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Leslie J. Rabaut

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# Medically Tailored Meals as a Prescription for Treatment of Food-Insecure Type 2 Diabetics

Leslie J. Rabaut, DO

Aurora Family Medicine Residency Program, Aurora Health Care, Milwaukee, WI

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**Abstract** Type 2 diabetes mellitus is an immense burden to the health of our population and to our current health care system, and the weight of this burden is only projected to multiply in coming years. A nutritious diet is an indispensable aspect of diabetes treatment, and the lack of access to food engenders poor disease-state control, which correlates with increased health care utilization. Interventions aimed at improving access to food through medically tailored meals (MTMs) have demonstrated effectiveness in improving the health of food-insecure type 2 diabetic patients and reducing health care costs. Further studies are necessary to increase the external validity of existing positive research on medically tailored meals in food-insecure diabetic patients and to provide evidence to support potential policy changes under which the costs of medically tailored meals for diabetics might be covered by insurers. (*J Patient Cent Res Rev.* 2019;6:179-183.)

**Keywords** diabetes mellitus; public health; diet; nutrition; food security; meals; health care costs

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## What Is 'Food Insecurity'?

A nutritious diet is an indispensable aspect of diabetes treatment.<sup>1-3</sup> The lack of reliable access to food engenders poor disease-state control<sup>2,4-7</sup> and correlates with increased utilization of costly health care services.<sup>5,8-12</sup> In 2016, an estimated 14.3% of the general American population was food insecure as compared to 21% of the diabetic population.<sup>9</sup>

Food insecurity (FI) is defined as “limited or uncertain availability of nutritionally adequate and safe foods or ability to acquire food in socially acceptable ways.”<sup>13</sup> Food security encompasses not only economic factors.<sup>2,14</sup> Residing in a food desert, or an area with limited access to nutritious food,<sup>15</sup> reduces food security. Additional determining factors include the safety of the environment, transportation, work schedules, time, and familiarity with preparing

foods.<sup>2,14</sup> Factors that predict a high level of FI include poverty, low level of education, single-mother household, and ethnic minority.<sup>8</sup>

FI can be measured by either the 18-item U.S. Household Food Security Survey or the shorter and more practical 2-item Hunger Vital Sign. The Hunger Vital Sign asks the frequency with which 1) “we worried whether our food would run out before we got money to buy more,” and 2) “the food we bought just didn’t last and we didn’t have money to get more.” This tool has been validated in all ages and shown to have a high sensitivity and specificity for identifying food-insecure individuals.<sup>16</sup>

Screening for FI is important because FI is prevalent, it often goes undiagnosed, and there are interventions that can be taken to increase food access if the condition is identified.<sup>4,16</sup>

## How Does FI Influence the Health of a Type 2 Diabetic?

Perhaps the most important environmental and modifiable risk factor for type 2 diabetes (DM2) is a patient’s diet.<sup>1-3</sup> Diabetic patients benefit from a diet

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Correspondence: Leslie J. Rabaut, DO,  
Aurora Family Medicine Residency, 2801 W. Kinnickinnic  
River Parkway, #250, Milwaukee, WI, 53215  
(leslie.rabaut@aurora.org)

that prioritizes vegetables, whole grains, low-glycemic-index foods, dairy, legumes, and nuts while minimizing intake of processed red meats, sugary foods, and refined grains.<sup>1,2</sup> A recent meta-analysis of studies of diets and DM2 demonstrated a directly linear relationship between consumption of red meats, processed meats, and sweetened beverages and risk of DM2. There was an inverse association of DM2 risk with intake of whole grains, vegetables, and fruits.<sup>3</sup> Dietary changes, both in quality and caloric quantity, have proven powerful enough to cause diabetes remission and decreased diabetes complications.<sup>1</sup> Not surprisingly, type 2 diabetics are especially vulnerable to FI.<sup>5,9</sup>

FI is independently associated with diabetes — food-insecure patients are at up to twice the risk for diabetes<sup>4,5</sup> — and the prevalence of diabetes increases as the degree of FI increases, with the highest prevalence among the least secure.<sup>5,6</sup> In a 10-year cross-sectional study of National Health and Nutrition Examination Survey data, almost one-quarter of 2.1 million diabetics with uncontrolled A1c levels were food insecure.<sup>7</sup>

In a study of California's population, the odds of diabetes were 120% greater in patients who lacked food security, even after accounting for other variables (exercise, weight, and demographics).<sup>9</sup> Scientists are even starting to question which came first — the diabetes or the FI? Evidence now suggests that nutritional deprivation or malnutrition of pregnant mothers can actually predispose the developing fetus in utero to epigenetic changes that result in an increased risk for impaired glucose metabolism and diabetes as an adult.<sup>17,18</sup> Beyond these risk factors, food-insecure diabetic patients are more likely to have poorer glycemic control,<sup>2,4-6</sup> and FI has been shown in multiple studies to be independently associated with elevated hemoglobin A1c levels.<sup>2,7</sup>

