J-PAL
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CASE STUDY 3: ESTIMATING THE IMPACT OF MEDICAID

How to Randomize

Photo: Shutterstock.com

This case study was developed with Amy Finkelstein and draws lessons from her forthcoming book, *Healthy Skepticism: Understanding and Interpreting the Oregon Health Insurance Experiment*.

KEY VOCABULARY	
Unit of randomization	The level of observation (e.g., individual, household, school, village) at which treatment and comparison groups are randomly assigned.
Random sampling	The process of selecting units from a population of interest in a randomized manner to create a sample that is representative of the population.
Random assignment	The process of allocating a pool of eligible units--individuals, households, schools, villages, etc.--to treatment and comparison groups by means of a random process such as a coin toss, a random number generator, or a lottery.
Treatment assignment	The treatment or comparison group a unit is randomly assigned to. Note that whether a unit actually receives the treatment will depend on compliance with their treatment assignment.
Balance	When the treatment and comparison groups have similar average baseline characteristics. By design, randomization creates groups that will have similar characteristics on average. However, even when randomization is done correctly, average values of some characteristics may differ across groups due to random chance.
Stratification	The process of dividing units in your sample into different subgroups based on specific characteristics (e.g., gender, urban/rural) and then randomizing within those groups to ensure balance on these characteristics.
Factorial design	An evaluation design that tests different treatments in different combinations to understand their impact separately and in combination (also known as a cross-cutting design).
Cost-effectiveness	The ratio of a program's overall impact on a particular outcome to the total implementation cost (e.g., additional years of education per $100 spent).

LEARNING OBJECTIVE

This case study explores how to design an evaluation and determine an appropriate randomization strategy to answer relevant research questions.

SUBJECTS COVERED

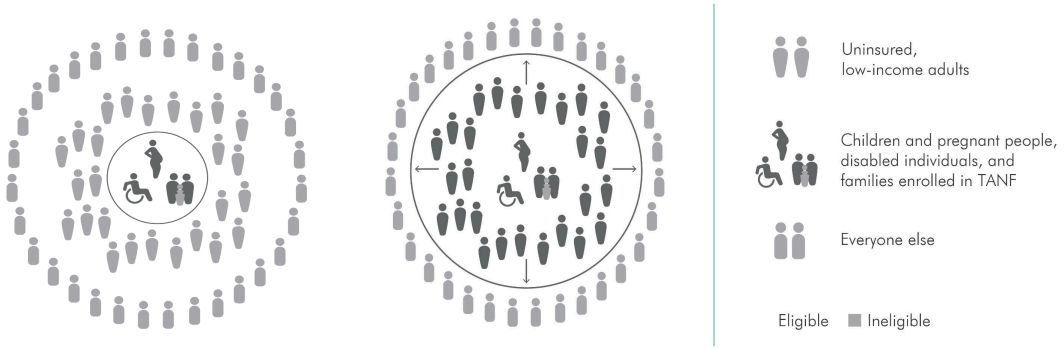
Evaluation design, randomization design, level of randomization, balance, multiple treatments.

BACKGROUND: MEDICAID IN THE UNITED STATES CONTINUED

In the last case study, we examined different methods for measuring the impact of health insurance, specifically insurance provided by Medicaid, on health, health care use, and financial strain. Using a randomized design could provide credible impact estimates by ensuring that the only difference between the treatment and comparison groups at the outset of the evaluation is the intervention itself and not other characteristics associated with taking up the treatment. However, implementing randomization requires careful consideration of numerous factors. In this case study, we will examine how a research team might design a randomized evaluation to measure the impact of health insurance provided by Medicaid.

STUDY CONTEXT

In 2008, Oregon had two Medicaid programs. One program was for people who fit into specific categories: children and pregnant people, people with disabilities, and families enrolled in a federal cash assistance program. The second program was for uninsured adults with low incomes but who don't otherwise qualify for the first program. This program for low-income adults had been closed to new enrollment for several years due to budget shortfalls. At the start of 2008, the state realized it had the budget to open the program again to new enrollment for adults and their households with a household income below an expanded eligibility threshold. See the figure below.



Source: J-PAL North America: "Real World Challenges to Randomization and their Solutions"

THE OREGON HEALTH INSURANCE EXPERIMENT

Oregon had the budget to expand Medicaid coverage to an additional 10,000 new enrollees, but tens of thousands more were eligible. By law, everyone who is eligible and successfully submits an application must be offered Medicaid coverage, so the state needed to manage applications.

