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Undocumented Immigration Status and Diabetes Care among Mexican
Immigrants In Two Immigration “Sanctuary” Areas

By

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Paper One: Review of Literature

Introduction

Approximately half of the Mexican population living in the United States is undocumented^[1,2,3], accounting for 57% (5.9 million) of the estimated 10.3 million undocumented immigrants^[4,5]. Undocumented immigrants are a vulnerable population with a decreased likelihood of having health insurance^[6,7] and limited use of^[8,9,10] and access to health care services^[11,12]. They are also less likely than legal immigrants to report having a primary care provider^[13] and a regular source of care^[14].

Furthermore, despite having lower prevalence of many conditions than the general population in the United States, Mexican Americans are 1.7 times as likely to have diabetes as non-Hispanic whites^[15]. Diabetes afflicts an estimated 9.5% of Latino adults in the US^[16] and is increasingly common among foreign born Latinos^[17].

To date, little research has focused on the association between immigration status and chronic disease management and processes of care. This literature review will address the scope of Mexican immigration, health care disparities faced by the undocumented population, and diabetes management. The history of Mexican immigration and its associated reforms will be described, followed by undocumented immigrants' use of and access to health care, diabetes epidemiology both in Mexico and the US, and general guidelines for individual and clinical management of type 2 diabetes mellitus.

Immigration from Mexico to the United States

Current trends and projections

Large-scale immigration to the US by Mexicans began in the 1970s. By 1980, the largest foreign-born population in the US, with 2.2 million people, originated in Mexico. The number of immigrants doubled from 1980 to 1990 and again more than doubled in the following decade. The growth rate of the Mexican immigrant population has slowed significantly since 2006, but the total number reached a record 12.7 million in 2008, an almost 17-fold increase since 1970^[18]. Mexicans account for one-third (32%) of all immigrants living in the US, and nearly two-thirds (65.7%) of the US Hispanic population in 2008^[19]. Immigrants represent a large segment from Mexico's perspective as well. In 1970, 760,000 Mexican immigrants, or 1.4% of Mexico's population, lived in the US, while by 2010, about 11%, or greater than 1 in 10 Mexicans, live in the US^[18].

The undocumented grew rapidly from 1990 to 2006, accounting for about 80–85% of the increase in the Mexican-born population during that time^[20]. However, this population growth has since stabilized^[21]. Of the total Mexican immigrants living in the US, more than half (59%) are undocumented, numbering 7 million in 2008. Overall, they comprise about six-in-ten (59%) of the estimated 11.9 million undocumented immigrants in the US^[22,23].

Destinations

Most immigrants from Mexico (63.4%) arrived in the US in 1990 or later^[19]. At that time, about 88% of the undocumented population lived in only *six* states that had been traditional settlement areas for the foreign-born: California, New York, Texas, Illinois, Florida and New Jersey. However, since the mid-1990s, the most rapid growth in the number of undocumented migrants has been in states that previously had relatively small foreign-born populations. As a result, Arizona and North Carolina are now among the states with largest numbers of undocumented migrants^[20,24,25]. Nevertheless, most undocumented Mexican immigrants are concentrated in the western part of the United States, and California still houses the largest number, approximately 2.7 million in 2008^[22,26].

The undocumented and “sanctuary” cities

Immigration reform

The concept of “sanctuary” cities originated in the 1980s when thousands of Central American refugees came to the United States seeking protection from civil wars occurring in their countries. At first, despite the passage of the Refugee Act of 1980^[27], many of them were denied asylum in the US due to Cold War politics, and were therefore termed “undocumented”^[28]. As a response to the denial of refuge by the US Immigration and Naturalization Service, religious organizations across the country provided *sanctuary* for these undocumented refugees fleeing the political turmoil in their home countries of Guatemala and El Salvador^[29].

During the mid-1980s, the sanctuary movement crossed into the public sector. It moved from religious organizations offering legal representation, employment, and other basic needs, to the passing of local resolutions in many US cities to serve as official sanctuaries for Central American refugees^[30]. Gradually, the sanctuary movement evolved and expanded its protection to all foreign-born individuals, such that by 2007 sanctuary policies were in place in over 70 cities, counties and state governments^[31]. Sanctuary policies generally “discourage government officials from asking about a person's immigration status and prohibit them from revealing such information to federal officials, except in the cases of serious criminal offense”^[32,33]. Despite a 1996 federal law (the Illegal Immigration Reform and Immigrant Responsibility Act) that requires local governments to cooperate with Department of Homeland Security's Immigration and Customs Enforcement, many urban cities continue to adopt sanctuary policies. San Francisco's sanctuary policy, for example, has evolved into its current status as an active Ordinance entrenched in the city's Administrative Code^[34].

Welfare and health reform

The existence of these sanctuary cities may have a positive impact on the health status of undocumented immigrants. Over the years, federal and state policies regarding access to health care have changed to limit the services available to the immigrant community. In 1994, California voters passed Proposition 187 through referendum, stating that undocumented immigrants were prohibited from using health care, public education, and other social services in the state. Under this proposition, physicians would have been required to report the undocumented immigrants to immigration authorities, but it was later deemed unconstitutional by a federal court in 1999^[35] and never enacted. In 1996, the federal welfare reform law

(Personal Responsibility and Work Opportunity Reconciliation Act, or PRWORA) restricted Medicaid eligibility of immigrants, so that those admitted to the United States after August 1996 could not receive coverage, except for emergencies, in their first five years in the country. Prior to this act, both citizens and noncitizens were equally eligible for Medicaid and other public benefits, but PRWORA drew a novel distinction between these two groups, limited federal benefits for future immigrants, and signaled an important change in the social contract^[7]. States were given the option to include immigrants already here in 1996 in their Medicaid programs. Although federal reimbursement is not available for this population, some states, including many with large immigrant populations, chose to use their own funds to enroll some groups of recent immigrants.

Most recently, the health care reform of 2010 (Patient Protection and Affordable Care Act, PPACA) expanded public programs such as Medicaid, but upheld federal law excluding undocumented immigrants from eligibility for Medicaid benefits financed by the federal government. Furthermore, under PPACA, undocumented immigrants will be prohibited from purchasing insurance in the exchanges with their own money and participating in employer-sponsored healthcare^[36]. This affects the states' ability to provide care to undocumented immigrants and may increase apprehension about immigrant status and use of public health care benefits^[35,37]. As a result, the undocumented community may find it even harder to obtain services in the future, and states that wish to provide benefits to undocumented immigrants will need to establish their own laws.

Many providers believe that, at an institutional level, sanctuary policies allow hospital administrators and health care providers to create trust in the local immigrant community by advertising a 'safe' hospital environment in which data on immigration status will not be obtained or transmitted to authorities^[38]. Whatever the connection between legislation, policy, and the perceived level of fear reported by the undocumented, data from studies show that lack of documentation – and the fear associated with it – is a powerful deterrent to people obtaining care they believe they need^[35]. This is an issue that will continue to require public attention and be addressed through safety-net services and public policies.

The undocumented and healthcare disparities

Undocumented immigrants are a population particularly vulnerable to health disparities. Their legal status makes them ineligible for most public health insurance or other healthcare programs except for emergency Medicaid and certain public health measures, and puts them at a constant risk of arrest and deportation while moving about society. Although healthcare institutions are not specifically required to report undocumented immigrants to federal immigration authorities, this risk of arrest and deportation has created a sense of fear in the immigrant community, making people wary of coming into contact with the medical care system and formal healthcare providers^[39]. In addition to the challenges the undocumented face particularly due to their lack of legal status, they are also affected by health disparities encountered by the immigrant and uninsured population as a whole^[40].

Health insurance coverage

Health insurance coverage, as classified by the US Census Bureau, includes persons with insurance through their employers, insurance purchased themselves in the small personal insurance market, and government insurance such as Medicaid, Medicare, military insurance, or state insurance^[41]. Individuals that are not covered by one of these entities are considered “uninsured”. Latinos constitute 32.4% of the 45 million uninsured in the United States^[26], with the lowest insurance rates of all major racial/ethnic groups in the US^[10,42]. Between 40% and 50% of *non-US citizens* are uninsured^[43].

In California, undocumented immigrants are not eligible for Medicaid (Medi-Cal) coverage, with the exception of emergency services (including labor and delivery). These services, as well as nonemergency services for recent legal immigrants, do not qualify for federal funds and are financed fully by the state. More than half of the low rates of health insurance among undocumented immigrants are attributable to their lack of access to public coverage. Additionally, immigrants are far more likely to work in food and agriculture, personal services, or textiles— all industries that are less likely to offer health insurance to their employees^[6]. Individuals who lack health insurance coverage may not receive medical care in a timely manner, receive worse care for minor conditions, and have a higher mortality rate^[44].

