Racial and Ethnic Disparities in Obesity

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AMERICAN BOARD OF OBESITY MEDICINE DIPLOMATE
Objectives

Discuss racial and ethnic disparities in the prevalence, treatment, and pathophysiology of obesity.

Explore issues surrounding obesity and socioeconomic status, education level, weight perception, provider diagnosis, and medical expenditures in obesity.

Understand differences in response to treatment of racial and ethnic minorities with regards to pharmacotherapy and weight loss surgery.
Body Mass Index Calculation

**Metric measurements:**

\[
\text{Weight (kg)} \div \text{Height (m)}^2
\]

**English measurements:**

\[
\text{Weight (lb)} \times 703 \div \text{Height (in)}^2
\]

How is Obesity defined in Adults?

<table>
<thead>
<tr>
<th>Weight Status Category</th>
<th>Body Mass Index (BMI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>&lt;18.5</td>
</tr>
<tr>
<td>Normal Weight</td>
<td>18.5-24.9</td>
</tr>
<tr>
<td>Overweight</td>
<td>25-29.9</td>
</tr>
<tr>
<td>Class I Obesity</td>
<td>30-34.9</td>
</tr>
<tr>
<td>Class II Obesity</td>
<td>35-39.9</td>
</tr>
<tr>
<td>Class III Obesity</td>
<td>≥40</td>
</tr>
</tbody>
</table>
The History of State Obesity Prevalence

1985

CDC

No Data  <10%  10%-14%  15%-19%  20%-24%  25%-29%  ≥30%
The History of State Obesity Prevalence

1986

CDC

Map showing state obesity prevalence in 1986.

Legend:
- No Data
- <10%
- 10%-14%
- 15%-19%
- 20%-24%
- 25%-29%
- ≥30%
The History of State Obesity Prevalence

1987

CDC

No Data

<10%
10%–14%
15%–19%
20%–24%
25%–29%
≥30%
The History of State Obesity Prevalence

1988

CDC

No Data <10% 10%-14% 15%-19% 20%-24% 25%-29% ≥30%
The History of State Obesity Prevalence
The History of State Obesity Prevalence

1991

[Map showing state obesity prevalence with color coding]

- No Data
- <10%
- 10%-14%
- 15%-19%
- 20%-24%
- 25%-29%
- ≥30%

[Logos and affiliations]
The History of State Obesity Prevalence

1992

CDC

No Data  <10%  10%-14%  15%-19%  20%-24%  25%-29%  ≥30%

MGH 1811
The History of State Obesity Prevalence

1993

CDC

No Data  <10%  10%-14%  15%-19%  20%-24%  25%-29%  ≥30%
The History of State Obesity Prevalence

1994

CDC

No Data  <10%  10%-14%  15%-19%  20%-24%  25%-29%  ≥30%

No Data  <10%  10%-14%  15%-19%  20%-24%  25%-29%  ≥30%

Map of the United States showing obesity prevalence by state in 1994.
The History of State Obesity Prevalence
The History of State Obesity Prevalence
The History of State Obesity Prevalence
The History of State Obesity Prevalence
The History of State Obesity Prevalence

1999

CDC

No Data     <10%     10%-14%     15%-19%     20%-24%     25%-29%     ≥30%
The History of State Obesity Prevalence
The History of State Obesity Prevalence

2001

No Data  <10%  10%-14%  15%-19%  20%-24%  25%-29%  ≥30%

[Map showing obesity prevalence by state in 2001, with color codes indicating different prevalence ranges.]
The History of State Obesity Prevalence
The History of State Obesity Prevalence

2003

CDC

No Data | <10% | 10%–14% | 15%–19% | 20%–24% | 25%–29% | ≥30%

Map showing state obesity prevalence with different color codes for different percentage ranges.
The History of State Obesity Prevalence
The History of State Obesity Prevalence

2005

CDC

No Data  <10%  10%-14%  15%-19%  20%-24%  25%-29%  ≥30%

Map of the United States showing obesity prevalence by state in 2005.
The History of State Obesity Prevalence

