Prevalence of Undetected High Risk for Type 2 Diabetes Mellitus in Primary Care: A South Florida Primary Care Practice–Based Research Network Study

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ABSTRACT

Background: The 2004 National Health Interview Survey suggests that 7.0% of adults in the US population have diabetes mellitus (DM). Minority populations in the United States are disproportionately burdened with this disease.

Objective: The purpose of this study was to determine the prevalence of DM risk in a cross-section of primary care practices in a large urban area that has considerable proportions of Latino and Caribbean populations and to examine the extent to which primary prevention of DM is provided to this ethnically and economically diverse population.

Methods: This was a cross-sectional study of primary care patients presenting to physicians participating in the South Florida Primary Care Practice–Based Research Network and 2 physicians from central and northern Florida. We used a validated instrument to calculate DM risk based on body mass index, family history of DM, age-appropriate physical activity, and obstetric history. We excluded people who self-reported DM, and classified undiagnosed patients into 2 groups: those who recalled receiving information about their high risk for DM and those who did not recall receiving such information.

Results: A total of 2836 patients were surveyed; data from 2486 were analyzed. The mean (SD) age of the study sample (N = 2486) was 50.22 (16.38) years, and the majority of the patients were female (n = 1685 [67.8%]). Of the 2018 patients without DM, 1013 (50.2%) were at high risk for the disease. Among high-risk patients, 839 (82.8%) reported not having been informed by their physician that they were at risk. Significant differences in DM risk were observed among ethnic groups ($P = 0.01$), but patient demographics were not associated with informed status in high-risk patients. High body mass index was strongly associated with informed status ($P < 0.001$).

Conclusions: Fewer than 1 in 5 patients at high risk reported having been informed of their elevated risk. This low rate of patient education may delay preventive measures and may contribute to the disproportionate effect of DM on ethnic groups in whom this disease is more common. (*Insulin*. 2007;2:109–117) Copyright © 2007 Excerpta Medica, Inc.

Key words: type 2 diabetes mellitus, risk, primary care, quality of care, health disparities, prevalence, education, screening, counseling.

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INTRODUCTION

The 2004 National Health Interview Survey suggests that 7.0% of adults in the US population have diabetes mellitus (DM), up from 5.1% in 1997.[1] Benjamin et al[2] estimated that 10.8% of overweight adults aged 45 to 74 years in the US population in 2000 had undiagnosed DM and 22.6% had pre-DM. By the year 2050, prevalence is estimated to increase 165%.[3] The American Diabetes Association (ADA) places the annual direct and indirect costs of DM at $132 billion.[4] A large proportion of the per-person costs of DM are associated with treating complications from the disease,[5] many of which may be prevented or delayed with improved screening for risk factors and concomitant primary and secondary prevention measures.

Minority populations in the United States are disproportionately burdened[6–9]: the age and sex-adjusted prevalence of diagnosed DM was estimated to be 10.4% for Latino persons, 11.1% for non-Hispanic blacks, and 5.9% for non-Hispanic whites in 2004.[1] Compared with white men, rates of DM among persons aged 20 to 74 years are 30% higher in white women, 70% higher in black men, and 100% higher in black women.[5,10–12] Minorities are also more likely to experience poor DM outcomes than non-Hispanic whites.[12,13]

Our growing understanding about the etiology of type 2 DM challenges primary care physicians to assume greater responsibilities for the primary prevention and effective management of DM. An estimated one third of all individuals who have DM are unaware of their disease,[14] and a large proportion of the population at risk for DM underestimates or is unaware of the risk.[15] Complications of poorly managed DM are severe and costly; these complications include cardiovascular disease, cerebrovascular disease, hypertension, blindness, renal disease, nervous system disease, amputations, dental disease, and complications of pregnancy. The disproportionate representation of black and Latino persons with poor DM outcomes requires more diligence in the reduction of risk factors among black and Latino patients who have not yet been diagnosed with DM.

Our growing understanding about the etiology of type 2 DM challenges primary care physicians to assume greater responsibilities for the primary prevention and effective management of DM.

