

Statistical Literacy: An Overview

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0. Causation from Association



By Rebecca Pollack and Kevin Kepple, USA TODAY

Source: American Cancer Society



Statistical Literacy

To be literate about everyday arguments
that use statistics as evidence

Statistics are man-made, socially constructed.

Motto: “**Take CARE!**”

- C = Confounding (Predictors tangled up)
- A = Assembly (Define/Choose/Present)
- R = Randomness (Chance)
- E = Error or Bias (Mistakes, Sampling bias)

Different Emphasis

Confounding: Predictors are tangled up.

- ‘Take control of’ by random assignment.
 - ‘Control for’ by standardizing (regression).
-

Assembly:

- defining groups (bullying, heat-wave deaths)
- choosing statistics (centers, rates, percents)
- presenting statistics (graphs & comparisons).

Traditional Statistics

Statistical Literacy

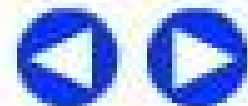
Association		Association
Descriptive Statistics		<i>Confounding</i> [New]
Randomness		<i>Assembly</i> [Mostly New]
		Randomness / Error

C = Confounding

Age of Respondents



By Julia Neyman and Keith Carter, USA TODAY
Source: Ipsos for Findlaw



C = Confounding

Size of the Group

Table 1: State Prison Expenses: MN vs. IA

State	Total	# Inmates	Per Inmate
MN	\$186M	4,917	\$37,825
IA	\$146M	6,012	\$24,286
%	27%		56%

Table 2: State Prison Expenses: MN vs. ME

State	Total	# Inmates	Per Inmate
MN	\$186M	4,917	\$37,825
ME	\$52M	1,543	\$33,711
%	260%		12%

C = Confounding

Size of the Group

Table 3: State Prison Expenses: CA vs. NY

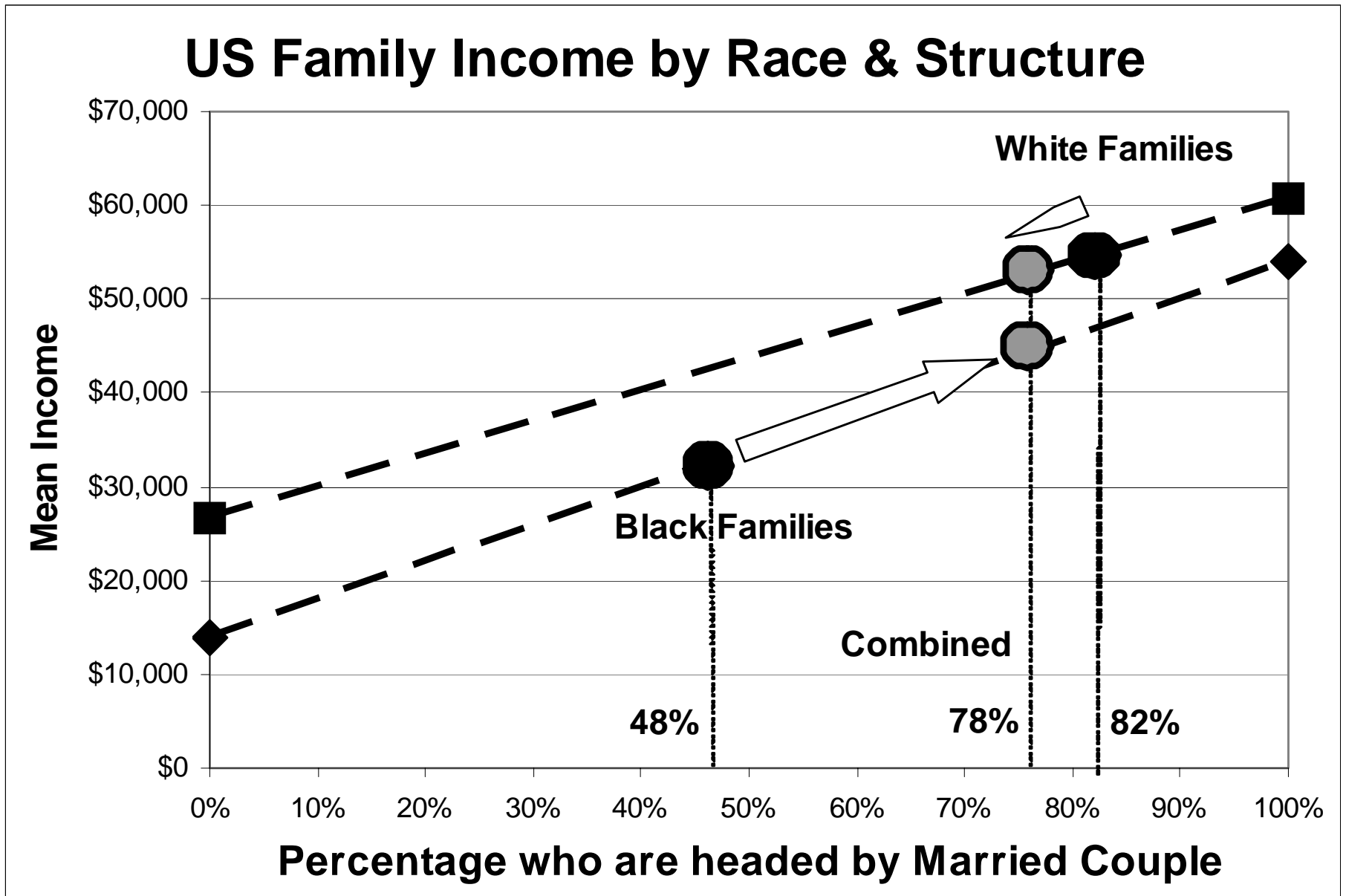
State	Total	# Inmates	Per Inmate
CA	\$3.0B	140	\$21,385
NY	\$2.2B	77	\$28,426
%	36%		-25%