Furthermore, among undocumented immigrants, lack of insurance tends to be chronic and coverage is often transient. Goldman, et al. showed that, for those without health insurance at the time of their survey, 95% of undocumented migrants had been uninsured for the prior two years, compared with only 69% of the native-born. Among those who were insured, only 62% had been continuously insured for the previous two years^[45]. Thus, even for undocumented immigrants with health insurance at a point in time, the odds for maintenance of coverage are smaller.

Regular source of care

Some studies have concluded that having health insurance is the most important predictor of an individual’s reporting access to a regular health care provider^[5,11]. Previous research by the US Centers for Disease Control and Prevention has shown that Hispanics are twice as likely as non-Hispanic blacks and three times as likely as non-Hispanic whites to lack a regular health care provider^[13,46]. Undocumented Mexican immigrants in California, in particular, are less likely to have a usual source of care and fewer routine physician visits compared with US-born Mexicans and non-Hispanic whites, even after controlling for sociodemographics, insurance, and need^[10,12,14,47].

Healthcare utilization

Studies show lower use of health care services among undocumented Latino immigrants^[48,49]. Contrary to popular belief, hospital services are not their primary source of care^[12]. Undocumented immigrants tend to seek care from primary care clinics that offer special payment arrangements or instead postpone medical care. Thus, when immigrants use hospital services, they are more likely to use emergency department services than documented immigrants, who use outpatient services^[8]. Overall though, undocumented immigrants’ emergency department use is lower than comparable uninsured US populations^[41]. The dependence on emergency services to address health care needs, due to delayed care until illness is severe enough to warrant emergency care, may exacerbate the burden of pathology among undocumented immigrants^[5].

Additionally, the undocumented have been shown to have lower use of preventive services like pre-natal care, general checkups and dental services^[8]. They also show greater likelihood of delaying care, missing access to specialized services such as mental healthcare services, limited chronic care, low levels of ambulatory healthcare services utilization, and poorer access to pharmaceuticals^[9,50,51,52,53]. Ortega et al. state that undocumented Mexicans and other undocumented Latinos not only report less use of health care services, but also poorer experiences with the health care received (hard time understanding the physician and perceived discrimination) compared with their US-born counterparts, even after adjustment for socioeconomic confounders and self-reported health in multivariate analyses.

Other barriers to health care

In addition to limited insurance coverage and health care utilization, undocumented immigrants experience other barriers to care. Their lack of legal documentation makes it more difficult to obtain formal employment and achieve economic stability, resulting in low incomes that decrease their ability to afford the high cost of health care^[8]. Many Latinos also experience language barriers to social integration and access to health care^[54]. The 2000 US Census found that more than 13.7 million Latinos speak English “less than very well,” and more than 28.1 million Americans speak Spanish at home^[55]. Nandi et al. found that undocumented Mexican immigrants experiencing discrimination with respect to language were less likely to report access to a regular health care provider than those who did not experience discrimination^[5].

Furthermore, anxieties about the risk of deportation may represent a significant barrier to accessing health services and decrease the likelihood of receiving care^[56,57]. This was seen many years ago in a study of undocumented immigrants with tuberculosis, where those who voiced fear of deportation were four times as likely to delay seeking care as those who did not^[53]. More recently, Berk et al. found that 39% of undocumented adult immigrants in their study expressed fear about receiving medical services because of undocumented status. Those reporting fear were more likely to report inability acquiring medical and dental care, prescription drugs, and eyeglasses^[35].

Type 2 Diabetes Mellitus in the Mexican population

Diabetes Mellitus is a group of diseases marked by high levels of blood glucose resulting from defects in insulin production, insulin action, or both. Over time, this excess glucose in the blood (hyperglycemia) results in microvascular and macrovascular complications that can lead to conditions like kidney failure and blindness (microvascular) or heart disease and stroke. Development of microvascular complications can be prevented by tight glycemic control, whereas macrovascular complications require aggressive control of risk factors such as hypertension and hyperlipidemia. However, Latinos with diabetes are known to have poor glycemic control and encounter many health disparities, posing a difficult challenge in preventing both diabetes and diabetes-related complications. The rest of this section will address some of these disparities and the general approach to diabetes management for all people with type 2 diabetes mellitus (T2DM).

Diabetes prevalence in Mexico

Diabetes Mellitus is a chronic disease that affects people all around the world. In less than four decades, it has become the main health problem in Mexico – it is the primary cause of death in women and the second among men since 2000^[58]. The prevalence of T2DM has increased in recent years; the increment close to 25% over a 7-year period (1993-2000)^[59]. According to the 2009 estimates from the International Diabetes Federation, 10.8% of Mexico's 20 to 79-year-old population has diabetes (both T1DM and T2DM), and this is expected to increase to 12.9% in 2030^[60].

Diabetes prevalence in the US

Type 2 Diabetes Mellitus (T2DM) is the most common form of diabetes in the United States and is widely recognized as one of the leading causes of death and disability in the country. As of 2010, it ranks as the seventh leading cause of death. In 1933, less than 1% of the population was believed to have T2DM. This increased to approximately 5% in the early 1990s and then to almost 7% by the end of that decade^[61,62]. In 2010, about 1.9 million people aged 20 years or older were newly diagnosed with diabetes (both T1DM and T2DM, although T2DM represents 90-95% of all cases), now totaling 25.8 million people (all ages) with this disease – 8.3% of the general US population^[63]. Based on these statistics, the increase in T2DM in the US may be considered an epidemic and is expected to increase substantially during the next 50 years^[64].

Diabetes disparities in the US

Hispanics have lower prevalence of many chronic conditions than the US adult population. However, they have a higher prevalence of diabetes than non-Hispanic white adults^[65]. According to the CDC's 2007-2009 national survey data for people aged 20 years or older, after adjusting for population age differences, 11.8% of Hispanics had diagnosed diabetes (both T1DM and T2DM), compared to 7.1% of non-Hispanic whites^[63] - more than 50% increased risk. Among Hispanics, Mexican-Americans in particular are at increased risk of diagnosed diabetes. This same survey indicated diabetes rates for Mexican-Americans to be 13.3%, making them almost twice as likely to have diabetes as non-Hispanic whites^[15]. Diabetes is increasingly common among *foreign-born* Latinos as well, likely reflecting changes in obesity in source countries, such as described in Mexico^[17]. This increase in the total number of people with diabetes in the United States follows the increase in obesity, itself the product of numerous social trends.

Diabetes risk factors

There are certain factors that place people at risk for developing diabetes. These include a family history of diabetes, history of gestational diabetes, being over the age of 40 (more on this below), being overweight or obese, having an inactive lifestyle^[66], and having limited access to health care. High percentages of Mexican-Americans, in particular, are overweight – more than 47% of men and 35% of women^[67]. Additionally, Latino adolescents report the highest rates of not engaging in physical activity compared with their peers, and one-fifth of Latino adults lead a sedentary lifestyle^[68]. Among adults with diabetes, Latinos in California are nearly four times more likely to have no usual source of health care than non-Hispanic whites^[69].

Type 2 diabetes mellitus occurs most commonly in adults aged 40 years or older, and the prevalence of disease increases with age. The CDC's 2011 National Diabetes Fact Sheet

indicated that 11.3% (25.6 million) of individuals aged 20 years or older have diabetes, while 26.9% (10.9 million) of individuals aged 65 years or older have diabetes. However, the incidence of T2DM is increasing more rapidly in adolescents and young adults than in other age groups. The rate of new cases of T2DM in this group is much higher in Latinos, as well as American Indians, Asian/Pacific Islanders, and African-Americans^[70]. Additionally, the prevalence of diabetes is slightly higher in men than women – 11.8% of men vs. 10.8% of women aged 20 years or older^[63].

The prevalence of diabetes has also been shown to be strongly associated with social, economic and demographic factors – including education, income and, among immigrants, number of years lived in the US. Although all educational groups showed an increase in diabetes prevalence between 2001-2005, the greatest increase was among those with the least education. The prevalence of diabetes was nearly three times as high among adults with no more than an eighth-grade education compared to those who graduated from college (13.7% vs. 4.7%). Similarly, the prevalence of diabetes is highest among adults from the lowest-income households. Adults from households with incomes below 200% the Federal Poverty Level (FPL) have a prevalence almost twice that of adults from households with incomes of 300% FPL and above^[71]. These trends are particularly significant for undocumented immigrants who tend to have low income and less education.

Furthermore, diabetes rates are highest among immigrants living longest in the United States. Diabetes prevalence among first-generation immigrants who have lived in the US fifteen years or more is three-times the rate for those who have lived here for fewer than ten years (9.8% vs. 3.2%)^[71]. This finding is consistent with other studies that have shown that the longer immigrants live in the US, the more their health-related behaviors and rates of chronic diseases come to resemble those of US-born adults^[72].

