



DIABETES AND U.S. AGRICULTURAL WORKERS

Diabetes mellitus is a disease in which the body does not properly process the glucose (sugar) in food. This results in a high blood sugar count. Pre-diabetes indicates a high blood sugar, but not high enough to be diagnosed as diabetes. Diabetes causes more blindness, kidney failure, and lower limb amputations than any other single disease, and underserved populations may struggle to be screened, diagnosed, and treated in a timely manner or on a regular basis. Agricultural workers may be particularly vulnerable to the development of type 2 diabetes mellitus due to a variety of factors, ranging from conditions of poverty to migratory status.

BACKGROUND

- Diabetes is identified as a risk factor for mortality and rates of progression to acute respiratory distress syndrome in patients with COVID-19.¹
- The International Diabetes Federation shows 463 million patients worldwide in 2019 were diagnosed with type 2 diabetes, which is estimated to increase to 700 million by 2045.¹⁰
- Epidemiological data show that diabetes increases the risk of most cancers, knowing that the diseases share many common risk factors such as physical inactivity, obesity, and diet.²
- The prevalence of diabetes increases with age, with approximately one in four adults 65 years and older having diabetes.³ Older individuals with diabetes also have higher rates of comorbidities compared with those without diabetes.¹⁶
- Diabetes health care expenditures include \$8,050 per person in 2017 in the U.S. who identify as Hispanic. Total diabetes expenditures in direct medical costs in the U.S. are estimated to be \$237 billion. The total indirect cost of diabetes is estimated at \$89.9 billion. Contributions to these indirect costs are reduced employment, premature mortality, workdays absent, and reduced productivity for those not in the workforce.¹¹
- Social determinants of health are associated with poor health outcomes related to diabetes.¹⁹ Lower educational attainment and poverty level income are associated with higher rates of diabetes and an increased risk of diabetes-related mortality.²⁰ Unstable

housing is associated with increased-risk of diabetes related emergency department and inpatient use.¹⁸

ENVIRONMENTAL, SOCIAL AND CULTURAL RISK FACTORS

- Residing in a rural, low-income household may limit access to nutritious foods.⁵ According to research conducted with farmworkers in North Carolina, approximately 20% of workers reported food security issues, and half of lunches and one-fourth of dinners were obtained pre-prepared from vendors.⁵
- Rates of obesity and increased intake of added sugars (diabetes risk factors) in agricultural worker families can be influenced by parenting styles. Feeding style is how parents interact around feeding, which is a range of passive and involved behaviors. Using encouraging language and involved behavior around mealtimes positively effects eating habits.⁴
- Research by Tyson et al., found that Latino farmworkers with diabetes were knowledgeable about necessary behavior modifications to manage the disease but struggled with management due to the high cost of supplies for managing diabetes and having fewer financial resources to make the necessary modifications to diet and lifestyle.⁷
- Living in the United States for ten years or more was associated with higher odds of hypertension for male agricultural workers in Oregon, and increased odds of obesity for male and female agricultural workers.¹²
- Research suggests that pesticide exposure may be associated with type 2 diabetes. Odds of diabetes were significantly elevated with ever having used pesticides, years of pesticide use, frequency of pesticide use, volume/intensity of use, and cumulative exposure index of pesticide use among agricultural workers.¹³ Research suggests an association between specific organochlorines (insecticide) and diabetes.¹⁴
- According to Cartwright et al., diabetes can be associated with weakness in the Hispanic agricultural worker community, leading to stigmatization and unwillingness to discuss the illness within the family. Some cultural norms, such as the meaning of foods and fullness (i.e. association of hunger and poverty), can create barriers to diet and exercise changes among Hispanic agricultural worker families.¹⁵

BARRIERS TO SELF-MANAGEMENT

Self-management for diabetes includes medical follow-up and access to prescription drugs.⁶ Significant barriers to regular health care for agricultural workers are:

- Migratory lifestyle interrupting continued care, medical follow-up/monitoring
- High cost of glucometer test strips
- Difficulty adhering to a diabetic diet⁷
- Lack of paid time off work
- Limited clinic hours
- Lack of culturally and linguistically-appropriate resources
- Concern over lost wages or job loss from taking leave⁶

These barriers can delay diagnosis as well as increase the difficulty of self-managing diabetes. In a recent study of 579 agricultural workers in California, not one of the 59 people who had pre-diabetes were aware of their diagnosis and of the 54 with diabetes, nearly 40% were previously unaware of their illness and had not been previously diagnosed.⁶ It is estimated that in the U.S., 34.1 million adults have diabetes, approximately 21% are undiagnosed.³ Delayed diagnosis or management of diabetes can result in severe health outcomes, such as blindness, kidney disease, neuropathy, and death.¹⁷

PREVENTION

An important step in prevention of diabetes mellitus among agricultural workers is to identify early risk factors and implement effective interventions.

