



How to Randomize

Nassreena Sampaco-Baddiri
Country Director
IPA Philippines

How to design Impact Evaluations
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Lecture Overview

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

UNIT AND METHOD OF RANDOMIZATION

Unit of Randomization: Options

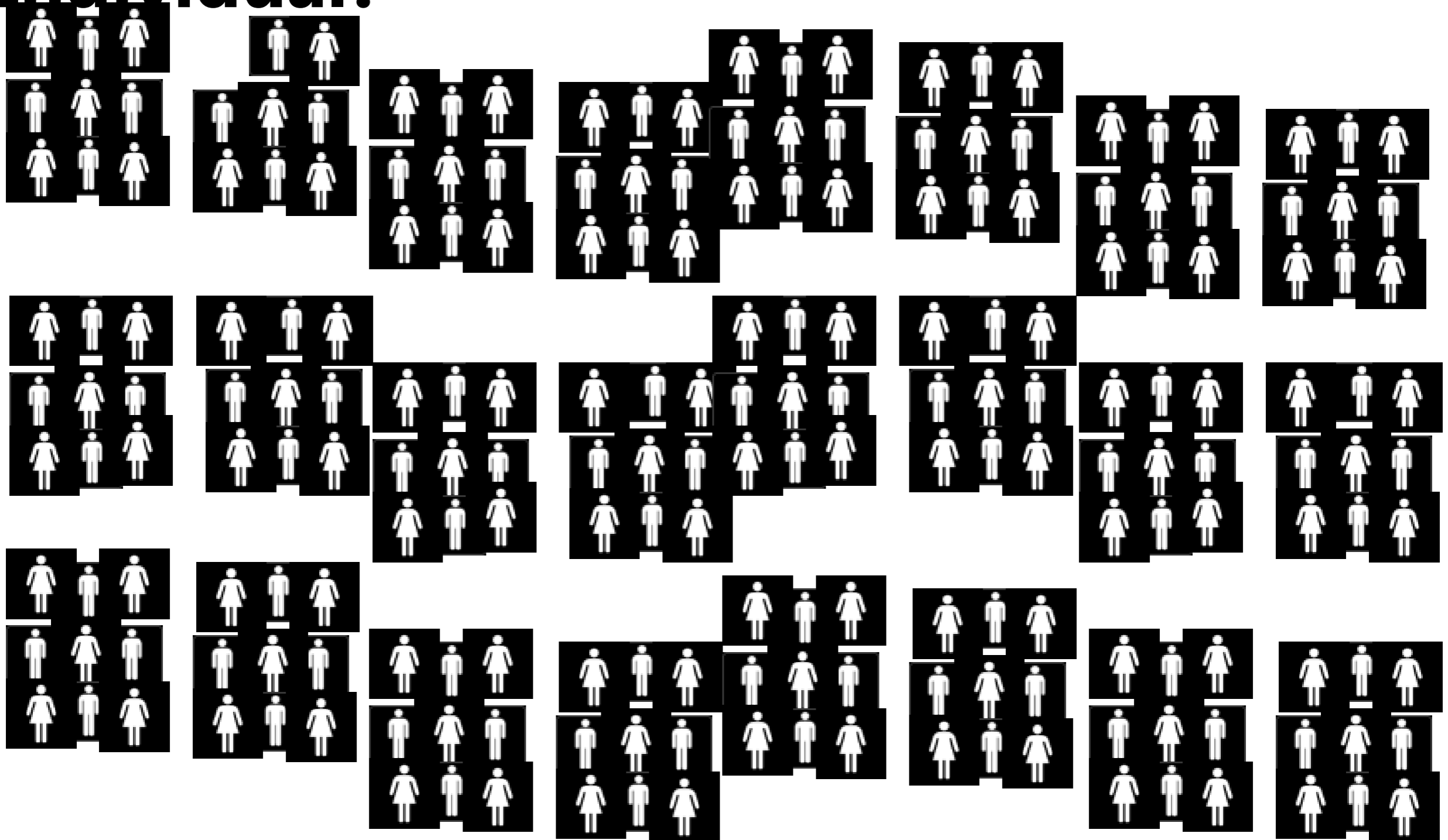
1. Randomizing at the individual level
2. Randomizing at the group level- “Cluster Randomized Trial”

Which level to randomize?

Unit of Randomization: Considerations

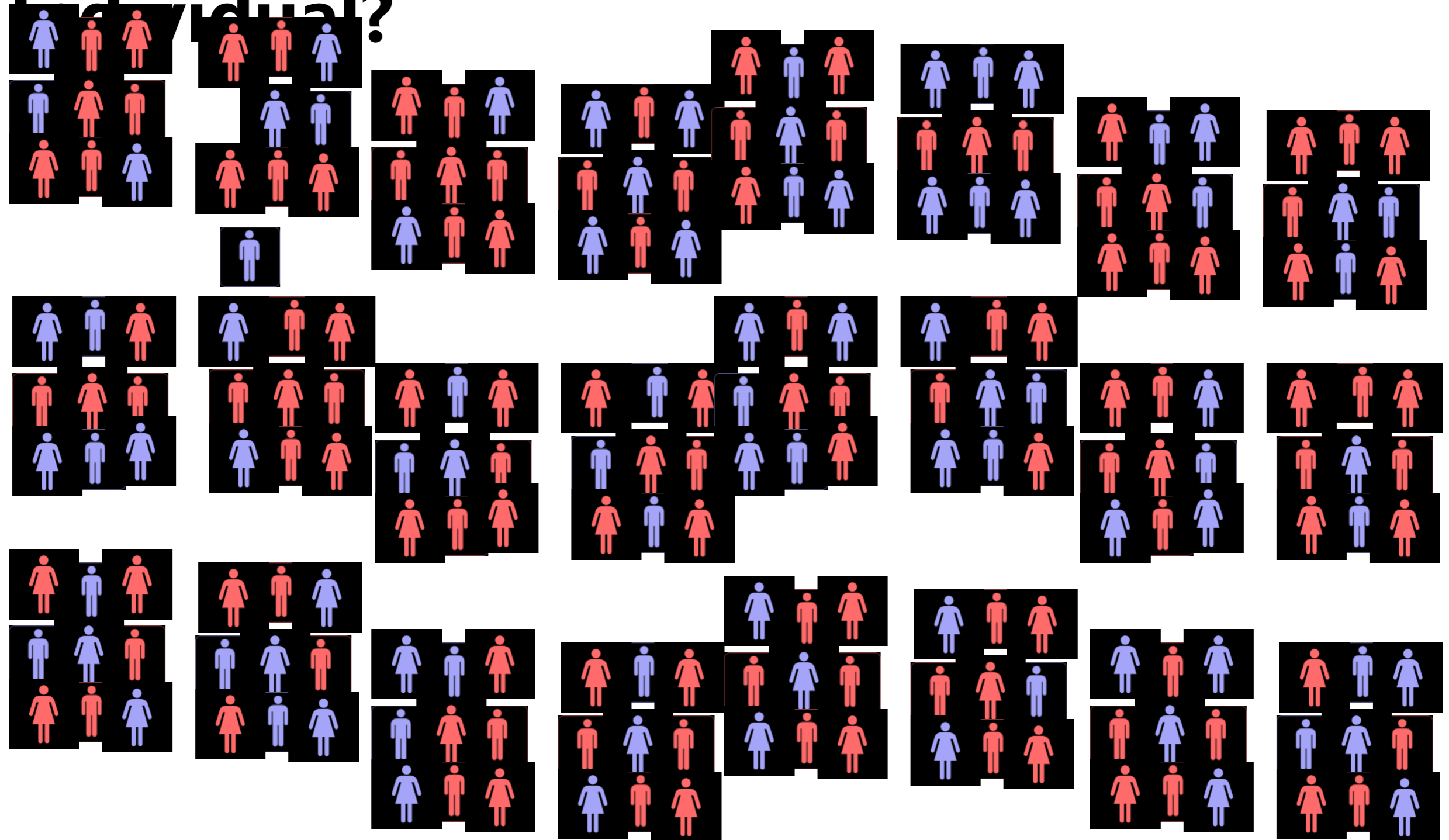
- What unit does the program target for treatment?
 - Groups in microfinance.
 - Political constituencies for governance projects.
 - Schools for education projects.
- What is the “unit” of analysis?
 - What are the outcomes we care about?
 - At what level are we able to measure them?
 - Examples-
 - Test scores for school children.
 - Health outcomes for individuals.
 - Vote shares for politicians.

