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Poverty Action Lab

TRANSLATING RESEARCH INTO ACTION

How to Randomize?

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J-PAL

Course Overview

1. What is Evaluation?
2. Outcomes, Impact, and Indicators
3. Why Randomize and Common Critiques
4. **How to Randomize**
5. Sampling and Sample Size
6. Threats and Analysis
7. Project from Start to Finish
8. Cost-Effectiveness Analysis and Scaling Up

Lecture Overview

- Unit and method of randomization
- Real-world constraints
- Revisiting unit and method
- Variations on simple treatment-control

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Unit of Randomization: Options

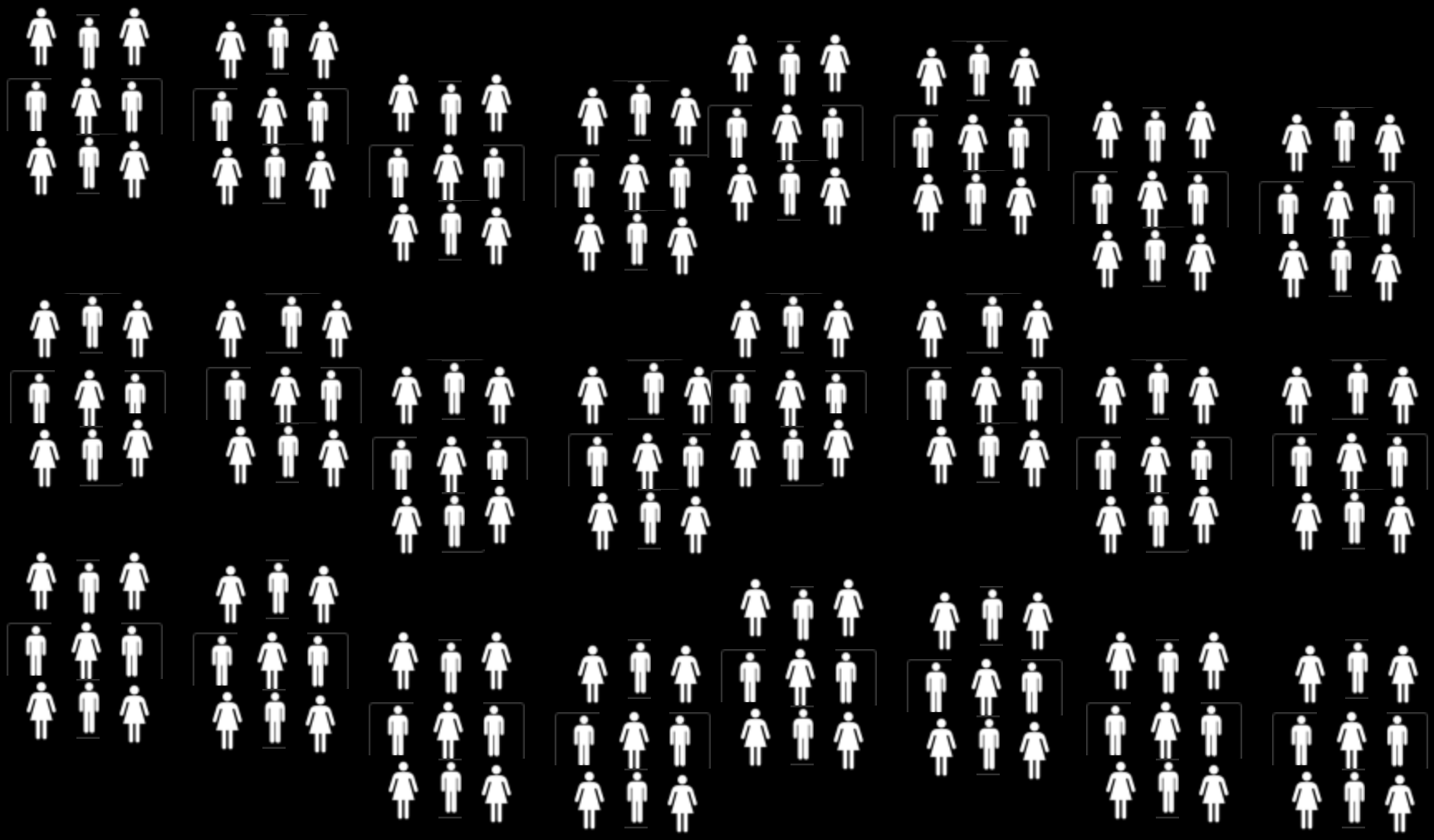
1. Randomizing at the individual level
2. Randomizing at the group level
   "Cluster Randomized Trial"

- Which level to randomize?

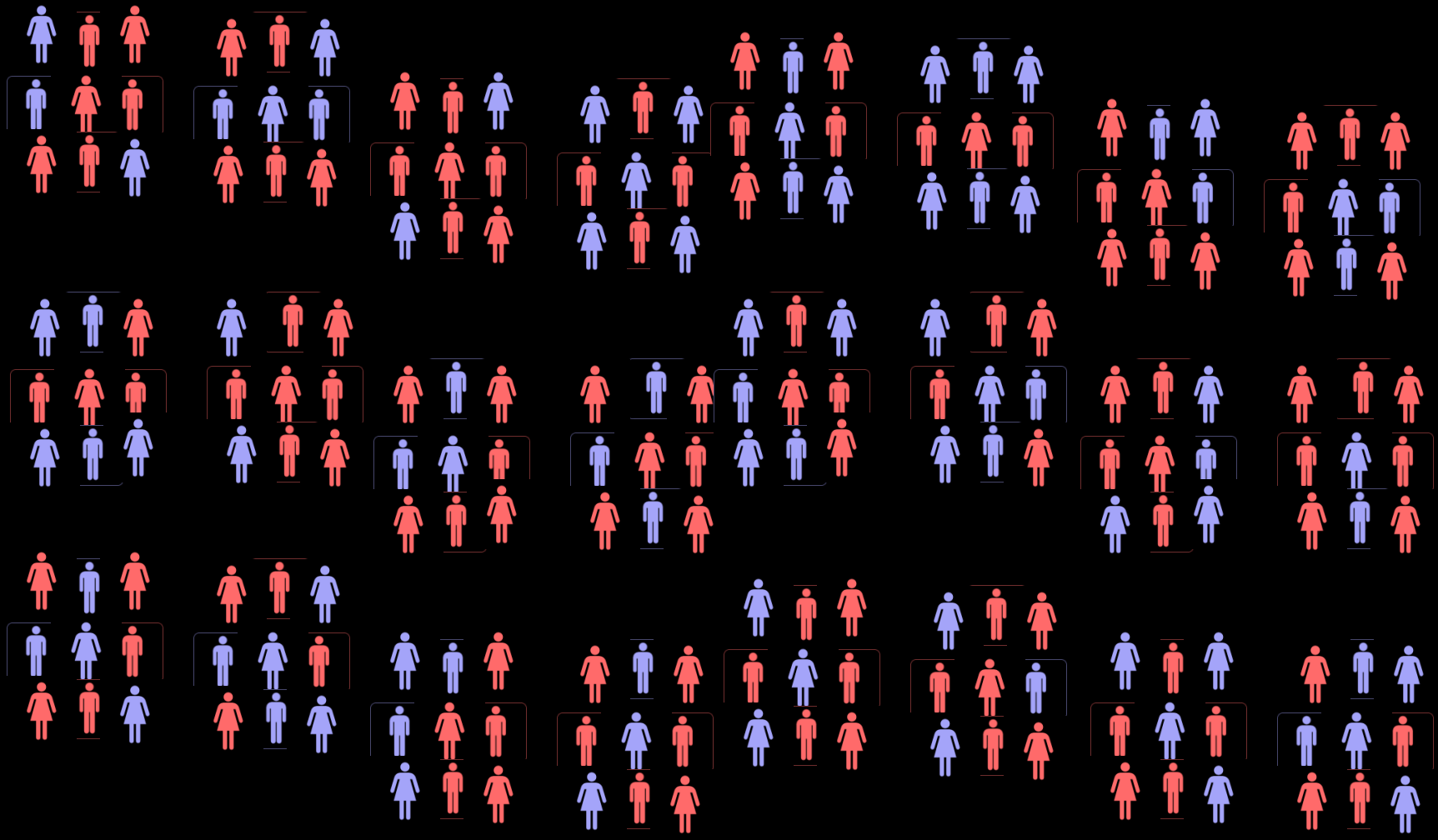
Unit of Randomization: Considerations

- What unit does the program target for treatment?
- What is the unit of analysis?

