Obesity: Understanding the Risk & Underwriting the Epidemic

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(Genworth Financial, Inc)
Obesity – Agenda (Dr. MacDonnell)

- Definition
- US statistics
- Estimated healthcare costs
- Pathophysiology
- Risk factors
- Morbidity concerns
Obesity – excess body fat

- Measured by
  - Body Mass Index (BMI)
    - Quick, easy, reliable
    - Metric BMI
      - $BMI = \frac{Wt(kgs)}{Ht(m) \times Ht(m)}$
    - English BMI
      - $BMI = \frac{Wt(lbs)}{Ht(in) \times Ht(in)} \times 703$
  - Waist Circumference (WC)
• BMI correlates to percentage of body fat but *does not directly measure* body fat
  – Ex: Arnold Schwarzenegger

• At identical BMIs
  – Women tend to have more body fat than men
  – Older people tend to have more body fat than younger people
Obesity - Definition

• Underweight  
  BMI $<18.5$ (kg/m$^2$)

• Normal weight  
  BMI $18.5 - 24.9$ (kg/m$^2$)

• Overweight  
  BMI $25 - 29.9$ (kg/m$^2$)

• Obese
  – Class I  
    BMI $30 - 34.9$ (kg/m$^2$)
  – Class II  
    BMI $35 - 39.9$ (kg/m$^2$)
  – Class III  
    BMI $\geq 40$ (kg/m$^2$)
    *(Severe, extreme, morbid)*
Obesity – Waist Circumference (WC)

- Central adiposity is associated with an increased risk of morbidity and mortality
  - Risk factor for heart disease, diabetes, hypertension, and dyslipidemia
- Elevated WC
  - Men > 40in
  - Women > 35 in
• National Health and Nutrition Examination Survey (2009-2010)
  – Cross-sectional survey, non-institutionalized US population

• Over 78 Million adult Americans are obese

• 35.7% of US adults are obese

• 17% (12.5M) ages 2-19 years are obese
Obesity Trends* Among U.S. Adults
BRFSS, 1990, 2000, 2010
(*BMI ≥30, or about 30 lbs. overweight for 5’4” person)

1990

2000

2010

Source: http://www.cdc.gov/obesity/data/trends.html

Obesity - Underwriting the Epidemic
In 2009–2010, over 78 million U.S. adults and about 12.5 million U.S. children and adolescents were obese.

Almost 41 million women and more than 37 million men aged 20 and over were obese in 2009–2010 (Figure 3). Among children and adolescents aged 2–19, more than 5 million girls and approximately 7 million boys were obese.

Figure 3. Number of obese individuals: United States, 2009–2010

Figure 4. Trends in the prevalence of obesity among adults aged 20 and over, by sex: United States, 1999–2010

Women

Men¹

¹Significant increasing linear trend 1999–2000 to 2009–2010 (p < 0.0001).

NOTE: Estimates were age adjusted by the direct method to the 2000 U.S. Census population using the age groups 20–39, 40–59, and 60 and over. SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, 2009–2010.
Figure 5. Trends in the prevalence of obesity among children and adolescents aged 2–19, by sex: United States, 1999–2010

1Significant increasing linear trend 1999–2000 to 2009–2010 (p < 0.05).

Session 24: Obesity: Understanding the Risk
• Between 1999-2000 and 2009-2010 the prevalence of obesity increased among men but not among women

• Between 1999-2000 and 2009-2010 the prevalence of obesity increased among boys but not among girls

• Is the prevalence of obesity beginning to level off?
Obesity Prevalence* of Self-Reported Obesity Among U.S. Adults

*Prevalence reflects BRFSS methodological changes in 2011, and these estimates should not be compared to previous years.

