Measuring Impact Quantitatively

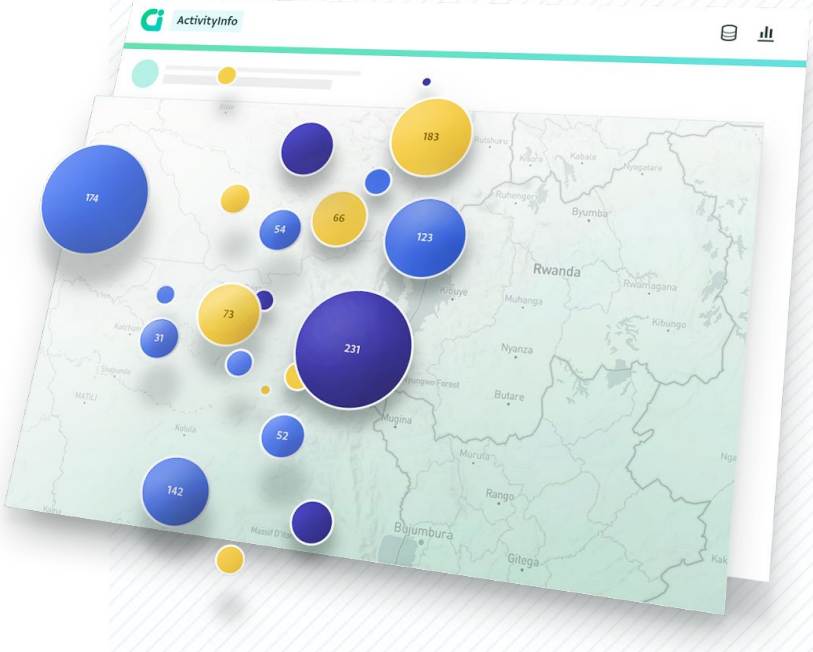
March 10th, 2022

ActivityInfo

Presented by the ActivityInfo Team

Monitoring & Evaluation Software

- Track activities, outcomes
- Beneficiary management
- Surveys
- Work offline / online



Activity Info

Mini-course outline

Part 1 (Today)

- What is a quantitative impact evaluation?
- Measurement challenges
- Statistics for reliability
- Using cognitive interviewing to improve survey instruments
- Designing experiments

Part 2 (Next week)

- Designing experiments (continued)
- Understanding Statistical significance vs effect size
- Communicating results

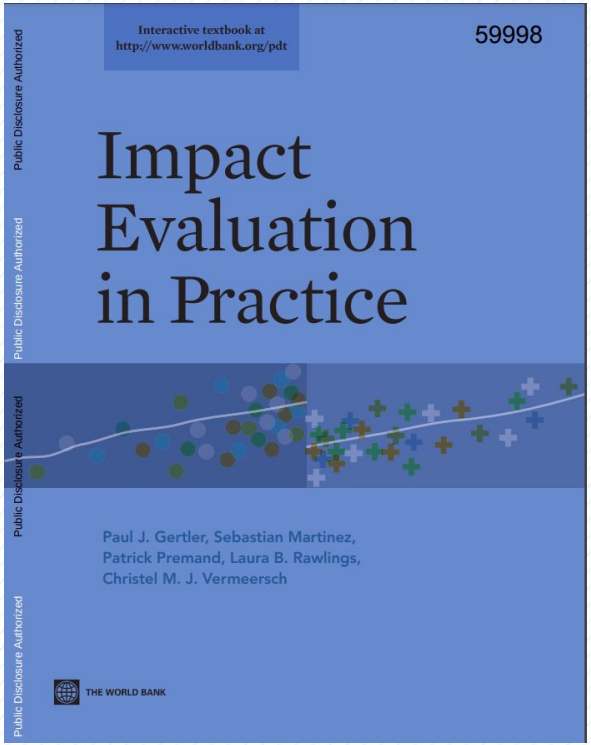
Activity Info

Learning objectives

- Understand **what** an quantitative impact assessments and **when** to undertake
- Understand the **challenges** and ⚠️ **potential pitfalls**
- Be aware of tools available to improve quality

