An assessment of diabetes care for Latinos living in non-metropolitan Iowa

Iowa, United States of America

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May 2010

Thesis submitted as a part of the Master of Philosophy Degree in International Community Health

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Acknowledgements

I first would like to recognize my family and future wife for their continuous support during the two years of this master's program. The year abroad and semester of fieldwork were at times emotionally taxing, but the love from them helped me through the challenging moments.

I appreciate the fellowship from my classmates in our international community health program, and wish everyone the best of luck with future endeavors.

My supervisor, Akhtar Hussain, has extended to me numerous hours of advice throughout the research process. From the development of a research topic to the submission of manuscripts to scientific journals, Akhtar has been steadfast in his role as a supervisor.

My local supervisor, Michele Devlin, provided me with useful insight on my target population in the state of Iowa and practical advice during fieldwork. She offered me a place to call home at her office at the University of Northern Iowa and connected me with an opportunity to present my research findings.

Vibeke Christie and Line Løw allowed me to complete the master's program. Originally only slated to take courses from the first year curriculum, I decided to pursue the full degree and was warmly welcomed to complete it with the administrative help from Vibeke and Line.

Lien Diep assisted me with statistical analysis during class presentations and personal correspondence as issues specific to my data arose.

My research project would not be possible without the generous allocation of time from all the participants. I express sincere gratitude for their time and trust.

Numerous community members from my study recruitment towns provided me with information as I sought out participants for the research project. Religious leaders, community health clinic staff, English as a second language teachers, Latino store and restaurant workers, and other Latino community leaders assisted me in recruitment.

I would be remiss not to acknowledge the essential role Rotary has served in my pursuit of this master's degree. I was able to begin my studies at the University of Oslo with the generous financial support derived from a Rotary Ambassadorial scholarship. I extend my best regards to the Holmenkollen Rotary Klubb and my host Rotarian, Trond Schumacher, and his family for their hospitality.

Lastly, I wish to broadly thank the people of Norway. During my time in the country, I have come to love the national sport of cross-country skiing and learned much during my observations of and interactions with Norwegian society.

Personal finances of the principal investigator funded this research project.

Abstract

Title: An assessment of diabetes care for Latinos living in non-metropolitan Iowa
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Project description: Latinos are nationally overrepresented among the uninsured, and rural Latinos are shown to face a variety of barriers to accessing quality health care. The Latino community continues to grow in the rural Midwest, and diabetes is a pertinent disease for research in this demographic. Diabetes care encompasses processes of care provided by health care professionals and personal health behavior including self-management activities, both of which may mitigate complications. The present research project investigated the degree to which the study population receives the recommended diabetes care services and executes self-management activities vis-à-vis access to care. A quantitative, cross-sectional survey yielded responses from 134 participants on socio-demographic, access to care, and diabetes-related questions. The study sample was predominantly foreign-born with low income and educational attainment. Participants with a community health clinic as the source of diabetes care and those in advanced disease progression were more likely to receive the appropriate care services. This study population demonstrated higher proportions of most individual services received when compared with a national sample of Latinos but still warrants significant improvement in the delivery of the recommended preventive and monitorial diabetes care services. Improvements are also needed in all four of the self-management activities investigated.

List of Abbreviations

US	United States of America
ADA	American Diabetes Association
HbA1c	Glycated hemoglobin
SMBG	Self-monitoring of blood glucose
DSME	Diabetes self-management education
MSA	Metropolitan Statistical Area
MEPS	Medical Expenditure Panel Survey
CTS	Community Tracking Survey
BRFSS	Behavioral Risk Factor Surveillance System

1. Introduction

1.1 Relevant information

'Latino' and 'Hispanic' are terms used interchangeably to describe people who self-identify Hispanic origin. Hispanic origin, considered an ethnicity, and race are not mutually exclusive (1). Government records document ethnicity as self-reported from censuses. Latinos in the United States of America (US) identify with the following places of origin: Mexico, 66%; Central and South America, 14%; Cuba, 9%; Puerto Rico, 4%; and other, 6% (2).

An estimated 126,000 Latinos live in the Midwestern state of Iowa, representing 4.2% of the total state population, compared with Latinos nationally accounting for 15.4% of the total US population (3). Nearly 1 in 3 Latinos lacks health insurance (4). The age-adjusted prevalence of type 2 diabetes for Hispanics aged 20 years or older is 10.4%, as compared to 6.6% for non-Hispanic whites (5). Latinos also have a higher prevalence of undiagnosed diabetes both nationally and in Iowa (6;7). The prevalence of diabetes is higher among rural Americans than those living in urban areas. Rural Latinos may even be considered 'doubly disadvantaged,' demonstrating a higher prevalence of diabetes than urban and rural non-Hispanic whites as well as urban Latinos (8).

The American Diabetes Association (ADA) estimates the total cost of diabetes in the US was $174 billion in 2007, considering both direct costs from medical expenditures and indirectly through diminished economic productivity (9). Complications of diabetes include heart disease and stroke, high blood pressure, nervous system damage, periodontal disease, and pregnancy complications (5). Additionally, diabetes is the leading cause of the following: blindness for people 20-74 years old in the US, end-stage renal disease, and non-traumatic lower-extremity amputations (10). Preventive services provided by health care professionals and self-management activities may ameliorate or postpone these often-debilitating health problems (11). In one study, Mexican Americans were found to have disproportionately more diabetes-related amputations than blacks or non-Hispanic whites in south Texas (12). In another study

analyzing national data of US veterans, ethnic minority groups, including Latino, demonstrated an increased risk of lower-extremity amputation compared with non-Hispanic whites (13).

A shortage of health care professionals in rural areas of the US is an issue for all rural residents regarding convenient access to health care, considering both distance and availability. However, the situation for minorities in rural settings is compounded with additional factors. Not only may the aforementioned barriers exist, but also communication and cultural competency may influence the care received by rural minorities. In urban settings often health clinics are established to serve particular underrepresented groups. Many rural minorities, on the other hand, do not have these clinics available and rather utilize the mainstream health system facilities (14).

Health literacy entails the ability for a patient to read and comprehend health-related instructions, such as prescription bottles or treatment instructions, and may be an important factor in chronic disease management (15). Female gender, Latino ethnicity, lower educational attainment, lower income, and Spanish language are all associated with lower health literacy, which is found to be related to poorer diabetes outcomes as measured by higher glycated hemoglobin (HbA1c) levels and increased complications (16).

1.2 Diabetes care

The quality of any type of health care can be evaluated subjectively by the patient's desires, expectations and satisfaction or objectively with professional standards or patient outcomes. This study used the professional standards endorsed by the ADA that served as a reference for diabetes care (17). Personal satisfaction of each respondent regarding their diabetes care was also assessed.

Diabetes care can be executed by the patient and the health care provider. Since diabetes is a chronic condition and must be monitored over a lifetime, the activities of the health care provider are limited mainly to assessing health status, treating complications and providing patient education. The daily activities and behavior of the

patient are paramount to diabetes management. As Brown et al. frame these elements of care, the activities of the health care provider can be viewed as 'processes of care' and the patient self-activity as 'health behaviors' (18). The processes of care can further be divided into three categories: examinations/assessments, treatment, and counseling (19). A variety of benchmarks were collected through a review of numerous studies and surveys addressing diabetes care (18-30). All of the processes of care mentioned hereunder are included in the ADA standards of medical care in diabetes, but the aggregate of them do not represent the complete set of ADA guidelines.

The following elements are all considered processes of care as provided by a health care professional. Examinations/assessments include: HbA1c lab test, measure of fasting lipid profile, blood pressure measurement, nephropathy screening, dilated and comprehensive eye exam, and comprehensive foot exam. Treatment incorporates influenza vaccine and referrals to an ophthalmologist or podiatrist. Counseling encompasses instructions on self-monitoring of blood glucose (SMBG); advising on diet and exercise; providing or referral to diabetes self-management education (DSME); and encouraging smoking cessation.

Although the role of the patient in managing diabetes is vital for success, the number of benchmarks highlighted in the studies reviewed was significantly smaller in comparison to the processes of care from health care providers. Diabetes self-management activities include regular SMBG, medical nutrition therapy (ie, diet adjustment), physical activity, smoking cessation, and daily personal foot inspection. The ADA also recommends DSME upon diabetes diagnosis and subsequent follow-up sessions as needed (17). These diabetes classes have been associated with increased knowledge and execution of self-care activities (31); lower HbA1c levels (11); and improved self-efficacy with diet (32). Another study showed an improvement in glycemic control for low-income Latinos among interventions emphasizing DSME (33).

The two central categories of measures for diabetes care are processes of care and health behaviors, which have been described above. Other useful variables to assess diabetes care include age upon diagnosis, treatment regimen (i.e., insulin, oral medications and/or diet adjustment), comorbidity, number of visits to a health care

professional for diabetes, use of medications for hypertension and/or dyslipidemia, and a description of the diabetes education.

1.3 Access to health care

A variety of factors affect one's opportunity to utilize health care services, including distance to an appropriate health clinic or provider, ability to reach the facility, language abilities, effective communication between patient and provider, and ability to pay for services. Access can be seen as the opportunity or ability to utilize health care, existing as a separate entity from the actual utilization of health care services. One reference presents a more amorphous description and blends the concepts of access and utilization, claiming, "access includes the receipt of preventive health care services, the likelihood of receiving treatment for certain illnesses, and having illness-related physician visits" (34).

Another way to perceive access to health care is as the absence of the many barriers to health care identified extensively in the literature and research, including, but not limited to: high medical services cost; lack of health insurance; communication difficulties, including language and cultural understanding; lack of transportation; immigration status and discrimination; unavailability of timely appointments; long waiting times in the facility; inconvenient office hours; need for child care; difficulty in maneuvering the health system and bureaucratic enrollment in programs; lack of trust in providers; lack of information where to go for services or on the specific health concern; negative attitudes of patients on services, health care providers, preventive practices and the relevant health concern; and cultural or community practices that may discourage utilization of conventional medicine (34-41). These barriers to health care can be categorized as individual, societal, organizational, structural and/or provider-based (40).

Access to health care has been measured with different variables in research. Three objective variables often used include one or more of the following: usual source of care, utilization of ambulatory care, and health insurance (23;34;38;42). A more direct,

yet subjective, technique to assess access to health care is by asking the respondent to evaluate the ease of obtaining needed health services (38). Another indicator for access to health care used is a subjective evaluation of satisfaction with care (43).

The usual source of care proxy variable suggests the patient has an established relationship with a particular ambulatory care provider and thus knows where to utilize health services when needed (42;44). An emergency room is not considered a usual source of care for access to health care research analysis.

The utilization of ambulatory care has been used as a gauge for access to health care and justified through logical reasoning. If patients utilize ambulatory health services regularly then one may assume the barriers to access are limited, thus concluding the patients have access to health care (42). An alternative method while coming to a similar conclusion is to inquire if the respondents were ever unable to access needed care (43).

The third variable commonly used to assess access to health care is health insurance coverage. This benchmark is included in almost all studies involving access to health care, and its robustness as a valid measure has been scrutinized. Health insurance is presumed to alleviate the financial barrier to utilizing health services. But viewing health insurance coverage as a dichotomous variable neglects the diversity of insurance plans. The types of services covered, patient choice of provider and patient contributions for services (including co-payments and deductibles) are a few important elements that differ significantly among plans. Additionally, the continuity of coverage is an important factor to consider, especially in a cross-sectional design study. An assessment of insurance coverage should consider not only the current insurance status but also take into account the history of stability in the coverage. In one study on the relevance of continuous insurance coverage, those currently insured but with a recent time uninsured were two to three times as likely to report problems in access to health care as compared to those stably insured (43). People with unstable insurance coverage or with a plan that does not adequately meet their financial needs are categorized as underinsured.

1.4 Existing knowledge

According to a review of the literature conducted by the principal investigator, the influence of access to health care on the receipt of appropriate diabetes care for this target population has not directly been investigated in scientific literature to date. Further, a quantitative analysis on diabetes care for Latinos living in rural Iowa has not previously been conducted.

Numerous qualitative studies have been performed regarding utilization of and barriers to health care for Latinos in the rural Midwest (35;36;45;46). A quantitative study found that nearly half of the Latina women residing in a Midwestern city interviewed experienced difficulty in obtaining health services (37). The connection between the importance of access to health care and chronic disease management has been cited, with health insurance used as a proxy for access to care. Insured Americans were more likely to receive the recommended diabetes care services than the uninsured in a nationally representative sample (47). A study of adults with diabetes in Mexico found increased utilization of conventional health care among the insured (48).

The concept of continuity of care and having a regular source of health care and/or regular provider has been studied extensively and compared to various disease managements and outcomes. The beneficial impact of having a regular provider for receiving diabetes care services among a nationally representative Hispanic subsample has been demonstrated (49). However, another study has shown the relationship between continuity of care measured by an index with preventive diabetes care services, including HbA1c test, cholesterol test, and eye examination, is not statistically significant (50). One quantitative study showed that people with diabetes are more likely to have a regular provider compared to counterparts without diabetes (51).

1.5 Knowledge gaps

Studies incorporating the Latino demographic often use data from national samples or regions with the largest Latino populations in the country (52-55). Iowa and selected other states in the Midwest have been identified as areas where limited research has

been done among rural minorities (14). Additionally, rural Latinos are more often lower income, lower education, US born, and married when compared to their urban counterparts, justifying an investigation for this target population, as health care differences may also exist between rural and urban cohorts (56). Rural minorities in a state where the Hispanic population is nearly four times less than the national percentage would presumably have different health situations as compared with national averages, which do not take into account population density or minority population distribution. As many rural Hispanics lack health insurance and rely on safety net providers for care, it is important to understand which elements of access to care influence their diabetes care.

1.6 Purpose

The general objective of this project was to study diabetes care vis-à-vis access to health care for Latinos with diagnosed type 2 diabetes mellitus living in rural Iowa counties. A specific objective of the study was to identify which of the socio-demographic, access to care, and disease-related variables have a significant relationship with the diabetes care services provided by health care professionals and with self-management activities executed by patients. Another specific objective was to evaluate the degree to which rural Latinos in Iowa receive the recommended diabetes care services and execute self-management activities as outlined in ADA guidelines (17).

