Asian Development Bank - International Initiative for Impact Evaluation

Video Lecture Series

Introduction to Randomized Control Trials

Annette N. Brown

Lecture outline

- When does a comparison group not give you a valid counterfactual?

- Sources of selection bias

- What is a Randomized Control Trial (RCT)?

- What isn't an RCT ?

- What are approaches to randomized assignment?

- Common concerns and remedies

An example

Jóvenes en Acción

Subsidized employment skills training to poor young people living in urban areas

"Subsidizing Vocational Training for Disadvantaged Youth in Colombia: Evidence from a Randomized Trial," Orazio Attanasio, Adriana Kugler, and Costas Meghir. *AEJ: AE*, July 2011
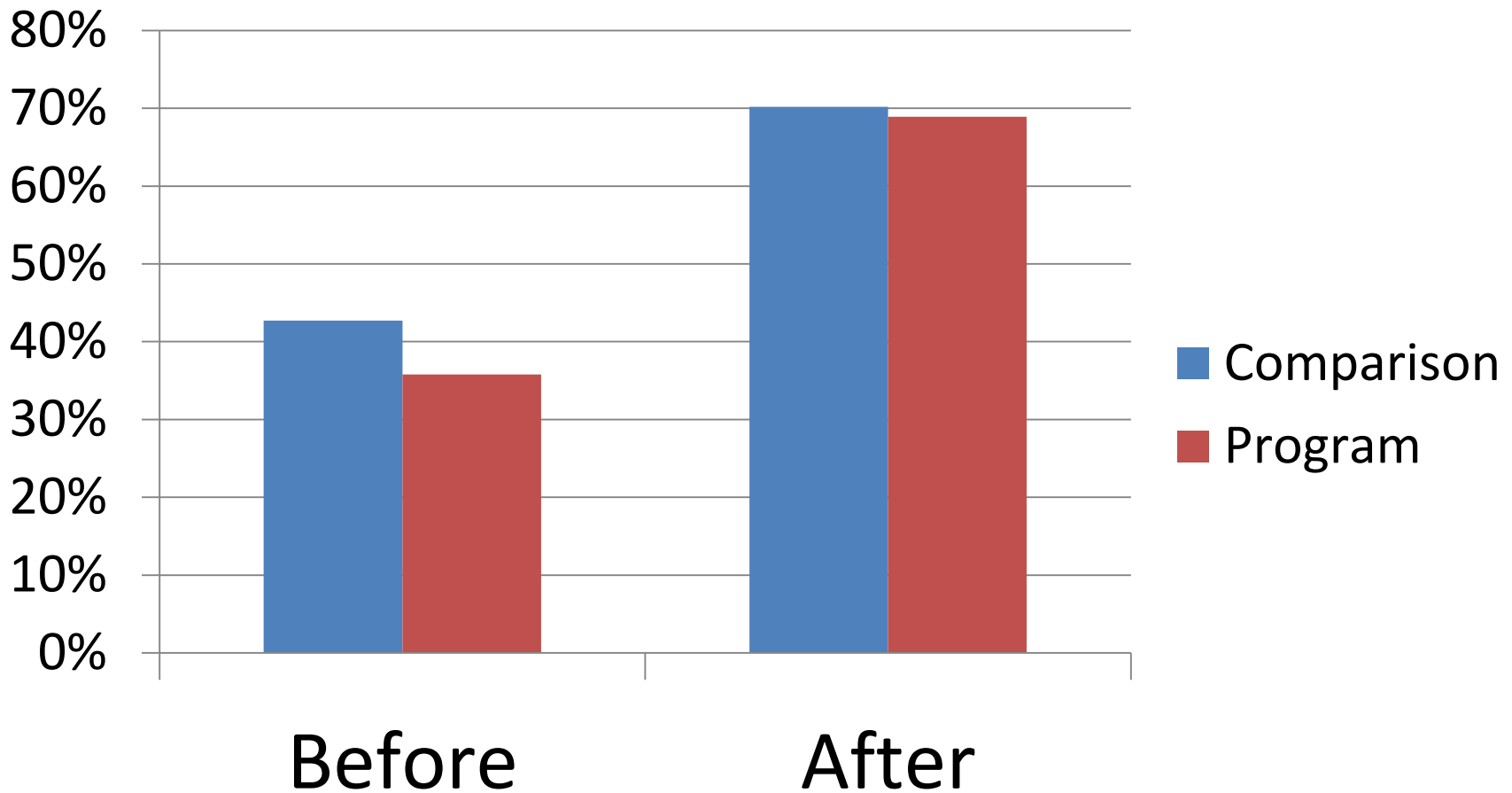
Program design