Prediabetes in the US

Prediabetes is a condition in which individuals have blood glucose or hemoglobin A1c (HbA1c) levels higher than normal, but not high enough to be classified as diabetes. HbA1c serves as a marker for average blood glucose levels over the months prior to the measurement. People with prediabetes have an increased risk of developing T2DM within 10 years, unless they take steps to prevent or delay diabetes. They are additionally at risk for heart disease and stroke. In 2005-2008, based on fasting glucose or A1c levels, 35% of US adults aged 20 years or older had prediabetes (50% of those aged 65 years or older). After adjusting for population age differences, the percentage of adults with prediabetes was similar for non-Hispanic whites (35%) and Mexican Americans (36%)^[63].

Diabetes medical complications

Although often asymptomatic in its early stages, the chronic hyperglycemia of diabetes can result in further medical complications and worse health outcomes. It is one of the leading causes of morbidity and mortality in the US because of its role in the development of cardiovascular, renal, neuropathic and retinal disease. Macrovascular disorders, particularly cardiovascular disease, are the leading causes of morbidity and mortality in people with T2DM. Adults with diabetes have heart disease death rates and risk for stroke about 2-4 times higher than adults without diabetes^[73]. Approximately two thirds of those with diabetes die of heart disease or stroke. In

2005-2008, 67% of adults aged 20 years or older with self-reported diabetes also had hypertension^[63]. Compared with diabetic non-Hispanic Whites, Mexican Americans with diabetes have a greater incidence of macrovascular complications^[74].

Diabetes is also the major cause of blindness in adults aged 20-74 years in the United States; diabetic retinopathy accounts for 12,000-24,000 newly blind persons every year^[75]. In 2005-2008, 4.2 million (28.5%) people with diabetes, over the age of 40, had diabetic retinopathy, and of these, 655,000 (4.4% of them) had advanced diabetic retinopathy that could lead to severe vision loss. Additionally, diabetes, particularly T2DM, is the leading cause of kidney failure, accounting for 55% of all new cases of kidney failure in 2008^[63]. Among people with diabetes, Mexican Americans are 4.5-6.5 times more likely to suffer from end-stage renal disease^[74]. These medical complications likely reflect poor tight glycemic control and poor control of hypertension and hyperlipidemia in the Mexican immigrant population, which is partially influenced by their decreased likelihood of having health insurance and limited use of and access to health care services.

About 60-70% of people with diabetes have mild to severe forms of nervous system damage, resulting in impaired sensation of pain in the feet or hands, slowed digestion of food in the stomach, carpal tunnel syndrome, erectile dysfunction, or other nerve problems. Thus, diabetes is the leading cause of non-traumatic lower limb amputations, with a 15- to 40-fold increase in risk over that of the non-diabetic population. Over 60% of non-traumatic lower-limb amputations occur in people with diabetes, resulting in about 65,700 such amputations in 2006^[63]. Other complications of diabetes include dental disease, complications of pregnancy, biochemical imbalances, depression, and susceptibility to infections such as pneumonia and influenza^[76].

Diabetes Cost

Medical expenses for people with diabetes are more than two times higher than for people without diabetes; it is a chronic disease with high economic costs for both the US community and healthcare system^[77]. According to the Centers for Disease Control and Prevention, the total estimated health care costs related to diabetes treatment were about \$174 billion in 2007. Of these, \$116 billion were direct medical expenditures, while \$58 billion were from the indirect costs of disability, work loss, and premature mortality^[63]. Brown et al. found that macrovascular complications were associated with up to 89% of the costs for inpatient treatment in patients hospitalized for diabetes-related complications^[78]. Given the aging of the US population, the rapid growth of the Mexican-American population, the increasing prevalence of diabetes and rising costs of treatment, medical expenditures are expected to continue to increase.

Moreover, in the case of uninsured undocumented immigrants with diabetes, the economic burden of treatment is shouldered not only by individual patients, but also by the greater population who pay into the health care system. Stimpson et al. found that non-citizen immigrants were more likely than the US-born to have a health care visit classified as uncompensated care, either as charity care or as care that goes unpaid for. Thus, although the rationale for excluding non-citizens and recent immigrants from government health care programs includes cost reduction, the cost of uncompensated care is still passed on to insured consumers through higher charges for other services^[79].

Medical costs can be reduced when patients receive information and care that allow them to avoid the development of diabetes, or treatment that facilitates disease management. Many argue that lowering the barriers to health care access might reduce health care cost and the burden of expensive late-stage care that often falls to publicly-funded health services. An important strategy to reduce this chronic illness and the costs associated with it is prevention via regular self-management, clinical monitoring and educational initiatives^[80].

Type 2 Diabetes Management - Individual

As discussed thus far, the number of cases of T2DM in the Mexican community in the United States is growing each year, and the significant health burden it imposes on affected individuals makes it a chronic disease that needs to be prevented. In 2002, data from the Diabetes Prevention Program Research Groups showed that lifestyle interventions (such as improved nutrition and physical activity) or treatment with metformin could in fact prevent or delay type 2 diabetes in high-risk individuals – those who were obese and had pre-diabetes. After an average follow-up of nearly 3 years, the incidence of diabetes was reduced 58% in the group with the lifestyle intervention and by 31% in the group with metformin, as compared with placebo^[81]. Given the particular effectiveness of lifestyle modification in delaying or preventing T2DM, daily diabetes self-management guidelines have been recommended and promote patients taking individual responsibility for managing their health.

Diabetes self-care

Diabetes demands daily self-management, and people with this chronic disease generally need to make lifestyle modifications to achieve successful glycemic control. Diabetes self-management is defined as “the process of providing the person with diabetes with the knowledge and skills needed to perform self-care, manage crises, and make the lifestyle changes required to successfully manage the disease”^[82]. It is a multidimensional process that calls for daily engagement in a complex set of behaviors, and its effectiveness can be determined using seven diabetes self-care behavior measures: (1) healthy eating (a low-saturated-fat diet), (2) physical activity, (3) blood glucose monitoring, (4) taking medications, (5) problem solving (especially for high and low blood glucose levels), (6) healthy coping (psychosocial adaptation to living with diabetes), and (7) reducing risks of diabetes complications (eg, checking one’s feet)^[83].

The literature suggests that people equipped with diabetes self-management skills have increased knowledge, improved self-management of blood glucose, improved dietary habits, and better glycemic control^[84]. However, the successful management of these behavioral changes is often challenging for Latinos with diabetes, possibly due to the fact that many traditional diabetes self-management models are not culturally sensitive, contextual, or effective for this population^[85,86,87]. Recent studies have concluded that delivering a culturally tailored intervention can positively affect diabetes self-management behaviors^[88,89,90]. McEwen et al. showed that including *promotoras* (community health workers) as part of a social support intervention recruits and retains Mexican American adults with T2DM, improves self-management behaviors and diabetes knowledge, and decreases diabetes-related distress^[91]. *Promotoras* understand how nuances of culture affect self-management and draw on this understanding when providing culturally and linguistically appropriate social support. Future

efforts should be focused in targeting culturally-appropriate interventions to prevent the development of diabetes in the Mexican immigrant population.

Diabetes knowledge

Patient education is the cornerstone of care for patients with T2DM, and knowledge of the disease forms the basis for informed decisions about diet, exercise, weight control, blood glucose monitoring, use of medications, foot and eye care, and control of cardiovascular risk factors. People with diabetes are more likely to know the basic facts about their condition than the general population does, but not all diabetics are well-informed. According to the Pew Hispanic Center, in 2008, 73% of Hispanic adults diagnosed with diabetes score high on the diabetes knowledge test, 24% get a medium score and 3% get a low score^[16].

However, special consideration should be given to patients with diabetes and low literacy, who have been shown to have poorer knowledge about diabetes self-management, putting them at risk for worse health outcomes^[92]. A study conducted by Williams et al. at two public hospitals found that more than half of patients with inadequate literacy did not know the symptoms of hypoglycemia or how to treat it. These knowledge deficits occurred despite the fact that 73% of the patients had received diabetes education at some point^[93]. Measuring patient knowledge is thus critical both in assessing the impact of diabetes education interventions and as an intermediary to improved patient outcomes. Patient knowledge about disease treatment and symptoms is essential for proper self-management of type 2 Diabetes Mellitus. Improved diabetes awareness and knowledge among Latinos could prove valuable in reducing the heavy disease burden associated with diabetes in disadvantaged communities^[47].

