

In Brief

More than 14% of the U.S. population is food-insecure or at risk of running out of money for food. Food-insecure adults are at high risk for diabetes, and food-insecure adults with diabetes are at high risk for both hyper- and hypoglycemia. The clinical management of food-insecure individuals with diabetes can be challenging, but referrals to food resources, nutrition counseling that recognizes the challenges of food insecurity, smoking cessation support, and appropriate treatment of hypoglycemia may help these individuals reduce both hyper- and hypoglycemia. It is appropriate to screen individuals with diabetes who are receiving care in safety-net settings for food insecurity.

Clinical Management of Food-Insecure Individuals With Diabetes

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Despite the reputation of the United States as one of the wealthiest nations in the world, one in seven U.S. households struggled to afford adequate food in 2010.¹ The percentage of affected households is much greater in certain subpopulations, including African Americans, Latinos, households with children (especially if they are headed by a single parent), and households with incomes at or below the federal poverty level.

Food insecurity refers to the inability to access food because of inadequate finances or other resources. It exists “whenever the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways [e.g., without resorting to emergency food supplies, scavenging, stealing, or other coping strategies] is limited or uncertain.”²

Food insecurity encompasses a range of experiences and behaviors depending on its severity, including feeling anxiety that food budgets are insufficient, altering or reducing customary food intake to accommodate reduced food expenditures, skipping meals, and losing weight. Feeling hunger—the uncomfortable physical feeling that accompanies lack of food—is neither necessary nor sufficient to be considered food-insecure. Many food-insecure adults report that they no longer feel a sensation they identify as hunger,³ and the sensation of hunger is common among many people who can afford food but access it less frequently than they would like

for other reasons (such as dieting or competing priorities at lunchtime).

Food Insecurity and Food Intake

Eating patterns are complex, and there are many reasons why food and beverage intake in low-income populations may be less healthy than food intake in higher-income populations. Among these many reasons, however, food insecurity plays an important role.

The most energy-dense foods in the United States are generally the least expensive ways to obtain calories (e.g., sugar, butter, chocolate, cookies, bread, pasta, and rice all cost very little per calorie).⁴ A person who had ~ \$1 to spend on lunch might purchase an apple (~ 60 calories) or a small package of cookies (~ 200 calories). This is not an unrealistic choice for many; consider that in the United States, the average Supplemental Nutrition Assistance Program (SNAP; formerly the Food Stamps program) benefit is ~ \$288 per month for a family of four (or about \$2.40 per person per day).⁵

From 1998 to 2002, the average price of fresh fruits and vegetables grew at a substantially higher rate than the average price of sugars, sweets, and soft drinks.⁶ It was recently estimated that increasing nutritional intake of saturated fats and added sugars by as little as 1% significantly reduces food costs.⁷ In addition to shifting food intake away from nutrient-dense fruits and vegetables, food-insecure adults also tend to reduce dietary variety and concentrate intake on a few low-cost,

energy-dense foods (such as oatmeal or macaroni and cheese).⁸⁻¹³

In addition to changes in food and beverage intake, patterns of consumption may vary in food-insecure households. Food insecurity is a cyclical and episodic phenomenon, with lengthy periods of food adequacy followed by brief periods of food scarcity. The average food-insecure household in the United States completes this adequacy-inadequacy cycle seven times each year.¹ Periods of inadequacy may result from high seasonal expenditures (e.g., high heating costs in winter or the loss of school-based breakfast and lunch programs for children in summer), loss of or inadequate benefits or employment, or periodic, unforeseen expenditures and time away from work, including for illness.