- 3 months classroom training
  - Variety of for-profit and nonprofit training institutions, 70 categories of courses

- 3 months on the job training
  - Legally registered companies, unpaid internships

- Daily cash transfer for expenses

Women's paid employment
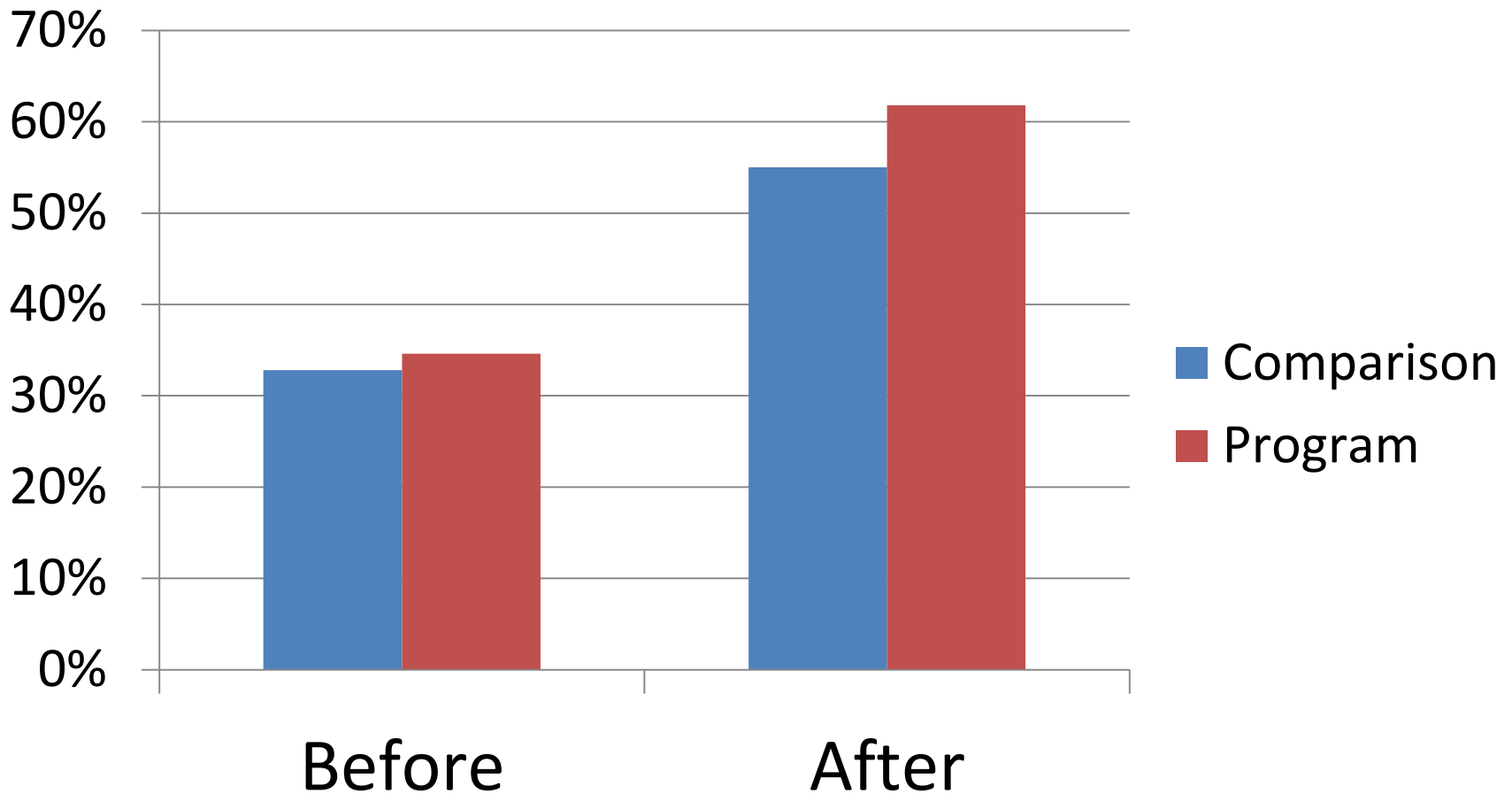
Men's paid employment

Can we compare these groups?