This study addresses both goals and one of the 10 leading health indicators set forth by Healthy People 2010, the national health promotion and disease prevention agenda in the US (57). The study also links to the health priorities of the state of Iowa (58).

2. Methods

A cross-sectional design was used for this study.

2.1 Study population

The target population was self-identified Latinos aged 18 years and older residing in non-metropolitan Iowa counties with self-reported diagnosed type 2 diabetes. Non-metropolitan counties in the state of Iowa were defined through exclusion criteria from the requirements outlined with the Metropolitan Statistical Area (MSA) classification (59). Seventy-nine of the total 99 Iowa counties did not encompass an MSA and were thus defined as non-metropolitan. Micropolitan and non-core counties were included in this study.

Assessing data from the 2000 US Census, 10 towns in the state of Iowa were identified to have more than 400 Hispanic residents, constituting at least 5% of the total town population and situated in rural counties. The 10 towns fulfilling these criteria for Latino demographics are listed here, with county name in parentheses: Columbus Junction (Louisa), Denison (Crawford), Estherville (Emmet), Fort Madison (Lee), Hampton (Franklin), Marshalltown (Marshall), Muscatine (Muscatine), Postville (Allamakee and Clayton), Storm Lake (Buena Vista), and West Liberty (Muscatine). Upon recommendation by a Latino community leader the town of Ottumwa (Wapello) was also included. The total number of Latino residents for these 11 towns was 14,159 according to 2000 US Census Bureau statistics (60).

All 11 of these towns were defined as rural in this study, however they range in population from 1,900 (Columbus Junction) to 26,009 (Marshalltown). West Liberty and Columbus Junction had the largest Hispanic population concentrations, with 40.5% and 39.0%, respectively, of the town identifying as Hispanic. The average population for the study communities was approximately 11,000, and seven of them were included in Micropolitan statistical areas. All towns but Columbus Junction, Postville, and West

Liberty are county seats. Agribusinesses are major employers for Latino immigrants in the state and are found in or near all of the recruitment towns except Fort Madison.

2.2 Instrument

Questionnaires were completed during structured interviews conducted by the principal investigator. The questionnaire was used to assess various elements of access to health care, including items such as health insurance, usual source of care, distance to health facilities, and language abilities of both health care provider and patient. Questions for diabetes care services provided by health care professionals and diabetes self-management activities performed by the patient were also included according to ADA guidelines (17). The utilization of health services was assessed by the number of visits to a health care professional as well as the existence of a usual source of care and usual provider (34;61). Questions were derived from existing, validated surveys.

The 2006 Medical Expenditure Panel Survey (MEPS) is a validated survey under the auspices of the Centers for Disease Control and Prevention and has both a section addressing access to care and a supplemental questionnaire for diabetes care (30). The MEPS section on Access to Care contains questions to assess health insurance coverage, continuity of insurance coverage, recent utilization of ambulatory care services, satisfaction with health care services and perceived health status. An additional option listed as a possible barrier to care was also inserted: difficulty in maneuvering the health care system. This barrier to care was identified among others in a study amongst rural Latinos in another Midwestern state (45). The MEPS section on Diabetes Care includes questions on processes of care and health behaviors, age upon diagnosis, and patient assessments of diabetes care provided by a health care professional and self-management activities.

Additional questions came from the 2003 Community Tracking Study (CTS), the 2009 Behavioral Risk Factor Surveillance System (BRFSS) and a survey used for a 2007 study by Rojas-Guyler on health-seeking behaviors among Latinas (22;37;62). Two questions included in the questionnaire were adapted from validated questionnaires, and

two questions were developed for the analysis of diabetes self-management: for diet adherence, “If a health care professional has recommended a special diet for your diabetes, how well do you adhere to this diet?” with Likert scale response; and for advisement on self-care activities, “About how long has it been since a health care professional advised you on…Diet adjustment? Quitting smoking? Checking your own blood for glucose or sugar? Checking your own feet for sores or irritations?” with numerical responses for each. Please see Appendix 3 for a full copy of the questionnaire.

2.2.1 Pretesting

The questionnaire was first administered during a pilot structured interview with two individuals with diabetes before the official data collection process began to assess the flow and clarity of questions. The two respondents were identified at an urban health clinic and highlighted important areas of improvement for the principal investigator to be addressed for the future interviews with study participants.

2.3 Recruitment

A multi-venue approach was implemented for study participant recruitment. Various locations were identified in each of the study communities to identify the target population and recruit participants. Recruitment assistance was provided by many Latino and Anglo community leaders in each study location. Community locations included Spanish-language religious services, English as a second language courses, community health clinics, organization meetings, and Latino restaurants and stores. After explaining the study, persons fulfilling the inclusion criteria were requested to approach the principal investigator if willing to participate, and others could provide references for potential participants. In the health clinics, health care providers first inquired if the patient would allow a researcher to talk about the project, then the principal investigator stepped in to request participation with the assenting patient in the absence of the provider. Participants were also asked to identify other prospective study participants in the community.

The total number of interviews conducted was 137. After excluding data from participants with pre-diabetes, gestational diabetes, and type 1 diabetes, the total sample size for this study was 134. All data sets were complete. The number of participants from each recruitment community was generally proportional to the size of the Latino population in each town according to census data. The sample size was restricted mostly by the capacity to recruit study participants within the limited timeframe and budget. Participants received a $5 grocer coupon in appreciation for their contribution, and the median time for completing the 56-item questionnaire was 20 minutes. Data was collected from September to December 2009.

2.4 Variables

The 2009 ADA standards of medical care in diabetes established outcome categories for appropriate diabetes care (17). The following measures were included as outcomes for diabetes care services provided by health care professionals: two HbA1c tests in the past year, one comprehensive foot examination in the past year, one dilated eye exam in the past three years, and one cholesterol test in the past two years. All four of these measures were required for the comprehensive outcome category. The following dependent variables were included in the assessment of diabetes self-management: at least one daily SMBG, at least one daily personal foot inspection, self-reported diet adherence, and having ever attended a class of DSME. The positive category for the diet adherence variable included all participants who reported to follow diabetes diet recommendations 'well' or 'very well.' The ADA does not present a recommendation for optimal frequency of SMBG, but most studies have used daily SMBG in analysis (18;53;55;63;64).

Cultural preference was assessed by asking with which culture the participant feels most comfortable: American, Hispanic/Latino, or both. Provider ethnicity sought to identify Hispanic or non-Hispanic health care providers and, as such, only Hispanic ethnicity was noted. Difficulty in accessing care was determined by asking if the participant had ever experienced difficulties in obtaining health services. The number of visits to a provider in the past year for any health care services formed the health

care utilization variable. Many questions used a four or five point Likert scale and response categories were merged for statistical analysis.

2.5 Statistical analysis

Statistical analyses included descriptive statistics, chi-squared analyses, t-tests, one-way ANOVA, Mann-Whitney U tests, and binary logistic regression, all with a statistical significance level of 0.05 and confidence intervals of 95%. Mean values with standard deviation were presented for normally distributed variables; otherwise, medians with interquartile range were given. The Pearson's chi-squared test was used to analyze associations between two nominal variables and calculate p-values in cross tabulations. A Fisher's exact test generated significance values when the expected number of cases was below five. One-way ANOVA was implemented to compare the mean number of visits to a health care provider in the past year for the three age groups and three diabetes treatment categories. The median time since last advised by a health care professional on each self-care activity and the execution of the corresponding activity was compared using the Mann-Whitney U test.

Binary logistic regression was used to identify predictors for receipt of the composite measure of all four diabetes care services and for execution of each of the four self-management activities. Socio-demographic, access to care and diabetes-related variables were considered if they were significantly associated ($p<0.05$) with the dependent variables in Chi-squared testing. These variables were then included as covariates in a logistic regression model if they fulfilled the input entry criteria for -2 log likelihood changes of critical value of $p<0.05$. Expected count in each cell of cross tabulations needed to be a minimum of five to be included in a logistic regression model. Each covariate was run individually in a univariate logistic regression analysis and a model adjusting for socioeconomic status, and all covariates were included together in the full, adjusted model.

SPSS version 16 (Chicago, Illinois) was used for all statistical analyses.

3. Ethical considerations

This study involved no more than minimal risk and informed consent was obtained from all participants prior to the interview. The questionnaire began with the following information: the general purpose of the study, notification that participation is voluntary, the approximate length of time to complete the questionnaire, and assurance that information is collected anonymously and will be stored securely. The principal investigator ensured the respondents sufficiently understood the aforementioned information while obtaining informed consent. Information was provided in either English or Spanish according to language preference.

All members of the study population can be identified as vulnerable in various possible categories, including minority status and burden of a chronic disease. This study addressed the specific concerns facing this population regarding their diabetes care in relation to access to health care.

A significant ethical issue seen in this study was the inability to provide appropriate diabetes care for those who were identified as needing such. The principal investigator was not a trained health care professional and not able to provide diabetes care. The study population was an ethnic minority overrepresented among the uninsured for health care in the US. Access to appropriate health care can be a major challenge for uninsured, rural Latinos. At the end of each survey information was offered on available low-cost or free clinics as well as contact information for diabetes support groups and Medicaid (public health insurance in the US) enrollment.

Concern for confidentiality was mitigated as the data collected was anonymous, in which the information was not linked to the respondents. All interviews were conducted in a private place where the conversation could not be overheard. Also, the principal investigator took extra precaution and stored all completed surveys in a locked file box. The surveys will be destroyed upon the completion of the master's degree program.

The study exposed participants to minimal risk. Minimal risk was defined as no more than the risks encountered in daily life. No significant physical, psychological, social or economic risks had been identified as a potential concern for this study. The participants each used approximately 20 minutes of their time to complete the survey. This small burden of time may be balanced by the value of the expected knowledge to be generated by the study for better understanding the needs of the target population. Additionally, a $5 USD monetary compensation for a grocery store provided a direct benefit to the individual participant.

The University of Northern Iowa Institutional Review Board, reference identification IRB 09-0015, approved the research project. The Norwegian Regional Committee for Medical Research Ethics, reference identification 2009/141-1, also approved the project. All relevant ethical safeguards were met in relation to participant protection.

4. Results

The study population was generally lower income with a median annual household income of $19,200 (interquartile range: $9,600-$28,800) and had lower educational attainment, demonstrated by the mean years of school (7.4 ± 4.4) below an 8th grade completion. The average age was in the mid-fifties (52.6 ± 12.8) and more females (59%) were represented in the sample. The sample was largely foreign-born (81%) and overwhelmingly reported Mexico as a familial homeland (93%). Twenty years (± 11.9) was the average amount of time living in the US among the foreign-born. A third of the sample lacked health insurance or had gone a period in the past year without it, yet all but 4% of participants reported a usual source of health care. Only 12% of the study population with a regular provider saw a Hispanic or Latino health care provider.

Just over half (54%) of the sample received all four of the diabetes care services provided by health care professionals. Four out of five participants received the two HbA1c tests in the past year, and just under 90% of the sample had a cholesterol test in the past two years. Seventy-five percent received an annual foot examination, and the same proportion of the sample received a dilated eye examination in the past three years. Participants visiting a health care provider three or more times in the past year and those who have had diabetes for more than ten years were more likely to receive the comprehensive diabetes care services in adjusted binary logistic regression analysis. Patient dissatisfaction showed less odds of receiving the composite of all four diabetes care services compared with the group reporting high satisfaction. Finally, participants who visit a community health clinic as the primary source of diabetes care were four times as likely to receive the comprehensive diabetes care than those who attend a private doctor's office.

Daily foot inspection had the highest prevalence of execution among the self-management activities with 58% fulfillment. Two out of five participants performed the daily SMBG and 44% self-reported strong diet adherence. Just under half (48%) of the sample has attended a DSME class. The groups using oral agents or diet alone for diabetes treatment had significantly lower odds of performing daily SMBG than insulin

users in an adjusted logistic regression model. Execution of daily foot inspection was less likely for those who reported difficulties in access to health care and more likely for patients advised on the self-care activity within the past two years. Participants with eight or more years of education were more likely to have attended a DSME class, and the foreign-born groups had lower odds of DSME class completion compared with the US-born group.

5. Discussion

This exploratory study found that only approximately half of the study population received the composite of selected recommended diabetes care services prescribed by ADA guidelines. When compared to a national sample of Latinos with diabetes, this study population generally demonstrated a greater proportion receiving the appropriate diabetes care procedures (65;66). Only in regard to the cholesterol test did this sample rank just below nationally representative data. Compared with a sample from Texas, more from the present study sample received HbA1c test and foot examination, but a slightly greater number had never received a dilated eye examination (55).

The fulfillment of the four self-management activities studied was generally low among this sample. Only the daily foot inspection achieved a proportion higher than 50% for completion. The ADA outlines clear guidelines for all persons with diabetes to perform a daily foot inspection, follow diabetes-specific diet recommendations, and receive DSME. The daily SMBG recommendation is not as steadfast for persons with diabetes in all treatment categories and an optimal frequency is not identified. This lack of an empirical guideline should be considered when reviewing the results for SMBG.

5.1 Limitations

The cross-sectional design prohibited any analysis of causal relationships. Recall bias and social desirability may have influenced patients as they self-reported the data. A weakness of this study was its small sample size that may induce low statistical power, and possible beta error in statistical inferences must be considered. The different methodologies applied for selection of participants may also bias results. The design intended to generate a representative sample of Latinos in non-metropolitan Iowa, but the convenience sample and varied recruitment strategies hinder generalization of the results. Also, the selection of recruitment communities focused on towns with larger Latino populations, thus excluding areas where Latinos represent a smaller minority of less than 5% of the population.

The assessment of DSME was limited to if the participant has ever taken a diabetes class, which does not account for frequency or content of the diabetes education, nor where the class was held or who was the instructor (54). A more refined assessment of DSME would likely produce greater associations with self-care activities.

The dominance of Mexican origin in the sample population, in conjunction with the small sample size, made it difficult to disaggregate the sample data into ethnic subgroups. Only 7% (n = 9) of the sample did not claim Mexico as a familial homeland, leaving six other countries being clumped together into an 'other' category. Although differences were identified between these two categories, the results have limited significance because of size.

