The Impact of Framing the Scale of Inequality on Judgments about Intervention Impacts

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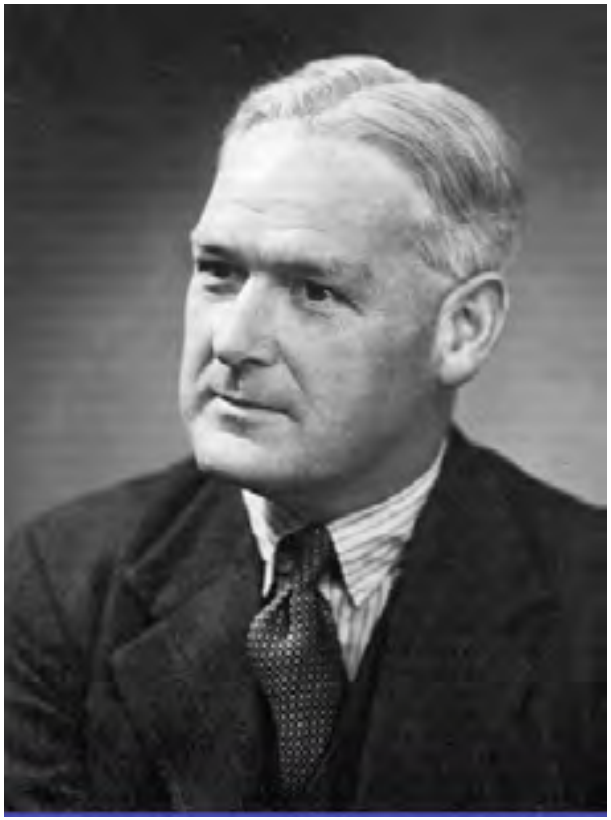
Sir Austin Bradford Hill's "Reasons for Writing"

1. Why did you start?
2. What did you do?
3. What did you find?
4. What does it all matter, anyway?



BMJ (1965)

Why did you start?

The problem of statistical illiteracy

- U.K. Committee on Safety of Medicines (1995): 3rd gen contraceptives increase blood clots by 100%.

- "Twofold" relative increase
- Absolute clot increase from 1/7,000 to 2/7,000
- Estimated 13,000 additional abortions after "pill scare"

- "Medical journals...continue to inform the public in terms of relative changes, if only because big numbers make better headlines and generate more attention."

Gigerenzer (2007)

Relevance for health inequalities

- Tracking health inequalities requires a framework for measurement.
- Challenges for both measurement and interpretation:
  - Which health inequalities are largest?
  - Do interventions exacerbate health inequalities?

- Potential impact of scale of measurement.
- Absolute scale: $I = [GroupA - GroupB]$
  - Measured on same scale as health outcome (deaths, lives saved, etc.)
- Relative scale: $I = [GroupA/GroupB]$ or $I = [A - B]/B$
  - Ignores scale of health variable.

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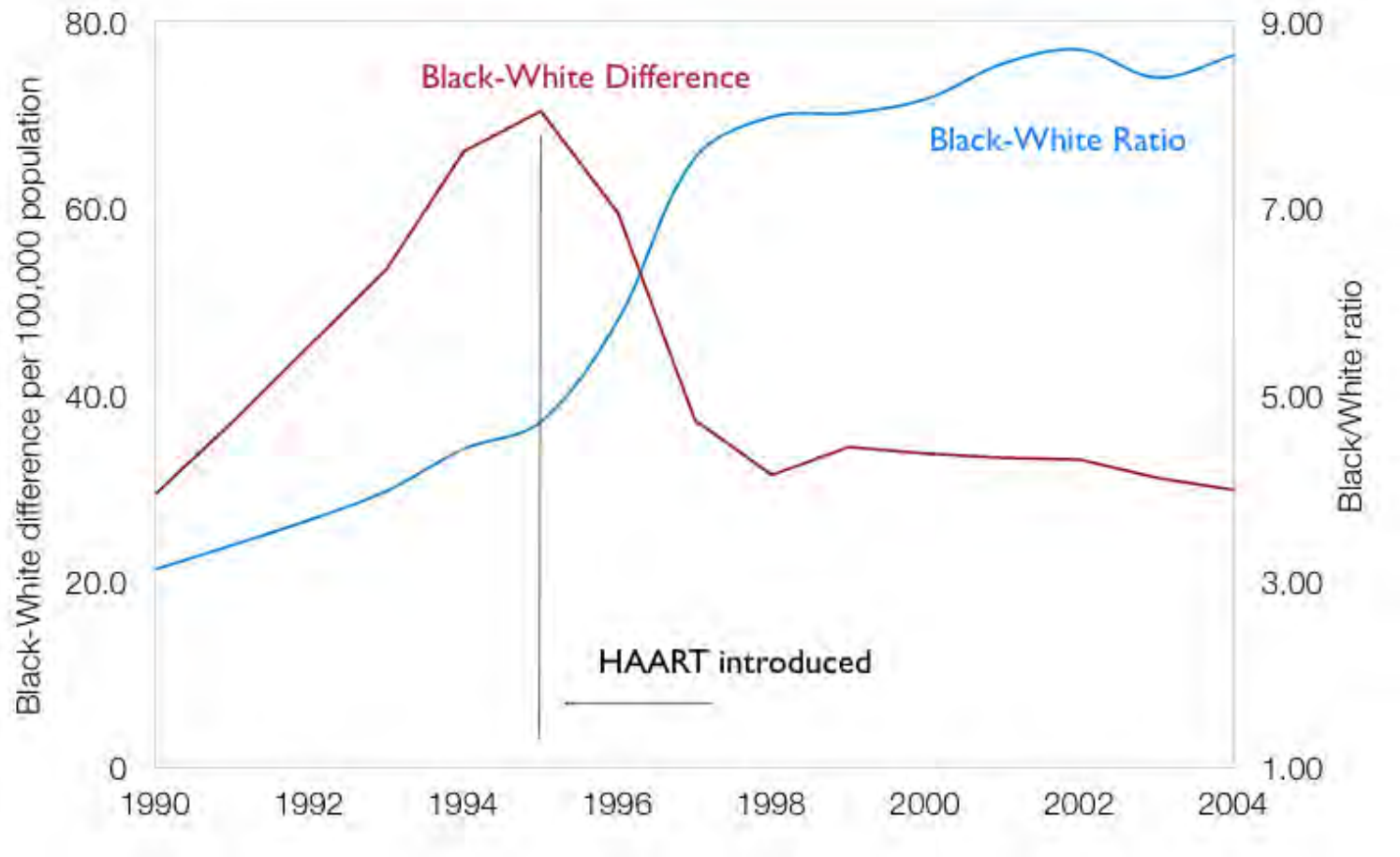
Example from HIV literature

- "National Black-White disparities widened significantly after the introduction of HAART, especially among women and the elderly"



