22 August 2011 ISI   1

Epidemiological Models Generate Spotty Statistics

MILO SCHIELD,
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US Rep: International Statistical Literacy Project
VP: National Numeracy Network
Webmaster: www. StatLit.org

August 22, 2011
International Statistical Institute Dublin, Ireland
www.StatLit.org/pdf/2011-Schield-ISI-Slides.pdf

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22 August 2011 ISI   2

1. Linear-model statistics are found in the media

• "the rate of [Alzheimer's] decline unfolded 4 percent more quickly *for each* additional year of education." Reuters 10/22/2007.

• "*For every* can or glass of sugar-sweetened beverage a child drank [a day] …, a child's … chance of becoming obese increased 60%." The Lancet, 2001; 357:505-508.

• "*each* hour of television watched per day at ages 1-3 increases the risk of attention problems, such as ADHD, by almost 10 percent at age 7." Science Daily 4/6/2004.

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22 August 2011 ISI   3

2. Epidemiological-model statistics are also found in the media

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2. How Epidemiological Models Generate Statistics

Percentage *Attributed* to Exposure = 100% * (RateExposed – RateControl)/RateExposed

Consider these death rates:

• 10% for a city hospital (4% for a rural hospital).

Based on this, one can say

• "60% of the deaths at city hospital are **attributed to that hospital."**

• Excess / Higher = (10% - 4%)/10% = 60%

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2. How Epidemiological Models Generate Statistics #2

If lung-cancer deaths are 10 times as prevalent for smokers as for non-smokers, then **90%** of smoker lung-cancer deaths are *attributable* to smoking.

Suppose the *coroner-certified* lung-cancer deaths among smokers number **100,000**.

The lung-cancer deaths among smokers *attributable* to smoking number 90,000: **90% of 100,000**.

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22 August 2011 ISI   6

Responsible for …

Study blames diesel for deaths

By Jon Brodkin / Daily News Staff
Wednesday, February 23, 2005

Diesel pollution is responsible for more deaths than drunk drivers and homicides, according to a new study that estimates how many premature deaths, asthma attacks and heart attacks are caused by diesel pollution in every U.S. county.

Nationwide, diesel pollution causes 21,000 premature deaths each year, including 475 in Massachusetts and 81 in Middlesex County, robbing those who die of an average of 14 years of their lives.

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2. Epidemiological statistics are common!
US Annual Deaths **Attributable To**:

Smoking: 467,000	Blood pressure: 395,000
Overweight: 216,000	Inactivity: 191,000
Blood sugar: 190,000	LDL cholesterol: 113,000
Dietary salt: 102,000	Low omega-3 : 84,000

High dietary trans fatty acids: 82,000
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Low intake of fruits and vegetables: 58,000
Low poly-unsaturated fatty acids: 15,000

www.emaxhealth.com/2/24/30740/
smoking-high-blood-pressure-obesity-top-preventable-death-causes.html

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2. Web Articles Involving Deaths
[Google matches]

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7 M	deaths **associated with**	591 K	deaths attributed
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Google Search (4/2011) Exact Phrase)

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2. Epidemiological statistics
are easily generated

Two rates: complementary wholes and a common part:

Percentage attributable:
- Graduation: % attributable to having educated parents
- Dropouts: % attributable to having a single-parent
- Incarceration: % attributable to having low IQ

Cases attributable:
- Premature babies attributable to mom being a smoker
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Causes; Account for

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Junk food causes a third of heart attacks

Mon Oct 20, 4:08 pm ET

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Their study of 52 countries showed that people who ate a "Western" diet based on meat, eggs and junk food were more likely to have heart attacks, while those who ate more fruits and vegetables had a lower risk.

Reuters – French fries are shown in

USA TODAY Your Life | Health

Your Life Health Fitness & Sports Family & Parenting Sex & Relationships
Alternative medicine | Alzheimer's | Breast cancer | Cold & flu | Depression | Diabetes

Coffee, sex, smog can all trigger heart attack, study finds

By Steven Reinberg HealthDay   Updated Feb 26, 2011 11:00 AM

Reprints & Permissions

A major analysis of data on potential triggers for heart attacks finds that many of the substances and activities Americans indulge in every day — coffee, alcohol, sex, even breathing — can all help spur an attack.

Because so many people are exposed to dirty air, air pollution while stuck in traffic topped the list of potential heart attack triggers, with the researchers pegging 7.4% of heart attacks to roadway smog.

But coffee was also linked to 5% of attacks, booze to another 5%, and pot smoking to just under 1%, the European researchers found.

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22 August 2011 ISI   13

2. Epidemiological statistics encourage seductive grammar

Consider these titles of news stories:
• 45,000 deaths *attributable to* uninsurance
• 45,000 deaths *associated with* lack of insurance
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• Lack of Health Insurance *cause* 44789 deaths
• Lack of insurance *to blame* for almost 45,000 deaths

Source: www.StatLit.org/pdf/2010SchieldICOTS.pdf

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3. Epidemiological models generate "spotty" statistics

Model-based numbers are sensitive to the assumptions.

Epidemiological models are extremely sensitive to what is – and is not – taken into account.

"Spotty" statistics are statistics generated by epidemiological models: they conceal more than they reveal.

"Spotty statistics" look like real statistics, but they are model-based. They look like they identify real causes, but they merely indicate the size of an association.

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22 August 2011 ISI   15

3. "Spotty" statistics are very sensitive to assumptions

2004: 400,000 deaths attributable to obesity.
"*Obesity might soon pass smoking as the country's leading cause of preventable death.*"

2005: 27,000 deaths attributable to obesity.
This finding **transformed obesity from fearsome killer to pitiable also-ran**, ranked in 7th place.

