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# Latinos With Diabetes and Food Insecurity in an Agricultural Community

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**Background:** Latinos from agricultural communities have a high prevalence of food insecurity and are at increased risk of obesity and diabetes, yet little is known about the associations between food insecurity and diabetes outcomes.

**Objective:** To examine the associations between food insecurity and diabetes outcomes among rural Latinos.

**Methods:** Cross-sectional survey with medical chart abstraction of 250 Latinos with diabetes. Primary outcomes are the control of 3 intermediate diabetes outcomes (hemoglobin A1C  $\leq$  8.0%, LDL-cholesterol  $\leq$  100 mg/dL, and blood pressure  $\leq$  140/90 mm Hg), a composite of control of the 3, and receipt of 6 processes of care. Secondary outcomes are cost-related medication underuse and participation in self-care activities.

**Results:** Fifty-two percent of patients reported food insecurity and 1-in-4 reported cost-related medication underuse. Patients with food insecurity were more likely to report cost-related medication underuse [adjusted odds ratio (AOR) = 2.49; 95% confidence intervals (CI), 1.30, 4.98;  $P=0.003$ ], less likely to meet the composite measure for control of the 3 intermediate outcomes (AOR = 0.24; 95% CI, 0.07, 0.84;  $P<0.05$ ), and less likely to receive a dilated eye examination (AOR = 0.37; 95% CI, 0.18, 0.77;  $P<0.05$ ) and annual foot examinations (AOR = 0.42; 95% CI, 0.20, 0.84;  $P<0.05$ ) compared with those who were food secure.

**Conclusions:** Among this rural Latino population, food insecurity was independently associated with not having control of the inter-

mediate diabetes outcomes captured in the composite measure, not receiving dilated eye and foot examinations, and with self-reporting cost-related medication underuse.

**Key Words:** diabetes, hispanics, latinos, food security, medication adherence, socioeconomic factors, underserved populations, food supply, rural, agricultural workers

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During the last 7 years, Americans endured the worst economic downturn since the great depression. During the great depression, a landmark documentary film shocked the country by documenting the hunger faced by migrant farm workers and named them the underfed.<sup>1</sup> About 50 years later and after the recent great recession, hunger persists in the United States as there are an estimated 49.1 million people with food insecurity.<sup>2</sup> Food insecurity is defined as “whenever the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain.”<sup>2</sup> Forty-two percent of households with incomes below the federal poverty level have food insecurity and the prevalence of food insecurity among Latino households is higher than the national average at 26.9%.<sup>3,4</sup>

Individuals from food-insecure households engage in unhealthy compensatory dietary behaviors to save money<sup>5,6</sup> and are more likely to become obese than those in food-secure households.<sup>7–9</sup> Household food insecurity is independently associated with more physician visits, postponing needed medical care, using less medication, and hospitalization.<sup>10</sup> Food insecurity is a risk for developing chronic health conditions such as hypertension, hyperlipidemia, cardiovascular disease, and diabetes.<sup>9,11</sup>

Understanding how food insecurity impacts diabetes outcomes is important for primary care physicians because of the clinical and cost implications of the now 17.9 million Americans with this chronic condition that disproportionately burdens Latinos and other minorities.<sup>12</sup> It is possible that patients with diabetes, limited financial resources, and food insecurity may be forced to choose between health care services, medication, or purchasing food. Among those with diabetes, food insecurity has been associated with poor control of glycemia<sup>13,14</sup> and LDL-cholesterol.<sup>15</sup> The issue of food insecurity is further compounded by socioeconomic status (SES). Individuals of low SES with

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food insecurity also report low diabetes self-efficacy<sup>14</sup> and more barriers to participation in diabetes self-management.<sup>16</sup>

The mechanisms by which food insecurity impacts diabetes outcomes are multiple, complex, and not fully understood. They involve competing demands for time and money (eg, inability to pay for medications or preventive and recommended health care), and impaired self-care capacity (eg, stress, depression, and inability to exercise or afford a healthy diet).<sup>17</sup> These mechanisms are cyclical for communities highly dependent on the agricultural employment sector.<sup>18</sup> In this study we investigate the relationships between food insecurity, health care services, and diabetes-related outcomes, among rural Latinos with diabetes from one of nation's most productive agricultural regions. We hypothesized that food insecurity is associated with poor clinical outcomes among rural Latinos. We also hypothesized that patients with diabetes and food insecurity make tradeoffs and prioritize buying food over resource and time-dependent health care services and participation in self-care.

