History of smoking research

From Data to Insight

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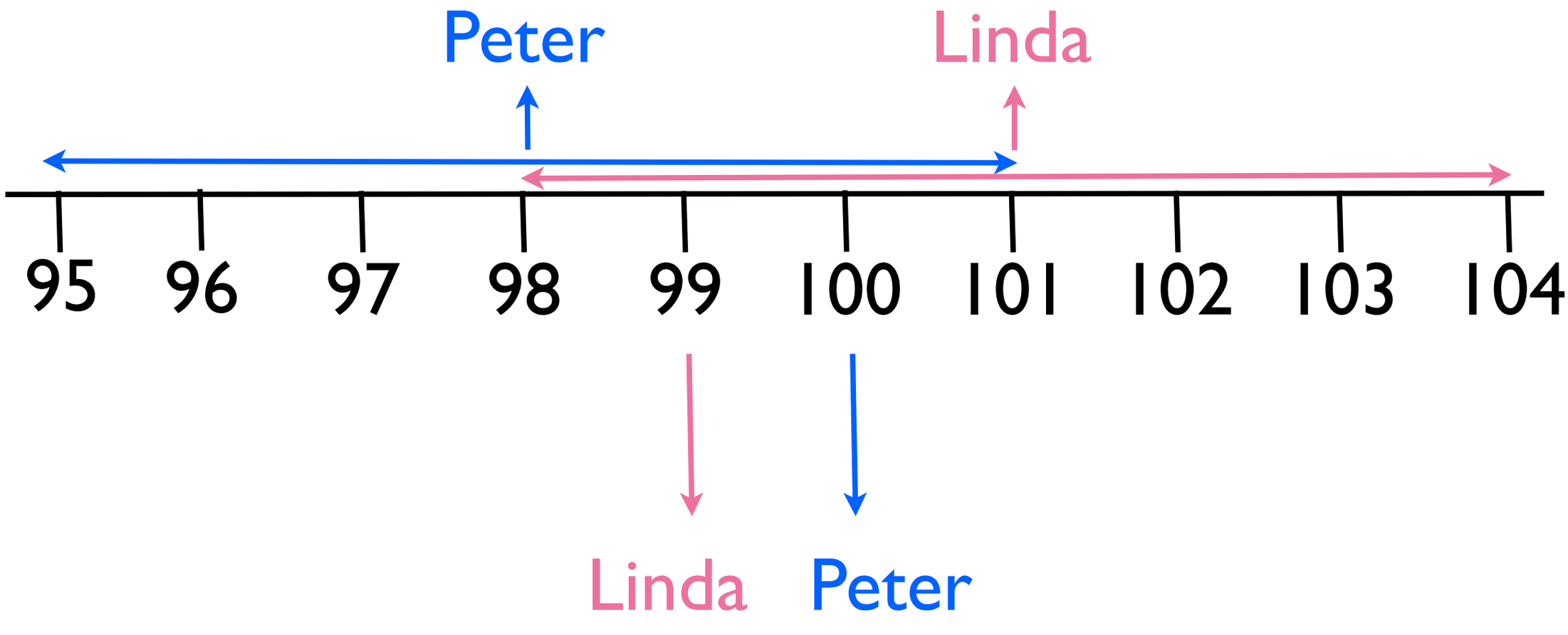
July 12, 2016

“A difference is a difference only if it makes a difference”

Huff, D. (2010). How to lie with statistics. WW Norton & Company. Chicago. p. 58.

IQ scores

- Comparisons between figures with small differences may be meaningless.
- Always keep the “plus-or-minus” in mind — especially when it is not stated.



Percentage of Obese Adults, by State

	Obese %
States with lowest obesity percentage	
Hawaii	18.5
Colorado	19.8
Massachusetts	23.6
New Mexico	23.7
Nevada	23.9
California	23.9
Montana	24.1
New Hampshire	24.3
Utah	24.5
New Jersey	24.7
States with highest obesity percentage	
West Virginia	37.0
Mississippi	35.5
Delaware	33.8
Arkansas	33.5
Oklahoma	33.5
Ohio	31.6
Maine	31.5
Michigan	31.5
Kentucky	31.4
South Carolina	31.4

GALLUP-HEALTHWAYS WELL-BEING INDEX, 2015

The margin of sampling error for most states is about ±0.6 points, although this increases to about ±1.6 points for the smallest population states such as North Dakota, Wyoming, Hawaii and Delaware.

Source: http://www.gallup.com/poll/191411/obesity-rate-lowest-hawaii-highest-west-virginia.aspx

Old Gold Cigarettes

- Reader's Digest had a laboratory analyze the nicotine and tar contents of smoke from several brands of cigarettes.

- July 1942: Reader's Digest published "Cigarette Advertising Fact and Fiction," claiming that cigarettes were **essentially** all the same, and were deadly.