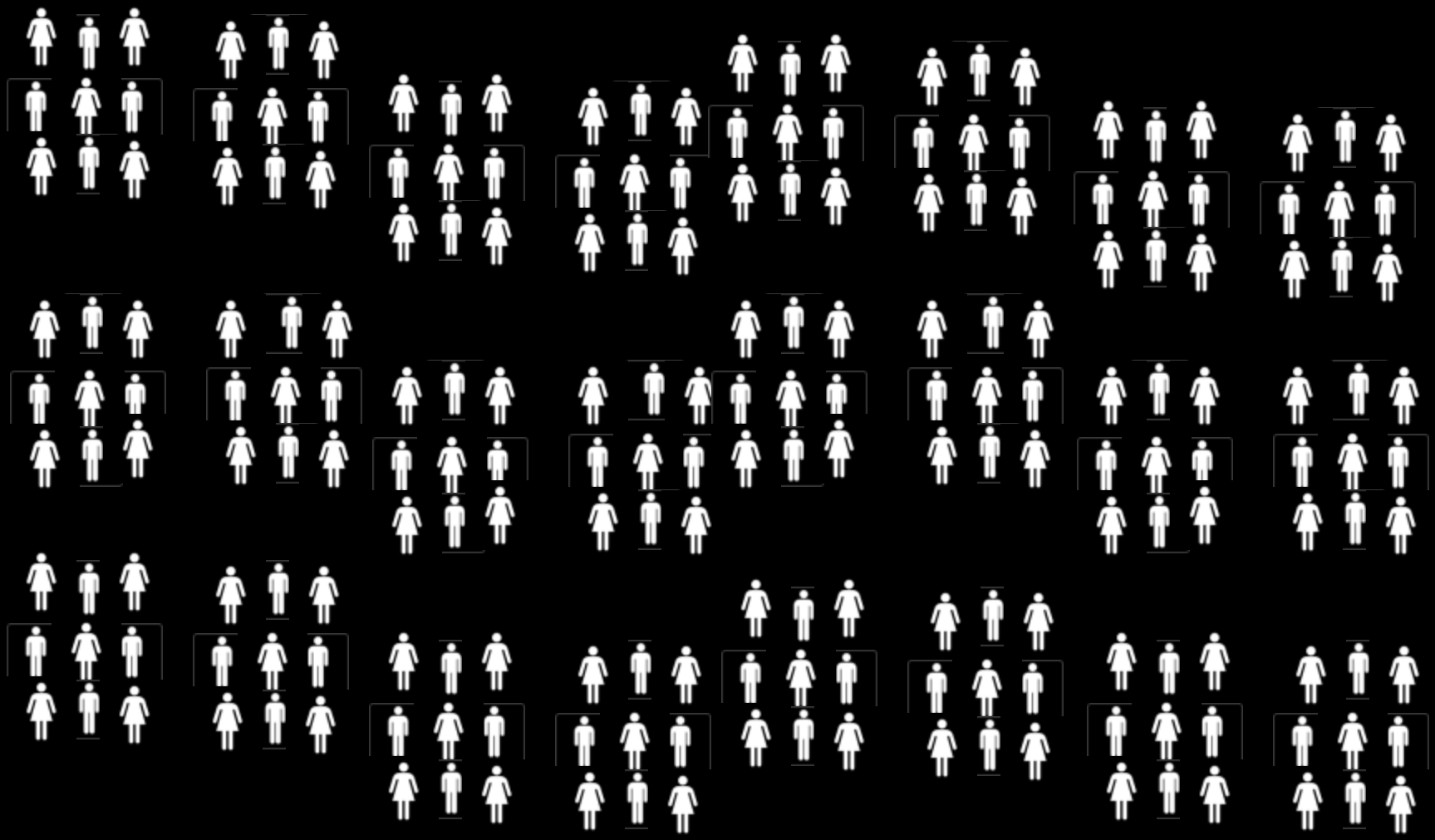
Unit of Randomization: Individual?



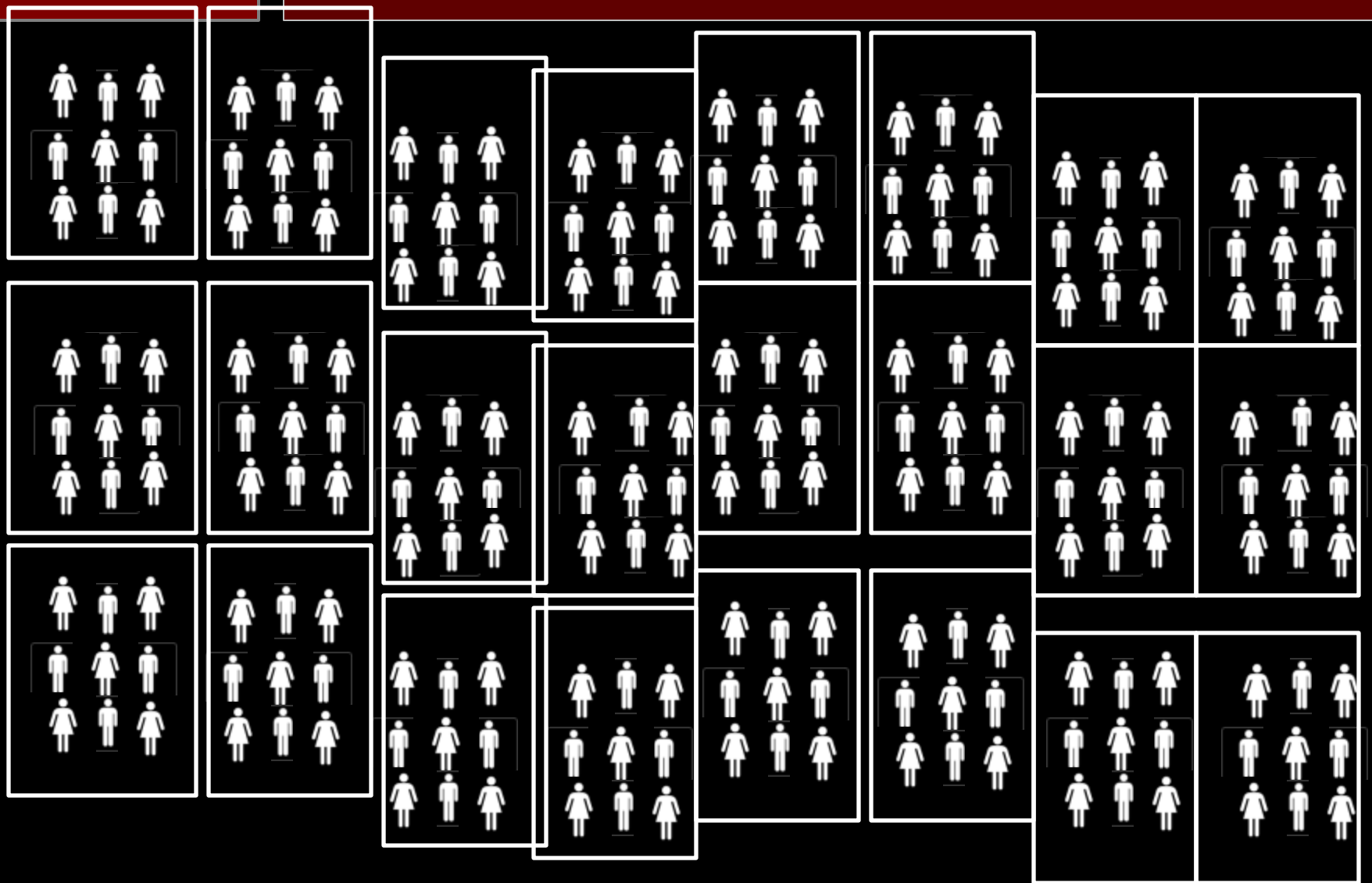
Unit of Randomization: Individual?