What might be different between the program group and the comparison group?

Observables

- Education
- Age
- Household characteristics
- Parents' education

Un-observables

- Motivation/drive
- Capabilities
- Support/encourage-ment

When do differences matter?

Observable and unobservable characteristics matter when they may influence both program participation and final outcomes. This creates selection bias.
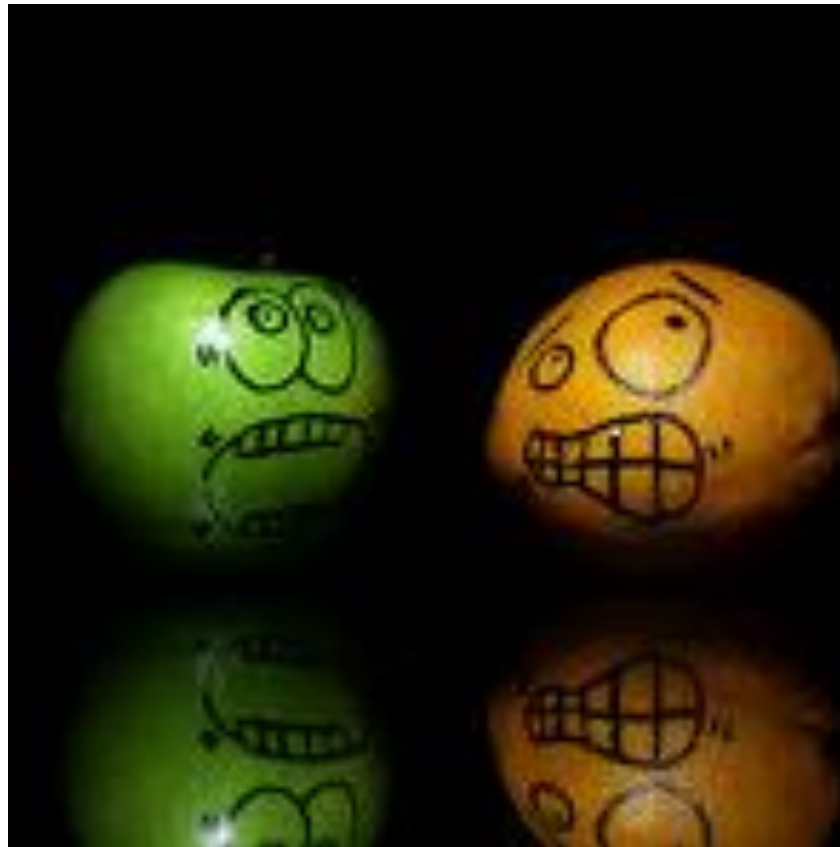
Selection bias

- If there are participants and non-participants, some kind of selection process determines who are the participants.

- Self selection: participants choose the program based on anticipated gains.

- Program-placement selection: third party selects participants into the program, typically based on defined characteristics or objectives.

Selection bias

means that you do not have a valid counterfactual

What is an RCT?

- A randomized control trial is one approach to address selection bias, often considered the best solution.

- Other names for RCTs include
  - Experiment
  - Field experiment
  - Randomized experiment
  - Randomized evaluation

- An RCT uses *random assignment* of a program or intervention to create a counterfactual comparison group.

- Random assignment balances the distribution of both observable and unobservable characteristics over the program and comparison groups.

- When truly random assignment is achieved, there is no selection bias.

