Evaluating Insurance Products Using Impact Evaluation

Qayam Jetha

CLEAR/J-PAL South Asia at IFMR

Joint Capacity Building Seminar in General Insurance & Micro Insurance
December 4th, 2015

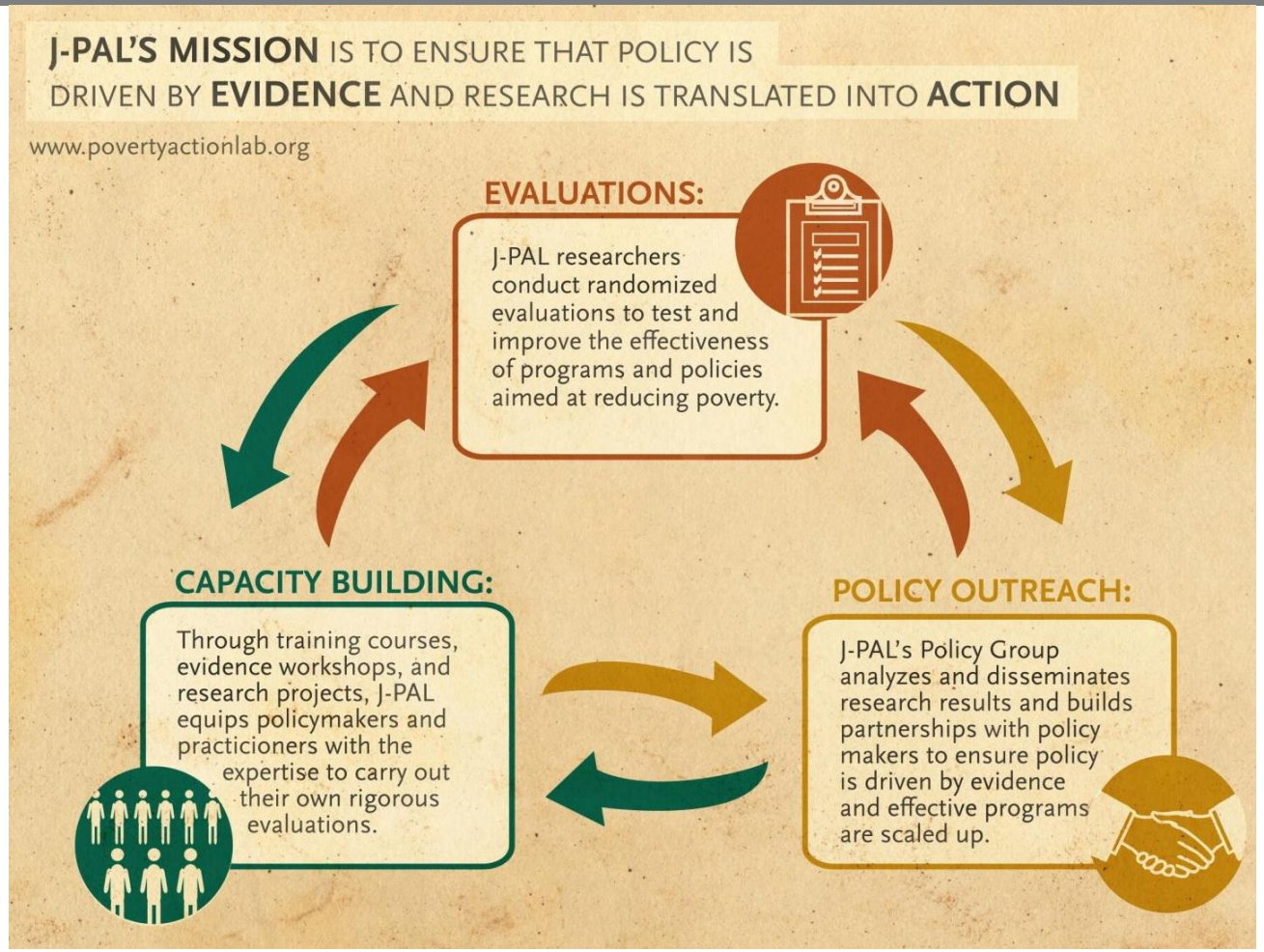
ABDUL LATIF JAMEEL Poverty Action Lab
TRANSLATING RESEARCH INTO ACTION

IFMR
INSTITUTE FOR FINANCIAL MANAGEMENT AND RESEARCH

clear
Regional Centers for Learning on Evaluation and Results

J-PAL started in 2003 as a center in the economics department at MIT and works to reduce poverty by ensuring that policy is informed by scientific evidence

Research affiliate network of over 102 professors in 34 universities; 552 evaluations in 56 countries across 7 global offices



ABDUL LATIF JAMEEL Poverty Action Lab
TRANSLATING RESEARCH INTO ACTION

IFMR
INSTITUTE FOR FINANCIAL MANAGEMENT AND RESEARCH

clear
Regional Centers for Learning on Evaluation and Results

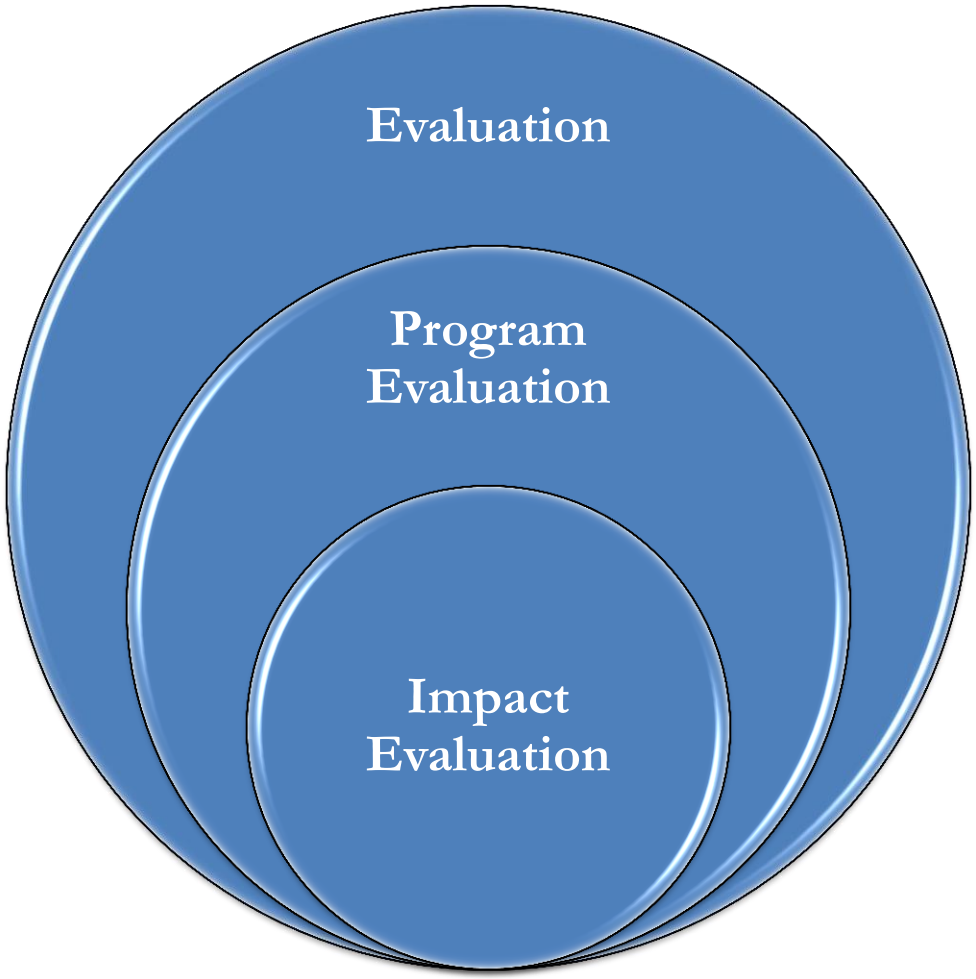
Presentation Overview

- What is Impact Evaluation?
- Why conduct Impact Evaluations?
- How to measure impact
- Impact evaluation methods
- Conducting a randomized evaluation
- J-PAL's lessons in insurance

Section I

WHAT IS IMPACT EVALUATION?

Evaluation, Program Evaluation, Impact Evaluation



What is Evaluation?

Evaluation refers to the process of determining merit, worth, or value of something, or the product of that process

- Broad concept that means different things to different people and organizations
  - Engineers evaluate or test the quality of product design
  - Critics evaluate or review the quality of a restaurant
  - Child Psychologist evaluates or assesses the decision making process of toddlers

- As researchers and policymakers we are interested in the subset of evaluation that focus on programs

What is Program Evaluation?

*A program evaluation is the process of assessing the design, implementation, and results of programs and policies considering their **relevance**, **effectiveness**, **efficiency**, **sustainability**, and **impact**.*

- Put simply, a program evaluation is meant to answer the question, "how is our program or policy doing?"