- But Old Gold was at the bottom of the list, with the least of these undesirable things in its smoke.

THE LITERARY DIGEST 41

You can't improve on Nature!

OLD GOLD won in scientific tests, because it is made of the PUREST, choicest tobacco . . . free of heat-generating flavorings. That's the "why" of OLD GOLD'S greater taste appeal, and delightful throat-ease.

A famous testing laboratory made 75 impartial cool tests* of the four leading cigarette brands. And OLD GOLD was shown definitely cooler than the other three leading brands.

NOT A COUGH IN A CARLOAD

*THE VERDICT OF SCIENCE

This is to certify that in 75 repeated tests made of four leading cigarette brands . . . measuring the heat content of each cigarette by the Calorimeter method . . . it was shown that OLD GOLD is from 112 to 156 B. T. U./lb. COOLER than the other brands.

Signed: NEW YORK TESTING LABORATORIES
G. Brinton Jack, Jr., *Director*

OLD GOLDS ARE PURE TOBACCO • NO HOT-BURNING FLAVORINGS ADDED

Old Gold CIGARETTES
THE TREASURE OF THEM ALL
Old Gold
© P. Lorillard Co., Inc.

Old Gold won in scientific tests, because it is made of the PUREST, choicest tobacco... free of heat-generating flavorings. That's the "why" of Old Gold's greater taste appeal, and delightful throat-ease.

A famous testing laboratory made 75 impartial cool tests of the four leading cigarette brands. And OLD GOLD was shown definitely cooler than other three leading brands.

NOT A COUGH IN A CARLOAD.

"the world's best tobacco"


OLD GOLD
CIGARETTES
Scored ··· with
Natural Goodness
Old Gold
CIGARETTES
THE TREASURE OF THEM ALL
P. Lorillard Company
Established 1760
Old Gold
NOT A COUGH IN A CARLOAD

In…*P. Lorillard Co. v. Federal Trade Commission (FTC)*, the company was charged by the FTC with making a distorted use of a *Reader's Digest* article that discussed the harmful effects of various brands of cigarettes. A laboratory had concluded that no particular brand of cigarettes was substantially more harmful than any other. A table of variations in brand characteristics was inserted in the article to show the insignificance of the differences that existed in the tar and nicotine content of the smoke produced by the various brands. The table indicated that Old Golds had less nicotine and tars, although the **difference was so small as to be insignificant**.

Lorillard launched a national advertising campaign stressing that the *Reader's Digest* test proved that its brand was "lowest in nicotine and tars," and defended its advertising before the FTC on the ground that it had truthfully reported what had been stated in the article. In a 1950 decision, the Fourth Circuit Court of Appeals, upholding the commission's cease-and-desist order, declared that **Lorillard's advertising violated the FTC Act because, by printing only a small part of the article, it created an entirely false and misleading impression**. "To tell less than the whole truth is a well-known method of deception," the court ruled.

More doctors smoke camels

Every doctor in private practice was asked:
—family physicians, surgeons, specialists…
doctors in every branch of medicine—
"What cigarette do you smoke?"

According to a recent Nationwide survey:

More Doctors Smoke Camels

than any other cigarette!

Not a guess, not just a trend . . . but an *actual fact* based on the statements of doctors themselves to 3 nationally known independent research organizations.

THE "T-ZONE" TEST WILL TELL YOU

The "T-Zone"—T for taste and T for throat—is your own laboratory, your proving ground, for any cigarette. For only your taste and your throat can decide which cigarette tastes best to *you* . . . and how it affects your throat. On the basis of the experience of many, many millions of smokers, we believe Camels will suit your "T-Zone" to a "T."

CAMEL
TURKISH & DOMESTIC BLEND CIGARETTES
CHOICE QUALITY

YES, your doctor was asked . . . along with thousands and thousands of other doctors from Maine to California.

And they've named their choice—the brand that more doctors named as their smoke is *Camel!* Three nationally known independent research organizations found this to be a fact.

Nothing unusual about it. Doctors smoke for pleasure just like the rest of us. They appreciate, just as you, a mildness that's cool and easy on the throat. They too enjoy the full, rich flavor of expertly blended costlier tobaccos. Next time, try Camels.

R. J. Reynolds Tobacco Co.
Winston-Salem, N. C.

1946 Camel cigarettes print ad

Every *doctor in private practice was asked*

Yes, ***your*** doctor was asked

Why “doctors”, and not “businessmen” or “actors”?