Source: Behavioral Risk Factor Surveillance System, CDC.
## Prevalence of Self-Reported Obesity Among U.S. Adults (BRFSS, 2011)

<table>
<thead>
<tr>
<th>State</th>
<th>Prevalence</th>
<th>Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>32.0</td>
<td>(30.5, 33.5)</td>
</tr>
<tr>
<td>Alaska</td>
<td>27.4</td>
<td>(25.3, 29.7)</td>
</tr>
<tr>
<td>Arizona</td>
<td>24.7</td>
<td>(22.7, 26.9)</td>
</tr>
<tr>
<td>Arkansas</td>
<td>30.9</td>
<td>(28.8, 33.1)</td>
</tr>
<tr>
<td>California</td>
<td>23.8</td>
<td>(22.9, 24.7)</td>
</tr>
<tr>
<td>Colorado</td>
<td>20.7</td>
<td>(19.7, 21.8)</td>
</tr>
<tr>
<td>Connecticut</td>
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<td>(23.0, 26.0)</td>
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<tr>
<td>Delaware</td>
<td>28.8</td>
<td>(26.9, 30.7)</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>23.7</td>
<td>(21.9, 25.7)</td>
</tr>
<tr>
<td>Florida</td>
<td>26.6</td>
<td>(25.4, 27.9)</td>
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<tr>
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<td>28.0</td>
<td>(26.6, 29.4)</td>
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<tr>
<td>Hawaii</td>
<td>21.8</td>
<td>(20.4, 23.4)</td>
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<tr>
<td>Idaho</td>
<td>27.0</td>
<td>(25.3, 28.9)</td>
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<td>Illinois</td>
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<td>Kansas</td>
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<td>(28.7, 30.4)</td>
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<td>Kentucky</td>
<td>30.4</td>
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<td>Louisiana</td>
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<td>Maine</td>
<td>27.8</td>
<td>(26.8, 28.9)</td>
</tr>
<tr>
<td>Maryland</td>
<td>28.3</td>
<td>(26.9, 29.7)</td>
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<tr>
<td>Massachusetts</td>
<td>22.7</td>
<td>(21.8, 23.7)</td>
</tr>
<tr>
<td>Michigan</td>
<td>31.3</td>
<td>(30.0, 32.6)</td>
</tr>
<tr>
<td>Minnesota</td>
<td>25.7</td>
<td>(24.6, 26.8)</td>
</tr>
<tr>
<td>Mississippi</td>
<td>34.9</td>
<td>(33.5, 36.3)</td>
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</table>

<table>
<thead>
<tr>
<th>State</th>
<th>Prevalence</th>
<th>Confidence Interval</th>
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<tbody>
<tr>
<td>Missouri</td>
<td>30.3</td>
<td>(28.6, 32.0)</td>
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<td>Montana</td>
<td>24.6</td>
<td>(23.3, 26.0)</td>
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<td>Nebraska</td>
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<td>(27.6, 29.2)</td>
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<td>Nevada</td>
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<td>(22.5, 26.6)</td>
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<td>New Hampshire</td>
<td>26.2</td>
<td>(24.7, 27.7)</td>
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<td>New Jersey</td>
<td>23.7</td>
<td>(22.7, 24.8)</td>
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<tr>
<td>New Mexico</td>
<td>26.3</td>
<td>(25.1, 27.6)</td>
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<tr>
<td>New York</td>
<td>24.5</td>
<td>(23.2, 25.9)</td>
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<td>North Carolina</td>
<td>29.1</td>
<td>(27.7, 30.6)</td>
</tr>
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<td>North Dakota</td>
<td>27.8</td>
<td>(26.3, 29.4)</td>
</tr>
<tr>
<td>Ohio</td>
<td>29.6</td>
<td>(28.3, 31.0)</td>
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<td>Oklahoma</td>
<td>31.1</td>
<td>(29.7, 32.5)</td>
</tr>
<tr>
<td>Oregon</td>
<td>26.7</td>
<td>(25.2, 28.3)</td>
</tr>
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<td>Pennsylvania</td>
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<td>(27.3, 29.8)</td>
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<td>Rhode Island</td>
<td>25.4</td>
<td>(23.9, 27.0)</td>
</tr>
<tr>
<td>South Carolina</td>
<td>30.8</td>
<td>(29.6, 32.1)</td>
</tr>
<tr>
<td>South Dakota</td>
<td>28.1</td>
<td>(26.3, 30.1)</td>
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<td>Tennessee</td>
<td>29.2</td>
<td>(26.8, 31.7)</td>
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<td>Texas</td>
<td>30.4</td>
<td>(29.1, 31.8)</td>
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<td>Utah</td>
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<td>(23.4, 25.5)</td>
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<td>Vermont</td>
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<td>(24.1, 26.8)</td>
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<td>Virginia</td>
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<td>(27.5, 30.9)</td>
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<tr>
<td>Washington</td>
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<td>(25.3, 27.7)</td>
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<td>West Virginia</td>
<td>32.4</td>
<td>(30.9, 34.0)</td>
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<td>Wisconsin</td>
<td>27.7</td>
<td>(25.8, 29.7)</td>
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<tr>
<td>Wyoming</td>
<td>25.0</td>
<td>(23.5, 26.6)</td>
</tr>
</tbody>
</table>

