Author: Kenneth A. Jamerson, M.D., 2009

License: Unless otherwise noted, this material is made available under the terms of the Creative Commons Attribution–Noncommercial–Share Alike 3.0 License: http://creativecommons.org/licenses/by-nc-sa/3.0/

We have reviewed this material in accordance with U.S. Copyright Law and have tried to maximize your ability to use, share, and adapt it. The citation key on the following slide provides information about how you may share and adapt this material.

Copyright holders of content included in this material should contact open.michigan@umich.edu with any questions, corrections, or clarification regarding the use of content.

For more information about how to cite these materials visit http://open.umich.edu/education/about/terms-of-use.

Any medical information in this material is intended to inform and educate and is not a tool for self-diagnosis or a replacement for medical evaluation, advice, diagnosis or treatment by a healthcare professional. Please speak to your physician if you have questions about your medical condition.

Viewer discretion is advised: Some medical content is graphic and may not be suitable for all viewers.
Citation Key
for more information see: http://open.umich.edu/wiki/CitationPolicy

Use + Share + Adapt

{ Content the copyright holder, author, or law permits you to use, share and adapt. }

Public Domain – Government: Works that are produced by the U.S. Government. (17 USC § 105)
Public Domain – Expired: Works that are no longer protected due to an expired copyright term.
Public Domain – Self Dedicated: Works that a copyright holder has dedicated to the public domain.
Creative Commons – Zero Waiver
Creative Commons – Attribution License
Creative Commons – Attribution Share Alike License
Creative Commons – Attribution Noncommercial License
Creative Commons – Attribution Noncommercial Share Alike License
GNU – Free Documentation License

Make Your Own Assessment

{ Content Open.Michigan believes can be used, shared, and adapted because it is ineligible for copyright. }

Public Domain – Ineligible: Works that are ineligible for copyright protection in the U.S. (17 USC § 102(b)) *laws in your jurisdiction may differ

{ Content Open.Michigan has used under a Fair Use determination. }

Fair Use: Use of works that is determined to be Fair consistent with the U.S. Copyright Act. (17 USC § 107) *laws in your jurisdiction may differ

Our determination DOES NOT mean that all uses of this 3rd-party content are Fair Uses and we DO NOT guarantee that your use of the content is Fair.

To use this content you should do your own independent analysis to determine whether or not your use will be Fair.
Identifying Issues and Overcoming Barriers: Hypertension in African Americans

Kenneth A Jamerson, M.D.
Professor of Cardiovascular Medicine
University of Michigan Health System
Medical Director, Program for Multi-cultural Health

Fall 2008
Hypertension in African Americans

- African Americans develop HTN earlier in life and their average BPs are much higher
- Prevalence of HTN in African Americans in US is among the highest in the world
- African American have increased Target Organ Damage compared with whites
  - 4.2X greater rate of ESRD
  - 1.8X greater rate of fatal stroke
  - 1.5X greater rate of heart disease death

References:
Heart Disease and Stroke Statistics- 2005 Update, AHA.
The Tecumseh Blood Pressure Study

A prospective epidemiological study of the antecedents of hypertension and cardiovascular disease in 1100 young men and women
Tecumseh BP Study: Association of DBP and Other CHD Risk Factors

n = 124 (aged 18-38 years)


BLOOD PRESSURE TRENDS IN TECUMSEH, MI

Hypertensive and Normotensive at 31 Years of Age

Blood Pressure mmHg

- Hypertensive
- Normotensive

* P< .01
** P< .001

Insulin Resistance Syndrome

- Excessive caloric intake
- Inherited genetic defect
- Obesity
- Insulin resistance
- NIDDM
- Hyperinsulinemia
- Hypertension
- Atherosclerosis
- Hypertriglyceridermia
- Hypercholesterolemia
- Decreased HDL-C

DeFronzo RA, Ferrannini E. Diabetes Care 1991;14:173-194. © ADA.
TREATMENT

Lifestyle

• Know your caloric needs to achieve and maintain a healthy weight.
• Know the calorie content of the foods and beverages you consume.
• Track your weight, physical activity, and calorie intake.
• Prepare and eat smaller portions.
• Track and, when possible, decrease screen time (eg, watching television, surfing the Web, playing computer games).
• Incorporate physical movement into habitual activities.
• Do not smoke or use tobacco products.
• If you consume alcohol, do so in moderation (equivalent of no more than 1 drink in women or 2 drinks in men per day).
Impact of Surgery For Obesity

- Weight had increased by 1.6% in the control group and decreased by 16.1% in the surgical group.
- Calorie intake was lower and physical activity was higher in the surgery group than in the control group.
- Recovery from high blood pressure, diabetes, high triglyceride levels, and a low HDL ('good') cholesterol level was more frequent in the surgical group than in the control group, both at 2 and 10 years.
- After 10 years diabetes had developed in 24% of those in the non-surgery group and 7% in the surgery group.
# Potential Drugs for Metabolic Syndrome