Unit of Randomization: Individual?

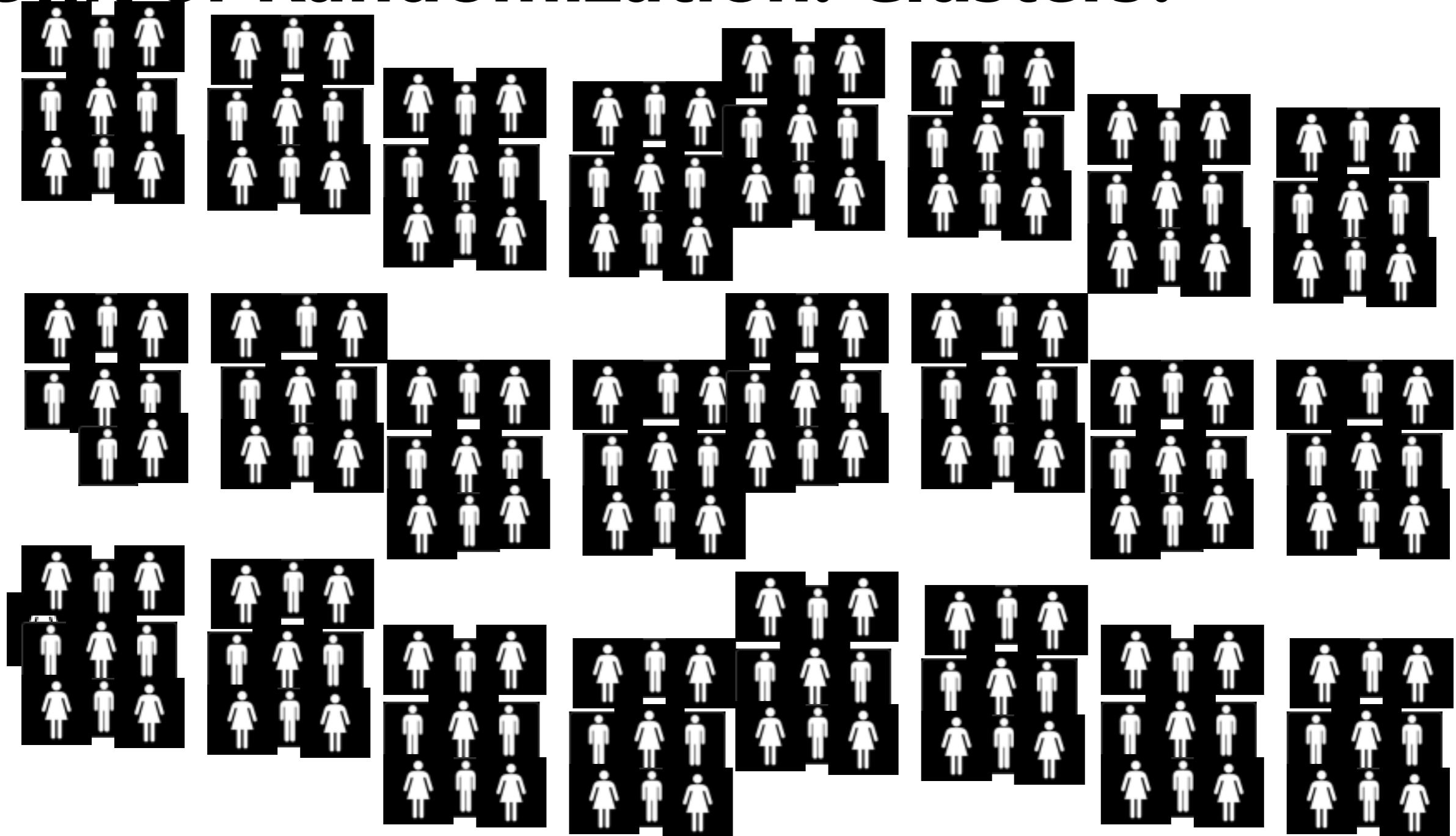


Unit of Randomization:

Individual?

