

Quality of Diabetes Care for Immigrants in the U.S.

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OBJECTIVE — To compare achievement of the American Diabetes Association diabetes care recommendations for U.S.- and foreign-born individuals with diabetes.

RESEARCH DESIGN AND METHODS — Using the 2001–2006 Medical Expenditure Panel Surveys, we report estimates for receipt of a cholesterol test, routine checkup, influenza vaccination, eye examination, dental checkup, foot examination, and two or more A1C tests in 1 year for foreign- ($n = 1,272$) and U.S.-born ($n = 5,811$) individuals aged ≥ 18 years. We define a dichotomous variable representing full compliance with the above examinations. We provide descriptive characteristics of the sample and use multivariable analysis for each procedure with random effects logit regression.

RESULTS — Compared with U.S.-born individuals with diabetes, foreign-born individuals are younger, have lower education levels and income, are more likely to have public or no insurance, and are less likely to have a usual source of care. With adjustment for all potential confounders, foreign-born individuals are less likely to report having had an influenza vaccination (odds ratio 0.51 [95% CI 0.31–0.71]) or to be compliant with any one of the seven recommendations (0.64 [0.34–0.95]).

CONCLUSIONS — These findings demonstrate that immigrants are less likely than U.S.-born individuals with diabetes to adhere to any one of seven diabetes care recommendations in general and, specifically, are less likely to report having received an influenza vaccination. Because immigrants are less likely to use health care, clinicians should take advantage of the office visit to effectively communicate to the patient the importance of receiving an influenza vaccination.

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The American Diabetes Association recommends a comprehensive diabetes evaluation for the diabetic patient, which includes a complete medical history, physical examination, laboratory evaluation, and appropriate referrals for eye and dental examinations. According to national data from 1999–2002, a low proportion of U.S. adults achieve the goals set forth by the American Diabetes Association. For example, 49.8% of individuals were in good glycemic control (A1C $< 7\%$) and 39.6% had acceptable blood pressure levels (< 130 mmHg systolic and < 80 mmHg diastolic) (1). Mi-

norities are less likely than whites to achieve the recommended goals: 36.9% of non-Hispanic blacks and 34.5% of Mexican Americans were in good glycemic control compared with 48.6% of non-Hispanic whites (2), and the same was true for blood pressure levels (3). Although such estimates are available for various racial and ethnic groups, they have not been examined for foreign-born individuals, even though a high proportion of Hispanics, for example, are foreign-born. For the purposes of this article, foreign born is defined as anyone who

was not born in the U.S., regardless of race or ethnicity.

The foreign-born population grew by 79.0% from 1980 (6.2%) to 2000 (11.1%) (4). Approximately 69% of Asians and 40% of Hispanics were born outside of the U.S. (4). Although foreign-born individuals have lower mortality and morbidity rates than their U.S.-born counterparts (5), foreign-born individuals (11.0%) are less likely to have health insurance coverage compared with U.S.-born individuals (25.7%) (6). The same pattern is observed for specific racial and ethnic groups by foreign- versus U.S.-born status, respectively: Hispanics (15.8 vs. 36.8%) and Asians (6.0 vs. 14.8%) (6). In addition, 24% of foreign-born compared with 12% of U.S.-born individuals did not have a usual source of care (6). Finally, one study reported the average number of preventive visits was 0.86 for immigrants and 1.19 for U.S.-born individuals ($P < 0.01$) in 2002 (7). Given these differences in access to and utilization of care between foreign- and U.S.-born individuals, what remains elusive is whether there is differential diabetes treatment between foreign- and U.S.-born individuals.

In the present study we use nationally representative data over a 6-year period to examine the quality of diabetes care for immigrants. Because quality of health care in general is worse for foreign-born individuals (8), we hypothesize that compared with persons born in the U.S., immigrants will have lower quality of diabetes care.