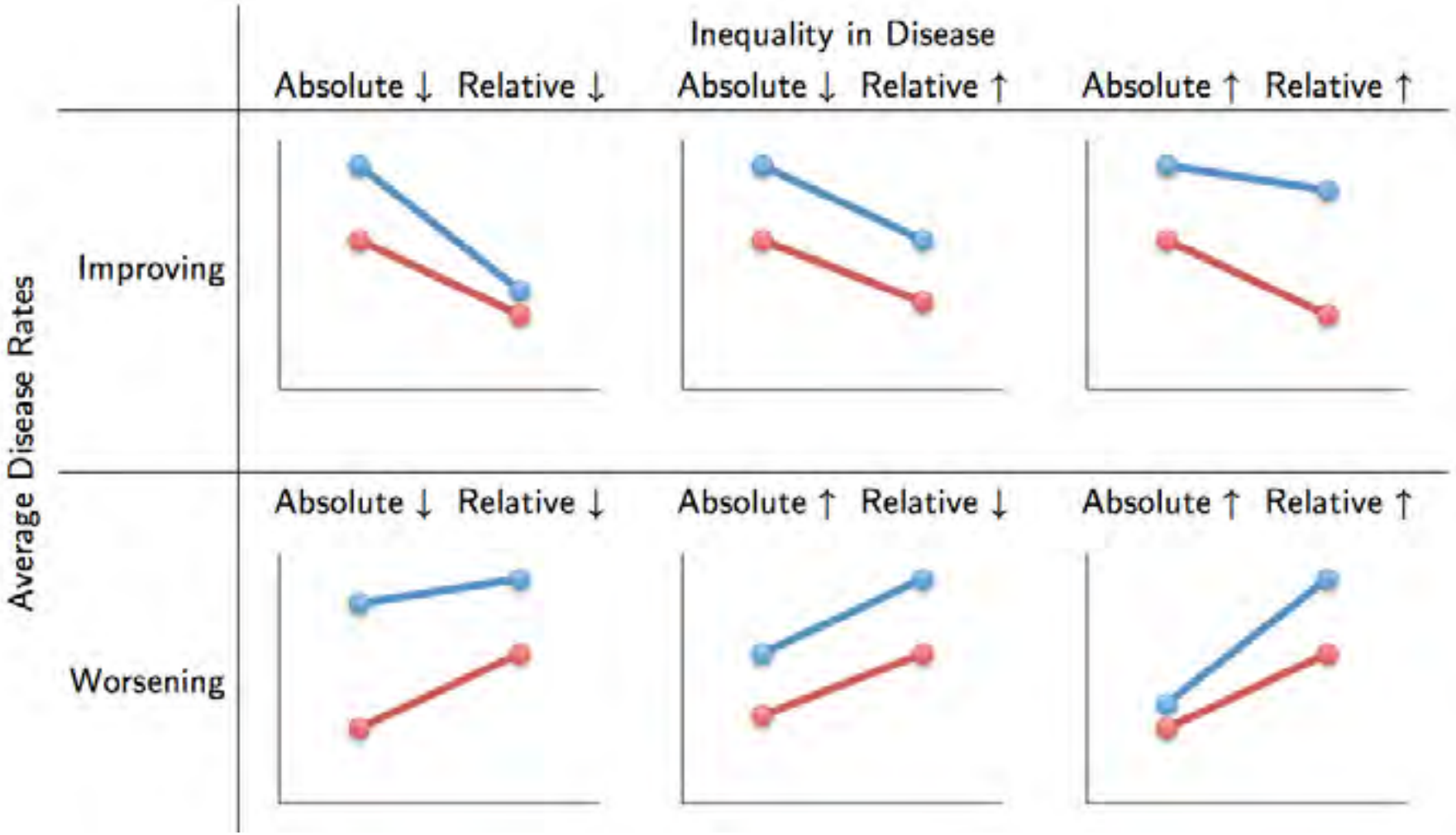
Levine et al. *AJPH* (2007)

Inequality is an ambiguous concept

"If a concept has some basic ambiguity, then a precise representation of that ambiguous concept must preserve that ambiguity. . . This issue is quite central to the need for descriptive accuracy in inequality measurement, which has to be distinguished from fully ranked, unambiguous assertions."

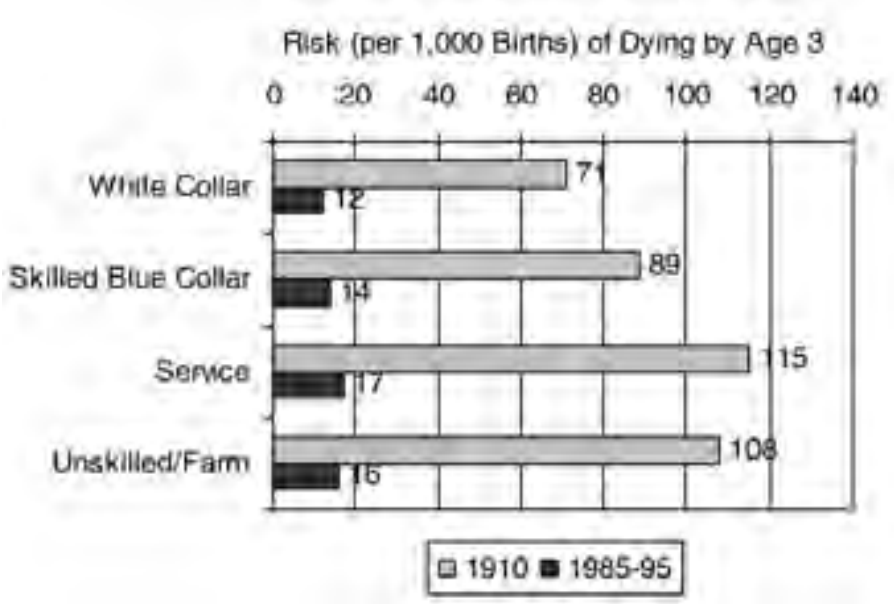
-Amartya Sen, On Economic Inequality, 1973

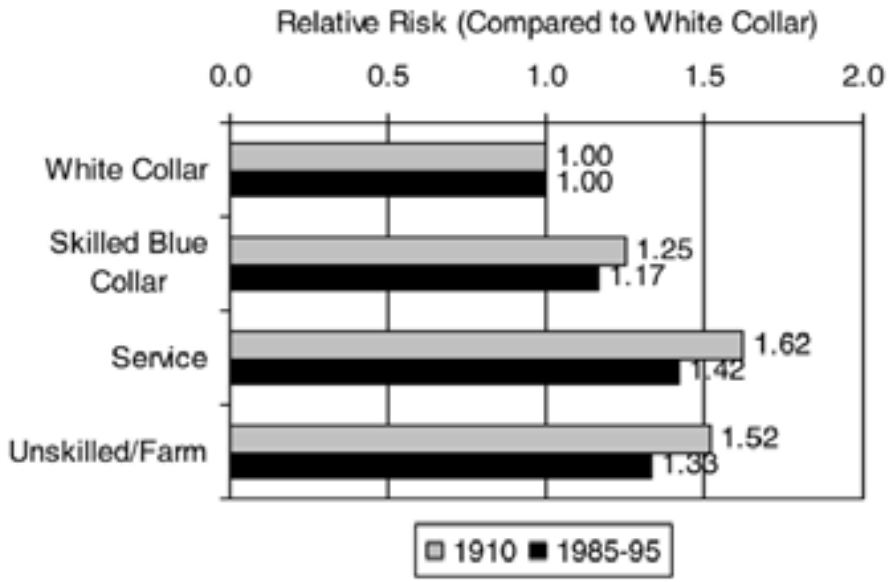
Changes in health inequality can be ambiguous



Selective measurement affects judgments about inequality

- "SES disparities in child mortality generally remained constant or declined modestly across the twentieth century."