Source: Behavioral Risk Factor Surveillance System, CDC.
Prevalence reflects BRFSS methodological changes in 2011, and these estimates should not be compared to previous years.
Health and economic burden of projected obesity trends in the USA and the UK
Lancet 2011 Nov19;378(9805):1778

Figure reproduced from the Organisation for Economic Co-operation and Development
Obesity – Estimated Healthcare Costs

Health Affairs

At the Intersection of Health, Health Care and Policy

Cite this article as:
Eric A. Finkelstein, Justin G. Trogdon, Joel W. Cohen and William Dietz
Annual Medical Spending Attributable To Obesity: Payer-And Service-Specific Estimates
Health Affairs, 28, no.5 (2009):w822-w831
(published online July 27, 2009; 10.1377/hlthaff.28.5.w822)

The online version of this article, along with updated information and services, is available at:
http://content.healthaffairs.org/content/28/5/w822.full.html
Obesity – Estimated Healthcare Costs

• Data from the 1998 and 2006 Medical Expenditure Panel Surveys (MEPS)
  – National survey, non-institutional, civilian population

• BMI based on self-reported height and weight

• 1998 – 10,597 adults
• 2006 – 21,877 adults

• Data limitations – self-reported height and weight, relatively small sample size

Obesity – Estimated Healthcare Costs

• 1998 – medical costs $78.5 billion
• 2008 – medical costs $147 billion

• In 2006 obese beneficiaries (on average) cost Medicare over $600 per year more c/w normal weight beneficiaries

• “Across all payers, obese people had medical spending that was $1,429 (42%) greater than spending for normal weight people in 2006”

Personal Care Assistance Needs of Obese Elders Entering Nursing Homes
Holy C. Felix, PhD, MPA (JAMDA – June 2008)

- 47,932 first admissions – Minimum Data Set (MDS) records for ≥65 years old entering Arkansas nursing homes from 1999-2004
- Extensive assistance with ADLs (≥ 2 person assist)
  - Eating excluded
- BMI calculated from the MDS
- 14.6% of elders were obese with average BMI of 34.9 and were significantly younger (78.5 vs 82.5yrs)
Personal Care Assistance Needs of Obese Elders Entering Nursing Homes
Holly C. Felix, PhD, MPA (JAMDA – June 2008)

<table>
<thead>
<tr>
<th>ADL</th>
<th>Odds (Confidence Interval)</th>
</tr>
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<tbody>
<tr>
<td>Bathing</td>
<td>1.32 (1.22 -1.43)</td>
</tr>
<tr>
<td>Dressing</td>
<td>1.46 (1.30 -1.64)</td>
</tr>
<tr>
<td>Toileting</td>
<td>1.65 (1.53 – 1.79)</td>
</tr>
<tr>
<td>Personal hygiene</td>
<td>1.43 (1.23 – 1.66)</td>
</tr>
<tr>
<td>Transferring</td>
<td>1.53 (1.43 – 1.63)</td>
</tr>
<tr>
<td>Eating</td>
<td>Excluded</td>
</tr>
</tbody>
</table>
Obesity – Long Term Care Costs

- 34-40% of US elders are obese (2010 estimates)
- Approximately 25% of US nursing home population
- Potential Costs of Obesity in Nursing Home Setting
  - Example: Bathing
    - 1 obese resident requires 2 CNAs for 105 minutes
    - 1 non-obese resident requires 1 CNA for 45 minutes
    - Cost differential for bathing estimated at $32/obese resident/week
- Assuming an average nursing home (96 residents, 24 obese) = $40,000 more per year for bathing alone

