The Changing face of Diabetes in African Americans: Urgency for a New Approach

James R. Gavin III, MD, PhD
Clinical Professor of Medicine
Emory University School of Medicine
CEO & Chief Medical Officer
Healing Our Village, Inc.
Atlanta, Georgia
Diabetes favors minorities.

Diabetes strikes one out of three Native American Indians; one out of seven Hispanic Americans; and one out of fourteen Blacks. See your doctor about how you can prevent or control diabetes. And stop this discrimination.

A message from the American Diabetes Association.
The fasting growing ethnic group with diagnosed diabetes is expected to be

Black males 363% from 2000-2050

Black females are second with 217% increase

Prevalence of Diabetes by Ethnicity in Adults—NHANES 1999-2003, CDC 2007

Note: Prevalence is age-sex adjusted. Adults are defined as ≥18 years of age.

Mexican-Americans were evaluated for NHANES 1999-2003 Hispanic population

Cowie et al. Diab Care 2006;29:1263-1268.
Insulin Sensitivity Differs among Ethnic Groups in Healthy Subjects

Insulin Sensitivity Index ($\mu$mol•L$^{-1}$•m$^{-2}$•min$^{-1}$•pmol$^{-1}$•L$^{-1}$)

- **Non-Hispanic White**: n=34
  - 6.87

- **African American**: n=9
  - 5.04

- **Asian American**: n=18
  - 4.17

- **Mexican American**: n=16
  - 3.74

*P =0.002 vs. Caucasians

Incidence of Insulin Resistance

- Increased insulin resistance and higher acute insulin response in non-Hispanic blacks and Hispanics compared with non-Hispanic whites\(^1\)

- Decreased insulin sensitivity and beta-cell function is observed in non-Hispanic black patients with type 2 diabetes or IGT\(^2\)

- These and other defects drive differences in disease expression and outcomes


# Children at risk for Diabetes (% overweight year 2003-2004)\(^1\)

<table>
<thead>
<tr>
<th></th>
<th>Non-hispanic whites (%)</th>
<th>Non-hispanic blacks (%)</th>
<th>Mexican-Americans (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preschoolers</td>
<td>11.5</td>
<td>13</td>
<td>19.2</td>
</tr>
<tr>
<td>(ages 2-5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children</td>
<td>17.7</td>
<td>22</td>
<td>22.5</td>
</tr>
<tr>
<td>(ages 6-11)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adolescents</td>
<td>17.3</td>
<td>21.8</td>
<td>16.3</td>
</tr>
<tr>
<td>(ages 12-19)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- An additional 16.5% of children and teens (age 2-19) are at risk of being overweight (BMI between 85\(^{th}\) to 95\(^{th}\) percentile)
- Several studies observed that 20-30% of obese children have pre-diabetes.\(^2\)

Where is the Science that will “fill in” the critical gaps in our knowledge?

- “Skeletal muscle fat oxidation is increased in African-American and White women after 10 years of endurance exercise training” (2006) R Cortright et al
- “Mitochondrial H$_2$O$_2$ emission and cellular redox state link excess fat intake to insulin resistance in both rodents and humans” (2009) EJ Anderson et al
Percentage of Students in Grades 9-12 who Participated in Vigorous or Moderate Physical Activity During the Past 7 Days

Source: 1997 data CDC/NCHS
Health Disparities
Communities of Color are Disproportionately Affected
DPP: Estimated Racial Difference in A1C* (compared with whites+)

*Using a multiple-regression model adjusting for differences in age, sex, education, marital status, BP, BMI, hematocrit, fasting and post-glucose load glucose levels, glucose AUC, B-cell function, and insulin resistance.

