Comparison of diabetes control among Haitians, African Americans, and non-Hispanic whites in an urban safety-net hospital

Running Title: Diabetes control among Haitians

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**Objective** — To compare diabetes care and outcomes among Haitians, African Americans, and non-Hispanic whites.

**Research Design and Methods** — We analyzed data from 715 Haitian, 1472 African-American, and 466 non-Hispanic white adults with diabetes, using chi-square testing and multiple logistic regression.

**Results** — Haitians had a higher mean A1C than African Americans (8.2±1.9 vs. 7.7±2.0) and non-Hispanic whites (7.5±1.7) (both P < 0.0001). There was no difference in completion of process measures. Haitians were more likely than non-Hispanic whites to have elevated LDL or blood pressure. Macrovascular complications were fewer among Haitians than African Americans (adjusted OR 0.35 [95% CI 0.23-0.55]), as were microvascular complications (0.56 [0.41-0.76]). Haitians also had fewer macrovascular (aOR 0.32 95% CI [0.20-0.50]) and microvascular (0.55 [0.39-0.79]) complications than non-Hispanic whites.

**Conclusions** — Haitians have worse glycemic control than African Americans or non-Hispanic whites. Future research and interventions to improve diabetes care should target Haitians as a distinct racial/ethnic group.

There are 531,000 black persons of Haitian ancestry living in the United States (1). We identified no studies of diabetes care or outcomes in this population. Thus it is unclear whether Haitians, like African Americans, have a higher mean A1C (2), receive less recommended testing (3), or have higher rates of retinopathy (4), nephropathy (5), or lower extremity amputations (6) than whites. We analyzed data from primary care clinics in the largest safety-net hospital in Massachusetts in order to compare diabetes care and outcomes among Haitians, African Americans and non-Hispanic whites.

**RESEARCH DESIGN AND METHODS**
We conducted an observational study of subjects with diabetes who received primary care at Boston Medical Center, an urban safety-net hospital with academic primary care practices. The Boston University Medical Center institutional review board approved the study protocol. We included individuals who had at least one primary care visit yearly between 8/1/07 and 8/1/09, were ≥ 20 years old, carried a diagnosis of diabetes by ICD-9-CM billing code 250.XX or by presence on the medical record problem list, and who self-identified as either Haitian, African American, or non-Hispanic white.

The percentage of patients with poor glycemic control (A1C > 9%) (7) was our primary outcome measure. Process measures included yearly testing of A1C, LDL, and urine microalbumin in patients without nephropathy (8). We ascertained diabetic complications by ICD-9-CM codes or presence on the problem list, although we defined nephropathy as an eGFR < 60ml/min, urinary albumin/creatinine ratio ≥ 30mg/g, or a history of kidney transplant or dialysis.

We used SAS statistical software (Version 9.1; SAS Institute, Cary, NC), performing cross-tabulations with chi-square tests where appropriate and multiple logistic regression to analyze race/ethnicity as a predictor of outcomes. Each regression model included age, sex, language, insurance type, number of primary care visits over two years, and having
at least one visit to an endocrinologist over two years. In models of complication risk, we also controlled for BMI, hypertension diagnosis, and having ever smoked. We assessed each model for interactions between race/ethnicity and either sex or higher health care utilization. A similar analysis was performed to compare English- and non-English-speaking Haitians.

**RESULTS**

We identified 2653 subjects, including 715 Haitians, 1472 African Americans, and 466 non-Hispanic whites. Thirty-two percent of Haitians were English-speaking. Haitians were of similar mean age to African Americans (58.8±12.0 years vs. 57.8±12.5 years) and non-Hispanic whites (59.8±11.8 years), but had a lower mean BMI compared to both African Americans (30.8±6.0 kg/m² vs. 33.8±8.0 kg/m², P < 0.05) and non-Hispanic whites (33.4±8.0 kg/m², P < 0.05). A history of smoking was significantly less common among Haitians compared to African Americans (52% vs. 85%, P < 0.05) and non-Hispanic whites (77%, P < 0.05). Compared to African Americans, Haitians had lower health care utilization as measured by number of primary care visits over two years (9.2±4.7 vs. 9.8±5.9, P < 0.05) and the likelihood of having an endocrinologist visit (16% vs. 26%, P < 0.05).

The mean A1C was higher among Haitians than among African Americans (8.2±1.9 vs. 7.7±2.0, P <0.0001) and among non-Hispanic whites (7.5±1.7, P < 0.0001), and the higher risk of poor glycemic control among Haitians persisted after adjustment (Table 1). In the unadjusted analysis, Haitians had a higher risk of poor blood pressure control compared to both groups and a higher risk of poor LDL control compared to non-Hispanic whites. After adjustment, these differences persisted in the comparison to non-Hispanic whites only. Rates of process measure completion were comparable across groups. The prevalence of retinopathy was similar across groups, but all other complications were less common among Haitians. Compared to African Americans, Haitians had lower adjusted odds ratios for macrovascular and microvascular complications (0.35 [95% CI 0.23-0.55] and 0.56 [95% CI 0.41-0.76, respectively). These risks were also lower than among non-Hispanic whites (0.32 [95% CI 0.20-0.50] and 0.55 [95%CI 0.39-0.79]). In the analysis of nephropathy alone, we found that Haitians fared better than both African Americans (0.56 [0.39–0.80]) and non-Hispanic whites (0.47 [0.31–0.70]). Haitian Creole- or French-speaking Haitians had better LDL control than English-speaking Haitians, but in the adjusted analysis there were no differences in other outcomes. There were no significant interactions between ethnicity and either sex or health care utilization.

