

Food Insecurity, Processes of Care, and Self-Reported Medication Underuse in Patients with Type 2 Diabetes: Results from the California Health Interview Survey

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Objective. To assess the independent association of food insecurity with processes of care and delays in filling prescriptions.

Data Source. 2007 California Health Interview Survey.

Study Design. Associations of food insecurity with processes of care and delays in filling prescriptions were examined using multivariable logistic regression analyses adjusted for sociodemographic characteristics, barriers to accessing care, and health status.

Data Extraction. Data were analyzed from adults currently receiving treatment for type 2 diabetes and who had seen a doctor in the prior 12 months ($N = 3,401$).

Principal Findings. For diabetes patients currently receiving medical care, food insecurity was not associated with lower rates of performance of recommended processes of care, but it was associated with delays in filling prescriptions (aOR = 2.15, 95 percent CI 1.25, 3.71).

Conclusions. Food insecurity may increase delays in filling prescriptions in daily life, even though the performance of recommended processes of care in the clinic is not diminished.

Key Words. Food insecurity, diabetes, quality of care, medication underuse

Barriers to accessing medical care, such as lack of insurance, low income, limited education, and lack of transportation, have been widely reported as important contributors to socioeconomic disparities in diabetes outcomes (Harris 2001; McBean et al. 2003; Brown et al. 2004; Heisler et al. 2007). Even among individuals who are able to access medical care, however, socioeconomically disadvantaged patients experience poorer health outcomes (Karter et al. 2002; Trinacty et al. 2007) likely due to lower rates of performance of recommended processes of care in the clinic setting, and

poorer individual health behaviors in daily life (Brown et al. 2004; Tseng et al. 2008; Moskowitz and Bodenheimer 2011).

Medication underuse has been implicated among those behaviors that contribute to poor health outcomes (Ho et al. 2006; Karter et al. 2009; Asche, LaFleur, and Conner 2011), particularly in socioeconomically disadvantaged populations (Osterberg and Blaschke 2005; Fischer et al. 2011). Examples of medication underuse include delaying or failing to fill prescriptions both at treatment initiation (“primary nonadherence” [Fischer et al. 2010]) and when a supply of the medication must be replenished over the course of treatment (“refill nonadherence” or “non-persistence” [Kim, Agostini, and Justice 2010]). Although making health insurance and health services available to low-income individuals may help reduce disparities, a significant residual impact of financial pressures on successful diabetes management is likely to remain, even for patients with access to care (Ngo-Metzger et al. 2012).

Among low-income individuals, those experiencing food insecurity—a state of limited or uncertain access to food due to inadequate financial resources affecting over 12 million households nationwide (Hampton 2007)—are particularly vulnerable to the impact of financial pressures on their diabetes management as they must choose between paying for food or paying for health care costs (Nelson et al. 2001; Holben and Myles 2004). Food insecurity among patients receiving treatment for diabetes has been shown to be associated with poorer glycemic control, due in part to difficulties following a diabetes-appropriate diet and emotional distress (Seligman et al. 2012). Less well understood, however, is how health services delivery differs for food insecure patients compared to other patients, both in terms of the processes of care received in the clinic and successful execution of a treatment regimen in the patient’s daily lives. Barriers such as out-of-pocket costs or a lack of paid time off from work may be particularly salient to food insecure individuals trying to attend regular medical visits to complete recommended processes of care, or to fill prescriptions in a timely manner. Therefore, even those food insecure patients who are able to access medical care may be less likely than other patients to receive the full complement of recommended processes of care in a given year, and more likely to delay filling prescriptions.

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Although other studies have established that food insecurity is a major barrier to accessing medical care (Kushel et al. 2006), this study specifically explores what happens to food insecure patients who manage to obtain care from a physician in spite of these barriers. Using data from a population-based survey, we examined, among diabetes patients currently accessing medical care, whether food insecurity carries an independent association with lower rates of performance of recommended process of care in the clinic setting, and with delays in filling prescriptions after accounting for sociodemographic characteristics, barriers to accessing care, and health status.

METHODS

Survey and Sample

Data were from the 2007 Public Use File of the California Health Interview Survey (CHIS), a random-digit dial telephone survey of Californian households representative of the state's noninstitutionalized population including a sample of 43,020 adults (of whom 4,311 have type 2 diabetes) surveyed between July 2005 and April 2006, and weighted to account for complex sample design (California Health Interview Survey 2009). To examine associations between food insecurity, processes of care, and medication underuse for individuals currently being treated for diabetes, the analytic sample was limited to adults with type 2 diabetes who reported seeing a doctor in the past year and reported that they are currently taking medications for diabetes ($N = 3,401$).