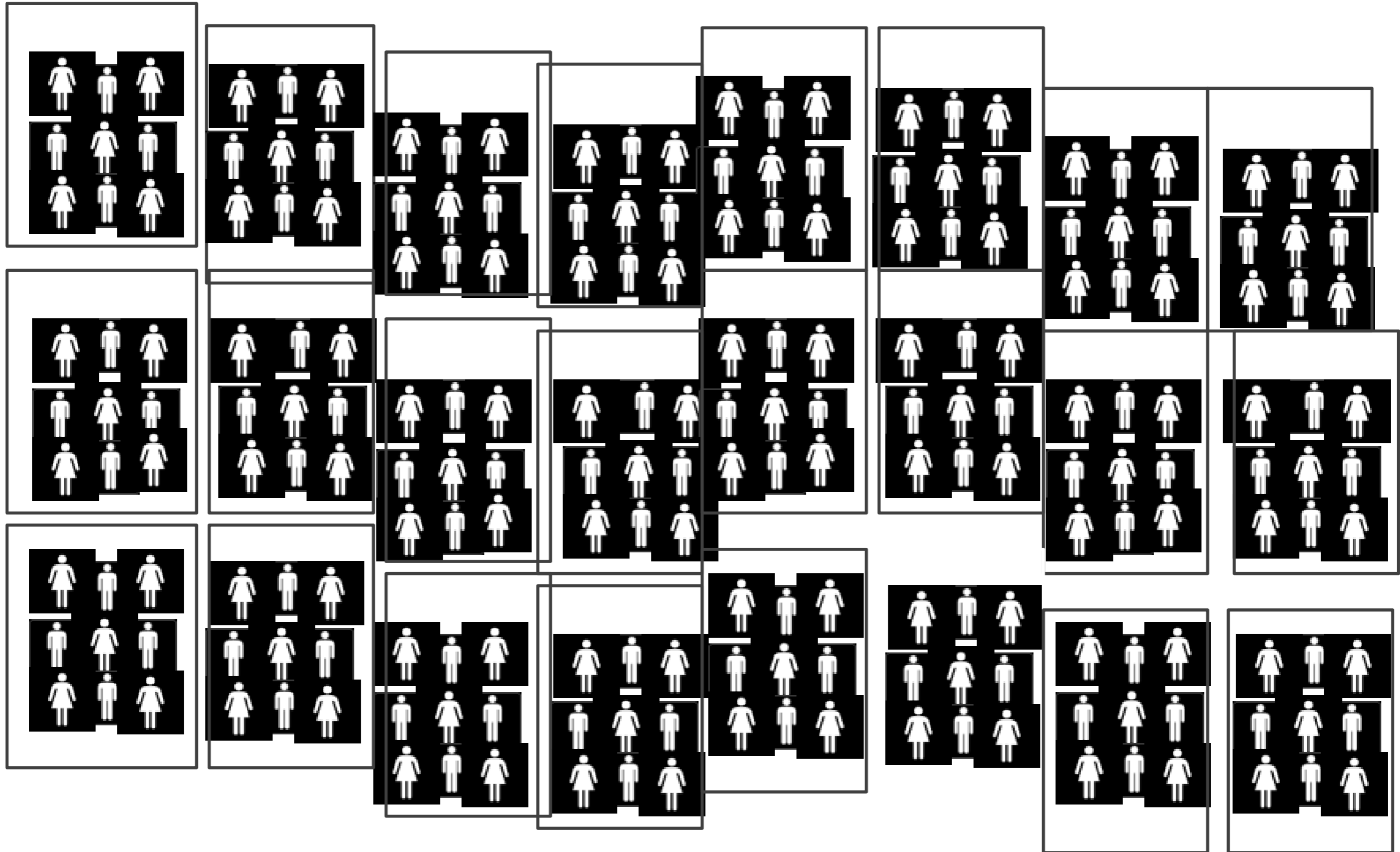


Unit of Randomization: Clusters?