## METHODS

### Setting

The study was conducted in a large migrant health center system that provides safety-net care in 2 rural California counties. This service area is part of California's San Joaquin Valley, an area known for its highly productive and diverse agricultural industry and unyielding regional poverty. The poverty of this region is coupled with one of the highest diabetes prevalence rates in this state.<sup>19,20</sup> The prevalence of food insecurity in this area is also particularly high (45%) among Latino agricultural workers,<sup>18,21,22</sup> many who experience seasonal underemployment and unemployment during the fall and winter months. Latinos with diabetes from this rural agricultural region have a particularly high risk for poor diabetes outcomes.<sup>19,20,23,24</sup>

### Sample

We examined cross-sectional survey responses linked to medical chart data collected between July 2009 and January 2010 from 250 Latino adults with diabetes. The inclusion criteria were: (1) self-identified as Latino; (2) spoke English or Spanish; (3) had a current diagnosis of diabetes type 2; (4) 18 years of age or greater; and (5) had 1 primary care visit to the health center in the last 12 months.

A list of potential participants (4128) was generated from the health center's electronic diabetes registry that captures over 90% of diabetics in the system. Trained clinical staff randomly called eligible patients and asked them to participate in the study. Consenting participants then completed a telephone survey. Patients were called up to 15 times during different times and days of the week. The response rate was 68%. A medical record review was conducted for all participants who completed the survey. The survey was pretested with volunteer patients and bilingual clinic health educators. The study protocol was approved by the RAND (Santa Monica, CA) protection of human subjects review committee (IRB) in partnership with UCLA.

### Dependent Variables

Dependent variables examined were hemoglobin A1C (A1C), LDL-cholesterol (LDL-c), blood pressure (BP), and receipt of 6 recommended processes of care.<sup>25</sup> Secondary outcomes were cost-related underuse of diabetes medication,<sup>26</sup> and participation in self-care activities.<sup>27</sup> A1C and LDL-c values were extracted from the diabetes registry and BP values were collected through chart reviews (12 mo timeframe). Trained clinical staff performed the chart reviews using a data abstraction protocol published in the literature.<sup>28</sup> These intermediate outcomes were dichotomized to indicate good control (A1C < 8%, BP < 140/90 mm Hg, and LDL-c < 100 mm Hg) and a composite measure (yes or no) was created for those that had A1C, BP, and LDL-c under control. For receipt of recommended diabetes processes of care, patient's chart data in the last 12 months was reviewed to determine whether they had received: a dilated eye examination, flu vaccine, foot examination, LDL-c blood test, A1c blood test, and were recommended or taking aspirin (all dichotomous: yes or no).<sup>25,28</sup> Cost-related underuse of diabetes medication was measured by asking, "In the past 12 months, did you use less diabetes medication than you wanted to, or than was prescribed because of the cost?" and response options were yes or no.<sup>26</sup> The Summary of Diabetes Self Care Activities (SDCA) questionnaire was used to measure patient participation over the last 7 days in foot care, eating a healthy diet, exercise, adherence, and glucose self-checks.<sup>27</sup> Self-care participation variables were operationalized as continuous (1–7 d).

### Independent Variables

The primary independent variable was food insecurity as measured using the short form of the USDA Household Food Security Survey Module.<sup>29</sup> A sample question from the 6-item module is, "In the last 12 months, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?" Other items have been described frequently in the literature.<sup>16</sup> On the basis of the literature, patients were classified into 2 groups based on 0–1 affirmative answers (food secure) versus 2+ affirmative answers (food insecure).<sup>16</sup>

We examined patient sociodemographic characteristics, including: age, sex, yearly household income for 2008, education, marital status, and birthplace. Patients were asked about migrant/seasonal agricultural status, whether they had health insurance or any kind of program that helped them pay for health care (dichotomous: yes or no), self-reported health status, years with diabetes, and utilization in the last 12 months (continuous variable: outpatient visits). Patient charts were used to determine their prescribed medications, and medical comorbidities.<sup>28</sup> Body mass index (BMI) was calculated using patient's weight and height obtained from chart reviews and classified as normal weight, overweight, and obese.

### Statistical Analyses

Stata 11.1 (College Station, TX) was used for all analyses. We first computed frequencies for our dependent and independent variable of interest and then conducted

bivariate analyses by food security categories. Bivariate analyses were conducted using  $\chi^2$  tests of association for categorical variables and the *t* test for continuous variables.