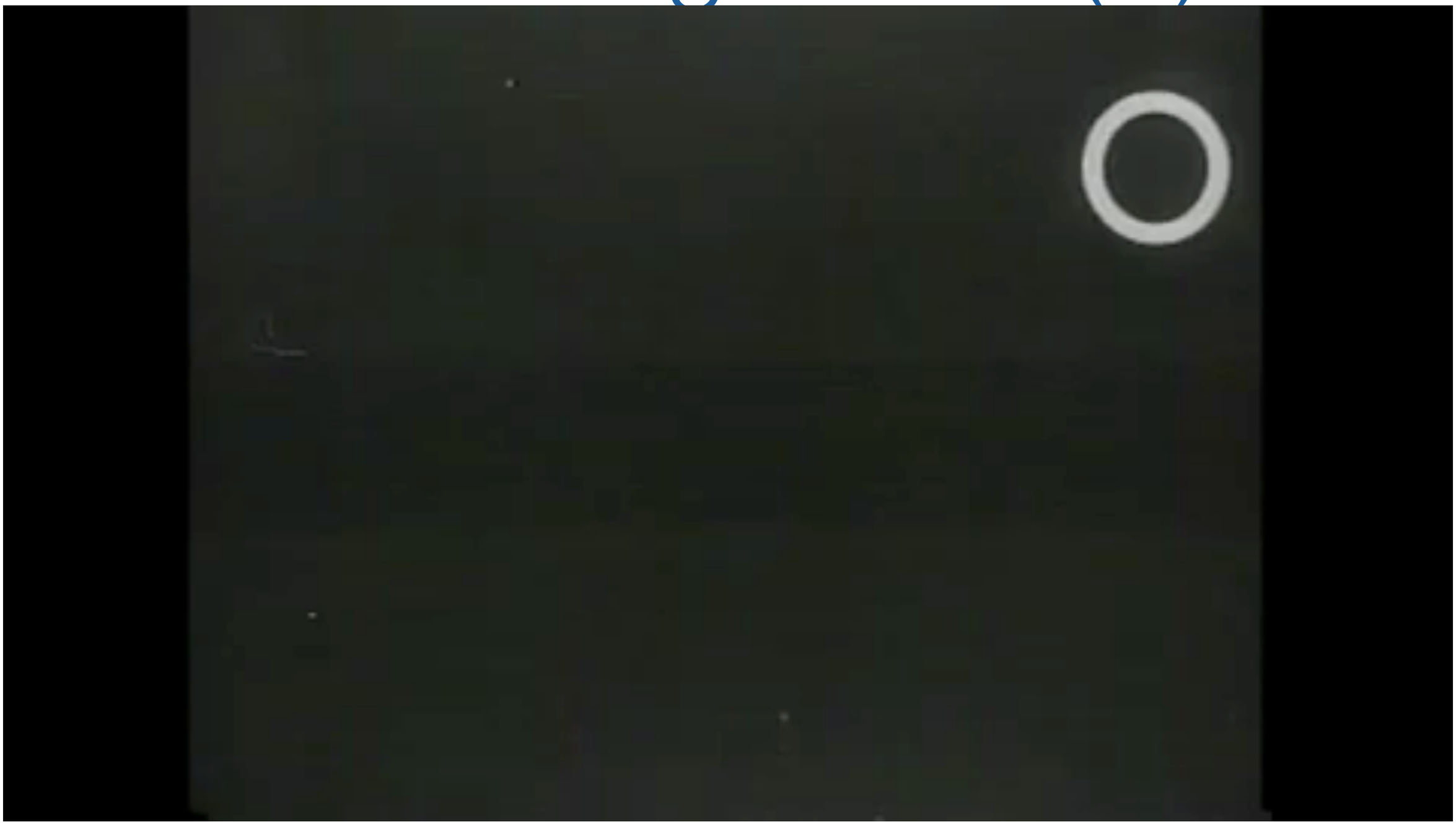
- implicit recognition of ongoing concerns about tobacco and serious disease (p.105)

- exploiting popular faith in modern medicine and clinical authority of doctors (p. 106)

- companies portrayed their cigarettes as the most healthy and utilized physicians to counteract any fears of serious health risks (p.106)