Measures

Processes of care were assessed from patient reports of their provider performing, in the prior year, a blood test for hemoglobin A1c, a dilated eye exam, and a foot exam, as recommended by the National Committee on Quality Assurance (NCQA) Diabetes Recognition Program (National Committee for Quality Assurance 2011).

Delays in obtaining prescription medications were assessed from two items adapted from the Medication Expenditures Panel Survey (Agency for Healthcare Research and Quality [AHRQ] 2004): *Delay in filling prescription for any reason* "During the past 12 months, did you either delay or not get a medicine that a doctor prescribed for you?" and, for those who responded affirmatively

to the first question, *Delay in filling prescription due to cost* “Was cost or lack of insurance a reason why you delayed or did not get the prescription?” These items have been used to assess medication underuse in prior research (Wroth and Pathman 2006; Billimek and Sorkin 2012) and are similar to items used in other large-scale survey studies to assess medication underuse (Kirking et al. 2006).

Food insecurity was scored as a binary indicator from five items assessing how often respondents with household income less than 200 percent of the federal poverty level experienced periods when they could not afford to put food on the table, had to forgo other basic needs to obtain food, and experienced episodes of hunger (Bickel et al. 2000). Respondents with a household income at 200 percent of the federal poverty level or greater were categorized as food secure.

Covariates models were adjusted for covariates hypothesized to be associated with disease management behaviors: demographic characteristics (age, gender, education, race/ethnicity, nativity, income); factors related to access to care (insurance status, number of visits to the doctor in the previous year, and access to an automobile); and health status variables (duration of diabetes, general health condition, and psychological distress assessed using the Kessler 6 [K6] Scale) (Kessler et al. 2002).

Data Analyses

All analyses were performed using SAS Callable SUDAAN Release 10.0.1 (Research Triangle Institute 2009) to account for the complex sampling design of CHIS and to obtain proper variance estimates. Bivariate comparisons were made using *t*-tests (for continuous variables) and chi-squared tests (for categorical variables). The association between food insecurity and each outcome was assessed using logistic regression models adjusted for age, gender, education, race/ethnicity, nativity, income, insurance status, number of visits to the doctor, access to an automobile, duration of diabetes, general health condition, and psychological distress.

RESULTS

Compared to food secure respondents, food insecure respondents were younger and less educated. More were Latino or identified in the “other/multiple race” group, fewer were born in the United States, and fewer had access to an

automobile. They reported poorer general health status and much greater psychological distress (all p 's < .05).

In this sample of diabetes patients currently receiving medical care, food insecurity was not associated with the performance of an annual A1c test or dilated eye exam (see Table 1) in models adjusting for sociodemographic characteristics, barriers to accessing care, and health status. A greater proportion of food insecure respondents, compared to those not reporting food insecurity, reported receiving a foot exam in the prior year (unadjusted proportions = 78.6 percent vs. 72.2 percent, respectively; aOR = 1.81, 95 percent CI 1.05, 3.13, p < .05). After adjustment for the same set of covariates, respondents who reported food insecurity were significantly more likely to delay filling a prescription for any reason (see Table 1; unadjusted proportions = 27.1 percent vs. 13.9 percent; aOR = 2.15, 95 percent CI 1.25, 3.71, p < .01) and to delay filling a prescription due to cost (unadjusted proportions = 18.5 percent, or roughly two-thirds of those reporting any delay, vs. 6.9 percent, or close to half of those reporting any delay; aOR = 2.89, 95 percent CI 1.36, 6.17, p < .01).

CONCLUSIONS

Among patients with type 2 diabetes currently receiving medical care, food insecurity was not associated with lower rates of performing recommended processes of care in the clinic setting, but it was associated with delays in filling prescriptions in daily life. These findings, which persisted after adjustment for a range of covariates, including income, insurance status, previous access to care, and health status, suggest that food insecurity may interfere with optimal disease management even for patients who are able to see a doctor.