**CONCLUSIONS**

Haitians had similar rates of completed process measures, but worse glycemic control, compared to both African Americans and non-Hispanic whites in an urban safety-net hospital. The higher mean A1C among Haitians was evident in both the unadjusted and adjusted analyses, as were the worse lipid and blood pressure control among Haitians compared to non-Hispanic whites. Despite these findings, the rates of diagnosed and documented complications were lower in the Haitian group than in either comparison group. We identified no other studies of diabetes care and outcomes in Haitians which with to compare these findings. Our results suggest that that worse glycemic control among Haitians may not be attributable to a language barrier or lower health care utilization. Patient-level factors, such as consumption of a traditional high-carbohydrate Haitian diet, or provider- and systems-level factors, such as
limited cultural competency, may contribute to worse glycemic control among Haitians. The finding of lower complication rates among Haitians is surprising in light of intermediate outcome measures that are worse than or similar to the comparison groups. One possible explanation is a shorter duration of diabetes in Haitians, but we cannot exclude detection bias or a higher loss to follow-up among Haitians. That nephropathy was also less common in Haitians is an interesting finding, as this complication was assessed primarily by results of lab testing and presence of serious complications, and thus was less subject to under-diagnosis and under-documentation. Worse glycemic control is associated with higher risk of hypoglycemia and symptomatic hyperglycemia, and the frequency of complications among Haitians may worsen with increasing acculturation, obesity, and prevalence of diabetes. Future interventions to prevent diabetes-related morbidity and mortality and reduce health disparities should target Haitians and address the unique features of Haitian culture that may affect the course of diabetes care.

Author contributions: V.V. researched data, contributed to discussion, and wrote manuscript. J.R. contributed to discussion and reviewed/edited manuscript. H.C. contributed to discussion and reviewed/edited manuscript. M.D. contributed to discussion and reviewed/edited manuscript. K.L. contributed to discussion and reviewed/edited manuscript.

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REFERENCES

Table 1—Intermediate outcomes and diabetic complications by race/ethnicity

<table>
<thead>
<tr>
<th>Intermediate Outcome measures</th>
<th>Haitians (n=715)</th>
<th>African Americans (n=1472)</th>
<th>P value*</th>
<th>Adjusted OR^1‡ (95% Cl)</th>
<th>Non-Hispanic Whites (n=466)</th>
<th>P value§ (95% Cl)</th>
<th>Adjusted OR^1‖ (95% Cl)</th>
</tr>
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<tbody>
<tr>
<td>A1C &gt; 9% (%)</td>
<td>24</td>
<td>18</td>
<td>0.003</td>
<td>1.43</td>
<td>15</td>
<td>.0002</td>
<td>1.67</td>
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<tr>
<td></td>
<td>(1.04-2.00)</td>
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<td></td>
<td>(1.11-2.50)</td>
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<td>(1.11-2.50)</td>
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<td>LDL ≥ 100 mg/dl (%)</td>
<td>29</td>
<td>30</td>
<td>0.61</td>
<td>1.08</td>
<td>19</td>
<td>&lt;0.0001</td>
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<td></td>
<td>(0.80-1.45)</td>
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<td></td>
<td>(1.28-2.63)</td>
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<td>(1.28-2.63)</td>
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<tr>
<td>BP ≥ 140/80 mmHg (%) †</td>
<td>51</td>
<td>45</td>
<td>0.01</td>
<td>1.07</td>
<td>33</td>
<td>&lt;0.0001</td>
<td>1.85</td>
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<tr>
<td></td>
<td>(0.81-1.43)</td>
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<td></td>
<td>(1.13-2.50)</td>
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<td>Diabetic complications</td>
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<tr>
<td>Macrovascular#</td>
<td>20</td>
<td>38</td>
<td>&lt;0.0001</td>
<td>0.35</td>
<td>42</td>
<td>&lt;0.0001</td>
<td>0.32</td>
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<tr>
<td></td>
<td>(0.23-0.55)</td>
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<td>(0.20-0.50)</td>
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<td>(0.20-0.50)</td>
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<tr>
<td>Microvascular**</td>
<td>46</td>
<td>59</td>
<td>&lt;0.0001</td>
<td>0.56</td>
<td>61</td>
<td>&lt;0.0001</td>
<td>0.55</td>
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<tr>
<td></td>
<td>(0.41-0.76)</td>
<td></td>
<td></td>
<td>(0.39-0.79)</td>
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<td>(0.39-0.79)</td>
</tr>
</tbody>
</table>

*P value for Haitians versus African Americans.
†Adjusted odds ratio for Haitians versus African Americans.
‡Odds ratios adjusted for age, sex, language (English-speaking/non-English-speaking), and insurance type (Medicaid or Free Care, Medicare, private, and other insurance), number of primary care visits over two years, and having at least one endocrinologist visit over two years. Models for complications are additionally adjusted for BMI, diagnosis of hypertension, and ever having smoked.
§P value for Haitians versus non-Hispanic whites.
‖Adjusted odds ratio for Haitians versus non-Hispanic whites.
#This quality measure selected on the basis of clinical trials which show a reduction in coronary heart disease events, stroke, and nephropathy with blood pressure ≤140/80 (9).
**Macrovascular complications include coronary artery disease, congestive heart failure, ischemic stroke, peripheral vascular disease, and lower extremity ulcers.
Microvascular complications include retinopathy, nephropathy and neuropathy.