RESEARCH DESIGN AND METHODS

Data sources

We use the 2001–2006 Medical Expenditure Panel Surveys (MEPS) to examine diabetes preventive care patterns, comparing foreign-born to U.S.-born individuals aged ≥ 18 years (9). The MEPS are nationally representative surveys of individuals completing an in-person survey over a 2-year period. The surveys include information on demographics, socioeconomic status, health care utilization, insurance status, access to care, and health characteristics. Persons who reported a

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physician diagnosis of diabetes were also administered a mailed survey asking about treatment and preventive screening for diabetes. The survey was offered in English, Spanish, Mandarin or Cantonese, Vietnamese, or Korean. In the Diabetes Care Survey, there are 7,968 adults aged ≥ 18 years. Of these, 7,083 (foreign born 1,272 and U.S. born 5,811) had complete information on socioeconomic characteristics, access to care, and health characteristics (9). Individuals surveyed in the MEPS are a subsample of the National Health Interview Survey, and information on place of birth was provided by data from the National Health Interview Survey (10).

Measures

Outcome variables. Our outcome variables are based on seven of the American Diabetes Association diabetes care recommendations: receipt of a cholesterol test, routine checkup, influenza vaccination, eye examination, dental checkup, foot examination, and two or more A1C tests in 1 year. The MEPS asked about cholesterol tests in the following way: "About how long has it been since you had your blood cholesterol checked by a doctor or other health professional?" For routine checkup, the MEPS asked, "About how long has it been since you had a routine checkup by a doctor or other health professional?" The question for influenza vaccine was worded, "About how long has it been since you had a flu shot?" Responses to these questions included 1) within past year, 2) within past 2 years, 3) within past 3 years, 4) within past 5 years, 5) more than 5 years, or 6) never. For cholesterol testing, routine checkup, and receiving an influenza vaccination, we collapsed the last five categories and compared them with "within past year" (9).

MEPS also asked about eye examinations ("In which year did you have an eye examination in which your pupils were dilated?"), dental checkups ("On average, how often do you receive a dental checkup?" Responses included 1) twice a year or more, 2) once a year, 3) less than once a year, or 4) never go to dentist) (9).

Next, MEPS asked whether the respondents had their feet checked and had an A1C test: for feet check, MEPS asked, "During 2005 [or 2004, etc., depending on the year of the survey], how many times did a health professional check your feet for any sores or irritations?" Responses were entered on a blank line to indicate number of times or never. For

A1C test, the question was, "During 2005 [or 2004, etc., depending on the year of the survey], how many times did a doctor, nurse, or other health professional check your blood for glycosylated hemoglobin or 'hemoglobin A-one-C'?" Responses included 1) a blank line to enter number of times, 2) did not have a blood test, 3) don't know, or 4) never (9).

Receipt of a cholesterol test, routine checkup, influenza vaccination, eye examination, dental checkup, foot examination, and two or more A1C tests in the past year are defined as dichotomous variables. These outcomes are consistent with American Diabetes Association guidelines. A dichotomous variable representing compliance with each of the above screenings and examinations also is defined.

Main predictor variable. Nativity status is defined as U.S. versus foreign born based on the following question, "Were you born in the U.S.?" Responses included yes or no (10).

Covariates. Demographic variables include age, sex, race/ethnicity, and marital status. We include age and its square as continuous variables. Race/ethnicity is categorized as Hispanic, white, black, Asian, and other. Marital status is coded as married versus not married (single, widowed, divorced, or separated). Socioeconomic status variables include education level, yearly personal income, and type and region of residence. Education level is defined as the number of years of education, income is collected as dollars per year, type of residence compares urban versus rural areas, and region of residence is categorized as midwest, south, northeast, or west. Acculturation variables include whether the person is comfortable speaking English and number of years in the U.S., which was categorized as < 15 versus ≥ 15 years based on the 50th percentile. Variables measuring access to care include insurance status (private, public, and no insurance) and whether the respondent has a usual source of medical care (yes versus no). Health status and health behavior variables include overweight/obese (BMI ≥ 25 kg/m²), current smoker (yes versus no), hypertensive status (yes versus no), cardiovascular disease history (yes versus no), self-reported health (excellent/very good/good versus fair/poor), and diabetes-related therapy and complications. Hypertensive status and cardiovascular disease history are self-reported responses to having received a diagnosis by

a medical provider. Cardiovascular disease history is defined as a dichotomous variable based on reporting history of stroke, heart attack, coronary disease, or other heart disease. Dichotomous variables are defined for self-reported receipt of insulin, medication, diet modification, and diabetes-related complications including kidney and eye problems (9).

