

## Community-level screening for type 2 diabetes risk in Mexicans living in Colorado

### Detección a nivel comunitario de riesgo de diabetes tipo 2 en mexicanos que viven en Colorado

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#### Abstract

**Introduction:** Many Mexican immigrants to the US are medically underserved and have a higher risk for type 2 diabetes; early identification of risk factors can prompt referrals to lifestyle changes and primary care in this population. We used a cross-sectional study design to assess diabetes risk using an existing community partnership, a public health professional, and a lay health promoter model to identify individuals at high risk for diabetes without imposing tests that are difficult to perform or sustain in a community setting. **Materials and Methods:** Between January 1<sup>st</sup>, 2018, and December 31<sup>st</sup>, 2019, a community-based approach for type 2 diabetes-risk screening was conducted by lay health workers using a standard protocol including an educational component, the FINDRISC questionnaire, and capillary plasma glucose criteria. Basic descriptive statistics were obtained for demographic, lifestyle, and diabetes risk factors. **Results:** Our team screened 783 adult individuals (444 females and 339 males) for type 2 diabetes risk. 29% of participants (35.6% of females and 20.6% of males) were at high risk of type 2 diabetes because they had FINDRISC scores of 14 or higher. We also identified other risk factors, 79% of females and 86% of males were overweight or obese, and 39% had high blood pressure; consequently, we referred 427 patients to their PCP or a new medical home. **Conclusions:** The use of a community-based intervention using the FINDRISC type 2 diabetes risk assessment tool is a suitable, easy to perform intervention that can be applied in community settings by community lay health promoters.

**Keywords:** community screening; type 2 diabetes; FINDRISC; Hispanic immigrants.

#### Resumen

**Introducción:** un gran número de mexicanos que viven en los Estados Unidos están medicamente desatendidos y tienen alto riesgo de desarrollar diabetes. La identificación oportuna de factores de riesgo puede iniciar el proceso de referencia a programas de mejora de estilo de vida y a primer nivel de atención. Presentamos un estudio transversal diseñado para evaluar el riesgo de diabetes utilizando alianzas comunitarias pre-existentes, un profesional en salud pública y un modelo de promotores comunitarios de salud para identificar personas con alto riesgo de diabetes sin usar estudios de laboratorio complejos. **Material y métodos:** entre enero de 2018 y diciembre de 2019 se aplicó un programa comunitario para detectar riesgo de diabetes por miembros de la comunidad utilizando un protocolo estandarizado que incluyó un componente educativo, el cuestionario FINDRISC y criterios de glucosa capilar. Se hicieron estudios estadísticos básicos en demografía, estilos de vida y factores de riesgo de diabetes. **Resultados:** 783 personas (444 mujeres y 339 hombres) fueron evaluados para determinar su riesgo de diabetes. 29% de los participantes (35.6% de las mujeres y 20.6% de los hombres) tuvieron un resultado mayor o igual a 14 en la escala FINDRISC lo que indica alto riesgo de desarrollar diabetes. Se identificaron otros factores de riesgo, 79% de las mujeres y 86% de los hombres tenían sobrepeso u obesidad. Se detectó hipertensión en 39% de la muestra. Como consecuencia de esta intervención se refirieron 427 personas a primer nivel de atención. **Conclusiones:** La detección de individuos de alto riesgo de diabetes a nivel comunitario utilizando la escala FINDRISC por miembros de la comunidad es factible y de fácil aplicación.

**Palabras clave:** detección comunitaria, diabetes tipo 2; FINDRISC; migrantes Hispánicos.

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## Introduction

The worldwide estimated prevalence of type 2 diabetes (T2D) in 2010 was 6.4% (Safari, 2014, IDF, 2017). In Mexico, the frequency of previously diagnosed type 2 diabetes has been rising in the past decades, reaching 9.4% in 2016, placing the country amongst the top 10 countries with a higher proportion of diabetics in the world (Rojas, 2018). In 2014, Hispanics constituted 17.4% of the population of the United States; these 55.4 million people are the largest ethnic minority in the country, this population is expected to increase to 28.6% (119 million) by 2060 (Velazco, 2016). The prevalence of type 2 diabetes in this population is higher than that for non-Hispanic Whites; Mexican Americans double that of Mexicans at 18.3% (Juarez, 2018). Uncontrolled diabetes leads to complications that impact the quality of life and increase mortality risk.

Poor conditions of daily life such as macroeconomics, cultural values, income disparities, education, occupation, and social support systems -including access to health services- disproportionately affect Hispanics in the United States (Velazco, 2016); these inequities have a negative impact on their health. In the United States, approximately 1 in 4 people with diabetes are undiagnosed; this number was closer to 1 in 2 among Hispanics in 2011-2012 (Juarez, 2018). While the population ages, the health inequalities that result from these social determinants, their cultural background, employment, and foreign-born or undocumented status will impact the burden of disease; this can be complicated by undiagnosed T2D.