5.2 Strengths

All surveys were thoroughly conducted by the principal investigator during in-person interviews with individual participants, ensuring a higher quality of the data. The structured interview also allowed participants unable to read to still take part in the study. Although convenience sampling was utilized, a wide range of venues were selected for recruitment in an attempt to generate a more random sample. The target population required a novel recruitment approach. The inclusion criteria were specific: Hispanic ethnicity and diagnosed type 2 diabetes, and the recruitment communities were non-metropolitan towns with small populations. Some traditional data collection methods such as mailed questionnaires or telephone interviews were not appropriate for this specific target population. The principal investigator went into each study community and interacted with members of the Latino community to generate trust and identify study participants. The sample included participants from eleven towns who were recruited from a variety of community locations, including churches, English classes, and Latino stores.

5.3 Implications

This project provides a quantitative assessment of various facets of diabetes care for Latinos living in rural Iowa. The results of this study may highlight important information as the government and health institutions around the state make future plans addressing the epidemic of diabetes as well as accomodating a growing Latino population. An example of this information is the finding regarding the source of diabetes care for the study population. Community health clinics are often more accustomed to serving Latino patients. This study recruited from communities with greater Latino demographics, and the community clinics all had full-time bilingual staff available to serve patients in need of translation services. These clinics also often employ Latino health care providers. The clinics offered health services at prices according to patient income level and financial ability. These factors, among others, may all contribute to a better comprehensive experience with culturally tailored care that was reflected in the higher proportion of patients receiving appropriate diabetes care. The results of this study support the importance of community clinics in serving the needs of Latino immigrants in smaller Midwest communities. Additionally, the comprehensive delivery of diabetes care services for mostly foreign-born, Spanish-speakers with diabetes was markedly higher in these community clinics as compared to private health providers' offices. Community health clinics deserve additional attention as the population of Latino immigrants continues to increase and are likely to utilize these clinics.

Advisement from a health care provider on personal foot inspection was strongly associated with the execution of the activity. Daily foot inspection is recommended by the ADA for all persons with diabetes and, thus, providers should advise all patients on it. The large gap in attendance to a DSME class between groups with different educational attainment should be addressed. Low literacy has been associated with decreased knowledge of diabetes and disease management, and diabetes education tailored to suit the needs of low literacy patients has proven effective in lowering HbA1c levels (67). The disparity between US- and foreign-born Latinos in DSME was also a concern identified in this project. DSME has been shown to improve self-

efficacy, diabetes self-management, and clinical outcomes (32;68;69), and the self-efficacy was associated with improved self-management behaviors that permeate among race and ethnicity as well as health literacy (70). An increased emphasis on DSME and specifically targeting the Spanish-speaking, foreign-born Latinos with lower educational attainment may have a beneficial impact on self-management behaviors.

5.4 Conclusion

The present research project focused on Latinos with diabetes in non-metropolitan communities of the Midwestern state of Iowa and provides insight into the particular health situation for this group often neglected in research. The receipt of diabetes care services from health care providers was higher with this study population when compared with their counterparts nationally. However, improvements in delivery of the ADA recommended standards of diabetes care are still needed. The proportions of the sample fulfilling each of the four diabetes self-management activities also showed that improvements across the board are warranted. The sample had comparable figures for foot inspection and attendance to a DSME class relative to peer samples, but nevertheless, fewer than half reported to perform SMBG daily, adhere strongly to diet recommendations, or have taken a DSME class. A number of predictors were identified for these self-management activities as well as the receipt of diabetes care services from health care professionals. Future studies should further investigate the role of health insurance and community health clinics for rural Latinos in the utilization of health care services. Additionally, the objectives of this study could be extended to other surrounding states in the Midwest that are similarly underserved in rural minority health research.

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"Better care at safety net providers? Receipt of recommended standards of diabetes care for rural Latinos in one Midwestern state," manuscript for submission to the Journal of Health Care for the Poor and Underserved, June 2010.

Title

Better care at safety net providers?

Receipt of recommended standards of diabetes care for rural Latinos living in one Midwestern state.

Keywords (MeSH terms): Midwestern United States; Iowa; Health Care Quality, Access, and Evaluation; Hispanic Americans; Mexican Americans; Diabetes Mellitus, Type 2; Rural Population; Suburban Population.

Abstract

Latinos are nationally overrepresented among the uninsured, and rural Latinos are shown to face a variety of barriers to accessing quality health care. The present study investigated the degree to which Latinos with diabetes living in non-metropolitan towns in the state of Iowa receive the recommended diabetes care services from health care providers vis-à-vis access to care. Four process measures were selected from the American Diabetes Association standards of medical care for diabetes: glycated hemoglobin tests, comprehensive foot examination, dilated eye examination and cholesterol test. Results from this research found that just over half (54%) of the sample received the comprehensive set of diabetes care services. Adjusted logistic regression analysis showed patients were four times more likely to receive the

comprehensive diabetes care at a community health clinic as compared to a private doctor office. These community clinics deserve additional attention as more Latino immigrants move to the Midwest.

Introduction

Relevant information. The state of Iowa population is approximately 3 million, and 4.0% claim Hispanic origin.[1] Hispanics represent 15.4% of the total US population, yet constitute 32.3% of uninsured Americans. Nearly 1 in 3 Latinos lacks health insurance.[2] The age-adjusted prevalence of type 2 diabetes for Hispanics aged 20 years or older is 10.4%, as compared to 6.6% for non-Hispanic whites.[3] The prevalence of diabetes is also higher among rural Americans than those living in urban areas.[4] Complications of diabetes include heart disease and stroke, high blood pressure, nervous system damage, periodontal disease, and pregnancy complications.[5] Additionally, diabetes is the leading cause of the following: blindness for people 20-74 years old in the US, end-stage renal disease, and non-traumatic lower-extremity amputations.[6] Diabetes care provided by a health care professional should include blood glucose monitoring, eye and foot examinations, blood pressure measurement, and urine analysis for protein.[7]

A shortage of health care professionals in rural areas of the US is an issue for all rural residents regarding convenient access to health care, considering both distance and availability. However, the situation for minorities in rural settings is compounded with additional factors. Not only may the aforementioned barriers exist, but also communication and cultural competency may influence the care received by rural minorities. In urban settings often health clinics are established to serve particular underrepresented groups. Many rural minorities, on the other hand, do not have these clinics available and rather utilize the mainstream health system facilities.[8]

Rural minorities in a state where the Latino population is nearly four times less than the national percentage would presumably have different health situations as compared with national averages, which do not take into account population density or minority population distribution. As many rural Latinos lack health insurance and rely on safety net providers for care, it is important to understand which elements of access to care influence the receipt of diabetes care from health care providers.

Existing knowledge. A literature review on health care access for rural minorities emphasized the need for studies in the West North Central region of the country, encompassing Kansas, Missouri, Nebraska, Iowa, North Dakota, South Dakota and Minnesota.[8] Numerous qualitative studies have been performed regarding utilization of and barriers to health care for Latinos in the rural Midwest.[9-12] A quantitative study found that nearly half of the Latina women residing in a Midwestern city interviewed experienced difficulty in obtaining health services.[13] Rural Hispanics were found to have the highest prevalence of diabetes when compared to urban and non-Hispanic white cohorts.[14] The connection between the importance of access to health care and chronic disease management has been cited, with health insurance used as a proxy for access to care. Insured Americans were more likely to receive the recommended diabetes care services than the uninsured in a nationally representative sample.[15] A study of adults with diabetes in Mexico found increased utilization of conventional health care among the insured.[16]

The concept of continuity of care and having a regular source of health care and/or regular provider has been studied extensively and compared to various disease managements and outcomes. The beneficial impact of having a regular provider for receiving diabetes care services among a nationally representative Hispanic subsample has been demonstrated.[17] However, another study has shown the relationship between continuity of care measured by an index with preventive diabetes care services, including glycated hemoglobin (HbA1c) test, cholesterol test, and eye examination, is not statistically significant.[18] One quantitative study showed that people with diabetes are more likely to have a regular provider compared to counterparts without diabetes.[19]

Objectives. The general objective of this project was to study diabetes care vis-à-vis access to health care for Latinos with diagnosed type 2 diabetes mellitus living in rural Iowa counties. A specific objective of the study was to identify which of the socio-demographic, access to care, and disease-related variables have a significant relationship with the diabetes care services provided by health care professionals. Another specific objective was to evaluate the degree to which rural Latinos in Iowa

receive the recommended diabetes care from health care professionals as outlined in American Diabetes Association (ADA) guidelines.[7]

Methods

A cross-sectional design was implemented in this project with data collection spanning from September to December 2009. All structured interviews were conducted in person by the principal investigator. Each survey required approximately 20-30 minutes to complete, and participants received a $5 grocer coupon in appreciation for their time. Ethical clearance was obtained from the University of Northern Iowa Institutional Review Board, and all participants provided informed consent.

Study population. The target population was Latinos aged 18 years and older residing in non-metropolitan Iowa counties with diagnosed type 2 diabetes. Non-metropolitan counties in the state of Iowa were defined through exclusion criteria from the requirements outlined with the Metropolitan Statistical Area (MSA) classification.[20] Seventy-nine of the total 99 Iowa counties did not encompass an MSA and were thus defined as non-metropolitan.

Assessing data from the 2000 US Census, 10 towns in the state of Iowa were identified to have more than 400 Hispanic residents, constituting at least 5% of the total town population and situated in rural counties. The 10 towns fulfilling these criteria for Latino demographics are listed here, with county name in parentheses: Columbus Junction (Louisa), Denison (Crawford), Estherville (Emmet), Fort Madison (Lee), Hampton (Franklin), Marshalltown (Marshall), Muscatine (Muscatine), Postville (Allamakee and Clayton), Storm Lake (Buena Vista), and West Liberty (Muscatine). Upon recommendation by a Latino community leader the town of Ottumwa (Wapello) was also included in this study. The total number of Latino residents for these 11 towns was 14,159 according to 2000 US Census Bureau statistics.[21]

All 11 of these communities were defined as rural in this study, however they range in population from 1,900 (Columbus Junction) to 26,009 (Marshalltown). West Liberty

and Columbus Junction had the largest Hispanic population concentrations, with 40.5% and 39.0%, respectively, of the town identifying as Hispanic. Agribusinesses are major employers for Latino immigrants in the state, and meat packing plants were found in eight of the study communities. The prevalence of health insurance coverage is higher in the meat packing industry when compared to employment in construction and eating and drinking establishments for Latinos nationally.[22] Even so, some employees opt not to purchase the employer-based insurance to keep more wages for use with family locally and sending remittances to home country relatives.[10]

Instrument. A questionnaire was used to assess various elements of the access to health care and the receipt of services for appropriate diabetes care as defined by ADA guidelines established for use by health care professionals.[7] The utilization of health services was assessed by the number of visits to a health care professional as well as the existence of a usual source of care and usual provider.[23] Questions were derived from existing, validated surveys.

The 2006 Medical Expenditure Panel Survey is a validated survey under the auspices of the Centers for Disease Control and Prevention and has both a section addressing access to care and a supplemental questionnaire for diabetes care.[24] Additional questions came from the 2003 Community Tracking Study (CTS), the 2009 Behavioral Risk Factor Surveillance System (BRFSS) and a survey used for a 2007 study by Rojas-Guyler on health-seeking behaviors among Latinas.[13,25,26] Two questions used for analysis in this report were not used verbatim from the validated questionnaires: one question modified from the BRFSS and CTS, assessing health care utilization, "How many times did you go to your provider in the past 12 months?" and one question modified from the Rojas-Guyler survey, assessing the source of diabetes care, "Where do you usually go for your diabetes care?"

Recruitment. A multi-venue approach was implemented for study participant recruitment. Various locations were identified in each of the study communities to identify the target population and recruit participants. Recruitment assistance was provided by many Latino and Anglo community leaders in each study location. Community locations included Spanish-language religious services, English as a second

language courses, community health clinics, organization meetings, and Latino restaurants and stores. Participants were also asked to identify other potential study participants in the community.

The total number of interviews conducted was 137. After excluding data from participants with pre-diabetes, gestational diabetes, and type 1 diabetes, the total sample size for this study is 134. All data sets were complete.

Variables. The 2009 ADA standards of medical care in diabetes established outcome categories for receipt of appropriate diabetes care from health care providers. The following measures were included as outcomes: two HbA1c tests in the past year, one comprehensive foot examination in the past year, one dilated eye exam in the past three years, and one cholesterol test in the past two years. All four of these measures were required for the comprehensive outcome category.

Cultural preference was assessed by asking with which culture does the participant feel most comfortable: American, Hispanic/Latino, or both. Provider ethnicity sought to identify Hispanic or non-Hispanic health care providers and, as such, only Hispanic ethnicity was noted. Difficulty in accessing care was determined by asking if the participant has ever had difficulties in obtaining health services. Health care utilization reflects the number of times the participant went to his/her provider in the past 12 months. Many questions used a four or five point Likert scale and response categories were merged for statistical analysis.

Statistical analysis. All data was analyzed with SPSS version 16 (Chicago, Illinois). Statistical analyses included descriptive statistics, chi-squared tests, one-way ANOVA, and binary logistic regression, all with a statistical significance level of 0.05 and confidence intervals of 95%. The Pearson's chi-squared test was used to evaluate associations between two categorical variables and calculate p-values in cross tabulations unless the expected number of cases was less than five in a cell; in that event the Fisher's exact test was employed. One-way ANOVA was implemented to compare the mean number of visits to a health care provider in the past year for the three age groups and three diabetes treatment categories.

Binary logistic regression was used to identify predictors for receipt of the composite measure of all four diabetes care services. Independent variables were considered if they were significantly associated ($p<0.05$) with the dependent variable in Chi-squared testing. These variables were then included as covariates in the logistic regression analysis if they fulfilled the input entry criteria for -2 log likelihood changes of critical value of $p<0.05$. Each covariate was tested individually in a univariate logistic regression analysis and a model adjusting for socioeconomic status, and all covariates were included together in the full, adjusted model and model excluding health-seeking participants. An additional logistic regression model was run looking specifically at the variable for source of diabetes care. Age, health care utilization, and time with diabetes were included as continuous data in this second round of logistic regression analysis, whereas in the first they were used as categorical variables. The 'other' category for source of diabetes care was excluded from regression analysis due to few cases (n=9).