Food budgets also may be inadequate to last households the duration of time from one paycheck to the next. It has been well documented that food expenditures increase substantially at the beginning of the month when paychecks and benefits are often distributed and decrease at the end of the month.¹⁴ The psychological effect of these cycles may be to encourage bingeing when food is available to buffer against the expectation of future food shortages.^{15,16}

Food Insecurity and Diabetes Risk

The odds of having diabetes are almost twice as high among low-income adults who are food-insecure compared to low-income adults who are food-secure.¹⁷ Pregnant women who are food-insecure may also have a greater risk of developing gestational diabetes than pregnant women who are food-secure.¹⁸ Therefore, it should not be surprising that > 40% of individuals with diabetes seeking care in diverse community health clinics providing safety-net care report being food-insecure.^{19,20}

Two mechanisms may explain this very high rate of food insecurity among adults with diabetes. First, the financial pressures created by chronic disease in general, and diabetes in particular, may leave less money available in the household budget for food. This hypothesis is supported by data suggesting that per-capita out-of-pocket health care expenditures for adults with diabetes exceeds out-of-pocket expenditures for people with any other disease, including heart disease and cancer.²¹ Alternatively, food inse-

curity could act as a risk factor for diabetes, either by altering food intake or establishing binge-fast cycles. Understanding the pressures that food insecurity places on individuals with diabetes is crucial to understanding appropriate clinical responses.

Food Insecurity and Hyperglycemia

Studies have demonstrated associations between food insecurity and hyperglycemia among adults and children with diabetes.²²⁻²⁴ A number of mechanisms may account for this hyperglycemia.²⁵ First, increased intake of inexpensive, energy-dense foods may raise blood glucose levels. Second, the systematic overconsumption and avoidance of food waste during episodes of food adequacy may overcompensate for the episodes of food scarcity that follow. Third, financial pressures may force some people to reduce medication doses or the frequency of medication administration to afford food. More than one-third of individuals seeking food at emergency food banks and soup kitchens report giving up food to pay for their medications,²⁶ and as many individuals probably give up medication to afford adequate food.^{27,28} Fourth, food insecurity is associated with a high degree of anxiety and distress, and this distress about one's ability to adequately manage diabetes may translate into suboptimal self-management behaviors.²⁴ Finally, the depression and fatigue that accompany inadequate access to nutritious food may decrease some individuals' motivation for physical activity.

Food Insecurity and Hypoglycemia

At the same time that food insecurity predisposes people with diabetes to hyperglycemia, food insecurity predisposes them to more frequent episodes of hypoglycemia. In one study conducted more than a decade ago in an urban, academic hospital, one-third of the individuals with diabetes who had experienced a hypoglycemia episode attributed the episode to the inability to afford food.²⁹ Among individuals with diabetes receiving care in community health centers, those who are food-insecure are more likely to report an emergency room visit because of a hypoglycemia episode and are more likely to attribute a hypoglycemia episode to the inability to afford food.²⁰ In the safety-net setting, food insecurity may be as strongly associated

with hypoglycemia as traditionally recognized hypoglycemia risk factors, including insulin use, kidney disease, and alcohol.¹⁹

Episodes of hypoglycemia may be sporadic, or they may occur more frequently at the end of the month, when household food budgets are more likely to be exhausted. Providers may respond to these episodes of hypoglycemia by reducing medication doses, a strategy that can exacerbate the hyperglycemia related to food insecurity.

Screening for Food Insecurity

Because identifying food insecurity among individuals with diabetes can assist with nutrition counseling and choosing appropriate medication regimens, we recommend that all adults and children with diabetes who seek care in safety-net settings be screened for food insecurity. Many individuals in non-safety net settings also may be food insecure, and screening should be targeted toward individuals with risk factors (e.g., those who are members of racial or ethnic minorities, who have children in the household, who are in single-parent households, and who have low education or low income levels).

The U.S. Department of Agriculture (USDA) publishes well-validated food insecurity scales suitable for research purposes.³⁰ However, just two questions are sufficient to identify individuals at high risk of food insecurity in clinical settings.³¹ Although validated in a more formal tone, a more conversational tone can be used to screen individuals with diabetes: 1) During the last year, did you ever worry whether the food in your house would run out before there was money to get more?, and 2) During the last year, was there ever a time when the food in the house just didn't last and there wasn't money to get more? A "yes" response to either of these questions indicates a high risk of household food insecurity. Alternatively, one can replace the first question with "During the last year, how often were you unable to afford balanced meals?" Any answer other than "never" is considered a "yes" response.³²

Many individuals feel highly stigmatized by their inability to provide for their basic needs. In addition, parents of young children often fear that children will be removed from their homes for neglect if they admit to not being able to feed them. It is thus

essential that these questions are asked nonjudgmentally, and, when possible, in the context of an ongoing patient-provider relationship.