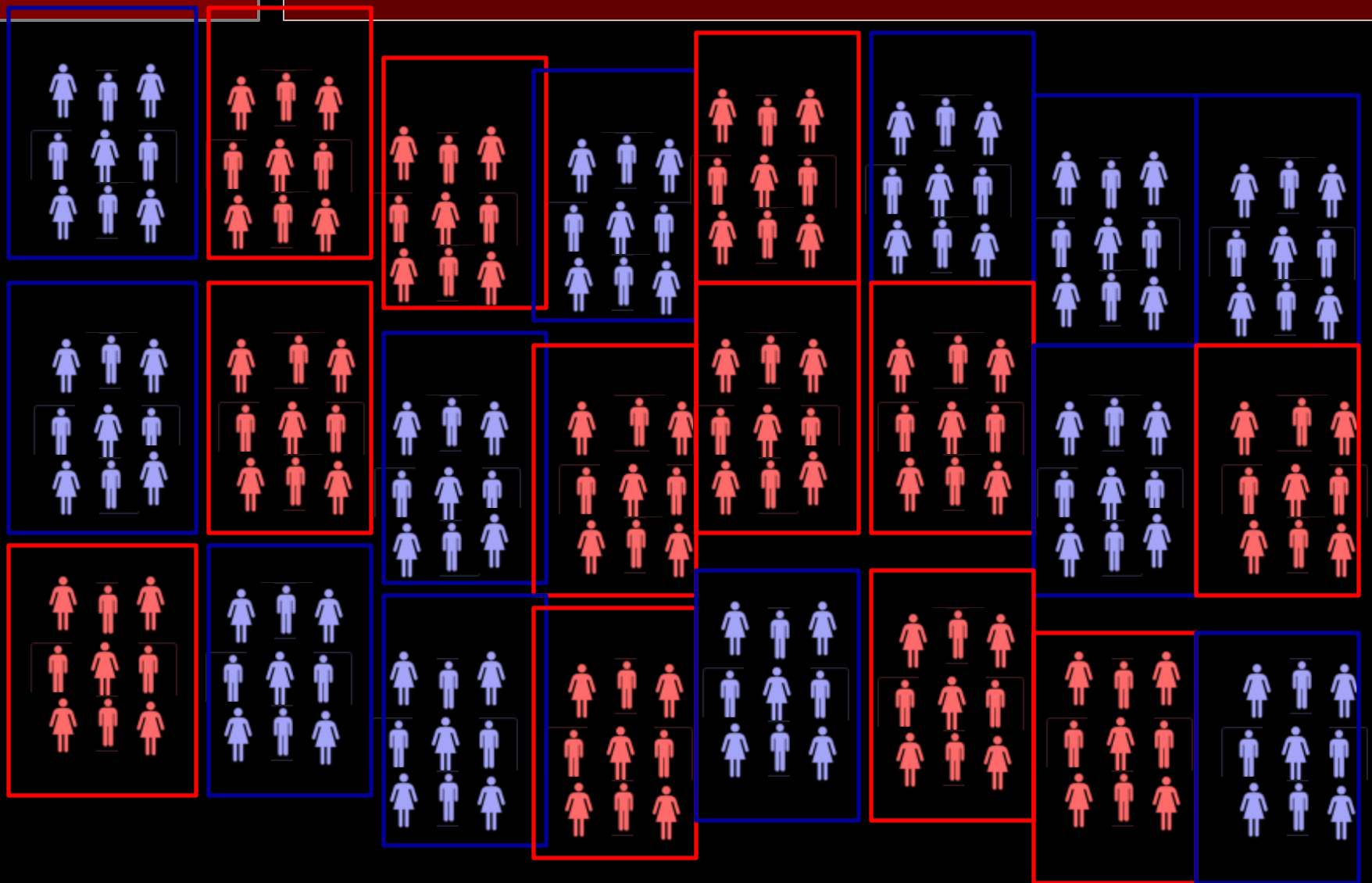
Unit of Randomization: Clusters?



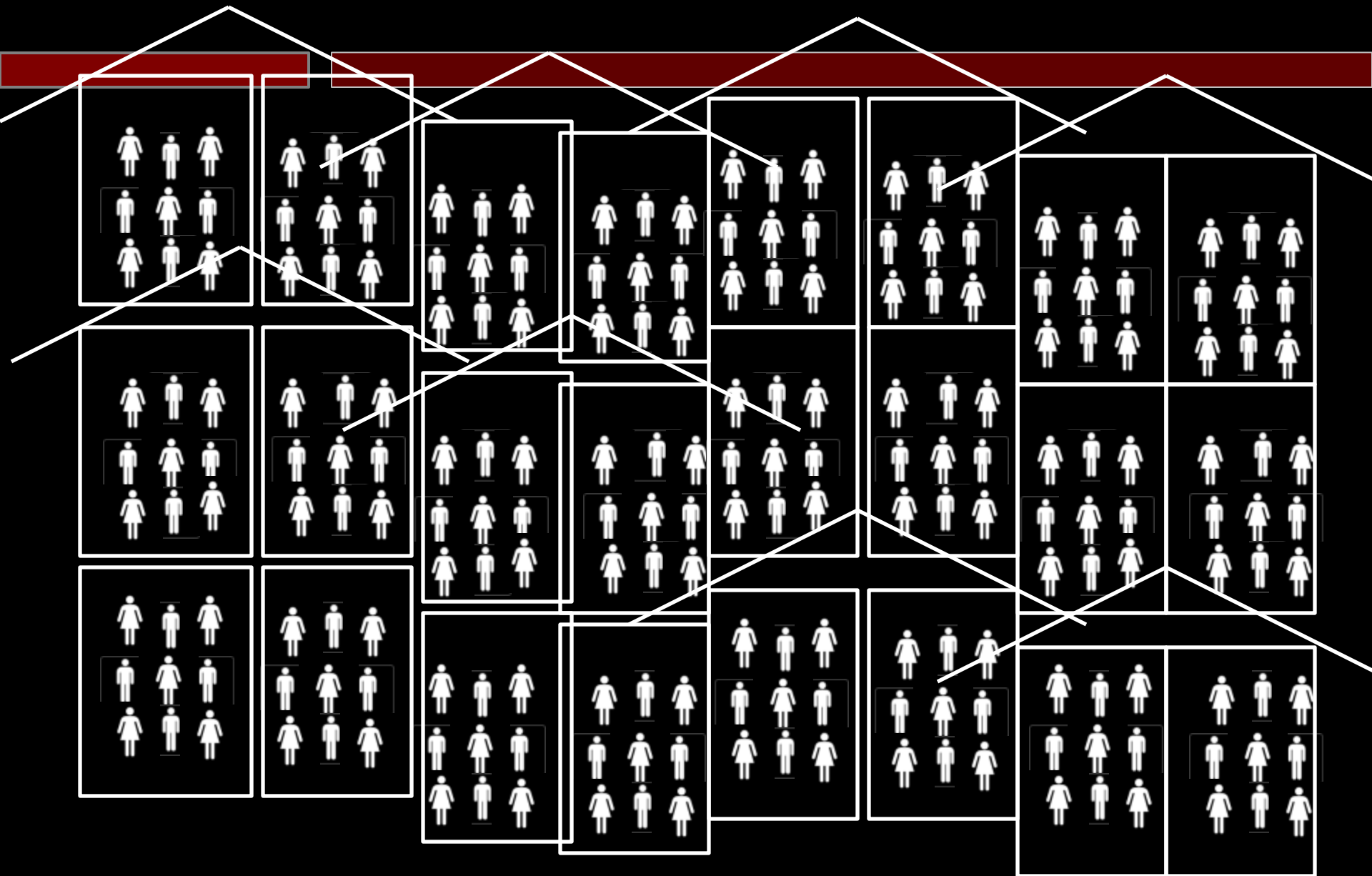
Unit of Randomization: Class?



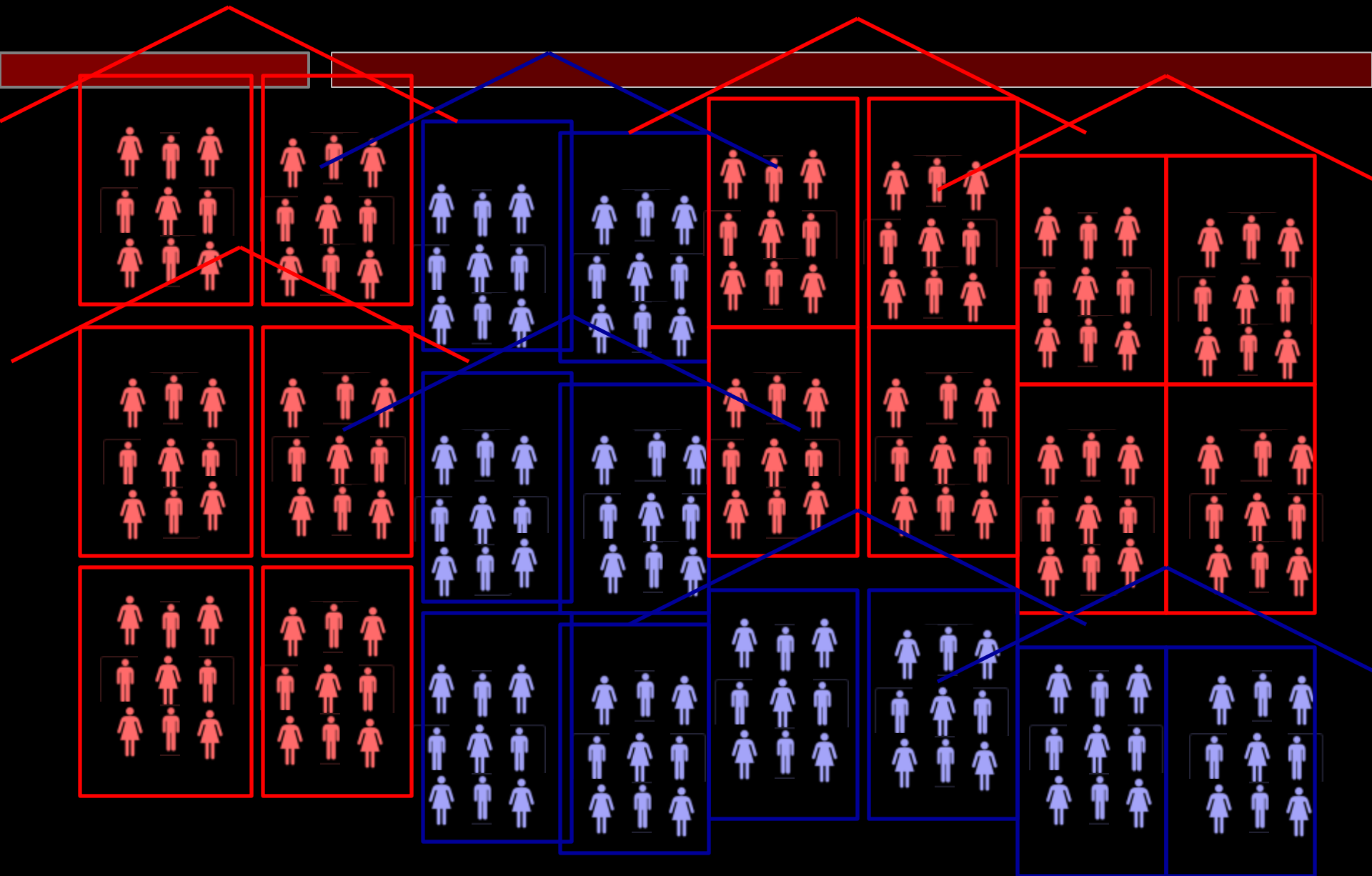
Unit of Randomization: Class?