Several recent well-designed clinical trials have reported the benefits of lifestyle change for the prevention of DM.[16,17] The ADA recommends individuals with a high risk for developing DM become aware of the benefits of modest weight loss and participation in regular physical activity.[4] Furthermore, the ADA recommends that people with the following characteristics be tested for DM: (1) age ≥45 years with a body mass index (BMI) of at least 25 kg/m^2; or (2) age <45 years but with a BMI of at least 25 kg/m^2 and risk factors for DM.[4] Evidence suggests, however, that primary care physicians may be inadequately addressing both the primary prevention of DM and the secondary prevention of unsatisfactory DM outcomes among their patients.[18,19]

The purpose of this study was to determine the prevalence of DM risk in a cross-section of primary care practices in a large urban area that has considerable proportions of Latino and Caribbean populations and to examine the extent to which primary prevention of DM is provided to this ethnically and economically diverse population.

MATERIALS AND METHODS

This was a cross-sectional study of primary care patients presenting to 16 primary care physicians participating in the South Florida Primary Care Practice–Based Research Network (SoFla-PBRN), which spans Miami-Dade and Broward counties, and 2 additional primary care physicians from central and northern Florida. This project was approved by the Institutional Review Board and Privacy Office of the University of Miami, Miami, Florida.

We used a validated instrument,[20] also used by the ADA, to determine a Diabetes Risk Score (DRS) based on calculated BMI, family history of DM, age-appropriate physical activity, and obstetric history. Based on patients' item responses, a DRS is computed with a range from 0 to 18. A DRS <10 is considered low risk; a DRS ≥10 is considered high risk.

We supplemented the risk assessment with 5 additional items. One item, drawn from the Behavioral Risk Factor Surveillance System,[21] was used to identify patients with diagnosed DM ("I have been told by my doctor that I have diabetes"). A second question was designed to identify whether patients had been informed about their risk ("My doctor has told me that I am at risk for getting diabetes"). Two additional questions queried ethnicity and education, and a fifth item identified country of origin for patients who self-identified as Latino.

The risk assessment and informed consent were administered as needed, in English, Spanish, or Creole. All consecutive patients presenting to each participating physician's medical office during a defined period of time were approached for recruitment. Cuban, African American, and Haitian patients were purposefully oversampled to ensure adequate representation.

BMI was calculated from patients' reported height and weight, using the following formula: BMI = (weight in pounds/[height in inches] × [height in inches]) × 703. Patients were categorized as overweight if their BMI was 25 to 29.9 kg/m^2 and obese if it was ≥30 kg/m^2.

Frequency and descriptive statistics were calculated for all demographic and clinical characteristics of the sample. Patient data were analyzed using a 3-tiered algorithm that consists of: (1) 100% of patients categorized according to DM status; (2) patients who self-identify as not having been informed that they have DM, categorized by low- and high-risk status; and (3) patients who are at high risk for DM, categorized by having been informed of their high-risk status or not.

The χ^2 test was employed to compare categorical variables (sex, ethnicity, and education) and the Student *t* test was used to compare continuous variables (age, DRS, and BMI) stratified according to DRS categories. *P* values ≤0.05 were considered statistically significant.

RESULTS

Table I shows the demographic characteristics of the participating physicians. Participating physicians had a mean of 19.7 years in practice. The majority (62.0%) delivered medical care primarily to low-income or publicly insured patients; 38.0% were in private or small group practice and delivered medical care primarily to privately insured patients.

Questionnaires were collected from 2836 patients presenting to 16 physicians. Due to noncompletion of the questionnaire, 344 subjects were excluded from the analyses. In addition, 6 subjects with outliers for variables used in this study were excluded. Thus, a total of 2486 subjects were analyzed. **Table II** illustrates the characteristics of the total sample and the subsample of subjects who had been informed that they have DM. The mean (SD) age of the overall sample was 50.22 (16.38) years (range, 18–95 years), and 67.8% of subjects were female. The ethnic breakdown of the sample was non-Hispanic white, 34.4%; Latino/Cuban, 18.7%; African American, 16.7%; Latino/not Cuban, 14.6%; Haitian, 9.8%; and other ethnic origin, 5.8%. With regard to educational attainment, 11.4% of subjects had completed eighth grade or less, 10.2% had attended some high school, 25.0% had completed high school or obtained their General Equivalency Diploma (GED), 26.3% had completed some college, 15.7% were college graduates, and 11.4% had completed a graduate degree.