2006

CDC

2006

No Data <10% 10%-14% 15%-19% 20%-24% 25%-29% ≥30%
The History of State Obesity

2007

CDC

No Data <10% 10%-14% 15%-19% 20%-24% 25%-29% ≥30%

MAP DESCRIPTION NEEDS TO BE ADDED
The History of State Obesity Prevalence

2008

CDC

No Data <10% 10%-14% 15%-19% 20%-24% 25%-29% ≥30%

[Map of the United States showing obesity prevalence by state in 2008]
The History of State Obesity Prevalence

2009

No Data <10% 10%-14% 15%-19% 20%-24% 25%-29% ≥30%
The History of State Obesity Prevalence

2010

CDC

No Data <10% 10%-14% 15%-19% 20%-24% 25%-29% ≥30%

Map of the United States showing obesity prevalence by state in 2010.
The History of State Obesity Prevalence

2010

CDC

No Data
<10%
10%-14%
15%-19%
20%-24%
25%-29%
≥30%

MHG 1811
Prevalence\(^1\) of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2011

\(^1\) Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.

*Sample size <50 or the relative standard error (dividing the standard error by the prevalence) ≥ 30%.
Prevalence of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2012
Prevalence of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2013
Prevalence of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2014
Prevalence of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2015
Prevalence of Self-Reported Obesity Among Non-Hispanic White Adults, by State and Territory, BRFSS, 2013-2015
Prevalence of Self-Reported Obesity Among Hispanic Adults, by State and Territory, BRFSS, 2013-2015
Prevalence of Self-Reported Obesity Among Non-Hispanic Black Adults, by State and Territory, BRFSS, 2013-2015
Mean (95% CI) abdominal visceral adipose tissue (VAT) area (top panels) and subcutaneous adipose tissue (SAT) area (bottom panels) in African American and white men and women aged <45 and ≥45 y.
Energy Balance (simple)
Energy Balance (simple)
All Calories are NOT created EQUAL
Obesity: A Multi-factorial Disorder

Genetics

Environment

Development

Behavior
Regulation of Food Intake

http://www.cellbiol.net/ste/alpobesity2.php
Regulation of Food Intake

Higher cortical centres governing food intake

Orexigenic signal
Increased food intake

BDNF

Anorexigenic signal
Decreased food intake

NTRK2

PVN

MC4R

MC4R

MC4R

α-MSH

α-MSH

ARC

AGRP neuron

LEPR

POMC neuron

Leptin

Hypothalamus

Nature Reviews Genetics 10, 431-442 (July 2009)
Central Nervous System regulates weight
BDNF Regulation and Obesity

Genome-wide analysis - African-specific variant in SEMA4D associated with body mass index
Foreign Born Persons Have Lower Likelihood of Obesity than those Born in the US

National Health Interview Survey 1997-2005

<table>
<thead>
<tr>
<th>Ethnicity/Nativity Status</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Born White</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>US Born Black</td>
<td>1.4</td>
<td>2.09</td>
</tr>
<tr>
<td>US Born Hispanic</td>
<td>1.53</td>
<td>1.51</td>
</tr>
<tr>
<td>Foreign Born White</td>
<td>0.63</td>
<td>0.62</td>
</tr>
<tr>
<td>Foreign Born Black</td>
<td>0.55</td>
<td>1.22</td>
</tr>
<tr>
<td>Foreign Born Hispanic</td>
<td>0.72</td>
<td>0.83</td>
</tr>
</tbody>
</table>

Barrington DS et al. Obesity 2010
Obesity Rates Increase as Income Decreases in Women in the US

- **Non-Hispanic White**
  - Low Income: 27%
  - Middle Income: 39%
  - High Income: 38%

- **Non-Hispanic Black**
  - Low Income: 55%
  - Middle Income: 52%
  - High Income: 48%

- **Mexican American**
  - Low Income: 45%
  - Middle Income: 46%
  - High Income: 35%

Ogden CL et al. NCHS Data Brief 2010
Non-Hispanic Black and Mexican American Men have Higher Obesity Rates at Higher Income Levels

Ogden CL et al. NCHS Data Brief 2010
Non-Hispanic Black Men Who Graduate From College or High School Have More Obesity

![Bar chart showing obesity rates by ethnicity and education level.]