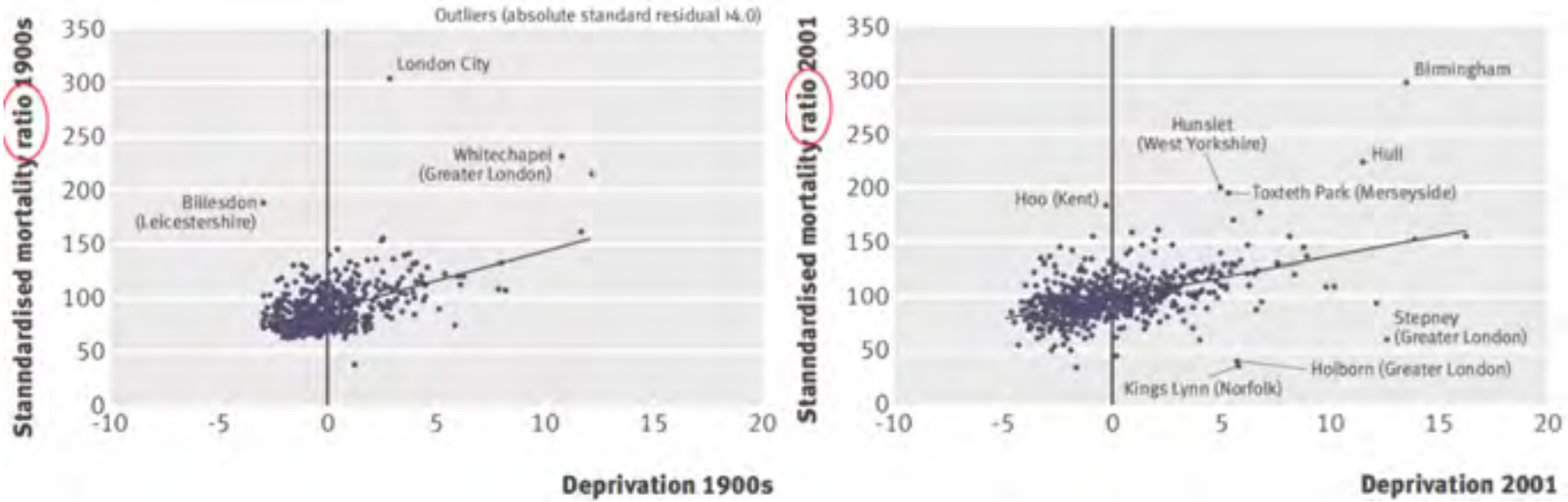


- Note: [BlueCollar - WhiteCollar] = **18** 1910, **2** in 1985-95

Warren *J Health Soc Behav* (2007)

Selective measurement affects judgments about inequality

- "...the link between mortality and deprivation across England and Wales remains as strong today as it was a century ago."



Gregory *BMJ* (2009)

Potential impact of "framing" inequalities

- Large literature on "framing" effects in decision-making [Kahneman, Gigerenzer, Ubel...]
  - "Different representations of the same choice problem should yield the same preferences."
  - Generally they don't.

Selective evidence may be generating systematically biased views on health inequalities.

- We wanted to test whether judgments about health inequality trends may be affected by selective presentations of "evidence"

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What did you do?

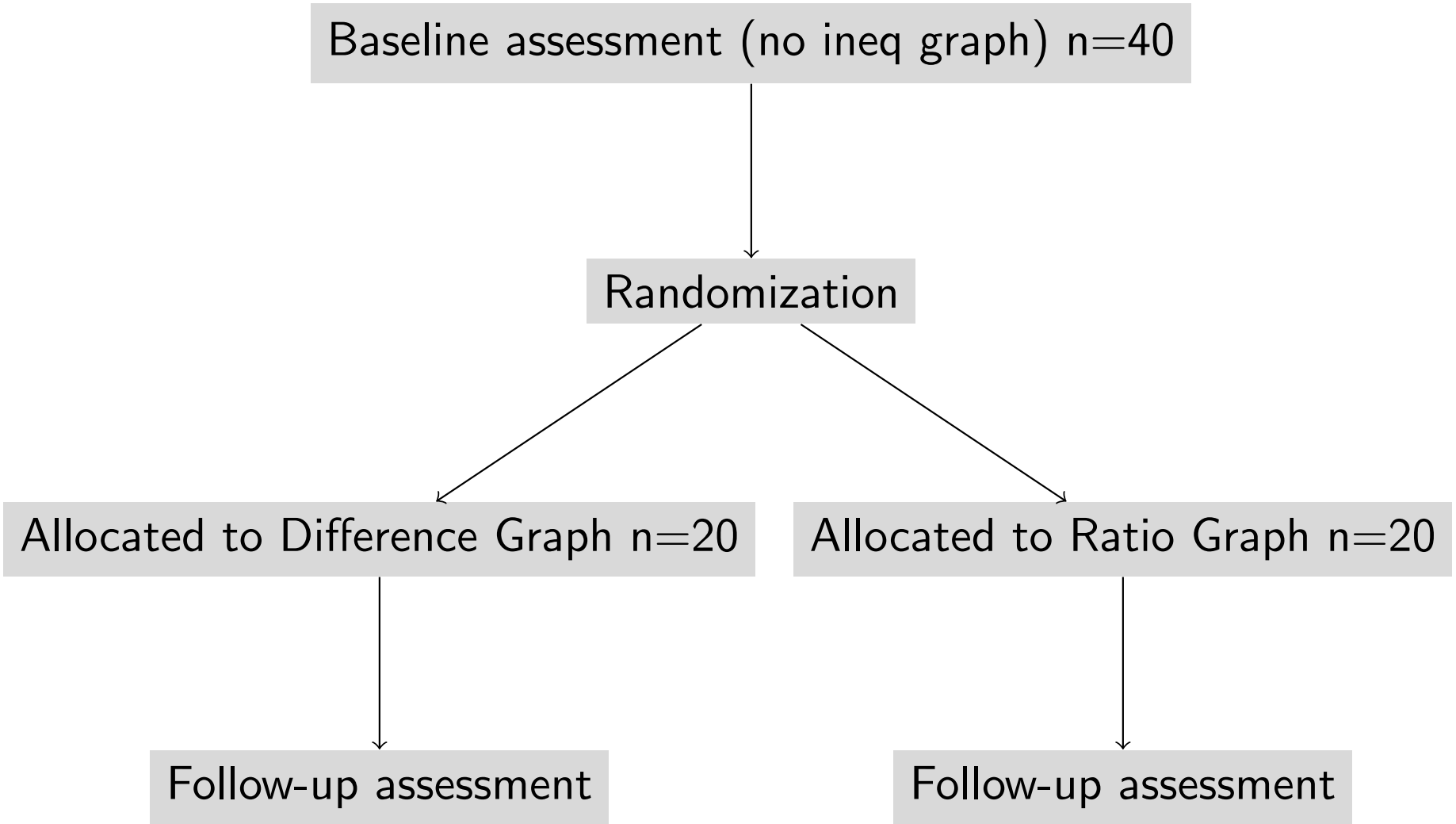
Methods

- We designed a computer-based cognitive psychology experiment.
- Recruited 40 McGill undergraduates (30 female, ages 17-37).
- Specified an intervention on fictitious diseases in Population A and Population B.
    - "Two groups of individuals have different susceptibilities to _____. The local health authorities have implemented an intervention program and would like to evaluate the effectiveness. Given the data here, please respond to the questions below:"

Methods

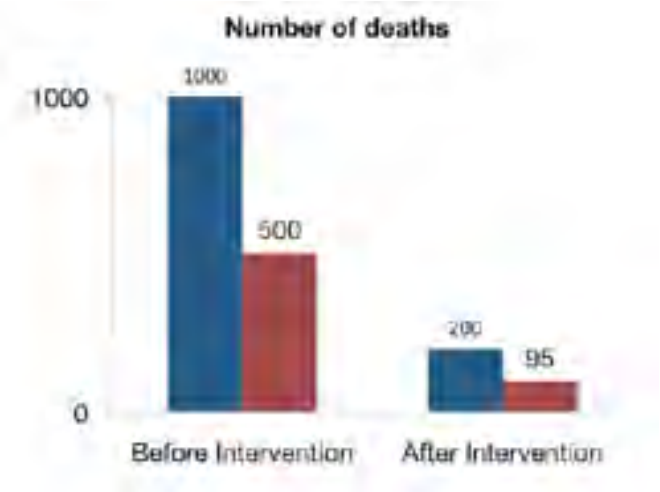
- We asked about:
  - Direction of change in inequality (Increased/Decreased/Same/DK).
  - Program success (1=not at all ... 7=very).
  - Should intervention continue (1=definitely not ... 7=definitely).
  - Monetary support to continue intervention ($0 - 100).