<table>
<thead>
<tr>
<th>LIPIDS</th>
<th>HTN</th>
<th>DIAB</th>
<th>OBESE</th>
<th>coag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stains</td>
<td>Diuretic</td>
<td>SU</td>
<td>orlistat</td>
<td>ASA</td>
</tr>
<tr>
<td>ezetimibe</td>
<td>Ace/Arb</td>
<td>MF</td>
<td>sibutramine</td>
<td>clopid</td>
</tr>
<tr>
<td>Bile seq</td>
<td>a block</td>
<td>ins</td>
<td>rimonabant</td>
<td></td>
</tr>
<tr>
<td>niacin</td>
<td>Bblock</td>
<td>gilt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>fibrate</td>
<td>CCB</td>
<td>PPG reg</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>incentins</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
INCIDENCE OF HYPERTENSION IN BLACK AND WHITE POPULATIONS BY AGE AND SEX
Leading Causes of Death for African American Males and Females

A = Total CVD
B = Cancer
C = Accidents
D = Assault (Homicide)
E = HIV (AIDS)
F = Diabetes Mellitus
G = Nephritis, Nephrotic Syndrome, and Nephrosis

CVD=cardiovascular disease.

Estimated Life Expectancy: 2001

- AA Males: 68.6 years
- White Males: 75.0 years
- AA Females: 75.5 years
- White Females: 80.2 years

Is There a Unique Etiology for Hypertension in African Americans?
### Repeated Observations on Racial Differences in the Pathophysiology of Hypertension

<table>
<thead>
<tr>
<th>Variable of Interest</th>
<th>Black vs. White</th>
<th>Family History</th>
<th>Genetic Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normotensive</td>
<td>Hypertensive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td>White</td>
<td></td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>Black</td>
<td>White</td>
</tr>
<tr>
<td>Kidney:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creatinine clearance</td>
<td>B = W</td>
<td>B &lt; W</td>
<td>?</td>
</tr>
<tr>
<td>Renal blood flow</td>
<td>?</td>
<td>B &lt; W</td>
<td>?</td>
</tr>
<tr>
<td>Excretion of Na⁺ load</td>
<td>B &lt; W</td>
<td>B &lt; W</td>
<td>?</td>
</tr>
<tr>
<td>Increase BP with Na⁺ load</td>
<td>B &gt; W</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Decrease BP with low Na⁺</td>
<td>B &gt; W</td>
<td>B &gt; W</td>
<td>?</td>
</tr>
<tr>
<td>Fractional Excret. Li⁺</td>
<td>B = W</td>
<td>B = W</td>
<td>?</td>
</tr>
<tr>
<td>Plasma Renin Activity</td>
<td>B &lt; W</td>
<td>B &lt; W</td>
<td>+ &gt; –</td>
</tr>
<tr>
<td>Aldosterone</td>
<td>B = W</td>
<td>B = W</td>
<td>?</td>
</tr>
<tr>
<td>Sympathetic (UNE/PNE)</td>
<td>B = W</td>
<td>B = W</td>
<td>+ = –</td>
</tr>
<tr>
<td>Response to Stressors</td>
<td>B = W</td>
<td>B &gt; W</td>
<td>+ &gt; –</td>
</tr>
<tr>
<td>Dopamine β-Hydroxylase</td>
<td>B &lt; W</td>
<td>B &lt; W</td>
<td>?</td>
</tr>
<tr>
<td>Kallikrein</td>
<td>B &lt; W</td>
<td>B &lt; W</td>
<td>+ &gt; –</td>
</tr>
<tr>
<td>Red Cell Transport</td>
<td>B &lt; W</td>
<td>B &lt; W</td>
<td>?</td>
</tr>
<tr>
<td>Atrial Natriuretic Factor</td>
<td>?</td>
<td>B &gt; W</td>
<td>?</td>
</tr>
<tr>
<td>Natriuretic Hormone</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>

+ = family history positive for hypertension; - = family history negative; = = groups are similar; BP = blood pressure; UNE = urinary norepinephrine; PNE = plasma norepinephrine; ? = unknown

Physiologic Differences Between Blacks and Whites

- Plasma Renin Activity
- Renal Function
- Vascular Reactivity
- Sodium Sensitivity
- Expanded Plasma Volume
Ethnicity and Plasma Volume in Hypertension

• 172 consecutive cases were examined

• Arbitrary cut point for plasma volume were established

• Subject with normal plasma volume were excluded for the analysis

Source: Chysant 1979
African American Study of Kidney Disease and Hypertension
### Achieved Blood Pressure in AASK

<table>
<thead>
<tr>
<th></th>
<th>ACE</th>
<th>CCB</th>
<th>BB</th>
<th>LOW</th>
<th>USUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SBP</strong></td>
<td>133.6</td>
<td>131.4</td>
<td>134.2</td>
<td>126.9</td>
<td>140.0</td>
</tr>
<tr>
<td><strong>DBP</strong></td>
<td>81.1</td>
<td>80.7</td>
<td>80.9</td>
<td>76.6</td>
<td>85.2</td>
</tr>
<tr>
<td><strong>Need for Step 5</strong></td>
<td>28%</td>
<td>24%</td>
<td>32%</td>
<td>35%</td>
<td>23%</td>
</tr>
</tbody>
</table>

K. Jamerson
Incidence of Renal Events and Death: AASK

GFR, glomerular filtration rate; ESRD, end-stage renal disease; RR, adjusted risk reduction.