Diabetes beliefs

Health beliefs in the Mexican American population, in addition to diabetes knowledge and self-management, can influence health outcomes. Diabetes-related health beliefs include perceptions of barriers to implementing lifestyle changes, beliefs in the benefits of effective self-management, perceptions that one can control the effects of diabetes, beliefs regarding the impact of one's job on diabetes therapy, and perceptions of support for their diabetes provided by family and friends. Of these different beliefs, the perception of control over one's diabetes and perception of social support are potentially the most critical factors. According to Brown et al., Hispanics value close familial and social relationships, and social support can improve glucose control. Furthermore, he states that older, less acculturated Mexican Americans may believe that illness results from wrongdoing and not something that is under one's control. Given this cultural difference, it is important that individuals change their perceptions of external control of their diabetes to one of internal control or empowerment. Otherwise, sufficient management of their disease will never be achieved, since 90% of diabetes management is done by the individual with diabetes^[94].

Type 2 Diabetes Management - Clinical

Successful management of diabetes is not only dependent on individual self-management and behavior change, but also necessitates a combined effort with the healthcare provider. In fact, having a *team* of providers (which can include a primary care physician, endocrinologist,

dietitian, ophthalmologist, podiatrist, etc) can improve diabetes care. The ultimate goal of diabetes management is to keep levels of blood glucose, blood pressure, and cholesterol as close to the normal range as safely possible. Each year, the American Diabetes Association (ADA) publishes clinical practice recommendations that include standards of care for patients with diabetes mellitus. The elements of comprehensive care are referred to as the “ABCs of Diabetes”, and include monitoring of (A) hemoglobin A1c, (B) blood pressure and (C) cholesterol levels^[95].

ABCs of Diabetes

The chances of having diabetes complications can be reduced or delayed significantly by keeping good control of blood sugar, blood pressure and lipids. The ADA recommends hemoglobin A1c levels be checked at least twice a year and kept at less than 7%; blood pressure checked at every doctor’s visit and kept at less than 130/80mmHg; and cholesterol levels (especially LDL) checked once a year and kept at less than 100mg/dL. These target values are often adjusted and personalized to each individual with diabetes according to co-morbidities they may suffer and their ability to self-manage their disease. Clinicians are further responsible for providing routine diabetes education, eye and foot examinations, health maintenance, and referrals to specialty care if needed.

The benefits of decreasing blood pressure and lipids are well recognized and include reductions in the risk of micro- and macrovascular disease and death^[96]. Improved glycemic control, the major factor for complications of diabetes, is associated with long-term health benefits and substantial short-term improvements in quality of life, symptom distress, physical functioning, and economic benefits^[97]. However, Livingston et al. showed that among Latinos diagnosed with diabetes, 10% of those with a regular place of health care had not had a test to check their blood sugar in the past two years – a number that jumped to 33% among those with no regular provider^[16]. Harris et al. reported that among insulin-treated diabetic patients, Mexican-Americans were less likely than Caucasians to self-monitor their blood glucose (27% vs. 44% of Caucasians), have their cholesterol checked (62-68% vs. 81%), and have their dyslipidemia diagnosed (45% vs. 58%)^[96]. This clearly indicates that even with access to care, healthcare providers are not adequately monitoring the management of disease in patients with diabetes. Since both medical complications and medical care charges (to payers and patients) increase significantly for increases in HbA1c levels above 7%, it is imperative that clinical systems improve their diabetes care.

Depression

Co-morbid depression is significantly higher among individuals with diabetes relative to patients without the disease. Approximately 30% of individuals with diabetes exhibit some form of depressive symptomatology, and the rate of clinical depression is twice that in the overall population^[98]. Depression is associated with poor chronic disease outcomes, particularly among patients with diabetes^[99]. Egede et al. concluded that depressed patients were more likely to report more problems with diabetes control, lower self-care ability, lower self-care adherence, negative attitudes, and less perceived ability to control the consequences of diabetes. There was no significant effect observed in diabetes knowledge, but diabetes self-management practices differed significantly by depression status^[100]. In addition, patients with both diabetes and depressive symptoms tend to be less physically active, more likely to smoke tobacco, and have

less healthy diet^[101]. Unfortunately, depression in diabetes is considerably underdiagnosed and undertreated.

Furthermore, patients with severe depressive symptoms have greater odds of reporting suboptimal communication with their healthcare provider^[98], potentially resulting in poorer delivery of diabetes care and self-management education and support. Depressive symptoms are associated with increases in hyperglycemia, thus increasing patients' risk of developing microvascular damage, cardiovascular complications and greater mortality^[102]. Persons with diabetes and major depression spend 50-75% more on health services compared to those diagnosed with diabetes only^[103].

Diabetes distress

Diabetes distress is a condition distinct from depression that is related to diabetes outcomes. Although many patients with diabetes display high levels of depressive affect, previous studies show that most of them are not necessarily clinically depressed but instead experience high levels of emotional distress stemming from concerns and worries associated with their disease and its management^[104]. Fisher et al. found that in their study, patients with diabetes showed higher prevalence of diabetes distress (18%) than major depressive disorder (10.7%)^[104].

As with depression, diabetes distress has also been associated with poor disease management and unhealthy lifestyle behaviors^[102], higher healthcare costs, and more days of missed work and mortality^[105]. However, research has found that diabetes distress is more strongly correlated with hemoglobin A1c and diabetes management than major depressive disorder^[106]. These findings are important because historically, disease-specific distress interventions have been derived from the depression treatment literature^[91] and have not consistently led to reductions in hemoglobin A1c or improvements in self-care behavior^[107]. Instead, future efforts for enhancing self-management in Mexican American adults with T2DM should aim at early identifying patients at risk for high diabetes distress (younger patients, women, and those with many comorbidities) and subsequent screening and follow-up care to reduce the emergence of high diabetes distress over time and its negative impact on diabetes outcomes.

Patient-Provider Relationships

As we have learned, patients' self-management practices, in addition to clinical monitoring, have substantial consequences for morbidity and mortality in diabetes. This disease requires patients to interact regularly and to build a relationship with their health care providers, and research has shown that the quality of patient-physician relations is associated with improved health outcomes and functional status, as is people's perceptions of their health care situations. In a 2008 publication, the Pew Hispanic Center and Robert Wood Johnson Foundation found that 23% of Latinos who received health care the year prior reported having received poor-quality medical treatment. The poor treatment was attributed to a variety of issues, including financial limitations, race or ethnicity, and their accent or manner in which they speak English. Furthermore, more than one in four Hispanics said they received no information regarding health or health care from doctors or health care professionals in the past year^[16]. This section will review different aspects of the patient-provider interaction that have been shown in the literature

to influence patients' perception of quality of care.

Patient-Provider Communication and Trust

Patient-provider communication is essential for effective care of diabetes – it leads to better diabetes self-care and better diabetes outcomes^[108]. Effective patient-provider communication includes providing patients with the information they need for priority setting and problem solving, assisting them in identifying realistic targets for behavior changes, and providing ongoing emotional support and encouragement. This improves patients' ability to maintain a successful self-management regimen and reduce or avoid the emotional burnout that is common among diabetes patients^[109].

Patient trust is considered an essential component of effective patient-physician communication. It is defined as a patient's belief that a physician's words and actions are credible and can be relied upon, that the physician will act in the patient's best interest, and that the physician will provide support and assistance when problems with health occur. Piette et al. found that patients with diabetes who reported low levels of physician trust were at significantly higher risk of underusing medications in response to cost pressures than were patients with similar burden but greater trust in their physicians^[110]. Thus, relationships with providers that are perceived as honest, collaborative and supportive by patients are associated with patients taking a more active role in their health^[111]. Physician trust correlates positively with acceptance of new medications, intentions to follow physicians' advice, perceived effectiveness of care, and improvements in self-reported health status^[112].

Shared Decision-Making

Shared decision-making also appears to be very important in patients setting their own self-care goals and adhering to treatment plans. It is increasingly recognized as the ideal model of patient-physician communication, especially in chronic diseases like diabetes mellitus. According to Heesen et al., essential to this model is the two-way exchange of information between physician and patient^[113]. Patients are encouraged to take an active role in their health care, thus influencing treatment success. Research has shown that low patient participation in the medical decision-making process is a key predictor of patient reluctance to engage in treatment, while those actively involved in the decision-making process result in greater patient satisfaction and diabetes management^[114]. Patients with shared decision-making are found to have greater adherence to treatment plans and improved health outcomes, such as higher self-reported health status, emotional health, symptom relief, and physiological measures of disease control^[115]. Patients with diabetes participating in shared decision-making are more likely to receive lipid, HbA1c, and eye screens^[116], possibly due to increased patient motivation and understanding.