Analysis

We present weighted probabilities and frequencies of screening by nativity status, using a χ^2 test to determine significant differences between U.S.- and foreign-born individuals. We also used multivariable analysis for each screening type with random effects logit regression. STATA 9.2 was used to adjust for the sampling weights and complex survey design of MEPS (11).

RESULTS— Compared with U.S.-born individuals with diabetes, foreign-born individuals are younger, have lower education levels and income, and are more likely to live in urban areas, the Northeast, or the West. Furthermore, foreign-born individuals are more likely to have public or no insurance and are less likely to have a usual source of care compared with U.S.-born individuals. It appears that foreign-born individuals are healthier than U.S.-born individuals. For example, they are less likely to be overweight/obese (74.0 vs. 83.4%), currently smoke (9.9 vs. 17.6%), have a history of cardiovascular disease (24.7 vs. 36.1%), and have hypertension (62.7 vs. 69.5%). However, foreign-born individuals are more likely to report fair/poor health compared with U.S.-born individuals (43.7 vs. 38.3%). With regard to diabetes treatment modalities, a lower proportion of foreign-born individuals are using insulin (19.8 vs. 26.5%) or diet modification (78.9 vs. 81.1%) compared with U.S.-born individuals. Finally, foreign-born individuals are less likely to have nephropathy (9.9 vs. 12.4%) but are more likely to have retinopathy (27.7 vs. 23.7%) compared with U.S.-born individuals (Table 1) (all $P < 0.05$).

Table 2 shows that of the American Diabetes Association seven diabetes care recommendations, only having a feet check, cholesterol check, and an influenza vaccination significantly differed between foreign- and U.S.-born individuals with diabetes. More specifically, foreign-born individuals were less likely to have their feet checked (64.0 vs. 71.8%,

Table 1—Characteristics of adults with a self-report of diabetes by nativity status; MEPS, 2001–2006

	Foreign born	U.S. born	P
n	1,272	5,811	
Demographics			
Age (years)	58.9 ± 0.5	60.6 ± 0.2	<0.001
Male (%)	48.9 ± 3.0	49.1 ± 0.3	0.955
Race/ethnicity (%)			
Hispanic	54.1 ± 2.3	7.3 ± 0.4	<0.001
White	70.0 ± 2.9	82.1 ± 1.8	<0.001
Black	8.0 ± 2.3	16.8 ± 1.8	0.003
Asian	21.4 ± 1.1	0.6 ± 0.1	<0.001
Other	0.7 ± 0.3	0.4 ± 0.1	0.367
Married (%)	67.2 ± 0.3	58.9 ± 0.6	<0.001
Education (years)	9.9 ± 0.3	12.2 ± 0.1	<0.001
Personal income (\$)	22,566.6 ± 1,249.6	25,595.2 ± 342.1	0.019
Residence (%)			
Urban	93.0 ± 1.5	75.2 ± 2.7	<0.001
Midwest	7.7 ± 1.5	23.2 ± 0.3	<0.001
South	29.0 ± 2.8	42.7 ± 2.2	<0.001
Northeast	23.7 ± 1.0	16.2 ± 0.8	<0.001
West	39.6 ± 4.6	17.9 ± 1.5	<0.001
Acculturation (%)			
Speak Spanish	12.8 ± 2.6	N/A	N/A
U.S. residency 15 or more years	79.8 ± 1.9	N/A	N/A
Health care access (%)			
Insurance status			
Private	47.5 ± 2.4	66.1 ± 0.6	<0.001
Public	38.7 ± 2.2	28.7 ± 0.9	<0.001
None	13.9 ± 1.5	5.2 ± 0.5	<0.001
Have usual source of care	91.8 ± 1.8	95.6 ± 0.2	0.038
Health status and behaviors (%)			
BMI ≥ 25 kg/m ²	74.0 ± 0.8	83.4 ± 0.2	<0.001
Current smoker	9.9 ± 1.0	17.6 ± 0.6	<0.001
Self-reported fair/poor health	43.7 ± 1.7	38.3 ± 1.5	0.016
Cardiovascular disease history	24.7 ± 0.9	36.1 ± 0.3	<0.001
Hypertensive	62.7 ± 3.1	69.5 ± 0.7	0.032
Diabetes characteristics (%)			
Therapy			
Insulin	19.8 ± 2.9	26.5 ± 0.3	0.020
Oral medication	79.3 ± 1.3	72.9 ± 0.6	<0.001
Insulin and oral medication	13.8 ± 2.4	12.5 ± 0.4	0.595
Diet modification	78.9 ± 0.9	81.1 ± 0.2	0.012
No diet/drug treatment	5.2 ± 0.5	1.8 ± 0.1	<0.001
Complications			
Nephropathy	9.9 ± 0.5	12.4 ± 0.2	<0.001
Retinopathy	27.7 ± 1.4	23.7 ± 0.7	0.014