- **Non-Hispanic White**
  - College Grad: 35%
  - Some College: 34%
  - High School Grad: 28%
  - <High School: 34%

- **Non-Hispanic Black**
  - College Grad: 41%
  - Some College: 35%
  - High School Grad: 31%
  - <High School: 43%

- **Mexican American**
  - College Grad: 34%
  - Some College: 36%
  - High School Grad: 33%
  - <High School: 29%

Ogden CL et al. NCHS Data Brief 2010
Non-Hispanic Black Men and Women are more Likely to Underestimate BMI

Comparison of self-described BMI with measured BMI

<table>
<thead>
<tr>
<th></th>
<th>US Men</th>
<th>US Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic White</td>
<td>55%</td>
<td>22%</td>
</tr>
<tr>
<td>Non-Hispanic Black</td>
<td>65%</td>
<td>62%</td>
</tr>
</tbody>
</table>

Hendley Y et al. Journal of Women’s Health 2002
Ethnic Minority Adolescents are More Likely to have Discordant Weight Perception

<table>
<thead>
<tr>
<th>Race/ Ethnicity</th>
<th>% with Discordant Weight Perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic White</td>
<td>27%</td>
</tr>
<tr>
<td>Native American</td>
<td>34%</td>
</tr>
<tr>
<td>Non-Hispanic Black</td>
<td>31%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>32%</td>
</tr>
<tr>
<td>Asian/ Pacific Islander</td>
<td>31%</td>
</tr>
<tr>
<td>Mixed Race</td>
<td>31%</td>
</tr>
</tbody>
</table>

Park E. Journal of School Health 2011
Ethnic Minorities are Less Commonly Diagnosed as Overweight/Obese

**NHANES 1999-2004 for Persons with BMI >30**

<table>
<thead>
<tr>
<th>Race/ Ethnicity</th>
<th>Odd Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic White</td>
<td>1.0</td>
</tr>
<tr>
<td>Non-Hispanic Black</td>
<td>0.6</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Davis NJ et al. Obesity 2009
Ethnic Minorities have Smaller Response to Weight Loss Pharmacotherapy

<table>
<thead>
<tr>
<th></th>
<th>Sibutramine</th>
<th>Orlistat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic Whites</td>
<td>-4.4kg</td>
<td>-2.8 kg</td>
</tr>
<tr>
<td>Ethnic Minorities</td>
<td>-2.7 kg</td>
<td>-2.3 kg</td>
</tr>
</tbody>
</table>

Osei-Assibey et al. Diabetes, Obesity, and Metabolism 2011
African-Americans Achieve Less Weight Loss After Bariatric Surgery

Mean Absolute Difference in Estimated Weight Loss in Caucasians versus African-Americans

-8.4%

% Estimated Weight Loss

Admiraal WM et al. Diabetes Care 2012
Potential Reasons for Ethnic Disparities in Obesity

- ↑↑ Energy Intake
- ↓ Energy Expenditure
- ↑↑ Life Stressors
  - Racism
  - Lack of Career Options
  - Family Illness/ Death
- Cultural Influences
- Genetics

Johnston DW et al. Demography 2011
Johnson P et al. ABNF 2012
Factors which affect access to weight loss surgery

Factors:
- Race
- Age
- Sex
- SES
- Location
- Referral

Jackson et al. Systematic Reviews 2014, 3:15
Access to RYGB in the United States

108,333 patients
- 79% white
- 12% black
- 9% Hispanic

Black patients
- Higher BMI
- More likely to have HTN

Serious Adverse Events
- Higher in Blacks (3.65%)
- Hispanics (3.19%)
- Whites (2.01%)

Are minorities less likely to proceed with weight loss surgery?