Equitable treatment and perceived discrimination

Many ethnic minority groups view their health care situations differently and, often, more negatively than whites. In Blendon et al.'s study, one in five Latinos felt that they were discriminated against when trying to receive care, and many felt that they would not receive the best care if they were sick. Most of these differences remained statistically significant after controlling for socio-demographic characteristics^[117]. Additionally, perceived discrimination has a significant negative effect on both mental and physical health. It produces significantly heightened stress responses and is related to participation in unhealthy and nonparticipation in

healthy behaviors^[118]. It has also been associated with increased psychological distress and increased symptoms of depression^[119].

Perceived discrimination, racism or disrespect in a health care setting may also contribute to suboptimal patient-provider communication and relationship-building, making patients less likely to follow provider recommendations. This becomes a barrier for management of diseases that require collaboration between the patient and provider, like type 2 diabetes mellitus. For people with diabetes, there is some indication that perceived racial discrimination is associated with poorer glycemic control, greater symptom burden, and worse physical functioning. Studies have found self-reported racial/ethnic discrimination was associated with a roughly 50% lower marginal probability of receiving a hemoglobin A1c test, foot exam, and blood pressure exam – a significant barrier to diabetes management^[120].

Language barriers and health literacy

Limited English proficiency (LEP) and low health literacy are additional obstacles to care for Mexican immigrant patients with diabetes^[121]. Previous research from national and regional studies found that almost half of undocumented Latinos who reported poor care in the past five years attributed their poor care to their accent or how well they speak English. Furthermore, receipt of preventive care was influenced by their ability to speak English, presumably because of the diminished communication between patients and their doctors and the doctors' limited ability to address patients' healthcare needs^[122]. A recent study among insured Mexican Americans with diabetes found that among those with limited English proficiency, the risk of poor glycemic control were more than twice as high (30% vs 15%) if the primary physician did not speak Spanish, suggesting that language barriers are a powerful contributor to poor outcomes^[123].

Poor health literacy is also common among patients who have low educational attainment, and among older patients and racial and ethnic minorities. It is a measure of a patient's ability to perform basic reading and numerical tasks required to function in the healthcare environment, and is used as a marker for oral communication problems, particularly in the explanatory domains of clinician patient dialogue^[124]. Poor health literacy has independently been associated with poor self-reported health, poor understanding of one's condition and its management, and with glycemic control and diabetes complications among a cohort of public hospital patients^[125].

Summary and Clinical Implications

The focus of this literature review has been on the Mexican undocumented immigrant population and the individual and clinical management of type 2 diabetes mellitus. The review highlighted that effective self-management of diabetes can be enhanced when adequate knowledge about the complex interrelationship between diabetes, its treatment, and the change in lifestyle behaviors needed for optimal outcomes is provided to patients. Additionally, successfully reducing blood glucose and HbA1c levels to normal ranges reduces the occurrence of complications, decreases medical expenses, and enhances quality of life for patients with type 2 diabetes^[77].

However, it is important to realize that the undocumented immigrant community is a particularly

vulnerable subgroup of the immigrant population. Undocumented status is associated with increased risk of not having health insurance or access to health care services, resulting in fewer medical visits, underdiagnosis, lower rates of recommended monitoring tests for diabetes, and less than optimal health outcomes^[126]. These challenges, along with many sociodemographic factors (such as low socioeconomic status and educational achievement), are powerful risk factors for higher prevalence of diabetes and poor diabetes outcomes in the undocumented Latino immigrant community.

Reducing disparities in access to care can lead to improved outcomes indistinguishable from those for fully insured persons with full access to care^[127,128]. However, most literature on the undocumented immigrant population has focused on issues of health insurance, health care access, and utilization, with few studies looking at how immigration status relates to clinical health outcomes, chronic disease management, or the patient experience of health care. Future studies should look at these potential associations in order to create more culturally appropriate interventions for the undocumented immigrant population. Additionally, future reform efforts should aim at including undocumented immigrants in healthcare legislation to reduce some of the disparities faced by this community and improve their health management.

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Paper 2: Undocumented Immigration Status and Diabetes Care Among Mexican Immigrants in Two Immigration “Sanctuary” Areas

ABSTRACT

Background. The approximately 11 million undocumented immigrants in the US constitute a vulnerable population known to have limited access to health care. The impact of immigration status on the experience or outcomes of health care is not known. Undocumented status may impact the health care experience and health management and outcomes, even when care is received in sanctuary areas where clinical staff do not routinely inquire about immigration status.

Objective. To investigate the relationship between immigration status and experience of health care, diabetes self-management, and clinical outcomes among Mexican immigrants with diabetes receiving health care in two immigration sanctuary cities.

Design: Cross-sectional survey study using data from the Immigration, Culture and Health Care study with clinical measures from chart review.

Participants: Self-identified Mexican/Mexican American adults with diabetes receiving primary care in safety-net clinics in the San Francisco Bay and Chicago areas.

Measures: Undocumented status was inferred from questions on citizenship and legal visas. Undocumented Mexican, documented Mexican immigrants and US-born Mexican Americans health care experiences, diabetes self-management, and clinical outcomes were compared using multivariable linear and logistic regressions adjusting for demographic and clinical confounders.

Key Results. Compared to documented immigrants, undocumented immigrants were more likely to be younger (50 vs 56 yrs, $p<0.001$), employed (39% vs 24%, $p=0.023$), in the US for fewer years (15 vs 32 yrs, $p<0.001$), and have limited English proficiency (78% vs 63%, $p=0.012$). There were no significant differences in reports of physician communication, or in measures of diabetes management between undocumented and documented immigrants. All three groups had similar clinical outcomes in glycemic control, systolic blood pressure, lipid, body mass index, depression and diabetes distress.

Conclusions. Undocumented Mexican immigrants with diabetes can achieve similar clinical outcomes and report similar health care experiences as documented immigrants and US-born Mexican-Americans when provided legally safe access to health care.

BACKGROUND

Approximately half of the Mexican population living in the United States is undocumented¹⁻³, accounting for 57% (5.9 million) of the estimated 10.3 million undocumented immigrants^{4,5}. Undocumented immigrants are a vulnerable population with a decreased likelihood of having health insurance^{6,7} and limited use of⁸⁻¹⁰ and access to health care services^{11,12}. Undocumented immigrants are less likely than legal immigrants to report having a primary care provider¹³ and a regular source of care¹⁴. Most literature on the undocumented immigrant population has focused on issues of health insurance, health care access, and health care service utilization, with few studies looking at how immigration status relates to clinical health outcomes or to the patient experience of health care. The limited number of studies that examined health status by immigration status concluded that those with concerns about deportation are at heightened risk of emotional health problems and report poorer health status^{15,16}.

Despite having lower prevalence of many medical conditions compared to the general population in the United States, Mexican Americans are 1.7 times as likely to have diabetes as non-Hispanic whites¹⁷. In the US, an estimated 9.5% of Latino adults suffer from diabetes¹⁸. Diabetes is increasingly common among foreign-born Latinos as well, likely reflecting changes in obesity in source countries, such as Mexico¹⁹.

To date, little research has focused on the association between immigration status and chronic disease management and processes of care. This study begins to address this research gap through a survey of US-born Mexican Americans and Mexican immigrants with diabetes receiving care in two sanctuary areas. Sanctuary areas are cities, counties, or states that have statutes limiting routine reporting of documentation status of people seeking police or health services²⁰. Prior research indicates that lack of documentation – and the fear associated with it – are powerful deterrents to seeking health care²¹. Conversely, advocates have argued that sanctuary policies at an institutional level allow for hospital administrators and health care providers to create trust in the local immigrant community²². It is plausible that the ‘safe’ environment created by these policies may decrease some of the barriers to health care access and foster trust with clinicians, thereby resulting in better outcomes. It is also plausible that the social burdens associated with undocumented status, which include stigma and barriers to employment and financing, might render diabetes self-care very difficult, or spill over into patient doctor interactions. Our specific aims then were to determine whether undocumented immigration status is associated with: (1) poorer perceived doctor-patient interactions; (2) poorer diabetes self-management (diabetes self-care, perceptions, self-efficacy, and medication adherence); and (3) poorer control of clinical outcomes (blood glucose, blood pressure, cholesterol, body mass index, depression, and diabetes distress), when compared to documented Mexican immigrants and US-born Mexican Americans.

RESEARCH DESIGN AND METHODS

Subjects and Setting

We analyzed data from the Immigration, Culture and Health Care (ICHC) Study, a cross-sectional study of a convenience sample of African American, Spanish- and English-speaking Mexican/Mexican American, and non-Hispanic white adults with diabetes who received care in nine free-standing or hospital-based safety-net clinics in the San Francisco Bay Area and Chicago in 2008-2009. The main purpose of the ICHC was to explore factors that impact diabetes self-management and health outcomes in minority populations. To be included in the study, patients had to have type 2 diabetes, be 18 years of age or older, and speak English or Spanish. Patients who exhibited cognitive impairment, active substance abuse, and/or psychosis were excluded. Recruitment was stratified by race/ethnicity and patient language in order to ensure a diverse sample.