- Types of program evaluations include:
  - Needs Assessments
  - Program Theory Assessments
  - Process Evaluations
  - **Impact Evaluations**
  - Cost Effectiveness Analysis

What is Impact Evaluation?

The causal effect of the program or policy on an outcome of interest by comparing the outcomes of interest (short-, medium-, or long-term) with what would have happened without the program—a counterfactual.

- Impact Evaluations determine whether or not a program had an effect on a specific outcome and quantifies the magnitude of this impact

- 2 key concepts:
  - **Causality**. Isolates what happened as a direct result of a program (positive, negative, direct, and indirect)
  - **Counterfactual**. Compares what happened with the program with what would have happened if the program was not implemented

- *What is the causal effect of the iron supplementation program on anemia rates?*

Section II

WHY CONDUCT IMPACT EVALUATIONS?

ABDUL LATIF JAMEEL
Poverty Action Lab
TRANSLATING RESEARCH INTO ACTION

IFMR
INSTITUTE FOR FINANCIAL MANAGEMENT AND RESEARCH

clear
Regional Centers for
Learning on Evaluation and Results

How Do We Know if Something Really Works?

- For thousands of years, around the world, experts in medicine used blood-letting to treat many conditions
  - Now believed to be mostly harmful

- Why is it so hard to tell when something works?
  - What typically happens when you are ill? You get better! Thus, any kind of intervention may be favored.
  - Very hard to tell if the treatment *caused* the improvement. Need to learn what would have happened, *in the absence* of the treatment.

- Similar problem exists in social policy
  - "Give a man a fish, [and] he'll eat for a day. Give a woman microcredit, [and] she, her husband, her children, and her extended family will eat for a lifetime."

Questions that an impact evaluation can answer

- How does price affect insurance product take up?
- Does health insurance increase access to healthcare, improve health outcomes, and increase income?
- Does indemnifying loans to interlink credit with an insurance product increase demand?
- Does increasing financial literacy result in higher demand of insurance products?
- Does providing rainfall index insurance to farmers impact farmers production decisions?
- Does receiving an insurance payout influence the decision to purchase insurance in subsequent years?
- Does seeing a neighbor receive an insurance payout influence their decision to purchase insurance products?

Section III

HOW TO MEASURE IMPACT

How to Measure Impact?

- **Impact** is defined as a comparison between:

-The outcome some time after the program has been introduced **&**

-The outcome at that same point in time had the program not been introduced

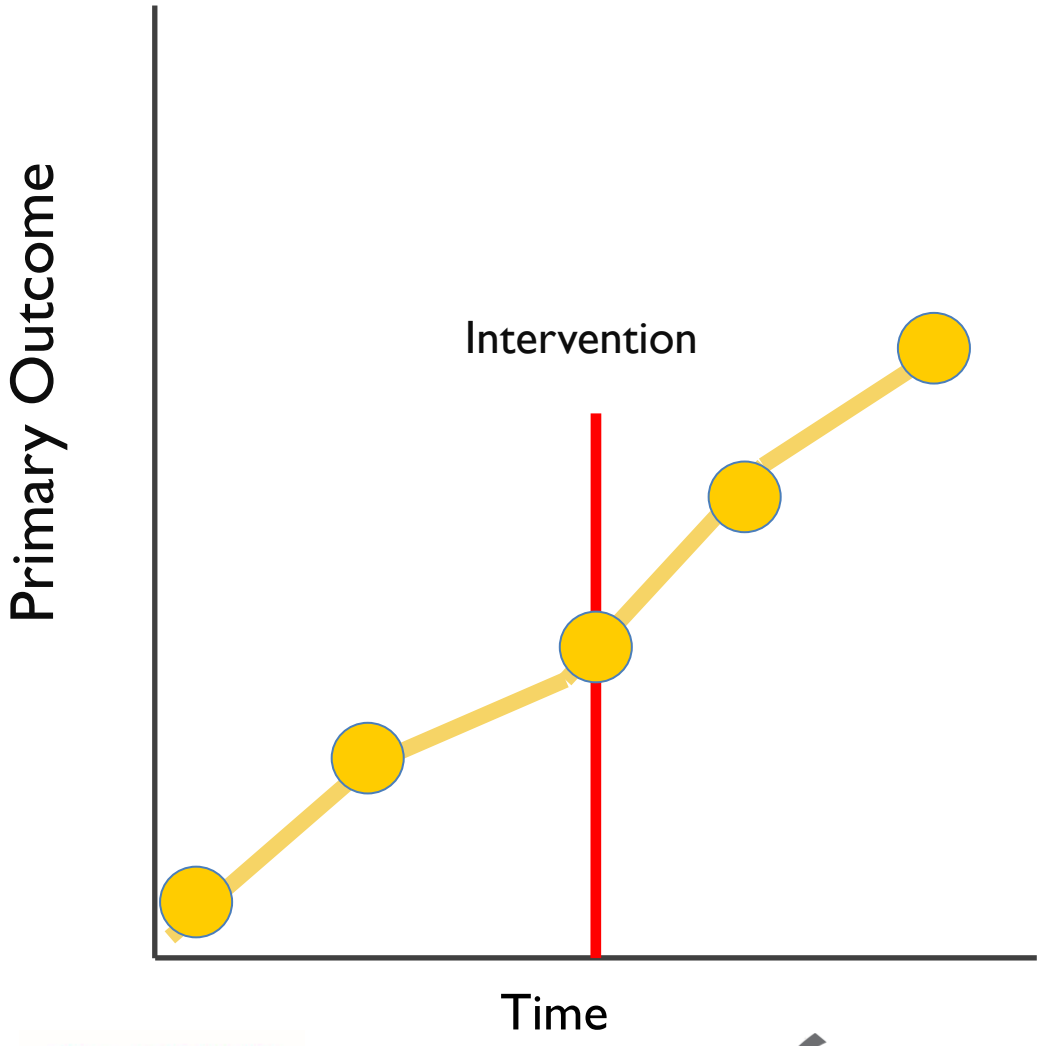
- This is know as the **"Counterfactual"**

IMPACT = **What happened with the program** (Ex. % immunized with immunization program) - **What would have happened without the program** (Ex. % immunized if immunization program did not occur)

Counterfactual

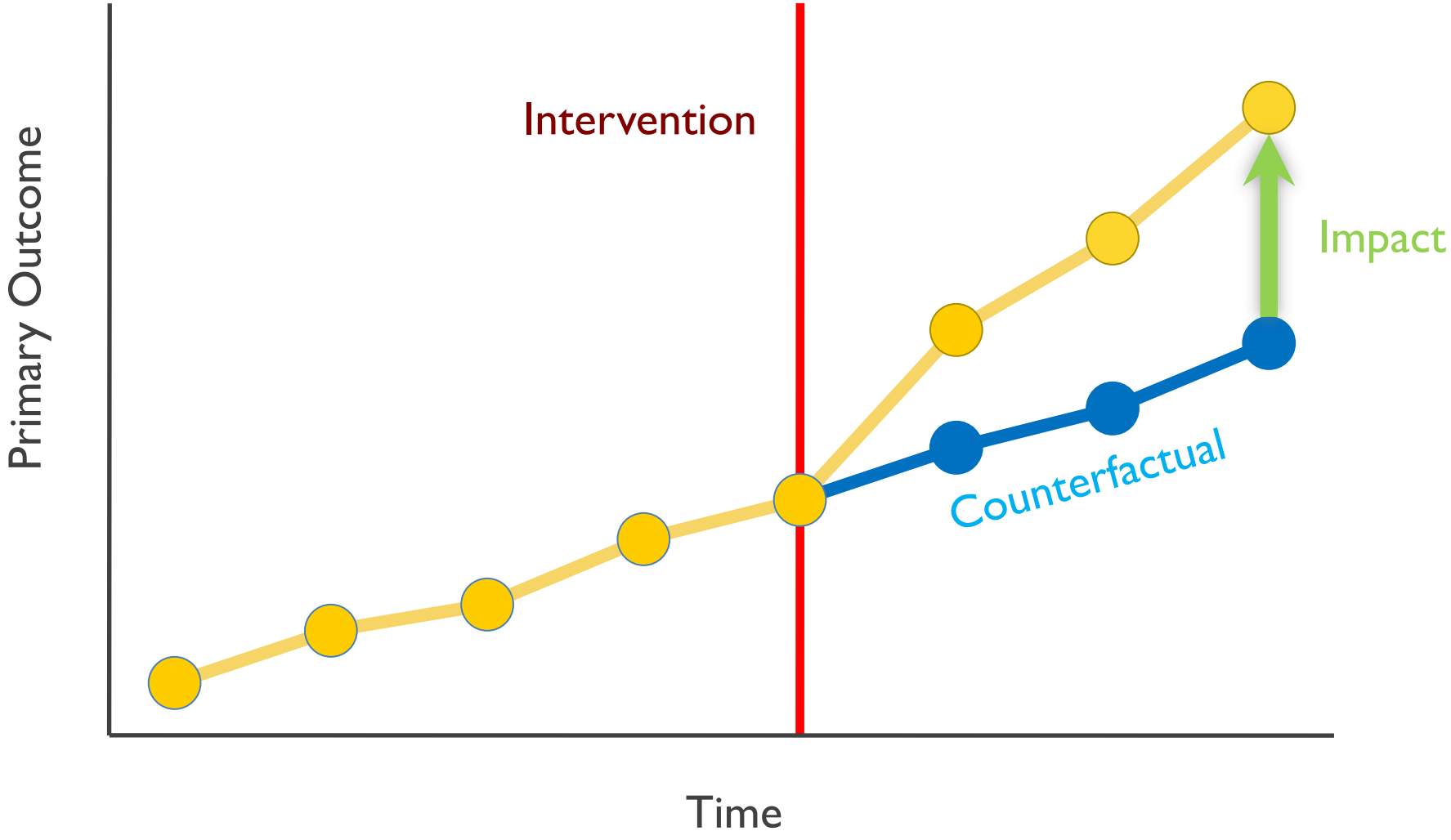
- The ***Counterfactual*** represents the state of the world that program participants would have experienced in the absence of the program (i.e. had they not participated in the program)
- ***Problem***: Counterfactual cannot be observed
- ***Solution***: We need to "mimic" or construct the counterfactual

Impact: What is it?