Unit of Randomization: School?



Unit of Randomization: School?

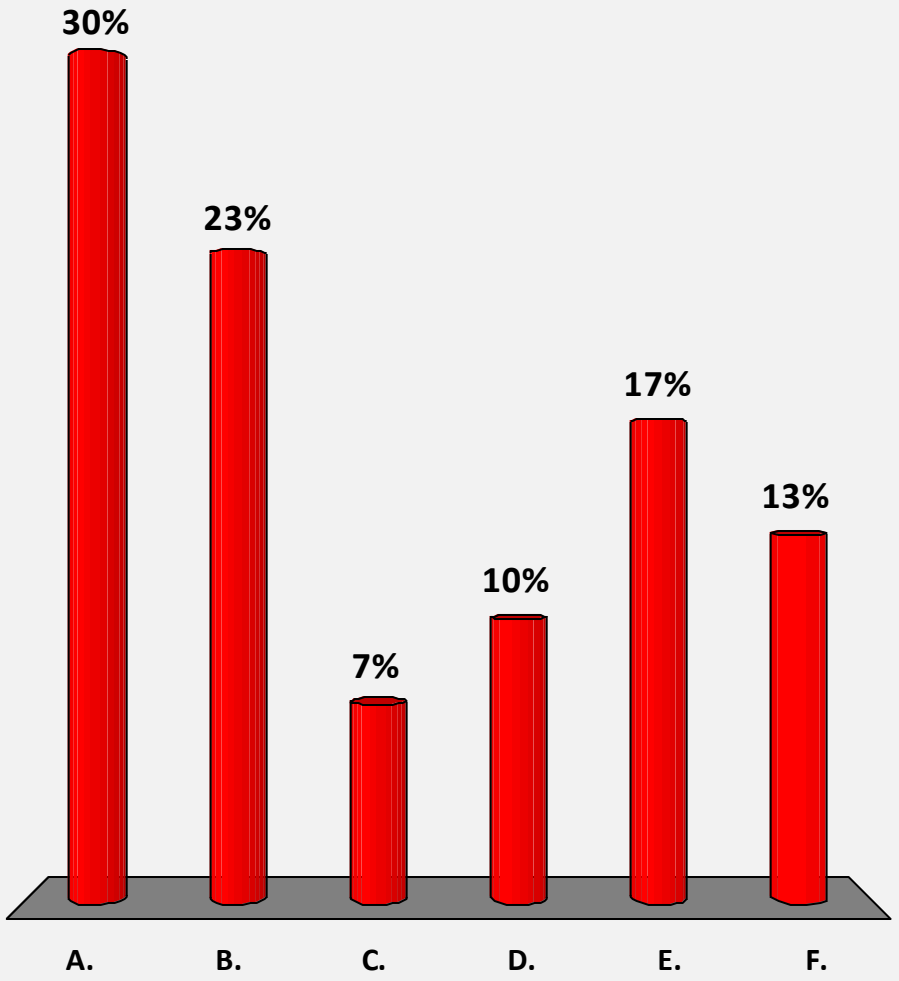


How to Choose the Level

- Nature of the Treatment
  - How is the intervention administered?
  - What is the catchment area of each "unit of intervention"
  - How wide is the potential impact?
- Aggregation level of available data
- Power requirements
- Generally, best to randomize at the level at which the treatment is administered.

Suppose an intervention targets health outcomes of children through info on hand-washing. What is the appropriate level of randomization?

A. Child level
B. Household level
C. Classroom level
D. School level
E. Village level
F. Don't know



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Constraints: Political Advantages

- Not as severe as often claimed
- Lotteries are simple, common and transparent
- Randomly chosen from applicant pool
- Participants know the "winners" and "losers"
- Simple lottery is useful when there is no a priori reason to discriminate
- Perceived as fair
- Transparent

Constraints: Resources

- Most programs have limited resources
  - Vouchers, Farmer Training Programs
- Results in more eligible recipients than resources will allow services for
- Limited resources can be an evaluation opportunity

Constraints: contamination Spillovers/Crossovers

- Remember the counterfactual!
- If control group is different from the counterfactual, our results can be biased
- Can occur due to
  - Spillovers
  - Crossovers

Constraints: logistics

- Need to recognize logistical constraints in research designs.
- E.g. individual de-worming treatment by health workers
  - Many responsibilities. Not just de-worming.
  - Serve members from both T/C groups
  - Different procedures for different groups?

Constraints: fairness, politics

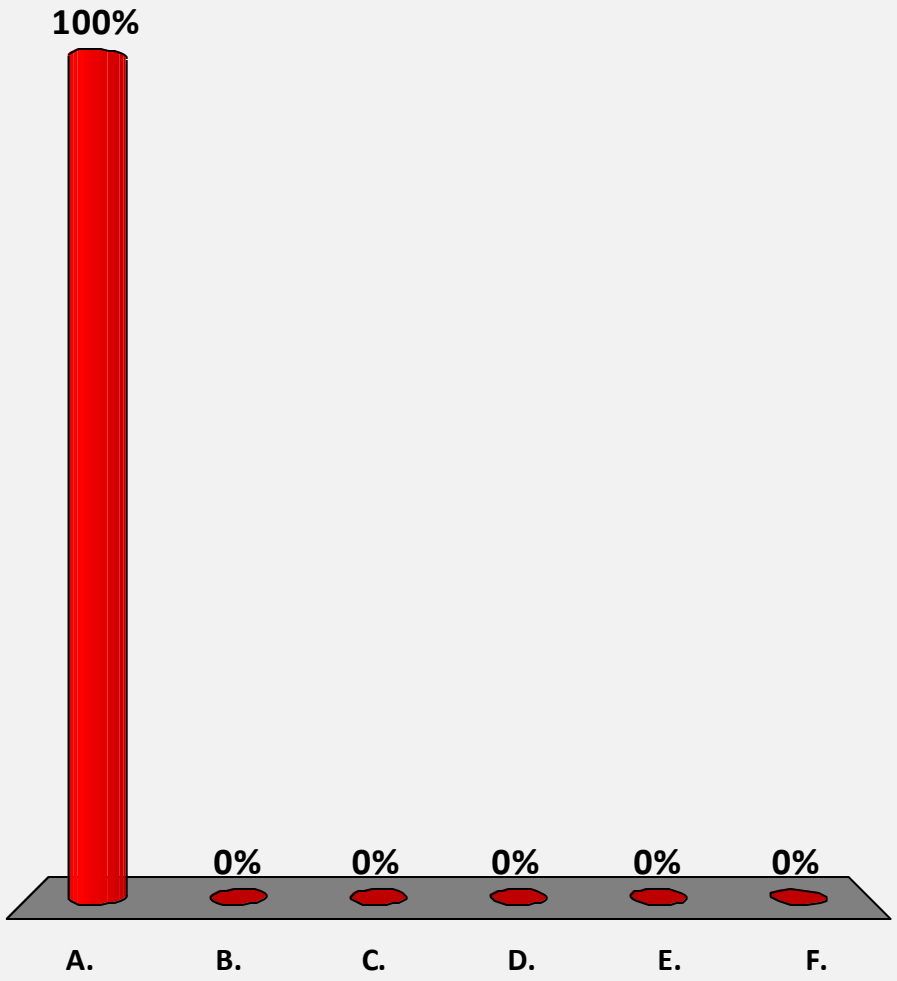
- Randomizing at the child-level within classes
- Randomizing at the class-level within schools
- Randomizing at the community-level

Constraints: sample size

- The program is only large enough to serve a handful of communities
- Primarily an issue of statistical power
- Will be addressed tomorrow

What real world complaints against randomization have you encountered, if any? (up to 2 responses possible)

A. Control group would complain
B. It is not fair to poor
C. Not enough resources
D. You are treating people like lab rats
E. Too complicated
F. None of the above



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What if you have 500 applicants for 500 slots?

- Consider non-standard lottery designs
- Could increase outreach activities
- Is this ethical?

Sometimes screening matters

- Suppose there are 2000 applicants
- Screening of applications produces 500 "worthy" candidates
- There are 500 slots
- A simple lottery will not work

- What are our options?