Health and economic burden of projected obesity trends in the USA and the UK


- Simulation model - trends suggested 65 M more obese adults in US and 11M more in UK by 2030 with a combined
  - 6-8.5M more cases of DM
  - 5.7-7.3M more cases of heart disease and stroke
  - 492,000-669,000 additional cases of CA
  - 26-55M more quality-adjusted life years forgone

- Medical costs associated with treatment of above preventable diseases were estimated to increase by $48-66 billion/year in US and 1.9-2 billion pounds /year in the UK by 2030
Obesity - Pathophysiology

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Obesity - Pathophysiology

Obesity results when calories in (consumed) are greater than calories out (burned or metabolized)

- “Thrifty genotype” hypothesis
- Obesity is a feature in >24 genetic disorders
- The Response to Long-Term Overfeeding in Identical Twins (NEJM, 5/24/90)
- Proposed genetic mechanisms:
  - Poor regulation of appetite and satiety
  - Tendency to be sedentary
  - Decreased ability to metabolize fats
  - Predisposition to store fat
Obesity - Pathophiology

• Circulating levels of various hormones are felt to be involved in homeostatic regulation of body weight including:
  – Leptin
  – Ghrelin
  – Peptide YY
  – Gastric inhibitory peptide
  – Glucagon-like peptide 1
  – Amylin
  – Pancreatic polypeptide
  – Cholecystokinin
  – Insulin
Obesity - Leptin

• From the Greek “leptos” meaning thin
• Protein discovered in 1994
• Produced primarily by adipose tissue (fat cells)
• Felt to be involved in body weight regulation
• Signals satiety to the hypothalamus (brain)
• Leptin deficiency vs leptin resistance
Obesity – Risk Factors

• Societal Components
  – American diet
  – Sedentary lifestyle
  – Community factors

• Smoking cessation

• Medications
  – Anti-diabetic drugs, antidepressants, anti-psychotics, steroids

• Endocrine disorders
  – Hypothyroidism, Polycystic Ovarian Syndrome, Cushing’s Syndrome

• Other
  – Socioeconomic factors, psychological factors, binge eating, night-eating syndrome
Obesity – Risk Factors

The Surgeon General’s report on Physical Activity suggested that the percent of time Americans spend in physical activity decreased as their age increased.

Data from US Department of Health and Human Services. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, 1996.
## Health risks associated with obesity

- Coronary artery disease, hypertension
- Hyperlipidemia
- Type 2 diabetes mellitus
- Asthma, obesity hypoventilation syndrome, obstructive sleep apnea
- Gastroesophageal reflux, esophagitis
- Fatty liver, cholelithiasis, non-alcoholic steatohepatitis (NASH), cirrhosis
- Stress urinary incontinence
- Venous stasis disease, deep vein thrombosis, pulmonary embolus, superficial thrombophlebitis
- Hernias (inguinal, ventral, umbilical, incisional)
- Irregular menstruation, hirsutism, gynecomastia, infertility, polycystic ovary syndrome
- Cancer (colon, prostate, uterine, breast)
- Infection (cellulitis, panniculitis, post-operative wound infections)
- Degenerative joint disease, osteoarthritis
- Pseudotumor cerebri (idiopathic intracranial hypertension)
- Clinical depression

*Source: [www.cdc.gov/vitalsigns/AdultObesity/Risk.html](http://www.cdc.gov/vitalsigns/AdultObesity/Risk.html)*
*Adapted from Yale University Rudd Center for Food Policy and Obesity*
Obesity – Agenda (Dr. Margolis)

- Disability Impact
- LTC/ADL Impact
- Mortality Impact
- Treatment
- Underwriting Implications
- Summary
Disability Prevalence Estimates of Men by Weight Status, 2003-2009
National Health Interview Survey – Basic Actions Difficulty

Disability Prevalence Estimates of Men by Weight Status, 2003-2009
National Health Interview Survey – Complex Actions Difficulty

Disability Impact

Disability Prevalence Estimates of Women by Weight Status, 2003-2009
National Health Interview Survey – Basic Actions Difficulty

Disability Impact

Disability Prevalence Estimates of Women by Weight Status, 2003-2009
National Health Interview Survey – Basic Actions Difficulty