- 651 patients at 2 academic medical centers in Boston
- Evaluated whether racial and ethnic minorities were less likely to proceed with weight loss surgery
- Once referred, racial and ethnic minorities just as likely to proceed with surgery as their non-white counterparts
- Comorbid illness burden was similar, but there was difference in baseline BMI

Stanford FC et al. Surgical Endoscopy 2015
What accounts for difference in response from weight loss surgery?

- Demographics
- Clinical (BMI, comorbidities, QOL)
- Behavioral (Eating, PA, ETOH intake)

Wee CC et al. Obesity Surgery 2017
Case #1

- 58 year old African-American woman
- **Past medical history:**
  - Hypertension
  - GERD
  - Depression
- **Diet**
  - Breakfast: Scrambled eggs with spinach, onions, peppers, or sausage; OR Oatmeal with nuts/ blueberries/ blackberries
  - Snack: Fruit; Protein Bar (KIND bars of Jif creamy peanut butter)
  - Lunch: Leftovers (Baked chicken, vegetables, brown rice)
  - Snack: Almonds, Protein Bar
  - Dinner: Baked chicken, vegetables, brown rice
- **Exercise:** 4 days a week (1 hour); 2 days of cardio; 2 days of strength (meets with trainer twice a week)
- **Sleep:** 6-7 hours (feels well rested)
- **Stress:** Normal
- **Post partum weight retention; Night Shift Nurse for 4 years**
58 year old woman

BMI: 34
82% EBWL/22% TBWL
Phentermine + Topiramate

Weight (pounds)

Date

Case #2

49 year old Hispanic woman

Past medical history:
- Anxiety/Depression
- Ventricular tachycardia s/p ablation
- Mixed connective tissue disease
- Hypertension
- GERD

Diet:
- Breakfast: Fruit, Vitamins
- Snack: Vitamin Water, Sobe Life Water, Fruit
- Lunch: Lettuce (romaine and iceberg); cheese; ham, tomato, peppers, lite Italian dressing, OR vinegar/oil
- Snack: Fruit (sometimes)
- Dinner: Spinach, Smart Ones
- Snack: Denies

Exercise: Walking, some form of cardio, Walks 5 miles a day, Goes to Planet Fitness (Elliptical); Zumba (1 times per day; 7 days a week)

Weight gain became prominent after childbirth (10 lbs. with each pregnancy X6); tobacco cessation, with metoprolol
49 year old woman

BMI: 52
87.3% EBWL/45% TBWL
150 lbs (BMI of 25)
BMI: 26.5
Case #3

- 67 year old African-American woman

**Past medical history:**
- Type 2 Diabetes Mellitus
- Hypertension
- CAD
- CHF
- NASH
- Breast Cancer
- GERD

**Diet:**
- Breakfast: Regular Yogurt with Fruit (may snack)
- Snack: Occasionally popcorn
- Lunch: Chicken or Fish with vegetables and/or fruit
- Snack: Fruit (apple, oranges, and watermelon)
- Dinner: Fish (Haddock, Tilapia) or Chicken with occasional vegetables
- Snack: Nuts

**Exercise:** Walking, some form of cardio; 1/2 hour per day; joined a gym (started on the treadmill)

Weight gain became prominent in peri-menopause
67 year old woman s/p VSG

BMI: 40

BMI: 23.5

109% EBWL/
45% TBWL

155 lbs (BMI of 25.5)
Summary

- Obesity is a multifactorial disease process
- Regulation of food intake is complex
- ↑ Prevalence of Obesity in Ethnic Minorities
- ↓ Prevalence of Obesity in Foreign Born
- Persons vary with response to education level and obesity
- Ethnic Minorities are more likely to have discordant weight perception
- Health Care Providers are less likely to diagnose ethnic minorities with overweight/obesity
- Ethnic minorities have less pronounced response to weight loss surgery and pharmacotherapy
Action Items

- Steps should be taken to ascertain etiology of higher prevalence of obesity in ethnic minorities
- Health care providers should be more vigilant about giving appropriate diagnosis of overweight/obesity in ethnic minorities
- Strategies should be employed to address disparities in prevention and treatment of obesity in ethnic minorities