Activity Info

Sources & Further Reading



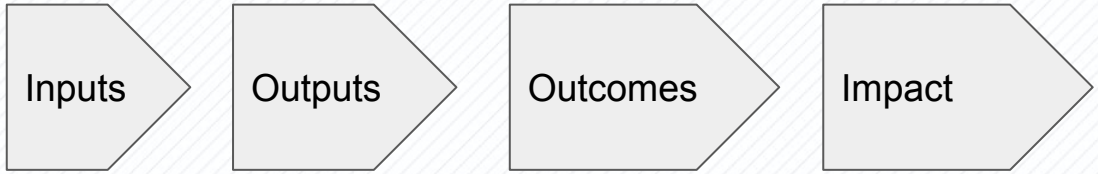
Paul J. Gertler, Sebastian Martinez, Patrick Premand, Laura B. Rawlings, Christel M. J. Vermeersch

Download from
World Bank

Activity Info

What is a quantitative impact evaluation?

Impact evaluation in the results chain



Activity Info

Results chain example

Problem: Children in returnee communities are falling behind in school because of a high rate of waterborne diseases.

Results chain:

Dig protected wells at schools →

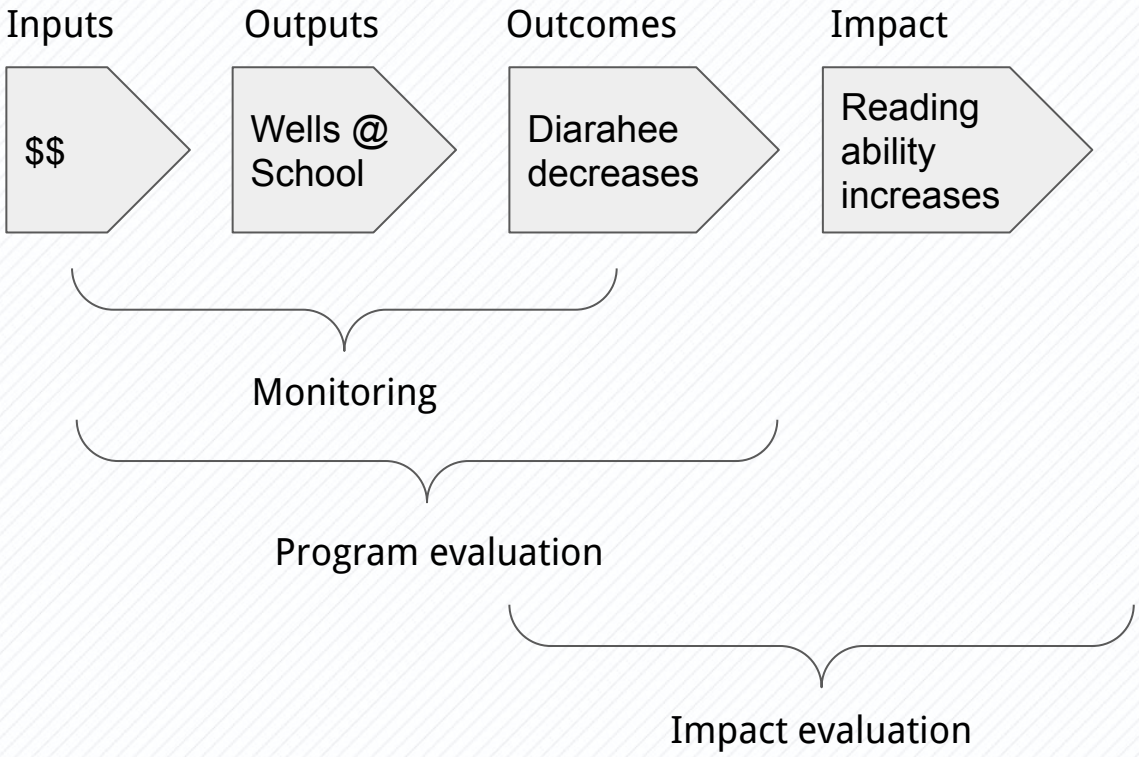
Lower rates of waterborne diseases →

Absenteeism declines →

Reading scores improve

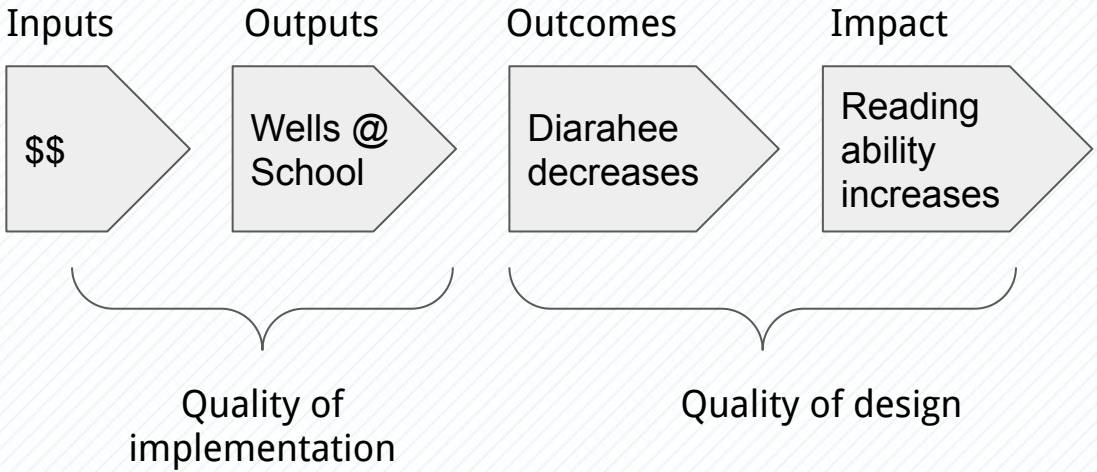
Activity Info

Impact evaluation and M&E



Activity Info

Impact evaluation and M&E



Activity Info

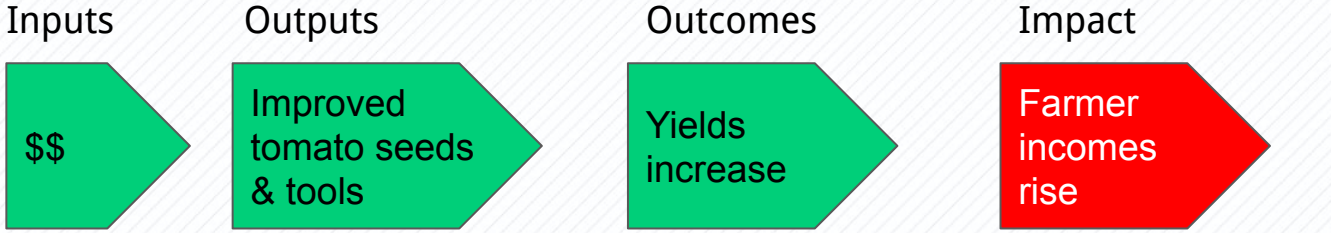
Design problems - example

Farmers in a rural district have low incomes because their produce is of low quality.

We will help them switch to tomatoes, a high value crop in this area, in order to increase incomes.

Activity Info

Design problems - results chain



✅ Distribution completed ahead of schedule

✅ Tomato yields double!

❌ Market flooded with tomatoes, incomes fall

Activity Info

Impact Evaluation

Evaluate the changes **directly attributable** to the program.

Quantitative Impact Evaluation

Causal impact

Outcome Y *without* the program

$$\Delta = (Y \mid P = 1) - (Y \mid P = 0)$$

Outcome Y *with* the program

Activity Info

Quantitative evaluations are expensive!

- Requires significant technical expertise to do properly
- Requires significant attention from program team
- Data collection costs can be high