Data are means ± SD. N/A, not available.

$P < 0.001$), to have their cholesterol checked (87.8 vs. 91.0%, $P = 0.024$), and to have had an influenza vaccination (48.6 vs. 58.6%, $P < 0.001$). In addition, foreign-born individuals (4.5%) were less likely to report being compliant with at least one of the seven recommendations compared with U.S.-born individuals (5.7%) ($P = 0.019$).

In the unadjusted results of Table 3, foreign-born individuals were less likely to have their cholesterol (odds ratio 0.71 [95% CI 0.53–0.90]) or feet checked (0.70 [0.58–0.82]), to have had an influenza vaccination (0.67 [0.62–0.72]), or to have been compliant with all of the recommendations (0.76 [0.58–0.94]) compared with U.S.-born individuals. In

model 1, with adjustment for sex and age, the same variables are still statistically significant, with slightly less attenuated point estimates. With adjustment for socioeconomic status (model 2), the significant association between nativity status and having a cholesterol check disappears. Finally, in model 4, with adjustment for all potential confounders, the only statistically significant variable is having had an influenza vaccination (0.51 [0.31–0.71]) or compliance with any one of the seven recommendations (0.64 [0.34–0.95]). In both cases, foreign-born individuals were less likely to be compliant than U.S.-born individuals.

CONCLUSIONS — To our knowledge, this is the first study to assess the association between adherence to diabetes care guidelines and nativity status in a nationally representative sample of adults. After adjustment for potential confounders, foreign-born individuals were 49 and 36% less likely to have had an influenza vaccination or to be compliant with at least one of the seven recommendations compared with U.S.-born individuals, respectively. Studies conducted in the U.S. compare diabetes care by race and ethnicity, but not by nativity status; thus, it is challenging to compare our study with previous U.S. studies.

Therefore, we turned to studies conducted outside of the U.S. to inform our current findings. One study focused on diabetes care (12) and the other study was qualitative in nature and shed light on diabetes beliefs (13). Other researchers examined the influence of patient-physician interactions on diabetes care (14,15) or just compared clinical indicators (i.e., BMI and cholesterol) between U.S.- and foreign-born individuals with diabetes (16). It is important to emphasize that the latter studies did not evaluate whether or not recommended diabetes care guidelines had been achieved; they just provided descriptive characteristics.