After providing written informed consent in English or Spanish, participants completed an in-person survey with a trained bilingual research assistant. Clinical data was abstracted from participants' electronic health record. The values for glycosylated hemoglobin (A1C), low-density lipid (LDL) cholesterol and systolic blood pressure recorded within 1 year prior and closest to the date of the interview were abstracted. For this specific study, we analyzed data for the 401 patients of the ICHC study sample population who self-identified as Mexican or Mexican American. All analyses measuring patient perception of culturally competent care were performed with the additional inclusion criterion of having reported a consistent primary care provider during the last 12 months (N=317). This study was approved by the Committee for Protection of Human Subjects at the University of California, San Francisco; Cook County Health and Hospital System; UC Berkeley; and by participating institutions in Chicago and the San Francisco Bay Area.

Measures

Immigration Status. Immigration status was determined in a two-step procedure: first, by responses to questions about country of birth; and second, by responses to questions about US citizenship and permanent residency with a green card for foreign-born participants. Participants who reported the United States as their country of birth were considered US-born Mexican Americans. Immigrants who reported having US citizenship or legal permanent residency were considered to be documented. Participants who reported neither status were categorized as undocumented immigrants by exclusion.

CAHPS-Cultural Competency. We used the trust and positive communication subdomains from the Consumer Assessments of Healthcare Providers and Systems' Cultural Competency Item Set (CAHPS-CC) to assess patient experiences. CAHPS-CC is a 24-item set of Likert-response questions designed to measure patients' overall experience of their physician's interpersonal and cultural competence as well as their experience of their physician's office. CAHPS-CC has been validated for use in ethnically diverse low-income populations in English and Spanish²³. Self-reports were heavily skewed towards positive responses. Therefore, responses were dichotomized into two categories²⁴: the upper 25% ("optimal") and the lower 75% ("suboptimal"). Further details about this tool are provided in the Appendix.

Diabetes Self-Management Measures. We used several instruments to capture different facets of patient self-management: (1) *Diabetes self-care* was measured through a brief adapted version of the Summary of Diabetes Self-Care Activities (SDSCA) scale²⁵. (2) *Diabetes perceptions* were measured using a diabetes-related health belief instrument translated for use with Spanish-speaking Mexican Americans²⁶. (3) *Diabetes self-efficacy* was measured through an 8-item scale originally developed and tested in Spanish for the Diabetes Self-Management study²⁷. (4) *Medication adherence* was measured using the Morisky scale²⁸. Details about these scales are provided in the Appendix.

Health Outcomes. Measurements of hemoglobin A1C (A1C), systolic blood pressure (SBP), low-density lipoprotein (LDL) and weight were obtained by chart review, selecting the last measurement prior to the survey interview. Body mass index (BMI) was calculated using weight measurements from chart review and self-reported height. Categorical health outcomes were determined by clinical recommendations²⁹ for people with diabetes and established as follows: poor A1C control $\geq 8\%$, high SBP $\geq 130\text{mmHg}$, high LDL $\geq 100\text{mg/dL}$, and obesity as BMI $\geq 30\text{kg/m}^2$. Depression was measured using the Patient Health Questionnaire-9 (PHQ-9), which has been validated in English and Spanish³⁰⁻³². A score of ≥ 10 indicated patients with greater likelihood of having major depression. Diabetes distress was measured using the 5-item emotional burden domain of the Diabetes Distress Scale³³. Patients who scored ≥ 3 were considered to have high diabetes distress. Details about these two scales are provided in the Appendix.

Covariates. Socio-demographic variables: age, gender, household income, highest level of education achieved, employment status, marital status, diabetes duration, and number of comorbidities were ascertained through survey responses. Food insecurity, which is defined as the risk of going hungry because of an inability to afford food³⁴, was measured using the six-item Food Security Survey Module. This well-validated measure of food insecurity asks about access to food over the previous 12 months; two or more affirmative answers indicate food insecurity³⁵.

Statistical Analysis

Chi-square tests, used to evaluate differences of proportions, and t-tests, used to evaluate differences in means, were used to examine the association between immigration status and socio-demographic characteristics, perceived doctor-patient interactions, diabetes-related behaviors, and clinical outcomes. Clinical outcomes (A1C, systolic BP, LDL, and BMI) were analyzed both as binary variables determined by clinical cut-off recommendations and as continuous variables.

Multivariable logistic regression analyses were conducted to calculate beta coefficients or adjusted odds ratios, and 95% confidence intervals for these four clinical variables in addition to depression and diabetes distress. Each model included the same set of independent variables, including age, gender, diabetes duration, and number of comorbidities. The adjusted model for the comparison between undocumented and documented Mexican immigrants additionally included limited English proficiency in the regression. Selection of covariates was based both on bivariate analyses and a conceptual framework. If there was no evidence of association between immigration status and the outcomes, power calculations would be carried out to determine if

group sizes are large enough to detect clinically important differences.

RESULTS

Of the 401 subjects in the study, 124 (31%) were US-born Mexican Americans, 166 (41.4%) documented Mexican immigrants, and 111 (27.7%) undocumented Mexican immigrants. Socio-demographic and clinical characteristics are shown in Table 1. Gender, annual income, type of residence, and food insecurity did not vary across the three groups. While similar with respect to education, marital status, and acculturation, undocumented Mexican immigrants were more likely than documented immigrants to be younger (50 vs 56 yrs, $p<0.05$), employed (39% vs 24%, $p<0.05$), have lived in the US for fewer number of years (15 vs 32, $p<0.05$) and have limited English proficiency (77% vs 63%, $p<0.05$). Compared to US-born Mexican Americans, undocumented Mexican immigrants were more likely to be employed (39% vs 26%, $p<0.05$) and married/living together (56% vs 29%, $p<0.05$), less likely to have a high school education (12% vs 38%, $p<0.05$) and less likely to be Anglo-oriented on the Acculturation Rating Scale for Mexican Americans-II (4% vs 80%, $p<0.05$). Patients in all three groups reported a mean diabetes duration of about 10 years. Undocumented immigrants reported somewhat fewer comorbidities than both documented immigrants and US-born Mexican Americans (1.8 vs 2.1 vs 2.3, $p<0.05$).

Table 2 examines participant report of patient perception of culturally competent care and diabetes-related behaviors across the three immigration groups. There were no statistically significant differences between the three groups on either physician trust or reports of positive physician communication. Diabetes self-care behaviors (healthy diet, exercise, blood glucose testing, and foot care) did not differ between the two immigrant groups or between the undocumented and US born. Compared to US-born Mexican Americans, undocumented immigrants were more likely to, on a 1-5 scale, perceive barriers to following a diabetic diet and taking medications (3.2 vs 2.7, $p<0.001$) and report impact of their job on their therapy (2.8 vs 2.4, $p=0.013$).

Table 3 shows the association of diabetes intermediate clinical outcomes with immigration status. While the prevalence of poor glycemic, blood pressure and lipid control was high, with 40-60% having poor glycemic control, US-born Mexican Americans and undocumented and documented Mexican immigrants did not differ significantly in either mean glycemic, blood pressure, or lipid control, measured via means or proportion in poor control.

Table 4 provides the results of separate multivariable logistic and linear regression analyses for each clinical outcome. Undocumented immigrants, documented immigrants, and US-born Mexican Americans had similar odds of poor control (glycemic, blood pressure, lipids). They also show comparable results in the continuous clinical outcome variables with the exception of BMI, where the undocumented immigrants tend to have lower BMI than the US-born Mexican Americans. Documented Mexican immigrants had lower BMI and A1C values, were at lower odds of having uncontrolled diabetes ($A1C \geq 8.0\%$), and at higher odds of suffering from diabetes distress than US-born Mexican Americans. Other clinical outcomes did not differ.

Power calculations determined that the study sample size has over 80% power to detect differences in good versus poor control in each analyzed clinical outcome, ie, A1C 7.0% vs. 8.0%.

DISCUSSION

We examined the experience of diabetes care among Mexican immigrants receiving care in two immigration sanctuary areas in the US where people seeking health services are protected against questioning or reporting of immigration legal status. In this setting, we found that undocumented immigrants achieved comparable clinical outcomes and reported similar experiences of health care as documented immigrants and US-born Mexican Americans. Undocumented immigrants did not differ from documented immigrants in their ability to manage and control their blood sugar, blood pressure, blood lipids or BMI and showed comparable rates of depression and diabetes distress. Furthermore, undocumented immigrants also showed comparable scores for all perceived doctor-patient interactions and diabetes self-management-related measures. In this sanctuary setting, undocumented immigrants were as likely as documented immigrants and US-born Mexican Americans to report trust in their primary care physician.