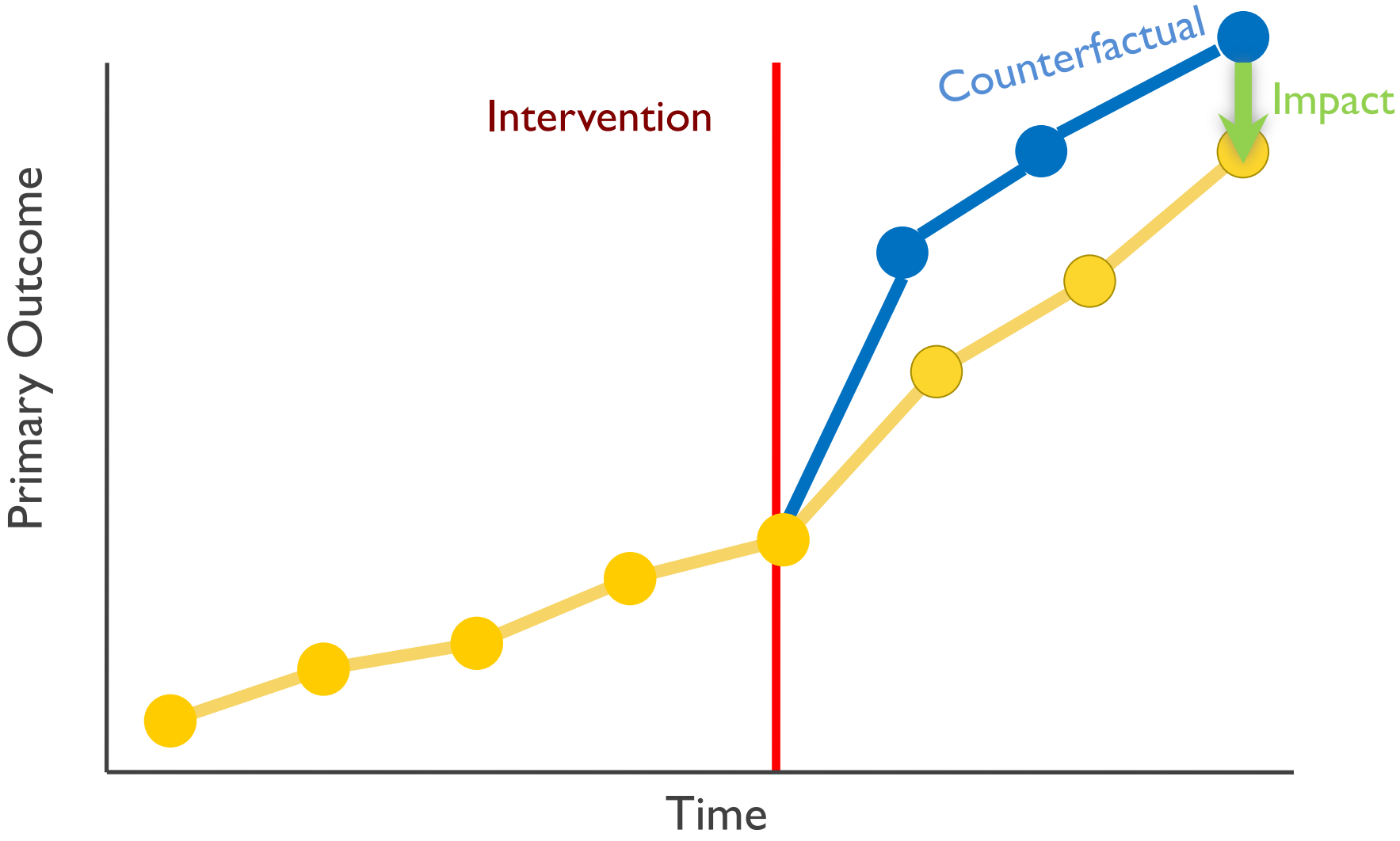


A. Positive
B. Negative
C. No impact

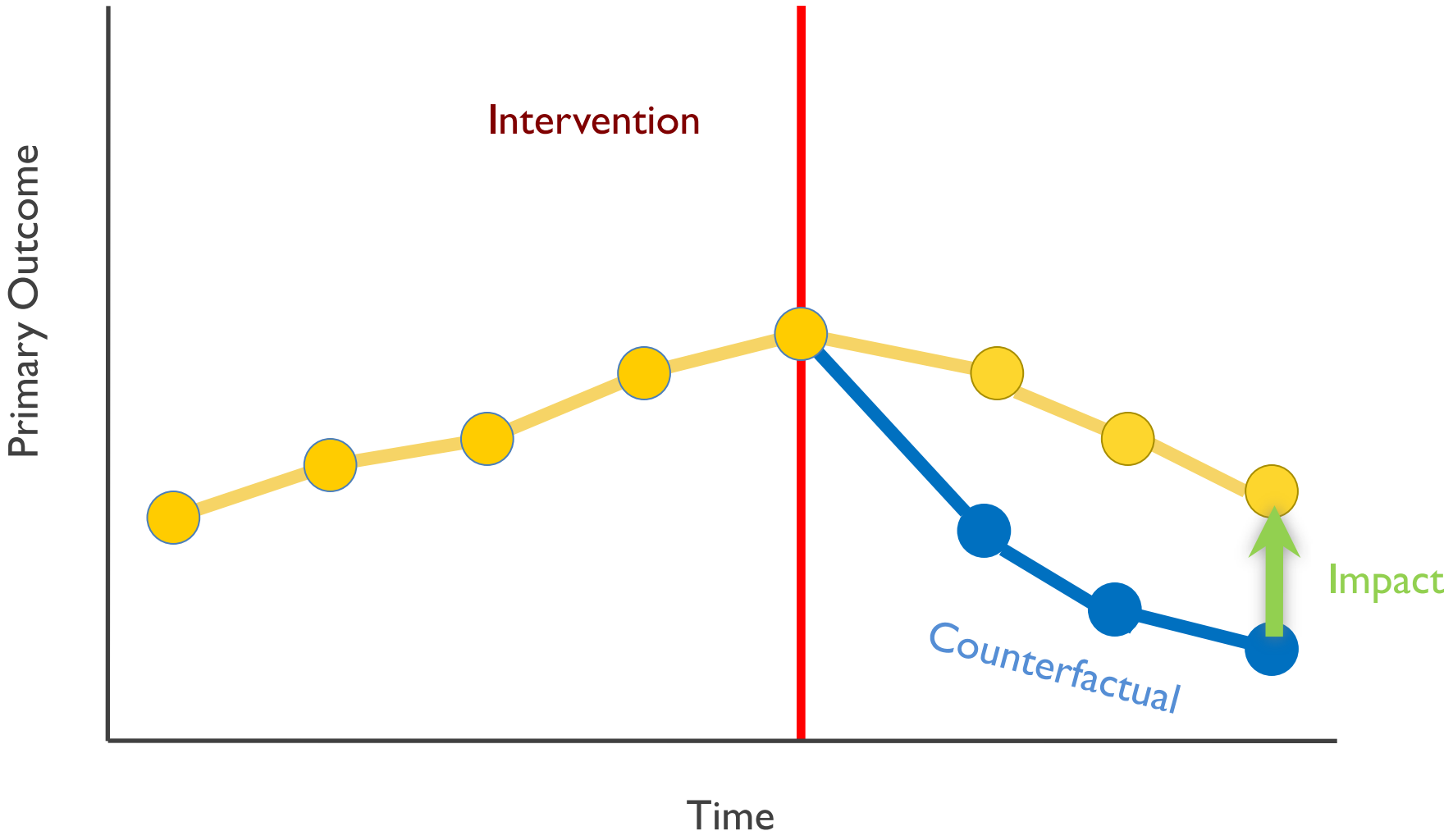
Impact: What is it?