*P=0.005 (95% CI, 13-56%); †P=0.007 (95% CI, 14-60%).

IMPLICATIONS OF THE AASK STUDY

- Aggressive control of blood pressure can eliminate ethnic differences in ESRD
- Inadequate treatment of hypertension may cause excess risk of target organ disease.
- Cultural rather than genetic differences may underlay the excess risk of hypertensive ESRD
• ARE OTHER ETHNIC GROUPS AT RISK FOR CARDIOVASCULAR DISEASE?
Prevalence of MI in Asian Indians Living in the U.S.: Introduction

• Approx. 1.9 million Asian Indians currently live in the United States and are one of the fastest growing ethnic minorities in this country

• Data on epidemiology of MI in this community is very limited

• Present study estimates the prevalence of MI and associated risk factors in this group

Prevalence of MI in Asian Indians Living in the U.S. -- Results

• Total population surveyed—1046 adults*

• 537 men (51.3%), 509 women (48.7%)
  – sex ratio- 1.06

• Mean age of the population 53.7 yrs (± 11.3 yrs)
  – ages ranged from 17 to 87 yrs

• Mean age for men 53.7 yrs (± 11.3 yrs);
  women 51.9 yrs (± 11.3 yrs)

*Members of Bochasanwasi Shri Akshar Purushottam Swaminarayan Sanstha, a prominent Hindu sect

Asian Indians Living in the U.S. -- Prevalence of MI and Risk Factors

<table>
<thead>
<tr>
<th>Condition</th>
<th>Population, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI</td>
<td>6.5%</td>
</tr>
<tr>
<td>HTN</td>
<td>23.7%</td>
</tr>
<tr>
<td>DM</td>
<td>18.2%</td>
</tr>
<tr>
<td>Stroke</td>
<td>2.8%</td>
</tr>
<tr>
<td>HCO</td>
<td>18.5%</td>
</tr>
<tr>
<td>ESRD</td>
<td>2.6%</td>
</tr>
</tbody>
</table>

Prevalence of MI in Asian Indians Living in the U.S. -- Distribution of Risk Factors in MI and Control Group

- HTN*
- DM*
- CHOL*
- Stroke*
- ESRD*

Population, %

*P < 0.001

Prevalence of MI: Data from India

• In two large studies from New Delhi, India, the prevalence of MI between ages 25–64 was 1.05%

• Prevalence among Asian Indian immigrants to the U.S. was 5.31% in this age group

Sources:
Conclusions

- Prevalence of MI among Asian Indians in the United States is higher than in India.
- It approaches the same level as whites and slightly higher than Hispanics and blacks in the United States.
- HTN, HCO, DM, ESRD, stroke and FH of MI were independent risk factors for MI in this group.

Models to explain Health Disparities

- **Racial Genetic Model**
  - Cause of HD: population differences in the distribution of *genetic variants*

- **Health-behavior Model**
  - Cause of HD: differences between R/E groups in the distribution of *individual behaviors* related to health such as diet, exercise, and tobacco use

- **SES Model**
  - Cause of HD: over-representation of some R/E groups within *lower SES*

- **Psychosocial Stress Model**
  - Cause of HD: stresses associated with minority group status, especially the experience of racism and discrimination
Race
(social)

Disease

Ancestry
(genetic)
Although much genetic variation (85-90%) is shared among all human populations, about 5% of SNPs have high levels of allele frequency differential ($\delta > 50\%$). We call these markers Ancestry Informative Markers (AIMs).
Disease gene identification may be facilitated if we know which parts of the genome the cases and controls have inherited at a disproportionate rate from one of the parental populations.

Patterson et al. AJHG 74, 2004
Era of Genomic Ancestry and challenges related to Health.

1. Group definition and membership.

2. Can we accurately assess genomic ancestry?

3. How does genomic ancestry relate to skin color and possibly SES?

4. How useful is genomic ancestry for informing us about disease risk?

5. Health Disparities: are they due to biological differences?

6. How do we prevent repeating the negative past abuses of “race”?
Semhur adapted from Francois Nancy (wikipedia)
The Future

Whole genome Association

Population Genomics

HuGENet

Pharmacogenomics

Gene Expression

Proteomics

Model Systems
Additional Source Information
for more information see: http://open.umich.edu/wiki/CitationPolicy

Slide 5: Source Undetermined
Slide 11: K. Jamerson
Slide 12: Source Undetermined
Slide 15: NEJM 322:173
Slide 19: Source: Chysant 1979
Slide 21: K. Jamerson
Slide 22: Source Undetermined
Slide 33: K. Jamerson
Slide 35: Patterson et al. AJHG 74, 2004