Randomized to see different "evidence"



Hypothetical example

- Baseline "Raw data"



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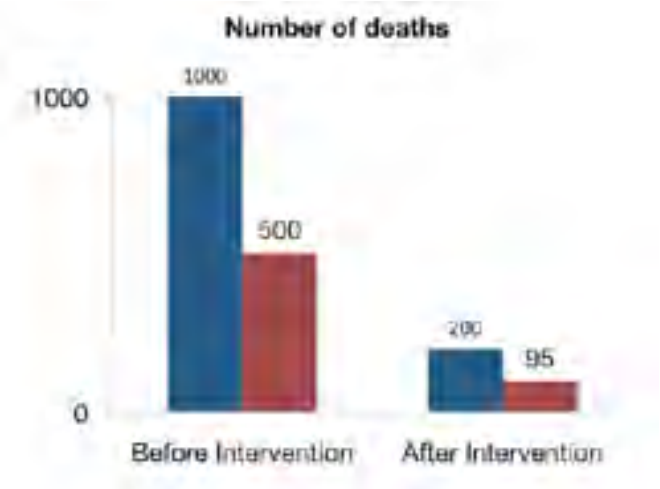
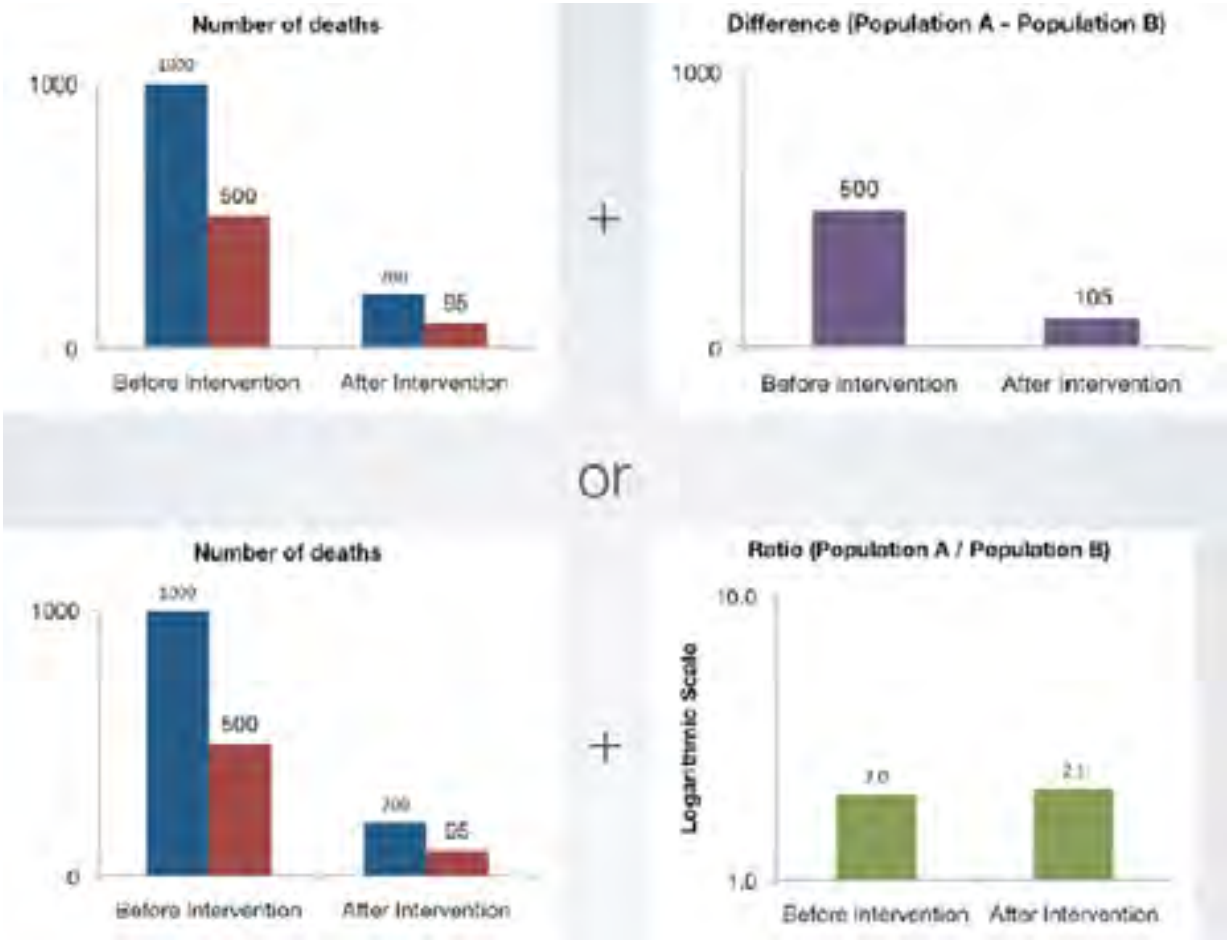
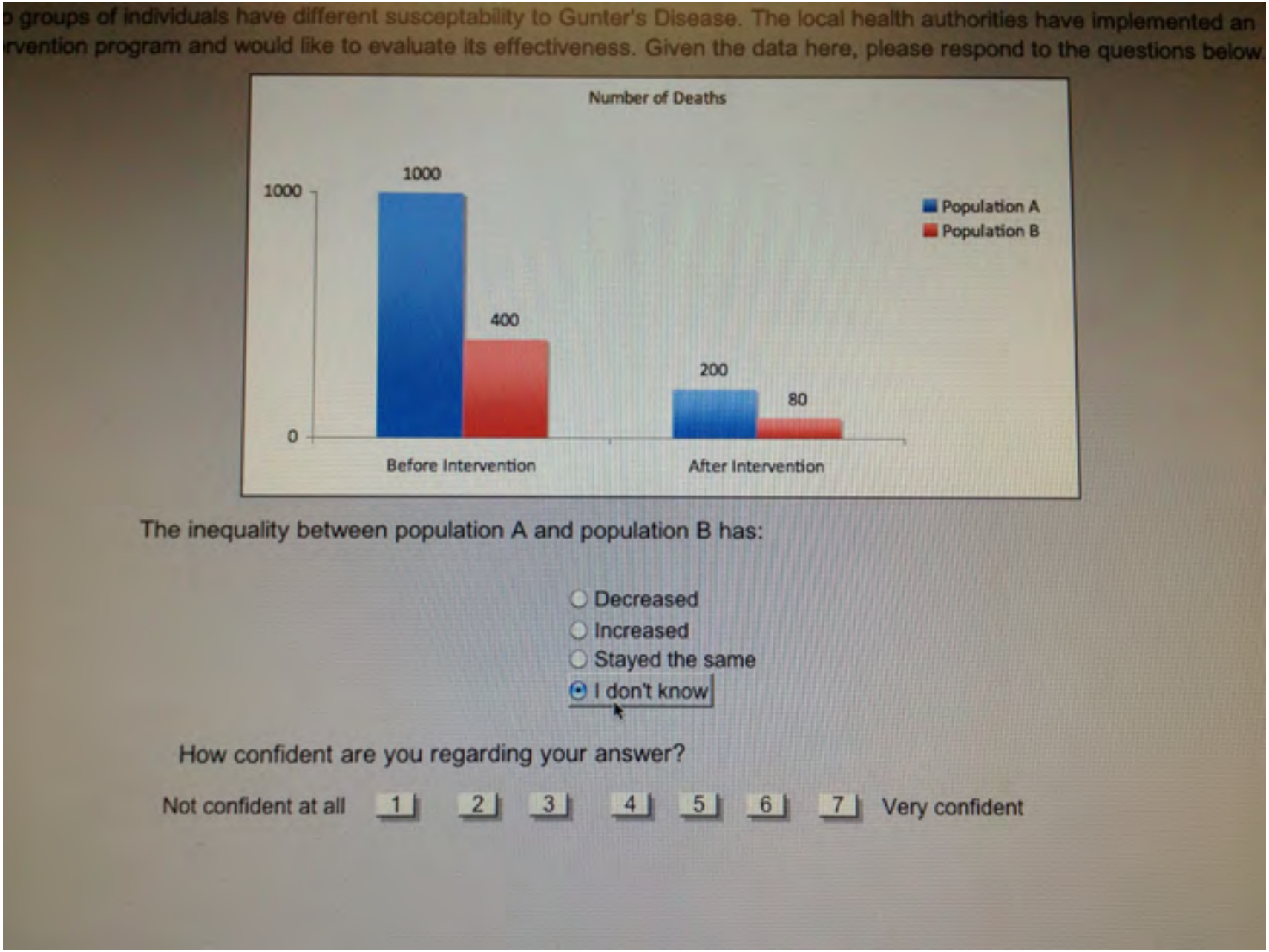


