.8%). Sociodemographic characteristic of respondents and their households are summarized in Table 1. Survey respondents were predominantly female (69.6%) and had a mean age of 49.4 years. Respondents representing households with DM were more likely to be Black or Hispanic/Latino compared to respondents representing households without DM. Education level attainment was overall lower among respondents representing DM households.

There was no statistically significant difference in the prevalence of poverty between households with and without DM (71.8% vs 72.1%; $p = 0.75$). More than 85% of households reported experiencing food insecurity at some point during the past 12 months, with a trend toward an increased rate of food insecurity reported among DM households compared to non-DM households (86.2% vs 84.8%; $p = 0.07$). More than a quarter of respondents reported that everyone in their household was uninsured, but the prevalence of having no insurance was 8% lower in those households with DM compared to those without.

Food preferences:

The prevalence of types of food wanted and unable to be obtained from US food pantries are listed in Table 2. Among all households, desire (“wanting and not being able to obtain”) for perishable items from the food pantry was high. More than 56% of households wanted but could not obtain fruits/vegetables; 48%, proteins; and 42%, dairy. Fewer households reported wanting and not obtaining less perishable items, including grains (14.5%) and non-food products (19.7%). A higher percentage of households with DM wanted and were unable to obtain fruits/vegetables (59.1% vs 55.0%; $p < 0.01$), proteins (50.0% vs 47.4%; $p = 0.03$), and dairy (43.8% vs 41.1%; $p = 0.01$) compared to households without DM.

After adjusting for household size, annual household income, and health insurance status, households with DM had a significantly higher odds of wanting and being unable to obtain

fruits/vegetables (OR 1.17, 95% CI 1.06-1.30; $p < 0.01$) and dairy products (OR 1.14, 95% CI 1.03-1.26; $p = 0.01$) compared to households without DM (Table 2). Sensitivity analysis including individual-level sociodemographic characteristics (race/ethnicity and education level) as covariates did not significantly alter the results.

Coping Strategy Utilization:

The prevalence of coping strategy utilizations by households with and without DM are summarized in Table 3. Nearly all households reported using at least one coping strategy in the preceding 12 months (95.7%). Of all the coping strategies assessed, purchasing the cheapest food available knowing it was not the healthiest option was the most common, present in more than 80% of all households. Households reported having to choose between paying for food and paying for the following expenses at some point in the preceding 12 months: medical care (67.7%), utilities (71.9%), housing (58.7%), and transportation (68.9%). Households chose between paying for food and paying for educational expenses less frequently (31.5%), likely because many households did not have any educational expenses. Overall, the mean number of coping strategies utilized was higher in households with DM compared to those without (6.8 vs 6.4; $p < 0.001$) (Figure 2).

After adjusting for household size, annual household income, and health insurance status, households with DM had higher odds of growing food in a home or community garden (OR 1.14, 95% CI 1.02-1.28; $p = 0.02$), buying food in dented or damaged packages (OR 1.21, 95% CI 1.10-1.34; $p < 0.01$), consuming food after its expiration date (OR 1.31, 95% CI 1.17-1.45; $p < 0.01$), and watering down food or drinks to make them last longer (OR 1.16, 95% CI 1.05-1.28; $p < 0.01$) compared to households without DM. In terms of spending trade-offs, households with DM had higher odds of choosing between paying for food and paying for medical care (OR 1.69, 95% CI 1.51-1.89; $p < 0.01$), utilities (OR 1.20, 95% CI 1.07-1.35; $p < 0.01$), and transportation (OR 1.16, 95% CI 1.04-1.30; $p < 0.01$) compared to households without DM, after adjusting for the household-level covariates (Table 3). Sensitivity analysis including individual-level sociodemographic characteristics (race/ethnicity and education level) as covariates did not significantly alter the results.