Results

The study population was largely foreign-born (81%) and overwhelmingly reported Mexico as a familial homeland (93%). The median annual household income was $19,200 (interquartile range: $9,600-$28,800). Only 12% of the study population with a regular provider saw a Hispanic or Latino health care provider.

Older age, higher income, US born, familial country of origin other than Mexico and English proficiency were all associated with an increased receipt of appropriate comprehensive diabetes care (Table 1). Most of these variables showed a difference for each of the individual diabetes care services but only demonstrated statistical significance in the eye exam and comprehensive outcomes. Thus, the eye exam appeared to influence the significance of the difference in the comprehensive outcome when compared with the socio-demographic variables.

Health care utilization, ease of phone communication, patient satisfaction, source of care, time with diabetes, and diabetes treatment categories were all related to the

comprehensive receipt of selected ADA recommended care services (Table 2). Variables related to transportation were also related to individual diabetes care services: transportation difficulty was associated with foot and eye examinations, while travel time to provider was related to HbA1c and cholesterol tests. Insurance coverage was related to increased receipt of three of the individual services, but not statistically significant for the foot exam or comprehensive outcome.

The significant relationship regarding health care utilization lay among individuals who accessed care twice or less in the past year as compared to all others. No significant difference was observed in the groups accessing care three to four times as compared to five or more times in the past year.

The mean (with standard deviation) number of visits to a health care provider in the past year for patients treating diabetes with diet alone, oral agents and insulin were 4.69 (4.13), 4.61 (3.33), and 5.41 (3.08), respectively, and for age categories 40 years old or less, 41 to 64 years old, and older than 65 years were 3.62 (2.72), 4.45 (2.74), and 6.85 (4.63), respectively. No statistically significant difference was found among the treatment categories in a one-way ANOVA ($p=0.520$). A significant difference was noted among the three age groups ($p=0.001$), but not between the two youngest groups ($p=0.515$). The proportion of individuals using insulin receiving all four diabetes care services was five times the proportion for those using diet alone for diabetes treatment. The 41 to 64 years old group demonstrated a proportion twice the value compared to the group less than 40 years old.

The proportions of receipt of comprehensive diabetes care services were approximately equivalent for private health insurance and no health insurance. Proportions for individual services, including HbA1c test, eye exam, and cholesterol test, were significantly higher for private health insurance as compared to no health insurance.

Type of provider, provider ethnicity, and night or weekend office hours did not demonstrate significant associations with any of the outcome services and results are not shown.

In Table 3, seven independent variables were included in a binary logistic regression model predicting the receipt of comprehensive diabetes care. Participants who visited a health care provider more than twice in the past year were 4.3 to 5.7 times more likely to receive the sum of diabetes care services. Those with diabetes for longer than 10 years showed much greater odds of receiving the services, as well as participants who self-reported satisfaction compared to dissatisfaction when asked about the health care received in the past year.

The significant relationship between source of diabetes care and receipt of appropriate care was further analyzed with additional binary logistic regression analysis (Table 4). The individuals with a community health clinic as the source of diabetes care were four times more likely to receive the comprehensive diabetes care as compared to their counterparts visiting a private doctor's office when adjusting for covariates. The differences were less significant when the health-seeking participants recruited at community health clinics were excluded; however, the results were still statistically significant.

Discussion

This exploratory study found that only approximately half of the study population received the composite of selected recommended diabetes care services prescribed by the ADA guidelines. When compared to a national sample of Latinos with diabetes, this study population generally demonstrated a greater proportion receiving the appropriate diabetes care procedures.[27,28] Only in regard to the cholesterol test did the sample rank just below nationally representative data. Compared with a sample from Texas, more from the present study sample received HbA1c test and foot examination, but a slightly greater number had never received a dilated eye examination.[29]

The large number of participants who reported a cholesterol test in the past two years was likely overreported, as many may have thought any extraction of blood for lab tests

would include checking cholesterol. Some participants may have believed that cholesterol levels were assessed any time an HbA1c test was performed.

An increase in receipt of appropriate diabetes care was seen with insulin use and an increase in number of years with diagnosed diabetes. This observation may also be seen in the higher proportion of older participants receiving the recommended care. Diabetes complications become more serious and more frequent as patients age and the disease progresses. The ADA standards of medical care for diabetes are for all individuals with diabetes, however. The diabetes care services selected for review in this study were intended to monitor the chronic condition and prevent diabetes-related conditions that are applicable to all people with diabetes, regardless of status of disease progression.

There was no significant difference in the health care utilization between the two younger age categories or among the three treatment categories. These results suggested the cause of these age and treatment category disparities may be the fault of the health care providers in the execution of diabetes care services. Providers may be less apt to provide monitoring and preventive care services to these younger and seemingly healthier patients.

All participants not from Mexico received the recommended care, while only half of those reporting Mexico as their familial homeland did so. This result may simply be attributed to chance, given the small number of data for country of origin not from Mexico. However, there may be broader implications connected to this result, such as an influence of being among the minority of the Latino community. Other diabetes studies have emphasized the importance of disaggregating data among the subgroups of the heterogeneous Hispanic ethnicity, and the results of this study, although limited, support this suggestion.[30,31]

Health insurance coverage is often cited as an important aspect of access to care.[15] The results here showed no significant relationship with health insurance coverage and receipt of comprehensive diabetes care services. However, when taken individually, higher proportions of receipt of HbA1c test, eye exam, and cholesterol test were all

associated with insurance coverage. This result may be unique to the study population, given the greater number of uninsured and increased utilization of clinics with flexible payment schemes not requiring health insurance. Four of the recruitment towns in this study were home to a community health clinic, viz. Columbus Junction, Marshalltown, Ottumwa and Storm Lake. The community health clinics serve many uninsured patients with services provided on a sliding pay scale according to financial need. Some private doctor offices, especially clinics affiliated with hospitals, also offer reduced cost services for the uninsured or medically indigent.

Another aspect of access to care often cited as important in the delivery of quality care is a usual source of care or regular provider. Although this study found only one statistically significant relationship (for HbA1c test) between continuity of care and receipt of appropriate diabetes care, the trend in the results showed having a regular provider or usual source of care well outperformed those with no usual source of care. These results are not strong, however, given the small amount of data in the category for no usual source of care. The pattern was consistent for those with a regular provider to have greater receipt of the services, save the cholesterol test, compared to those with only a usual source of care. Five participants in this study had no usual source of care, and 21 reported no regular provider. These proportions of continuity of care for rural Hispanics are consistent with the results of another study.[14]

It is important to note that the dilated eye examination is mostly performed at an optometrist or ophthalmologist, outside of a regular office visit to a primary care provider. The HbA1c and cholesterol tests may also be administered outside of the primary care setting. More area for unmeasured influence results as these additional elements are considered in the patient self-reported receipt of diabetes care services. Factors that may influence receipt of services include provider referrals, patient fulfillment of the referral, patient requests for service referrals, and patient knowledge of diabetes care recommendations.[32]

All surveys of this study were thoroughly conducted by the principal investigator during in-person interviews with individual participants, ensuring a higher quality of the data. The structured interview also allowed participants unable to read to still take

part in the study. Although the recruitment technique was convenience sampling, a wide range of venues were selected for recruitment to attempt to generate a more random sample. The study population required a special targeted recruitment approach as used in this study. The inclusion criteria were specific: Hispanic ethnicity and diagnosed type 2 diabetes, and the recruitment communities were non-metropolitan towns with small populations. Some traditional data collection methods such as mailed questionnaires or telephone interviews were not appropriate for this specific target population. The principal investigator went into each study community and interacted with members of the Latino community to generate trust and identify study participants.

All data was self-reported from the individual patients and their recollection. Other studies have verified the accuracy of self-reported diabetes diagnosis and treatment category in diverse populations.[33,34] A rural American study showed patients overreported diabetes care services provided by health professionals.[35]

Limitations. The cross-sectional design of this study prohibited any analysis of causal relationships. A weakness of this study was its small sample size, and possible beta error in statistical inferences must be considered. The different methodologies applied for selection of participants in this study may also bias results. The design of this study intended to generate a representative sample of Latinos in non-metropolitan Iowa, but given the convenience sample and varied recruitment strategies, the representativeness of the results must be regarded with caution. Also, the selection of recruitment communities focused on towns with larger Latino populations, thus excluding areas where Latinos represent a smaller minority of less than 5% of the population.

Implications. The findings of this study put community health clinics into the spotlight. Community health clinics are often more accustomed to serving Latino patients. This study recruited from communities with greater Hispanic demographics, and the community clinics all had full-time bilingual staff available to serve patients in need of translation services. These clinics also often employ Hispanic health care providers. The clinics offered health services at prices according to patient income level and financial ability. These factors, among others, may all contribute to a better comprehensive experience with culturally tailored care that was reflected in the higher

proportion of patients receiving appropriate diabetes care. The results of this study support the importance of community clinics in serving the needs of Latino immigrants in smaller Midwest communities. Additionally, the comprehensive delivery of diabetes care services for mostly foreign-born, Spanish-speakers with diabetes was markedly higher in these community clinics as compared to private health providers. Community health clinics deserve additional attention as the population of Latino immigrants continues to increase and are likely to receive medical care from these clinics.

This study also found disparities in diabetes care among age groups and treatment categories. Further research on this topic is warranted, and greater emphasis on the administration of ADA recommended standards of care for all persons with diabetes should be emphasized.

Conclusion. The present study focused on Latinos with diabetes in non-metropolitan communities of the Midwestern state of Iowa and provides insight into the particular health situation for this group often neglected in research. The receipt of diabetes care services from health providers was higher with this study population when compared with their counterparts nationally. However, improvements in delivery of the ADA recommended standards of diabetes care are still needed. Future studies should further investigate the role of health insurance and community health clinics for this study population in the utilization of health care services.

Acknowledgements

This study would not be possible without the generous allocation of personal time from each study participant. Sincere appreciation also goes to all of the people from the various recruitment venues for their help and cooperation. The authors thank Lien Diep for assistance with statistical analysis.

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Table 1. Socio-demographic composition of sample (N=134) by receipt of selected ADA standards of care, n (%)

	HbA1c tests		Foot exam		Eye exam		Cholesterol test		Comprehensive	
Characteristic	**HbA1c n=107 (80%)**	**p-value**	**Foot n=100 (75%)**	**p-value**	**Eye n=101 (75%)**	**p-value**	**Cholest-erol † n=119 (89%)**	**p-value**	**All n=72 (54%)**	**p-value**
Gender		0.149		0.409		*0.064*		0.392F		0.846
Female	66 (85)		61 (77)		55 (70)		67 (94)		43 (54)	
Male	41 (75)		39 (71)		46 (84)		52 (98)		29 (53)	
Age (years)										
≤40	18 (69)	----	17 (65)	----	15 (58)	----	21 (91)	----	8 (31)	----
41-64	67 (83)	0.139	62 (76)	0.305	64 (78)	**0.041**	76 (97)	0.222F	48 (59)	**0.014**
65+	22 (85)	0.188	21 (81)	0.211	22 (85)	**0.032**	22 (96)	1.000F	16 (62)	**0.026**
Annual household income		0.466		0.174		**0.004**		0.321F		**0.018**
<$25,000	72 (79)		65 (71)		63 (69)		80 (94)		43 (47)	
$25,000+	33 (85)		32 (82)		36 (92)		37 (100)		27 (69)	
Education, years										
<6	32 (82)	----	30 (77)	----	29 (74)	----	32 (97)	----	21 (54)	----
6-11	50 (79)	0.740	46 (72)	0.572	48 (75)	0.942	58 (94)	0.655F	32 (50)	0.705
12+	25 (81)	0.881	24 (77)	0.961	24 (77)	0.767	29 (100)	1.000F	19 (61)	0.532
Employment		0.685		*0.060*		0.769		**0.014F**		0.200
Employed	57 (79)		49 (68)		55 (76)		70 (100)		35 (49)	
Unemployed[1]	50 (82)		51 (82)		46 (74)		49 (91)		37 (60)	
Marital status		0.880		0.674		0.500		0.298F		0.515
Married or living together	85 (80)		79 (74)		82 (77)		94 (97)		59 (55)	
Not married or living together[2]	22 (82)		21 (78)		19 (70)		25 (93)		13 (48)	
Country of origin		0.204F		0.111F		0.112F		1.000F		**0.004F**
Mexico	98 (79)		91 (73)		92 (74)		110 (96)		63 (50)	
Other[2]	9 (100)		9 (100)		9 (100)		9 (100)		9 (100)	
US born/time in US										
US born	21 (84)	----	20 (80)	---	23 (92)	----	25 (100)	----	18 (72)	----
11+ years	67 (80)	0.777F	63 (75)	0.607	66 (79)	0.153F	72 (95)	0.570F	43 (51)	*0.066*
1-10 years	19 (79)	0.725F	17 (68)	0.333	12 (48)	**0.001**	22 (96)	0.479F	11 (44)	**0.045**
Survey language		0.405F		0.494		**0.008**		0.582F		**0.042**
English	22 (88)		20 (80)		24 (96)		25 (100)		18 (72)	
Spanish	85 (79)		80 (73)		77 (71)		94 (95)		54 (50)	
Preferred culture		0.613		0.840		0.762		0.231F		0.990
American/both	87 (81)		81 (75)		82 (76)		98 (97)		58 (54)	
Hispanic/Latino	20 (77)		19 (73)		19 (73)		21 (91)		14 (54)	

† Excludes those who did not know of or did not remember last cholesterol test (n=10)
[1] Includes homemakers, retirees, students, and those not able to work
[2] Includes widowed, divorced, separated, and single, never married
[3] Includes Cuba (n=1), El Salvador (n=3), Guatemala (n=1), Peru (n=1), Puerto Rico (n=2) and US (n=1)
F = Fisher's exact test used **bold** if $p<0.05$, *italics* if $0.05<p<0.10$

Table 2. Access to care and diabetes-related variables by receipt of appropriate diabetes care according to ADA standards of care guidelines, n (%)