1949 TV commercial from Camel cigarettes (1)

1949 TV commercial from Camel cigarettes (2)

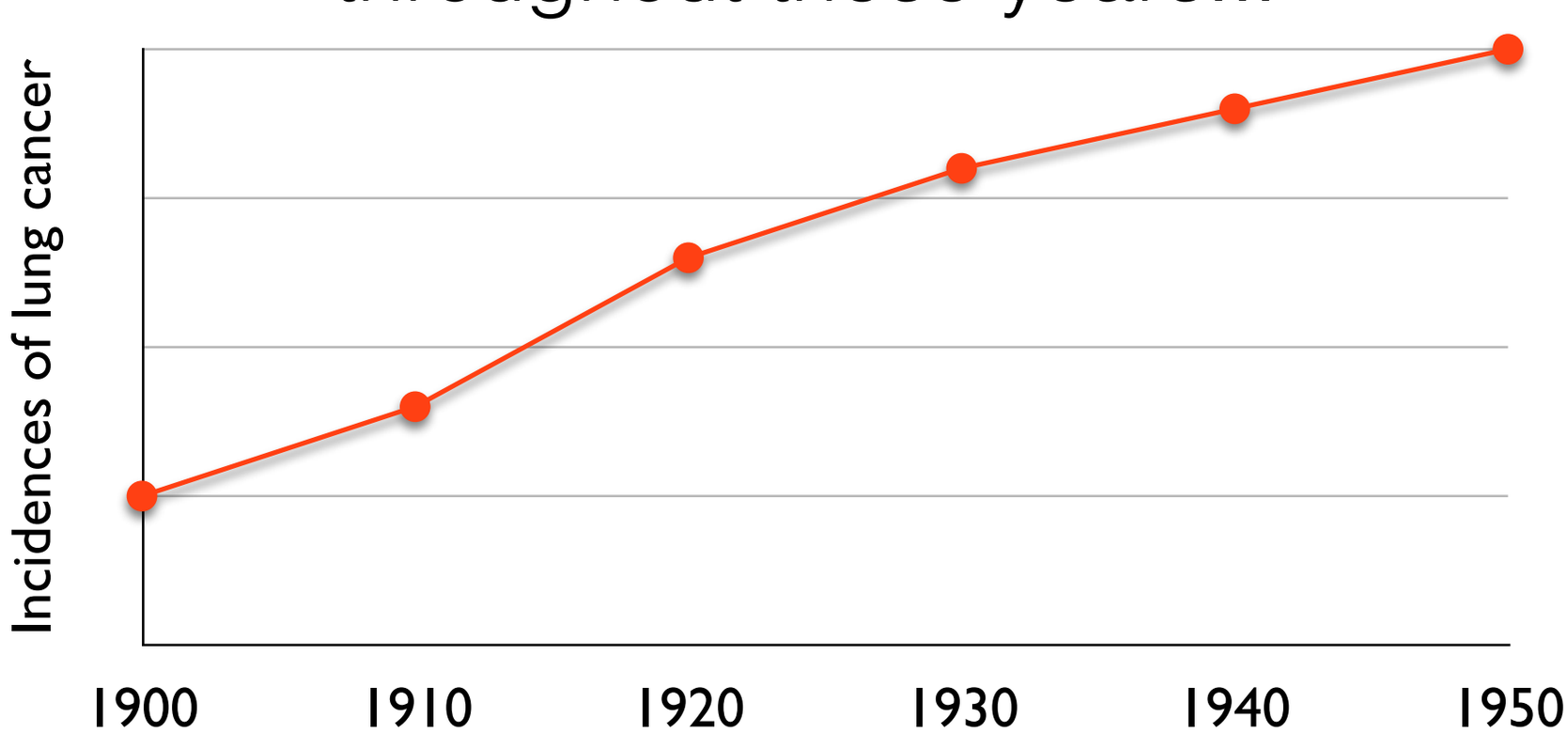


1949 TV commercial from Camel cigarettes (3)

Causation vs. correlation

Cigarette smoking **causes (?)** serious disease and death

Given that cigarette consumption increased steadily throughout these years...