Timely identification followed by behavioral lifestyle intervention and pharmacological treatment can benefit people at the pre-diabetes stage and those with an early diagnosis of type 2 diabetes, making the identification of such individuals crucial and cost-effective (Zhang, 2010; Misra, 2016).

Because Hispanics in the USA utilize fewer preventive care services than other ethnic groups (Velazco, 2016), many do not know their risk for T2D. However, awareness of their actual risk can help them control risk factors such as physical inactivity, tobacco consumption, and increased body mass index.

To improve participation in programs to prevent T2D and its complications, we must identify individuals who are undiagnosed or at high risk. Screening for T2D at the community level with a simple, reliable, and cost-effective tool can identify individuals at high risk while avoiding invasive, inconvenient, and expensive tests. Several translations of the Diabetes Prevention Program and Finnish Diabetes Prevention Study have been applied by healthcare professionals, trainers, and community health workers. These interventions have produced positive results in different community settings, churches, and YMCAs (Misra, 2016). The Finnish Diabetes

Risk Score (FINDRISC) is a simple and non-invasive tool designed for this purpose (Zhang, 2010)

The purpose of this study was to identify individuals with undiagnosed T2D and T2D risk factors in Mexicans living in Colorado, as well as to evaluate the applicability of a community-based screening intervention in visitors of the Mexican Consulate General in Denver using a non-invasive survey, followed up with a capillary glucose test to identify individuals with higher risk for T2D who could benefit from a referral to further studies.

## Materials and Methods

We used a cross-sectional study design to assess diabetes risk using an existing community partnership, a public health professional, and a lay health promoter model.

The *Ventanilla de Salud* (VDS) is a program of Mexico's Government developed by the Department of Health and the Ministry of Foreign Affairs and implemented in all 50 Mexican Consulates in the United States. Local health organizations and non-profits operate the program to increase access to primary and preventive health services; *Servicios de La Raza* is the fiscal agent for the VDS in Denver. The VDS provides counseling, reliable information on health topics, and referrals to health services available and accessible in local communities. It was designed to improve the physical and mental health of Mexicans and subsequent generations in the United States and to increase access to health, health insurance and provide information in a culturally sensitive matter (Rangel, 2017).

Clients of this program come from the waiting room of the Mexican Consulate General in Denver that receives more than 120 visitors per day. The average waiting time at the main waiting room is 1 1/2 to 2 hours; the VDS puts this time to good use through health education and screenings.

Our main goal was to identify individuals at high risk for diabetes without imposing tests that are difficult to perform or sustain in a community setting.

A Mexican trained physician (RGF) developed a culturally and linguistic appropriate 15-minute lecture about T2D and diabetes risk which was delivered by trained lay health promoters (*promotoras*) (OA, JP, AMH), who invited the public to participate in a free personal T2D risk evaluation using an approach that combines a questionnaire and point-of-care capillary glucose tests to predict the risk for pre-diabetes or undiagnosed diabetes (Misra, 2016). Our lay health promoters evaluated voluntary participants by helping them complete a validated and reliable diabetes risk assessment questionnaire that can easily be used in primary care settings and

by individuals themselves. Therefore, it includes only variables assessed without laboratory tests and clinical measurements that do not require special skills. The Finnish Diabetes Risk Score (FINDRISC) developed at the National Institute for Health and Welfare, Helsinki, Finland, was selected for this community intervention. Details on the development and validation of this approach in a prospective setting have been published elsewhere (Lindström, 2003) and validated for different ethnic groups (Zhang, 2010; Silvestre, 2017). The FINDRISC form is a one-page questionnaire containing eight questions, with categorized answers, about age, BMI, waist circumference, physical activity, daily consumption of fruits, berries, or vegetables, history of drug treatment for hypertension, personal history of high blood glucose, and family history of diabetes (Supplementary material 1).

Our *promotoras* also collected a drop of whole blood by finger stick to assess the capillary glucose using a point-of-care blood glucose monitoring kit by Abbot (FreeStyle, Precision Neo). They registered the resting blood pressure and heart rate of participants; if blood pressure was out of range, it was verified by two more measurements. Each participant received a copy of their results. Participants with no prior diagnosis of T2D with a FINDRISC score of  $\geq 14$ , individuals with a medical history of diabetes who were not receiving treatment, and those with high capillary glucose levels (fasting  $\geq 110$ , random  $\geq 140$ ) were considered high-risk individuals (Krujishoop, 2004; Trimacco, 2010). We also classified individuals with obesity in the high-risk group. High-risk participants who reported having a Primary Care Provider (PCP) were encouraged to visit their PCP for follow-up care, those who reported not having a PCP were referred to the Family Medicine Clinic of the Colorado Alliance for Health Equity and Practice (CAHEP) for a complimentary medical evaluation and further treatment if needed. Participants with hypertension - defined as Systolic Blood Pressure of 130 mm Hg or greater and/or Diastolic Blood Pressure of 80 mm Hg or greater - were also referred for evaluation (Dorans, 2018).

