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**Confound those  
Speculative Statistics!**

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*American Statistical Association*  
Washington DC      5 August 2009  
[www.StatLit.org/pdf/2009-Schild-ASA-Slides.pdf](http://www.StatLit.org/pdf/2009-Schild-ASA-Slides.pdf)

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**Let's Talk About  
A Big Subject**

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Over  
Weight

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**Certified Deaths:  
Two Kinds of Causes**

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Death is a fact, but there two kinds of causes:

1. **Coroner-certified (observed) causes**
  - **Natural:** heart (861k), cancer (554k)
  - **Accidental:** traffic (45K), falls (19k)
  - **Other:** suicide (32k), alcohol (17k)

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2. **Statistically-linked (attributed) causes.**

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**Statistically-linked  
'Speculative' Statistics**

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**Statistically-linked (attributed) deaths\*:**

- 435k – smoking (primary smoke)
- 400k – overweight (CDC, 2003)
- 160k – eating meat
- 75k – gap in quality healthcare
- 70k – pollution-related
- 50k – second-hand smoke
- 22k – radon
- 5k – soot pollution

\* Web sources: not necessarily reliable.

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**Speculative Deaths:  
Deaths Due to Obesity**

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CDC: Deaths **attributed to** obesity:

- 2003: 400,000 deaths/yr
- 2004: 26,000 deaths/yr.

**This is a big change!**

To see how, consider:

- **Percentage due to ...**
- **Number due to ...**



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**Percentage of Deaths  
Due to Overweight**

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Suppose these are the death rates:

- 1.6% for those who are overweight
- 1.2% for those who are not overweight

Based on this alone, one can say:

- “25% of the deaths among the overweight are due to [being] overweight.”

The math is simple:

- 25% = Excess/Larger = (1.6% - 1.2%)/1.6%

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### Number of Deaths Due to Overweight

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US adult population: 220 million (73% of 300M).

- ~120 M are overweight (60% of adults)

Actual number of deaths among adults

- 1.65 M overweight deaths (1.6% of 120M)
- 1.30 M non-overweight deaths (1.2% of 100M)

~400,000 deaths (25% of the 1.65 million deaths among overweight adults) are “due to” overweight.

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### Plausible Confounders

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What confounders might be strongly associated with the outcome (death) and the predictor (overweight)?

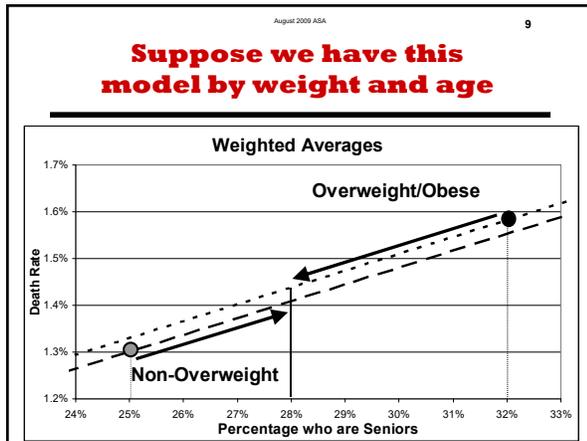
Taking into account confounders may decrease the observed association between overweight and death.

What factors weren't taken into account?

- Diet, exercise and occupation
- Health, heredity, environment

We need a big factor. What could be bigger?

**Let's take into account the influence of AGE.**



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### Age-Adjusted % of Deaths Due to Overweight

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Suppose these are the age-adjusted death rates:

- 1.43% for those who are overweight
- 1.41% for those who are not overweight

Based on this alone, one can say:

- “1.4% of the deaths among the overweight are due to [being] overweight.”

The math is simple:

- $1.4\% = \text{Excess/Larger} = (1.43\% - 1.41\%)/1.43\%$

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### Age-Adjust # of Deaths Due to Overweight

---

US adult population: 220 million (73% of 300M).

- ~120 M are overweight (60% of adults)

Actual number of deaths among adults:

- 1.72 M overweight deaths (1.43% of 120M)
- 1.41 M non-overweight deaths (1.41% of 100M)

~25,000 deaths (1.4% of the 1.72 M among overweight adults) are “due to” overweight.

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### Review

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Taking into account age changed the number of deaths attributable to (due to) overweight

- from 410,000 (25% of 1.65 M)
- to 25,000 (1.4% of 1.72 M) .

**Moral: A small change in assumptions can make a big change in the statistics!**

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**Why?**

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Why didn't the CDC take into account other factors in their original study?

One plausible explanation is money (\$\$\$)

- **3/9/2004** — **The CDC attributes 400,000 deaths** to poor diet and physical inactivity. CDC Director Julie Gerberding is a co-author.
- **3/31/ 2004** — **CDC director Julie Gerberding requests \$6.9 billion** from Congress for the agency's 2005 budget...