Activity Info

Reasons to conduct a quantitative impact…

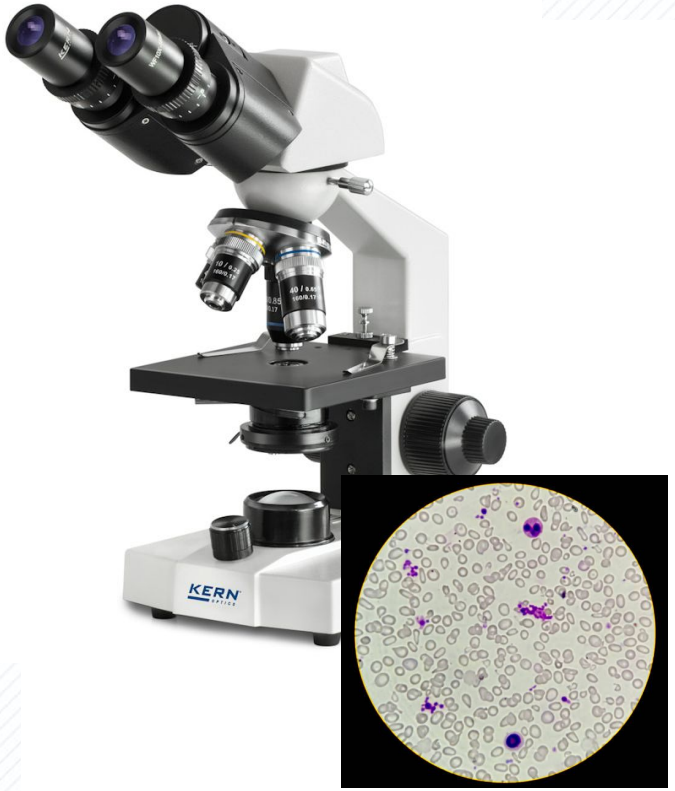
- Innovative programs
- Untested programs
- Is it replicable?
- Strategically relevant

Activity Info

Measurement challenges

Direct measurement of outcomes

- Health interventions to reduce **morbidity** and **mortality**
- Programmes designed to increase **income**



Activity Info

Measurement based on self-reporting

- School attendance
- Family planning practices
- Purchase history
- Safe-sex practices
- Drug use

Activity Info

Indirect measurements

- Psychological resilience
- Attitudes towards women in policing
- Educational outcomes
- Religious tolerance

Activity Info

General sources of error from survey data

- Question understanding
- Problems remembering/recalling past behavior
- Not motivated to answer
- Social desirability bias