Previous studies have shown that undocumented immigrants are at heightened risk of not having health insurance or access to health care services^{6,7,11,12}. This results in limited use of these services and a decreased likelihood of having a regular source of care and a primary care provider^{8-10,13,14}. Although Cavazos-Rehg et al. found that Latino immigrants with concerns about deportation reported poorer subjective health status¹⁵, to our knowledge, our study is the first of its kind that investigates the association between immigration status and chronic disease health outcomes. Contrary to our hypothesis, we found that undocumented immigrants' health outcomes were comparable to those of both documented Mexican immigrants and US-born Mexican Americans in these sanctuary cities, despite having several risk factors such as younger age⁶ and limited English proficiency that are known to be associated with poorer glycemic control³⁶. It is possible that sanctuary policies may serve as a potential pathway for reducing disparities within the documented and undocumented immigrant populations by creating a safe environment where immigrants can seek out health care and manage their disease. Our finding that reports of trust in physician and positive communication among doctor-patient interactions were also similar among the three groups may help explain the comparable clinical results achieved³⁷⁻⁴⁰.

The generalizability of this study may be limited. First, all participants were receiving clinical care at community clinics in sanctuary areas, where immigration status is not ascertained or shared with immigration enforcement. Therefore, the results are only representative of an immigrant population that has access to health care services and can receive care in a legally safe environment. As importantly, the study enrolled patients in a primary care setting; undocumented immigrants with diabetes who have great mistrust of the health system may refuse all but episodic care and their clinical outcomes would likely differ from those enrolled in primary care. Third, the cross-sectional design of the study provides only one snapshot in time. As national

debates on immigration continue, the lack of association between immigration status and health status or perception of patient-doctor interaction may change. Finally, the relatively small number of participants enrolled cannot allow us to exclude small differences in clinical outcomes.

In conclusion, this study suggests that, in an environment with legally protected access to health care, undocumented Mexican immigrants are able to achieve comparable clinical outcomes and diabetes self-management behaviors as documented immigrants and US-born Mexican Americans. While rates of poor clinical control and depression were high among all three groups, underscoring the need for improvement in Latino diabetes outcomes overall, it is noteworthy that despite the many social burdens associated with illegal immigration status, undocumented patients and their clinicians are able to successfully partner in diabetes care. As the Patient Protection and Affordable Care Act, which promises to expand health care coverage to millions of Americans, excludes undocumented immigrants, these patients are likely to continue to concentrate in relatively few health care delivery settings. Future studies should investigate the association between immigration status and health outcomes when immigrants do not reside in sanctuary cities.

Table 1. Socio-demographic characteristics, acculturation, limited English proficiency and food insecurity by immigration status (N=401)

	U.S.-born Mexicans	Mexican Immigrants		P-value [*]	
		Documented	Undocumented	Undocumented vs. US-born Mexicans	Undocumented vs. Documented immigrants
	N=124 N (%)	N=166 N (%)	N=111 N (%)		
Clinic Site				0.19	0.44
San Francisco	38 (30.7)	72 (43.4)	43 (38.7)		
Chicago	86 (69.3)	94 (56.6)	68 (61.3)		
Age (years), mean ± SD	51.8±13.9	55.7±10.8	49.8±12.5	0.24	<0.001
Gender				0.71	0.51
Female	64 (51.6)	83 (50.0)	60 (54.0)		
Educational Level				<0.001	0.36
Incomplete High School	44 (35.5)	108 (65.1)	78 (70.3)		
Completed High School/GED	47 (37.9)	30 (18.1)	13 (11.7)		
Some advanced degree	33 (26.6)	28 (16.9)	20 (18.0)		
Employment status				0.036	0.023
Full or part-time	32 (25.8)	39 (23.5)	43 (38.7)		
Unemployed	67 (54.0)	75 (45.2)	42 (37.8)		
Retired/willingly unemployed	25 (20.2)	52 (31.3)	26 (23.4)		
Annual household income				0.094	0.072
<\$10,000	42 (33.9)	34 (20.5)	34 (30.6)		
\$10,000-\$24,999	49 (39.5)	73 (44.0)	38 (34.2)		
≥\$25,000	27 (21.8)	44 (26.5)	23 (20.7)		
Unsure/declined	6 (4.8)	15 (9.0)	16 (14.4)		
Type of residence				0.46	0.081
Rent	68 (54.8)	79 (47.6)	68 (61.2)		
Own/with family	53 (42.7)	78 (47.0)	39 (35.1)		
Shelter/homeless	3 (2.4)	9 (5.4)	4 (3.6)		
Marital status				<0.001	0.25
Married/living together	36 (29.0)	103 (62.1)	62 (55.9)		
Divorced/separated/widowed	49 (39.5)	47 (28.3)	31 (27.9)		
Single, never married	39 (31.45)	16 (9.6)	18 (16.2)		
Years in US, mean ± SD	--	31.95±11.63	14.60±8.44	N/A	<0.001
Acculturation				<0.001	0.082
Anglo oriented	88 (80.0)	15 (9.5)	4 (3.9)		
Limited English proficiency	--	105 (63.2)	86 (77.5)	N/A	0.012
Food insecurity	54 (43.5)	80 (48.2)	54 (48.6)	0.43	0.94
Diabetes duration (years), mean ± SD	11.75±10.35	11.27±9.71	9.24±9.92	0.059	0.094
Number of comorbidities[†], mean ± SD	2.26±1.20	2.13±1.08	1.78±1.03	0.001	0.007

* Significant differences (p<0.05) indicated in bold type

† Comorbidities included past myocardial infarction, transient ischemic attack/stroke/cerebrovascular accident, cancer, hypertension, arthritis, and hypercholesterolemia

Table 2. Participant report of patient perception of culturally competent care and diabetes-related behaviors

	U.S.-born Mexicans N=124 mean ± SD	Mexican Immigrants		P-value*	
		Documented N=166 mean ± SD	Undocumented N=111 mean ± SD	Undocumented vs. US-born Mexicans	Undocumented vs. Documented immigrants
CAHPS-CC^{†,‡}					
1. Trust				0.36	0.31
Optimal	50 (48.5)	66 (48.9)	33 (41.8)		
Suboptimal	53 (51.5)	69 (51.1)	46 (58.2)		
2. Positive communication				0.13	0.45
Optimal	41 (39.8)	46 (34.1)	23 (29.1)		
Suboptimal	62 (60.2)	89 (65.9)	56 (70.9)		
Diabetes self-care (0-7days/week)					
1. Healthy diet					
General diet	4.17 ± 2.32	4.24 ± 2.48	3.93 ± 2.46	0.44	0.30
Specific diet	4.20 ± 2.38	3.67 ± 2.37	3.62 ± 2.46	0.068	0.87
2. Exercise	4.13 ± 2.55	3.97 ± 2.62	3.86 ± 2.54	0.43	0.74
3. Blood glucose testing	5.11 ± 2.48	4.42 ± 2.58	4.51 ± 2.53	0.062	0.69
4. Foot-care	5.08 ± 2.64	5.05 ± 2.71	5.14 ± 2.72	0.87	0.81
Diabetes perceptions (0-5, low-high)					
1. Barriers to following a diabetic diet and taking medications	2.74 ± 0.77	3.04 ± 0.76	3.15 ± 0.69	<0.001	0.19
2. Social support for diet	3.58 ± 0.92	3.58 ± 0.97	3.75 ± 0.86	0.15	0.13
3. Impact of job on therapy	2.43 ± 0.77	2.72 ± 0.96	2.76 ± 0.89	0.013	0.75
4. Benefits of therapy	4.14 ± 0.49	4.14 ± 0.37	4.14 ± 0.35	0.90	1.00
5. Control of effects of diabetes	3.16 ± 1.24	3.35 ± 1.20	3.29 ± 1.15	0.42	0.67
Diabetes self-efficacy (1-10, low-high)	7.59 ± 1.40	7.47 ± 1.66	7.61 ± 1.68	0.91	0.50
Medication adherence	1.04 ± 1.10	1.16 ± 1.13	1.02 ± 1.06	0.87	0.30

* Significant differences (p<0.05) indicated in bold type

† Dichotomous variables are given as number (percentage)

‡ CAHPS-CC, The California Assessment of Healthcare Providers and Systems – Cultural Competency. A validated tool used to measure patient perception of culturally competent care for those with a steady primary health care provider (N=317)

