Measuring Impact Quantitatively

March 17th, 2022
Presented by the ActivityInfo Team

Monitoring & Evaluation Software

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

Part 1 (Last week)

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

Part 2 (Today)

- Causal inference

Part 3 (April)

- Understanding Statistical significance vs effect size
Key points from last week

- Why conduct a quantitative impact evaluation?
- When would you not conduct a quantitative impact evaluation?
- Types of measurements
- Sources of measurement error
- Reliability: Cronbach’s alpha
- Cognitive interviewing, a tool for improving questionnaires
Learning objectives

- Describe the “fundamental problem of causal inference”
- Identify four strategies for “counterfeit counterfactuals”
- Identify risks of before-and-after comparisons
Introduction to causal inference
Quantitative Impact Evaluation

\[ \Delta = (Y \mid P = 1) - (Y \mid P = 0) \]

Causal impact

Outcome Y with the program

Outcome Y without the program
The counterfactual problem

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

FYI: This is the framework introduced by the Rubin causal model.
The lack of a multiverse is inconvenient

Peter Parker in Universe 1 with vocational training

Peter Parker in Universe 2 with cash transfer

Peter Parker in Universe 3 with no intervention
Counterfeit counterfactuals

If we can’t experiment on multiverses, then we must find comparable groups.

\[ \Delta Y \mid P = 1 = Y \mid P = 0 \]

“Treatment” group

“Control” or “Comparison” group
Valid comparison groups…

1. Two groups must be same on average: participation should be the only difference.
2. Program should only affect the treatment group.
3. Program should (potentially) affect both groups in the same way.
Counterfeit estimates of the counterfactual

Problematic
● Before-and-after comparisons
● Enrolled and non-enrolled

Better...
● Randomized assignment
● Differences-in-Differences
Before and after comparisons
Before and after comparisons

Is participation the only difference??

\[ \Delta Y | P = 1 \]

\[ Y | P = 0 \]

After the program

Before the program
Example: agricultural intervention

(Y | P = 0) = 10300 kg/ha grain maize

(Y | P = 1) = 12800 kg/ha maize

+2500 kg/ha

2019

3-year programme to introduce better soil management practices

2021
Example: agricultural intervention

(Y | P = 0) = 10300 kg/ha grain maize
(Y | P = 1) = 12800 kg/ha maize

Rainfall: 975mm
Rainfall: 582mm

2019
3-year programme to introduce better soil management practices

2021
+2500kg/ha
Example: agricultural intervention

- 3-year programme to introduce better soil management practices
  - Price of pesticides fell
  - New strains of maize introduced

2019
Rainfall: 582mm

2021
Rainfall: 975mm

(Y | P = 1) = 12800 kg/ha maize
(Y | P = 0) = 10300 kg/ha grain maize

+2500kg/ha
Enrolled vs Non-Enrolled
Enrolled vs Non-enrolled

- Allow eligible beneficiaries to enroll for a programme
- After the program, compare those who enrolled vs those who did not.
Example: vocational training in refugee camp

Rwandese refugees in Inera Camp, Bukavu Region, South Kivu. UNHCR/12.1994/A.
Hollmann
Example: vocational training in refugee camp

Is participation the only difference??

\[(Y | P = 1) = 60\$/month\]

\[(Y | P = 0) = 10\$/month\]

Choose to Enroll
- Received training

Choose not to Enroll
- No training
Example: vocational training in refugee camp

Choose to Enroll

- Received training
- Secondary education: 60%
- Previous business owner: 80%

(Y | P = 1) = $60/month

+50$

Choose not to Enroll

- No training
- Secondary education: 10%
- Previous business owner: 30%

(Y | P = 0) = $10/month

Nope!
Enrolled vs Non-Enrolled
Controls for external changes over time

Before-and-after
Controlling for differences between groups
Multiple regression
Multiple regression

Statistical technique that allows you to examine the impact of multiple independent variables at the same time.
Demo

Enroll vs Non-enrolled with ActivityInfo + R
Requirements

- Must be able to identify and measure ALL external factors ahead of time.
- Must have sufficient variation to conduct analysis.
Randomized assignment
Randomized assignment

- Identify eligible people
- Randomly select beneficiaries for participation
- Compare selected beneficiaries with sample of non-selected, eligible people
Example: vocational training in refugee camp

Choose to Enroll

Received training
University educated: 60%
Previous business owner: 80%

Choose not to Enroll

No training
University educated: 10%
Previous business owner: 30%

(Y | P = 1) = 60$/month
(Y | P = 0) = 10$/month

+50$
Example: vocational training in refugee camp

\[(Y \mid P = 1) = 17\$/month\]

\[(Y \mid P = 0) = 15\$/month\]

**Randomly selected**
- Received training
- University educated: 20%
- Previous business owner: 35%

**Randomly not selected**
- No training
- University educated: 21%
- Previous business owner: 34%
Practical: How to?

Initial Survey
ID
Name
Biographic data
Eligibility criteria

Selected and Comparison

Routine data
Participant ID
Date of training
Output and Outcome data

Evaluation
Participant ID
Impact measure
Differences-in-Differences
Example: provide wifi in refugee camps

Selected group

Comparison group

After Vs Before

After Vs Before

+$2$
Example: media campaign against domestic violence

<table>
<thead>
<tr>
<th></th>
<th>District with campaign</th>
<th>District without campaign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reports of domestic violence <em>before</em> campaign (last 12 months)</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>Reports of domestic violence <em>after</em> campaign</td>
<td>5%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Difference</td>
<td>+1%</td>
<td>+3.5%</td>
</tr>
</tbody>
</table>
Learning check!
Do you use before-and-after comparisons in your work? Identify a few potential biases?
How could you integrate randomized assignment into your work? Or not?
Sources & Further Reading

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

Download from World Bank
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