The mean (SD) BMI for the 2486 patients analyzed was 28.4 (6.75) kg/m^2, with 34.3% of the sample being categorized as overweight and 32.3% of the sample categorized as obese based on their calculated BMI. About one quarter of the sample (25.2%) had either a parent or a sibling who had been diagnosed with DM, and 11.7% of subjects reported having both a parent and a sibling who had been diagnosed with DM. In addition, 46.9% of the sample reported little or no physical activity, and 10.1% of the sample reported giving birth to a baby weighing >9 pounds at birth. Four hundred sixty-eight (18.8%) of the total sample reported that they had been informed they have DM.

The mean (SD) age of diabetic subjects was 54.23 (13.75) years, and 63.7% of the diabetic subjects were female. The prevalence of self-reported DM among the targeted ethnic groups was as follows: non-Hispanic whites, 24.8%; Latino/Cuban, 22.2%; African American, 17.9%; Latino/not Cuban, 15.6%; Haitian, 11.8%; and other ethnic origin, 7.7%. With regard to educational attainment, 18.0% of subjects had completed eighth grade or less, 13.7% had attended some high school, 30.3% had completed high school or obtained their GED, 19.2% had completed some college, 9.8% were college graduates, and 9.0% had completed a graduate degree.

Table I. Physician characteristics.

Specialty, %	
Family medicine	88
Internal medicine	6
General practitioner	6
Ethnicity, %	
Non-Hispanic white	36
Black/African American	27
Hispanic	18
Asian	18
Age, %	
30–39 y	25
40–49 y	50
50–64 y	25

The mean (SD) BMI for self-reported diabetics was 30.9 (7.5) kg/m^2, with 31.2% being categorized as overweight and 48.3% of diabetics categorized as obese based on their calculated BMI. A third of the sample (33.5%) had either a parent or a sibling who had been diagnosed with DM, and 32.7% of subjects reported having both a parent and a sibling who had been diagnosed with DM. In addition, 57.5% of the sample reported little or no physical activity, and 17.1% of the sample reported giving birth to a baby weighing >9 pounds at birth.

The **figure** illustrates the manner with which we assigned patients to relevant groupings for analysis based on responses. Among the 2018 subjects without a diagnosis of DM, 1005 (49.8%) were low risk (ie, DRS <10). Among the 1013 (50.2%) who were high risk (ie, DRS ≥10), 174 (17.2%) indicated that they had been informed by a physician of their high risk. The remainder of the sample, consisting of 839 (82.8%) subjects who were at high risk and who had not been informed of their risk, comprised 33.8% of the sample of subjects analyzed.

Using *t* tests and χ^2 tests, we compared low-risk and high-risk subjects without a diagnosis of DM (**Tables III** and **IV**). Analyses revealed that high-risk subjects were older ($t = -15.9$; $P < 0.001$) and had a higher calculated BMI ($t = -23.3$; $P < 0.001$). Other analyses revealed that high-risk subjects were more likely to be female ($\chi^2 = 5.2$; $P < 0.05$); more likely to be of African American, Latino/Cuban, or Latino/not Cuban origin ($\chi^2 = 11.84$; $P < 0.05$); and more likely to have a lower level of educational attainment ($\chi^2 = 51.53$; $P < 0.001$). The mean (SD) DRS for the low-risk group was 4.6 (3.0) compared with 12.3 (2.4) for subjects in the high-risk group ($t = -63.8$; $P < 0.001$).