State officials grappled with a fair way to choose which of the many eligible enrollees should get the limited slots if they reopened the program to new enrollment. They considered allocating Medicaid slots on a first-come, first-served basis. In theory, this method might enroll the most in need, assuming people who are willing to wait in line and apply first need insurance the most. But, alternatively, it might enroll relatively more well-off individuals or people with better access to information.

"We thought about other options, such as should we try to pick all of the sickest people…or the people with cancer or heart disease," Jim Edge, Oregon's Medicaid Director at the time explained in an interview published by the New York Times,[1] "But the Feds won't allow that, and there's just no way to guarantee the fairness of that. Why would cancer be more deserving than heart disease?"

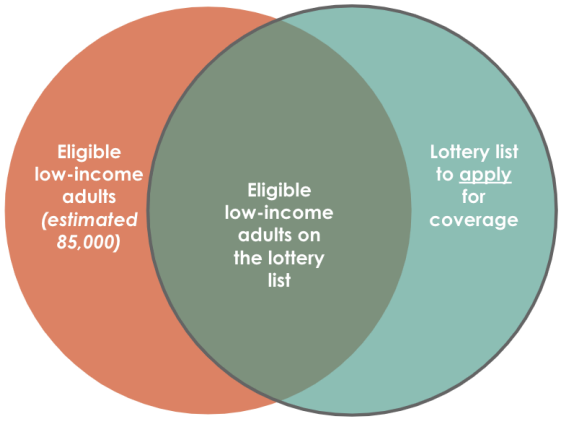
After consulting with stakeholders in the community, policymakers decided that the fairest thing to do would be to use a lottery to determine who could apply to receive health insurance. This lottery presented a clear research opportunity to randomize. So how did the research team get on board? Primary investigator, Amy Finkelstein, found out about the lottery through watching Stephen Colbert's *The Colbert Report* on Comedy Central, which ran a segment poking fun at the idea of a state using a lottery for Medicaid.

In the following sections, we will consider questions that the research team and program and state officials encountered when deciding how to randomize. After each section, we will highlight what the research team actually did and why.

DISCUSSION TOPIC 1: SELECTING THE SAMPLE

Prior to randomizing, research teams need to have a list of participants to randomize. Challenges arising from constructing a sample often have implications for statistical power–or the likelihood of finding an impact if there is one–and the degree to which results may be generalizable to other contexts.

The state of Oregon estimated that an additional 85,000 adults met the income eligibility requirements for the renewed Medicaid program. The research team needed to come up with a strategy for identifying and contacting these individuals so that they could join the lottery to be offered eligibility for Medicaid coverage for themselves and their households. Capturing the full population of eligible adults is near impossible, so any strategy can bias certain individuals within the sample. Below are options for constructing a sample (i.e., creating a lottery list to randomize); consider each process and record your thoughts on the pros and cons of that strategy.



Everybody on the lottery list is offered the opportunity to apply and is included in the study sample, even if they don't actually apply or meet eligibility requirements.

[1] See the full article: https://www.nytimes.com/2008/03/13/us/13bend.html

Sample selection process	How might this process create a sample that differs from the actual newly eligible population?
Option A: Work with healthcare providers who serve low-income populations to identify newly eligible participants. Participants work with providers to verify eligibility. Once eligibility is verified, participants are added to the lottery list.	
Option B: Conduct an outreach campaign about the upcoming lottery. Potential participants complete a form indicating whether they want to participate in the lottery. The form indicates eligibility requirements for receiving Medicaid coverage if randomly selected but does not require respondents to prove eligibility. All participants who complete the form are added to the lottery list.	
Option C: Conduct an outreach campaign about the upcoming lottery. Potential participants complete a form indicating whether they want to participate in the lottery. The form indicates eligibility requirements for receiving Medicaid coverage if randomly selected and requires participants to submit income verification documents to prove eligibility. All participants who complete the form and have valid income documents are added to the lottery list.	

LESSONS FROM OREGON

In the real-life Oregon Experiment, the state conducted an outreach campaign for joining the lottery list. Individuals could join the list by mail, phone, fax, in-person, or online. Participants were informed of eligibility criteria but were not required to prove eligibility before joining the lottery. This prioritized keeping barriers to sign up low.

Ultimately, the research team received a dataset of all sign-ups from the state of Oregon, with 100,600 individuals. After the research team removed duplicates and clearly ineligible participants, such as those with an out-of-state address, the study population included 74,922 individuals.