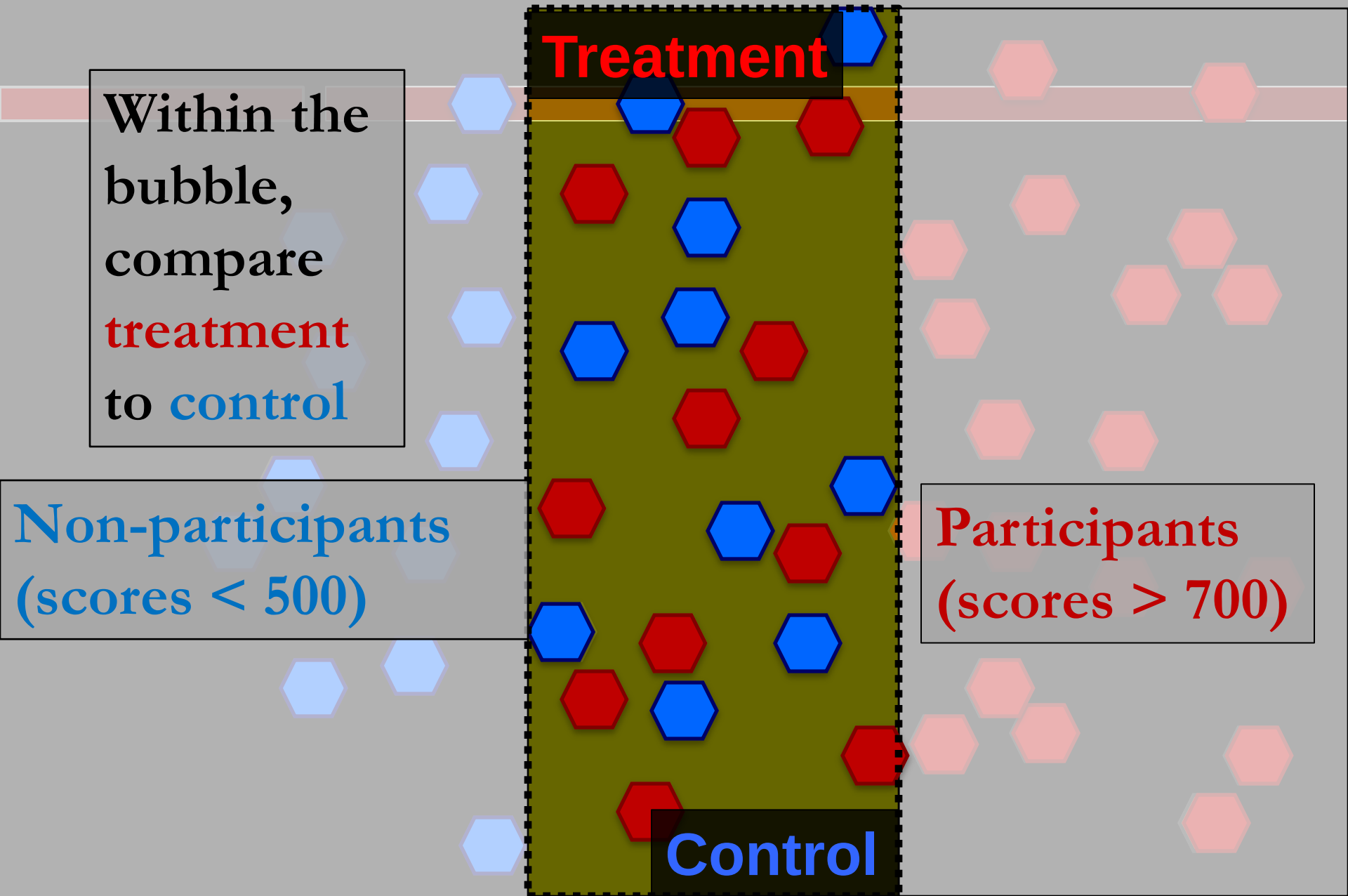
Consider the screening rules

- What are they screening for?
- Which elements are essential?
- Selection procedures may exist only to reduce eligible candidates in order to meet a capacity constraint
- If certain filtering mechanisms appear "arbitrary" (although not random), randomization can serve the purpose of filtering *and* help us evaluate

Randomization in "the bubble"

- Sometimes a partner may not be willing to randomize among eligible people.
- Partner might be willing to randomize in "the bubble."
- People "in the bubble" are people who are borderline in terms of eligibility
  - Just above the threshold → not eligible, but almost
- What treatment effect do we measure? What does it mean for external validity?

Randomization in “the bubble”



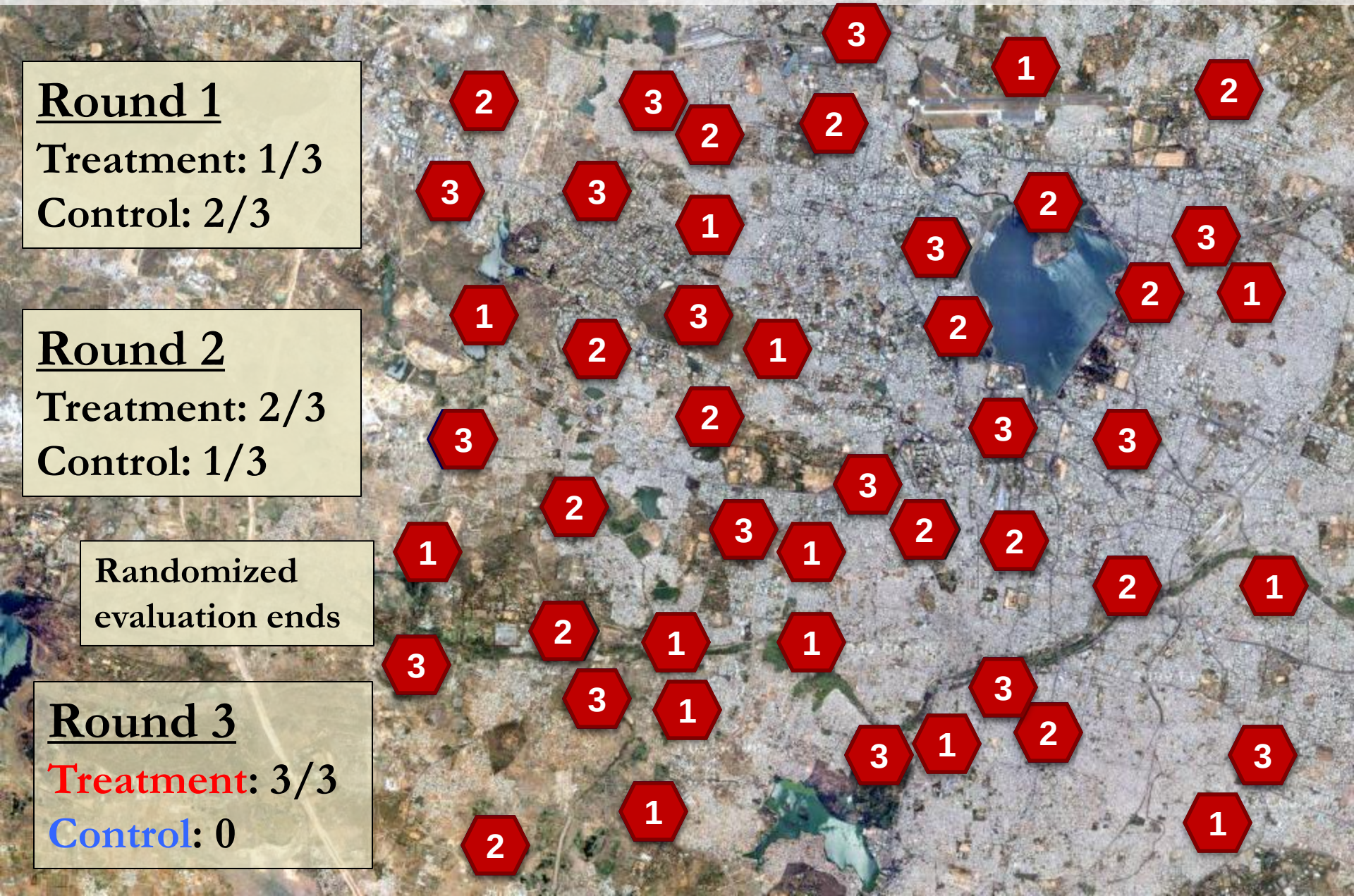
When screening matters: Partial Lottery

- Program officers can maintain discretion
- Example: Training program
- Example: Expansion of consumer credit in South Africa

Phase-in: takes advantage of expansion

- Everyone gets program eventually
- Natural approach when expanding program faces resource constraints
- What determines which schools, branches, etc. will be covered in which year?