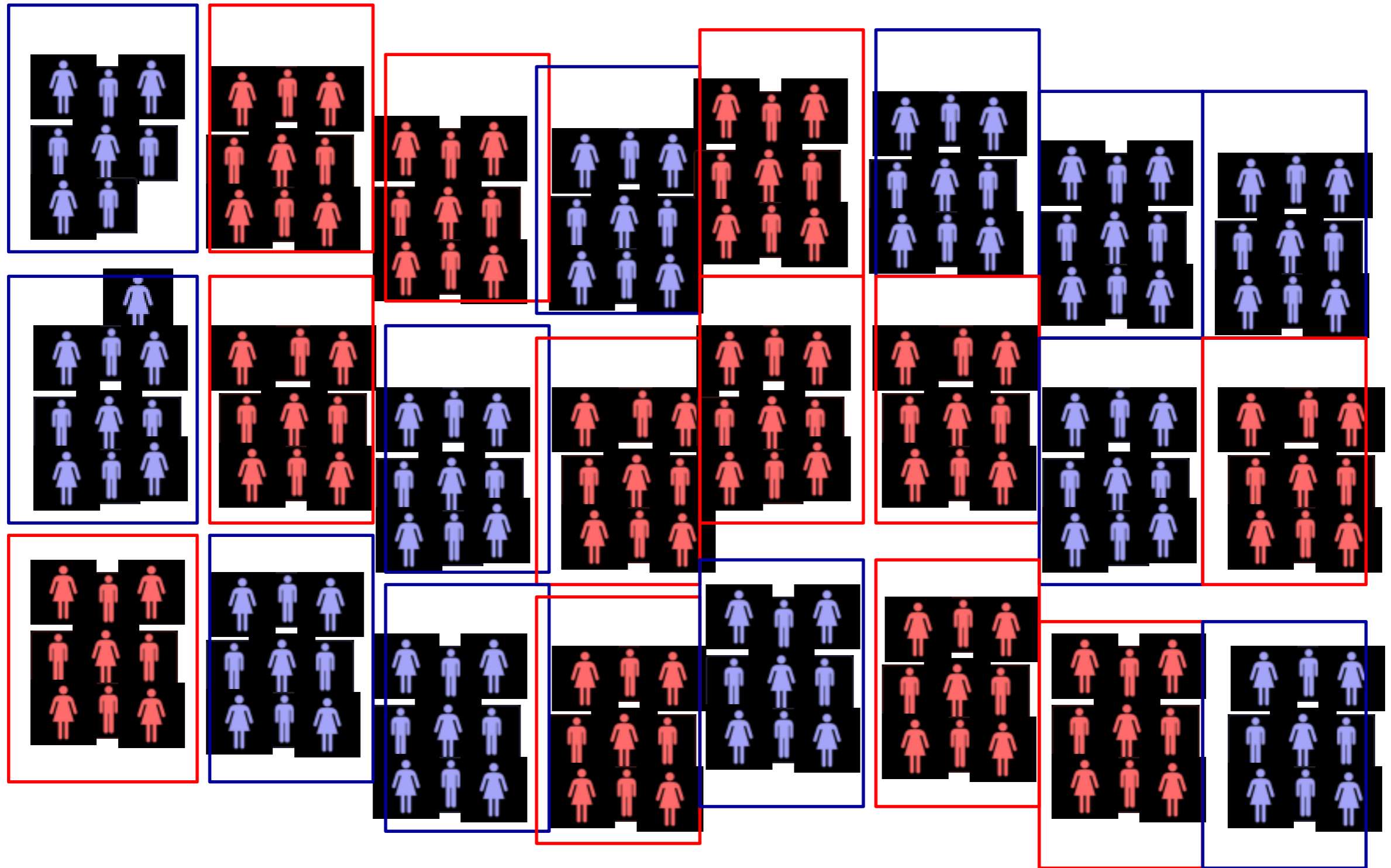


“Groups of individuals”: Cluster Randomized Trial

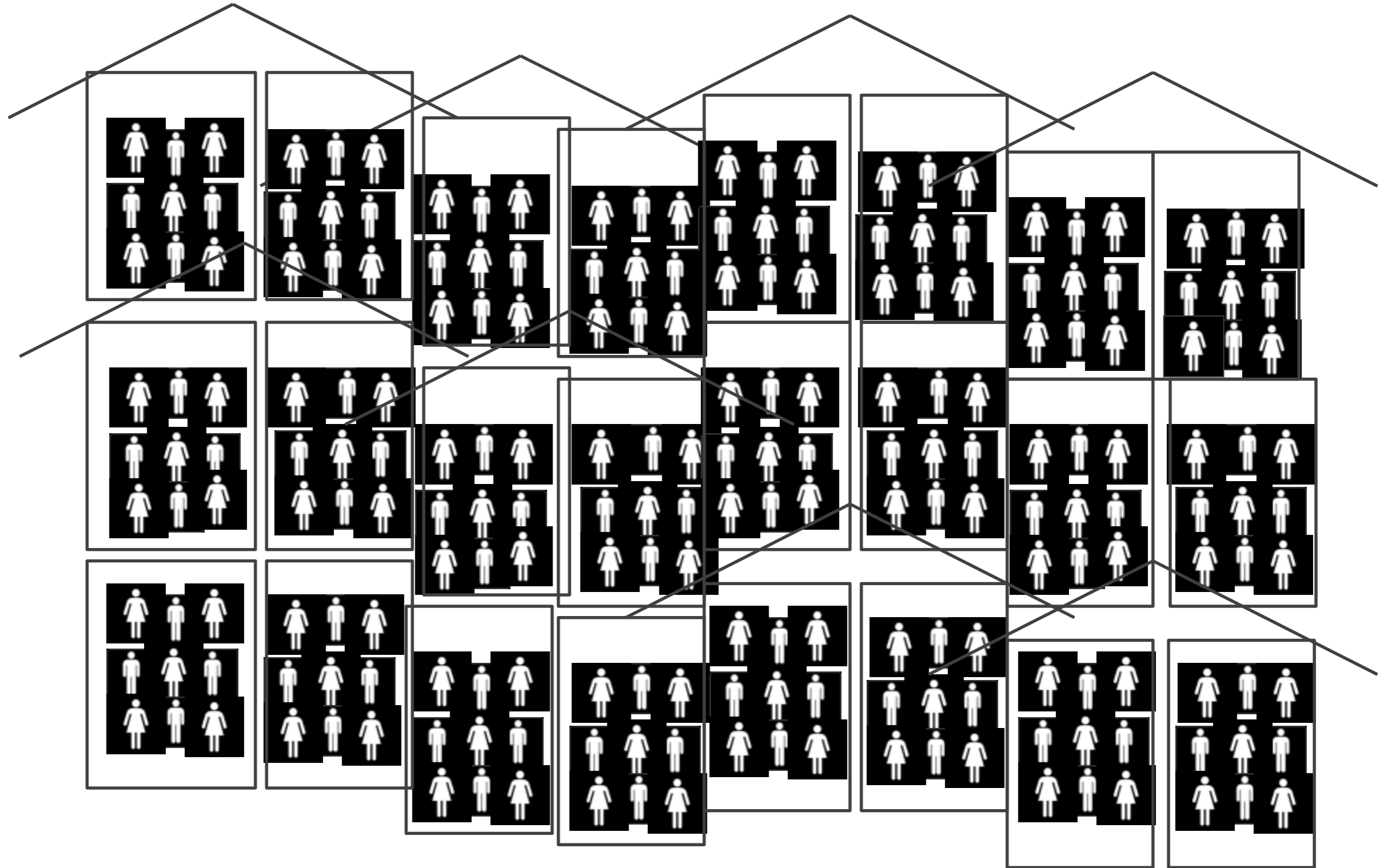
Unit of Randomization: Class?