Discussion:

In this study of individuals seeking assistance at US food pantries, the prevalence of wanting and not being able to obtain healthy food options including fruits, vegetables, dairy, and protein was high. This finding may reflect the general desire across the US for increased availability of healthy foods, including at food pantries.[27–29] Alternatively, this finding may reflect the more limited availability of these healthy perishable products at food pantries in general. Although the food pantry and food banking system has markedly increased the nutrient content of available foods over the last decade,[30–31] it is still a system that was originally designed for the distribution of shelf-stable food donations that are often dense in calories but poor in nutritional quality. Limited refrigeration capacity and a lack of volunteer coordinators may be important barriers for providing perishable products.[32–33] In our study, it was not surprising that grains were the least frequently requested items as these less perishable products tend to be readily available at most food pantries.[32,34]

Households with DM members had a higher odds of wanting and not obtaining fruits, vegetables, and dairy products compared to households without DM members. Given the important role these food groups play in DM management and prevention, in conjunction with the focus on these food groups in diabetes self-management education,[35] this outcome is not surprising. This finding may reflect increased referrals to nutritional counseling among individuals from DM households compared to those from non-DM households. In addition, a diagnosis of DM may act as a motivator for individuals in the entire household to improve diet quality. Although the magnitude of the effect we observed was small, this finding is notable due to trends towards increased food pantry usage and growing DM prevalence in the US,[16,36] combined with the extra burdens food insecurity places on DM management.

As DM is readily inheritable,[37] it is important that individuals with a personal or family history of DM have access to metabolically appropriate food options. Further, food insecurity rates are particularly high among adults with diet-sensitive cardiometabolic conditions, including DM.[38] As such, additional interventions may be warranted to increase the availability and appeal of these healthy food products for households with DM members seeking assistance at US food pantries. Initiatives are currently underway within the Feeding America network both on the supply-side (increasing the distribution of healthy foods in food pantries) and on the demand-side (using behavioral economics principles to support choosing healthier food options).

We also found that most households seeking assistance from US food pantries used numerous coping strategies in order to afford adequate food. Particularly relevant for dietary self-management of chronic diseases, 80% of households reported having to buy the cheapest food knowing it was not the healthiest option. Furthermore, more than two-thirds of all households had to choose between paying for food and paying for medical care, utilities, and transportation, and more than half had to choose between paying for food and housing. These findings are comparable to previous studies examining the use of coping strategies among food pantry clients.[18–19]

Households with DM reported even greater challenges in stretching their food budgets compared to households without DM, as demonstrated by the higher prevalence in the utilization of many of the coping strategies assessed. One explanation for this finding may be the increased out-of-pocket expenditures associated with DM care and its concomitant co-morbidities. In 2013, the average out-of-pocket spending per capita for an individual with DM in the US was 2.5 times higher than for an individual without DM ($1,922 vs $738), a gap that has been steadily increasing.[39] Further, individuals with DM and low income experience a greater out-of-pocket expenditure burden compared to those with DM and higher incomes.[40] Of note, among the spending trade-offs assessed, the difference in choosing between paying for food and paying for medical care between households with and without DM members was the most prominent. This finding could reflect greater medical expenses incurred by households with DM members compared to those without. It also may lead to cost-related medication non-adherence (CRN), defined as stretching or not filling prescription medications due to unaffordable out-of-pocket drug costs.[41] CRN is one hypothesized mechanism by which food insecurity may impact diabetes self-management.[42]

Strengths of this study include the use of a large multi-ethnic cohort with participants from food pantries across the US and the use of probabilistic sampling to create population-level estimates. However, our results must be interpreted within the context of a number of limitations. We cannot determine causality from a cross sectional study, and indeed it could be that households with the poorest food access (and therefore the greatest need and desire for healthier foods) are the ones at highest risk of DM (an “effect-cause” rather than the “cause-effect” we have described). In addition, this study examined participants’ perceptions of food availability at the pantry rather than an objective measure of food availability. Further, participants were asked in a single question which items they both “wanted and were unable to obtain”. As such, it is not clear the extent to which items that were not identified by participants were unwanted, or if they were wanted but obtainable at the pantry. Moreover, as not all participants reported food insecurity and only food pantry users were examined (rather than other meal programs), the extent to which the results apply to all food insecure households is unclear. Finally, the survey response rate has the potential to introduce bias.

In conclusion, households seeking assistance from US food pantries have a strong desire for healthy food and must utilize multiple coping strategies in order to access sufficient food. These challenges are particularly acute in households with DM members. Continued efforts to support healthier food availability in the food pantry setting are warranted, particularly among diabetic households.