Phase-in design



Phase-in designs

Advantages

- Everyone gets something eventually
- Provides incentives to maintain contact

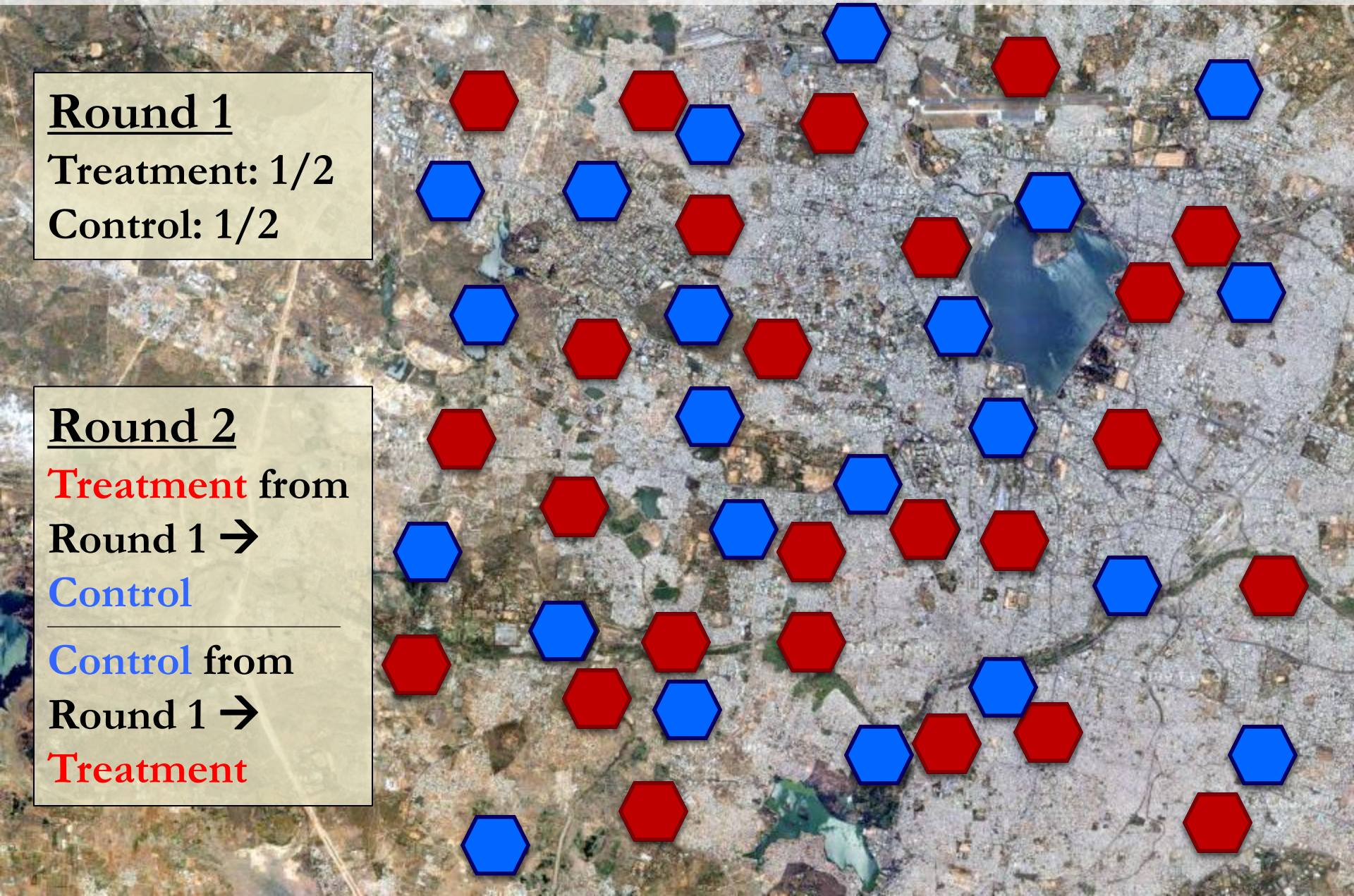
Concerns

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

Rotation design

- Groups get treatment in turns
- Advantages?
- Concerns?

Rotation design



Round 1

Treatment: 1/2

Control: 1/2

Round 2

Treatment from Round 1 → Control

Control from Round 1 → Treatment

“Want to survey me? Then treat me”

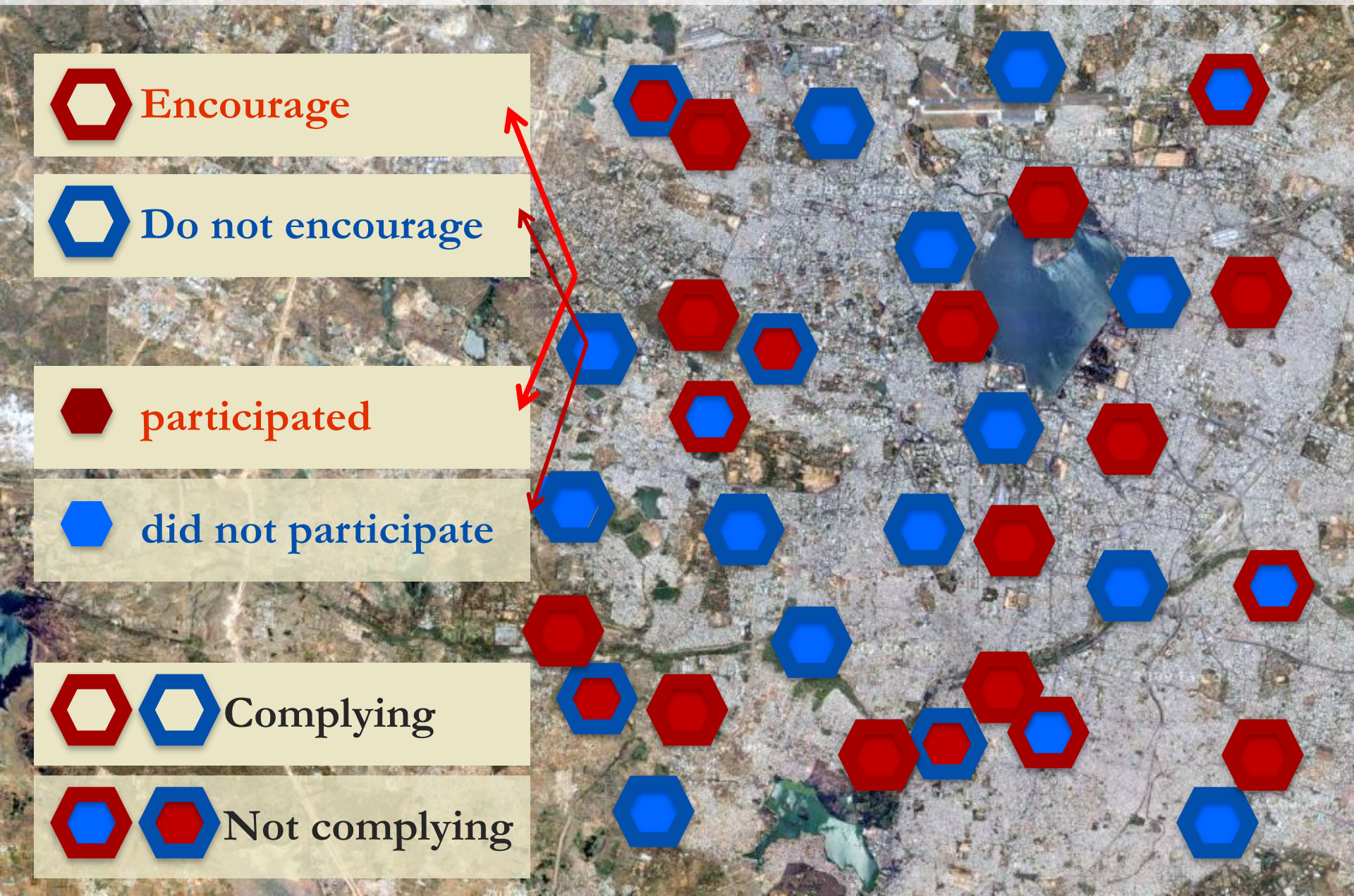
- Phase-in may not provide enough benefit to late round participants
- Cooperation from control group may be critical

- Consider within-group randomization
- All participants get some benefit
- Concern: increased likelihood of contamination

Encouragement design: What to do when you can't randomize access

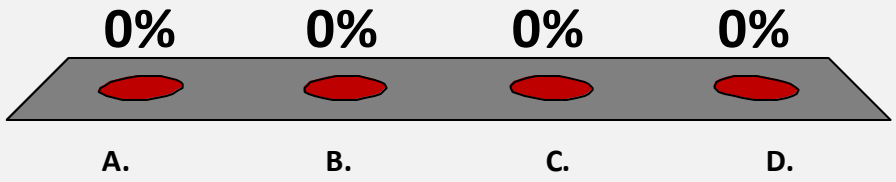
- Sometimes it's practically or ethically impossible to randomize program access
- But most programs have less than 100% take-up
- Randomize encouragement to receive treatment