Statistics for measurement validation

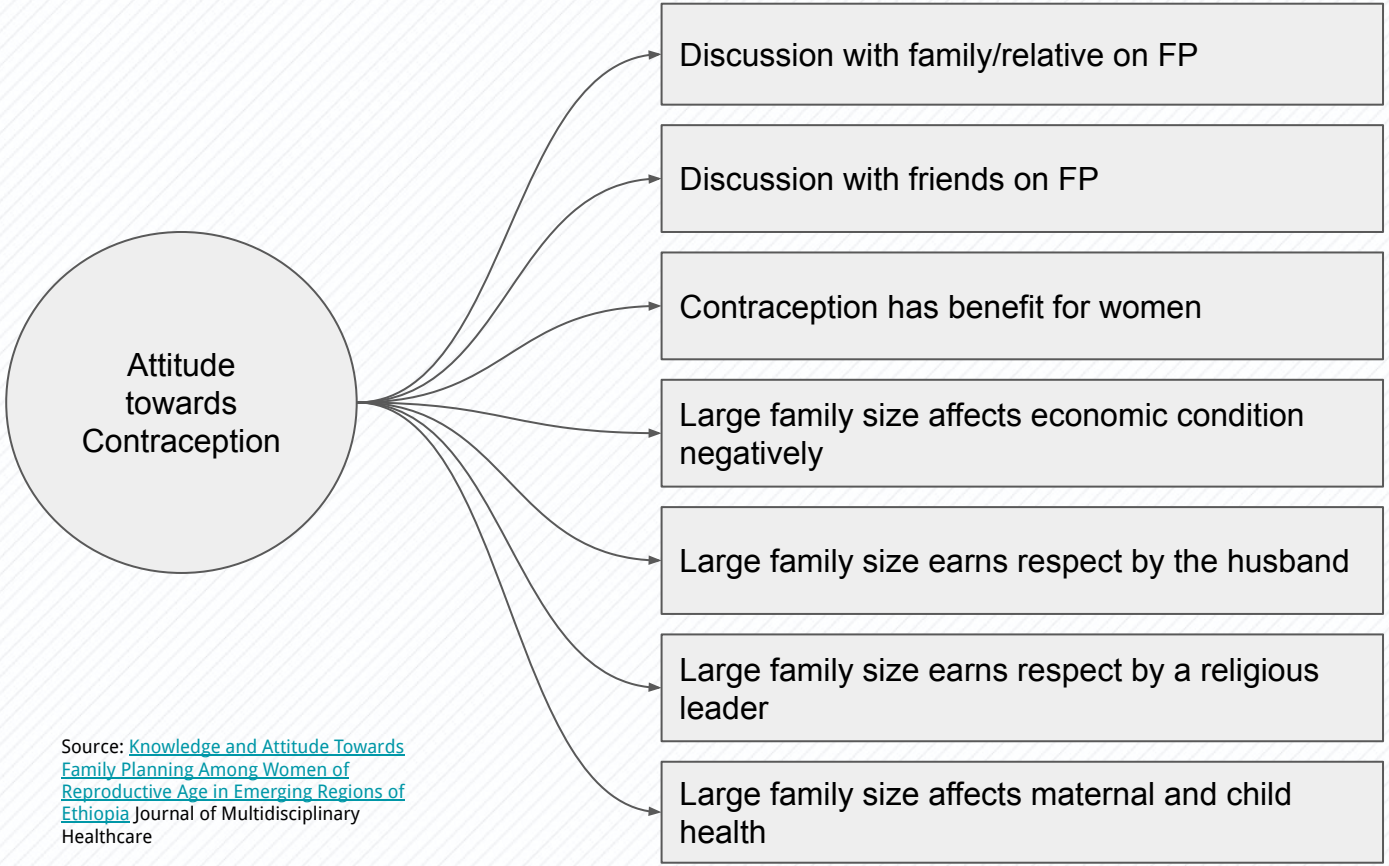
Indirect measurements

Some things can only be measured indirectly.

We call these “latent variables”

Activity Info

Indirect measurements - example



Source: Knowledge and Attitude Towards Family Planning Among Women of Reproductive Age in Emerging Regions of Ethiopia Journal of Multidisciplinary Healthcare

Activity Info

Internal consistency

If a set of questions (or judges) are a good measure of a latent variable, they will agree more often than not.

Judges from Afghan Star (2015)

Activity Info

Internal consistency

Judge A	Judge B	Average
90	10	50
20	80	50
100	0	50

$\alpha < 0$

Activity Info

Internal consistency

Question 1	Question 2	Average
5	4	4.5
1	2	1.5
5	3	4.0

$\alpha = 0.774$

Activity Info

Cronbach's alpha (α)

$0.9 \leq \alpha$	Excellent
$0.8 \leq \alpha < 0.9$	Good
$0.7 \leq \alpha < 0.8$	Acceptable
$0.6 \leq \alpha < 0.7$	Questionable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

Activity Info

Research papers

TABLE 4 Support for Women in Policing Index

Item	*M*	*SD*
1. Police work is an appropriate occupation for women.	2.10	1.11
2. I feel some women police officers are capable of handling the duties of patrol work because being a man or a woman does not determine your skills for patrol work.	1.76	1.04
3. A female can be just as good a police officer as a male.	1.59	1.02
4. Females have the physical skills to do patrol work.	1.97	1.05
5. More women need to be recruited as patrol officers.	2.20	1.14
6. Women are emotionally equipped to handle the work of a patrol officer.	2.19	1.13
7. Police work is too dangerous for a female.	2.18	1.20
8. I would give a female police officer the same degree of respect I would give to a male police officer.	1.47	0.93
9. Female police officers should be promoted to supervisory positions if qualified.	1.40	0.79
10. Women should be taken out of patrol duties.	1.80	1.13
11. Female police officers are effective on the street as patrol officers.	2.12	1.10

Note: Alpha = .927.

Activity Info

Calculating Cronbach's Alpha

With R and ActivityInfo:

```
library(activityinfo)
library(ltm)

# Retrieve the data from ActivityInfo using the form id.
# This form is public so you do not need credentials.
df <- queryTable(formId = "cgw34tdl0l13ekh2")

# Extract only the scores we calculated in ActivityInfo
scores <- df[, c("S1", "S2", "S3", "S4", "S5", "S6")]

cronbach.alpha(scores)
```