DISCUSSION TOPIC 2: SELECTING THE UNIT OF RANDOMIZATION

Now that we've shared how the Oregon team constructed their sample, or lottery list, of 74,922 individuals, let's think about how researchers can randomize these people into treatment and comparison groups.

2.1 What **unit of randomization** should the research team use? What might be the benefits and downsides of different units?

2.2 What characteristics might the research team **stratify** by? Discuss if there are other characteristics that could have been used for stratification and when stratifying may be appropriate.

Source: J-PAL North America: "Randomization"

2.3 The state of Oregon budgeted for 10,000 individuals to receive Medicaid coverage, but 74,922 individuals were placed on the lottery list. How can the research team ensure that implementing the intervention does not exceed budget constraints?

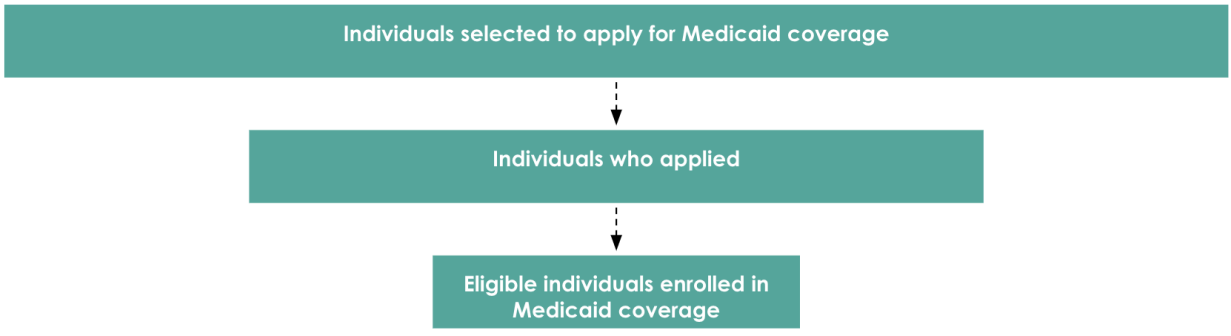
2.4 Should the research team randomize the lottery list all at once or over time? What should be considered when making this decision?

LESSONS FROM OREGON

Medicaid eligibility is based on household income and assets. However, the Oregon lottery enrolled individuals, primarily to prioritize fewer sign-up barriers. Additionally, other Medicaid programs served families with children, making single-person households the typical lottery enrollee. Thus, the research team randomized individual applicants on the lottery list.

In this case, if multiple individuals from the same household applied for Medicaid, larger households would have a higher chance of receiving treatment. The research team chose to stratify by household size to ensure that treatment probability did not correspond with household size. The research team also chose to measure outcomes at the individual level because available data was already collected at the individual level, including credit reports, survey responses, and hospital discharge data, among other sources.

The state of Oregon conducted eight lottery draws from March through September 2008. Selected individuals won the opportunity, for themselves and all members of their household,[2] to apply for Medicaid coverage. In total, 29,664 households with 35,169 individuals were selected for the treatment group. Of the 29,664 households who won the lottery to apply for Medicaid coverage, 60% applied, and half of these applications were ineligible. Ultimately, 30% of the original treatment group, about 9,000 households, successfully enrolled in and received Medicaid coverage.



[2] Who is considered a member of a household is defined by Medicaid: https://tinyurl.com/55wzdrzr

DISCUSSION TOPIC 3: BALANCE

Randomization creates groups that are, on average, "balanced," meaning they are very similar in terms of their characteristics, such as age, gender composition, and education levels. However, even when randomization is done correctly, meaningful differences can occur by chance. These differences can bias your results if not accounted for in your analysis. Moreover, as the experiment unfolds, external influences can cause groups to become unbalanced by the end of the program–people may migrate or we may find it harder to track and survey respondents in one of the treatment or comparison groups. These and other events can potentially reintroduce bias, diminishing the validity of the impact estimates.

3.1 What is a **balance** test and when would it be important to conduct a baseline balance test? What are the tradeoffs to doing so?

3.2 How can you check if households assigned to the treatment and comparison groups are balanced prior to the Oregon experiment? Are there other balance tests that could be insightful? What could be done if groups are not balanced?

LESSONS FROM OREGON - BALANCE

Baseline data was limited for all participants on the lottery list, as the only requirement to join was to submit a short form requesting to participate. The research team obtained credit report data and administered a survey to participants to assess baseline balance on additional characteristics to those reported in the sign-up form.