Controlling for the influence of a confounder can \uparrow , \downarrow or reverse an association of totals.

Q. Can we show this for an association of ratios?

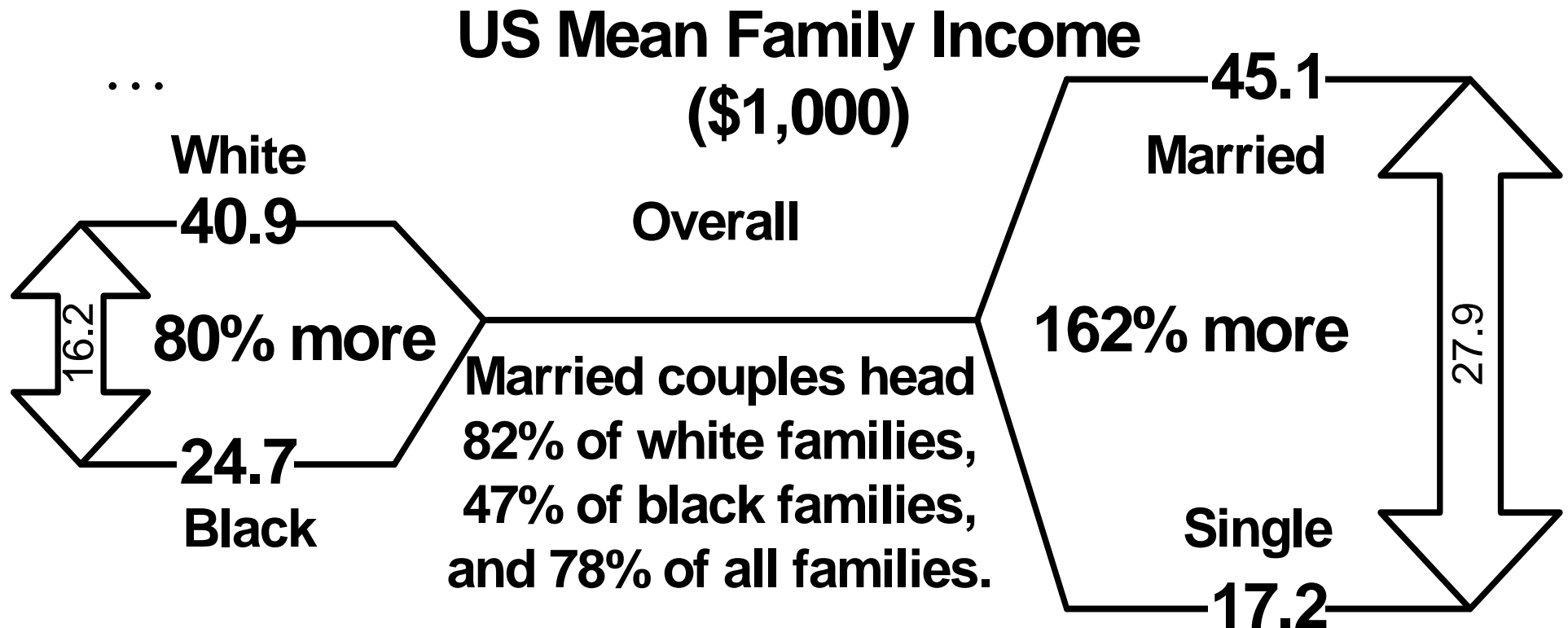
A. YES!