https://gist.github.com/akbertram/352682e3c20fedc1c2f6b4e5136eede2

Also possible with Excel at a bit of work

Activity Info

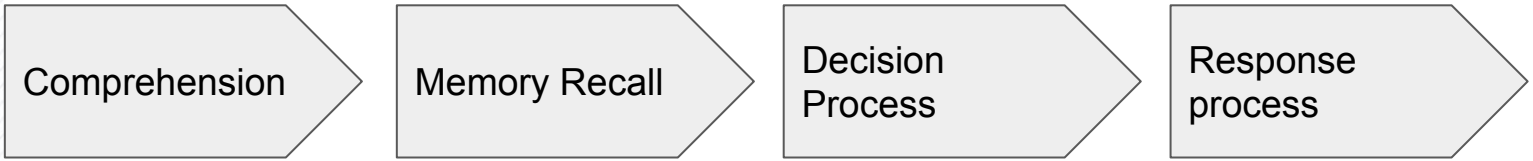
Cognitive interviewing

Cognitive interviewing

A tool for evaluating sources of response error in survey questionnaires.

Use **before** you launch your full survey to improve your questionnaire.

Cognitive theory



- Question intent
- Meaning of terms

- Recallability of information
- Recall strategy

- Motivation
- Sensitivity/Social Desirability

- Mapping the response

Cognitive model of survey response
Tourangeau (1984)

Activity Info

Cognitive interviewing methods

- “Think-aloud” interviewing
- Verbal probing

Activity Info

Examples of verbal probes

- Can you tell me in your own words what the question means to you?
- What were you thinking of when you answered the question?
- Were there any words in the question that were not clear?
- How did you go about deciding on which answer to pick?
- Was the question easy/hard/OK to answer for the past 7 days/past 30 days/past 4 weeks?
- How did you choose between some of the answer choices, for example “Rarely” and “Sometimes” or “Often” and “Always”?

Activity Info

Cognitive interviewing example

Use of Cognitive Interviews to Adapt PROMIS Measurement Items for Spanish Speakers Living with HIV

Original

In the last 7 days, I felt emotionally exhausted.

En los últimos 7 días, me sentí exhausto/a emocionalmente

Activity Info

Problem & Revision

Problem: Participants thought that “exhuasto/a emocionalmente” referred to a physical act and did not understand the relationship to an emotion.

Revised question:

En los últimos 7 días, me sentí completamente agotado emocionalmente

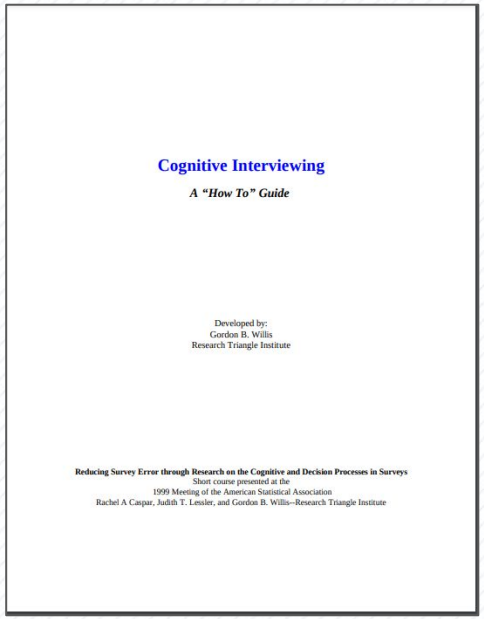
Activity Info

Logistics

- Recruitment of 20-50 participants
- Need not be random
- Consider compensation
- Interviewers need to be training in verbal probing
- Considering recording interviews