Armour, BS et al. *Prev Chronic Dis* 2012;9:120136. DOI: http://dx.doi.org/10.5888/pcd9.120136
Falls, Injury and Disability Risk

Himes CL, Reynolds SL. *J Am Geriatr Soc* 2012;60:124
Relative Risk of LTC Insurance Claim

Based on Genworth Experience as of February 2011
## Table 1. Comparisons of Actual and Expected Health Outcomes for Persons with Self-Reported Obesity/Overweight and Diabetes in the NLTCS; Reweighted to U.S. 2004 Unisex Population, Age 65 and Above

<table>
<thead>
<tr>
<th>Self-Reported Medical Condition</th>
<th>Outcome</th>
<th>Actual (A)</th>
<th>Expected (E)</th>
<th>A/E Ratio</th>
<th>s.e.(A/E)</th>
<th>A − E</th>
<th>Percent of Total</th>
<th>s.e.(Pct. of Total)</th>
<th>Effective N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diabetes</td>
<td>2,258,554</td>
<td>1,031,473</td>
<td>2.19</td>
<td>0.20</td>
<td>1,227,081</td>
<td>19.95%</td>
<td>2.62%</td>
<td>3,120</td>
</tr>
<tr>
<td></td>
<td>HIPAA Disability</td>
<td>604,790</td>
<td>540,425</td>
<td>1.12</td>
<td>0.17</td>
<td>64,365</td>
<td>1.76%</td>
<td>2.51%</td>
<td>3,120</td>
</tr>
<tr>
<td></td>
<td>Death</td>
<td>192,011</td>
<td>311,628</td>
<td>0.62</td>
<td>0.17</td>
<td>-119,617</td>
<td>-6.60%</td>
<td>3.22%</td>
<td>3,120</td>
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<tr>
<td></td>
<td>HIPAA Disability</td>
<td>900,089</td>
<td>453,785</td>
<td>1.98</td>
<td>0.26</td>
<td>446,305</td>
<td>12.21%</td>
<td>2.71%</td>
<td>3,120</td>
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<tr>
<td></td>
<td>Death</td>
<td>422,549</td>
<td>236,910</td>
<td>1.78</td>
<td>0.36</td>
<td>185,639</td>
<td>10.24%</td>
<td>4.10%</td>
<td>3,120</td>
</tr>
</tbody>
</table>

Note 1: The referenced total is the weighted sum of the indicated outcomes for persons with and without the indicated self-reported medical condition in the NLTCS.

Source: Author's calculations based on the 2004 NLTCS.

Stallard E. Living to 100 Symposium. January, 2011
Table 2. Selected Comparisons of Actual and Expected Health Outcomes for Noninstitutionalized Persons with Self-Reported BMI Obesity and Diabetes in the NLTCS; Reweighted to U.S. 2004 Unisex Noninstitutionalized Population, Age 65 and Above

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Actual (A)</th>
<th>Expected (E)</th>
<th>A/E Ratio</th>
<th>s.e.(A/E)</th>
<th>A − E</th>
<th>Percent of Total</th>
<th>s.e.(Pct. of Total)</th>
<th>Effective N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obesity (BMI ≥ 30) at Age 50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>1,393,590</td>
<td>527,724</td>
<td>2.64</td>
<td>0.27</td>
<td>865,866</td>
<td>16.41%</td>
<td>2.22%</td>
<td>2,399</td>
</tr>
<tr>
<td>HIPAA Disability</td>
<td>381,210</td>
<td>164,023</td>
<td>2.32</td>
<td>0.46</td>
<td>217,187</td>
<td>12.03%</td>
<td>3.63%</td>
<td>2,399</td>
</tr>
<tr>
<td>Death</td>
<td>141,157</td>
<td>121,630</td>
<td>1.16</td>
<td>0.37</td>
<td>19,527</td>
<td>1.65%</td>
<td>3.63%</td>
<td>2,399</td>
</tr>
<tr>
<td>Current Obesity (BMI ≥ 30)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>2,165,735</td>
<td>937,273</td>
<td>2.31</td>
<td>0.22</td>
<td>1,228,462</td>
<td>21.51%</td>
<td>2.75%</td>
<td>2,607</td>
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<tr>
<td>HIPAA Disability</td>
<td>437,541</td>
<td>307,014</td>
<td>1.43</td>
<td>0.28</td>
<td>130,527</td>
<td>6.15%</td>
<td>3.78%</td>
<td>2,607</td>
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<tr>
<td>Death</td>
<td>135,350</td>
<td>237,222</td>
<td>0.57</td>
<td>0.20</td>
<td>-101,872</td>
<td>-7.71%</td>
<td>3.84%</td>
<td>2,607</td>
</tr>
</tbody>
</table>