The mechanisms by which FI increases the risk of diabetes and the propensity for it to be uncontrolled are multifaceted.<sup>1,2,4-6,10,11,19-21</sup> Firstly, vegetables and fruits simply cost more than refined fats and sugary foods.<sup>1,4,6</sup> For example, between 1985 and 2000 the cost of sugary sweetened beverages rose by 20%, sweets by 46%, and fresh fruits and vegetables by 118%.<sup>6</sup> Thus, the diabetic diet can be inherently cost-prohibitive for low-income families.<sup>1,4,6</sup> Consequently, food-insecure patients often resort to the cheapest food

items available, which tend to be the exact opposite of the preferred diabetic diet, wreaking havoc on their blood sugars and diabetes control.<sup>4,6,10,22</sup>

Secondly, food-insecure persons may reside in food deserts and simply do not have geographically accessible nutritious food.<sup>2</sup> Whether food is not accessible due to cost or geography, the lack of a reliable diet inherently provokes additional maladaptive behaviors that further complicate the regulation of blood sugars.<sup>4-6</sup> Food-insecure patients may binge when food is prevalent or skip meals when food is scarce.<sup>4,6</sup> Such eating patterns may contribute to the development of insulin resistance,<sup>5,6</sup> the primary pathology of diabetes.

Not only does FI lead to skipping meals but also to skipping medical care. For monetary reasons, food-insecure persons are often forced to choose between medications and food<sup>4,6,20</sup> or to postpone health care visits.<sup>5,6,11,19</sup> These patients have decreased ability to perform self-care management with medication use and glucose monitoring<sup>21,23</sup> and are at twice the risk of dangerous hypoglycemic events.<sup>2,4,6,9</sup>

All of the aforementioned factors likely contribute to higher reports of depression, decreased self-efficacy, and increased diabetes distress among food-insecure patients.<sup>20,21</sup>

### **Effect of FI on the Health Care System**

Not only is FI associated with increased prevalence of diabetes and poor diabetes control, but it is also associated with increasing health care expenditures due to increased numbers of costly emergency department visits, inpatient hospitalizations, and prescription medications.<sup>5,8-12,19</sup> FI is associated with \$77 billion in excess health care expenditures annually.<sup>24</sup> Diabetics with low food security and self-efficacy have been demonstrated to have more than twice the health care utilization of their food-secure counterparts.<sup>9</sup> Specifically, these patients have increased utilization of acute care,<sup>19</sup> often presenting to the emergency department with hypoglycemic events necessitating hospitalization.<sup>10,19</sup> Interestingly, this increased use of acute care has not been demonstrated to be mitigated by maintaining regular ambulatory care visits.<sup>19</sup> The increased propensity for hospitalization has costly implications when taking into account the fact that 30% of total medical costs of DM2 is derived from

hospitalizations. The national cost of diabetes in 2017 was estimated at \$327 billion.<sup>25</sup>

Even after being stabilized in the hospital, food-insecure patients have double the likelihood of being readmitted within 15 days of discharge.<sup>26</sup> This fact should give all health care systems pause in a world in which hospitals are reimbursed significantly less for “excessive readmissions” of Medicare and Medicaid patients under the Affordable Care Act.<sup>27</sup> In light of these costs and the immense rise and projected continued growth in diabetes prevalence — the number of patients with diabetes globally has more than doubled over the past 3 decades, and prevalence is expected to rise to almost 440 million by 2030<sup>17</sup> — it becomes clear that novel, more effective, and cost-reducing treatment options of diabetes are needed.<sup>9,17</sup>

### **Current Programs to Address FI Are Not Adequate**

Currently the health care system does not directly address FI,<sup>16,18</sup> and existing resources aimed at addressing the issue of FI are either not nutritionally appropriate, not robust enough in size, or not reliably reproducible.<sup>14,18,21,22,24</sup>

The largest governmental safety net for the food insecure is the Supplemental Nutrition Assistance Program (SNAP), which was created in the 1960s and has failed to adjust its dietary offerings as the dietary practices of Americans have become increasingly unhealthy. The control of SNAP has shifted from the federal government to retailers, the food service industry, and manufacturers who do not have the health of recipients in mind and continue to lobby against any SNAP restrictions on refined carbohydrates, fats, and sugary sweetened beverages.<sup>22</sup> SNAP recipients today eat a very unhealthful diet, the antithesis of the diabetic diet.<sup>22</sup> What’s more, only the most severely impoverished persons qualify for SNAP benefits, thus a significant proportion of food-insecure patients who do not meet the levels of poverty necessary to qualify for SNAP remain without any governmental supports.<sup>8,10,21,22</sup>