Activity Info

Sources and further reading

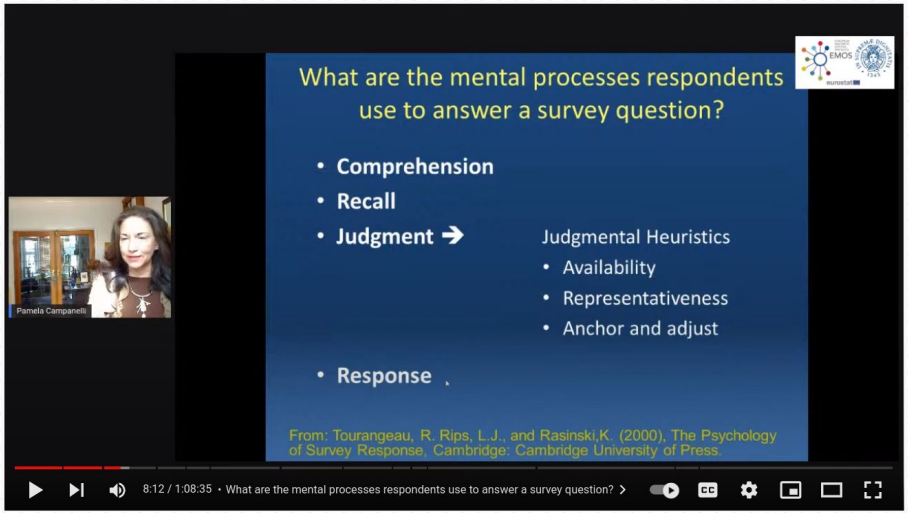


Cognitive Interviewing

A "How To" Guide

Developed by:
Gordon B. Willis
Research Triangle Institute

Reducing Survey Error through Research on the Cognitive and Decision Processes in Surveys
Short course presented at the
1999 Meeting of the American Statistical Association
Rachel A Caspar, Judith T. Lessler, and Gordon B. Willis--Research Triangle Institute