Impact: What is it?



Impact: What is it?



Section IV

IMPACT EVALUATION METHODS

ABDUL LATIF JAMEEL
Poverty Action Lab
TRANSLATING RESEARCH INTO ACTION

IFMR
INSTITUTE FOR FINANCIAL MANAGEMENT AND RESEARCH

clear
Regional Centers for
Learning on Evaluation and Results

Typology of Impact Evaluations

- **Randomized experiment:** An experiment in which units are assigned to receive the program by a random process such as the toss of a coin or a table of random numbers.

- **Quasi-experiment**: An experiment in which units are not assigned to the program using deliberate randomization but instead a process that is "almost" random so that treatment assignment is "as if" randomly assigned.

- **Observational study**: Usually synonymous with a non-experimental or correlation study: a study that simply observes the size and the direction of a relationship among variables.

Impact Evaluation Methods

1. **Randomized Experiments**
2. **Quasi-Experimental Methods**
   - Regression Discontinuity Designs
   - Propensity Score Matching
   - Difference-in-Differences
   - Instrumental Methods
3. **Observational Methods**
   - Multivariate Regression
   - Simple Difference
   - Pre/Post

Example: Examining Underinvestment in Agriculture

Context of Evaluation

- Almost flat yield growth in Africa in the past three decades
- Underinvestment in agriculture inputs such as fertilizer, hybrid seeds, or labor may explain low crop yields in Africa
- Evidence suggests that the return to fertilizer in northern Ghana is high, yet the median farmer uses no chemical fertilizers
- Agriculture in northern Ghana is entirely rain fed, and prone to extreme variation in rainfall
- Failure to invest in potentially profitable investments may be due to risk – farmers could invest and crops may still fail

The Intervention

- To ease rainfall risk and promote investment in agriculture inputs, the Ghana Agricultural Insurance Program created a rainfall index insurance product

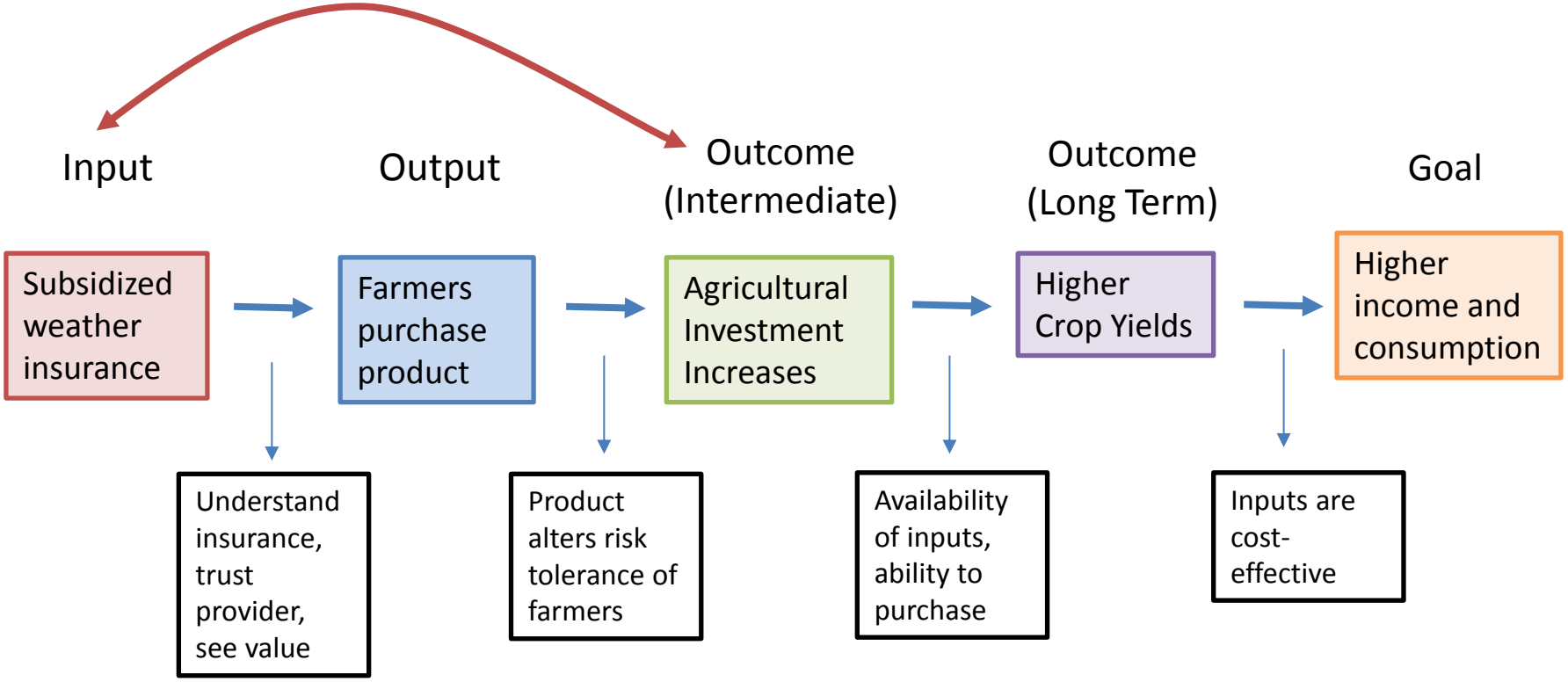
- Farmers had access to purchase the rainfall index insurance at a highly subsidized price

- Price of insurance = $1.30 while the actuarial fair price = $9.58.

- Maximum payout amount covered 100% of a full loss, or roughly $145 per acre of maize

The Evaluation

- We want to test whether the purchase of highly subsidized weather index insurance increased investments in agricultural inputs.
  - *What is the impact of weather insurance on investments in agricultural inputs?*



J-PAL Conducts a Test at the End

- Average cultivation expenditure was $2,124 for those that bought insurance

What can we conclude?

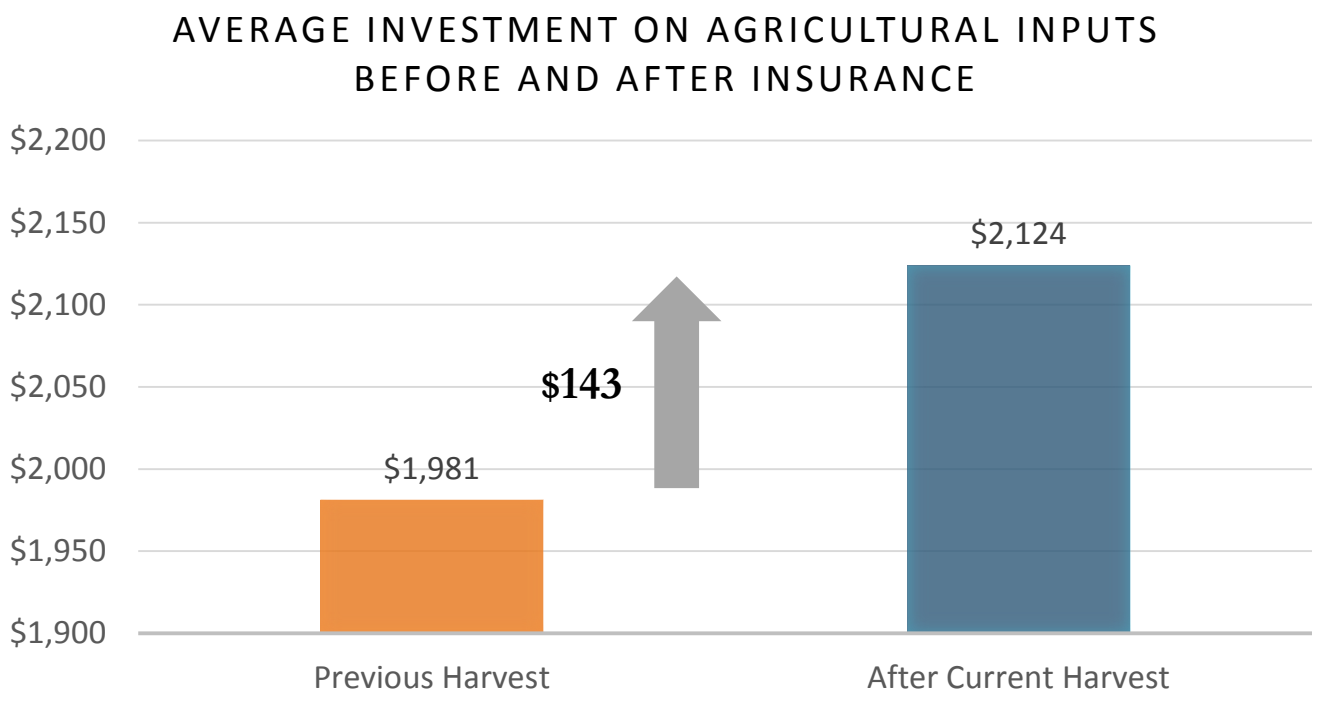
Method 1: Pre-post (Before vs. After)

Average change in the outcome of interest before and after the programme

Look at farmer's average change in cultivation expenditure in the harvest before purchase of the weather index insurance (t=0) and the harvest after purchase (t=1)

$$impact = expenditure_{t=1} - expenditure_{t=0}$$

Method 1: Pre-post (Before vs. After)



Under what conditions can $143 constitute impact?