Other Sources of Nutritional Risk

Food-insecure adults are often at very high risk of nutritional risk for other reasons, including poor dentition or other mouth problems (often because of a lack of access to dental services) and physical disability. These barriers to healthy food intake must be addressed in the context of food insecurity as well.

Addressing Hyperglycemia in Food-Insecure People With Diabetes

Referrals to food resources

Whenever possible, providers should refer food-insecure patients to appropriate food and nutrition resources.³³ A number of programs are available (Table 1).

SNAP provides benefits for purchasing food through the use of an Electronic Benefit Transfer card. These debit cards can be used at authorized retailers. The benefit allotment varies depending on household size, income level, and state of residence. SNAP benefits are intended to supplement, not replace, the household's food budget, although in many families, SNAP benefits provide for all food needs.

The Supplemental Nutrition Program for Women, Infants, and Children (commonly referred to as WIC) is generally available to low-income pregnant and postpartum women and their children ages 0–5 years who are at nutritional risk. WIC provides vouchers redeemable for specific foods at authorized retail outlets. The WIC program is administered at the state level, so eligibility criteria and benefits are somewhat variable, although, in most states, income cannot be > 185% of the federal poverty level (~ \$41,350 for a family of four in 2011).

Keeping a list of other nutrition resources that are available in the local community is important. These food resources include Meals-on-Wheels programs, emergency food pantries, and soup kitchens.

Encouraging parents to enroll their children in school-based breakfast and lunch programs can also relieve food budgets. There is stigma and bureaucratic effort associated with enrolling in each of these programs. Addressing

Table 1. Hunger and Food Insecurity Resources

National Hunger Hotline 1-866-348-6479 (1-866-3-HUNGRY) or 1-877-842-6273 (1-877-8-HAMBRE) Spanish
Supplemental Nutrition Assistance Program (SNAP) 1-800-221-5689, http://www.fns.usda.gov/snap Eligibility screening tool: http://www.snap-step1.usda.gov/fns
Women, Infants, and Children (WIC) 1-866-348-6479 (1-866-3-HUNGRY) or 1-877-842-6273 (1-877-8-HAMBRE) Spanish http://www.fns.usda.gov/wic
Food Distribution Program on Indian Reservations 1-866-348-6479, http://www.fns.usda.gov/fdd/programs/fdpi
Senior Farmers' Market Nutrition Program http://www.fns.usda.gov/wic/SeniorFMNP/SFMNPcontacts.htm
Commodity Supplemental Food Program 1-866-348-6479, http://www.fns.usda.gov/fdd/programs/csfp
Meals on Wheels 703.548.5558, http://www.mowaa.org
Feeding America (a network of food banks across the United States) http://feedingamerica.org

this stigma might open the opportunity to discuss with individuals the extent to which having reliable access to food can improve their own health and the health of their family.

Nutrition counseling

It is certainly possible to consume a diabetes-appropriate eating pattern on a limited food budget. Such food plans take motivation, planning, time, and often a willingness to eat the same inexpensive (but healthy) foods with great frequency. The USDA estimates the cost of a nutritious meal plan at four different cost levels: liberal (the most expensive), moderate, low-cost, and thrifty (the least expensive). It is estimated that adhering to the Thrifty Food Plan would require the average American to spend more than twice as many hours on food preparation as is currently spent.³⁴

In addition, many areas of the United States, particularly neighborhoods with racial minorities and low-income families, have inadequate access to full-service grocery stores stocking a variety of fresh fruits and vegetables.^{35–37} The USDA recently released an Internet-based tool called the Food Desert Locator (www.ers.usda.gov/data/fooddesert/fooddesert.html), which allows users to pinpoint areas without access to full-service

grocery stores at the neighborhood level.