In Oregon, the research team also wanted to ensure that study participants were representative of the broader population of newly eligible adults in Oregon. The table shows balance across characteristics measured in hospital discharge data for study participants and non-study participants.

Table A6: Comparison of hospital admissions (different samples)

	All		Adults aged 19-64		Uninsured adults aged 19-64		Control sample	
	N	%	N	%	N	%	N	%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
By gender:								
Male	217538	47	107485	48	17086	56	3300	47
Female	245323	53	116975	52	13372	44	3697	53
By type of admission:								
Non-ED	214499	46	108909	49	8612	28	2420	35
All ED	248362	54	115551	51	21846	72	4577	65
By length of stay:								
1-2 days	194270	42	103540	46	14852	49	2945	42
3-4 days	131149	28	59510	27	7872	26	1861	27
5 or more days	137442	30	61410	27	7734	25	2191	31
By number of procedures:								
None	173649	38	77101	34	12980	43	3268	47
One	109550	24	55507	25	7160	24	1471	21
Two or more	179662	39	91852	41	10318	34	2258	32
By list charges:								
Less than 5,000	34043	7	16083	7	2111	7	584	8
5,000 – 9,999	88717	19	42014	19	7064	23	1612	23
10,000 – 24,999	189809	41	94445	42	13795	45	2972	42
25,000 or more	150292	32	71918	32	7488	25	1829	26
By condition:								
Mental disorders	20960	5	16417	7	2051	7	977	14
Alcohol/substance	5451	1	4759	2	1122	4	278	4
Heart disease	47377	10	15408	7	2134	7	357	5
Diabetes	7213	2	4664	2	1069	4	231	3
Skin infection	8354	2	5250	2	1422	5	278	4
Back Problems	15871	3	10011	4	379	1	184	3
Pneumonia	17563	4	5186	2	848	3	176	3

Notes: All analyses are based on the hospital discharge data from January 1 2008 through September 30, 2009 but exclude childbirth and new births. In total, there were 84935 hospital stays for childbirth and 78162 new births. The childbirth stays included 80169 stays for adults ages 19-64, 1868 stays for uninsured adults aged 16-64 and 7036 stays for our control sample. Columns 7 and 8 are for our control sample; the other columns include a larger set of individuals in Oregon.

Source: "Supplement Appendix II: The Oregon Health Insurance Experiment: Evidence from the First Year."

DISCUSSION TOPIC 4: RANDOMIZATION DESIGN

Recognizing the incomplete take up of the program among eligible participants, imagine a research study that tests both the impact of different outreach strategies on applying to Medicaid and the impact of receiving Medicaid.

4.1 How would you design a study to do this? Draw a diagram to illustrate the randomization design and which groups you would compare to answer each research question in the space provided:

- Research Question 1: Does the opportunity to apply for Medicaid increase health care use among low-income, eligible adults?
- Research Question 2: What is the added value of reminding households to apply for Medicaid coverage via text and automated calls?
- Research Question 3: What is the added value of providing personalized application assistance to households randomly selected to apply for Medicaid?

LESSONS FROM OREGON - RESEARCH RESULTS

A series of evaluations examined the impact of Medicaid on health, health care use, and financial strain in the first two years after the lottery[3]. Researchers found that Medicaid increased health care use of both preventative services and emergency departments. Medicaid also reduced financial strain, depression, and self-reported health. However, Medicaid did not improve physical health or employment rates.

ETHICAL CONSIDERATIONS

Many partners have ethical concerns about randomizing and there are many situations in which an experiment would be unethical. For example, if the participants are not adequately informed about the study, or if there is already evidence one treatment is clearly better than the other. However, when two policies are untested and neither is clearly better, there is "equipoise," a principle underlying the ethics of policy research. If we don't know which treatment is better, it may be ethical to randomize which treatment a patient gets. Indeed, one could almost argue that it's unethical not to randomize. As Dr. Leora Horwitz—a medical director who conducts Randomized Controlled Trials (RCTs) in health care—once put it: "People sometimes worry that they will be deprived of the most effective care through randomization. But the reality is that we are depriving all of our patients of the most effective care by not testing." This week, we will talk more about the ethics of randomized evaluations and how to address ethical concerns with partners, implementers, and participants.

[3] View OHIE-related publications, results, media, and more at http://www.nber.org/oregon/

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