Table 3. Clinical outcomes by immigration status (N=401*)

	U.S.-born Mexican	Mexican Immigrants		P-value†	
	N=124	Documented N=166	Undocumented N=111	Undocumented vs. US-born Mexicans	Undocumented vs. Documented immigrants
	mean ± SD	mean ± SD	mean ± SD		
HbA1c ≥8.0%	67 (60.9)	63 (41.2)	50 (49.5)	0.096	0.19
HbA1c (%)	8.70±2.22	7.98±1.76	8.45±2.11	0.41	0.063
Systolic BP ≥130.0mmHg‡	54 (43.9)	83 (50.3)	47 (42.3)	0.81	0.19
Systolic BP (mmHg)	130.46±18.07	130.2±17.03	126.07±18.58	0.069	0.063
LDL ≥100.0mg/dL‡	40 (42.1)	48 (35.6)	30 (33.7)	0.24	0.78
LDL (mg/dL)	94.28±33.26	89.70±33.67	88.29±33.49	0.23	0.76
BMI ≥30.0kg/m²‡	82 (66.1)	96 (57.8)	65 (59.6%)	0.31	0.77
BMI (kg/m²)	34.41±8.54	32.13±6.35	32.52±6.94	0.064	0.64
Depression (PHQ-9 ≥10)‡	50 (40.3)	50 (30.1)	33 (29.7)	0.090	0.95
Diabetes distress‡,§	71 (57.3)	118 (71.1)	73 (65.8)	0.18	0.35

Abbreviation: PHQ-9, nine-item patient health questionnaire

* The number of subjects in each clinical outcome is limited to those whose lab values were present during chart review (HbA1c N=364, BMI N=399, Systolic BP N=399, LDL N=319)

† Significant differences (p<0.05) indicated in bold type

‡ Dichotomous variables are given as number (percentage)

§ Diabetes distress is defined as ≥3 on the emotional burden subscale of the 17-item diabetes distress questionnaire

Table 4. Adjusted and unadjusted odds ratio and beta coefficients (95% Confidence Intervals) for clinical outcomes by immigration status

	Undocumented vs. Documented Mexican Immigrants		Undocumented Mexican Immigrants vs. U.S.-born Mexicans		Documented Mexican Immigrants vs. U.S.-born Mexicans	
	Unadjusted β /OR (CI)	Adjusted* β /OR (CI)	Unadjusted β /OR (CI)	Adjusted† β /OR (CI)	Unadjusted β /OR (CI)	Adjusted* β /OR (CI)
HbA1c \geq 8.0%	1.4 (0.85,2.32)	1.3 (0.74,2.28)	0.63 (0.36,1.09)	0.58 (0.32,1.03)	0.45 (0.27,0.74)	0.5 (0.30,0.85)
HbA1c (%)	0.47 (-0.03,0.98)	0.28 (-0.22,0.78)	-0.24 (-0.79,0.30)	-0.34 (-0.88,0.19)	-0.72 (-1.21,-0.22)	-0.54 (-1.03,-0.57)
BMI \geq 30.0kg/m ²	1.08 (0.66,1.76)	0.94 (-0.55,1.61)	0.76 (0.44,1.29)	0.72 (0.42,1.26)	0.7 (0.43,1.14)	0.75 (0.45,1.23)
BMI (kg/m ²)	0.39 (-1.37,2.15)	0.16 (-1.48,1.80)	-1.89 (-3.76,-0.02)	-1.94 (-3.79,-0.08)	-2.28 (-3.97,-0.59)	-1.97 (-3.65,-0.28)
Systolic BP \geq 130mmHg	0.73 (0.45,1.18)	0.89 (0.52,1.51)	0.94 (0.56,1.58)	1.23 (0.71,2.12)	1.29 (0.81,2.07)	1.37 (0.83,2.25)
Systolic BP (mmHg)	-4.13 (-8.42,0.17)	-2.22 (-6.73,2.30)	-4.38 (-8.96,0.20)	-2.43 (-7.00,2.14)	-0.26 (-4.42,3.91)	-0.14 (-4.30,4.02)
LDL \geq 100.0mg/dL	0.92 (0.53,1.62)	0.76 (0.40,1.41)	0.7 (0.38,1.27)	0.64 (0.34,1.21)	0.76 (0.44,1.30)	0.77 (0.44,1.35)
LDL (mg/dL)	0.84 (-7.64,9.33)	-2.01 (-10.70,6.68)	-5.94 (-15.11,3.23)	-6.57 (-15.54,2.40)	-6.79 (-15.10,1.53)	-5.03 (-13.17,3.11)
Depression (PHQ-9 \geq 10)	0.98 (0.58,1.66)	0.96 (0.55,1.70)	0.62 (0.36,1.08)	0.66 (0.38,1.15)	0.64 (0.39,1.04)	0.71 (0.43,1.18)
Diabetes distress‡	0.78 (0.47,1.31)	0.68 (0.39,1.18)	1.43 (0.85,2.44)	1.45 (0.85,2.49)	1.84 (1.13,2.99)	1.95 (1.18,3.23)

Abbreviation: PHQ-9, nine-item patient health questionnaire

* Model adjusted for age, gender, diabetes duration and number of comorbidities

† Adjusted model additionally includes limited English proficiency

‡ Diabetes distress is defined as \geq 3 on the emotional burden subscale of the 17-item diabetes distress questionnaire

Significant differences ($p < 0.05$) indicated in bold type

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APPENDIX. Details on the different measures discussed in the methods section.

CAHPS-Cultural Competency. The CAHPS-CC has seven subdomains: positive doctor communication, negative doctor communication, health promotion, alternative medicine, shared decision-making, equitable treatment, and trust. Internal consistency for the Immigration, Culture and Health Care (ICHC) study population was determined by Cronbach alpha (0.82 for positive communication, 0.77 for trust, 0.72 for preventive care counseling). Negative communication and equitable treatment were not included in this study due to their low Cronbach alpha in the Spanish-speaking population. Shared decision-making and alternative medicine are also excluded due to their overall low Cronbach alpha. Due to highly skewed distributions and as a proof of concept, scores for the two domains included in the study were collapsed into two categories²⁴: the upper 25% (optimal) and the lower 75% (suboptimal). Scores for each of the CAHPS-CC subscales range from 0-100.

Diabetes Self-Management. (1) *Diabetes self-care* is measured through a brief version of the Summary of Diabetes Self-Care Activities (SDSCA) scale²⁵. It is a self-report questionnaire that measures levels of self-management across different components of the diabetes regimen: general diet (2 items), specific diet (2 items), exercise (2 items), blood-glucose testing (2 items), foot care (2 items), and smoking (not included in the ICHC Study survey). Due to issues of recall, we decided to use only the item of each measure that asked about behaviors within the immediate past week. For the foot care measure, we only used the item that asked about checking feet and not inspecting the inside of shoes. Responses range from 0 to 7 (days a week) with higher scores indicating better diabetes self-management. (2) *Diabetes perceptions* were measured using a diabetes-related health belief instrument translated for use with Spanish-speaking Mexican Americans²⁶. It is a 25-item health belief instrument from Starr County, Texas consisting of five subscales: Social support for diet, Impact of job on therapy, Benefits of therapy, Control of effect of diabetes, and Total barriers to diet and taking medications. Responses were given in a Likert-scale format, ranging 1 (strongly disagree) to 5 (strongly agree). The higher the score on an item, the stronger the belief. (3) *Diabetes self-efficacy* was measured through an 8-item scale originally developed and tested in Spanish for the Diabetes Self-Management study²⁷. Responses range from 1 (not at all confident) to 10 (completely confident) and the score for this scale is the average of the eight items. Higher averages indicate higher self-efficacy. (4) *Medication adherence* was measured using the Morisky scale, a four-item self-reported adherence measure (Cronbach alpha = 0.61) that addresses barriers to medication-taking. Responses are yes/no categories and the score is calculated by assigning 1 point for each “yes” answer, thus ranging from 0 to 4. Higher scores indicate poorer medication adherence²⁸.

Health Outcomes. (1) *Depression* was measured using the Patient Health Questionnaire-9 (PHQ-9), which has been validated in English and Spanish³⁰⁻³². The PHQ-9 items ascertain negative feelings or thoughts, using a 4 point Likert Scale ranging from 0 (not at all) to 3 (nearly every day). A PHQ-9 score of more than or equal to ten indicates greater likelihood of having major depression. (2) *Diabetes distress* was measured using the 5-item emotional burden domain of the Diabetes Distress Scale³³. Questions in this subscale ask the degree to which feelings of diabetes-related stress are problematic, ranging from 1 (no problem) to 6 (serious problem). An average of more than or equal to three indicates elevated diabetes distress.