Average post-insurance expenditure for farmers with insurance	$2,124
Average pre-insurance expenditure for farmers with insurance	$1,981
Difference	**$143**

ABDUL LATIF JAMEEL Poverty Action Lab
TRANSLATING RESEARCH INTO ACTION

IFMR
INSTITUTE FOR FINANCIAL MANAGEMENT AND RESEARCH

clear
Regional Centers for Learning on Evaluation and Results

Method 2: Simple Difference

Measure difference between program participants and non-participants after the program is completed

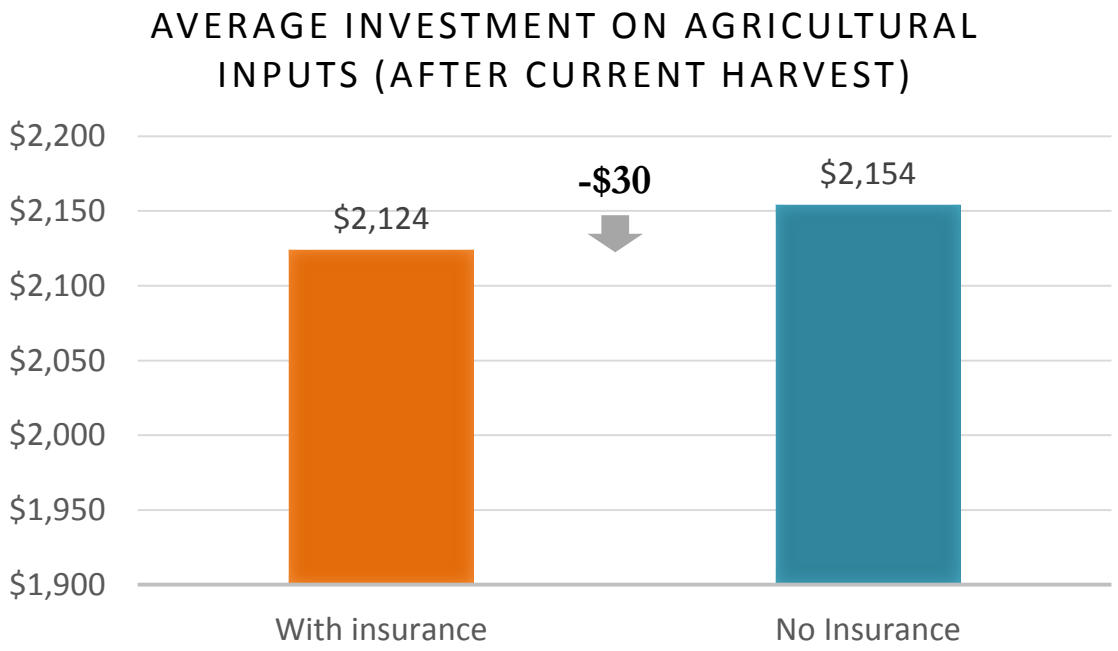
Divide farmers into **two** groups:

One group purchased the index insurance (Treatment)

One group did not purchase the index insurance (Control)

Compare average expenditure of these two groups at the end of the program

Method 2: Simple Difference



Under what conditions can -$30 constitute impact?

Average expenditure for farmers with insurance	$2,124
Average expenditure for farmers without insurance	$2,154
Difference	**-$30**

Method 3: Difference-in-difference

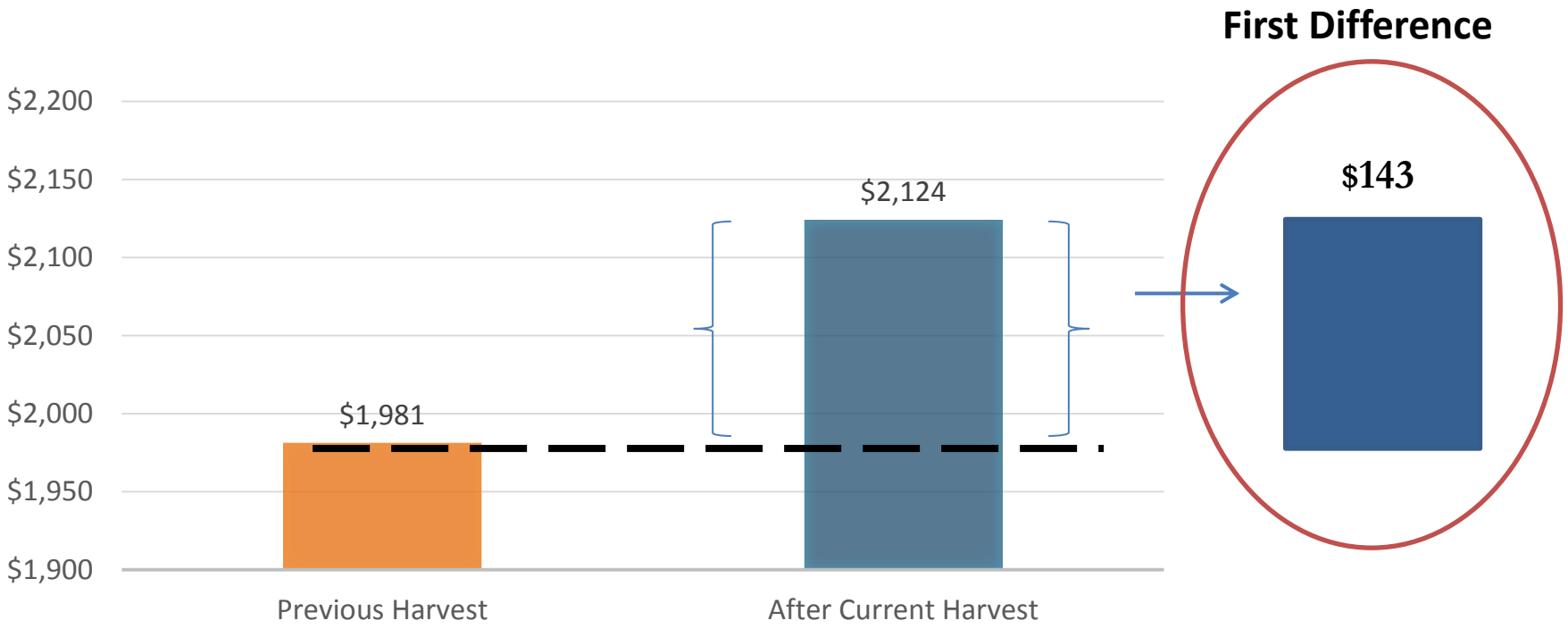
Measure improvement (change) over time of participants *relative to* the improvement (change) over time of non-participants

- Divide the population of farmers into **two** groups:
  - One group purchased the index insurance (Treatment)
  - One group did not purchase the index insurance (Control)
- Compare the *change* in expenditure between Treatment and Control
  - i.e., difference in differences in test scores
- Same thing: compare difference in test scores at post-test with difference in test scores at pretest

Method 3: Difference-in-Difference

First Difference (Pre-Post of **Farmers who purchased insurance**)

	Pre-insurance (previous harvest)	Post-insurance (after current harvest)	Difference
Average expenditure for farmers with insurance	$1,981	$2,124	$143