- Follow-up "Raw data + ineq graph"



Experiment interface: Direction of change



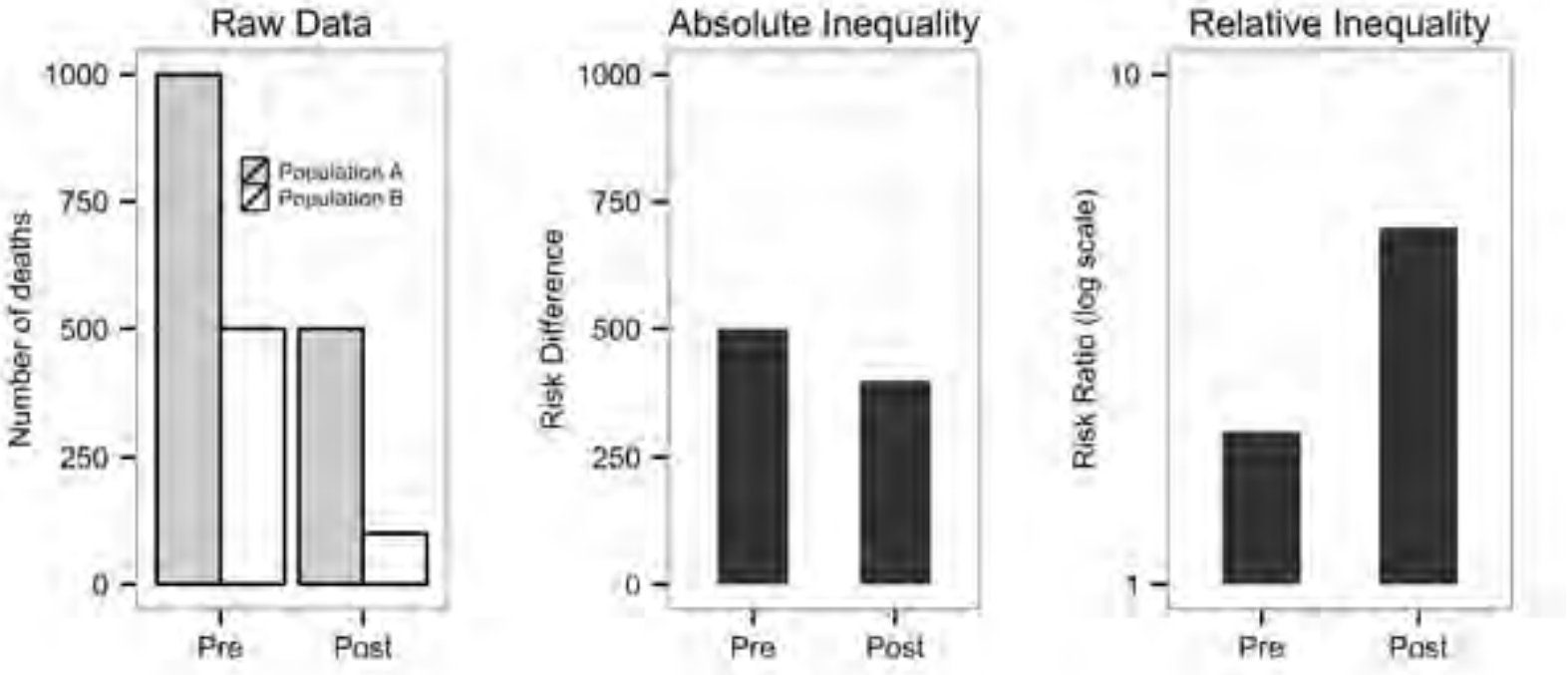
Inequality scenarios we tested

Inconsistent scenarios	Size	Pre-Intervention RD	Pre-Intervention RR	Post-Intervention RD	Post-Intervention RR
Decreasing absolute, Increasing relative	small	500	2.00	105	2.11
	large	500	2.00	400	5.00
Constant absolute, Increasing relative	small	500	2.00	500	2.25
	large	500	2.00	500	6.00
Decreasing absolute, Constant relative	small	500	2.00	400	2.00
	large	600	2.50	120	2.50
Consistent scenarios					
Decreasing absolute, Decreasing relative	small	800	5.00	310	2.63
	large	300	2.00	225	1.82
Increasing absolute, Increasing relative	small	200	1.25	700	8.00
	large	500	2.00	600	3.00

Note: RD=Risk difference (absolute); RR=Risk ratio (relative)

Decreasing Absolute, Increasing Relative Inequality

- Scenario 1: Situation where an intervention decreases deaths in both populations. [as in the HAART/HIV example].
- Absolute decrease greater in Population A, Relative decrease greater in Population B.