The income variable had 18% missing and was imputed using the multiple imputations (*n*=10) by chained equations (ICE) program in Stata.<sup>30</sup> We performed separate multivariable logistic regression models for each dichotomous outcome measured and estimated the adjusted odds ratio (AOR) of each as a function of food security status. Linear regression models were computed for the self-care outcomes. In the models we controlled for age, sex, yearly household income, education, insurance coverage, general health status, BMI, ambulatory care visits, use of insulin, and years with diabetes. Covariates were included if they were potential confounders based on our review of the literature or if they were statistically significant in bivariate analysis.<sup>10,16,21,31,32</sup> We estimated the same regression models using case-wise deletion for those with missing data and obtained results similar (data not shown) to those reported.

We also performed sensitivity analyses to assess whether including the number of ER visits and hospitalizations (continuous), depressive symptoms as measured with the Patient Health Questionnaire 2 (1 = “not at all” to 4 = “every day”),<sup>33,34</sup> comorbidities, birthplace, years in the United States, and years with provider affected the results (data not shown) but the results were similar to those reported. For all analyses reported in this study, a *P*-value of <0.05 was used to determine statistical significance.

### RESULTS

The mean age of participants was 54 years (SD = 13) and 59.0% were female. Sixty-four percent completed 0–6 years of education, and 76.2% were married or living with someone. Seventy-eight percent of the patients were from Mexico and 43.2% were uninsured. The mean number of years with diabetes was 9.8 years and 14% of patients were using insulin to manage their diabetes. Table 1 compares demographic and clinical characteristics between those with food security and food insecurity. Those with food insecurity were more likely to be middle aged (40–49 and 50–59 y) (*P*-value <0.05), have lower incomes (*P*-value <0.05), be migrant/seasonal agricultural workers (45.4% vs. 34.8%, *P*-value <0.05), have no insurance coverage (*P*-value = 0.06), report poor health status (*P*-value = 0.05), and have higher BMIs (*P*-value <0.05), compared with those who were food secure.

The prevalence of food insecurity in this sample was 52.4%. Table 2 reports the unadjusted differences in health outcomes by food security status. In unadjusted bivariate analyses, patients who were food insecure were more likely to have an A1C > 8%, LDL-c > 100 mg/dL, and lack control of the 3 intermediate variables (A1C, LDL-c, and BP) compared with those that were food secure. Patients with food insecurity were less likely to receive a dilated eye examination, flu vaccine, or all 6 recommended processes of care during the last 12 months. They also were more likely to report cost-related medication underuse and less participation in foot care, when compared with those that were food secure.

**TABLE 1.** Sociodemographic Characteristics by Perceived Food Security Among Rural Latinos With Diabetes

	Food Secure (%)	Food Insecure (%)	<i>P</i>
Total sample ( <i>n</i> = 250)	48.0	52.0	—
Age (y)			
18–39	13.3	9.2	0.02
40–49	22.5	28.5	
50–59	21.7	32.3	
60–69	20.0	20.8	
70+	22.5	9.2	
Female	64.7	53.1	0.06
Yearly household income (dollars)			
0–12,499	29.7	32.5	0.001
12,500–17,499	13.0	34.1	
17,500–24,999	24.8	22.1	
≥ 25,000	32.5	12.1	
Education (years completed)			
0–6	62.1	66.4	0.85
7–11	19.8	15.6	
≥ 12	18.8	18.0	
Married or living with someone	73.1	79.7	0.40
Birthplace			
United States	20.0	14.7	0.50
Mexico	76.7	80.6	
Other country	3.3	4.7	
Migrant/seasonal agricultural worker	32.8	47.4	0.04
Insured	63.8	51.6	0.06
Self-reported health status			
Excellent/very good/good	28.6	19.2	0.05
Fair	64.7	65.8	
Poor	6.7	15.0	
Years with diabetes [mean (SD)]	11.5 (12.5)	10.1 (9.8)	0.31
Primary care clinic visits [mean (SD)]*	3.8 (2.5)	3.9 (3.0)	0.67
Insulin use	10.0	17.7	0.08
Chronic conditions (range, 0–11) [mean (SD)] <sup>†</sup>	2.6 (2.0)	3.1 (2.3)	0.07
Body mass index (kg/m <sup>2</sup> )			
Normal (18.5–24.9)	12.0	3.4	0.04
Overweight (25.0–29.9)	25.1	30.3	
Obese (> 30.0)	63.0	66.4	

\*During the last 12 months.