ABDUL LATIF JAMEEL Poverty Action Lab
TRANSLATING RESEARCH INTO ACTION

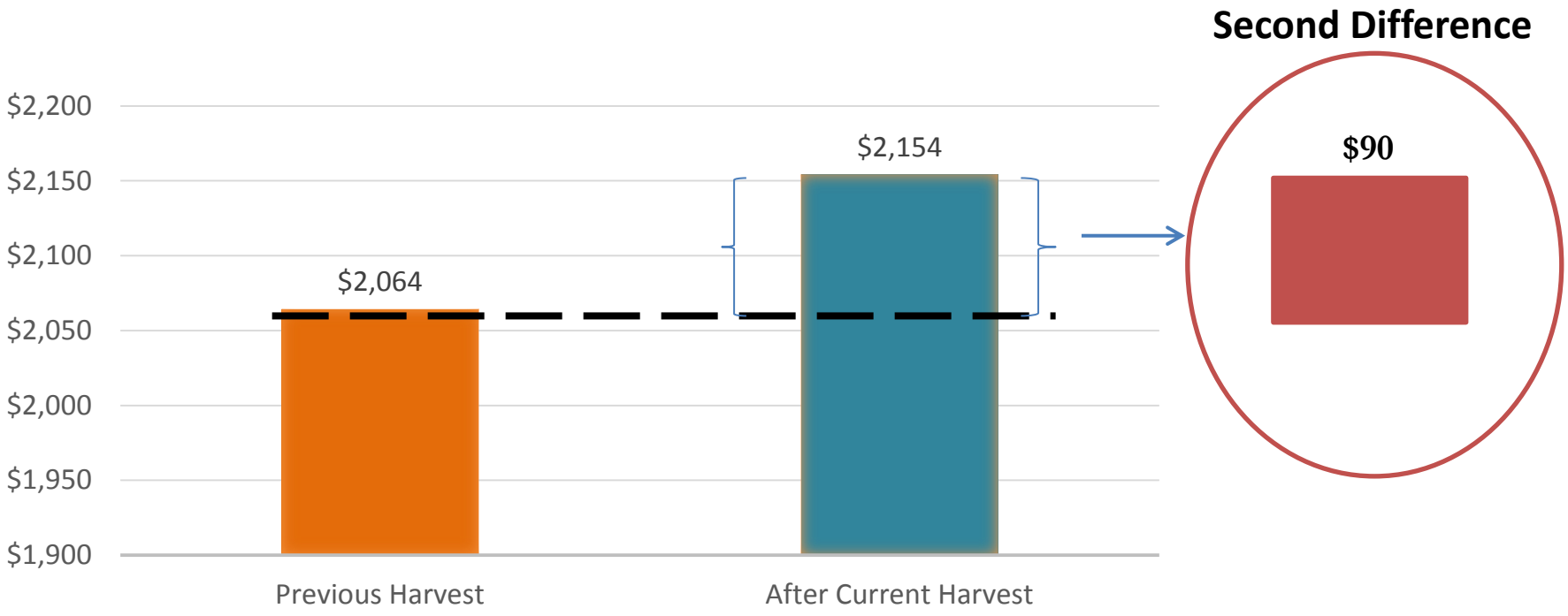
IFMR
INSTITUTE FOR FINANCIAL MANAGEMENT AND RESEARCH

clear
Regional Centers for Learning on Evaluation and Results

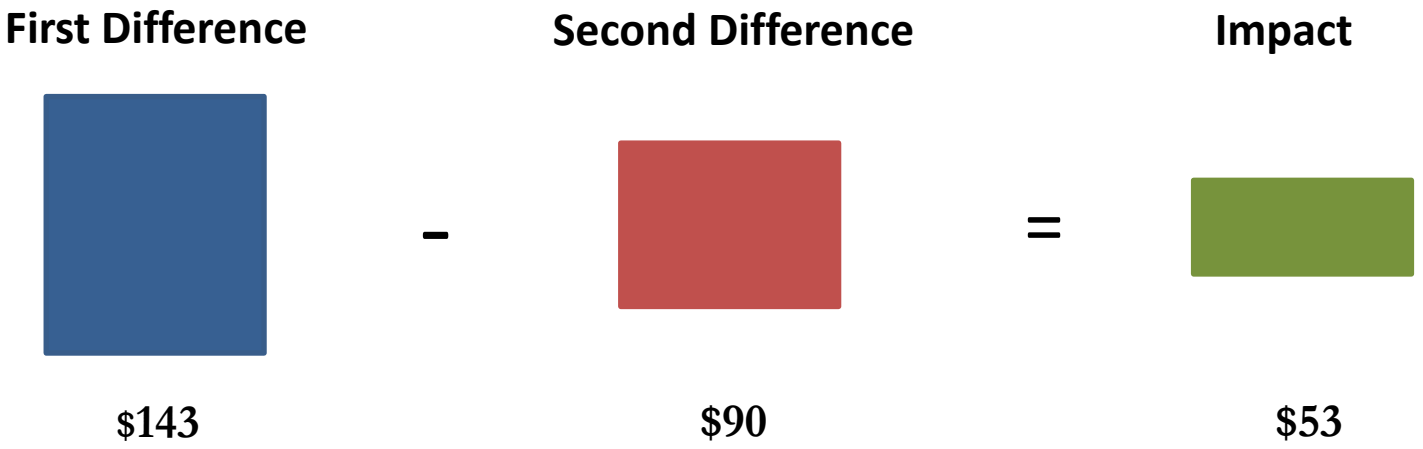
Method 3: Difference-in-Difference

Second Difference (Pre-Post of **Farmers who did not purchase insurance**)

	Previous harvest	This harvest	Difference
Average expenditure for farmers with no insurance	$2,064	$2,154	$90



Method 3: Difference-in-Difference



QUESTION: Under what conditions can $53 be interpreted as the impact of the weather index insurance?

Method 4: Regression Analysis

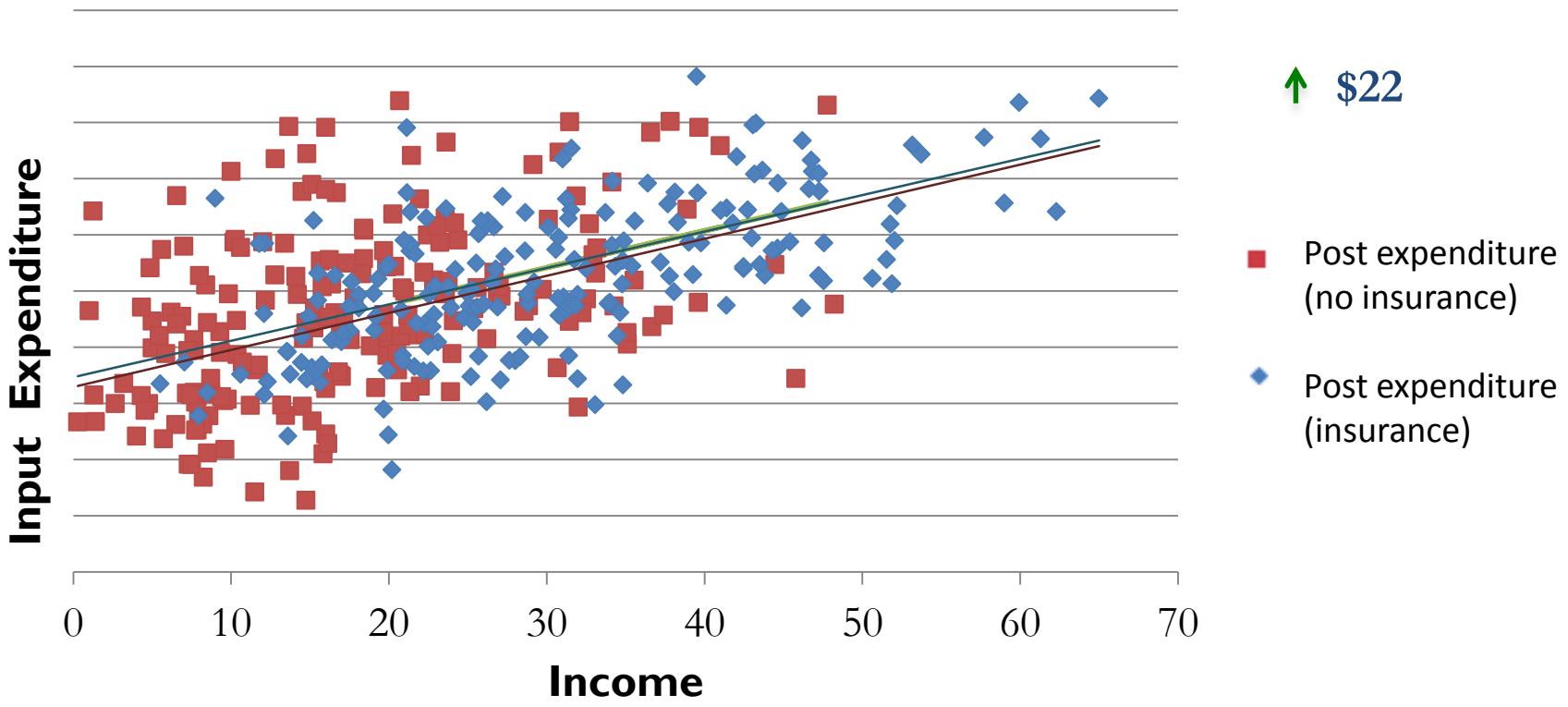
- Divide the population into **two** groups:
  - One group bought the insurance
  - One group did not buy the insurance

- Compare agricultural investment of these two groups at the **end** of the program. But also…

- **Control** for additional variables like plot size, risk-aversion, income, etc.

- Investment = $\beta_0 + \beta_1 \text{PlotSize} + \beta_2 \text{Income} + \boldsymbol{\beta_3} Insurance + e$

Method 4: Regression Analysis



QUESTION: Under what conditions can $22 be interpreted as the impact of the Index Insurance program?

Impact of Index Insurance

Method	Impact Estimate
(1) Pre-post	26.42*
(2) Simple Difference	-5.05*
(3) Difference-in-Difference	6.82*
(4) Regression with controls	1.92

* Significance at 5% Level

Which of these methods do you think is closest to the truth?