Patients at high risk for DM (ie, DRS ≥10) were dichotomized based on recollection of having been informed about their high risk for DM (**Tables V** and **VI**). Using *t* tests and χ^2 tests, the differences between the 2 groups were evaluated. We found no significant differences between those who were not informed and those who recalled having been informed of their risk with regard to age, sex, ethnicity, or educational attainment. Those who had been informed of

Table II. Characteristics of patients in the total sample compared with the subsample of patients who had been told they have diabetes mellitus (DM).

Characteristic	Study Sample (N = 2486)	Patients with DM (n = 468)
Age, y*	50.22 (16.38)	54.23 (13.75)
Sex, no. (% female)	1685 (67.8)	298 (63.7)
Race/ethnicity, no. (%)		
Non-Hispanic white	855 (34.4)	116 (24.8)
Latino/Cuban	464 (18.7)	104 (22.2)
African American	414 (16.7)	84 (17.9)
Latino/not Cuban	365 (14.6)	73 (15.6)
Haitian	243 (9.8)	55 (11.8)
Other	145 (5.8)	36 (7.7)
Educational attainment, no. (%)		
8th Grade or less	284 (11.4)	84 (18.0)
Some high school	254 (10.2)	64 (13.7)
High school or GED	622 (25.0)	142 (30.3)
Some college	654 (26.3)	90 (19.2)
College graduate	389 (15.7)	46 (9.8)
Graduate degree	283 (11.4)	42 (9.0)
Calculated BMI, kg/m^2*	28.4 (6.75)	30.9 (7.5)
Overweight, no. (%)†	852 (34.3)	146 (31.2)
Obese, no. (%)‡	803 (32.3)	226 (48.3)
Family history of DM, no. (%)		
Parent	744 (29.9)	262 (56.0)
Sibling	466 (18.7)	201 (43.0)
Little or no physical activity, no. (%)	1167 (46.9)	269 (57.5)
Females with baby weighing >9 lb at birth, no. (%)	251 (10.1)	80 (17.1)

GED = General Equivalency Diploma; BMI = body mass index.
*Mean (SD).
†Defined as BMI 25 to 29.9 kg/m^2.
‡Defined as BMI ≥30 kg/m^2.

their risk did have a higher mean DRS ($t = -3.1$; $P < 0.01$) and a higher BMI ($t = -3.7$; $P < 0.001$).

DISCUSSION

We recruited patients presenting to community-based primary care practices, in a manner intended to approximate the distribution of the population in Miami-Dade County, an ethnically diverse urban area that includes uniquely large proportions of Latinos from the island of Cuba and blacks from Haiti. It was our intention to measure the prevalence of type 2 DM among Latinos who self-report as Cuban compared with non-Cuban Latinos, and among Haitians compared with African Americans. We collaborated with 16 physicians participating in the SoFla-PBRN and 2 physicians from central and northern Florida to recruit an adequate and diverse sample of patients within a reasonable period. To estimate prevalence of DM, we identified existing cases of DM using the same instrumentation as was used in the national Behavioral Risk Factor Surveillance System, which relies on patient self-report.[21] The prevalence of self-reported type 2 DM in our sample of 2486 primary care patients was 18.8%, with the following rates among subpopulations: non-Hispanic whites, 11.9%; Latino/not Cuban, 16.6%; Latino/Cuban, 18.3%; African Americans, 16.9%; and Haitians, 18.5%. The differential in prevalence rates observed between non-Hispanic whites and all others, although approximately double that found at the national level, perhaps more accurately reflects the burden of type 2 DM among minority populations in major US metropolitan areas.

Our secondary purpose for this research was to examine the quality of DM primary prevention delivered by primary care physicians and to examine the uniformity with which DM prevention may be delivered to low-risk patients such as non-Hispanic whites, compared with high-risk patients such as blacks and Latinos. We did this by first quantifying patients' risk for DM using validated instrumentation and