Outside of governmental resources, some health care systems offer clinic-community models in which clinics provide food vouchers and refer patients to

local food pantries.<sup>18</sup> The success of these programs is dependent on the unique resources available in a particular area (and thus not easily generalizable), and these programs require a lot of active work on the part of the patient to seek out local food suppliers, to choose the “correct” foods, and to prepare those foods at home on a consistent basis.<sup>18</sup> This model does not account for other aspects that contribute to FI, including lack of transportation, environment, personal stressors such as work and time availability, and lack of familiarity with choosing and preparing nutritious foods.<sup>2,14,18</sup>

### **Role of Medically Tailored Meals in Addressing FI in Diabetic Patients**

One intervention demonstrated to be successful in decreasing FI, improving health, and cutting costs is medically tailored meal (MTM) programs.<sup>11,21,24,28,29</sup> MTMs are designed by a nutritionist to meet the particular nutritional needs of patients according to their disease states.<sup>24,29</sup> A population that has benefited from meal delivery programs since the 1950s — and, consequently, is the most studied — is homebound seniors receiving Meals on Wheels. Seniors receiving Meals on Wheels receive standard but consistent meals with resulting improved dietary intake, decreased rates of depression and loneliness, and higher quality of life.<sup>11,28</sup> They have improved measures for activities of daily living, significant reductions in hospital readmission rates,<sup>11,28</sup> and are less likely to be admitted to a nursing home.<sup>30</sup>

Recent studies have demonstrated a greater potential of meal delivery programs to improve health and cut costs when those meals are medically tailored to patients’ disease states.<sup>21,24,29</sup> A 2013 study by Gurvey et al that provided MTMs over a 6-month period to nutritionally at-risk, chronically ill patients, one-quarter of whom had diabetes, resulted in impressive outcomes. In the intervention group, the number of hospital admissions decreased by 50%, hospitalizations were 37% shorter in length, and patients were more than 20% more likely to be discharged to home as opposed to an expensive nursing facility. The overall average monthly cost per patient decreased by 55%.<sup>29</sup>

A more recent (2018) study of MTMs published in *Health Affairs* demonstrated similarly promising results.<sup>24</sup> In this study, MTMs were provided over

a 6-month period to chronically ill, dually eligible Medicaid/Medicare patients, resulting in substantial statistically significant reduction in health care utilization and costs. The study reported decreased number of emergency department visits, inpatient hospitalizations, and ambulance usage among persons who received delivery of MTMs in comparison to matched persons who did not receive meals. What's more, the program saved the health care system money, with an estimated monthly net savings of >\$200 per person in the meal program.<sup>24</sup>

Finally, a 2017 study in San Francisco demonstrated the beneficial aspects of MTMs specifically for the food-insecure diabetic population in the realms of mental, physical, and behavioral health.<sup>21</sup> Over a 6-month period, 53 diabetic patients with incomes less than 300% of federal poverty level were provided weekly MTMs based on a Mediterranean diet in line with American Diabetic Association guidelines. Patients picked meals up from a distributing location twice weekly, and meals provided 100% of daily energy requirements. The result was a statistically significant improvement in individual health. Patients reported improved diets, with decreased consumption of fats and sugars and increased consumption of fresh fruits and vegetables. Patients also had significantly improved confidence, with decreased diabetes distress and improved perceived self-management of their diabetes. Finally, patients reported decreased depressive symptoms, binge drinking, and the sacrificing of health care or prescriptions for food. Patients had decreased body mass index, A1c levels, emergency department visits, and hospitalizations; however, this study was not sufficiently powered to demonstrate statistical significance of those changes. Perhaps most fascinating is the fact that the cost per patient per 6 months was \$1184; in comparison the cost of 1 day in a California hospital was estimated to be \$2774.<sup>21</sup>

## Conclusions

Diabetes is a prevalent and immense burden to the health care system, and food insecurity increases this burden through decreased glycemic control and increased health care utilization. Nutrition is an essential aspect of diabetes management, and access of food-insecure patients to appropriate meals is an indispensable aspect of diabetes treatment. Recent studies have demonstrated

medically tailored meals to be an effective treatment intervention in both improving health and decreasing health care costs. Future studies are needed to further elucidate the impact of MTMs on health and costs of the diabetic population, specifically. Additional positive data might support the potential reimbursement of MTMs in the health care setting by private insurers and Medicare/Medicaid. The current health care system is increasingly cost-conscious and quality-oriented, and health care systems and insurers must seek out novel treatment options such as MTMs to meet these goals.

## Patient-Friendly Recap

- Inadequate access to food results in poor nutritional status, with diabetic patients more vulnerable to the negative effects of an unhealthy diet.
- Medically tailored meals have been shown to improve health outcomes in specific patient populations (eg, seniors, chronically ill) as well as reduce care costs.
- The author's review of available evidence suggests further research on the potential benefits of prescribing (and insuring) medically tailored meals for patients with type 2 diabetes is warranted.

## Conflicts of Interest

None.

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