Participants included individuals aged 18 years and older who were assessed for their risk for diabetes. There were no exclusions by gender, place of birth, race, or pregnancy status. It is not possible to determine the impact of the educational intervention but interested participants -those with concerns about diabetes- completed the FINDRISC screening survey guided by a health promoter.

#### Statistical analysis:

We used basic descriptive statistics for demographic, lifestyle, and diabetes risk factors. Nominal data -demographic information- and ordinal data -age ranges, BMI status, abdominal perimeter, physical activity, history of diabetes- are reported as counts (absolute frequencies) and percentages (relative frequencies). The following

variables were included in the model: age, gender, body mass index, physical activity, daily ingestion of fruits and vegetables, waist circumference, previous history of diabetes, family history of diabetes, resting blood pressure, and capillary glucose.

## Results

Participants included 783 Hispanic individuals aged 18 years and older assessed for their risk for diabetes.

Participants were 444 females (56.7%) and 339 males (43.3%). With ages ranging between 18 and 81 years old, mean 42.7 in females and 42 in males with a median of 43 for females and 42 for males (Table 1). 69% of the population studied had a family history of diabetes while, 16% of females and 6% of males had a previous history of hyperglycemia or pre-diabetes.

29% of participants (35.6% of females and 20.6% of males) were at high risk of T2D because they had FINDRISC scores of 14 or higher; however, we also found that 79% of females and 86% of males were overweight or obese, with obesity (body mass index greater than 30) in 39% of females and 40% of male participants. Waist circumference greater than 31 inches was prevalent in 46.6% of females; in 19.3%, it was greater than 35 inches, while 34.5% of males had a waist circumference greater than 37 inches, in 7.96%, it was more than 40 inches (Table 2).

**Table 1:** Demographics of study participants.

	females	males	Total
<b>N</b>	444	339	783
Age median	43	42	44.0
<b>Age Mean</b>	42.71	42.03	44.82

**Table 2:** Risk factors identified in the current population. 79.7% of the population were obese or overweight, 35% had a Findrisc score of 14 or greater and 22% had undiagnosed hypertension.

	females	%	males	%	Total
<b>Findrisc of 14 or greater</b>	158	35.8	70	20.6	228
<b>Overweight</b>	177	39.8	157	46.3	334
<b>Obesity</b>	173	38.9	135	39.8	308
<b>Abdominal obesity</b>	122	27.5	55	16.2	177
<b>High capillary glucose</b>	97	21.8	105	30.9	202
<b>High blood pressure</b>	97	21.8	133	39.2	230

When asked about eating habits, 68% of females and 52% of males reported eating fruits and vegetables every day. Regarding physical activity, 59% of males and 45 % of females did at least 30 minutes of exercise per day.

39% of participants had undiagnosed high blood pressure.

As a consequence of this community-based approach, we referred 427 patients to their PCP or established an appointment to a new medical home; 82% of those referred were between the ages of 45 and 72. The scope of this study didn't include follow-up contact, so we cannot determine the outcomes of these referrals.

## Discussion

Hispanics are less likely to participate in preventive health activities and screenings; however, the 2017 Healthy Americas Survey released by the National Alliance for Hispanic Health and the University of Southern California showed 55 percent of improvements in diabetes care, risk factor management, self-management education, and support, and better integration of care. These improvements have shown a positive impact on the long-term outlook for adults with T2D, which is one of the most important clinical and public health successes in recent decades, with gains most notable for reductions in acute myocardial infarction, stroke, and death due to hyperglycemia between 1990 and 2010. Unfortunately, as a continued decrease in the overall public health burden caused by diabetes seemed promising, a resurgence of diabetes complications has appeared in national statistics and the epidemiology literature (Gregg, 2019).

A rise in diabetes complications will have enormous collective implications for health and costs. Therefore, there is an urgent need for effective screening strategies and screening tools that can identify individuals with type 2 diabetes and those at high risk for type 2 diabetes. The metabolic syndrome and cardiovascular disease risk factors are frequently present in T2D patients and require treatment according to current guidelines.

Impacts of the 2017 guideline may include increased awareness of hypertension, encouragement of lifestyle modification, and, among US adults with a high risk of cardiovascular disease, increased antihypertension medication initiation and intensification (Dorans, 2018).