C = Confounding



C = Confounding

Ability to Influence



Married couples are 75% (35 percentage points) more prevalent among white families than among black families.

A = Assembly: “Per Patron...”



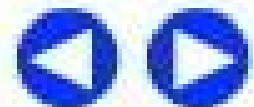
By Ashley Burrell and Ron Coddington, USA TODAY
Source: American Library Association



A = Assembly: Choice of Time Period



By Mary Cadden and Keith Carter, USA TODAY
Source: Directions Research



A = Assembly

1M Scouts; 2M Badges

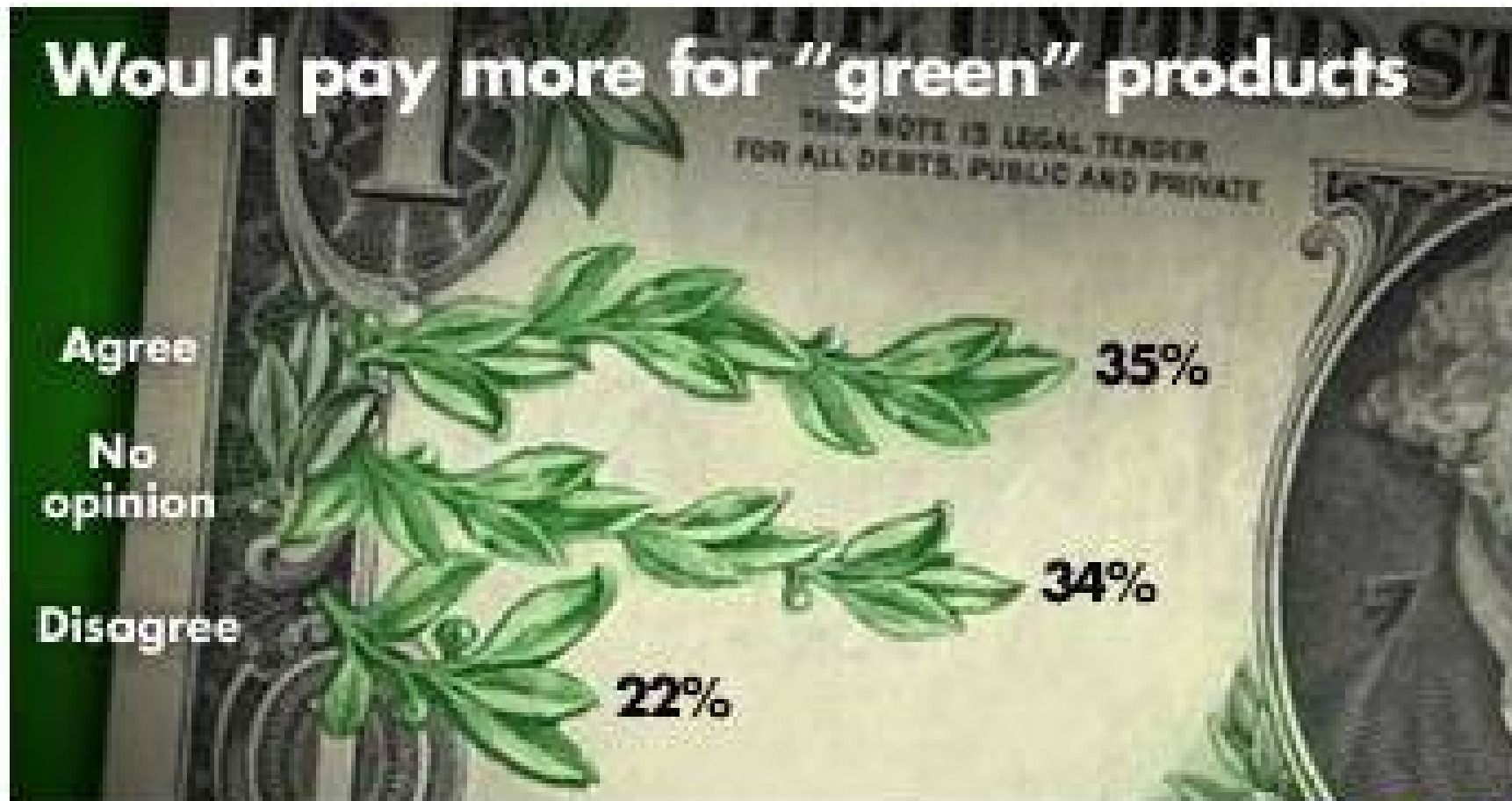


By Cindy Clark and Rod Coddington, USA TODAY
Source: Boy Scouts of America



A = Assembly

How Much More?



By Anne R. Carey and Jerry Mosemak, USA TODAY
Source: Simmons Market Research



A = Assembly

“Many”: 30% or 9%

Types of bumper stickers we have



By Justin Dickerson and Rod Coddington, USA TODAY
Source: Roper for Mercedes-Benz



A = Assembly More/Most

Full Comparatives

- Women live longer than men.
- Autism more prevalent among boys than girls.

Incomplete (Null) comparatives.

- More doctors like Crest.

Superlatives (Majority vs. Plurality)

- Most doctors like Crest.

A = Assembly Part vs. Whole

Difficulty reading graphs in USA Today



R = Randomness: Not Due to Chance

**Too Unlikely to be Due to Chance
so the association must be causal.**

- This statistic is central to arguments about ESP and Intelligent Design and to arguments about the safety of nuclear power plants, cell phones and cell-phone towers. .
- These arguments are central to education, to moral decisions and to legal liability.

R = Randomness Evolution

Too Unlikely to be *Due Just to Chance*