More specifically, Kristensen et al. (12) found that diabetes care did not differ among native Danes compared with Lebanese or Turkish immigrants. However, Thabit et al. (17) suggested that immigrants in Ireland had significantly worse glycemic control and a higher microalbumin to creatinine ratio compared with Irish patients. Our study contributes to this literature by including U.S. findings in the discourse and by specifically showing in which areas immigrants fall behind in diabetes care recommendations

Table 2—Weighted proportions of U.S. adults with a self-report of diabetes reporting receipt of various diabetes care recommendations by nativity status; MEPS, 2001–2006

	n	Foreign born	U.S. born	P
n		1,272	5,811	
A1C test	5,640	78.4	79.1	0.628
Feet check	6,832	64.0	71.8	<0.001
Routine checkup	7,000	84.6	85.9	0.547
Cholesterol check	6,932	87.8	91.0	0.024
Dental examination	7,068	51.5	50.4	0.703
Eyes checked	7,019	33.4	36.2	0.091
Influenza vaccine	7,024	48.6	58.6	<0.001
Compliance with recommendations	6,963	4.5	5.7	0.019

Data are % unless otherwise indicated.

and in which areas they are similar compared with U.S.-born individuals.

In our study, immigrants were less likely to have had an influenza vaccination than U.S.-born individuals. One study suggested that immigrants in general were less likely to obtain vaccinations compared with U.S.-born individuals (18). This may be due to language barriers in that immigrants may not know they need a vaccination. In addition, various cultures have different beliefs about vaccines, thinking they may cause illness or they are only needed if an individual is concerned about getting influenza (19). Hence, the foreign-born individuals in our study may have related to some of these beliefs and therefore not obtained an influenza vaccination.

Another reason we may see this difference is that there may be disparities in access to and quality of health care between foreign- and U.S.-born individuals (8). Dallo et al. (8) showed that foreign-born individuals had greater odds of reporting that their physician did not involve them in their care as much as they would have liked and that their physician did not spend as much time with them as they would have liked. In our sample, perhaps physicians did not spend as much time with foreign-born individuals to review all of the diabetes care recommendations.

To mitigate the aforementioned barriers, we suggest that clinicians take advantage of the office visit to effectively communicate with the patient about the importance of receiving an influenza vaccination. There are several other reasons why we put forth such a recommendation. First, influenza is a preventable infection; second, having diabetes increases the risk of death from influenza (20); and third, the influenza vaccination reduces

hospital admissions among individuals with diabetes (21).

Literature suggests that foreign-born individuals enjoy better health in general than U.S.-born individuals (5). However, with acculturation, this health advantage tends to decline (22). In our study, we could not compare various levels of acculturation, because the MEPS did not incorporate a comprehensive acculturation scale. However, we did examine whether language spoken, length of residency in the U.S., and other demographic characteristics account for the differences between foreign- and U.S.-born individuals with respect to diabetes care.

In our study, of the foreign-born, only 12.8% spoke Spanish at home and 79.8% had lived in the U.S. for ≥15 years, which may signify high acculturation levels. Further studies should include an acculturation scale (i.e., Acculturation Rating Scale for Mexican Americans) (23) to lend validity and reliability to the acculturation measures. Our findings also show that foreign-born individuals had fewer years of education compared with U.S.-born individuals. One study showed that “greater acculturation, higher educational attainment, and higher diabetes prevalence were associated with greater cultural knowledge about diabetes” (24). Perhaps the foreign-born sample in our study had low acculturation and educational attainment; therefore, they were less likely to comply with diabetes protocol.

Our study is not without strengths and limitations. Its strengths are the large sample size, which allowed us to compare foreign- to U.S.-born individuals, while controlling for many potential confounders. In addition, the findings can be generalized to the U.S. population. Its limitations are that we could not probe reasons that foreign-born individuals

Table 3—ORs (95% CIs) for each test/procedure for adults with a self-report of diabetes by nativity status; MEPS, 2001–2006