<sup>†</sup>Hypertension, asthma, chronic lung disease (emphysema or chronic obstructive pulmonary disease), kidney disease, liver disease/cirrhosis, arthritis or other rheumatism, ulcer, cancer, heart disease (coronary heart disease, angina, or heart failure), or cerebrovascular disease in addition to diabetes mellitus.

Table 3 reports results from the adjusted multivariable regression analyses. Food insecurity was independently associated with the composite measure for control of the 3 intermediate outcomes [AOR = 0.24; 95% confidence interval (CI), 0.07, 0.84; *P* < 0.05] compared with those that were food secure. Food insecurity was independently associated with not receiving a dilated eye examination (AOR = 0.37; 95% CI, 0.18, 0.77; *P* < 0.05) and annual foot examination (AOR = 0.42; 95% CI, 0.20, 0.84; *P* < 0.05), and not receiving all 6 recommended processes of diabetes care (AOR = 0.22; 95% CI, 0.29, 0.95; *P* < 0.01) compared with their counterparts. Reporting food insecurity was also independently associated with cost-related medication underuse (AOR = 2.49; 95% CI, 1.30, 4.98; *P* = 0.003), compared with reporting food security. In the adjusted linear regression models for self-care outcomes,

**TABLE 2.** Unadjusted Health-related Outcomes for Patients With Diabetes by Food Security Status

	Food Secure (%)	Food Insecure (%)	P
Control of intermediate outcomes			
A1C < 8%	71.2	58.9	0.04
Blood pressure <140/90 mm Hg	93.3	91.5	0.59
LDL-cholesterol <100 mg/dL	61.2	46.5	0.02
Composite measure*	50.8	29.2	<0.001
Mean levels of intermediate outcomes			
A1C [mean (SD)] (%)	7.61 (1.74)	7.98 (1.85)	0.10
LDL-cholesterol [mean (SD)] (mg/dL)	91.6 (33.4)	101.6 (33.4)	0.03
Systolic blood pressure [mean (SD)] (mm Hg)	127.6 (18.7)	127.5 (18.2)	0.96
Diastolic blood pressure [mean (SD)] (mm Hg)	73.3 (11.7)	77.0 (10.2)	0.005
Receipt of processes of care <sup>†</sup>			
Dilated eye examination	63.7	47.3	0.01
Flu vaccine	52.8	38.1	0.03
Foot examination	45.8	35.4	0.09
A1c test <sup>‡</sup>	93.9	89.3	0.19
LDL-cholesterol test	92.3	88.6	0.32
Recommend or taking aspirin	76.9	75.2	0.78
Receipt of all processes of care <sup>§</sup>	17.7	6.11	0.004
Medication use			
Cost-related medication underuse	16.7	32.3	0.004
Participation in self-care activities <sup>  </sup>			
Healthy diet [mean (SD)] (d/wk)	5.0 (2.2)	5.4 (2.0)	0.12
Exercise [mean (SD)] (d/wk)	3.3 (2.4)	3.2 (2.5)	0.83
Foot checks [mean (SD)] (d/wk)	1.3 (2.4)	0.7 (1.8)	0.03
Home glucose monitoring [mean (SD)] (d/wk)	4.6 (2.4)	4.9 (2.4)	0.37
Adherence to medications [mean (SD)] (d/wk)	6.7 (0.9)	6.9 (0.5)	0.13

\*Achievement of A1c < 8%, blood pressure <140/90 mm Hg, and LDL < 100 mg/dL.

<sup>†</sup>During the last 12 months.

<sup>‡</sup>For 2 A1C tests in 12 months (73.3% vs. 52.9%, P=0.004).

<sup>§</sup>Receipt of dilated eye examination, flu vaccine, foot examination, A1C test, LDL-cholesterol test, and on aspirin during the last 12 months.

<sup>||</sup>Over the last 7 days.