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**Speculative Statistics are a Big Problem**

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Speculative statistics – epidemiologically-based statistics – **are common – but hidden** – in the news.

- No unique grammar or keywords.
- They look plausible -- coroners might count.
- We treat counts as facts.
- Journalists and politicians don't question them.
- We don't question them.

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**Conclusion?**

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Public policy (passing laws, taking drugs off the market, demonizing overweight or second hand smoke) is based on these "speculative statistics."

But are these numbers real – or spurious?  
 Educated adults don't know! They can't tell!

Can traditional statistics address these questions?  
**If not traditional statistics, then what?**  
**If not statistical educators, then who?**

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**Bibliography**

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Actual Causes of Death in the United States, 2000. Mokdad, Marks, Stroup and Gerberding. JAMA, March 10, 2004; 291: 1238 - 1245.

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# **Let's Talk About A Big Subject**

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# **Certified Deaths: Two Kinds of Causes**

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Death is a fact, but there two kinds of causes:

## **1. Coroner-certified (observed) causes**

- **Natural:** heart (861k), cancer (554k)
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## **2. Statistically-linked (attributed) causes.**

# **Statistically-linked 'Speculative' Statistics**

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## **Statistically-linked (attributed) deaths\*:**

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# **Speculative Deaths: Deaths Due to Obesity**

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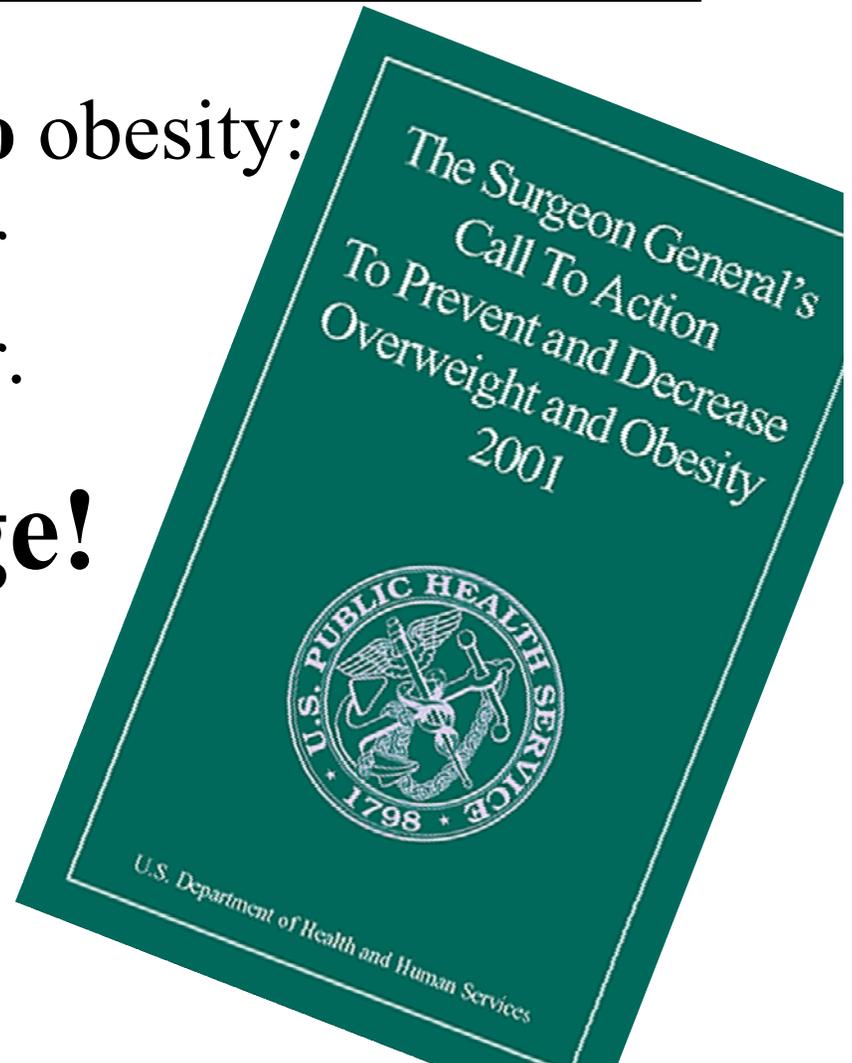
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- 2003: 400,000 deaths/yr
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**This is a big change!**

To see how, consider:

- **Percentage due to ...**
- **Number due to ...**



# Percentage of Deaths Due to Overweight

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Suppose these are the death rates:

- 1.6% for those who are overweight
- 1.2% for those who are not overweight

Based on this alone, one can say:

- “25% of the deaths among the overweight are due to [being] overweight.”