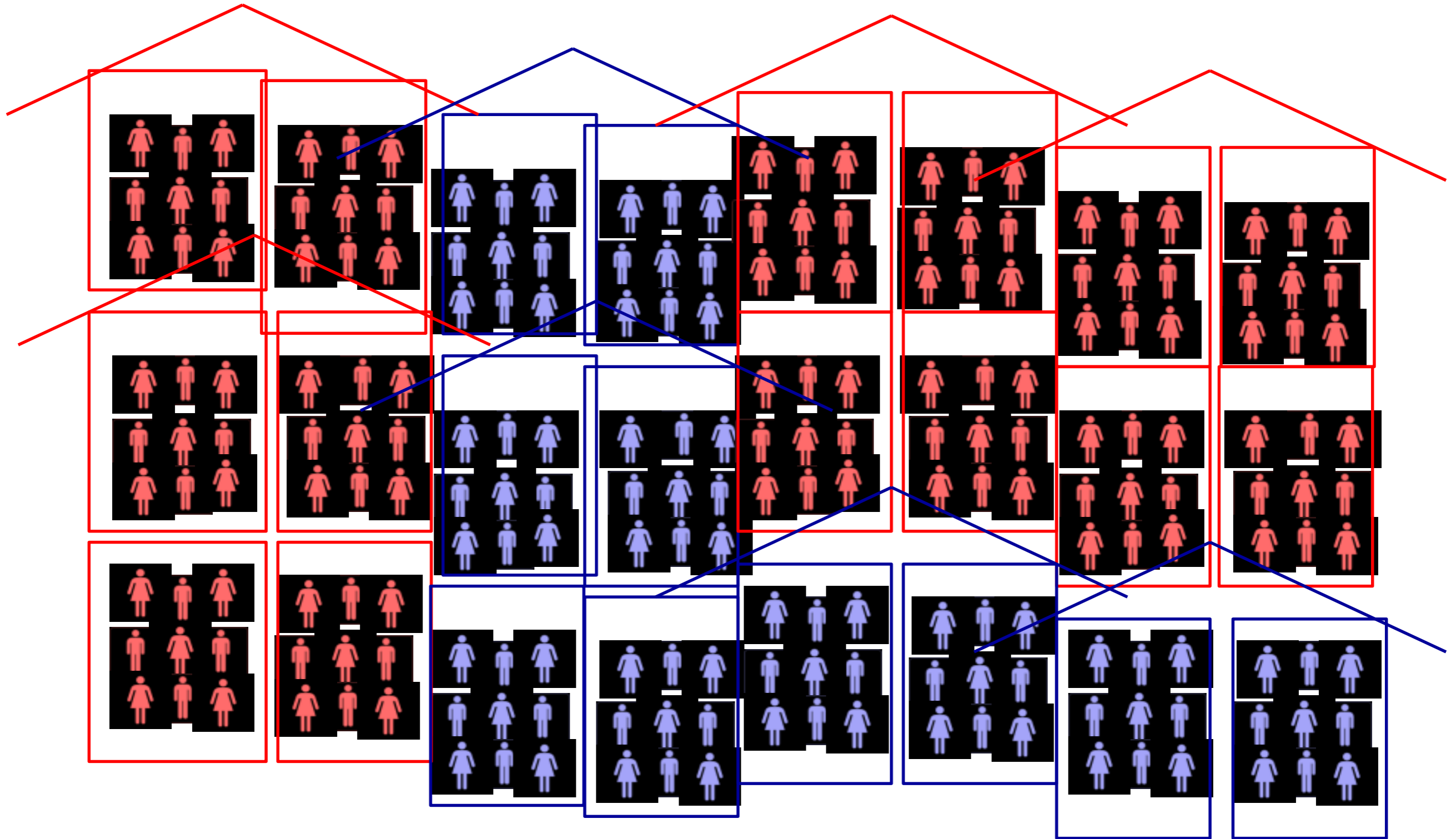
Unit of Randomization: Class?



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.

Example: Deworming



- School-based deworming program in Kenya:
 - Treatment of individuals affects untreated (spillovers) by interrupting oral-fecal transmission
 - Cluster at school instead of individual
 - Outcome measure: school attendance
- Want to find cost-effectiveness of intervention even if not all children are treated
- Findings: 25% decline in absenteeism

What would you do?



Suppose an intervention tests the effect of textbooks on student learning outcomes (test scores).

At what level should you randomize the treatment?

- A. At the level of the child
- B. At the level of the classroom
- C. At the level of the school
- D. At the level of the district

REAL-WORLD CONSTRAINTS

Constraints: Fairness

- Randomizing at the individual level within a farmers' association
 - Non-treated farmers might be unhappy
- Randomizing at the household-level within the community
 - Non-recipient households or the village chief might be unhappy
- Randomizing at the community or farmers' association level
 - Ministry of Agriculture might be unhappy

Constraints: Political, Fairness

- 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 and transparent

Constraints: Resources

- Most programs have limited resources
 - Farmer Training Programs
- Results in more eligible recipients than resources will allow services for.
- More often than not, a lot of resources are spent on programs that are never evaluated.
- Randomized experiments are usually no more costly than other methods.

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.
- For example- 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: Sample Size

- The program has limited scale
- Primarily an issue of statistical power

What would you do?

Suppose an intervention targets health outcomes of children through information 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

REVISITING UNIT AND METHOD

Phase-in: Takes Advantage of Expansion

- Extremely useful for experiments where everyone will / should get the treatment
- Natural approach when expanding program faces resource constraints
- What determines which schools, branches, etc. will be covered in which year?