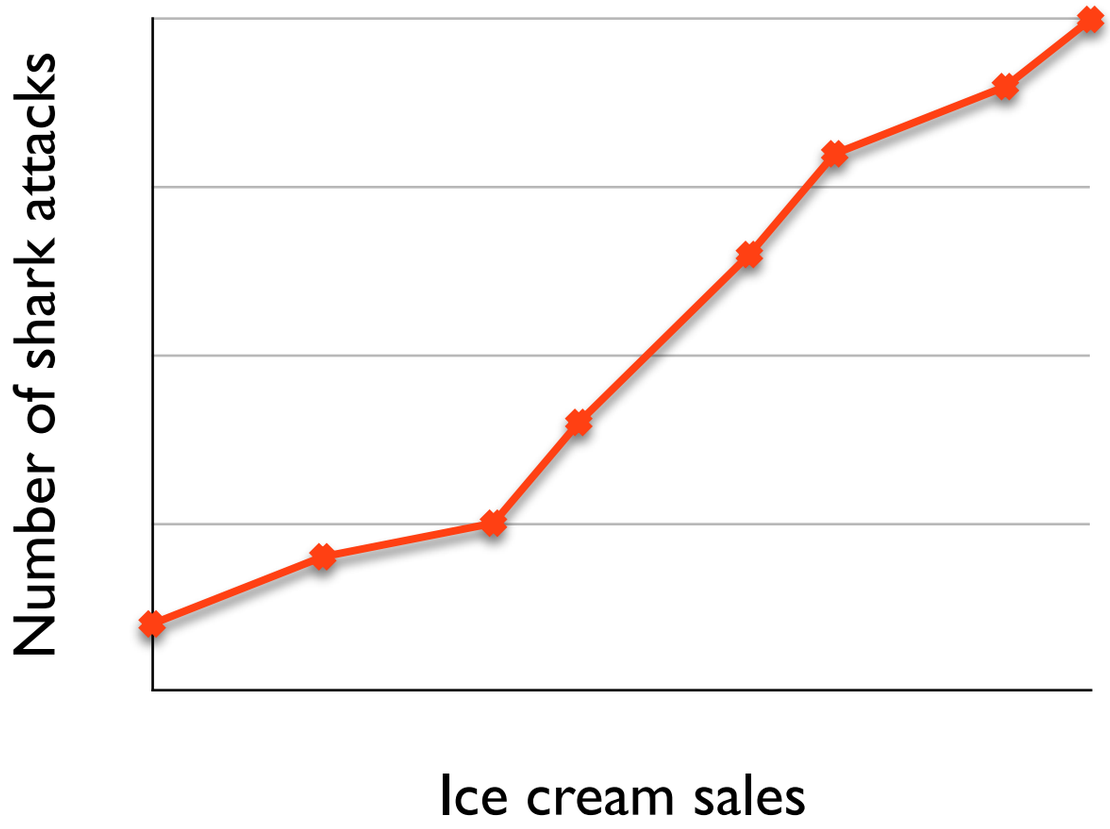


can we conclude that smoking was the cause of increased incidence of lung cancer?

Correlation vs. causation

- Does this chart show that increased ice cream sales cause number of shark attacks to increase?

- There is a confounding variable that may be causing both ice cream sales and number of shark attacks to increase: Season (or more specifically summer)



Inferring causation

- We cannot infer causation based on observational studies.
    - If a person who smokes dies, it may be that s/he died because of smoking, or it may be due to some other reason.
- In order to be able to infer causation, we need to do a controlled experiment.
    - Sample matched pairs based on age, sex, height, weight, health conditions, etc. Randomly assign one of the pairs to smoke. At the end determine if a significantly higher proportion of the smokers die.
- It was not feasible to do a controlled experiment on smoking, therefore the debate on whether or not smoking causes cancer was not easily settled.

What were some early indicators of the harmful effects of smoking?

- 18th century: effects of nicotine on health
- 19th century: “a drop of nicotine in its purest form could kill”
- 20th century:
  - baby dead from swallowing a cigar
  - cattle straying into tobacco field died
  - easy consumption of cigarettes (unlike pipes and cigars) lead to excessive use and autopsies confirmed deaths due to nicotine poisoning

What moral implications of smoking does the text mention?

- smoking - defined as an act of dubious morals - must lead to disease (p.107)

- did smoking cause degeneracy? or was it simply that degenerates liked to smoke? (p.108)

- tobacco as the preeminent “gateway drug” leading its patrons to lives of decay and degradation (p. 110)

Smoking and men

- How can we say that smoking is unhealthy when
  - some smokers are excellent athletes?
  - some are tall and healthy?
  - others noted for their literary skills and sharp intellect?
- Studies show lowered scholastic aptitude among men who smoke.
- Smoking doesn't affect everyone in the same negative way. Then, how can we prove that smoking is unhealthy?

Smoking and women

- Vulnerabilities of the “weaker sex”
    - women smoke nervously and therefore cannot smoke moderately (p. 112)
- Nicotine intake leads to insufficient lactation in breast feeding mothers (p. 113)
    - or was it the intemperate nature of women that lead her to smoke and decreased lactation?
- Some women who smoked were perfectly healthy, fertile, and had healthy babies. Other women who smoked had complications at child birth or could not breast feed properly. Then, how can we conclude that cigarettes constitute a clear danger to mother and child?

Early smoking research

What were some problems early 20th century scientists encountered that prevented them from inferring a direct causal pathway between smoking and lung cancer?

Smoking research in 1930's and 1940's

- 1930's: Researchers took care to isolate their claims from moral concerns
  - "tobacco heart": arrhythmia, angina, cardiac arrest
- 1940's: Studies concerning the impact of cigarettes on circulation under controlled experimental conditions
  - reduce confounding variables and bias
  - smoking (nicotine) constricts blood vessels
    - smoking might exacerbate a preexisting condition or weakness, but when the heart is healthy, no harm is likely to result from smoking
  - animal research (controlled experiments)
    - animal experiments could not simulate smoking by the human being and therefore were subject to criticism that results could not be generalized to humans

Anecdotal evidence and variability

- Too many smokers used tobacco without any apparent consequences to sustain the reformers' claims of incipient moral and physical decay (p. 114)