Encouragement design

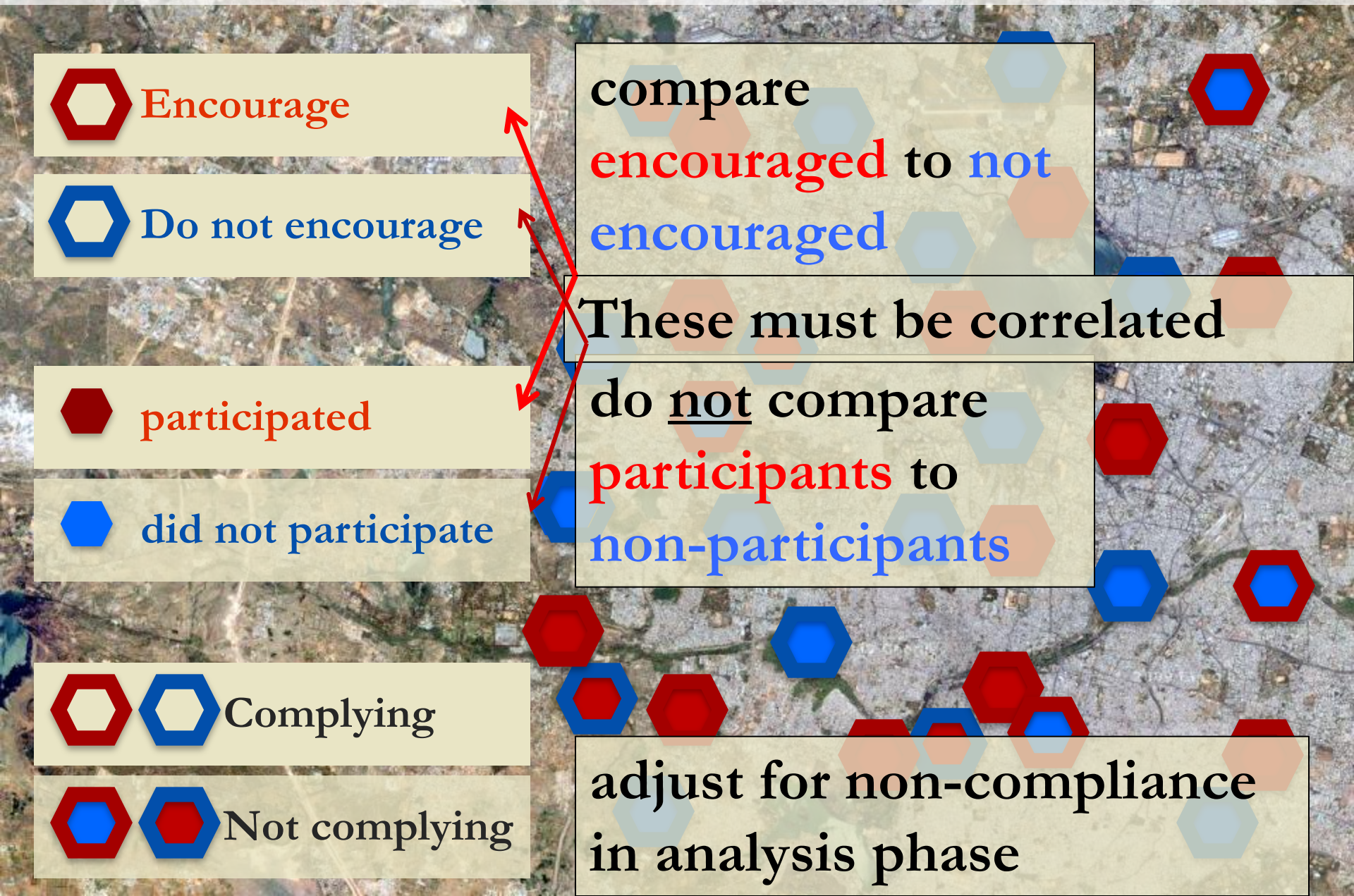


Which two groups would you compare in an encouragement design?

A. Encouraged vs. Not encouraged
B. Participants vs. Non-participants
C. Compliers vs. Non-compliers
D. Don't know



Encouragement design



What is “encouragement”?

- Something that makes some folks more likely to use program than others
- Not itself a “treatment”
- For whom are we estimating the treatment effect?
- Think about who responds to encouragement

To summarize: Possible designs

- Simple lottery
- Randomization in the "bubble"
- Randomized phase-in
- Rotation
- Encouragement design

  – Note: These are not mutually exclusive.

Methods of randomization - recap

Design	Most useful when…	Advantages	Disadvantages
Basic Lottery	•Program oversubscribed	•Familiar •Easy to understand •Easy to implement •Can be implemented in public	•Control group may not cooperate •Differential attrition

Methods of randomization - recap

Design	Most useful when…	Advantages	Disadvantages
Phase-In	•Expanding over time •Everyone must receive treatment eventually	•Easy to understand •Constraint is easy to explain •Control group complies because they expect to benefit later	•Anticipation of treatment may impact short-run behavior •Difficult to measure long-term impact

Methods of randomization - recap

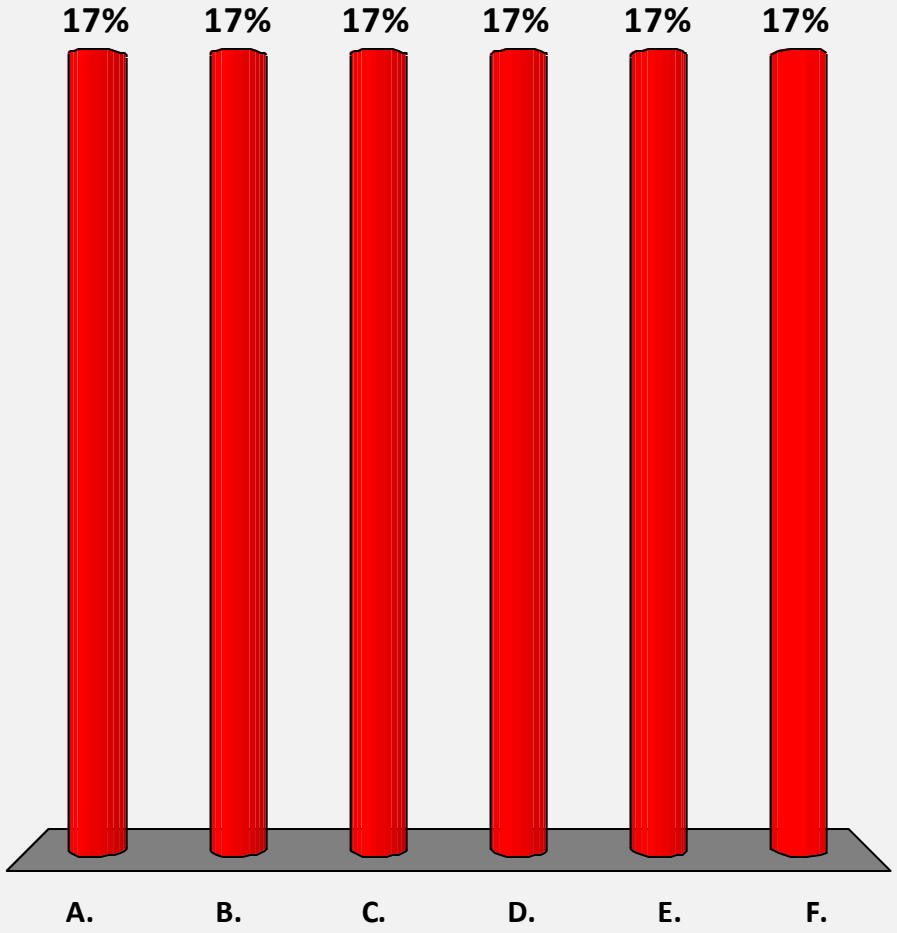
Design	Most useful when…	Advantages	Disadvantages
Rotation	•Everyone must receive something at some point •Not enough resources per given time period for all	•More data points than phase-in	•Difficult to measure long-term impact

Methods of randomization - recap

Design	Most useful when…	Advantages	Disadvantages
Encouragement	•Program has to be open to all comers •When take-up is low, but can be easily improved with an incentive	•Can randomize at individual level even when the program is not administered at that level	•Measures impact of those who respond to the incentive •Need large enough inducement to improve take-up •Encouragement itself may have direct effect

What randomization method would you choose if your partner requires that everyone receives treatment at some point in time? (Up to 2 responses allowed)