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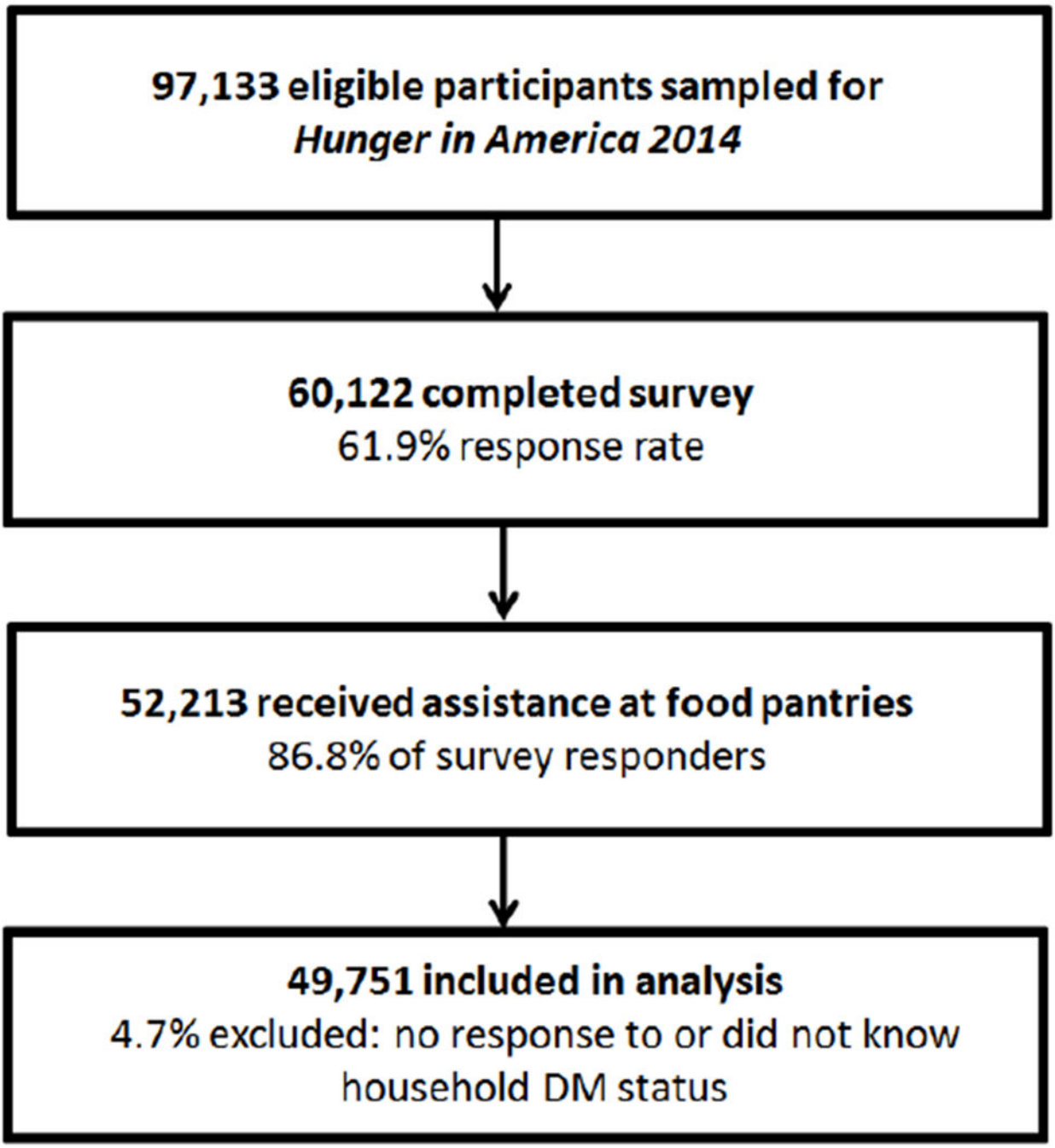