- Research shows Latino Community Health Workers (CHWs) are better able to support these populations due to lack of a cultural or language barrier. CHWs can screen for diabetes with similar accuracy to registered nurses using non-invasive tools.⁸
- Prevention of this disease includes greater control over meal content increasing access to culturally appropriate foods, more fresh produce and nutrient dense foods.⁵
- Implement interventions with bilingual programs such as the *Pasos Saudables* curriculum for *promotores* developed by the University of California, Davis (UCD) specifically for Latino communities can be helpful in diabetes prevention efforts among agricultural workers.⁹

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- ¹ Selvin E, Juraschek SP. Diabetes Epidemiology in the COVID-19 Pandemic. *Diabetes Care*. 2020;43(8):1690. Accessed April 14, 2021. <https://search-ebSCOhost-com.ezproxy.lib.uwf.edu/login.aspx?direct=true&db=edsgea&AN=edsgcl.640450678&site=eds-live>
- ² Abudawood M. Diabetes and cancer: A comprehensive review. *J Res Med Sci*. 2019;24:94. Published 2019 Oct 25. doi:10.4103/jrms.JRMS_242_19
- ³ National Diabetes Statistics Report 2020. Estimates of diabetes and its burden in the United States. Published online 2020:32.
- ⁴ Ip EH, Marshall SA, Arcury TA, et al. Child Feeding Style and Dietary Outcomes in a Cohort of Latino Farmworker Families. *Journal of the Academy of Nutrition and Dietetics*. 2018;118(7):1208-1219. doi:10.1016/j.jand.2017.07.024
- ⁵ Quandt SA, Groeschel-Johnson A, Kinzer HT, et al. Migrant Farmworker Nutritional Strategies: Implications for Diabetes Management. *JOURNAL OF AGROMEDICINE*. 2018;23(4):347-354. doi:10.1080/1059924X.2018.1501453
- ⁶ Moyce S, Hernandez K, Schenker M. Diagnosed and Undiagnosed Diabetes among Agricultural Workers in California. *Journal of Health Care for the Poor and Underserved*. 2019;30(4):1289-1301. doi:10.1353/hpu.2019.0102
- ⁷ Tyson DM, Arriola NB, Medina-Ramirez P, Dao LU, Smith CAS, Livingston T. “You Have to Control It However You Can”: Type 2 Diabetes Management in a Hispanic Farmworker Community in Rural Florida. *HUMAN ORGANIZATION*. 2019;78(3):205-217. doi:10.17730/0018-7259.78.3.205
- ⁸ Thompson RH, Snyder AE, Burt DR, Greiner DS, Luna MA. Risk Screening for Cardiovascular Disease and Diabetes in Latino Migrant Farmworkers: A Role for the Community Health Worker. *Journal of Community Health*. 2015;40(1):131. doi:10.1007/s10900-014-9910-2
- ⁹ Borelli MR, Riden HE, Bang H, Schenker MB. Protocol for a cluster randomized controlled trial to study the effectiveness of an obesity and diabetes intervention (PASOS) in an immigrant farmworker population. *BMC PUBLIC HEALTH*. 2018;18. doi:10.1186/s12889-018-5560-0
- ¹⁰ Facts & figures. Accessed April 16, 2021. <https://idf.org/aboutdiabetes/what-is-diabetes/facts-figures.html>
- ¹¹ Economic Costs of Diabetes in the U.S. in 2017. *Diabetes Care*. Published online March 21, 2018:dci180007. doi:10.2337/dci18-0007
- ¹² López-Cevallos DF, Escutia G, González-Peña Y, Garside LI. Cardiovascular disease risk factors among Latino farmworkers in Oregon. *Ann Epidemiol*. 2019;40:8-12.e1. doi:10.1016/j.annepidem.2019.10.002
- ¹³ Curl CL, Spivak M, Phinney R, Montrose L. Synthetic Pesticides and Health in Vulnerable Populations: Agricultural Workers. *Curr Environ Health Rep*. 2020;7(1):13-29. doi:10.1007/s40572-020-00266-5
- ¹⁴ Starling AP, Umbach DM, Kamel F, Long S, Sandler DP, Hoppin JA. Pesticide use and incident diabetes among wives of farmers in the Agricultural Health Study. *Occup Environ Med*. 2014;71(9):629-635. doi:10.1136/oemed-2013-101659

¹⁵ Cartwright E, Schow D, Herrera S, et al. Using participatory research to build an effective type 2 diabetes intervention: the process of advocacy among female Hispanic farmworkers and their families in Southeast Idaho. *Women Health*. 2006;43(4):89-109. doi:10.1300/J013v43n04_06

¹⁶ Older Adults: Standards of Medical Care in Diabetes—2018. *Diabetes Care*. 2018;41(Supplement 1):S119. doi:10.2337/dc18-S011

¹⁷ American Diabetes Association. Standards of Medical Care in Diabetes-2018 Abridged for Primary Care Providers. *Clin Diabetes*. 2018;36(1):14-37. doi:10.2337/cd17-0119

¹⁸ Berkowitz SA, Kalkhoran S, Edwards ST, Essien UR, Baggett TP. Unstable Housing and Diabetes-Related Emergency Department Visits and Hospitalization: A Nationally Representative Study of Safety-Net Clinic Patients. *Diabetes Care*. 2018;41(5):933. doi:[10.2337/dc17-1812](https://doi.org/10.2337/dc17-1812)

¹⁹ Hill-Briggs F, Adler NE, Berkowitz SA, et al. Social Determinants of Health and Diabetes: A Scientific Review. *Dia Care*. 2021;44(1):258-279. doi:[10.2337/dci20-0053](https://doi.org/10.2337/dci20-0053)

²⁰ Saydah S, Lochner K. Socioeconomic Status and Risk of Diabetes-Related Mortality in the U.S. *Public Health Reports*. 2010;125(3):377-388. doi:10.1177/003335491012500306