Phase-in Design

Round 1

Treatment: 1/3

Control: 2/3

Round 2

Treatment: 2/3

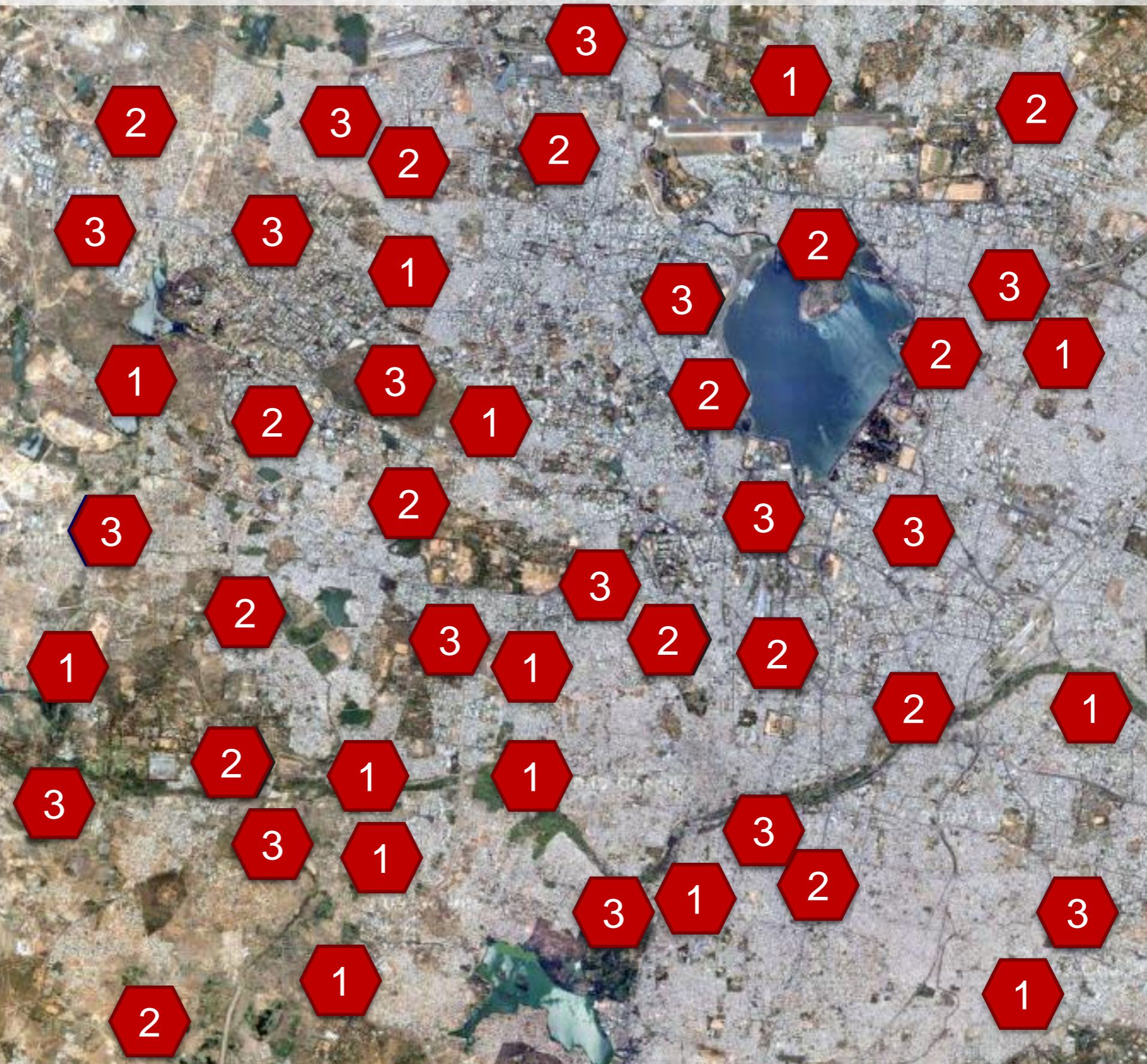
Control: 1/3

Round 3

Treatment: 3/3

Control: 0

Randomized
evaluation ends



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?

Phase-in: Primary School De-Worming



- Logistical and Resource Constraints:
 - Coverage could not be extended to all at once
 - For some schools, treatment was delayed

Three phase-in groups with 25 schools each

Mass-deworming treated 30,000 students in 75 primary schools in Kenya

Rotation Design

- Groups get treatment in turns:
 - Group A benefits from the program in period 1 but not in in period 2
 - Group B does not have the program in period 1 but receives it in period 2

Question: What happens to people during the time they have access to the program?

Measure seasonal influences

Rotation Design

Round 1

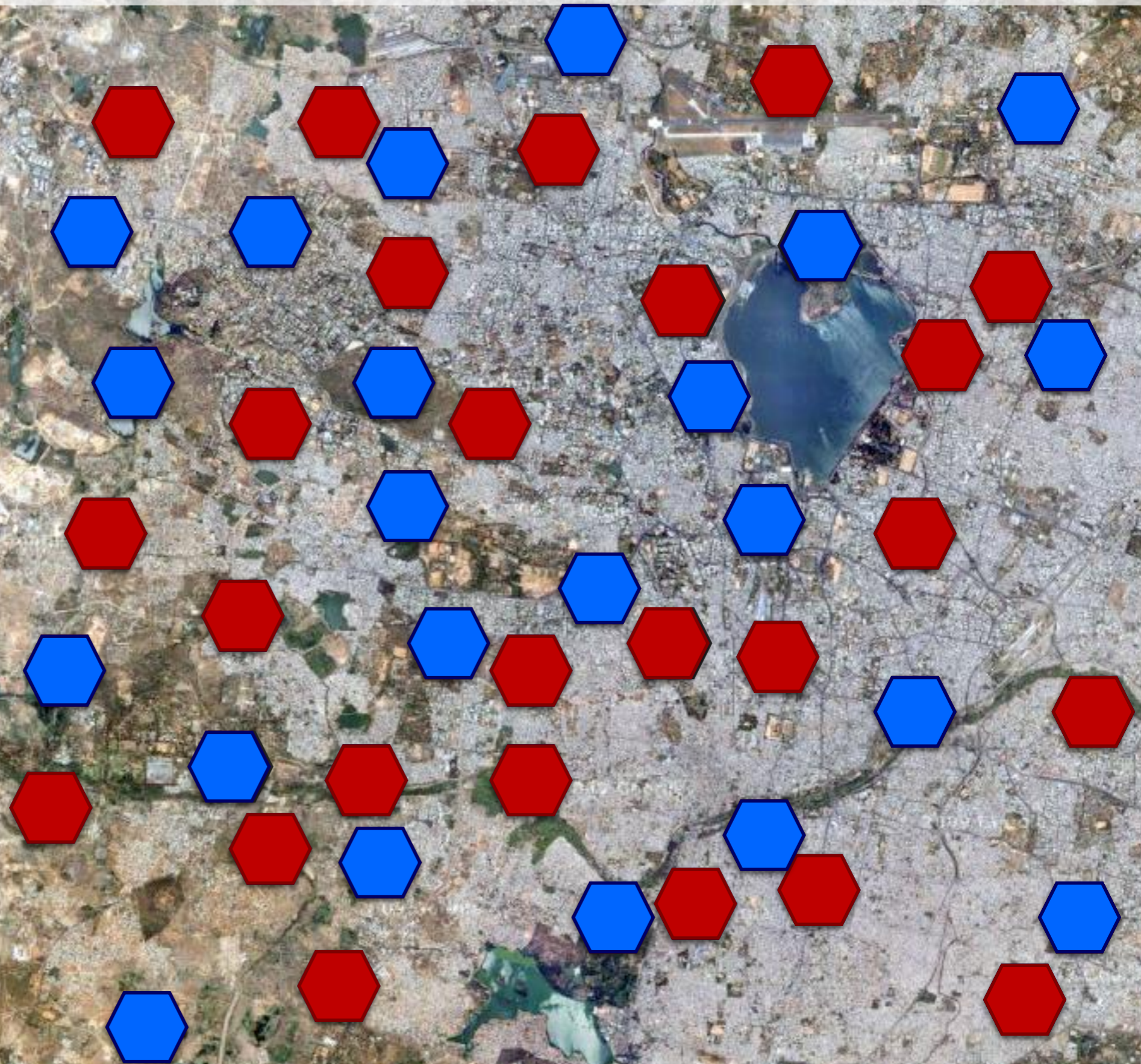
Treatment: 1/2

Control: 1/2

Round 2

Treatment from
Round 1 → Control

Control from Round
1 → Treatment



Rotation Design

- **Advantages**

- Perceived as fairer
- Easier to get accepted (at least initially).

- **Concerns**

- Control group anticipates future eligibility
- AND Treatment group anticipates the loss of eligibility
- Impossible to estimate a long term impact.