The math is simple:

- $25\% = \text{Excess/Larger} = (1.6\% - 1.2\%)/1.6\%$

# Number of Deaths Due to Overweight

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Actual number of deaths among adults

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Taking into account confounders may decrease the observed association between overweight and death.

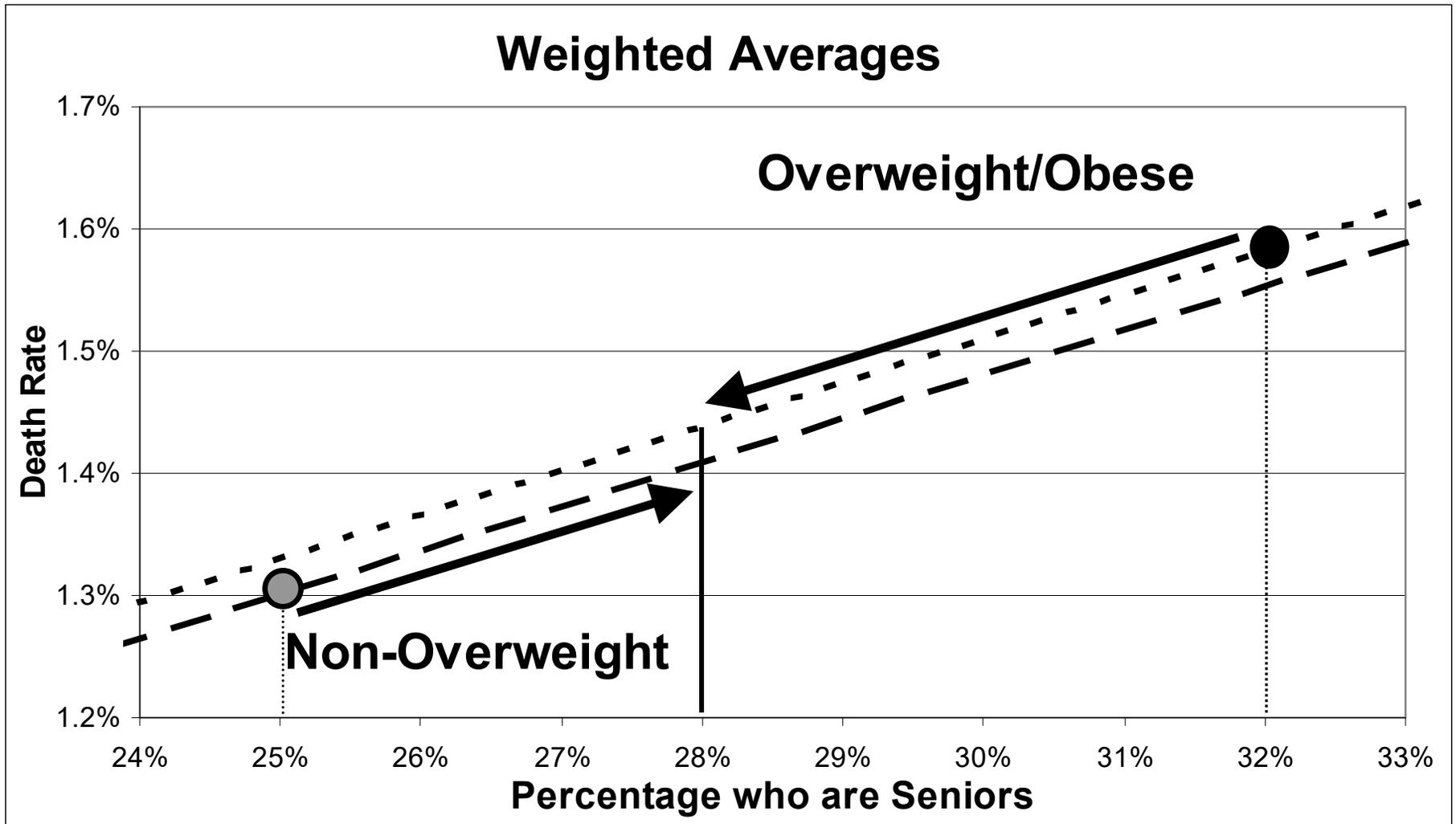
What factors weren't taken into account?

- Diet, exercise and occupation
- Health, heredity, environment

We need a big factor. What could be bigger?

**Let's take into account the influence of AGE.**

# Suppose we have this model by weight and age



# Age-Adjusted % of Deaths Due to Overweight

---

Suppose these are the age-adjusted death rates:

- 1.43% for those who are overweight
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Based on this alone, one can say:

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