	HbA1c tests		Foot exam		Eye exam		Cholesterol test		Comprehensive	
Characteristic	**HbA1c n=107 (80%)**	**p-value**	**Foot n=100 (75%)**	**p-value**	**Eye n=101 (75%)**	**p-value**	**Cholest-erol † n=119 (89%)**	**p-value**	**All n=72 (54%)**	**p-value**
Continuity of care										
Usual provider	89 (83)	----	84 (78)	----	83 (77)	----	96 (95)	----	60 (56)	----
Usual source	16 (76)	0.534F	14 (67)	0.276	15 (71)	0.595	18 (100)	1.000F	11 (52)	0.789
None	2 (40)	**0.045F**	2 (40)	*0.087F*	3 (60)	0.592F	5 (100)	1.000F	1 (20)	0.179F
Travel time to provider		**0.027**		0.892		0.102		**0. 008F**		0.143
≤20 minutes	86 (86)		77 (76)		80 (79)		92 (99)		59 (58)	
>20 minutes	19 (68)		21 (75)		18 (64)		22 (85)		12 (43)	
Transportation difficulty										
No difficulty	72 (87)	----	67 (81)	----	66 (80)	----	77 (95)	----	50 (60)	----
Little difficulty	22 (73)	*0.092*	23 (74)	0.447	24 (77)	0.807	25 (96)	1.000F	16 (52)	0.406
Some difficulty	11 (73)	0.238F	8 (53)	**0.041F**	8 (53)	**0.047F**	12 (100)	1.000F	5 (33)	*0.053*
Phone communication difficulty										
Much or some	22 (76)	----	22 (73)	----	19 (63)	----	24 (92)	----	12 (40)	----
Little	22 (88)	0.309F	21 (84)	0.340	19 (76)	0.311	23 (100)	0.491F	17 (68)	**0.038**
None	56 (85)	0.293	52 (79)	0.556	54 (82)	**0.049**	59 (95)	0.630F	40 (61)	*0.060*
Translator services		0.384F		0.251		0.450F		*0.056*		*0.097*
Available or not needed	98 (83)		92 (77)		89 (75)		106 (97)		68 (57)	
Not available	7 (70)		6 (60)		9 (90)		8 (80)		3 (30)	
Difficulties in access to care		0.509		**0.026**		0.134		1.000F		*0.059*
Yes	30 (77)		24 (62)		26 (67)		35 (97)		16 (41)	
No	77 (82)		76 (80)		75 (79)		84 (96)		56 (59)	
Heath care utilization										
0-2 visits	12 (40)	----	15 (48)	----	21 (68)	----	27 (100)	----	6 (19)	----
3-4 visits	44 (90)	**<0.001**	41 (84)	**0.001**	40 (82)	0.155	44 (96)	0.527F	33 (67)	**<0.001**
5+ visits	51 (94)	**<0.001**	44 (82)	**0.001**	40 (74)	0.532	48 (94)	0.547F	33 (61)	**<0.001**
Patient satisfaction										
Very satisfied	65 (82)	----	67 (85)	----	60 (76)	----	70 (96)	----	49 (62)	----
Somewhat satisfied or neutral	33 (85)	0.750	26 (65)	**0.013**	31 (78)	0.851	36 (97)	1.000F	20 (50)	0.209
Dissatisfied	9 (69)	0.274F	7 (54)	**0.018F**	9 (69)	0.730F	11 (92)	0.462F	3 (23)	**0.009**
Self-reported health status										
Good	40 (82)	----	43 (86)	----	40 (80)	----	46 (96)	----	31 (62)	----
Moderate	56 (82)	0.920	47 (69)	**0.033**	50 (74)	0.414	60 (97)	1.000F	35 (52)	0.255
Poor	11 (69)	0.306F	10 (63)	*0.067F*	11 (69)	0.493F	13 (93)	0.543F	6 (38)	*0.086*
Insurance type										
Private	47 (86)	----	41 (73)	----	46 (82)	----	54 (100)	----	29 (52)	----
Government	30 (88)	1.000F	27 (79)	0.507	27 (79)	0.748	28 (97)	0.349F	22 (65)	0.230
Uninsured	30 (68)	**0.040**	32 (73)	0.957	28 (64)	**0.036**	37 (90)	**0.032F**	21 (48)	0.687
Source of diabetes care										
Community health clinic	32 (89)	----	33 (92)	----	32 (89)	----	33 (97)	----	26 (72)	----
Private doctor office	70 (81)	0.258	61 (69)	**0.008**	65 (74)	*0.066*	78 (98)	1.000	44 (50)	**0.023**
Other[1]	5 (56)	**0.039F**	6 (67)	*0.084F*	4 (44)	**0.009F**	7 (78)	0.106F	2 (22)	**0.017F**
Time with diabetes		**0.002**		**0.015**		**0.007**		0.649F		**<0.001**
<10 yrs	60 (72)		56 (68)		56 (68)		73 (95)		34 (41)	
10+ yrs	47 (94)		44 (86)		45 (88)		46 (98)		38 (75)	
Diabetes treatment										
Insulin	31 (94)	----	26 (79)	----	30 (91)	----	32 (100)	----	25 (76)	----
Oral agents	67 (78)	**0.040**	67 (77)	0.835	66 (76)	*0.066*	75 (94)	0.319F	45 (52)	**0.017**
Diet alone	9 (69)	**0.045F**	7 (54)	0.145F	5 (39)	**0.001F**	11 (100)	n/a	2 (15)	**<0.001**

† Excludes those who did not know of or did not remember last cholesterol test (n=10)
[1] Includes hospitals (n=3), free clinics (n=5) and naturalist (n=1)
F = Fisher's exact test used **bold** if p<0.05, *italics* if 0.05<p<0.10

Table 3. Binary logistic regression analyses predicting receipt of comprehensive diabetes care among study population according to significant covariates (0=no, 1=yes)

		Multivariate		
	Univariate	SES [a]	Model 1 [b]	Model 2 [c]
Covariate	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Age, years				
≤40*				
41-64	**3.2 (1.2, 8.1)**	**3.3 (1.3, 8.8)**	2.6 (0.7, 9.5)	1.9 (0.5, 7.3)
65+	**3.6 (1.1, 11.3)**	**4.5 (1.3, 15.8)**	1.3 (0.2, 7.3)	1.1 (0.2, 6.6)
Survey language				
English*				
Spanish	**0.4 (0.1, 1.0)**	*0.4 (0.1, 1.2)*	0.4 (0.1, 2.0)	0.4 (0.1, 2.0)
Health care utilization				
0-2 visits*				
3-4 visits	**8.6 (2.9, 25.1)**	**7.6 (2.6, 22.5)**	**5.7 (1.5, 22.2)**	**8.2 (1.9, 34.4)**
5+ visits	**6.5 (2.3, 18.6)**	**6.3 (2.2, 18.3)**	**4.3 (1.2, 15.6)**	**4.7 (1.2, 17.8)**
Patient satisfaction				
Very satisfied*				
Somewhat satisfied or neutral	0.6 (0.3, 1.3)	0.6 (0.3, 1.3)	0.5 (0.2, 1.3)	0.4 (0.1, 1.3)
Dissatisfied	**0.2 (0.0, 0.7)**	**0.2 (0.0, 0.7)**	**0.1 (0.0, 0.9)**	*0.2 (0.0, 1.1)*
Source of diabetes care [d]				
Private doctor office*				
Community health clinic	**0.4 (0.2, 0.9)**	**0.3 (0.1, 0.8)**	*3.1 (1.0, 9.6)*	2.5 (0.7, 9.0)
Time with diabetes, years				
<10*				
10+	**4.2 (2.0, 9.1)**	**4.6 (2.1, 10.3)**	**4.2 (1.4, 13.0)**	**5.3 (1.5, 18.0)**
Diabetes treatment				
Insulin use*				
Oral agents	**0.3 (0.1, 0.8)**	**0.4 (0.1, 0.9)**	0.7 (0.2, 2.3)	1.1 (0.3, 3.9)
Diet alone	**0.1 (0.0, 0.3)**	**0.1 (0.0, 0.3)**	*0.1 (0.0, 1.1)*	0.2 (0.0, 1.6)

OR = odds ratio; CI = confidence interval.
* Reference category.
[a] Socioeconomic status (SES) model includes education and income.
[b] Model 1 includes education, income, age, survey language, health care utilization, patient satisfaction, source of diabetes care, time with diabetes, and diabetes treatment.
[c] Same as Model 1, excluding health seeking participants (n=12).
[d] 'Other' category of source of diabetes care excluded from analysis due to minimal data (n=9).
bold if $p<0.05$, *italics* if $0.05<p<0.10$

Table 4. Adjusted‡ binary logistic regression analyses predicting receipt of comprehensive diabetes care according to source of care (0=no, 1=yes)

Variable [a]	**OR (95% CI)**	**p-value**
Source of diabetes care [b] Private doctor office* Community health clinic	4.2 (1.4, 12.5)	0.010
Source of diabetes care [c] Private doctor office* Community health clinic	3.4 (1.0, 11.1)	0.048

OR = odds ratio; CI = confidence interval.
‡ All confounders are included as continuous data, when possible.
* Reference category
[a] 'Other' category of source of diabetes care excluded from analysis due to minimal data (n=9).
[b] Controlling for education, income, age, survey language, health care utilization, patient satisfaction, time with diabetes, and diabetes treatment.
[c] Same as previous model. Excludes health-seeking participants (n=12).

"Diabetes self-management activities for Latinos living in non-metropolitan Iowa," manuscript for submission to the Journal of Rural Health, July 2010.

Title

Diabetes self-management activities for Latinos living in non-metropolitan Iowa

Keywords (MeSH terms): Midwestern United States; Iowa; Self Care; Hispanic Americans; Diabetes Mellitus, Type 2; Rural Population; Suburban Population; Mexican Americans; Health Care Quality, Access, and Evaluation.

Abstract

Context. The Latino community continues to grow in the rural Midwest, and diabetes is a pertinent disease for research in this demographic. Patient self-management is an important aspect of comprehensive care for diabetes and may mitigate complications. **Purpose**. The present study provides an assessment of diabetes self-management activities for Latinos living in non-metropolitan Iowa and identifies variables with significant associations. **Methods**. A cross-sectional survey yielded responses from 134 participants on socio-demographic, access to care, and diabetes-related questions. The activities analyzed include self-monitoring of blood glucose, personal foot inspection, diet adherence, and diabetes self-management education. **Findings**. The study population was predominantly foreign-born with low income and educational attainment. Less than half of the sample performed self-monitoring of blood glucose daily (40%), adhered strictly to special diabetes diet recommendations (44%), or attended a diabetes self-management education class (48%). Fifty eight percent of participants reported daily personal foot inspection. Adjusted logistic regression

analyses showed increased visits to a health care provider and insulin use as predictors for execution of daily self-monitoring of blood glucose. Participants advised on personal foot inspection by their provider were almost 2.5 times more likely to perform the self-care activity. Greater educational attainment and US nativity were strong predictors for completion of diabetes self-management education. **Conclusions**. Improvements are needed in all four of the self-management activities. An increased emphasis on enrollment in diabetes self-management classes for foreign-born Latinos with lower levels of education may contribute to better self-care.

Introduction

Relevant information. An estimated 126,000 Latinos live in the Midwestern state of Iowa, representing 4.2% of the total state population, compared with Latinos nationally accounting for 15.4% of the total US population.[1] Latinos are overrepresented in lacking health insurance and having diabetes.[2,3] Rural Latinos may even be considered 'doubly disadvantaged,' demonstrating a higher prevalence of diabetes than urban and rural non-Hispanic whites as well as urban Latinos.[4] Complications of diabetes are extensive, but preventive services provided by health care professionals and self-management activities may ameliorate or postpone the often-debilitating health problems.[5,6] In one study, Mexican Americans were found to have disproportionately more diabetes-related amputations than blacks or non-Hispanic whites in south Texas.[7] In another study analyzing national data of US veterans, ethnic minority groups, including Latino, demonstrated an increased risk of lower-extremity amputation compared with non-Hispanic whites.[8] Health literacy entails the ability for a patient to read and comprehend health-related instructions, such as prescription bottles or treatment instructions, and may be an important factor in chronic disease management.[9] Female gender, Latino ethnicity, lower educational attainment, lower income, and Spanish language are all associated with lower health literacy, which is found to be related to poorer diabetes outcomes as measured by higher glycated hemoglobin (HbA1c) levels and increased complications.[10]

Diabetes self-management activities include regular self-monitoring of blood glucose (SMBG), medical nutrition therapy (ie, diet adjustment), physical activity, smoking cessation, and daily personal foot inspection. The American Diabetes Association (ADA) also recommends diabetes self-management education (DSME) upon diabetes diagnosis and subsequent follow-up sessions as needed.[11] These diabetes classes have been associated with increased knowledge and execution of self-care activities[12]; lower HbA1c levels[6]; and improved self-efficacy with diet.[13] Another study showed an improvement in glycemic control for low-income Latinos among interventions emphasizing DSME.[14]

Knowledge gaps. The inadequate health literacy, lower health insurance coverage, and greater diabetes complications warrant a closer look into what socio-demographic, access to care, and disease-related variables are associated with diabetes self-management among Latinos in the rural Midwest. Studies incorporating the Latino demographic often use data from national samples or regions with the largest Latino populations in the country.[15-18] Iowa and selected other states in the Midwest have been identified as areas where limited research has been done among rural minorities.[19] Additionally, rural Latinos are more often lower income, lower education, US born, and married when compared to their urban counterparts, justifying an investigation for this target population, as health care differences may also exist between rural and urban cohorts.[20]

Objectives. This article derives data from a wider study that also investigated the influence of various elements of access to care and diabetes care services provided by health care professionals. The general objective of the project was to study diabetes care vis-à-vis access to health care for Latinos with diagnosed type 2 diabetes mellitus living in non-metropolitan Iowa counties. A specific objective of this analysis was to furnish an assessment of diabetes self-management among the sample population and associations with relevant variables. Three important self-care activities (viz, daily SMBG, daily foot check, and diet adherence), as well as completion of DSME, were analyzed in the present study.

Methods

Quantitative data was collected in this cross-sectional study with a questionnaire administered during a structured interview by the principal investigator during the fall of 2009. The median time for completing the 56-item questionnaire was 20 minutes. The University of Northern Iowa Institutional Review Board approved the research project under the expedited review process.

Study population. The target population was self-identified Latino adults at least 18 years old living in rural Iowa counties with self-reported diagnosed type 2 diabetes. Rurality was defined in this project through exclusion criteria from the requirements outlined for the Metropolitan Statistical Area classification.[21] Micropolitan and non-core counties were included in this study.