Study sample

Random assignment
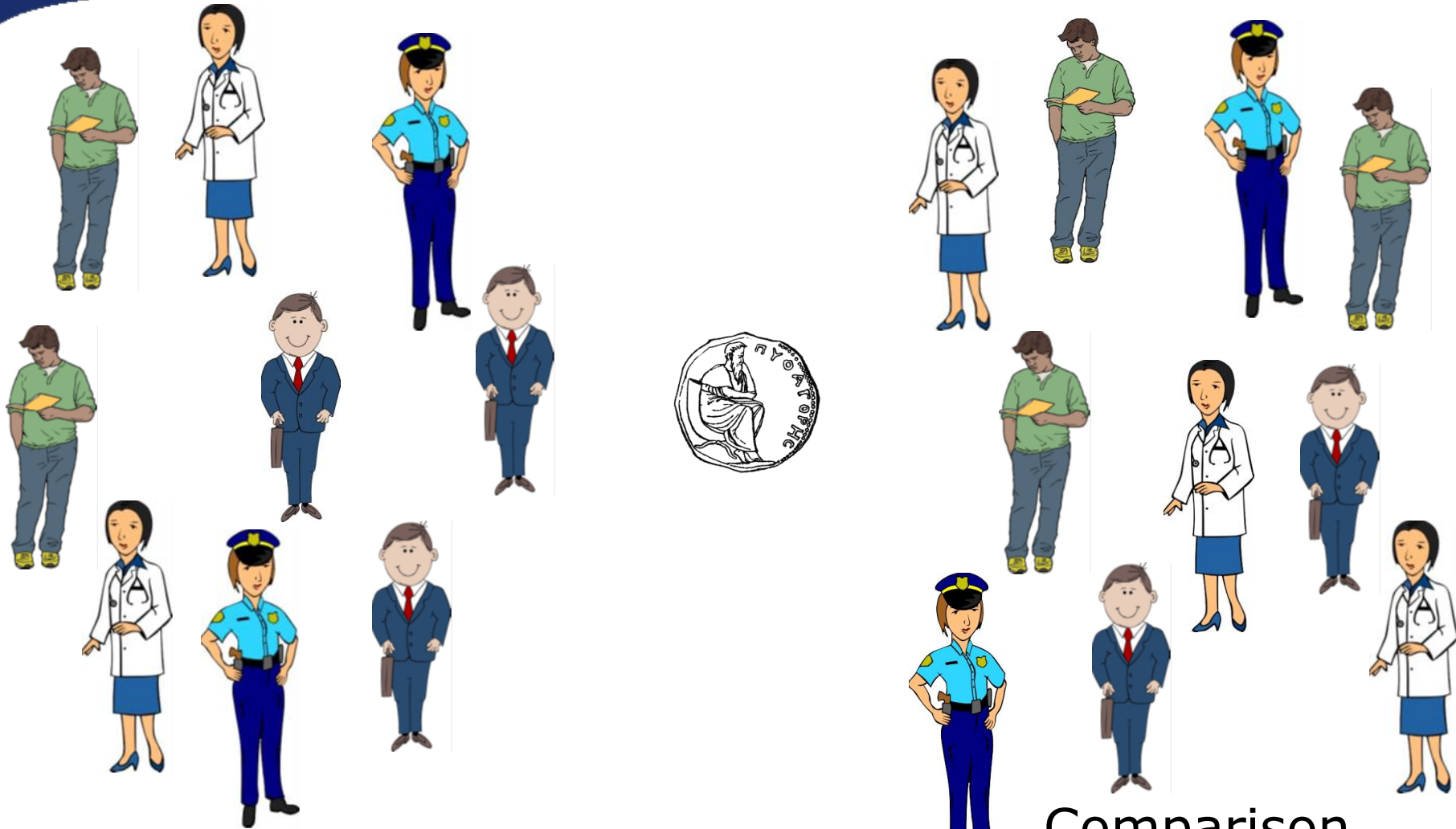
Program group

Comparison group

Balance

Program group

Comparison group

Balance

Comparison group

Program group

Random sampling is not random assignment—not an RCT.