- Evolving life *by chance alone* is as likely as having tornado turn a junk yard into a 747.
-

If a Robin = 1,000 “ones” on a 10-sided die.

- 10^{990} years *by chance alone* (~300/sec)
- 30 seconds by chance plus “genetic inheritance” or “natural selection”

R = Randomness

Many Coincidences

Explain coincidences (unlikely events):

- Winning lottery twice.
 - 9/11 coincidences.
-

Law of Large Numbers

- Unlikely is almost certain given enough tries.
- 60% chance of 8 heads in 8 flips in 256 tries.

E = Error/Bias: Casino's Loose Money?



By Anne R. Carey and Keith Carter, USA TODAY
Source: Maritz Poll





SUMMARY

Peter Holmes (2003)

W. M. Keck Statistical Literacy course

- “is *different*”: “different emphasis”, “different background”, “a different package”
- “goes beyond Numeracy”
- is more in line with the statistical literacy “needed by most people in everyday life to read the news, by those in business commerce or management, and by policy makers.”

To Get Educated

1. Read “*Statistical Literacy and Liberal Education at Augsburg College*” by Milo Schield (2004 AACU Peer Review)
2. Read *Damned Lies & Statistics* and *More Damned Lies & Statistics* by Joel Best
3. Read “*Statistical Literacy – Online at Capella University*” by Mark Isaacson.
4. Investigate Stat Lit at www.Statlit.org

Next Steps

1. Network with faculty interested in critical thinking about arguments involving statistics.
2. Read “*The Case for Quantitative Literacy*” by Lynn Steen (or any of his other QL books)
3. Schedule faculty workshops to discuss different approaches to QR/QL.
4. Consider adopting Statistical Literacy as a QR/QL course for humanities majors.