+All comparisons to whites were significant (P<.0001)

n-=3819  ages ≥25 yo with impaired glucose tolerance eligible for DPP

DPP=Diabetes Prevention Program
Herman et al. Diab Care. 2007:30: 2453-2457
Disparities Remain Prevalent---Driving Poor Health Outcomes

- Across many clinical conditions including: cancer, diabetes, end stage renal disease (ESRD), heart disease, mental health, HIV disease, substance abuse, and respiratory diseases
- Across many care settings including: primary care, home health care, hospice care, emergency departments, hospitals, and nursing homes
- Within many subpopulations including: women, children, elderly, residents of rural areas, and individuals with disabilities and other special health care needs
- The true burdens of these disparities are often highly-visible and easily-quantified
Amputations in People With Diabetes: Disparate Outcomes in Three Ethnic Groups

Amputation rates per 10,000 persons with diabetes

White: 50
Hispanic: 120
African-American: 200

End-Stage Renal Disease and Diabetes: Five Ethnic Groups

US national data

New cases of ESRD per million population

Premature Death from Coronary Heart Disease Varies Between Ethnicities

There are Important but Poorly-Understood Pathophysiologic Differences in T2DM Between Ethnic Groups in the USA

- There are likely to be differences in gene susceptibility clusters
- Such differences lead to differences in gene-environment interactions
- Ultimately, we see differences in diabetes prevalence and virulence across groups
- Awareness of such differences should dictate differences in treatment approaches
THE MOST SIGNIFICANT CHANGES THAT DRIVE THE CURRENT TRENDS IN DIABETES AMONG HIGH-RISK MINORITIES HAVE LITTLE TO DO WITH CHANGES IN THE BIOLOGICAL GENES!

OUR FOCUS SHOULD BE SHARPLY ON THOSE ELEMENTS OF \textit{ENVIRONMENT} AND \textit{BEHAVIOR} THAT WE CAN MODIFY---THAT’S WHERE POTENTIAL FOR CHANGE RESIDES, AND DIABETES IS A “POSTER CHILD” FOR THIS CHRONIC DISEASE PARADIGM!
Not one single factor responsible for poor outcomes

- Health Care System-related barriers
  (e.g. access, resources, follow-up)

- Health-care provider-related barriers
  (e.g. training, guidelines, communication)

- Patient-related barriers

Marshall, Flyvbjerg, 2006; De Vries et al. 2004; Wallace, Matthews, 2000
Real Life Disparities: Just one Case!

- 54 yo AA male
- Hypertension, high cholesterol, diabetes, significant family history of DM and heart disease
- Physically active
- Developed left shoulder pain after playing 18 holes of golf one Friday afternoon
- Seen in ED, found to be significantly hyperglycemic, not ketotic, in significant distress; given insulin injection → sent home with basal insulin, Ibuprofen and muscle relaxant
- Little psychosocial support provided
Real Life Disparities

- Admitted to the hospital after later findings showed clear evidence of acute myocardial infarction
- Was not given thrombolytics
- 12 hours later had still not yet seen a cardiologist or had catheterization
- Was not given intensive diabetes therapy with insulin infusion
- After aggressive and unconventional intervention, had 4 vessel bypass surgery on hospital day #2
- Received endocrinology referral for intensification of therapy
- Referred to support group, which he embraced happily!
- Currently is healthy, active, and 25 lbs lighter
## Black and White Differences in Specialty Procedure Utilization Among Medicare Beneficiaries Age 65 and Older, 1993

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Black (procedures per 1,000 beneficiaries per year)</th>
<th>White (procedures per 1,000 beneficiaries per year)</th>
<th>Black-to-White Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angioplasty</td>
<td>2.5</td>
<td>5.4</td>
<td>0.46</td>
</tr>
<tr>
<td>Coronary Artery Bypass Graft Surgery</td>
<td>1.9</td>
<td>4.7</td>
<td>0.40</td>
</tr>
<tr>
<td>Mammography</td>
<td>17.1</td>
<td>26.0</td>
<td>0.66</td>
</tr>
<tr>
<td>Hip Fracture Repair</td>
<td>2.9</td>
<td>7.0</td>
<td>0.42</td>
</tr>
<tr>
<td>Amputation of All or Part of Limb</td>
<td>6.7</td>
<td>1.9</td>
<td>3.64</td>
</tr>
<tr>
<td>Bilateral Orchietomy</td>
<td>2.0</td>
<td>0.8</td>
<td>2.45</td>
</tr>
</tbody>
</table>