Rotation Design: Balsakhi Remedial Education



- In 2000, Pratham expanded their program to primary schools in Vadodara, western India
- Not enough resources to cover all schools at once
- Municipal authorities requested that all eligible schools receive the program

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

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

Question

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

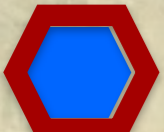

 Encourage

 Do not encourage

 Participated

 Did not participate

  Complying

  Not complying

Compare **encouraged** to
not encouraged

These must be correlated

Do not compare
participants to **non-**
participants

Adjust for non-compliance in analysis
phase

SEED: A Commitment Savings Product



- Commitment savings products create withdrawal restrictions to incentivize long-term savings
- SEED is a product of the Green Bank, a rural bank in the Philippines with the following characteristics:
 - Withdrawal restriction
 - Deposit incentive
 - Same interest rate as regular savings account

Encouragement...



GREEN BANK

You have been chosen to receive
our encouragement to

SAVE



"If ants can do it, so can you!"

GREEN BANK

Is ready to help you...



*Do you want to finance your own business?
Thinking, where you can secure tuition fee
payments? Do you want a high standard of
living?*

MAKE YOUR DREAMS COME TRUE!

SAVING is the answer

- You can choose your own savings goal.
- Deposit regularly until you reach your goal
- Anyone can save! With small amount of deposits, you can save more
- Green Bank is willing to help you in order to reach your goal through your deposit account.

*Make use of your savings, after you reach your
goal and make your dreams come true.*

Study design: sample frame



- Sample frame: 4,000 existing (or former) bank clients
- 3,154 individuals randomly chosen to be surveyed
- 1,777 surveys completed
- Participants randomized individually into:
 - *Treatment (Offered SEED), 50%*
 - *Marketing(Encouraged to Save), 25%*
 - *Control (Nothing), 25%*
- Marketing team from Bank visited one-on-one with T & M groups
- 28% of Treatment group took-up

Randomization « In the Bubble »

Sometimes there are as many eligible as treated individuals

- Suppose there are 2000 applicants
- Screening of applications produces 500 « worthy » candidates
- There are 500 slots: you can't do a simple lottery.

Randomization « In the Bubble »

Consider the screening rules

- Selection procedures may only exist to reduce eligible candidates in order to meet a capacity constraint
- It may be interesting to test the relevance of the selection procedure and evaluate the program at the same time.

Randomization in the bubble:

Among individuals who are just below the threshold

Randomization in "The Bubble"

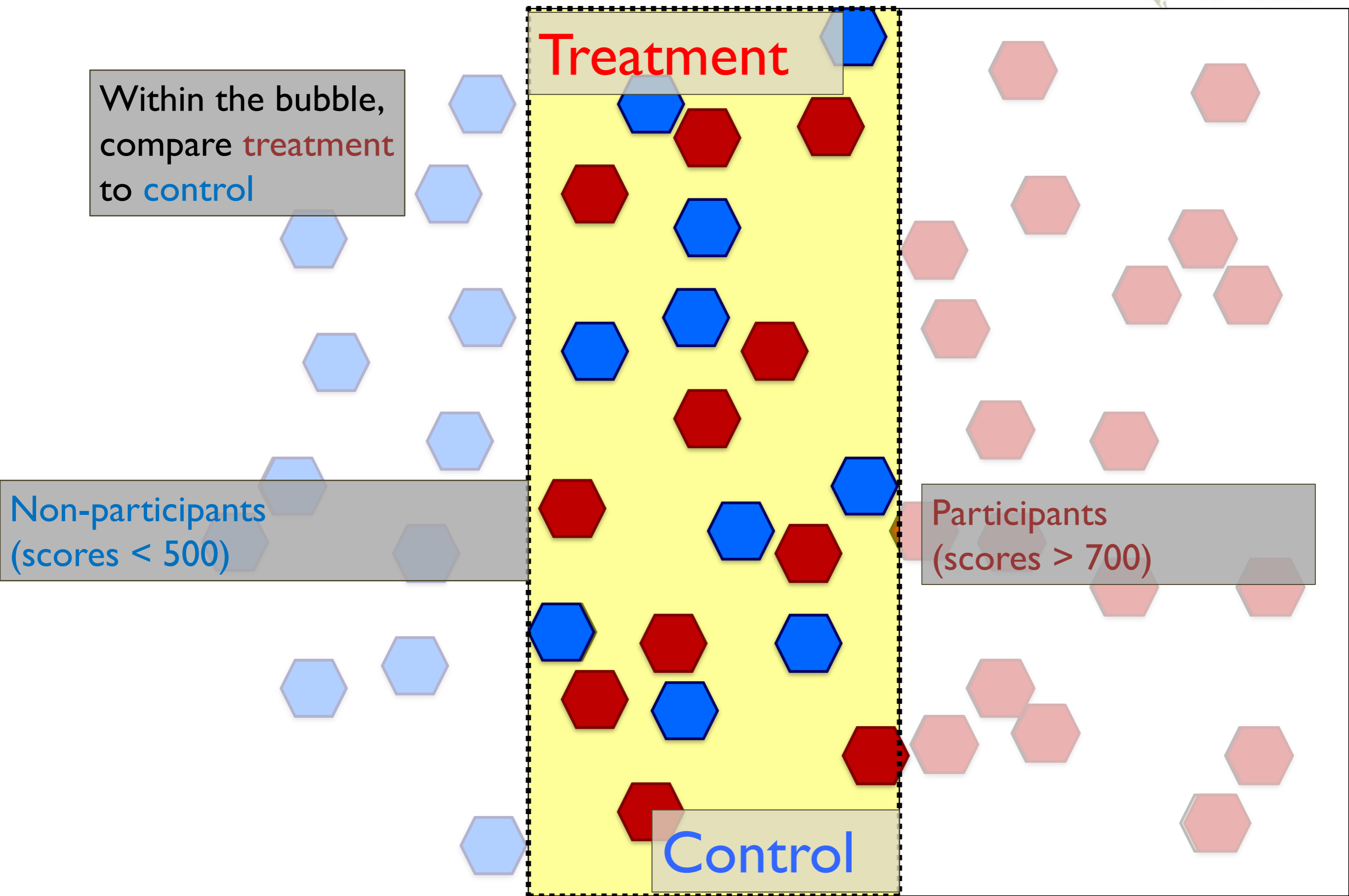
Within the bubble, compare **treatment** to **control**

Non-participants
(scores < 500)

Treatment

Participants
(scores > 700)

Control



To Summarize: Possible designs

- Simple lottery
- Randomized phase-in
- Rotation
- Encouragement design
 - Note: These are not mutually exclusive.
- Randomization in the “bubble”
 - Partial lottery with screening