Figure 1:
Schematic of study sample

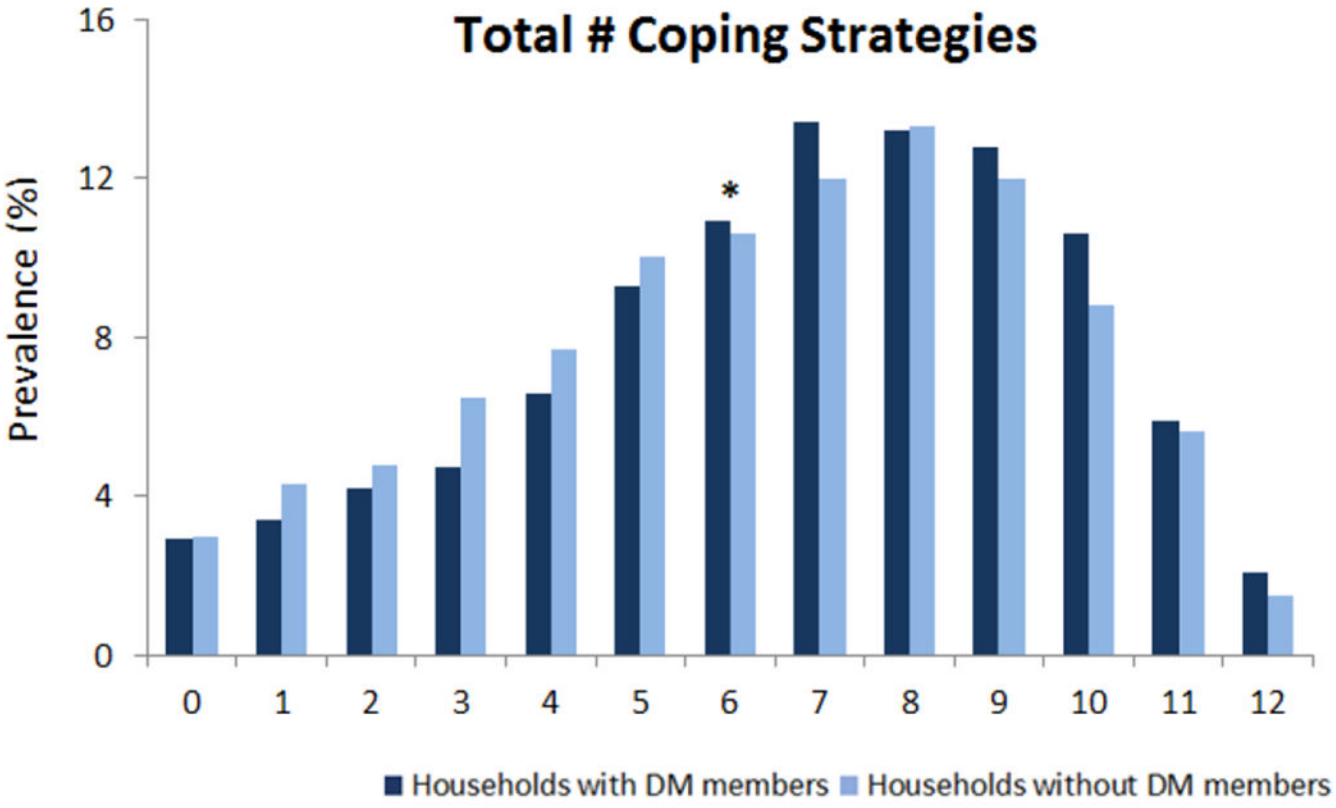

Figure 2:

Total number of coping strategies utilized by households with and without diabetes[a]

[a]Unadjusted prevalence for participants completing all 12 survey questions (70%). Weighted to account for survey study design

* Average: DM households: 6.8, non-DM households 6.4 ($p < 0.001$)

Table 1:

Primary survey respondent and household sociodemographic characteristics among households with and without diabetes[a]