A. Phase-in design
B. Rotation design
C. Basic lottery
D. Randomization in the bubble
E. Encouragement
F. Don't know



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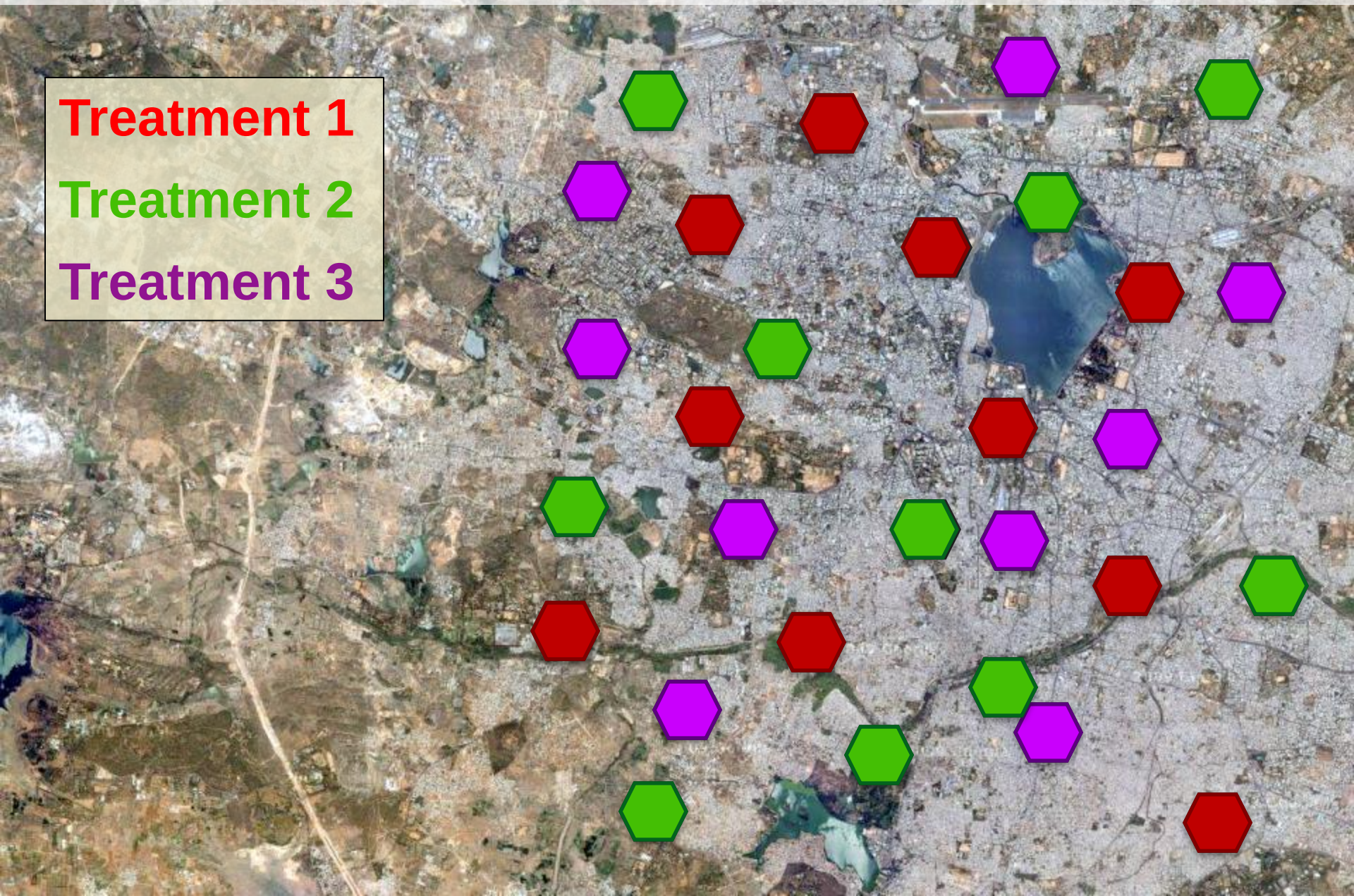
Multiple treatments

- Sometimes core question is deciding among different possible interventions
- You can randomize these programs
- Does this teach us about the benefit of any one intervention?
- Do you have a control group?

Multiple treatments



Cross-cutting treatments

- Test different components of treatment in different combinations
- Test whether components serve as substitutes or compliments
- What is most cost-effective combination?
- Advantage: win-win for operations, can help answer questions for them, beyond simple "impact"!

Varying levels of treatment

- Some schools are assigned full treatment
  - All kids get pills
- Some schools are assigned partial treatment
  - 50% are designated to get pills
- Testing subsidies and prices

Stratification

- Objective: balancing your sample when you have a small sample
- What is it:
  - dividing the sample into different subgroups
  - selecting treatment and control from each subgroup
- What happens if you don't stratify?

When to stratify

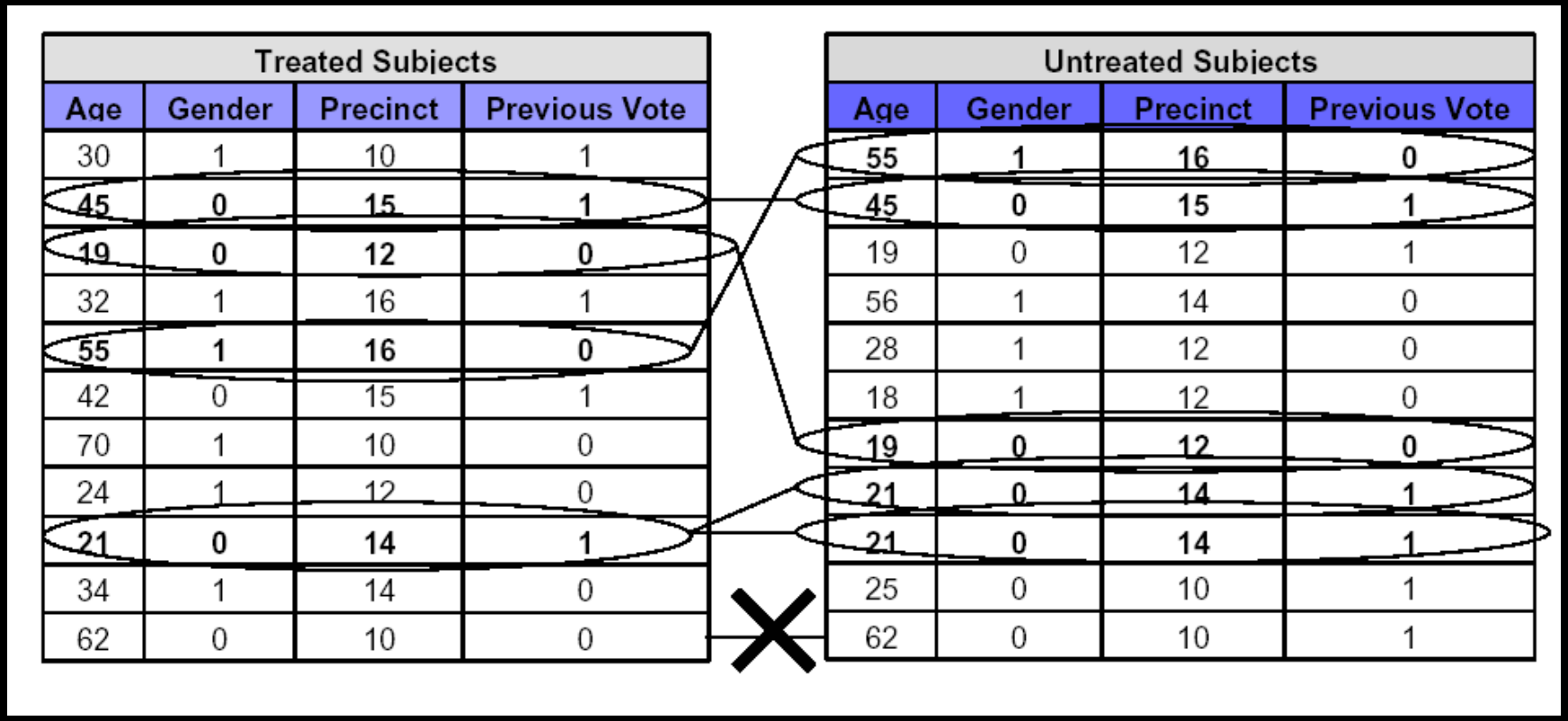
- Stratify on variables that could have important impact on outcome variable
- Stratify on subgroups that you are particularly interested in (where may think impact of program may be different)
- Stratification more important with small sample frame
- You can also stratify on index variables you create
- Can stratify closely on one continuous variable or coarsely on multiple
  - Baseline value of Primary Outcome Variable

- Can get complex to stratify on too many variables
- Makes the draw less transparent the more you stratify
- Degrees of freedom

Matching

- An extreme form of stratification
- How to account in analysis
  - Dummy variables
  - What happens to degrees of freedom?
- What happens with attrition?
  - Can you drop corresponding matched pair?
- What happens with compliance?
  - Can you drop corresponding matched pair?
- (Threats: Next lecture)

An illustration of matching



Treated Subjects			
Age	Gender	Precinct	Previous Vote
30	1	10	1
45	0	15	1
19	0	12	0
32	1	16	1
55	1	16	0
42	0	15	1
70	1	10	0
24	1	12	0
21	0	14	1
34	1	14	0
62	0	10	0

Untreated Subjects			
Age	Gender	Precinct	Previous Vote
55	1	16	0
45	0	15	1
19	0	12	1
56	1	14	0
28	1	12	0
18	1	12	0
19	0	12	0
21	0	14	1
21	0	14	1
25	0	10	1
62	0	10	1

Source: Arceneaux, Gerber, and Green (2004)

Mechanics of randomization

- Need sample frame
- Pull out of a hat/bucket
- Use random number generator in spreadsheet program to order observations randomly
- Stata program code
- What if no existing list?

Source: Chris Blattman