Methods of Randomization: Recap



Design	Most useful when...	Advantages	Disadvantages
Basic Lottery	<ul style="list-style-type: none">Program over subscribed	<ul style="list-style-type: none">FamiliarEasy to understandEasy to implementCan be implemented in public	<ul style="list-style-type: none">Control group may not cooperateDifferential attrition

Methods of Randomization: Recap



Design	Most useful when...	Advantages	Disadvantages
Phase-In	<ul style="list-style-type: none">▪ Expanding over time▪ Everyone must receive treatment eventually	<ul style="list-style-type: none">▪ Easy to understand▪ Constraint is easy to explain▪ Control group complies because they expect to benefit later	<ul style="list-style-type: none">▪ 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	<ul style="list-style-type: none">▪ Everyone must receive something at some point▪ Not enough resources per given time period for all	<ul style="list-style-type: none">▪ More data points than phase-in	<ul style="list-style-type: none">▪ Difficult to measure long-term impact

Methods of randomization: Recap



Design	Most useful when...	Advantages	Disadvantages
Encouragement	<ul style="list-style-type: none">▪ Program has to be open to all comers▪ When take-up is low, but can be easily improved with an incentive	<ul style="list-style-type: none">▪ Can randomize at individual level even when the program is not administered at that level	<ul style="list-style-type: none">▪ Measures impact of those who respond to the incentive▪ Need large enough inducement to improve take-up▪ Encouragement itself may have direct effect

What would you do?



What randomization method would you choose if the implementing agency requires that everyone receives treatment at some point in time?

- A. Basic lottery
- B. Phase-in
- C. Rotation
- D. Randomization in the bubble
- E. Encouragement

VARIATIONS ON SIMPLE TREATMENT-CONTROL

Multiple Treatments

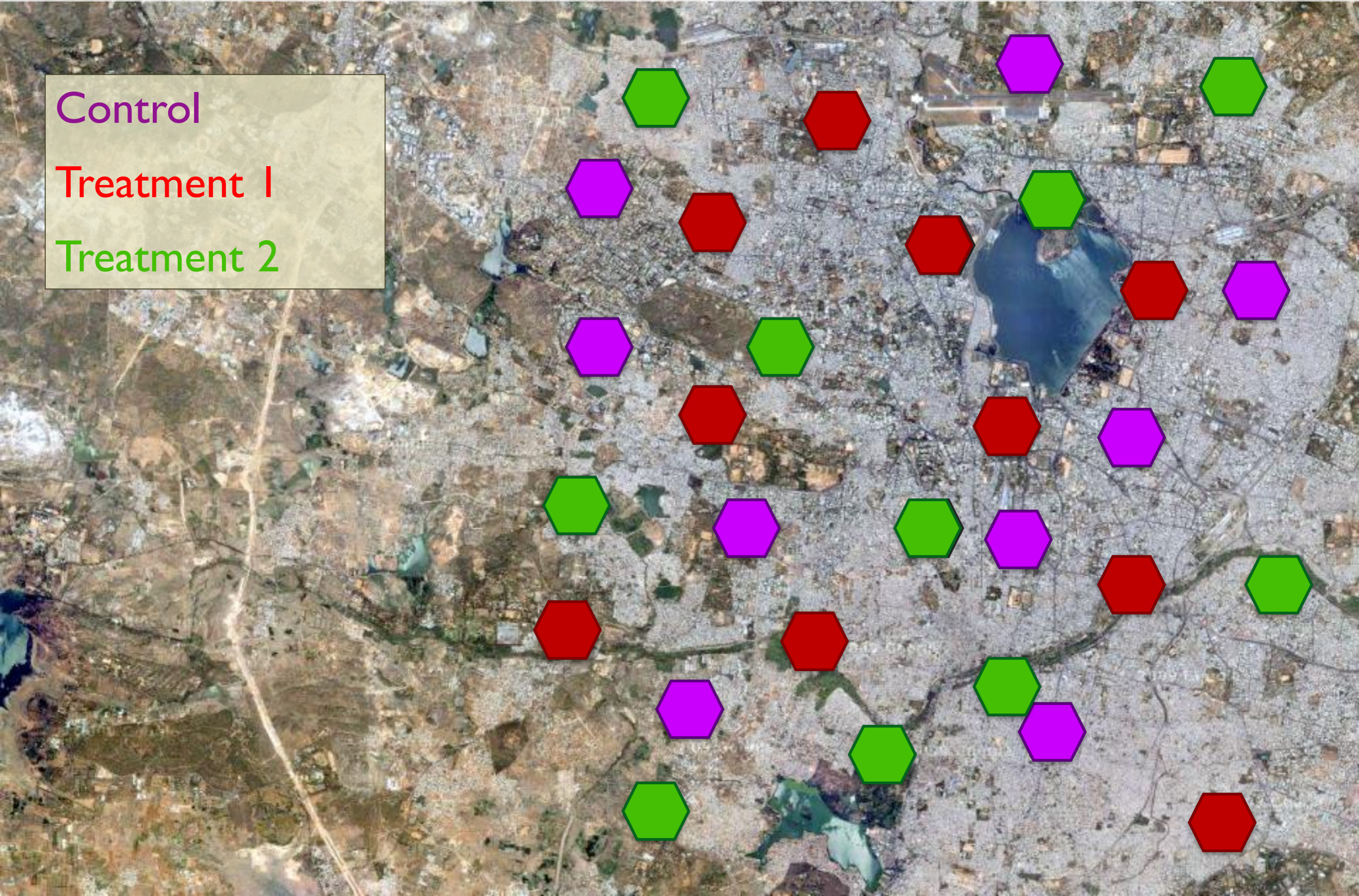
- Sometimes core question is deciding among different possible interventions
- You can randomize these programs
- Does this teach us about the benefit of any one intervention?
- Do you have a control group?

Multiple Treatments

Control

Treatment 1

Treatment 2



Cross-cutting Treatments

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

Varying Levels of Treatment

- Some villages are assigned full treatment
 - All households get double fortified salt
- Some villages are assigned partial treatment
 - 50% of households get double fortified salt
- Testing subsidies, prices and cost-effectiveness!

Stratification

- Objective: balancing your sample when you have a small sample
- What is it?
 - Dividing the sample into different subgroups
 - Assign treatment and control within each subgroup

When to Stratify

- Stratify on variables that could have important impact on outcome variable
- Stratify on subgroups that you are particularly interested in (where you may think impact of program may be different)
- Stratification more important when small data set
- Can get complex to stratify on too many variables
- Makes the draw less transparent the more you stratify

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?





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Less Poverty**



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Salamat po!