**TABLE 3.** Adjusted Odds Ratios for Primary Diabetes Outcomes by Food Security Status

Outcome Measure	Food Secure		Food Insecure	
	AOR	95% CI	AOR	95% CI
Control of intermediate outcomes				
A1C < 8%	1.0	—	0.62	0.26, 1.46
Blood pressure <140/90 mm Hg	1.0	—	1.02	0.50, 2.09
LDL-cholesterol <100 mg/dL	1.0	—	0.75	0.34, 1.67
Composite measure <sup>§</sup>	1.0	—	0.24*	0.07, 0.84
Receipt of processes of care				
Dilated eye examination	1.0	—	0.37*	0.18, 0.77
Flu vaccine	1.0	—	0.50	0.24, 1.07
Annual foot examination	1.0	—	0.42*	0.20, 0.84
Annual A1C test	1.0	—	0.39	0.11, 1.39
Annual LDL-cholesterol test	1.0	—	0.34	0.10, 1.19
Recommended or taking aspirin	1.0	—	0.76	0.29, 1.95
Receipt of all processes of care <sup>  </sup>	1.0	—	0.22 <sup>†</sup>	0.29, 0.95
Medication use				
Cost-related medication underuse	1.0	—	2.49 <sup>‡</sup>	1.30, 4.98

Adjusted for age, sex, yearly household income, education, insurance coverage, general health status, body mass index, number of doctor visits in last 12 months, insulin use, and years with diabetes.

\*P < 0.05.

<sup>†</sup>P < 0.01.

<sup>‡</sup>P < 0.001.

<sup>§</sup>Achievement of A1C < 8%, blood pressure <140/90 mm Hg, and LDL-cholesterol <100 mg/dL.

<sup>||</sup>Receipt of dilated eye examination, flu vaccine, foot examination, A1C test, LDL-cholesterol test, and on aspirin (or recommended) during the last 12 months.

AOR indicates adjusted odds ratio; CI, confidence interval.

frequency of participation in healthy eating ( $\beta$ -coefficient = 0.40; 95% CI, -0.17, 0.97; P=0.16), exercise ( $\beta$ -coefficient = -0.05; 95% CI, -0.71, 0.61; P=0.88), foot care ( $\beta$ -coefficient = -0.27; 95% CI, -1.02, 0.48; P=0.48), home glucose testing ( $\beta$ -coefficient = 0.21; 95% CI, -0.48, 0.91; P=0.54), and medication adherence ( $\beta$ -coefficient = 0.03; 95% CI, -0.20, 0.26; P=0.81) were not significantly associated with food insecurity.

**DISCUSSION**

In this study of rural Latinos with diabetes, we found that food insecurity was independently associated with not receiving foot and eye examinations, reporting cost-related medication underuse, and not having control of a composite measure of A1C, BP, and LDL-c. Food insecurity was also independently associated with not receiving all 6 processes of care as measured. Our findings help us to understand why some patients with very low incomes may have poor diabetes outcomes, and could support a mechanism whereby these patients make tradeoffs during economic hardships and may be forced to buy food over resource-dependent health care services, including medications. Physicians may often undervalue the patient's social context and history but understanding these social factors such as food security could contribute to our understanding of why certain patients have poorly controlled diabetes despite aggressive pharmacologic treatment by physicians.<sup>35</sup>

We examined the relationship between food insecurity and health outcomes for rural Latinos with diabetes in an agriculturally rich region and make an additional link to intermediate clinical outcomes. This study expands the current literature by linking food insecurity to poor control of intermediate diabetes outcomes<sup>36</sup> and receipt of recommended processes of care (dilated eye examination and foot examinations) among Latinos. This is the first study of its kind of food insecurity among agricultural workers with diabetes. Our results are in agreement with other similar studies that found associations between food insecurity and medication underuse in different populations without<sup>10,37–39</sup> and with diabetes,<sup>16,40</sup> but we expand those findings in important ways. We focused on low-income Latinos with diabetes from one of the most productive agricultural regions in the country that has an abundance of high-quality fruits and vegetables. We did not find consistent statistically significant associations between food insecurity and self-care behaviors. This differs from findings from the Canadian Community Health Survey that found a positive independent relationship between food insecurity and unhealthy behaviors.<sup>31</sup> However, this difference is likely explained the different measures used to capture health behaviors.