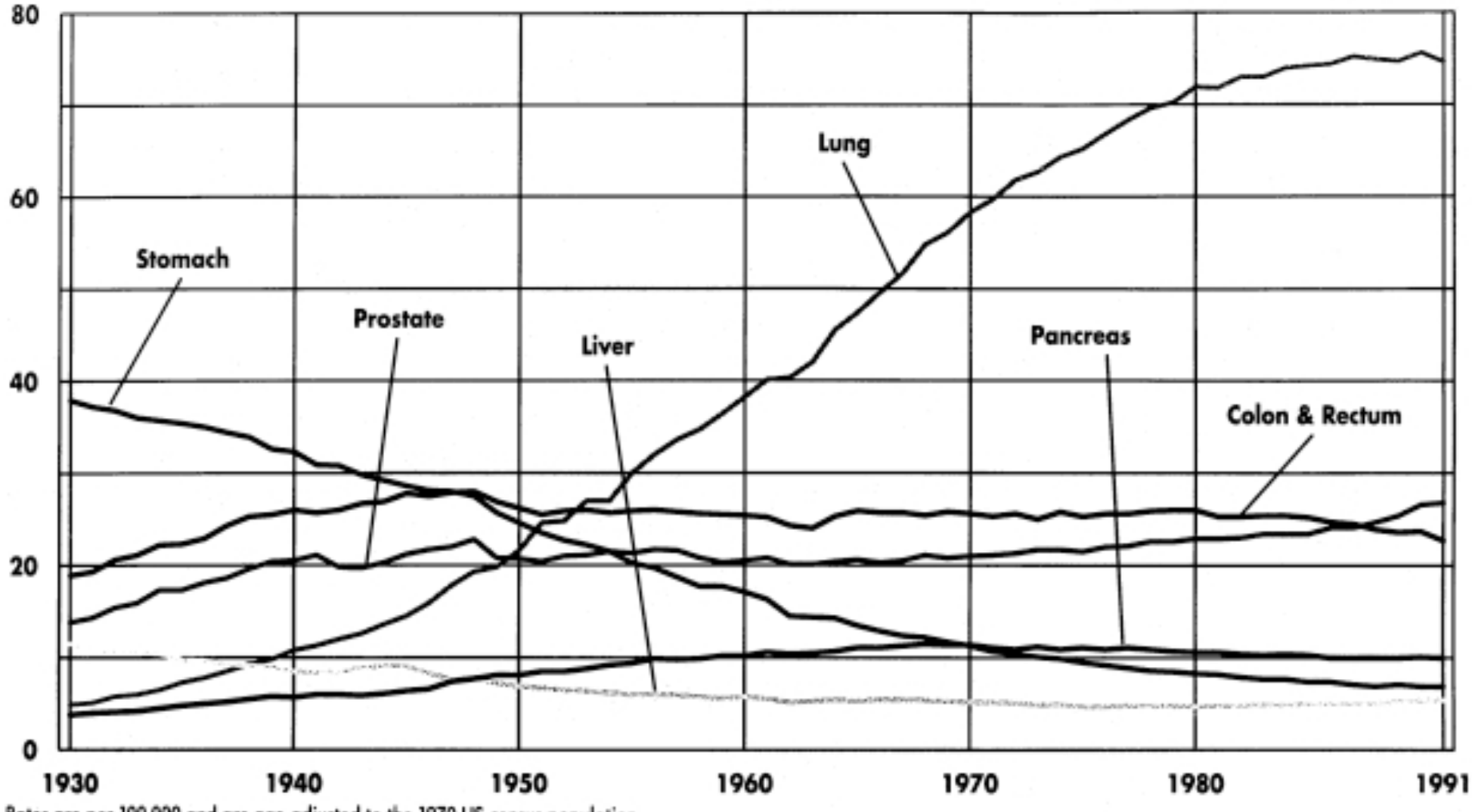
- Individual variation became the theater of clinical judgement: some smokers seemed completely unaffected b their habit; others particularly sensitive to the complex constituents of cigarette smoke. (p. 115)

- As cigarette smoking became increasingly popular [1930's], medicine offered no new insight into how best to evaluate such variability other than after the fact. If and when an individual developed symptoms, a physician might appropriately advise restricting or eliminating tobacco. (p. 116)

- Smoking is a complex human behavior, by its nature difficult to study, confounded by human variability. (p. 121)