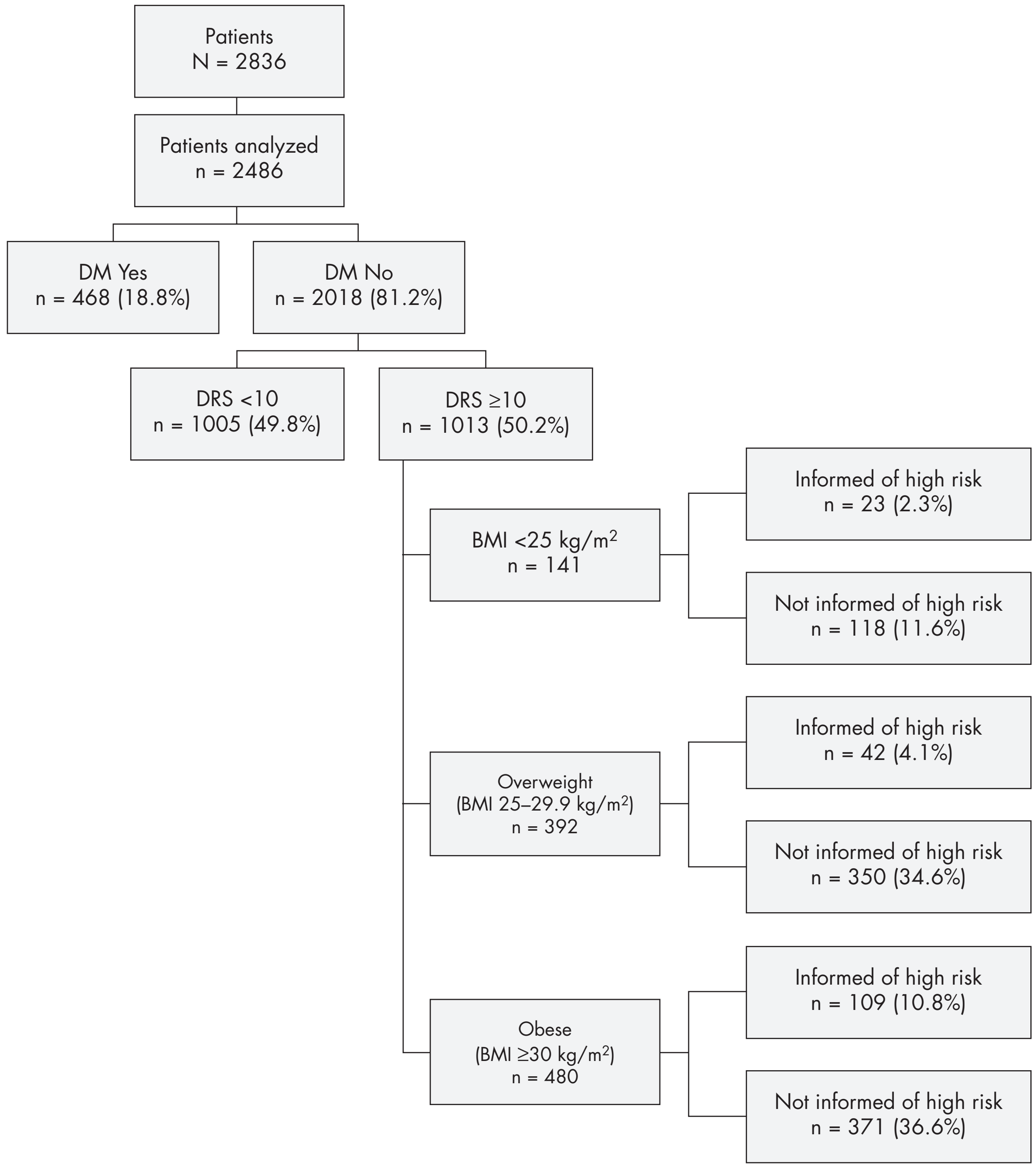

Figure. Algorithm for categorizing patients for analysis of undetected risk for type 2 diabetes mellitus (DM). DRS = Diabetes Risk Score; BMI = body mass index. DRS <10 is considered low risk; DRS ≥10 is considered high risk.

assessing whether patients had previously been informed of their DM risk, so that they may potentially reduce their risk. If the patient is determined to be at high risk, then we believe it is reasonable to expect that a health care provider will inform the patient of his or her risk, especially if the risk may be lowered by lifestyle changes.