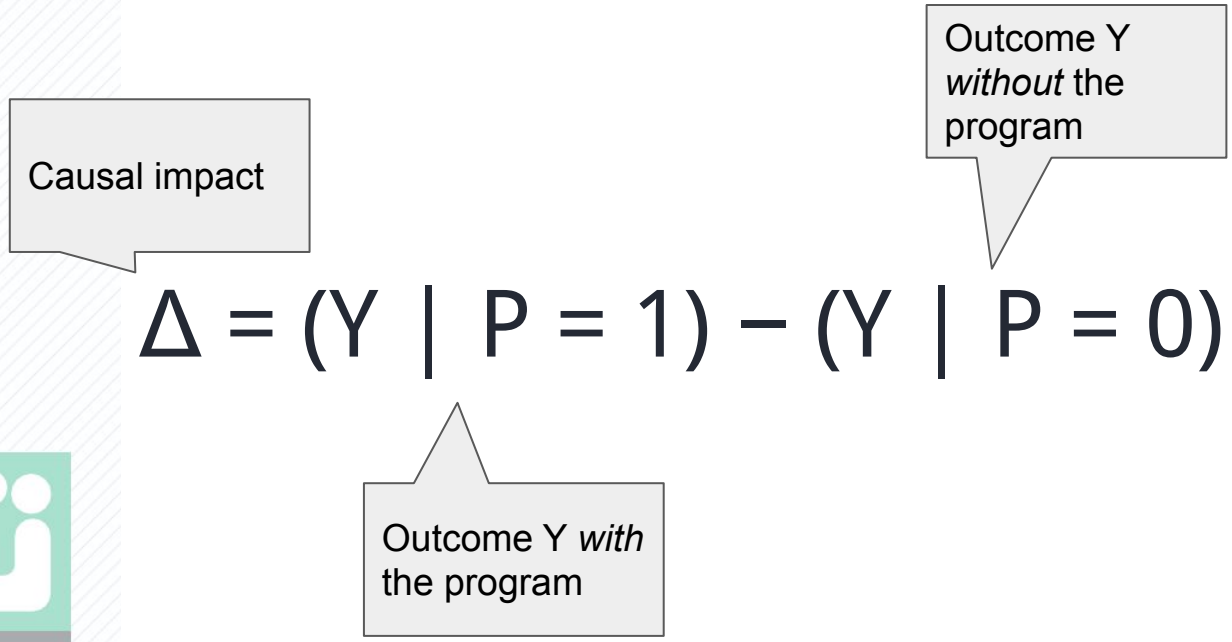
Activity Info

Cognitive interviewing: A How-To Guide (1999)
Gordon B. Willis

Webinar: Cognitive Interviewing for testing surveys (2021)
Pamela Campanelli

Designing quantitative impact evaluations

Causal impact



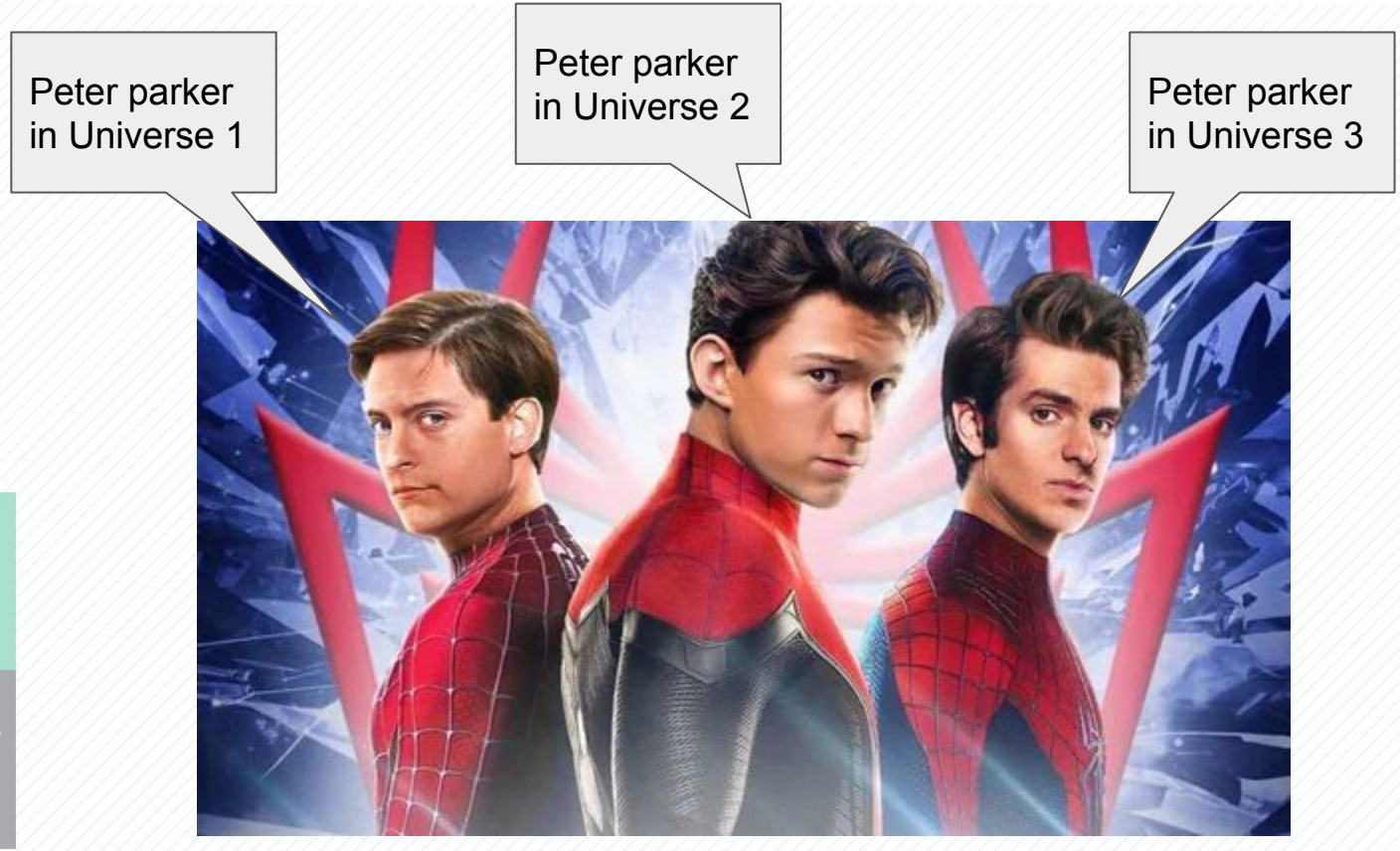
Activity Info

The counterfactual problem

What would have happened for a participant if we hadn’t conducted our intervention?

Activity Info

The lack of a multiverse is inconvenient



Activity Info

In search of counterfeit counterfactuals…

- Randomized control trials
- Before-and-after (?)
- Compare similar groups

Activity Info

Learning check!

Thinking about the program you are working on now, would investing in a quantitative impact evaluation be appropriate or not?

What are some sources of quantitative measurement error that are relevant to your work?

Name two tools that can help improve quantitative measurement