Statistical Analysis

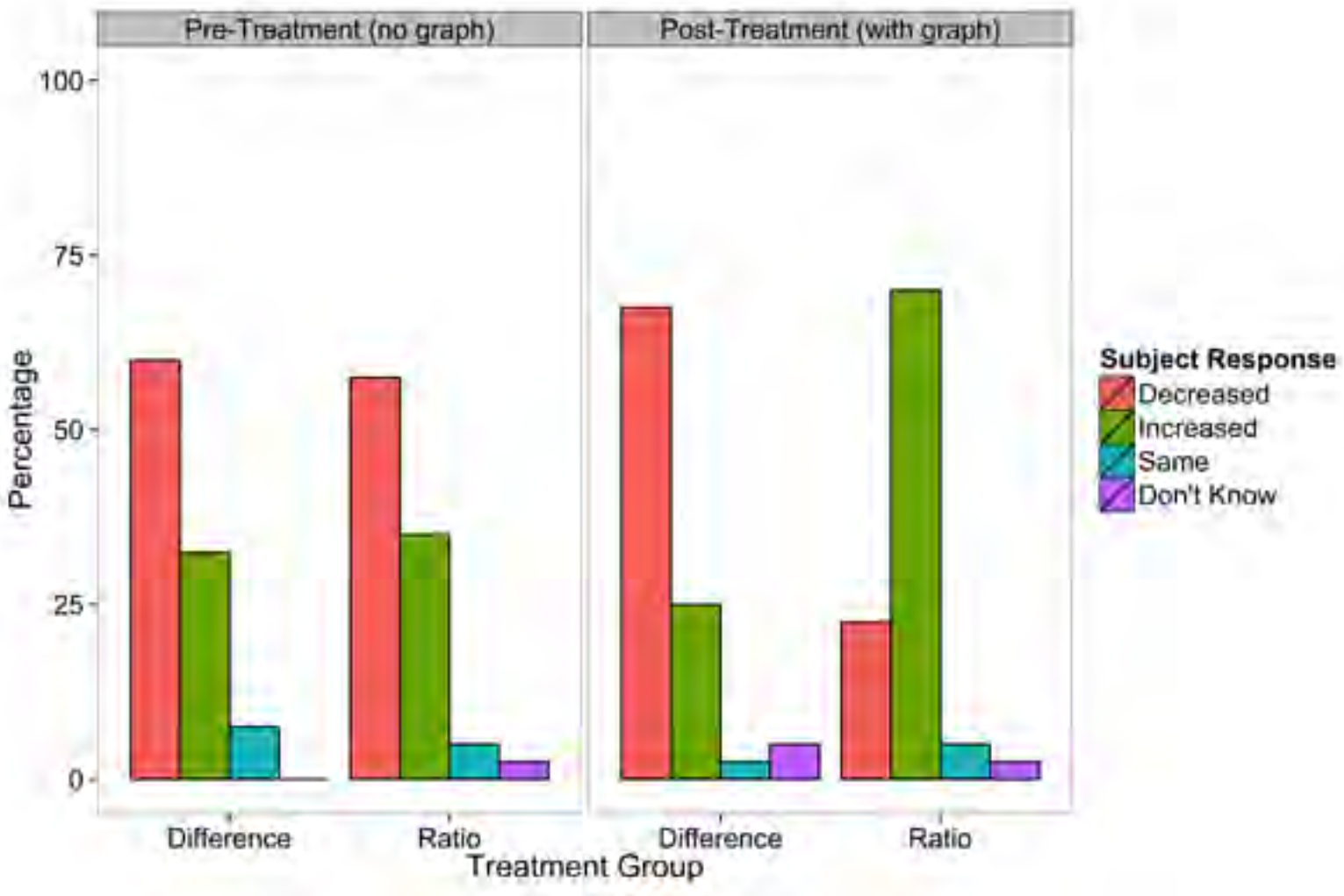
- χ^2 tests to assess differences in proportions between treatment groups.
- Regression models to assess impact of treatment on outcome:
  - Logistic regression for agreement with relative inequality (yes/no).
  - Linear regression for program success, willingness to donate money, continuation of intervention.
- Tested for different effect by small/large inequality change.
- Absent evidence of heterogeneity, we adjusted for magnitude.

What did you find?

Distribution of Responses: With and without ineq graphs

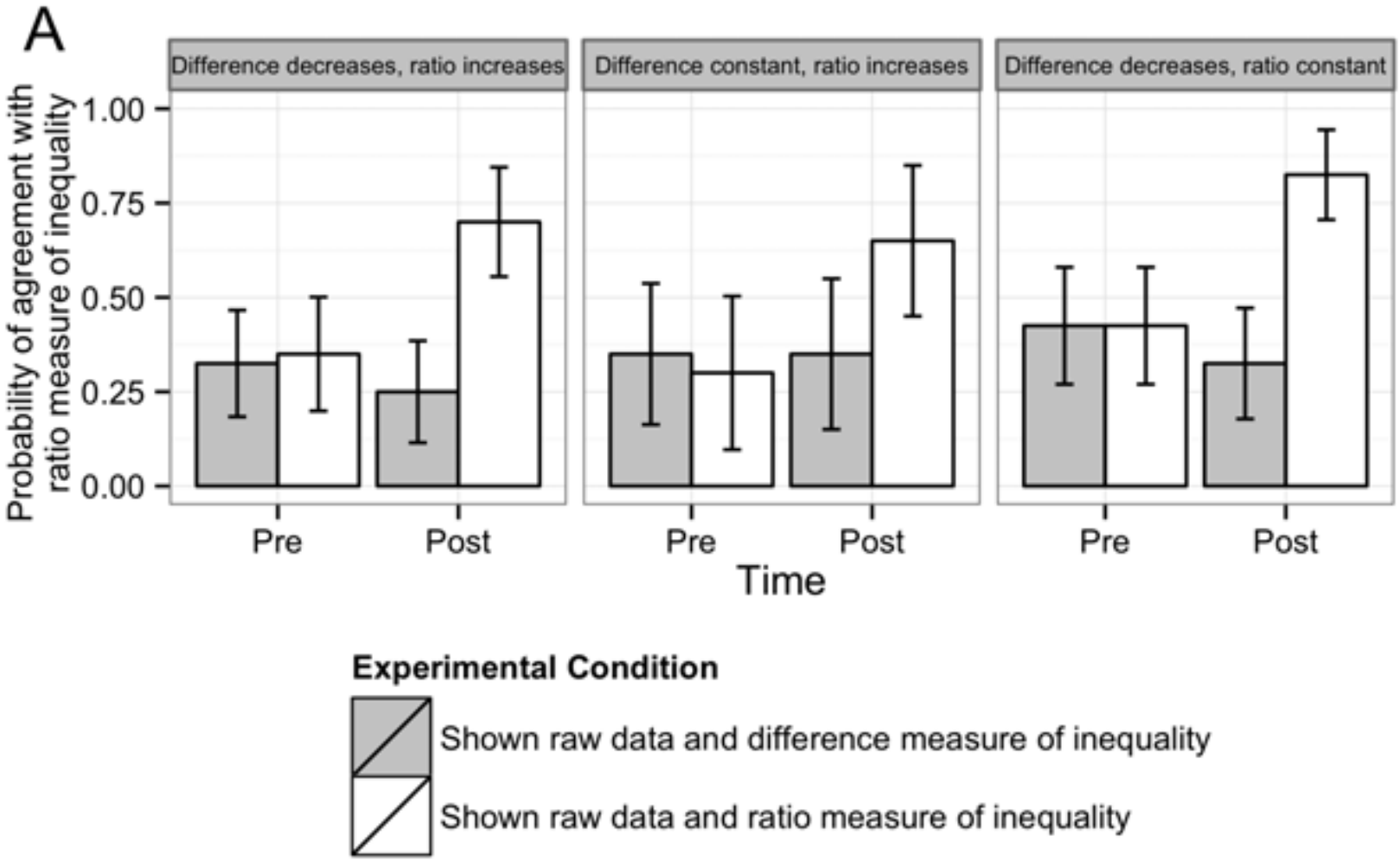
Scenario: Decreasing absolute inequality, Increasing relative inequality

"The inequality between population A and B has _____"