	Total Households (49,751)	Household with DM members (17,472)	Household without DM members (32,279)	p-value[b]
Primary Survey Respondent Characteristics				
Gender (% female)	69.6%	70.1%	69.4%	0.50
Age, years (mean ± SE)	49.4 ± 0.2	53.9 ± 0.3	47.1 ± 0.2	< 0.001
Race/Ethnicity				0.03
Caucasian	48.9%	46.4%	50.1%	
African American	27.0%	28.0%	26.5%	
Hispanic/Latino	16.8%	17.6%	16.4%	
Asian American	1.5%	1.6%	1.5%	
Other[c]	5.9%	6.5%	5.6%	
Education Level				< 0.001
Less than high school	20.9%	23.1%	19.7%	
High School or equivalent	43.8%	43.2%	44.1%	
Some college/2 year degree	28.9%	27.9%	29.4%	
College graduate or higher	6.4%	5.7%	6.8%	
Household Sociodemographic Characteristics				
Household Size (mean ± SE)	3.08 ± 0.03	3.11 ± 0.05	3.06 ± 0.03	0.33
Annual Income				< 0.001
< $10,000	51.6%	49.6%	52.6%	
$10,000-20,000	29.1%	31.3%	28.0%	
$20,000-30,000	12.6%	13.7%	12.0%	
> $30,000	6.8%	5.5%	7.4%	
< 100% FPL[d]	72.0%	71.8%	72.1%	0.75
Uninsured[e]	27.4%	22.1%	30.1%	< 0.001
Food Insecure	85.3%	86.2%	84.8%	0.07

[a] Values represent unadjusted prevalence except age and household size (unadjusted means). All data are weighted to account for survey study design

[b] X^2 for all categorical variables; *t*-test for continuous variables

[c] Includes American Indian/Native Alaskan, Native Hawaiian/Pacific Islander, and other

[d] Federal poverty level, 2013 guidelines (https://aspe.hhs.gov/2013-poverty-guidelines)

[e] Health insurance status for primary survey respondent or anyone in household

Table 2:

Types of food and products requested and unable to be obtained among households with and without diabetes[a]

	Total Households (49,751)	Household with DM members (17,472)	Household without DM members (32,279)	p-value	AOR[b]	95% CI[b]	p-value[b]
Fruits/Vegetables	56.4%	59.1%	55.0%	< 0.01	1.17	1.06-1.30	< 0.01
Proteins	48.3%	50.0%	47.4%	0.03	1.09	0.98-1.20	0.11
Grains	14.5%	14.2%	14.7%	0.44	0.99	0.86-1.13	0.85
Dairy	42.1%	43.8%	41.1%	0.01	1.14	1.03-1.26	0.01
Non-food	19.7%	18.5%	20.3%	0.02	0.89	0.80-0.99	0.03

[a]Values for food and products represent unadjusted prevalence. All data are weighted to account for survey study design

[b]Adjusted odds ratios (AORs), 95% confidence intervals (CIs), and p-values adjusted for household size, annual household income, and health insurance status

Table 3:

Coping strategies utilized by households with and without diabetes[a]

	Total Households (49,751)	Household with DM members (17,472)	Household without DM members (32,279)	p-value	AOR[b]	95% CI[b]	p-value[b]
Choose Cheapest/Less Healthy Food	80.1%	81.4%	79.5%	0.02	1.09	0.96-1.23	0.20
Receive Help from Family/Friends	53.8%	51.8%	54.9%	< 0.01	0.89	0.80-0.98	0.02
Pawn Personal Property	36.1%	34.3%	37.1%	0.01	0.92	0.82-1.03	0.15
Grow own Food	23.7%	25.8%	22.5%	< 0.01	1.14	1.02-1.28	0.02
Buy Food in Dented/Damaged Packages	53.4%	56.6%	51.8%	< 0.01	1.21	1.10-1.34	< 0.01
Consume Expired Food	57.2%	60.8%	55.3%	< 0.01	1.31	1.17-1.45	< 0.01
Water Down Food/Drinks	40.6%	42.4%	39.7%	0.01	1.16	1.05-1.28	< 0.01
Spending Trade-offs[c]							
Food and Medical Care	67.7%	74.6%	64.1%	< 0.01	1.69	1.51-1.89	< 0.01
Food and Utilities	71.9%	74.4%	70.6%	< 0.01	1.20	1.07-1.35	< 0.01
Food and Housing	58.7%	59.3%	58.3%	0.45	1.03	0.93-1.16	0.56
Food and Transportation	68.9%	71.1%	67.7%	< 0.01	1.16	1.04-1.30	< 0.01
Food and Education	31.5%	31.0%	31.7%	0.48	0.96	0.86-1.07	0.46

[a] Values for coping strategies represent unadjusted prevalence. All data are weighted to account for survey study design

[b] Adjusted odds ratios (AORs), 95% confidence intervals (CIs), and p-values adjusted for household size, annual household income, and health insurance status

[c] Choosing between paying for food and paying for medical care, utilities, housing, transportation, and education