Small, neighborhood stores in low-income areas tend to charge higher prices than larger chain stores for fresh foods.³⁶ Travel to geographically distant stores with a variety of healthy foods requires additional time or access to private transportation, both of which may be considered a luxury in low-income households. Nutrition counseling for food-insecure individuals with diabetes may therefore need to decrease emphasis on food and beverage substitutions (“fill up less of your plate with rice and more of your plate with vegetables”) and increase emphasis on decreasing portion sizes of foods that are available both financially and geographically.

Additional strategies can assist with shifting eating patterns toward more diabetes-appropriate alternatives. Some of these include:

- Reducing the frequency of restaurant eating
- Purchasing frozen fruits and vegetables if a functional freezer is available
- Purchasing fresh fruits and vegetables only when they are in season or buying them at local farmers' markets
- Purchasing canned fruits and vegetables (without added sugar or salt), particularly those precut

into smaller pieces (e.g., pineapple chunks instead of pineapple rings, cut green beans instead of whole green beans), which often cost less per ounce

- Buying bulk items during infrequent visits to larger stores
- Creating more meals with nonmeat sources of protein (e.g., dried beans and lentils)

Although these strategies can help, most food-insecure households will require additional support for large changes in eating patterns. Each of these strategies is likely to require additional time for meal preparation. For example, dried beans are cost-efficient and healthy but require preplanning to accommodate the time needed for soaking. Whole chickens are often less expensive than cut-up chicken parts, but they require additional preparation time and skill.

People in charge of purchasing food and cooking for a food-insecure household may worry about purchasing fresh foods with a short shelf-life that could spoil before they are used and about wasting food that is served to family members (often children) but not eaten. The USDA has created a handout that includes suggestions for preparing healthy food on a limited budget and information about SNAP and WIC benefits and school nutrition programs.³⁸ This handout is available at no charge and is written at a reading level appropriate for this population. Another excellent resource developed by Messer et al.³⁹ includes additional nutrition counseling strategies.

Smoking cessation

Tobacco purchases are very expensive, and recent studies have shown that households that include a member who smokes are much more likely to be food-insecure.^{40,41} Studies in the developing world demonstrate direct relationships between increases in household expenditures on tobacco products and decreasing household expenditures on food,⁴² although to our knowledge, these studies have not been replicated in the United States.

Increasing support for smoking cessation for family members could help to relieve pressure on household food budgets. It may be reasonable to assume that expenditures on illicit drugs will also decrease household food expenditures, although even fewer data are available about links

between household food security and illicit drug use.

Addressing Hypoglycemia in Food-Insecure People With Diabetes

All food-insecure individuals with diabetes should be screened for hypoglycemia at every visit, and individuals who experience repeated episodes of hypoglycemia should be screened for food insecurity regardless of their sociodemographic background.

A number of strategies can help to decrease the risk of hypoglycemia among food-insecure people with diabetes. A key diabetes self-care message includes discussion about how a day without reliable access to food should be treated as a “sick day.” In other words, if food and beverage intakes are going to be reduced for any reason (not just illness), medications that cause hypoglycemia (e.g., insulin and insulin secretagogues) should be reduced. It is important to keep in mind, however, that food access among many food-insecure individuals is unpredictable. For example, at many soup kitchens, clients line up for a meal but receive one only if food remains when they reach the front of the line.

Medication schedules that are coordinated with meals, rather than to a time of day, can help alleviate the hypoglycemia associated with this unpredictability. For example, writing a prescription for rapid-acting or short-acting insulin for “three times daily” may result in hypoglycemia when meals are skipped. However, writing the prescription for “with meals” (or “with meals, up to three times a day”) may help food-insecure individuals habituate to taking insulin with food, rather than at a certain time of day.

Finally, many oral hypoglycemic medications have a long half-life. Preferentially prescribing oral medications with a shorter half-life can reduce the hypoglycemia that results from the unexpectedly missed meals. Despite their higher costs, longer-acting insulin preparations without marked peaks in action (e.g., glargine and detemir) may also help to reduce hypoglycemia episodes caused by lack of reliable access to food.

Conclusion

The clinical management of food-insecure individuals with diabetes can be challenging, but referrals to

food resources, nutrition counseling that recognizes the challenges of food insecurity, smoking-cessation support, and appropriate treatment of hypoglycemia can help these individuals reduce both hyper- and hypoglycemia.

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