Increased rate of lung cancer for men

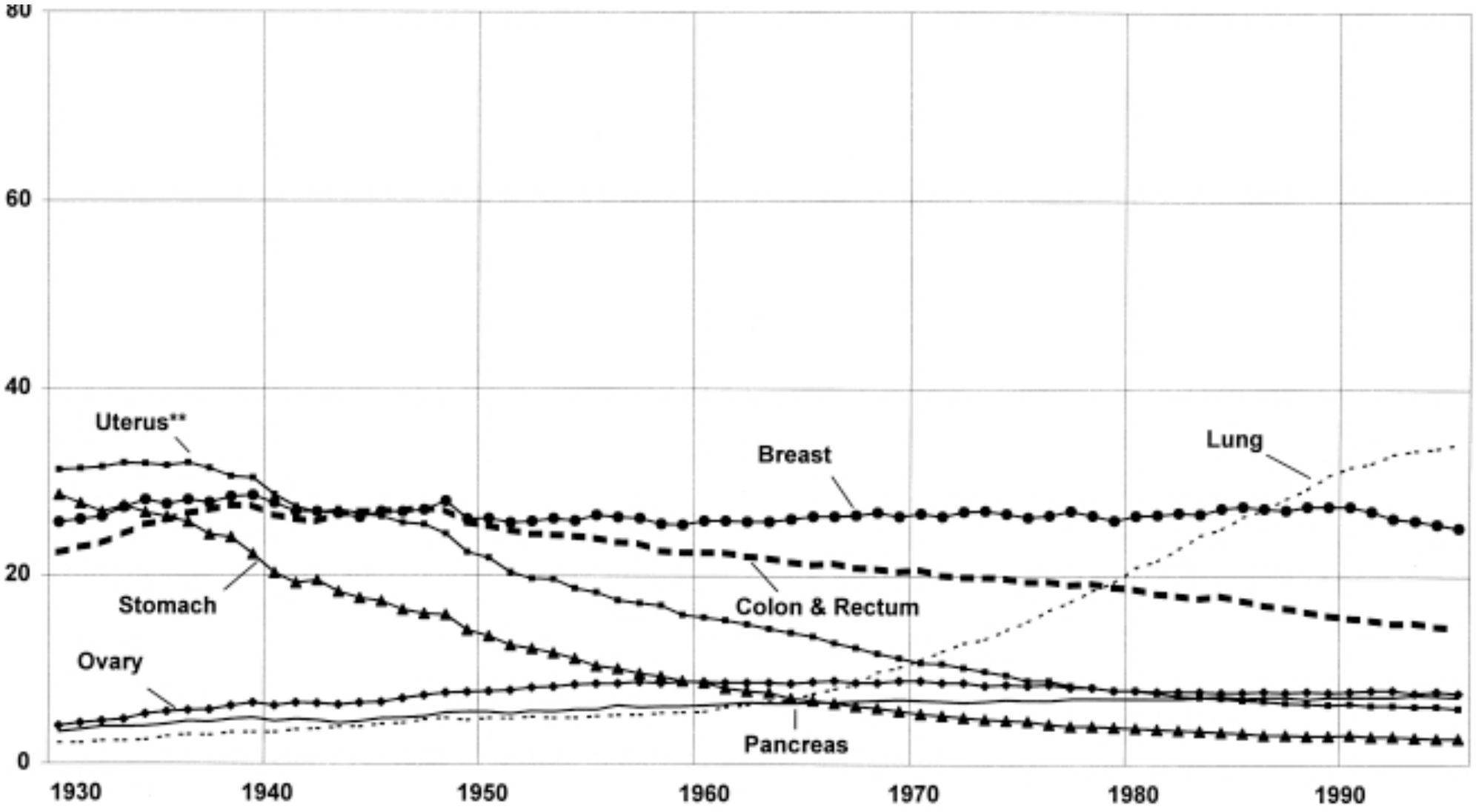
Cancer Death Rates by Site Males, United States, 1930 - 91



Rates are per 100,000 and are age-adjusted to the 1970 US census population.

… and for women

Cancer Death Rates by Site Females, United States, 1930 - 91



Does this prove that smoking causes cancer?

- Was cancer more prominent because individuals survived longer?

- Did smoking lead to diseases that caused death? Or were less healthy individuals predisposed to smoke?

- Were some people more vulnerable to the effects of smoking than others?

Correlation vs. causation (revisited)

- Smoking of tobacco statistically associated with the impairment of life duration, and the amount of this impairment increased as the habitual amount of smoking increased (p. 127)

- Graham (surgeon): “Yes there is a parallel between the sale of cigarettes and lung cancer, but there is also a parallel between the sale of silk stockings and cancer of the lung.” (p. 128)

How were Wynder and Graham's and Doll and Hill's studies different from previous studies on effects of smoking? What were some similarities and differences between these two studies? How did these studies contribute to inferring a direct causal pathway between smoking and lung cancer?