	Routine checkup	Cholesterol check	A1C test	Dental check	Influenza vaccine	Feet check	Eye examination	Compliance*
Foreign born, unadjusted†	0.90 (0.61–1.20)	0.71 (0.53–0.90)	0.91 (0.75–1.06)	1.05 (0.81–1.28)	0.67 (0.62–0.72)	0.70 (0.58–0.82)	0.88 (0.75–1.02)	0.76 (0.58–0.94)
Model 1: age-sex‡	0.81 (0.58–1.04)	0.60 (0.40–0.79)	0.87 (0.63–1.11)	0.85 (0.58–1.13)	0.46 (0.32–0.60)	0.55 (0.38–0.71)	0.89 (0.75–1.04)	0.66 (0.41–0.91)
Model 2: + SES	0.82 (0.53–1.11)	0.75 (0.44–1.06)	1.06 (0.70–1.42)	1.22 (0.73–1.71)	0.45 (0.28–0.63)	0.65 (0.40–0.89)	0.86 (0.69–1.03)	0.63 (0.36–0.90)
Model 3: + access	0.98 (0.62–1.34)	0.96 (0.59–1.32)	1.24 (0.81–1.67)	1.37 (0.82–1.92)	0.49 (0.30–0.69)	0.73 (0.46–1.01)	0.89 (0.72–1.07)	0.65 (0.35–0.95)
Model 4: + health status	1.0 (0.63–1.37)	1.02 (0.62–1.41)	1.28 (0.87–1.70)	1.25 (0.75–1.76)	0.51 (0.31–0.71)	0.76 (0.48–1.04)	0.89 (0.71–1.07)	0.64 (0.34–0.95)
n	7,000	6,932	5,640	7,068	7,024	6,832	7,019	6,963

*Compliance variable is defined as receiving all screenings and examinations in the past year. †Reference group is U.S. born. ‡Age-sex variables include sex, year of age, and its square (model 1). Model 2 additionally adjusts for socioeconomic status (SES) (race/ethnicity, marital status, education level, personal income, urban/rural, and region of residence variables). Model 3 additionally adjusts for access (having private insurance, public insurance, and usual source of care). Model 4 additionally adjusts for health status (overweight, current smoker, hypertensive status, history of cardiovascular disease, self-reporting fair or poor health, nephropathy, retinopathy, receiving insulin, and receiving oral medication).

were less likely to report having specific tests. In addition, we would have liked to explore subgroup variation by nativity status. However, the small sample size for Asians (U.S.-born = 31 and foreign-born = 165) precluded us from providing any meaningful conclusions for Asians. Among Hispanic subgroups, Mexican Americans would be the only subgroup large enough to detect meaningful differences (U.S.-born = 537 and foreign-born = 558). All other Hispanic subgroups had sample sizes too small to generate reliable estimates in the adjusted analyses (i.e., Cubans: U.S. born, $n = 8$; foreign born, $n = 73$).

Furthermore, the goal of this article was to add to the literature by providing overall estimates for diabetes care by nativity status. Our findings call attention to the importance of oversampling minorities in national studies, inquiring about specific subgroup identification, and including place of birth as a questionnaire item in future studies. Another limitation is that the data were self-reported. Patients may not always have recalled if or when they obtained each test. It would have been useful to verify the respondent's information with their medical records.

As suggested earlier, further research is needed to ask additional questions related to acculturation status, such as the language individuals speak or think in when they are at home or with relatives or friends, whether individuals follow the diet of their own or their host society's culture, and whether they choose to view, read, or listen to media in their own or their host society's culture.

These measures will provide more detailed information about acculturation levels. Further, we believe qualitative research would be the next best step, which would provide us with an in-depth analysis of why foreign-born individuals are less likely to follow some of the diabetes care recommendations. Was it because of lack of knowledge, lack of access to care, no recommendation from their physician, or the respondent's beliefs? Such studies also would inform appropriate interventions so that all individuals with diabetes would comply with diabetes care recommendations. One study suggested that, "Communication interventions to educate vulnerable populations need to be strategic and evidence-based. It is important for health educators to adopt culturally sensitive communication practices to reach and influence vulnerable popula-

tions" (25). Foreign-born individuals are a vulnerable population, and their health may worsen with increased length of stay in the U.S. (22). This study suggests that we should track diabetes disparities not only by race and ethnicity but also by nativity status.

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