Further inclusion criteria were applied to identify recruitment communities. Towns with a minimum of 400 Hispanic residents, constituting at least 5% of the total town population, were selected using 2000 US Census Bureau statistics. One town did not meet the criteria but was included upon expert recommendation. The 11 towns included in this study, with county name in parentheses, are: Columbus Junction (Louisa), Denison (Crawford), Estherville (Emmet), Fort Madison (Lee), Hampton (Franklin), Marshalltown (Marshall), Muscatine (Muscatine), Ottumwa (Wapello), Postville (Allamakee and Clayton), Storm Lake (Buena Vista), and West Liberty (Muscatine).

The average population for these 11 towns was approximately 11,000, and seven of them are included in Micropolitan statistical areas. All towns but Columbus Junction, Postville, and West Liberty are county seats. Agribusinesses are major employers for Latino immigrants in the state and were found in or near all of the recruitment towns except Fort Madison. The age demographic of the Latino community in Fort Madison was older than the other towns and many families included multiple generations, as a wave of Mexican immigrants had come to the area a century earlier to work on the Santa Fe Railroad. Multiple generations also existed in Muscatine, in addition to many younger Latino immigrants. The other recruitment towns had mostly Latino immigrants representing the adult population.

Instrument. A questionnaire was developed to address the specific objectives of this project. Questions were derived from validated questionnaires, including the 2006 Medical Expenditure Panel Survey, the 2003 Community Tracking Study, the 2009 Behavioral Risk Factor Surveillance System and a survey used to assess health-seeking behaviors among Latinas in Ohio.[22-25] Two questions included in the questionnaire were adapted from validated questionnaires, and two questions were developed for the

present analysis of self-management: for diet adherence, "If a health care professional has recommended a special diet for your diabetes, how well do you adhere to this diet?" with Likert scale response; and for advisement on self-care activities, "About how long has it been since a health care professional advised you on…Diet adjustment? Quitting smoking? Checking your own blood for glucose or sugar? Checking your own feet for sores or irritations?" with numerical responses for each.

Recruitment. The principal investigator visited various locations to identify the target population and received permission to explain the research project. Recruitment venues included religious services in Spanish, English as a second language courses, community health clinics, organization meetings, and Latino restaurants and stores. After explaining the study, persons fulfilling the inclusion criteria were requested to approach the principal investigator if willing to participate, and others could provide references for potential participants. In the health clinics, health care providers first inquired if the patient would allow a researcher to talk about the project, then the principal investigator stepped in to request participation with the assenting patient in the absence of the provider. Participants were also asked to identify other prospective study participants in the community. All participants were given a $5 grocer gift certificate as compensation for their time. The total sample size was $N = 134$, and the number of participants from each recruitment community was generally proportional to the size of the Latino population in each town according to census data.

Variables. The following dichotomous variables were included in the assessment of diabetes self-care: at least one daily SMBG, at least one daily personal foot inspection, self-reported diet adherence, and having ever attended a class of DSME. The positive category for the diet adherence variable included all participants who reported to follow diabetes diet recommendations 'well' or 'very well.' The ADA highlights the important elements of self-management in its 2009 standards of medical care in diabetes. However, the ADA does not present a recommendation for optimal frequency of SMBG,[11] but most studies have used daily SMBG in analysis.[16,18,26-28]

The question, "Have you ever had difficulties obtaining health services?" assessed if the participant experienced difficulties in access to care. The number of visits to a

provider in the past year for any health care services formed the health care utilization variable.

Statistical analysis. Mean values with standard deviation are presented for normally distributed variables; otherwise, medians with interquartile range are given. The four dependent variables were analyzed with all other variables in cross tabulations, and the Pearson's chi-squared test was applied to examine the association between two nominal variables. A Fisher's exact test generated significance values when the expected number of cases was below five. The Mann-Whitney U test was used to compare the median time since last advised by a health care professional on each self-care activity and the execution of the corresponding activity.

Logistic regression was used to identify predictors with strong associations of the four self-management activities. Dependent variables were adjusted for education and income. Other socio-demographic, access to care and diabetes-related variables were considered as covariates if they were significantly associated with the individual self-management activity outcomes in cross tabulations at $\alpha = .05$ and then included in a logistic regression model if they fulfilled the input entry criteria of critical value at 5% significance level for -2 log likelihood changes. The model for each of the four outcomes was unique, with a set of different covariates included for each self-management activity. Expected count in each cell of cross tabulations needed to be a minimum of five to be included in a logistic regression model.

SPSS version 16 (Chicago, Illinois) was used for all statistical analyses.

Results

The study sample was generally lower income, with almost 70% earning less than $25,000 (median: $19,200, interquartile range: $9,600-$28,800) annually for household income, and had lower education attainment, demonstrated by the mean years of school (7.4 ± 4.4) below an 8^{th} grade completion. The average age was in the mid-fifties (52.6 ± 12.8) and more females (59%) were represented in the sample. Only one in five

participants were US born, and 20 years (± 11.9) was the average amount of time living in the US among the foreign born. A third of the sample lacked health insurance presently or had gone a period in the past year without it, yet all but 4% of participants reported a usual source of health care. Only 7.5% (n = 10) of the sample smoked, and of those, all but two had been advised on smoke cessation in the past year by their health care provider. The small size of the smoker subsample precluded further analysis.

Daily foot inspection had the highest prevalence of execution among the self-management activities with 58% fulfillment. Only two out of five participants performed the daily SMBG and 44% self-reported strong diet adherence. Just under half of the sample had attended a DSME class.

Gender, age, and employment were variables associated with SMBG, showing female, older and unemployed groups had increased frequency of daily SMBG (Table 1). Better self-reported diet adherence was seen among older, higher income participants who did not claim Mexico as the familial country of origin. US born, English-speaking, and higher educational attainment were all significantly associated with attendance to a DSME class.

Results for access to care and disease-related variables are displayed in Table 2. More frequent visits to a health care provider and the insured were associated with higher daily SMBG, and government insurance was significantly higher than both private insurance and the uninsured. A much greater proportion of the sample with advanced disease progression, represented by insulin treatment and a longer time with diabetes, performed the self-care activity of SMBG. Execution of the daily foot inspection was less likely for participants who had experienced difficulties in access to care and more likely for those who were advised on the activity within the past two years. Patient satisfaction and better self-reported health status seemed to be linked with improved diet adherence.

The following variables were analyzed with the four dependent variables in cross tabulations but found to not be statistically significant with any: preferred culture of

participant, type of health care provider, phone communication difficulty with provider, night or weekend office hours of provider, availability of translator services, and provider ethnicity.

In separate bivariate analysis using Mann-Whitney U testing, the association was examined between each of the self-care activities and the median number of days since last advised on the respective activity. SMBG ($P = .573$) and foot inspection ($P = .497$) results were not significant, but diet adherence was statistically significant at $P = .011$. The number of days (median and interquartile range) for the group adhering to diet recommendations was 180 (60 to 544) and 90 (16 to 365) for the group not fulfilling the diet adherence criteria. These results signify less diet adherence when more recently advised on diet.

Table 3 presents the odds ratios for numerous independent variables from binary logistic regression analyses with the four dependent variables. Participants visiting a health care professional five or more times in the past year were more likely to perform daily SMBG than those seeking health services two times or less. The diabetes treatment categories of oral agents and diet alone showed markedly reduced odds of executing SMBG compared to insulin users. Female and unemployed categories were both over twice as likely to perform daily SMBG in adjusted models, but these results were slightly outside of the threshold for statistical significance for this study.

Participants who reported difficulties in access to health care were two and a half times less likely to carry out a daily foot inspection, while those advised on the self-care activity within the past two years had twice the odds to do so. A self-reported health status of moderate was almost three times less likely to adhere to diet recommendations when compared to the higher rating. Attendance to a DSME class was much more likely with more than 8 years of education, and foreign born Latinos were considerably less likely compared with US born counterparts, although the ten years or less in the US group did not meet the cutoff for statistical significance.

Discussion

The fulfillment of the four self-management activities studied was generally low among this sample. Only the daily foot inspection achieved a proportion higher than 50% for completion. The ADA outlines clear guidelines for all persons with diabetes to perform a daily foot inspection, follow diabetes-specific diet recommendations, and receive DSME. The daily SMBG recommendation is not as steadfast for persons with diabetes in all treatment categories and an optimal frequency is not identified. This lack of an empirical guideline should be considered when reviewing the results for SMBG.

The higher proportion of daily SMBG seen among increased health care utilization and insulin use does not come as a surprise. Patients able and willing to more frequently visit a health care professional would presumably also be more likely to acquire and use the materials for SMBG. Persons with diabetes using insulin treatment have a greater imperative to regularly monitor their blood glucose levels and adjust insulin and nutrition intake accordingly. A 2007 study found significant predictors for SMBG include English speaking, having a usual provider, and insulin use for Hispanic adults, and the present results mirror these trends.[15] Health insurance coverage was also related to SMBG, and government based insurance showed a stronger association than private plans. SMBG requires lancets for pricking the skin, tests strips, and a glucometer device. The cost of the test strips may be prohibitive for some patients, and thus health insurance may play an important role in providing access to this self-care activity.[29,30]

The advisement on self-management and temporality of such showed interesting results when compared with the respective activities. Having been advised on foot inspection within the past two years was significantly associated with execution of the activity, yet the median time since last advised on it did not differ between the two groups for fulfillment of daily foot inspection. These results may suggest that it is important for a patient to be advised on foot inspection, but increased time since last advised does not deter fulfillment of the activity. Perhaps once a person gets into a habit of checking feet daily further advisement has limited influence. No significant difference was

observed in latest advisement times nor for those advised within the past two years between groups for daily SMBG execution. Finally, Mann-Whitney U testing indicated that more recent advisement for diet was associated with less diet adherence. One possible explanation for this association is that patients who had recently been informed of diet recommendations were aware that their actual diet was not congruent and self-reported their adherence to the diet more accurately. Another conjecture is that patients who were not following diet recommendations were more often reminded by health care providers to adjust diet practices, but to no avail.

Worse health status was associated with less diet adherence, and both of these variables derived from self-reported data. The subjective nature of the responses may explain some of the relationship. Participants who self-reported poorer health may have attributed their condition to substandard personal diet practices.

The strong association between country of nativity and DSME may be linked to acculturation. US- versus foreign-born is a crude dichotomous proxy for acculturation and has been used previously.[31] A study by Wells and associates found less acculturated Mexican Americans were less likely to utilize general health, mental health, and human services for problems.[32]

The prevalances of daily SMBG for Latino samples from other studies are not congruent with the current findings. An unexpected 3% performed SMBG daily in a Texas study, 68% in a nation-wide managed care organization, and just over half of a sample of Puerto Ricans in New York City.[16,18,27] The higher proportion conducting SMBG in the managed care organization may be ascribed to the universal access to care for all members, and the Puerto Rican sample was older with higher educational attainment and insurance coverage when compared with the predominantly Mexican sample of the present study. Another study revealed a language-attributed disparity in SMBG similarly seen in the results here for Latinos in Iowa. The study used data from a managed care organization registry and showed increased SMBG among fluent, English-speaking Latinos compared with their non-fluent peers.[30] Results from a different study also deriving data from a managed care organization support this

finding, though not statistically significant, that more English-speaking Latinos performed SMBG compared to Spanish-speakers.[28]

The study of Puerto Ricans in New York City demonstrated improved foot self-care among bilingual and English speakers when compared with Spanish speakers.[33] The present study found the opposite, although not statistically significant, with Spanish-language interviewees reporting foot care 17 percentage points more than those who completed the interview in English. An aforementioned study from a managed care organization supports the trend seen in the results here with better foot self-care among Spanish-speaking Latinos.[28] Overall, the percentage of Iowa Latinos in this study checking feet daily was similar to the sample of Puerto Ricans and of a nationally representative sample of Mexican Americans from 1989.[16]

Less than half of the study sample reported strongly adhering to special diet recommendations for diabetes. This low level of diet adherence was shown in another study where Hispanics demonstrated a lower proportion when compared with non-Hispanic whites, with two thirds of the Hispanic sample reported monitoring diet usually or always.[27]

Finally, the proportion of this sample attending a DSME class was about half. The sample of Latinos from Texas and another study with a sample population from rural Washington state reported similar figures.[18,34] The national sample of Mexican Americans from 1989 showed only 25% had taken a diabetes class, and an increased emphasis on DSME over the past two decades may explain this difference.[26]

This study analyzed a number of socio-demographic, access to care, and diabetes-related variables relative to four self-management activities. Although numerous independent variables were included, many other factors were not, such as an account of the doctor-patient relationship, personal emotional health, and social context including family and friends. These variables were assessed in another study of mostly Mexican Americans in South Texas, and the importance of family support was shown to be an important predictor for a number of self-care activities.[35]

Additionally, only SMBG, personal foot inspection, diet adherence and DSME were analyzed as outcomes in this study. Other important self-management behaviors as highlighted by the American Association of Diabetes Educators include being active, taking medication, problem solving, reducing risks and healthy coping.[36]

The assessment of DSME was limited to if the participant had ever taken a diabetes class, which did not account for frequency or content of the diabetes education, nor where the class was held or who was the instructor.[17] A more refined assessment of DSME would likely produce greater associations with self-care activities.

The dominance of Mexican origin in the sample population, in conjunction with the small sample size, made it difficult to disaggregate the sample data into ethnic subgroups. Only 7% (n = 9) of the sample did not claim Mexico as a familial homeland, leaving six other countries being clumped together into an 'other' category. Although differences were identified between these two categories, the results had limited significance because of size.

Limitations. Recall bias and social desirability may influence patients as they self-report the data, and the small sample size may induce low statistical power making type II error a concern. The cross sectional data allowed only conclusions to be drawn regarding associations and was not able to assess causality. The study implemented convenience sampling and thus the representativeness of the sample was limited and hinders generalization of the results. Although the different methodologies employed for recruitment in this study may create some internal inconsistencies within the data, the varied recruitment approach attempted to generate a more representative sample from the selected towns in non-metropolitan Iowa. The study sample included participants from eleven towns who were recruited from a variety of community locations, including churches, English classes, and Latino stores.