Note 1: The referenced total is the weighted sum of the indicated outcomes for persons with and without the indicated self-reported medical condition in the NLTCS.

Source: Author's calculations based on the 2004 NLTCS.

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Mortality Impact

All-Cause Mortality Versus BMI by Gender

Source: The Lancet 2009; 373:1083-1096  DOI:10.1016/S0140-6736(09)60318-4

Session 24: Obesity: Understanding the Risk
## Cause-Specific Mortality Versus Baseline BMI

<table>
<thead>
<tr>
<th></th>
<th>15-25 kg/m²</th>
<th>25-50 kg/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deaths</td>
<td>HR (95% CI)</td>
</tr>
<tr>
<td>Ischaemic heart disease</td>
<td>7461</td>
<td>1.22 (1.13-1.32)</td>
</tr>
<tr>
<td>Stroke</td>
<td>2964</td>
<td>0.92 (0.82-1.02)</td>
</tr>
<tr>
<td>Other vascular disease</td>
<td>2649</td>
<td>0.84 (0.75-0.95)</td>
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<tr>
<td>Diabetes</td>
<td>171</td>
<td>0.96 (0.90-1.05)</td>
</tr>
<tr>
<td>Kidney disease (non-neoplastic)</td>
<td>197</td>
<td>1.14 (0.74-1.77)</td>
</tr>
<tr>
<td>Liver disease (non-neoplastic)</td>
<td>481</td>
<td>0.66 (0.52-0.81)</td>
</tr>
<tr>
<td>Lung cancer</td>
<td>2959</td>
<td>0.71 (0.63-0.79)</td>
</tr>
<tr>
<td>Upper aerodigestive cancer</td>
<td>685</td>
<td>0.49 (0.35-0.67)</td>
</tr>
<tr>
<td>Other specified cancer</td>
<td>6134</td>
<td>0.94 (0.87-1.02)</td>
</tr>
<tr>
<td>Respiratory disease</td>
<td>4126</td>
<td>0.81 (0.78-0.85)</td>
</tr>
<tr>
<td>Other specified disease</td>
<td>2049</td>
<td>0.62 (0.54-0.71)</td>
</tr>
<tr>
<td>External causes</td>
<td>2112</td>
<td>0.82 (0.71-0.95)</td>
</tr>
<tr>
<td>Unknown cause†</td>
<td>4961</td>
<td>0.72 (0.66-0.79)</td>
</tr>
<tr>
<td>All causes</td>
<td>35256</td>
<td>0.79 (0.77-0.82)</td>
</tr>
</tbody>
</table>

Source: The Lancet 2009; 373:1083-1096 DOI:10.1016/S0140-6736(09)60318-4

Session 24: Obesity: Understanding the Risk
Mortality Impact

Ischemic Heart Disease and Stroke Mortality Versus BMI

Source: The Lancet 2009; 373:1083-1096 (DOI:10.1016/S0140-6736(09)60318-4)

Session 24: Obesity: Understanding the Risk
Mortality Impact

All-Cause Mortality at Ages 35-79 Versus BMI by Smoking Status

Source: The Lancet 2009; 373:1083-1096. DOI:10.1016/S0140-6736(09)60318-4

Session 24: Obesity: Understanding the Risk
## All-Cause Mortality Versus Baseline BMI