The study has some limitations, including relying on self-reported data and not directly assessing several important types of medication underuse (e.g., skipping doses, discontinuing medications), and likely fails to capture important disruptions in medication-taking behaviors associated with food insecurity. By focusing on individuals currently being treated for diabetes, the study does not provide information about the impacts of food insecurity on diabetes management for those most vulnerable individuals who lack access to care. Furthermore, although we limited the sample to patients who have seen the doctor in the previous year and adjusted for access to care (including the number of medical visits and insurance status) in the models presented,

Table 1: Comparisons of Patient Characteristics, Processes of Care, and Delays in Filling Prescriptions, by Food Security Status

	<i>Food Secure</i> <i>N = 2,988</i>	<i>Food Insecure</i> <i>N = 413</i>	
Patient characteristics [†]			<i>p</i> -value
Age (years [SE])	60.4 [0.5]	56.3 [1.5]	.008
Gender (% female)	45.3	58.3	.070
Education, high school or greater (%)	81.5	44.5	<.001
Race/ethnicity (%)			
Non-Hispanic white	48.0	23.2	<.001
Latino	18.4	36.6	
Black	9.4	7.4	
Asian/Pacific Islander	12.0	10.6	
American Indian	1.6	4.5	
Other/multiple race	12.3	22.3	
US born (%)	71.2	39.6	<.001
Uninsured at any point during year (%)	9.9	23.1	.143
Number of doctor visits in past year (mean [SE])	7.3 [0.3]	9.2 [1.1]	.092
No regular access to a car (%)	8.2	23.2	<.001
Years with diabetes (years [SE])	10.3 [0.3]	10.8 [0.9]	.844
General health status (higher is better; mean [SE])	2.5 [0.03]	1.9 [0.06]	<.001
Serious psychological distress (K6 score [SE])	3.6 [0.13]	6.9 [0.8]	<.001
Processes of care [‡]			<i>aOR</i> (95% CI)
Had A1c test in past year (%)	92.4	89.5	1.39 (0.60, 3.20)
Had dilated eye exam in past year (%)	75.4	75.1	1.19 (0.62, 2.27)
Had foot exam in past year (%)	72.2	78.6	1.81 (1.05, 3.13)*
Medication underuse [‡]			
Delayed filling prescription, any reason (%)	13.9	27.1	2.15 (1.25, 3.71)**
Delayed filling prescription, due to cost (%)	6.9	18.5	2.89 (1.36, 6.17)**

p* < .05; *p* < .01.[†]Patient characteristics for food secure and food insecure patients reported for continuous variables as means with standard errors with *p*-values computed from student's *t*-tests, and as proportion of patients with the characteristic with *p*-values from Pearson chi square tests.[‡]Unadjusted proportions of food secure and food insecure patients reporting each outcome are reported, followed by adjusted odds ratios and 95 percent confidence intervals for food insecurity (with food secure as the reference category) from logistic regression models adjusted for age, gender, education, race/ethnicity, nativity, income, insurance status, number of visits to the doctor, access to an automobile, duration of diabetes, general health condition, and psychological distress.

our measures of access did not differentiate between sources of care or types of insurance. We observed that food insecure patients were no less likely than food secure patients to receive recommended processes of care, but we cannot conclude definitively whether differences in medication underuse are explained by differences in sources of care or types of insurance coverage. Finally, although the sample is highly diverse, it is limited to residents of California who responded to the survey, which may limit the generalizability of findings. In this sample, however, the study suggests that food insecurity may contribute to delays in filling prescriptions among disadvantaged populations, even if recommended processes of care are performed.

Health care providers, including those who reliably perform recommended processes of care in the clinic, must be mindful of the additional difficulties faced by patients trying to follow through with a diabetes management regimen while dealing with food insecurity. Already, guidelines encouraging careful monitoring of patients from disadvantaged populations for diabetes complications are in place (Centers for Disease Control and Prevention 2005), and rates of processes of care such as foot exams have been shown to be highest in some groups of disadvantaged patients both in the current study, and in other research (Richard et al. 2011). In contrast, contextual influences on successful diabetes management are rarely adequately discussed during busy medical visits (Weiner et al. 2010), yet they may influence disease management behaviors in daily life (Billimek and Sorkin 2012). For this reason, approaches to facilitate doctor-patient communication about contextual barriers such as food insecurity and to coordinate health care delivery with supportive services in the community (Moskowitz and Bodenheimer 2011) may improve the ability of disadvantaged patients to maintain a current supply of their prescribed medications.

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