Treatment impact on "inconsistent" scenarios: direction

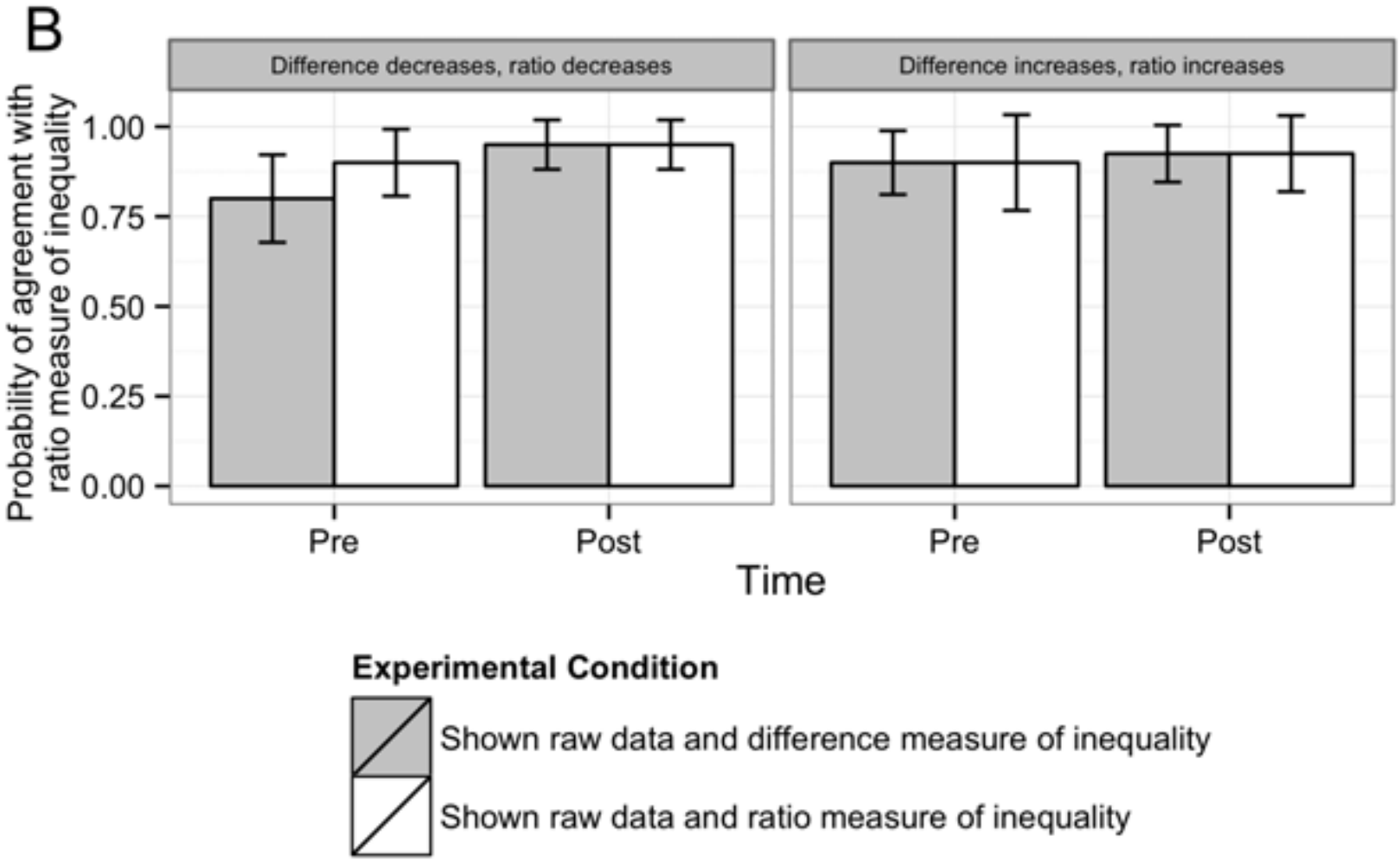
Exposure to ratio graphs altered judgment of "increased" inequality



Harper, King, Young *PLoS ONE* (2013)

Treatment impact on "consistent" scenarios: direction

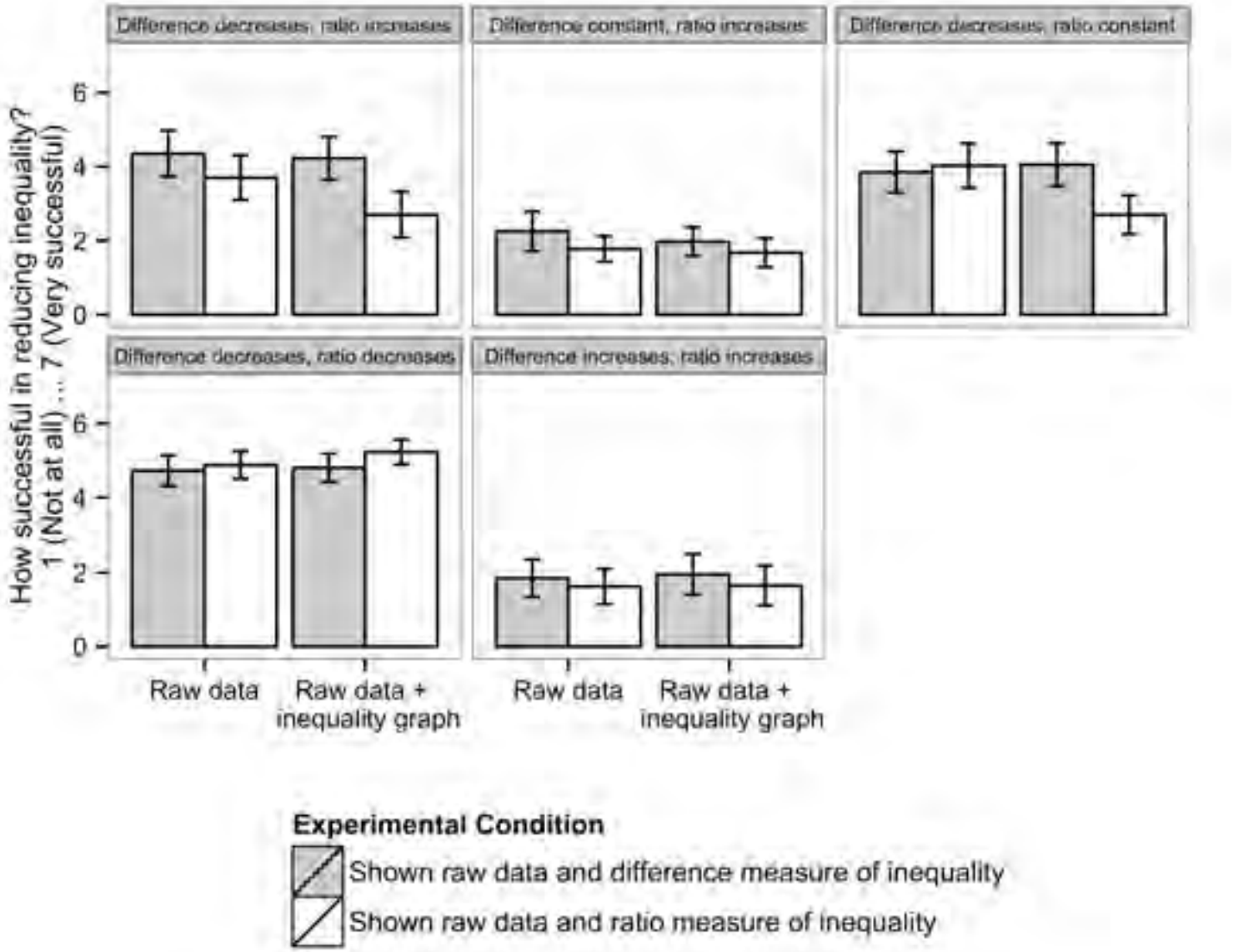
No impact when absolute and relative inequality were consistent.



Harper, King, Young *PLoS ONE* (2013)