Implications. Advisement from a health care provider on personal foot inspection was strongly associated with the execution of the activity. Daily foot inspection is recommended by the ADA for all persons with diabetes and, thus, providers should advise all patients on it. The large gap in attendance to a DSME class between groups

with different educational attainment should be addressed. Low literacy has been associated with decreased knowledge of diabetes and disease management, and diabetes education tailored to suit the needs of low literacy patients has proven effective in lowering HbA1c levels.[37] The disparity between US- and foreign-born Latinos in DSME is also a concern identified in this study. DSME is shown to improve self-efficacy, diabetes self-management, and clinical outcomes,[13,38,39] and the self-efficacy is associated with improved self-management behaviors that permeate among race and ethnicity as well as health literacy.[40] An increased emphasis on DSME and specifically targeting the Spanish-speaking, foreign-born Latinos with lower educational attainment may have a beneficial impact on self-management behaviors.

Conclusion. The proportion of Latinos living in non-metropolitan Iowa fulfilling the four diabetes self-management activities has been presented and shows that improvements across the board are warranted. The sample had comparable figures for foot inspection and attendance to a DSME class relative to peer samples, but nevertheless, fewer than half reported to perform SMBG daily, adhere strongly to diet recommendations, and have taken a DSME class. This study identified a number of predictors for these self-management activities, and although the DSME is not a self-management behavior per se, it is a vital source of disease-related knowledge and instruction for self-care.

Acknowledgements

The researchers express sincere gratitude to all the participants for their time during interviews. We also thank Lien Diep for her help with statistical analysis.

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Table 1. Socio-demographic composition of sample (N = 134) by self-management activities, n (%)

	SMBG		Foot inspection		Diet adherence		DSME class	
Characteristic	**SMBG *n* = 53 (40%)**	***P***	**Foot *n* = 77 (58%)**	***P***	**Diet † *n* = 57 (44%)**	***P***	**DSME *n* = 64 (48%)**	***P***
Gender		**0.039**		0.355		0.488		0.656
Female	37 (47)		48 (61)		33 (42)		39 (49)	
Male	16 (29)		29 (53)		24 (48)		25 (46)	
Age (years)								
<45	10 (24)	----	21 (51)	----	12 (30)	----	24 (59)	----
45-64	29 (43)	**0.047**	44 (66)	0.136	34 (53)	**0.021**	30 (45)	0.165
65+	14 (54)	**0.014**	12 (46)	0.686	11 (44)	0.251	10 (39)	0.109
Annual household income		0.387		0.309		*0.084*		0.391
<$25,000	35 (38)		56 (61)		34 (39)		42 (46)	
$25,000+	18 (46)		20 (51)		21 (55)		21 (54)	
Education (years)		0.752		0.746		0.335		**<0.001**
<8	26 (38)		40 (59)		26 (40)		19 (28)	
8+	27 (41)		37 (56)		31 (48)		45 (68)	
Employment		**0.008**		0.357		0.151		0.407
Employed	21 (29)		44 (61)		26 (38)		32 (44)	
Unemployed[1]	32 (52)		33 (53)		31 (51)		32 (52)	
Marital status		0.307		0.518		0.639		0.414
Married or living together	40 (37)		60 (56)		47 (45)		53 (50)	
Not married or living together[2]	13 (48)		17 (63)		10 (40)		11 (41)	
US-born and, if not, time in US								
US-born	13 (52)	----	13 (52)	----	10 (40)	----	20 (80)	----
11+ years	29 (35)	0.115	51 (61)	0.437	40 (50)	0.382	34 (41)	**0.001**
1-10 years	11 (44)	0.571	13 (52)	1.000	7 (29)	0.426	10 (40)	**0.004**
Survey language		*0.062*		0.131		0.639		**0.025**
English	14 (56)		11 (44)		10 (40)		17 (68)	
Spanish	39 (36)		66 (61)		47 (45)		47 (43)	
Country of origin		1.000F		0.732F		**0.043F**		0.309F
Mexico	50 (40)		71 (57)		50 (42)		58 (46)	
Other[3]	3 (33)		6 (67)		7 (78)		6 (67)	

† Excludes those not instructed on special diet from health professional (n = 5)
[1] Includes homemakers, retirees, students, and those not able to work
[2] Includes widowed, divorced, separated, and single, never married
[3] Includes Cuba (n = 1), El Salvador (n = 3), Guatemala (n = 1), Peru (n = 1), Puerto Rico (n = 2) and US (n = 1)
F = Fisher's exact test used
bold if $P < .05$, *italics* if $.05 \leq P < .10$

Table 2. Access to care and diabetes-related variables by self-management activities, *n* (%)

	SMBG		Foot inspection		Diet adherence		DSME class	
Characteristic	**SMBG *n* = 53 (40%)**	***P***	**Foot *n* = 77 (58%)**	***P***	**Diet † *n* = 57 (44%)**	***P***	**DSME *n* = 64 (48%)**	***P***
Continuity of care								
Usual provider	46 (43)	----	62 (57)	----	46 (43)	----	55 (51)	----
Usual source	6 (29)	0.231	14 (67)	0.430	10 (50)	0.586	7 (33)	0.140
None	1 (20)	0.400F	1 (20)	0.169F	1 (33)	1.000F	2 (40)	0.679F
Difficulties in access to care		0.579		**0.014**		0.189		0.167
Yes	14 (36)		16 (41)		13 (35)		15 (39)	
No	39 (41)		61 (64)		44 (48)		49 (52)	
Heath care utilization in past year								
0-2 visits	4 (13)	----	19 (61)	----	11 (41)	----	17 (55)	----
3-4 visits	19 (39)	**0.013**	29 (59)	0.851	22 (46)	0.670	21 (43)	0.296
5+ visits	30 (56)	**<0.001**	29 (54)	0.497	24 (44)	0.751	26 (48)	0.553
Patient satisfaction								
Very satisfied	33 (42)	----	45 (57)	----	38 (50)	----	36 (46)	----
Somewhat satisfied or neutral	13 (33)	0.326	24 (60)	0.751	12 (30)	**0.039**	21 (53)	0.475
Dissatisfied	7 (54)	0.416	8 (62)	0.757	7 (54)	0.798	7 (54)	0.579
Self-reported health status								
Good	19 (38)	----	29 (58)	----	28 (58)	----	27 (54)	----
Moderate	27 (40)	0.851	39 (57)	0.944	23 (35)	**0.013**	31 (46)	0.366
Poor	7 (44)	0.682	9 (56)	0.902	6 (40)	0.214	6 (38)	0.251
Insurance coverage		**0.042**		0.523		0.333		0.267
Uninsured[1]	12 (27)		27 (61)		16 (38)		18 (41)	
Insured	41 (46)		50 (56)		41 (47)		46 (51)	
Insurance type								
Private	21 (38)	----	34 (61)	----	25 (47)	----	29 (52)	----
Government	20 (59)	**0.049**	16 (47)	0.206	16 (47)	0.992	17 (50)	0.869
Uninsured	12 (27)	0.280	27 (61)	0.947	16 (38)	0.375	18 (41)	0.279
Source of primary diabetes care								
Community clinic	11 (31)	----	24 (67)	----	16 (46)	----	15 (42)	----
Private doc office	38 (43)	0.192	48 (55)	0.214	39 (45)	0.971	46 (52)	0.284
Other[2]	4 (44)	0.454F	5 (56)	0.700F	2 (25)	0.434F	3 (33)	0.721F
Time with diabetes, years		**0.001**		0.912		0.391		0.559
<10	24 (29)		48 (58)		33 (41)		38 (46)	
10+	29 (57)		29 (57)		24 (49)		26 (51)	
Treatment								
Insulin	21 (64)	----	17 (52)	----	13 (41)	----	19 (58)	----
Oral agents	30 (35)	**0.004**	52 (60)	0.414	35 (42)	0.919	40 (46)	0.256
Diet alone	2 (15)	**0.003**	8 (62)	0.539	9 (69)	*0.082*	5 (39)	0.243
Attended a diabetes class		0.342		0.437		0.798	n/a	
Yes	28 (44)		39 (61)		29 (45)			
No	25 (36)		38 (54)		28 (43)			
Advised within past 2 years on relevant self-care activity	(on SMBG)	0.392	(on feet)	**0.017**	(on diet)	0.283	n/a	
Yes	45 (41)		58 (64)		45 (42)			
No	8 (32)		17 (42)		12 (55)			

† Excludes those not instructed on special diet from health professional (*n* = 5)
[1] Includes those having been uninsured at one point in the past 12 months (*n* = 4)
[2] Includes hospitals (*n* = 3), free clinics (*n* = 5) and naturalist (*n* = 1)
F = Fisher's exact test used **bold** if $P < .05$, *italics* if $.05 \leq P < .10$

Table 3. Binary logistic regression analyses predicting each self-management activity according to variables with significant associations (0=no, 1=yes)

	Univariate	Multivariate: SES Adjusted [a]	Multivariate: Activity-specific models
	OR (95% CI)	**OR (95% CI)**	**OR (95% CI)**
SMBG daily [b]			
Female gender	**2.1 (1.0-4.5)**	**2.7 (1.2-5.8)**	*2.4 (0.9-6.4)*
Age			
<45*			
45-64	*2.4 (1.0-5.6)*	**2.7 (1.1-6.8)**	1.9 (0.6-5.7)
65+	**3.6 (1.3-10.3)**	**5.8 (1.8-18.8)**	2.2 (0.5-11.1)
Unemployed	**2.6 (1.3-5.3)**	**3.9 (1.7-8.7)**	*2.5 (0.9-6.9)*
Health care utilization			
0-2 visits*			
3-4 visits	**4.3 (1.3-14.2)**	**4.3 (1.3-14.5)**	2.5 (0.6-9.8)
5+ visits	**8.4 (2.6-27.4)**	**8.1 (2.5-26.6)**	**4.3 (1.1-16.6)**
Insurance type			
None*			
Private	1.6 (0.7-3.8)	1.1 (0.4-2.8)	2.1 (0.6-7.3)
Government	**3.8 (1.5-9.9)**	**3.9 (1.5-10.4)**	*3.0 (0.8-10.6)*
10+ years with diabetes	**3.2 (1.6-6.7)**	**3.5 (1.7-7.6)**	1.6 (0.6-4.4)
Treatment			
Insulin*			
Oral agents	**0.3 (0.1-0.7)**	**0.3 (0.1-0.7)**	**0.3 (0.1-0.8)**
Diet alone	**0.1 (0.0-0.5)**	**0.1 (0.0-0.5)**	**0.1 (0.0-0.6)**
Foot inspection daily [c]			
Difficulties in access to care	**0.4 (0.2-0.8)**	**0.4 (0.2-0.8)**	**0.4 (0.2-0.9)**
Advised within past 2 years on foot self-care	**2.5 (1.2-5.3)**	**2.5 (1.1-5.4)**	**2.4 (1.1-5.4)**
Diet adherence [d,†]			
Self-reported health status			
Good*			
Moderate	**0.4 (0.2-0.8)**	**0.3 (0.2-0.8)**	**0.3 (0.2-0.8)**
Poor	0.5 (0.1-1.6)	0.5 (0.1-1.5)	0.5 (0.1-1.5)
DSME class [e,◊]			
8+ years of education	**5.5 (2.6-11.6)**	**5.4 (2.4-11.8)**	**4.5 (2.0-10.3)**
US-born or time in the US			
US-born*			
11+ years	**0.2 (0.1-0.5)**	**0.3 (0.1-0.9)**	**0.1 (0.0-0.8)**
1-10 years	**0.2 (0.0-0.6)**	0.3 (0.1-1.5)	*0.1 (0.0-1.1)*
Spanish language survey	**0.4 (0.1-0.9)**	0.7 (0.2-2.0)	4.8 (0.5-47.0)

OR = odds ratio; CI = confidence interval.
* Reference category.
[a] Adjusted for income and education as continuous variables. Results shown are from analyses with each covariate tested individually.
[b] Final model includes education, income, gender, age, employment status, health care utilization, insurance type, time with diabetes, and treatment category.
[c] Final model includes education, income, difficulties in access to care, and advised by provider on foot self-care within the past 2 years.
[d] Final model includes education, income, and self-reported health status.
† Excludes those not instructed on special diet from health professional (n = 5)
[e] Final model includes education, income, US-born or time in the US, and survey language.
◊ Categorical variable used for education.
bold if $P < .05$, *italics* if $.05 \leq P < .10$

Appendix 1. “An assessment of diabetes care for Latinos living in non-metropolitan Iowa,” poster presented at 2010 Iowa Governor’s Conference on Public Health, 14 April 2010.

An assessment of diabetes care for Latinos living in non-metropolitan Iowa

Dan Sadowski, B.A., Michele Devlin, Dr.P.H., and Akhtar Hussain, M.D., Ph.D., D.Sc.

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Iowa Center on Health Disparities, University of Northern Iowa, Cedar Falls, Iowa

Introduction

The state of Iowa population is approximately 3 million, and 4% claim Hispanic origin. Latinos represent 15% of the total US population, yet constitute 32% of uninsured Americans. Nearly 1 in 3 Latinos lacks health insurance. The prevalence of type 2 diabetes for Latinos is 10.4%, as compared to 6.6% for non-Hispanic whites. The prevalence of diabetes is also higher among rural Americans than those living in urban areas. Complications of diabetes include heart disease and stroke, high blood pressure, nervous system damage, periodontal disease, and pregnancy complications. Additionally, diabetes is the leading cause of blindness, end-stage renal disease, and non-traumatic lower-extremity amputations.

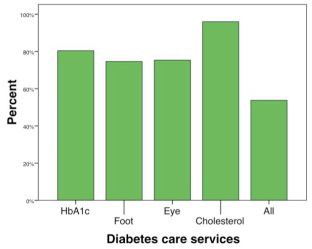
Methods

Questionnaires were completed during structured interviews in this quantitative, cross-sectional study. The study population is self-identified Latinos aged 18 years and older residing in non-metropolitan Iowa counties with diagnosed type 2 diabetes. Metropolitan Statistical Area classification is used. Recruitment communities include Columbus Junction, Denison, Estherville, Fort Madison, Hampton, Marshalltown, Muscatine, Ottumwa, Postville, Storm Lake, and West Liberty. Data was collected from September to December 2009, n=134. Informed consent was obtained from all study participants.