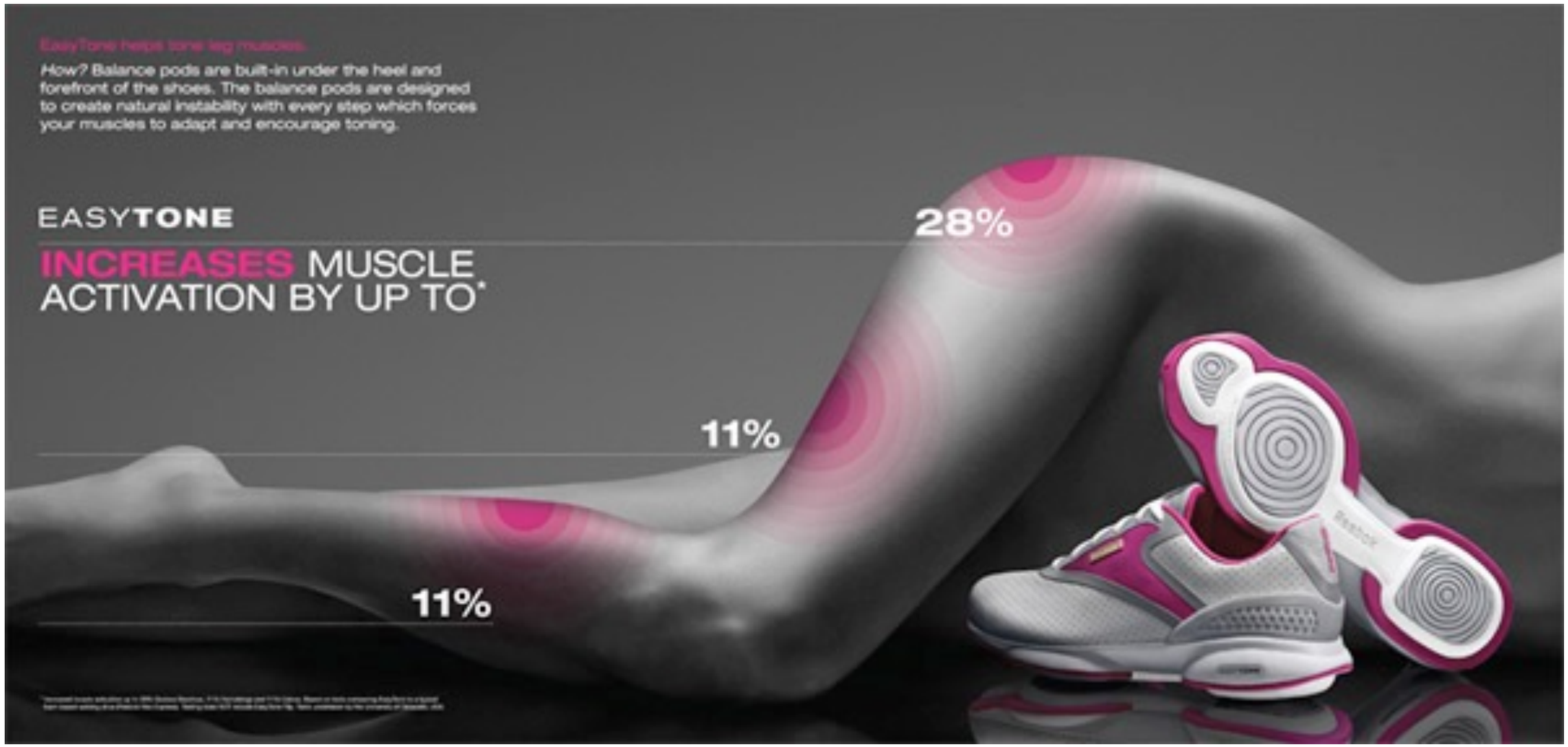
Proving causation

- In order to prove that smoking causes cancer, researchers would need to find a way to test this in a controlled experimental setting.

- Correlation between increased cigarette sales and increased incidence of lung cancer provided some insight, but did not prove causation.

- As long as a causal link was not established, cigarette companies could sustain the verdict that the links between smoking and disease were “unproven”. (p. 106)

Causal claims recently…



"increased muscle activation in 3 key areas of the leg"

Firm Body, No Workout Required?

By TARA PARKER-POPE DEC. 7, 2009

The New York Times

But the studies don't show whether more engagement leads to meaningful changes in muscle tone or appearance over time. Nor is it clear whether the high level of engagement continues once the walker becomes accustomed to the shoe.

But the claim that the shoes offer muscle toning is backed by a single study involving just five people, not published in a peer-reviewed academic journal. In that study, done at the University of Delaware, five women walked on a treadmill for 500 steps wearing either the EasyTone or another Reebok walking shoe, and while barefoot. Using sensors that measure muscle activity, the researchers showed that wearing the EasyTone worked gluteal muscles an average of 28 percent more than regular walking shoes. Hamstring and calf muscles worked 11 percent harder.

So the real effect may come from simple awareness that they are wearing a muscle-activating shoe, causing them to walk more briskly and with purpose.

Can you think of one (or few) products/issues where quantitative/ statistical information is mis-used in advertisements nowadays?