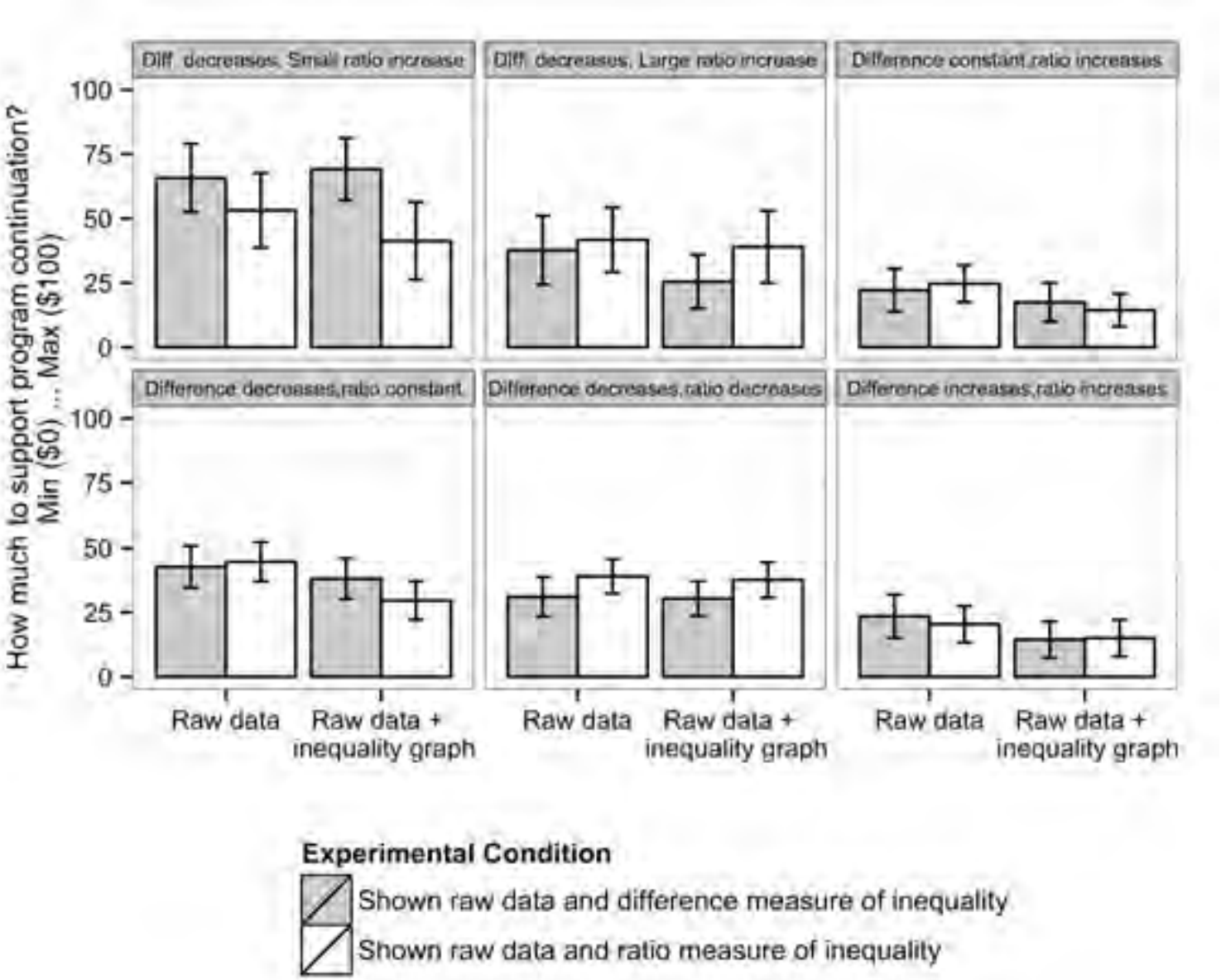
Treatment impact on perceived intervention success

Slightly less likely to perceive intervention as successful.



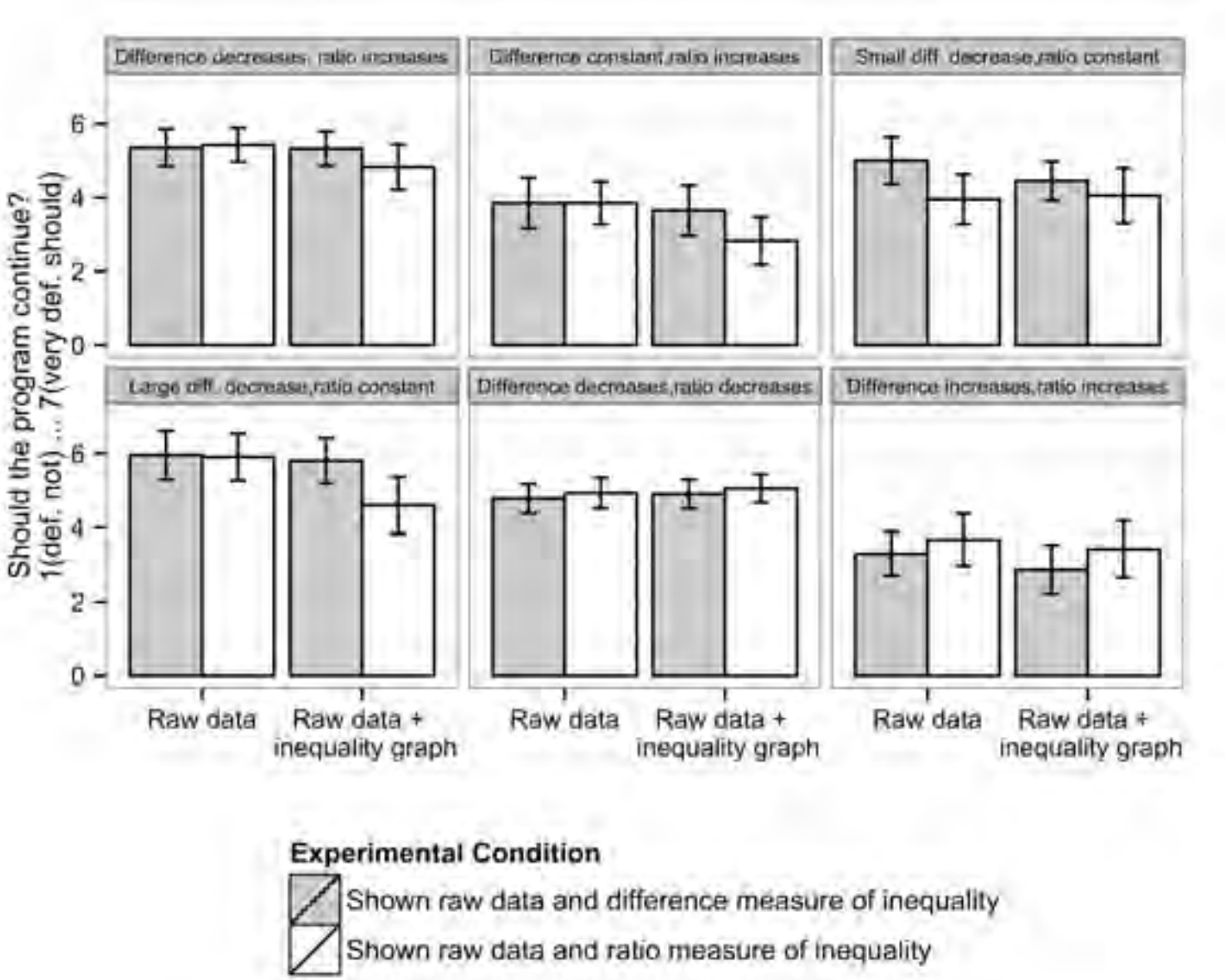
Treatment impact on donations to continue

Some evidence that hypothetical donations decreased



Treatment impact on decision to continue

Weak effects on decision to continue



What does it all matter, anyway?

Summary of Results

- Framing intervention impacts affects judgments about health inequalities.
  - Detectable effects on direction, perceived success, monetary value.
- We find effects only when absolute and relative inequality changes are "inconsistent."
- Exposure to ratio graphs appears to have stronger effect.
- Potential correspondence between "baseline" and absolute measures:
  - Is the "default" perspective absolute?

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Limitations

- Small sample.
- External validity (obviously).
  - Well-educated, (likely) numerate, advantaged population.
- We only assesed health improvements (i.e., fewer deaths).
  - Focusing on interventions that increase deaths could be different.
- Only graphical depictions of inequalities.

Final Thoughts

- Judgments about the effects of interventions on health inequalities are malleable.
- Researchers studying health inequalities should present, when feasible, measures of inequality on both the absolute and relative scale.
  - Reduces base-rate fallacy.
  - No different than reporting standards for any biomedical research.
- Consumers of medical and public health literature may be making systematically biased assessments of the magnitude, direction, and significance of social inequalities in health.
- Importance of testing sensitivity to framing, consider "bounded" views on inequality.

Thank You!

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