What changed? Perhaps they took something into account that is closely associated with death rates. Something such as age ... ☺

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3. "Spotty" statistics are hard to detect

Spotty statistics – epidemiologically-based statistics – are common – but hidden – in the news.
• They have no unique grammar or keywords.
• They look plausible -- coroners might count them.
• We treat counts as facts.
• Journalists and politicians don't question them.
• We don't question them.

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22 August 2011 ISI   17

3. Statistical education should focus more on "spotty statistics"

By remaining silent on these "spotty" statistics,

the most common type of model-based statistics in the everyday media,

statistical education may be seen as an archaic subject stuck in the 20th century fields of Fisher's Rothamsted agricultural station.

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22 August 2011 ISI   18

4. Statistical Literacy focuses on numbers in the everyday media

Statistical literacy is the ability to read and interpret summary statistics in the everyday media: in graphs, tables, statements, surveys and studies.

Statistical literacy studies the use and misuse of "spotty statistics" in the everyday media.

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4. Statistical Educators Should Promote Statistical Literacy

Almost 20% of US four-year colleges offer a course in statistical literacy.

Statistical educators may say
  "*This is not our job.*"

But if not you, then who?

If not now, then when?

Bibliography

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22 August 2011 ISI — 3

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22 August 2011 ISI — 4

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22 August 2011 ISI — 5

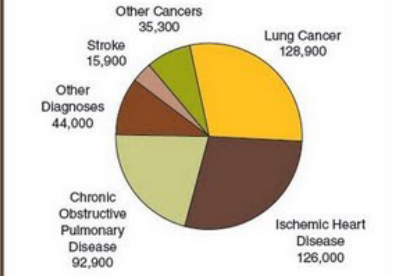### 2. How Epidemiological Models Generate Statistics #2

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6

About 443,000 U.S. Deaths Attributable Each Year to Cigarette Smoking*

Other Cancers 35,300
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Slide (Responsible for …)

22 August 2011 ISI

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Slide 8

22 August 2011 ISI   8

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Slide 9

22 August 2011 ISI   9

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[Google matches]

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Slide 10

22 August 2011 ISI   10

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Slide 11

22 August 2011 ISI   11

Causes; Account for

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Reuters – French fries are shown in

Slide (Coffee, sex, smog)

USA TODAY Your Life | Health

Your Life   Health   Fitness & Food   Family & Parenting   Sex & Relationships
Alternative medicine | Alzheimer's | Breast cancer | Cold & flu | Depression | Diabetes

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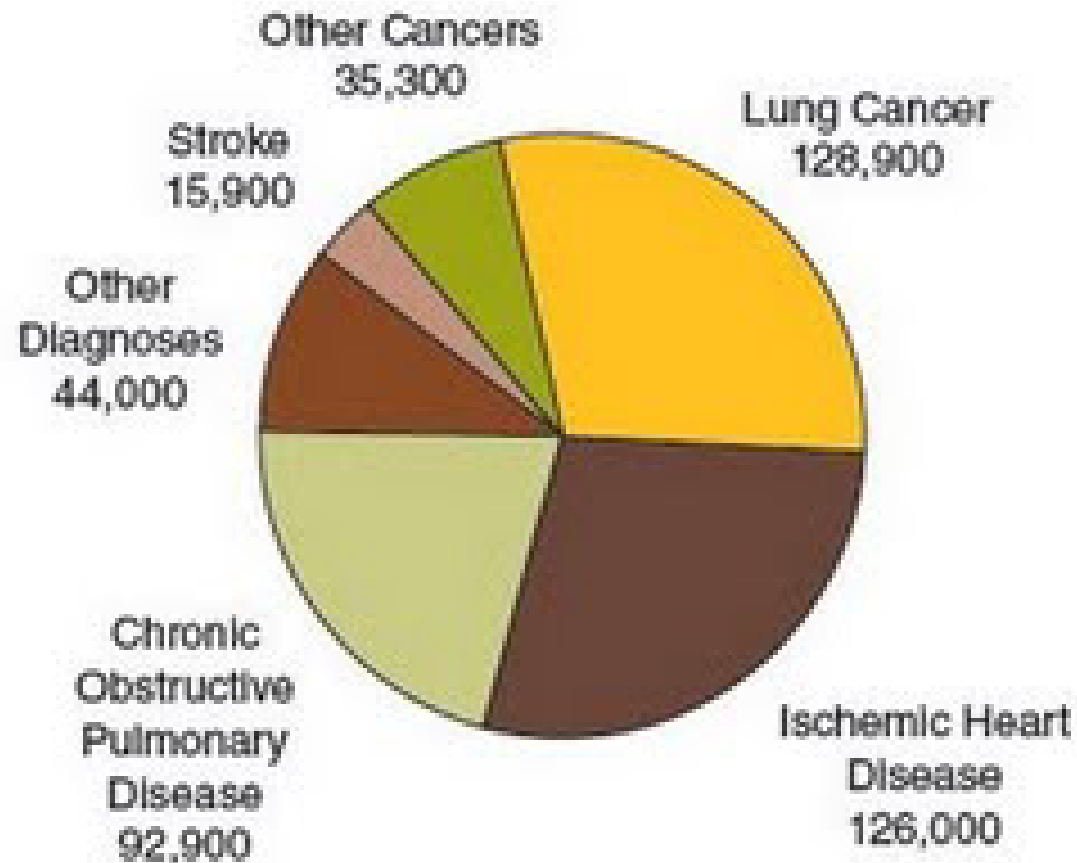# 2. How Epidemiological Models Generate Statistics #2

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