We found that nearly half of all nondiabetic patients screened (50.2%) had a high risk for type 2 DM. High risk for type 2 DM was different for patients depending on race/ethnicity. It would appear that our patient population demonstrated somewhat expected trends in terms of DM risk, with non-Hispanic white patients less likely to be at high risk for DM compared with Latinos and blacks.

In these analyses comparing high-risk patients who were informed versus those who were not informed of their high risk for DM, we found no differences for any of the depen-

Table III. Comparison using *t* tests of non–diabetes mellitus patients based on risk category (n = 2018).

Characteristic	Low Risk: DRS <10 (n = 1005)	High Risk: DRS ≥10 (n = 1013)	*t*	*P*
DRS score*	4.6 (3.0)	12.3 (2.4)	–63.8	<0.001
Age, y*	43.7 (17.8)	54.9 (13.5)	–15.9	<0.001
Calculated body mass index, kg/m^2*	24.8 (5.1)	30.8 (6.3)	–23.3	<0.001

DRS = Diabetes Risk Score.
*Mean (SD).

Table IV. Comparison using χ^2 tests of non–diabetes mellitus patients based on risk category (n = 2018).

Characteristic	Low Risk: DRS <10 (n = 1005)	High Risk: DRS ≥10 (n = 1013)	χ^2	*P*
Sex, no.				
Female	667	720	5.2	<0.05
Male	338	293		
Race/ethnicity, no.				
Non-Hispanic white	371	339	11.84	<0.05
African American	140	185		
Haitian	102	85		
Latino/not Cuban	149	178		
Latino/Cuban	157	203		
Other	61	48		
Educational attainment, no.				
8th Grade or less	80	120	51.53	<0.001
Some high school	67	123		
High school graduate or GED	211	269		
Some college	308	256		
College graduate	197	146		
Graduate degree	142	99		

DRS = Diabetes Risk Score; GED = General Equivalency Diploma.

Table V. Comparison using *t* tests of nondiabetic high-risk patients based on informed status (n = 1013).

Characteristic	Not Informed (n = 839)	Informed (n = 174)	*t*	*P*
DRS score*†	12.21 (2.3)	12.8 (2.5)	–3.1	<0.01
Age, y†	54.96 (13.5)	54.6 (13.8)	0.32	>0.05
Calculated body mass index, kg/m^2†	30.4 (5.8)	32.7 (8.0)	–3.7	<0.001

*Diabetes Risk Score (DRS) is computed with a range from 0 to 18. DRS <10 is considered low risk; DRS ≥10 is considered high risk.
†Mean (SD).

Table VI. Comparison using χ^2 tests of nondiabetic high-risk patients based on informed status (n = 1013).

Characteristic	Not Informed (n = 839)	Informed (n = 174)	χ^2	*P*
Sex, no.				
Female	596	124	0.004	>0.05
Male	243	50		
Ethnicity, no.				
Non-Hispanic white	254	60	8.8	>0.05
African American	154	31		
Haitian	74	11		
Latino/not Cuban	143	35		
Latino/Cuban	172	31		
Other	42	6		
Educational status, no.				
8th Grade or less	103	17	7.9	>0.05
Some high school	103	20		
High school graduate or GED	232	37		
Some college	211	45		
College graduate	114	32		
Graduate degree	76	23		

GED = General Equivalency Diploma.

dent variables we measured with the exception of calculated BMI. Nondiabetic, high-risk patients who self-reported having been informed of their high risk were likely to have a higher BMI, which is a risk factor for DM and other poor health outcomes. It is likely that patients with high BMI are more readily perceived by physicians as exposed to a higher risk for DM, making it more likely for physicians to discuss this risk with these patients.

Neither ethnicity nor educational status was associated with differences in informed status in nondiabetic, high-risk patients. Rates of patient recall of DM risk communication were universally low, regardless of ethnicity. Individuals who have a higher risk for DM due to their ethnicity are receiving a disproportionately low rate of risk information when compared with their peers with lower baseline risk.