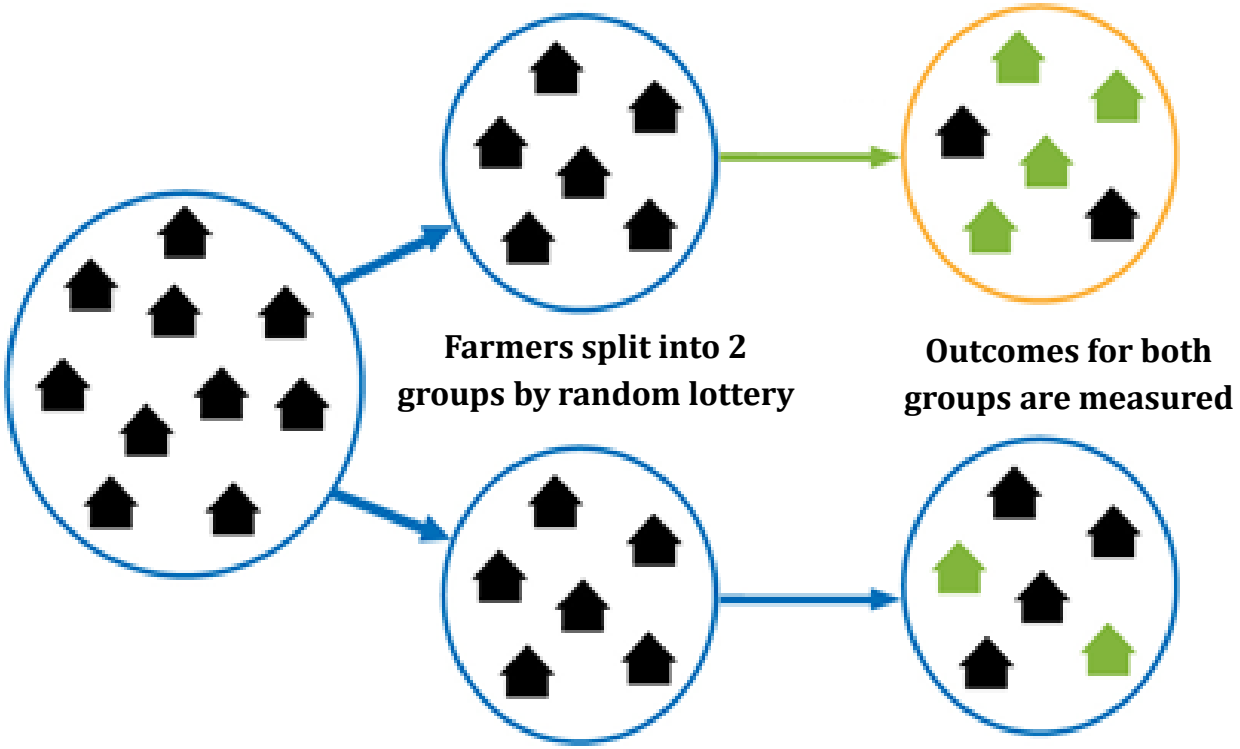
Method 5: Randomized Experiment

Start with simple case:

Take a sample of program applicants and ***Randomly*** assign them to either:

- **Treatment Group** – is offered treatment
- **Control Group** – not offered treatment (during the evaluation period)

Key Advantage



- Because members of the groups (treatment and control) do not differ systematically at the outset of the experiment,
- Any difference that subsequently arises between them can be attributed to the program rather than to other factors.