Source: Gornick et al., 1996
Potential sources of healthcare disparities

- Health systems-level factors – financing, structure of care; cultural and linguistic barriers
- Patient-level factors – including patient preferences, refusal of treatment, poor adherence, biological differences
- Disparities arising from the clinical encounter itself
Diabetes Care Across Ethnic Groups: Self-Monitoring of Blood Glucose

Use of Intensive Insulin Therapy Across Ethnic Groups

- Non-Hispanic White
- Non-Hispanic African-American
- Mexican-American

† $p < 0.01$

Type 2 Diabetes in Ethnic Minorities: Special Treatment Needs

- Family- or community-based programs
- Culturally appropriate
  - educational materials and educators
  - diet and exercise prescriptions
  - communication about illness
- Economic access to tools of diabetes
How well are we doing with diabetes control in the US?

- Poorly according to CDC
- 57% of diabetics had A1c > 7%
- 32% had BP > 140/90 mmHg
- 36% had LDL > 130 mg/dL
- 1 in 3 did not receive an annual eye exam
- 1 in 2 has not had an annual foot exam

The Bottom Line!

“Less Time, Fewer Resources, More Complex Patients”

“Lack of Culturally Appropriate Messaging!”

“Inadequate Motivation for Changes in Patient Behaviors”
Results from the Diabetes Prevention Program—It is Possible to do Better!

Substantial Reduction in Diabetes in All Race-Ethnic Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Cases per 100 person-years</th>
</tr>
</thead>
<tbody>
<tr>
<td>All participants</td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td></td>
</tr>
<tr>
<td>American Indian</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td></td>
</tr>
</tbody>
</table>

- **Lifestyle**: Lifestyle intervention
- **Metformin**: Metformin treatment
- **Placebo/Standard care**: Placebo or standard care

- It is possible to do better with lifestyle interventions and metformin treatment, reducing diabetes cases significantly in all race-ethnic groups.
“It is not sufficient that we know---we must do.”
__ Goethe

Where must we start? Can Better Education Make a Difference in Outcomes?
Help From Many Sources

“We must do”

- Medical instructions
- Understanding Drugs
- Help with physical activity and meal plans
- Visual demonstrations of many important lessons
- Less focus on WHAT, more focus on HOW!
- Launch of practical approach to diabetes across groups
Medicaid Managed Care Plan
Outcome Data Reporting 2007
(data sample for one clinic)

- Total Referral for All Classes in the Data Period – 1025
- Patients seen in Diabetes Clinic - 225
- Patients attending Diabetes Class/ Individual Follow-up - 94
- 65% of patient referrals attended all classes
- Telephonic outreach to additional 20%

List of Classes
- Diabetes - Sugar Busters
- Lifestyle Changes / Risk Reduction- CFHC- Choices and Changes 1
- Weight Reduction – Choices and Changes 2
- Asthma- Waiting to Exhale
- Pre Natal
- Parenting in the Real World
- Smoking Cessation
- Pediatric Obesity
Demographics for Diabetes Patients

Total Number of Combined Diabetes Patients - 319

Median Age – 54  Age Range – 50-59 had highest number

Females – 80%  Males – 20%

Race/Ethnicity

   African-American - 63%  Latino- 37%

Type 2 diabetes – 100%

Education  - Literacy Level – 3rd grade or less
Household Income of residents - <$16,959
Health Educator Directed Diabetes Care

- Specially trained physician assistant, clinical pharmacist and certified diabetes educator provided group classes and individual follow-up appointments
- Diabetes Clinic- Five days per week. Classes occurred two Saturdays per month

Combined Patients - 319

# Complete Outcome Data
150

# Partial data or lost to follow-up
169 (40%)

Cost Data* Available
2006 - 2007
52 patients

Cost Data analyzed: Hospitalizations, ER, Physician Visits, Specialty Visits, Monitoring Supplies
HEDIS data for the Diabetes class patients