Study sample

Program selection

Comparison group

Program group

Random sampling
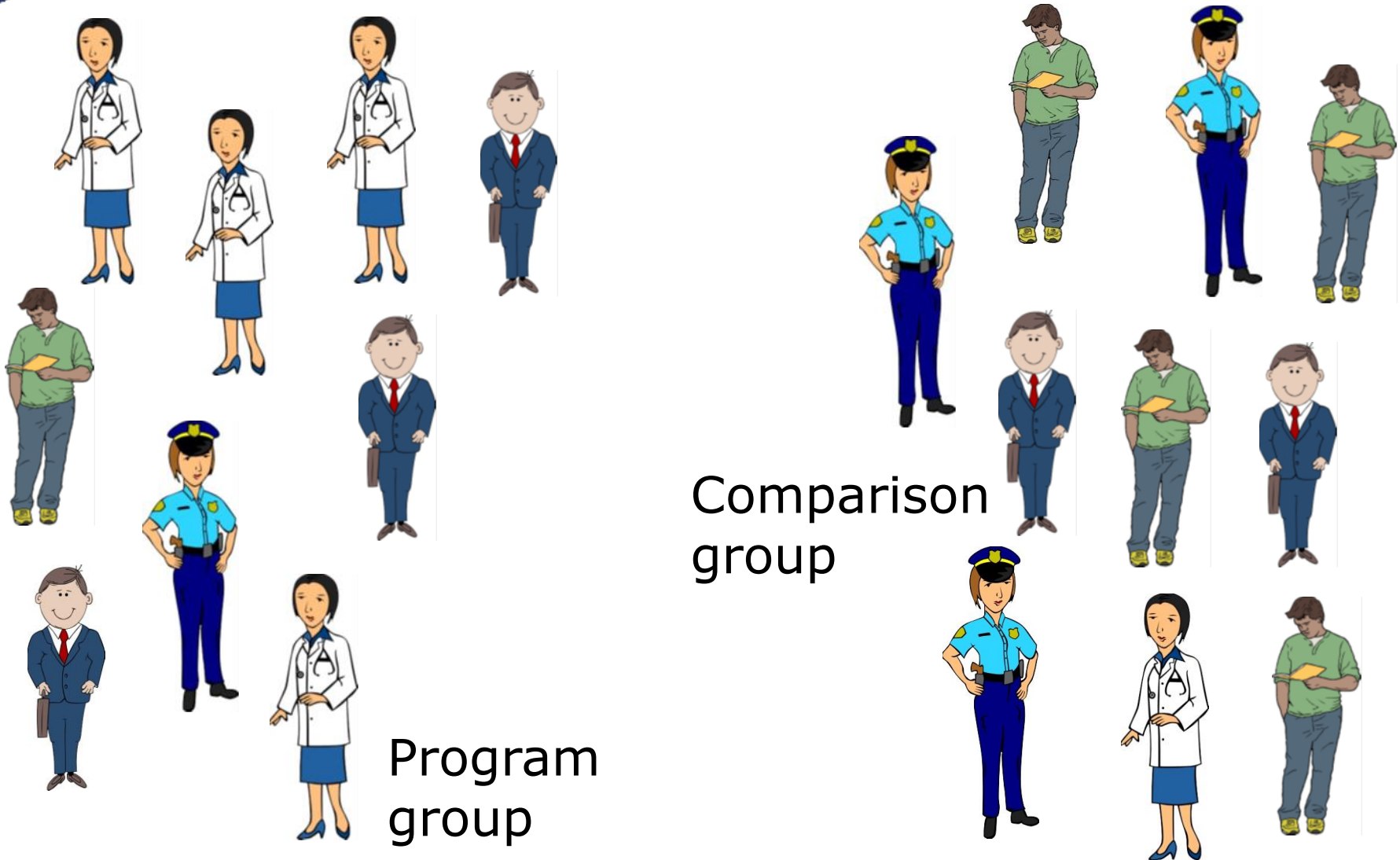
Comparison group
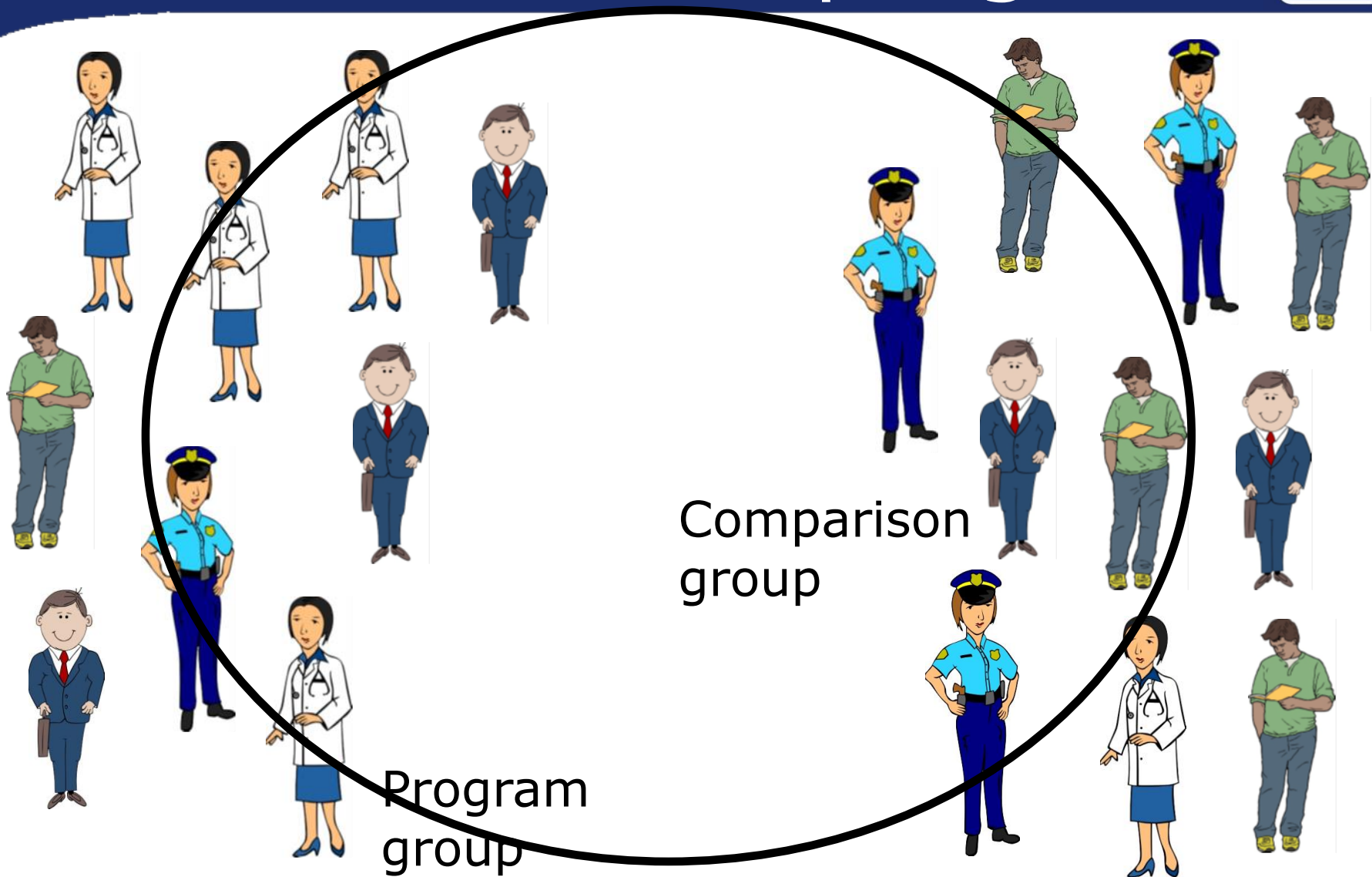
Program group