### Source:
The Lancet 2009; 373:1083-1096  DOI:10.1016/S0140-6736(09)60318-4

### Table: All-Cause Mortality Versus Baseline BMI

| Age at Entry (Years) | All participants | | | | | | Never smokers only | | | |
|----------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
|                      | 15-19 Kg/m²      | 20-24 Kg/m²      | 25-29 Kg/m²      | 30-34 Kg/m²      | 35-39 Kg/m²      | 40-44 Kg/m²      | Deaths  | HR (95% CI)  | Deaths  | HR (95% CI)  | Deaths  | HR (95% CI)  |
| Overall              | 35 256           | 37 493           | 37 493           | 31 476           | 25 729           | 20 185           | 70 544           | 0.87 (0.81-0.94) | 98 499           | 1.32 (1.28-1.36) |
| Male                 | 25 729           | 27 385           | 27 385           | 23 279           | 19 924           | 15 681           | 48 844           | 0.87 (0.78-0.97) | 68 841           | 1.24 (1.16-1.32) |
| Female               | 95 36            | 95 10            | 95 10            | 82 193           | 70 685           | 53 507           | 33 660           | 0.87 (0.78-0.97) | 50 388           | 1.27 (1.22-1.32) |

### Notes:
- HR: Hazard Ratio
- CI: Confidence Interval
- Deaths, HR, and CI are reported for each BMI category.
### Table 1: Drugs used for weight loss in obesity.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Introduced</th>
<th>Mechanism of action</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dinitrophenol</td>
<td>1930s</td>
<td>Increases metabolic rate</td>
<td>Withdrawn—risk of neuropathy and cataracts</td>
</tr>
<tr>
<td>Amphetamines: dexamfetamine, methylphenidate</td>
<td>1936</td>
<td>Appetite suppression</td>
<td>Banned, restricted or discouraged—dependency and abuse potential, cardiovascular adverse effects</td>
</tr>
<tr>
<td>Aminorex</td>
<td>1965</td>
<td>Appetite suppression</td>
<td>Withdrawn 1968—pulmonary hypertension</td>
</tr>
<tr>
<td>Mazindol</td>
<td>1970s</td>
<td>Appetite suppression</td>
<td>Discontinued 1993—Australia</td>
</tr>
<tr>
<td>Orlistat</td>
<td>1998-Europe and US</td>
<td>Decreased fat absorption</td>
<td>Also available over-the-counter in several countries</td>
</tr>
<tr>
<td>Sibutramine</td>
<td>1997-US 2001-Europe</td>
<td>Appetite suppression</td>
<td>Temporarily withdrawn 2002 Italy—concerns of raised risk of heart attacks and strokes Increase in contraindications 2010-US, Australia Suspension of market authorization 2010</td>
</tr>
<tr>
<td>Rimonabant</td>
<td>2006-Europe</td>
<td></td>
<td>Withdrawn 2009—potential of serious psychiatric disorders</td>
</tr>
</tbody>
</table>

Inhibition of Fat Absorption by Orlistat.

Weight-Loss Efficacy of Lorcaserin (Belviq) and Phentermine plus Extended-Release Topiramate (Qsymia) at 1 Year

<table>
<thead>
<tr>
<th>Drug, Study, and Treatment</th>
<th>Mean Percentage Change in Body Weight (Mean Efficacy Criterion)</th>
<th>Proportion of Patients Losing ≥5% of Body Weight (Categorical Efficacy Criterion)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Belviq</strong>&lt;sup&gt;†&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Studies 1 and 2 combined</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 mg BID</td>
<td>-5.8</td>
<td>47</td>
</tr>
<tr>
<td>Placebo</td>
<td>-2.5</td>
<td>23</td>
</tr>
<tr>
<td>Study 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 mg BID</td>
<td>-4.5</td>
<td>38</td>
</tr>
<tr>
<td>Placebo</td>
<td>-1.5</td>
<td>16</td>
</tr>
<tr>
<td><strong>Qsymia</strong>&lt;sup&gt;‡&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 mg/92 mg</td>
<td>-10.9</td>
<td>67</td>
</tr>
<tr>
<td>Placebo</td>
<td>-1.6</td>
<td>17</td>
</tr>
<tr>
<td>Study 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.3 mg/46 mg</td>
<td>-7.8</td>
<td>62</td>
</tr>
<tr>
<td>15 mg/92 mg</td>
<td>-9.8</td>
<td>70</td>
</tr>
<tr>
<td>Placebo</td>
<td>-1.2</td>
<td>21</td>
</tr>
</tbody>
</table>

<sup>†</sup> The mean efficacy criterion was a statistically significant difference in mean weight loss of at least 5% between the active-drug and placebo groups. The categorical efficacy criterion included the loss of at least 5% of baseline body weight in at least 35% of participants in the active-drug group; such weight loss in approximately double the proportion of participants in the active-drug group as in the placebo group; and a significant difference between the groups. BID denotes twice daily.