Analysis

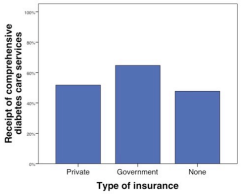
Four process measures were selected from the American Diabetes Association (ADA) standards of medical care for diabetes in this analysis: two glycosylated hemoglobin (HbA1c) tests per year, one annual comprehensive foot examination, one dilated eye examination in the past three years, and one lipid profile in the past two years. The self care activities assessed include a weekly self monitoring of blood glucose, a weekly foot check, adherence to diet recommendations, and attending a diabetes course on disease management.

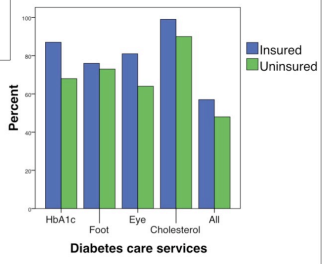
Results and Discussion



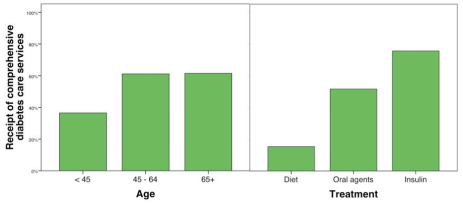
Approximately half received all recommended services; better than national comparison

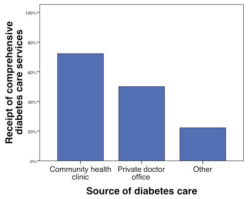
Insurance exhibits varied and limited influence





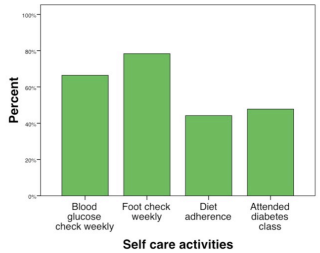
Unequal service provision according to age and treatment

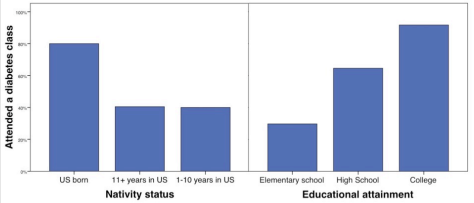




Four times more likely to receive all services at community health clinic as compared to private doctor office

Two thirds check blood glucose weekly, 4 out of 5 perform weekly foot check, and less than half strongly adhere to diet recommendations





Diabetes class: links to US nativity and education

Other interesting statistics

81% are foreign-born

Median household income is $19,200

93% report Mexico as familial homeland

12% see a Latino health care provider

Conclusion

The receipt of diabetes care services from health care providers is higher with this study population when compared with their counterparts nationally. However, improvements in delivery of the ADA recommended standards of diabetes care are still warranted. An increased emphasis on enrollment in diabetes classes for foreign-born Latinos with lower levels of education may contribute to better self care. Future studies should further investigate the role of health insurance and community health clinics for this study population in the utilization of health care services.

Appendix 2. “Alumnus researches diabetes care in Iowa Latino communities,” media article published in Drake University electronic newsletter, November 2009.

Alumnus researches diabetes care in Iowa Latino communities

Drake eBlue, The electronic newsletter of Drake Alumni and Friends
2009-Nov-03

Dan Sadowski

Dan Sadowski, AS'08, former 2007-08 Drake University student body president, is using field research to examine access to health care for diabetes among Hispanic populations in rural Iowa.

Sadowski is conducting field research for a master’s degree in international community health from the University of Oslo in Norway.

The project is based on statistics showing Hispanics are overrepresented among the uninsured for health care in the United States. In addition, Hispanics are 1.9 times more likely to have diabetes than non-Hispanic white age cohorts in the United States. The prevalence of diabetes also is higher among rural populations than in urban areas.

"As a disproportionate number of Latinos in rural communities lack health insurance or adequate access to health care, it is important to understand which elements of access to care influence the receipt of diabetes care," Sadowski said.

Sadowski narrowed his interest in public health research to diabetes care among Latino populations through his involvement with Latinos Unidos of Iowa, a community organization based in Des Moines. He was connected with the organization through Drake’s Global Ambassador program.

Sadowski aims to interview 100 adult Latino participants who are diagnosed with Type II diabetes and reside in counties in rural Iowa. He has established contacts with several organizations in recruiting participants and draws on community venues including churches and community health clinics.

His research will draw participants from the following communities in Iowa:

- Columbus Junction
- Denison
- Estherville
- Fort Madison
- Hampton
- Marshalltown

- Muscatine
- Ottumwa
- Postville
- Storm Lake
- West Liberty

He said he expects to encounter individuals with varying personal health situations, including everything from top-notch care for diabetes to limited contact with a health care professional.

Participants report elements of access to health care, including whether or not they have a regular provider and health insurance coverage, and their ease of communication with and transportation to health care providers.

Participants also provide detailed information about their diabetes care, specifically processes of care provided by health care professionals and personal health behavior, including self-management activities.

While Sadowski has only just started interviewing participants and will continue his research through December, he says the limited data has so far supported his expectations.

"I look forward to analyzing the complete data set next semester to get a better picture of the situation of the target population as a whole and to observe statistics and trends from the data," Sadowski said.

Sadowski intends to present his findings to students in Drake's College of Pharmacy and Health Sciences later in the fall semester.

Appendix 3. Questionnaire.

Survey of Access to Health Care and Diabetes Care for Latinos in Rural Iowa

This survey will help us better understand the health needs of Latinos living with diabetes in rural Iowa. Participation in this survey is voluntary. The survey should take approximately 10-20 minutes. The answers you provide are kept private and no one will know what you wrote, so please answer honestly. Thank you for your participation.

Instructions: When response options are in *italics*, please circle one option unless otherwise stated. Please fill in the blank when lines are provided.

1. Have you ever been told by a doctor or other health professional that you have diabetes or sugar diabetes? *YES* *NO*
2. Ethnicity: *Latino* *Non-Latino*

Basic information

3. What zip code do you live in? _____
4. Age: _____ years old
5. Gender: *FEMALE* *MALE*
6. What country(s) is your family from? _____
7. How many years of school have you completed? _____years
8. What is your current employment status?
Full time *Part time* *Unemployed*
9. Were you born in the US? *YES* *NO*
10. How long have you lived in the US? _____*months/years*
11. What is your marital status?
Single, never married *Married* *Separated or divorced*
Widowed *Living together*
12. How much do you and your spouse/partner earn each month? $_____
13. How well do you speak English?
Very well *Well* *Some* *Poorly* *Very poorly*
14. What language do you prefer to speak? _____
15. What culture are you more comfortable with?
American *Hispanic/Latino* *Both*

Access to Care

16. Is there a particular doctor's office, clinic, health center, or other place that you usually go if you are sick or need advice about your health? *YES* *NO*

If **NO**, What are the reasons you do not have a usual source of health care? (Circle **ALL** that apply)

a. Seldom or never gets sick
b. Recently moved into area
c. Don't know where to go for care
d. Usual source of medical care in this area is no longer available
e. Can't find a provider who speaks your language
f. Likes to go to different places for different health needs
g. Just changed insurance plans
h. Don't use doctors/treat yourself
i. Cost of medical care
j. Do not have health insurance
k. Health care system is confusing, difficult to maneuver
l. Other reason _____

*If your response to question #16 was **NO**, please skip to question #31.

17. Do you usually see a particular provider at the location? *YES* *NO* --> If **NO**, skip to #20

18. Is your provider a medical doctor, nurse, nurse practitioner, physician's assistant, midwife, or some other kind of person?
    a. Medical doctor
    b. Nurse
    c. Nurse practitioner
    d. Physician's assistant
    e. Midwife
    f. Other, specify _____
    g. Don't know

19. Is your provider Hispanic or Latino? *YES* *NO*

20. How do you usually get to your provider?
    a. Walk
    b. Drive personal car
    c. Borrow car from a family member or friend to drive
    d. Get a ride from a family member or friend
    e. Bus or other public transportation
    f. Taxi
    g. Other _____

21. How long does it take you to get to your provider? _____ minutes

22. How difficult is it for you to get to your provider?
Very difficult *Somewhat difficult* *Not too difficult* *Not at all difficult*

23. How difficult is it to contact your provider during regular business hours over the telephone about a health problem?
Very difficult *Somewhat difficult* *Not too difficult* *Not at all difficult*

24. Does your provider have office hours at night or on the weekend? *YES* *NO*

25. If there were a choice between treatments, how often would (a medical person at) your provider ask you to help make the decision?
Always *Usually* *Sometimes* *Never* *Don't know*

26. Does (someone at) your provider speak Spanish or provide translator services for you?
YES *NO* *Not needed*

27. How many times did you go to your provider in the past 12 months?
Number of times_____

28. Have you ever had difficulty obtaining health services? *YES* *NO* --> If **NO**, skip to #31

29. How often do you have difficulty obtaining health services?
Always *Almost always* *Sometimes* *Almost never* *Never*

30. Which of the following are problems you encounter when trying to obtain health services? (Circle **ALL** that apply)
    a. I don't speak English
    b. Provider does not speak Spanish
    c. Transportation
    d. High cost of care
    e. I don't have health insurance
    f. I do not have papers, I'm afraid
    g. The doctor is not sensitive to cultural issues
    h. It is difficult to find a doctor of my own culture
    i. It is difficult to find childcare while I go to the doctor
    j. I have to wait a long time for an appointment
    k. Health care system is confusing, difficult to maneuver
    l. Other reason(s) _____

31. How long has it been since you last saw your provider or any health care professional?
_____*days/weeks/months/years*

32. All things considered, are you satisfied or dissatisfied with the health care you have received during the past 12 months? (If you did not receive services you felt you needed, please consider that too)
Very satisfied *Somewhat dissatisfied* *Neither satisfied nor dissatisfied*
Somewhat satisfied *Very dissatisfied*

33. Overall, how would you rate your health status?
Very good *Good* *Moderate* *Poor* *Very poor*

34. Are you covered by a health insurance plan? *YES* *NO* --> If **NO**, skip to #37
If **YES**, which:
   a. A plan bought on your own
   b. A plan from your current or former employers or unions
   c. A plan provided by someone who does not live in your household (other than your current or former employers or unions)
   d. Medicare, the health insurance plan for people 65 years old and older or persons with certain disabilities
   e. Iowa Medicaid, the government assistance program that pays for health care
   f. CHAMPUS, CHAMP-VA, TRICARE, VA, or some other military health care
   g. The Indian Health Service

35. How long have you had this health insurance plan?
_____ *months/years*

36. Have you gone a time in the past 12 months without a health insurance plan? *YES* *NO*
If **YES**, for how long? _____*weeks/months*

Diabetes Care

37. How old were you when you were told you have diabetes?
Age: _____ years old

38. Did you begin taking insulin as soon as you were first told you have diabetes? *YES* *NO*

39. Did you have diabetes only during your pregnancy? *YES* *NO* *n/a*

40. Where do you usually go for your diabetes care?
   a. Community Health Clinic
   b. Private Doctor's Office
   c. Alternative Medicine
   d. Espirista /curandero /santero
   e. Emergency Room
   f. Health Educator/Promotora
   g. Other _____

41. Overall, what is your level of concern about your diabetes care?
Very high *High* *Moderate* *Low* *Very low*

42. Is your diabetes being treated by
   a. modifying your diet? *YES* *NO*
   b. medications taken by mouth? *YES* *NO*
   c. insulin injections? *YES* *NO*

43. In the past 12 months, how many times did a doctor, nurse, or other health professional check your blood for glycosylated hemoglobin or "hemoglobin A-one-C" (A1C)?
    a. Number of times _____
    b. Did not have a blood test
    c. Don't know
    d. Never

44. In the past 12 months, how many times did a health professional check your feet for any sores or irritations?
    Number of times_____ *Never*

45. Which of the following years did you have an eye exam in which your pupils were dilated? This would have made you temporarily sensitive to bright light. (circle **ALL** that apply)
This year *In 2008* *In 2007* *In 2006* *Before 2006* *Never*

46. About how long has it been since you had your blood cholesterol checked by a doctor or other health professional?
    _____*weeks/months/years* ago *Never*

47. About how long has it been since you had a flu shot?
    _____*weeks/months/years* ago *Never*

48. During the last 6 months, have you received any of the following to teach you how to take care of your diabetes:
    a. Telephone call to your house *YES* *NO*
    b. Appointment with nurse *YES* *NO*
    c. Visit to your home *YES* *NO*
    d. Referral to a specialist *YES* *NO*

49. About how long has it been since a health care professional advised you on…
    a. Diet adjustment? _____*weeks/months/years* ago *Never*

    b. Quitting smoking? _____*weeks/months/years* ago *Never* *Don't smoke*

    c. Checking your own blood for glucose or sugar?
    _____*weeks/months/years* ago *Never*

    d. Checking your own feet for sores or irritations?
    _____*weeks/months/years* ago *Never*

50. Overall, how would you rate the quality of your diabetes care provided by health care professionals?
Very good *Good* *Moderate* *Poor* *Very poor*

*Now we turn to a few questions regarding ***your*** self-management of diabetes*

51. About how often do you check your blood for glucose or sugar? Include times when checked by a family member or friend, but do NOT include times when checked by a health professional.
_____times per *day/week/month/year* *Never*

52. About how often do you check your feet for any sores or irritations? Include times when checked by a family member or friend, but do NOT include times when checked by a health professional.
_____times per *day/week/month/year* *Never*

53. If a health care professional has recommended a special diet for your diabetes, how well do you adhere to this diet?
Very well *Somewhat* *Very Poorly*
Well *Poorly* *Never recommended special diet*

54. Do you smoke? *YES* *NO*

55. Have you ever taken a course or class in how to manage your diabetes yourself?
YES *NO* *Not sure/Don't remember*

56. Overall, how would you rate the quality of your self-management of your diabetes? (circle one)
Very good *Good* *Moderate* *Poor* *Very poor*

Thank you for taking the time to fill out this survey! Upon completion of the survey you will receive a grocery coupon as a sign of our appreciation for your participation. Additionally, if you have any questions or are interested to learn about available community clinics, diabetes support groups, or Medicaid enrollment assistance, please approach Dan Sadowski, the person responsible for conducting this survey. If Dan is not physically present at the time of survey completion, please contact him on his mobile: 815-202-4935.