The current American Diabetes Association (ADA) guideline for type 2 diabetes screening among the asymptomatic population is based on laboratory testing (ADA, 2021). However, a preliminary screening using a simple and validated questionnaire followed by a more invasive and accurate diagnostic test can be a cost-effective and practical method in primary care and in community settings (Zhang, 2010).

Hispanics being vigilant about getting health screenings and checkups compared with 68 percent of African-Americans and 60 percent of Non-Hispanic Whites (NAHH, 2017), these groups have

a high prevalence of diabetes which, together with the disproportionately economic downturn, employment loss, and financial hardship that occurs in their communities, could contribute to a range of adverse complications of diabetes.

The application of non-targeted screenings to identify patients with pre-diabetes or undiagnosed diabetes has been effective in minority groups. Following recommendations of the US Preventive Services Task Force, Anderson et al. screened visitors to the Indian Health Service Emergency Department at Shiprock, New Mexico. Using blood glucose levels or A1c, the authors identified 26% of patients with previously undiagnosed pre-diabetes and 2.6% with previously undiagnosed diabetes. (Anderson, 2019)

This study was conducted by community members in a community setting, however, by giving a brief explanation of diabetes and its complications, we attracted a high percentage of participants with a family history of diabetes, but we identified a prevalence of increased risk for type 2 diabetes in 20.6% of males and 35.6% of females, these will surely benefit from participating in prevention efforts such as the Diabetes Prevention Program (DPP).

Balcazar showed that the integration of lay health promoters into clinical practices can build coalitions and partnerships for culturally competent and effective service delivery (Balcazar, 2009). Through this study, we also identified other risk factors such as high blood pressure in 39%, as well as overweight or obesity above reported state incidence according to ethnicity. We believe that a community approach by *promotores* can increase the number of screenings and will be successful in identifying at-risk individuals; as a community, we shall establish partnerships to provide adequate follow-up and therefore reduce the risk of severe complications.

FINDRISC is a simple and non-invasive diabetes risk score that can be well understood and easily calculated by laypeople or clinical personnel without any laboratory test and can work as the initial screening tool for adults at the community level (Saaristo, 2005; Zhang, 2010). This risk assessment tool has been shown to be a more suitable tool than the Canadian Diabetes Risk Score (CANRISK), the Indian Diabetes Risk Score (IDRS), the ADA risk score (Argawal, 2019) and the metabolic syndrome criteria (Meijnikman, 2018)

Other authors (Timm 2020) have identified that community-level screening using Findrisc has been more effective than facility-based approach in persons born in Africa and Asia when compared to persons born in Sweden and other European countries. Also, younger persons were reached more frequently through community screening compared with facility-based screening. Both types of screening reached more women than men.

The present study provides novel information on the application of community-based screening for T2D, diabetes risk, hypertension, and metabolic syndrome in Mexicans living in the United States using simple non-invasive tests. Furthermore, we have shown that using FINDRISC provides an easy reproducible educational tool and an effective option when screening for undiagnosed T2D in high-risk individuals. The increased prevalence of T2D and the economic burden associated with its complications make the use of simple and accurate methods to identify T2D risk at early stages a public health priority. Further research into this community approach may be warranted.

### Limitations

As mentioned above, this study was not designed to follow-up contact on patients referred to a medical home. Therefore, we will not know the outcomes of these referrals. In the same way, it will not be possible to evaluate if the educational intervention stimulated the population with higher risk of diabetes to participate in the study due to familial experience, generating a prevalence bias.

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### Supplementary Material 1 : FINDRISC Scale

Age	points
Less than 45	0
45 – 54	2
55 – 64	3
65 or more	3

BMI	points
<25 kg/m <sup>2</sup>	0
25 - 30 kg/m <sup>2</sup>	1
>30 kg/m <sup>2</sup>	3

Abdominal perimeter (measured at the navel)		
Men	Women	points
< 94 cm	< 80 cm	0
94– 102 cm	80 – 88 cm	3
>102 cm	> 88 cm	4

family history of type 2 diabetes	points
none	0
Cousins, uncles, grandparents,	3
Parents, siblings, offspring	5

30 minutes of exercise daily	points
yes	0
no	2

ingestion of fruits and veggies	points
Every day	0
Not every day	1

High blood pressure meds	points
yes	2
no	0

History of high blood glucose	points
yes	5
no	0

#### Interpretation

Total points	Risk of type 2 diabetes in next 10 years	interpretation
< 7	1%	Low risk
7 – 11	4%	Slightly high risk
12 – 14	17%	Moderate risk
15 – 20	33%	High risk
>20	50%	Very high risk