<sup>‡</sup> In Belviq studies 1 and 2, participants had a BMI of 27 to 45 and did not have type 2 diabetes mellitus, and in Belviq study 3, participants had a BMI of 27 or higher with inadequately controlled type 2 diabetes mellitus.

<sup>‡</sup> In Qsymia study 1, participants had a BMI of 35 or higher and did not have type 2 diabetes mellitus, and in Qsymia study 2, participants had a BMI of 37 to 45 (no lower limit for BMI in patients with type 2 diabetes mellitus) and had two or more obesity-related coexisting conditions (elevated blood pressure, hypertriglyceridemia, elevated fasting glucose levels, or increased waist circumference). For Qsymia, the first value in the dose information is for the dose of phentermine, and the second is for the dose of extended-release topiramate.

Current Treatment - Medication

Effects of phentermine plus topiramate on bodyweight

Estimated Number of Bariatric Operations Performed in the United States, 1992-2003

Current Treatment - Surgery

Common Surgical Procedures for Weight Loss

Current Treatment - Surgery

• NIH Guidelines – Candidates for Surgery
  – BMI \( \geq 40 \text{kg/m}^2 \)
  – BMI 35-39kg/m² with severe comorbidities (e.g., life-threatening cardio-pulmonary disorders or diabetes)
  – BMI 35-39kg/m² with obesity-induced physical problems interfering with lifestyle (e.g., joint disease)
  – No underlying endocrine abnormality that can contribute to obesity, ongoing substance abuse, or uncontrolled psychiatric disorders
  – Be able to understand the surgery, consequences of treatment and be compliant with follow up and treatment
  – Not have an illness that greatly reduces life expectancy (e.g., end stage renal or liver disease, cancer, etc)

Current Treatment - Surgery

Survival According to BMI in the Surgery Group and the Control Group

Current Treatment - Surgery

Weight Changes among Subjects in the SOS Study over a 10-Year Period


Session 24: Obesity: Understanding the Risk
Current Treatment - Surgery

Incidence of Diabetes, Lipid Disturbances, Hypertension, and Hyperuricemia among Subjects in the SOS Study over 2- and 10-Year Periods

Recovery from Diabetes, Lipid Disturbances, Hypertension, and Hyperuricemia over 2 and 10 Years in Surgically Treated Subjects and Their Obese Controls


Session 24: Obesity: Understanding the Risk
Current Treatment - Surgery

Glycated Hemoglobin Levels during 2 Years of Follow-up.

Current Treatment - Surgery

Cumulative Incidence of Type 2 Diabetes.


Session 24: Obesity: Understanding the Risk
Gastric Bypass Surgery

- Adverse Effects
  - Perioperative
    - Anastomotic leaks
    - Thromboemolic events (0.8%)
    - Infection
  - Postoperative
    - Dumping syndrome (up to 70%)
    - Vitamin/mineral deficiencies (iron, calcium, folate, B12, A,D,E,K)
    - Ulcers
    - Bowel obstruction
    - Hernias (internal/incisional)

DeMaria EJ. NEJM 2007;356:2176
Underwriting Considerations

- Consider age of applicant – greater morbidity implications at younger ages
- Consider combination of build and other cardiovascular risk factors
- Consider co-morbidities including osteoarthritis and cardiovascular disease
- Review trends and stability
- If applicant underwent surgery, consider stability, complications and compliance
In Conclusion

- Obesity is a global epidemic
- The etiology of obesity is a complex interaction of genetic predisposition, social, cultural and environmental influences
- Obesity results in substantial excess morbidity and mortality and is contributing to rising health care costs
- Diets and medical intervention have historically been variably effective
- Surgical intervention appears to be an effective option for those who meet the criteria with significant improvement in co-morbidities including insulin resistance and diabetes
- Research continues to focus on better medical therapies
The Future?

http://fitfemaleforty.com/tag/paleolithic-man/