We also report that in this population, those with food insecurity were less likely to receive a dilated eye examination and foot examination during the last 12 months, and all recommended processes of care measured. As health care utilization was controlled for, the reason for this finding is complex and multifactorial and likely includes provider and health system factors in addition to patient factors other than food insecurity. At the same time, providers have many competing demands during typical clinic visits with socially complex patients and may not have time to address everything. The patients in this study may need more intensive interventions from health care teams to improve process outcomes and our results suggest that addressing food insecurity alone may not improve processes of care. We suspect that in addition to addressing food insecurity, providers may need more intensive interventions to achieve better process outcomes among these very vulnerable patients. Another factor possibly contributing to the findings is that very low-income populations may prioritize employment over frequent return visits. The evidence linking food insecurity to receipt of diabetes processes of care is mixed but studies focus on significantly different populations.<sup>31,40,41</sup> We did not find that patients with diabetes and food insecurity had higher utilization of health services such as ER and clinic visits as has been reported among other populations.<sup>10,32,42</sup>

Understanding the social factors related to diabetes outcomes in this population is important given the documented health care disparities and the rapidly growing number of Latinos across rural US communities.<sup>21</sup> There are approximately over 3 million migrant/seasonal agricultural workers in the United States and this is likely an underestimate.<sup>43</sup> This population has distinct characteristics and barriers to high-quality health care.<sup>44</sup> The average median annual income for agricultural workers is estimated to be <\$20,000, the majority is foreign born (78%), and the

average level of education is estimated to be eighth grade. This population supports a 28 billion dollar fruit and vegetable industry in the United States.<sup>43</sup> We hypothesize that the seasonal nature of employment in the region predisposes poor individuals with diabetes to overconsume unhealthy and caloric-dense foods during the peak employment months<sup>18</sup> and to ration money for food during the agricultural off-season likely forcing them to forego recommended health care services that are time or resource intensive, including use of medications.

This study has limitations. The cross-sectional design does not allow for inference of casual relationships. We used self-reports for some measures which are subject to recall bias and socially desirable answers. Our results cannot be generalized to all low-income adults or all Latinos. We focused on an agricultural region with an extensive history of migrant/seasonal agricultural workers and the results may also not be generalized to other agricultural regions in the country. The measurement of food insecurity<sup>45</sup> does not measure thoroughly all levels of food insecurity recommended by the USDA (high, marginal, low, or very low food security), nor does it ask about conditions of children that might be living in the household. Food insecurity is measured at the household level and our reports are at the patient level. The USDA does have an 18-item food security module that measures different levels of food insecurity but we did not include it in our study due to concerns over respondent time and burden. We did not measure immigration status and this is an important factor associated with utilization in this population. Finally, we cannot entirely discount reverse directionality of the associations observed or that poor health leads to food insecurity.

Our study has policy implications. This rural population cultivates, processes, and handles the majority of high-quality produce consumed by many Americans but may be unavailable for nourishment by them and their families. The Census Bureau reports that the US poverty rate for 2010 was the highest rate reported since 1993.<sup>46</sup> Although there are federal food assistance programs such as the federal Supplemental Nutrition Assistant Program (SNAP) and the Women Infant and Children Program (WIC) that are intended to help individuals purchase food, they are often underused in California by those with food insecurity.<sup>47–49</sup> Reasons for underutilization in this population could include stigma associated with the use of government aid, complexity of the application process and eligibility rules, immigration status, and fear of deportation for those that are undocumented. Requirements for SNAP are complicated and not easy to understand. For a noncitizen to be eligible for SNAP, they must be a “qualified noncitizen” and generally meet 1 additional condition (5 y of residence, 40 qualifying work quarters, children under 18, blind or disabled, eligible elderly noncitizen, or have a military connection).

To improve diabetes outcomes for this rural low-income population, clinicians and health systems need to aggressively address social issues such as food insecurity in addition to improving standard diabetes medical management.<sup>50</sup> Our observational results inform clinical practice by supporting the recommendation in the literature

for screening of patients at high risk for food insecurity, aggressively referring patients to nutrition services, monitoring patients with food insecurity for inconsistent blood sugar levels and/or hypoglycemia, and rethinking target A1C goals for patients with food insecurity.<sup>14</sup> Finally, exploring formal links between food and nutrition programs with low-income patients with diabetes could help mitigate the effects of food insecurity.<sup>17</sup>

Many decades after the great depression, food insecurity remains a serious problem in California's agricultural regions that provide food for the nation but are paradoxically deep rooted in poverty that prohibits individuals from securing food throughout the year. In summary, we found that control of all 3 intermediate clinical outcomes (composite of control of A1C, BP, and LDL-c), receipt of dilated eye and foot examinations, and cost-related medication underuse were independently associated with food insecurity.

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