As a cross-sectional study with the intention of minimally distracting patient flow in medical offices, all data were self-reported by patients, including ethnic affiliation, DM diagnosis, and, if not diagnosed with DM, whether they were informed of their high risk for DM. Patient recall as a method for collecting research data is not without potential problems. Although research has shown the specificity of self-reported DM to be 97% when compared with medical records,[22] we expect the DM risk–informed status to be underreported in our study, as patient recall of health behavior advice is more susceptible to recall bias than patient recall of health outcomes.[23]

We relied on one individual practice staff member in each medical office, with an assigned back-up in case of absence, to recruit patients, collect study data, and record observable data

Individuals who have a higher risk for DM due to their ethnicity are receiving a disproportionately low rate of risk information when compared with their peers with lower baseline risk.

describing patients who refused to participate. The number of patients refusing to participate was negligible and, in fact, patients responded so favorably to the questionnaire that physicians reported a great many of them asked for more information about their own risk for DM and how to lower their chances of getting DM. Although study instrumentation was available in the 3 languages spoken by the majority of people in South Florida (English, Spanish, and Creole), investigators were not prepared for the large proportion of Haitian patients who could neither read nor write. Consequently, investigators staffed one community-based medical office that was used predominantly by Haitian patients with a research assistant who assisted a Creole-speaking clinical nurse in administering the study questionnaire as an interview.

These data reveal high rates of self-reported DM in primary care practices, with demographic patterns reflecting those that may be expected given general epidemiologic trends and disproportionate burdens with DM borne by black and Latino populations. Not surprisingly, however, we found that non-Hispanic white patients have a lower risk for undetected high-risk for DM. These data suggest an alarmingly high rate of patients with a high risk for DM and of patients who are unaware of their risk status. Although it is very likely that the number of uninformed high-risk patients may be overestimated due to recall bias, this number is significantly higher than in the low-risk category. There does not appear to be any difference in the extent to which patients self-report having been informed of their high risk for type 2 DM, with non-Hispanic white, Cuban, African American, and Haitian patients all sharing the same quality of care relating to DM prevention in primary care practices. However, it is possible that capability to self-report may be different in the various groups studied due to health literacy. We did not control for health literacy in this study. We also found no evidence of sex-related differences in informed status.

There are important implications attached to low rates of informed status among high-risk patients. First, low DM risk awareness rates imply that patients in need of lifestyle modification counseling may not be receiving such guidance. Second, if rates of DM risk notification were similar among ethnic groups and educational strata, minority patients and patients with a lower education level appear to be receiving disproportionately lower rates of DM risk notification when compared with nonminorities and patients with higher education. Third, if we consider that the DM risk test we used in our study has a positive predictive value of 10%, ~1 in 10 patients at high risk are undiagnosed persons with DM. By increasing DM risk awareness rates, more undiagnosed persons with DM would be targeted for risk reduction measures at an earlier stage.

Low DM risk awareness rates imply that patients in need of lifestyle modification counseling may not be receiving such guidance.

CONCLUSIONS

This cross-sectional study represents an initial step toward a more rigorous and comprehensive examination of the uniformity of providing primary prevention for DM among primary care patients in an effort to expand our understanding of the disproportionate patterns of DM health care. This study raises some important questions about the potential for inadequate primary prevention of DM. Future research is needed to better understand whether ecological, sampling biases, or health literacy may have impacted our results, and to more rigorously link DM prevention efforts with DM outcomes in primary care patients.