Balance

Comparison group

Program group

Example 1

Linking savings accounts to mobile phones: are potential users interested?

Photo © Ken Banks kiwanja

Suresh de Mel, University of Peradeniya
Dammika Herath, Kandy Consulting Group
Craig McIntosh, University of California, San Diego
Christopher Woodruff, University of Warwick

Random assignment

Table 1: Treatment Design

Treatment cell	Sample size - Design	Sample Size - Actual	Monthly Survey Sample
0% deposit cost treatment	700 individuals	683 individuals	456 individuals
2% deposit cost treatment	300 individuals	316 individuals	
4% deposit cost treatment	300 individuals	310 individuals	
8% deposit cost treatment	300 individuals	316 individuals	
Control	400 individuals	381 individuals	381 individuals

Balance

Table D1: Balance Tests
Treatment Group

	All Treated	0%	2%	4%	8%	Control
Observations	1625	683	316	310	316	381
Take-up rate (1)	85.5%	87.1%	86.4%	86.1%	**80.7%**	NA
Take-up rate w/o attritors (1)	89.8%	91.1%	89.8%	89.6%	**87.0%**	NA
Attrition rate (Offer not Given)	4.7%	4.4%	3.8%	3.9%	7.3%	NA
Age	40.9	40.3	41.5	**42.0**	40.6	41.1
Female	19.1%	18.2%	19.0%	19.7%	20.9%	21.0%
Married	85.0%	85.7%	86.1%	88.7%	**78.8%**	81.6%
Muslim	4.0%	5.0%	4.7%	**1.6%**	3.5%	2.6%
Years of Schooling	10.1	10.2	9.9	10.1	10.1	10.3
Household Head	61.5%	64.0%	61.7%	60.6%	**57.0%**	60.1%
Household owns mobile phone	89.0%	89.5%	90.2%	87.1%	88.9%	90.3%
Member Seetu	31.1%	31.8%	29.1%	31.3%	31.3%	33.9%
Has bank account	73.7%	75.0%	74.7%	73.5%	70.3%	71.7%
Financial Literacy	75.6%	75.5%	76.9%	76.8%	73.1%	79.3%
Self Employed	71.9%	70.7%	73.7%	72.3%	72.2%	71.4%
Has changed SIM	56.0%	58.1%	54.4%	51.9%	57.0%	58.5%
Tops up at least weekly	58.5%	60.6%	59.8%	**52.6%**	58.2%	58.5%
Reads text "Very easily"	19.2%	19.0%	19.6%	19.0%	19.3%	19.7%

Balance

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Treatment Group

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Observations	1625	683	316	310	316	381
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Take-up rate w/					87.0%	NA
Attrition rate (C					7.3%	NA
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Female		19.1%	18.2%	19.0%	20.9%	21.0%
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Household Head		61.5%	64.0%	61.7%	57.0%	60.1%
Household owns mobile phone	89.0%	89.5%	90.2%	87.1%	88.9%	90.3%
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Reads text "Very easily"	19.2%	19.0%	19.6%	19.0%	19.3%	19.7%