<table>
<thead>
<tr>
<th>HEDIS A1C Categories</th>
<th>Prior to Intervention (%)</th>
<th>After Intervention (%)</th>
<th>% Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 7.0%</td>
<td>30</td>
<td>56</td>
<td>87%</td>
</tr>
<tr>
<td>7.0 - 7.9%</td>
<td>19</td>
<td>29</td>
<td>53%</td>
</tr>
<tr>
<td>8.0 - 8.9%</td>
<td>9</td>
<td>7</td>
<td>22%</td>
</tr>
<tr>
<td>9.0 - 9.9%</td>
<td>9</td>
<td>3</td>
<td>67%</td>
</tr>
<tr>
<td>Greater than 10%</td>
<td>33</td>
<td>5</td>
<td>85%</td>
</tr>
<tr>
<td>A1C &gt; 9.5% - Highest Risk</td>
<td>33</td>
<td>7</td>
<td>79%</td>
</tr>
</tbody>
</table>
Knowledge Tests (CFHC)

There was a **15% increase** in knowledge.

There was a **72% increase** in knowledge.
The entry criteria for the class is an A1C of 8% or greater. The mean A1C prior to the class was 8.7% and the mean A1C after attending the class was 7.1%. This is a 1.6% drop in A1C = 18% improvement in A1C.

Results of paired t-test of pre and post A1C values. The pre-A1C are compared with the post- A1C. The test is the value for each person. The difference in the pre and post value for A1C is significance at the statistical level of alpha = 0.0001.
Prior to attending the classes there were 33% of patients at a goal A1C of 7% or less. After the class the percentage of patients at A1C of 7% increased to 64%.
Blood Pressure Changes:
(Systolic - Mean change - 17 mmHg
Diastolic - Mean change - 12 mmHg

Sugar Busters - Diabetes - Pre and Post Blood Pressures

Mean Difference

Pre Systolic | Post Systolic | Pre Diastolic | Post Diastolic
154 | 137 | 96 | 84
Prior to attending the class 24% of patients were at a goal blood pressure of less than 130/80. After the class 61% of patients had a blood pressure less 130/80.
### Claims Data for ER, Ambulance, Primary Care and Specialty Visits, Hospitalizations, Monitoring Supplies

<table>
<thead>
<tr>
<th>Directed Care</th>
<th>2006</th>
<th>2007</th>
<th>%↑ or ↓</th>
</tr>
</thead>
<tbody>
<tr>
<td>ER and Ambulance</td>
<td>8</td>
<td>3</td>
<td>166% ↓</td>
</tr>
<tr>
<td>Hospitalizations</td>
<td>60</td>
<td>38</td>
<td>58% ↓</td>
</tr>
<tr>
<td>Monitoring Supplies</td>
<td>32</td>
<td>88</td>
<td>175% ↑</td>
</tr>
<tr>
<td>Specialty Visits (Eye, Foot)</td>
<td>42</td>
<td>58</td>
<td>38% ↑</td>
</tr>
<tr>
<td>Primary Care Visits</td>
<td>45</td>
<td>52</td>
<td>15% ↑</td>
</tr>
</tbody>
</table>
**Total Charges for Emergency Room, Ambulance, Physician Visits, Monitoring Supplies, Specialty Visits (Ophthalmology)**

Based on claims data ICD 9 250.XX for 52 patients

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>DSMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>$50,092.55</td>
<td>$37,412.15</td>
</tr>
<tr>
<td>Difference</td>
<td>= $12,680.40</td>
<td></td>
</tr>
<tr>
<td>25% reduction</td>
<td></td>
<td>$243 per patient</td>
</tr>
</tbody>
</table>
Caveats on the Changing Landscape of Diabetes Treatment in Minorities

- Effective glycemic control is one of the best known strategies to reduce diabetes-associated morbidity and mortality --- but we are often missing targets in high-risk minorities.

- Despite the availability of numerous oral agents and various insulins and insulin analogues, clinicians must balance efficacy and side effects (eg, hypoglycemia, weight gain, edema) and respect the axiom that "one size cannot fit all".

- **CULTURAL concerns are real and must be included in care!**

- There is a need for newer insights into the underlying differences in disease behavior which could drive radical changes in the profile of lifestyle interventions and pharmacologic treatment in diabetes--- we need better tools (e.g. need help in the area of obesity).

- Treatment inertia must be rigorously avoided and new strategies adopted urgently for the high-risk -- we must use our insights wisely!
NEVER EVER GIVE UP

Picture supplied by JR Gavin, III, MD, PhD