Section V

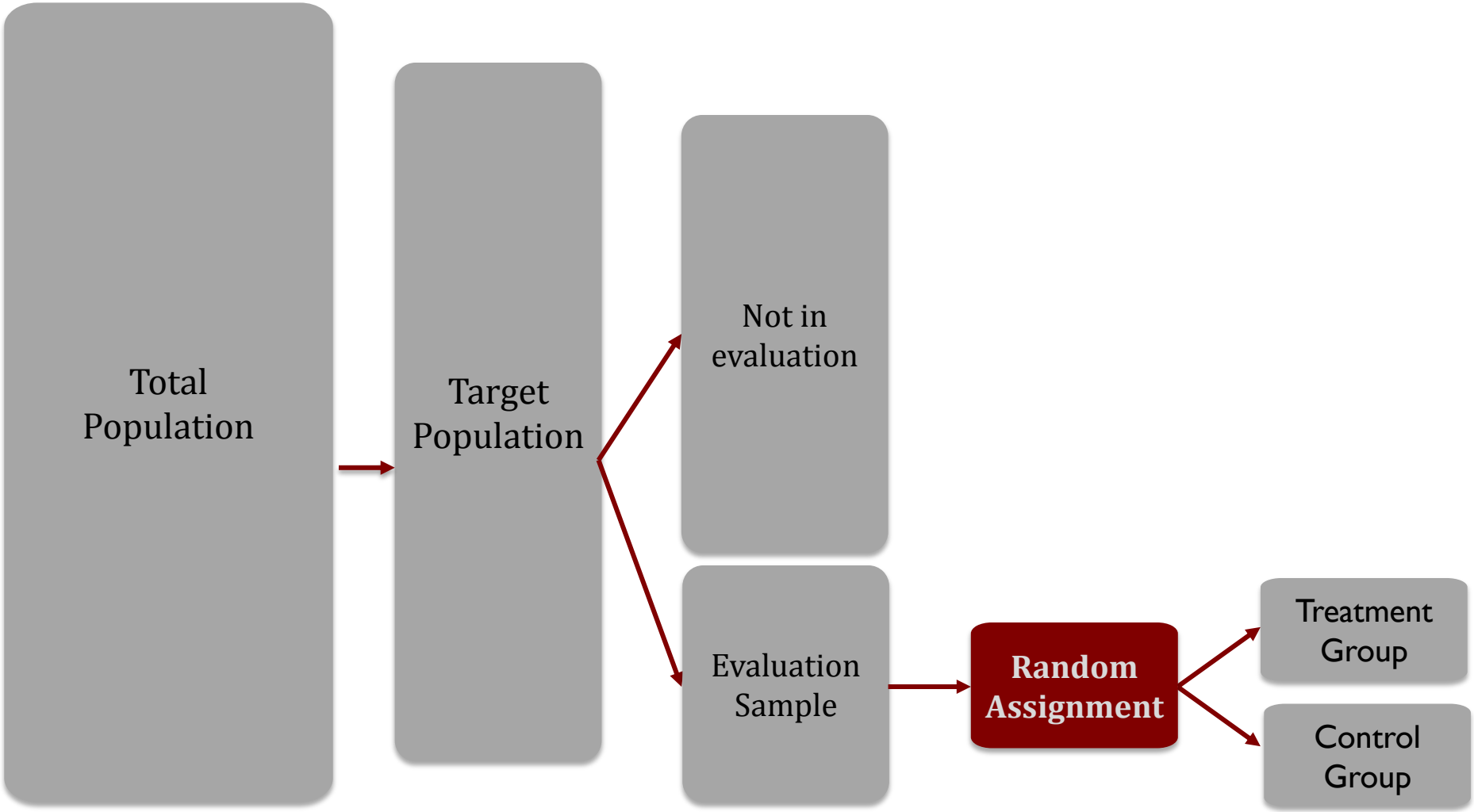
CONDUCTING A RANDOMIZED EVALUATION

ABDUL LATIF JAMEEL
Poverty Action Lab
TRANSLATING RESEARCH INTO ACTION

IFMR
INSTITUTE FOR FINANCIAL MANAGEMENT AND RESEARCH

clear
Regional Centers for
Learning on Evaluation and Results

Basic Set-up of a Randomized Evaluation



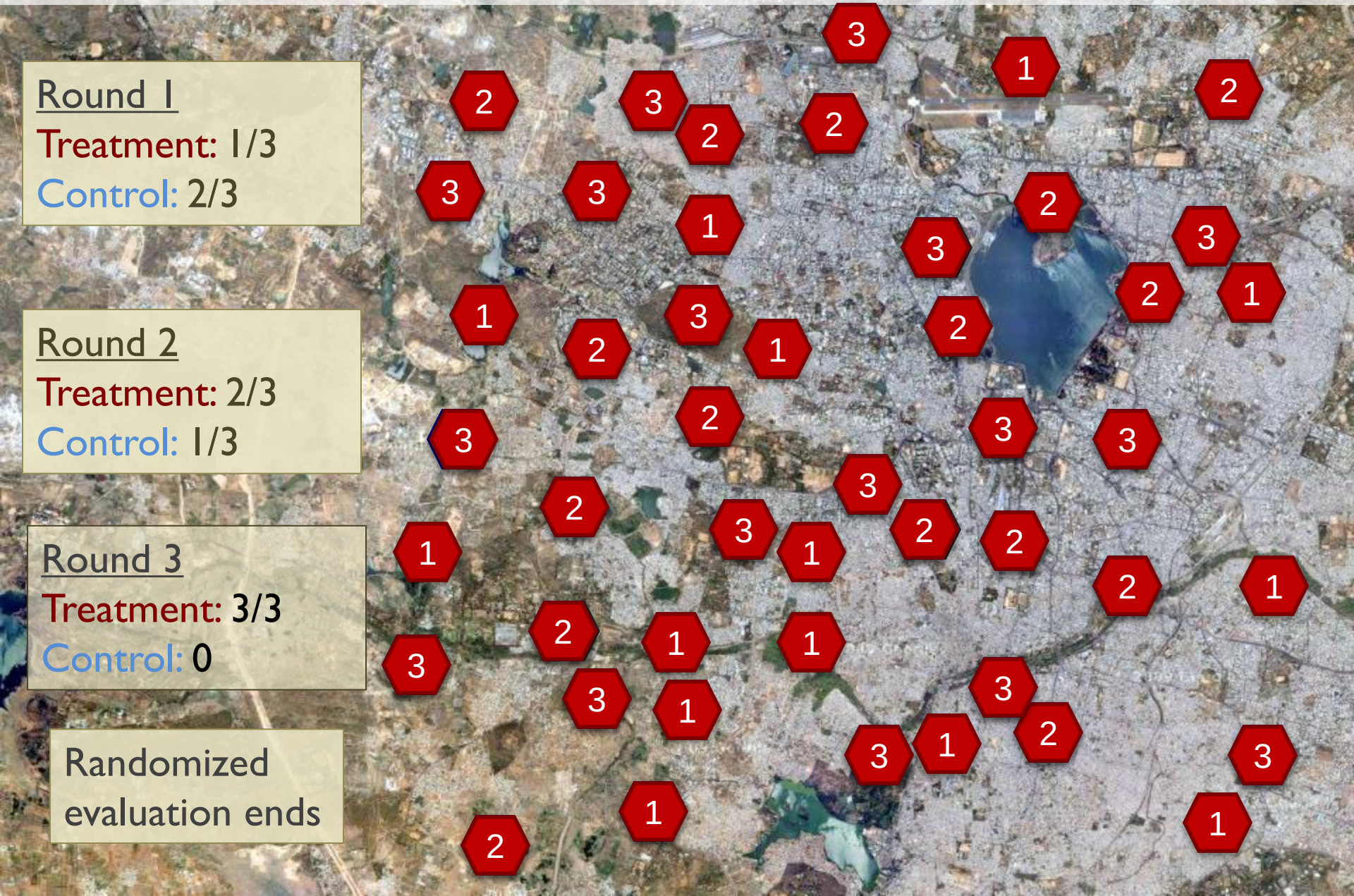
Key Steps in Conducting an Experiment

1. Collect baseline data
2. Randomly assign people to treatment or control
3. Verify that assignment looks random
5. Monitor process so that integrity of experiment is not compromised
6. Collect follow-up data for both the treatment and control groups
7. Estimate program impacts by comparing mean outcomes of treatment group vs. mean outcomes of control group.
8. Assess whether program impacts are statistically significant and practically significant.

Types of Randomized Design

- Basic Lottery
- Phase-in
- Encouragement design
- Rotation Design
- Lottery with cut-offs
- Two Stage Randomization

Phase-in Design



Phase-in Designs

- **Advantages**
  - Everyone gets the treatment eventually
  - Provides incentives to maintain contact

- **Concerns**
  - Can complicate estimating long-run effects
  - Care required with phase-in windows
  - Do expectations change actions today?

Unit of Randomization: Options

1. Randomizing at the individual level

2. Randomizing at the group level - "Cluster Randomized Trial"

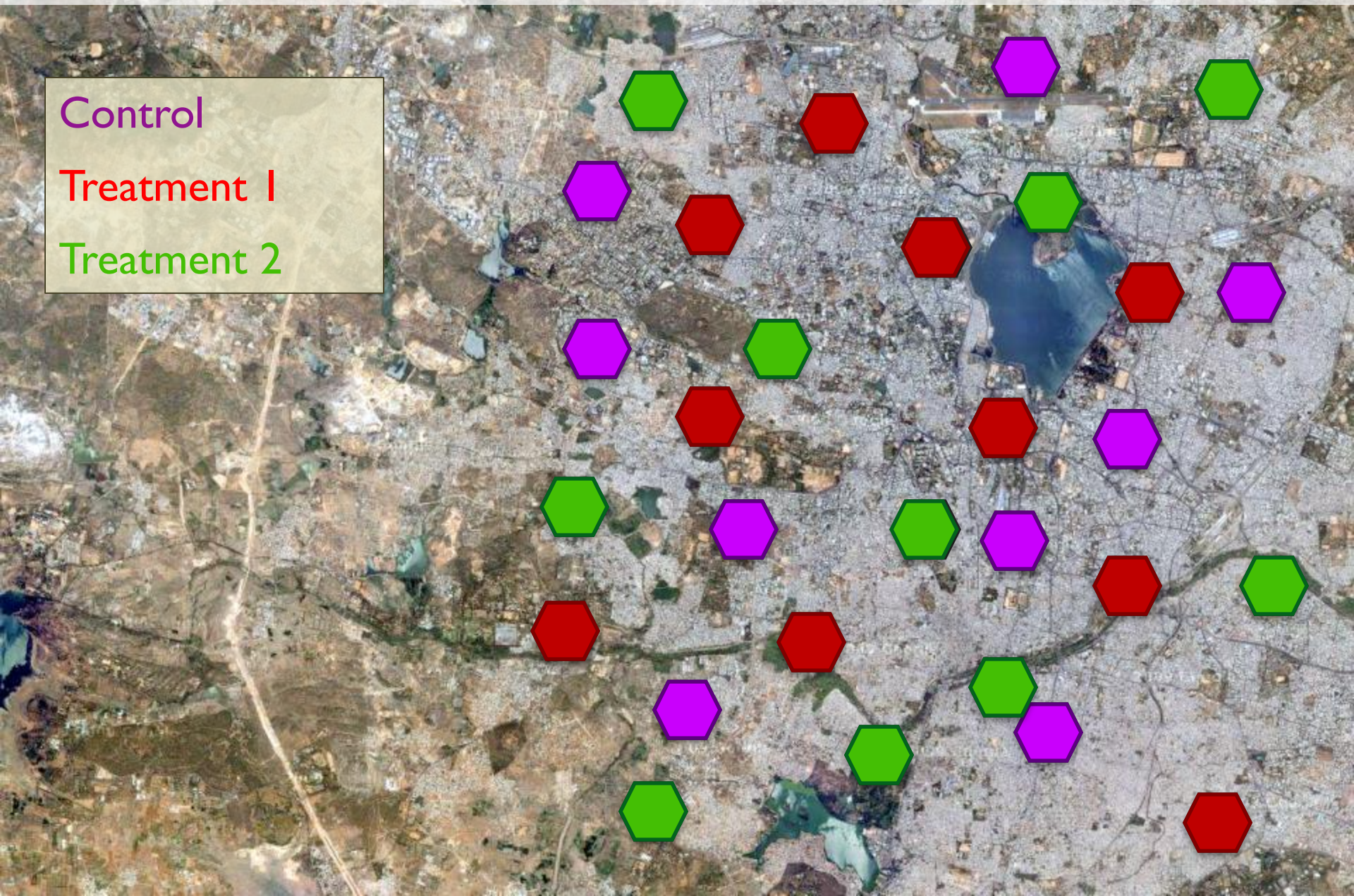
Which level to randomize?

Unit of Randomization: Considerations

- "Spillovers": At what level will your program's impacts not "spill over" to your control group in ways that you want to avoid?
  - Lower – level randomizations generally have larger concerns with spillovers

- "Statistical power": How can you maximize your ability to detect the effect of the intervention?
  - Lower - level randomizations generally have higher statistical power

Multiple Treatments



Section VI

J-PAL'S LESSONS IN INSURANCE

ABDUL LATIF JAMEEL
Poverty Action Lab
TRANSLATING RESEARCH INTO ACTION

IFMR
INSTITUTE FOR FINANCIAL MANAGEMENT AND RESEARCH

clear
Regional Centers for
Learning on Evaluation and Results

Oregon Medicaid Experiment

- Ambiguous effect of expanding public health insurance programs
  - Increase emergency room visits?
  - Increase employment?

- Selection bias confounds attempts to compare those enrollees vs. non-enrollees

- Oregon Health Plan (OHP) – covered doctor visits, hospital stays, and prescription drug costs for the low-income and uninsured

- In 2008, the OHP expanded to cover 10,000 additional enrollees
  - 75,000 individuals applied
  - To promote fairness, selection was done using random selection

Oregon Medicaid Experiment - Results

- **Medicaid increased the use of health-care services**
  - Increased probability of hospital admission (30%), number of emergency department visits (40%), increased take up of preventative care

- **Medicaid reduced depression and self-reported health, but had no impact on actual health outcomes**
  - No effect on blood pressure, cholesterol, hemoglobin levels, and other health measures.
  - Reduced rates of depression by 9 p.p.

- **No effect found on earnings and employment**