Example 2

Paying for performance in China's battle against anaemia

Linxiu Zhang, Scott Rozelle and Yaojing Shi

Photo © Joe Whittingham

Random assignment

85 schools enrolled

13 schools randomly excluded

27 schools in control

15 schools in information group

15 schools in subsidy group

15 schools in incentive group
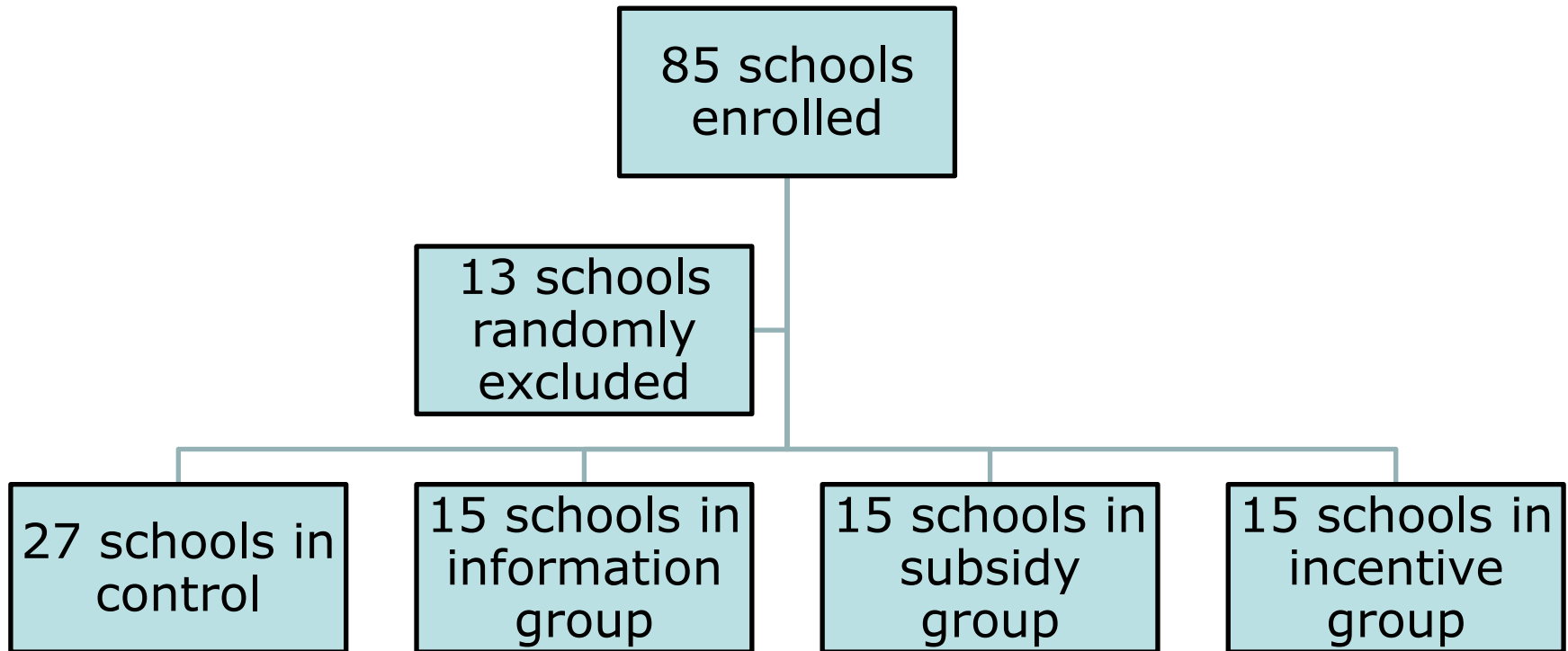
Balance

Table 1 Baseline student characteristics by experiment arm

	Control schoo 27 schools 1,623 students	Information schools: 15 schools 596 students	Subsidy schools: 15 schools 667 students	Incentive schools: 15 schools 667 students
Hb concentration (altitude adjusted g/dL)	12.6 (12.3–12.8)	12.5 (12.0–12.9)	12.4 (11.9–12.9)	12.4 (11.9–12.9)
Anaemic (Hb<11.5 g/dL)	338, 20.8% (14.4–27.3%)	130, 21.8% (9.9–33.7%)	160, 24.0% (12.4–35.5%)	161, 24.1% (10.3–38.0%)
Sex (female)	778, 47.9% (46.2–49.7%)	281, 47.2% (45.0–49.3%)	317, 47.5% (43.2–51.9%)	319, 47.8% (43.0–52.7%)
Age (months)	123.3 (120.6–125.9)	124.7 (121.8–127.6)	123.4 (118.4–128.3)	120.5 (116.4–124.7)
Boarding student	554, 34.1% (25.5–42.8%)	248, 41.6% (29.3–53.9%)	236, 35.4% (24.1–46.7%)	244, 36.6% (30.5–42.7%)

Results

Table 6 Changes in haemoglobin concentration and anaemia prevalence by experiment arm

	Dependent variable			
	Change in Hb concentration (g/dL)[a]		Anaemic (Hb <11.5 g/dL) after intervention[b]	
	(1)	(2)	(3)	(4)
Experiment arm dummy variables				
Student in information treatment school	0.24 (0.19)[c]	0.13 (0.10)	−0.02 (0.03)	−0.01 (0.02)
Student in subsidy treatment school	0.22 (0.25)	0.08 (0.10)	−0.01 (0.04)	−0.02 (0.02)
Student in incentive treatment school	0.23 (0.22)	0.19**[d] (0.09)	−0.02 (0.04)	−0.05*** (0.02)

Approaches to random assignment

- Use random assignment as a rationing method when a program is over-subscribed and/or resources are limited
- Use random assignment as the scheduling method when a program needs to be rolled out over time
- Randomize over clusters rather than over individuals
- Use random encouragements rather than random program assignment

Common concerns

- RCTs are expensive
  - The costs vary widely, but any rigorous evaluation requires dedicated resources

- Random assignment is not possible
  - RCTs have been conducted successfully in all development sectors and environments

- Random assignment is not ethical
  - Random assignment is often the most ethical way to ration or schedule programming