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REFERENCES

1. Centers for Disease Control and Prevention. Early Release of Selected Estimates Based on Data from the 2004 National Health Interview Survey. National Center for Health Statistics. Release date: May 23, 2005. Available at: http:///www.cdc.gov/nchs/about/major/nhis/. Accessed June 2, 2005.
2. Benjamin SM, Valdez R, Geiss LS, et al. Estimated number of adults with prediabetes in the US in 2000: Opportunities for prevention. *Diabetes Care*. 2003;26:645–649.
3. Boyle JP, Honeycutt AA, Narayan KM, et al. Projection of diabetes burden through 2050: Impact of changing demography and disease prevalence in the US. *Diabetes Care*. 2001;24:1936–1940.
4. American Diabetes Association. Standards of medical care in diabetes [published correction appears in *Diabetes Care*. 2005;28:990]. *Diabetes Care*. 2005;28(Suppl 1):S4–S36.
5. Skyler JS, Oddo C. Diabetes trends in the USA. *Diabetes Metab Res Rev*. 2002;18(Suppl 3):S21–S26.
6. Karter AJ. Race and ethnicity: Vital constructs for diabetes research. *Diabetes Care*. 2003;26:2189–2193.
7. Brown AF, Ettner SL, Piette J, et al. Socioeconomic position and health among persons with diabetes mellitus: A conceptual framework and review of the literature. *Epidemiol Rev*. 2004;26:63–77.
8. Engelgau MM, Geiss LS. The burden of diabetes mellitus. In: Leahy JL, Clark NG, Cefalu WT, eds. *Medical Management of Diabetes Mellitus*. New York: Marcel Dekker, Inc; 2000:1–18.
9. Liburd LC, Vinicor F. Rethinking diabetes prevention and control in racial and ethnic communities. *J Public Health Manag Pract*. 2003;9:S74–S79.
10. Harris MI. Noninsulin-dependent diabetes mellitus in black and white Americans. *Diabetes Metab Rev*. 1990;6:71–90.
11. Flegal KM, Ezzati TM, Harris MI, et al. Prevalence of diabetes in Mexican Americans, Cubans, and Puerto Ricans from the Hispanic Health and Nutrition Examination Survey, 1982–1984. *Diabetes Care*. 1991;14:628–638.
12. Harris MI, Eastman RC, Cowie CC, et al. Racial and ethnic differences in glycemic control of adults with type 2 diabetes. *Diabetes Care*. 1999;22:403–408.
13. Carter JS, Pugh JA, Monterrosa A. Non-insulin-dependent diabetes mellitus in minorities in the United States. *Ann Intern Med*. 1996;125:221–232.
14. Harris MI, Flegal KM, Cowie CC, et al. Prevalence of diabetes, impaired fasting glucose, and impaired glucose tolerance in US adults. The Third National Health and Nutrition Examination Survey, 1988–1994. *Diabetes Care*. 1998;21:518–524.
15. Harwell TS, Dettori N, Flook BN, et al. Preventing type 2 diabetes: Perceptions about risk and prevention in a population-based sample of adults > or = 45 years of age. *Diabetes Care*. 2001;24:2007–2008.
16. Tuomilehto J, Lindstrom J, Eriksson JG, et al, for the Finnish Diabetes Prevention Study Group. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *N Engl J Med*. 2001;344:1343–1350.
17. Knowler WC, Barrett-Connor E, Fowler SE, et al, for the Diabetes Prevention Program Research Group. Reduction in the evidence of type 2 diabetes with life-style intervention or metformin. *N Engl J Med*. 2002;346:393–403.

18. Helseth LD, Susman JL, Crabtree BF, O'Connor PJ. Primary care physicians' perceptions of diabetes management. A balancing act. *J Fam Pract*. 1999;48:37–42.
19. Kirkman MS, Williams SR, Caffrey HH, Marrero DG. Impact of a program to improve adherence to diabetes guidelines by primary care physicians. *Diabetes Care*. 2002;25:1946–1951.
20. Herman WH, Smith PJ, Thompson TJ, et al. A new and simple questionnaire to identify people at increased risk for undiagnosed diabetes. *Diabetes Care*. 1995;18:382–387.
21. Centers for Disease Control and Prevention. BRFSS: Turning Information into Health. Behavioral Risk Factor Surveillance System. Release date: May 2, 2005. Available at: http:///www.cdc/gov/brfss/. Accessed June 2, 2005.
22. Kehoe R, Wu SY, Leske MC, Chylack LT. Comparing self-reported and physician-reported medical history. *Am J Epidemiol*. 1994;139:813–818.
23. Flocke SA, Stange KC. Direct observation and patient recall of health behavior advice. *Prev Med*. 2004;38:343–349.

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