ECON 626: Applied Microeconomics

Lecture 8:

Randomization in Practice

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Besides statistics, documentation: CONSORT

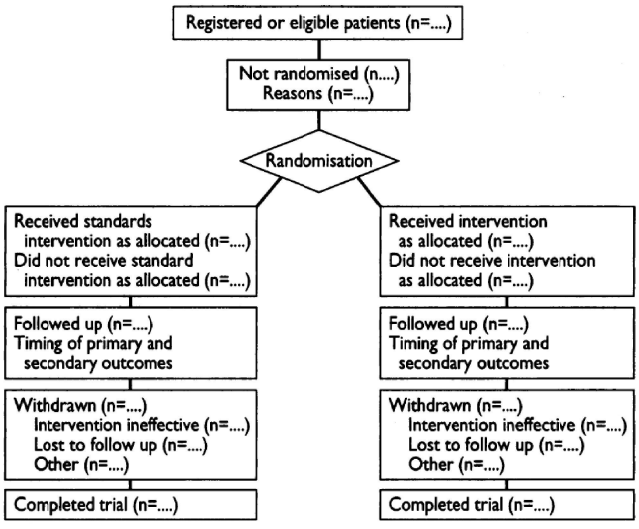

Fig 1—*Flow chart describing progress of patients through randomised trial (reproduced from JAMA)*[9]

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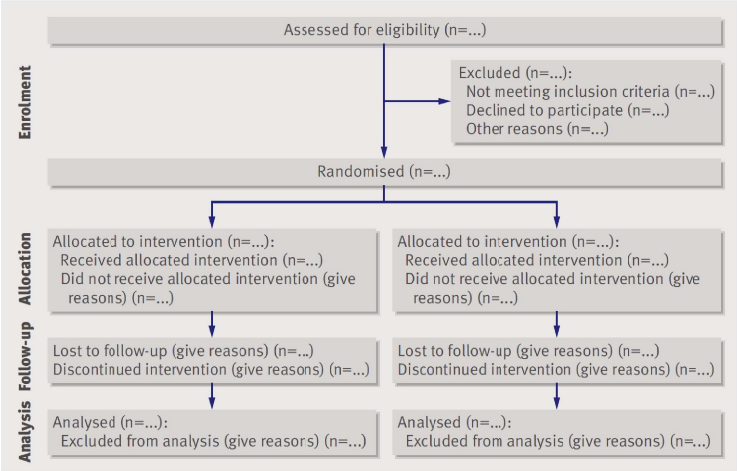

Flow diagram of the progress through the phases of a parallel randomised trial of two groups (that is, enrolment, intervention allocation, follow-up, and data analysis)

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Table 1—*Items that should be included in reports of randomised trials (reproduced from JAMA)*[9]

Heading	Subheading	Descriptor
Title		Identify the study as a randomised trial
Abstract		Use a structured format
Introduction		State prospectively defined hypothesis, clinical objectives, and planned subgroup or covariate analyses

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Methods	Protocol	Describe Planned study population, together with inclusion or exclusion criteria Planned interventions and their timing Primary and secondary outcome measure(s) and the minimum important difference(s), and indicate how the target sample size was projected Rationale and methods for statistical analyses, detailing main comparative analyses and whether they were completed on an intention to treat basis Prospectively defined stopping rules (if warranted)
	Assignment	Describe Unit of randomisation (for example, individual, cluster, geographic) Method used to generate the allocation schedule Method of allocation concealment and timing of assignment Method to separate the generator from the executor of assignment
	Masking (blinding)	Describe Mechanism (for example, capsules, tablets) Similarity of treatment characteristics (for example, appearance, taste) Allocation schedule control (location of code during trial and when broken) Evidence for successful blinding among participants, person doing intervention, outcome assessors, and data analysts

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Results	Provide a trial profile (fig 1) summarising participant flow, numbers and timing of randomisation assignment, interventions, and measurements for each randomised group
	State estimated effect of intervention on primary and secondary outcome measures, including a point estimate and measure of precision (confidence interval)
	State results in absolute numbers when feasible (for example, 10/20, not 50%)
	Present summary data and appropriate descriptive and interferential statistics in sufficient detail to permit alternative analyses and replication
	Describe prognostic variables by treatment group and any attempt to adjust for them
	Describe protocol deviations from the study as planned, together with the reasons
Discussion	State specific interpretation of study findings, including sources of bias and imprecision (internal validity) and discussion of external validity, including appropriate quantitative measures when possible
	State general interpretation of the data in light of the totality of the available evidence

Bruhn and McKenzie - Approach

A survey of practitioners, then **six datasets**:

- Microenterprise profits in Sri Lanka
- Employment survey in Mexico
- Indonesia Family Life Survey: children in school
- Indonesia Family Life Survey: household expenditure
- Learning & Educational Achievement Project (Pakistan): math test
- Learning & Educational Achievement Project: height z-score

Bruhn and McKenzie - Approach

Then, five **randomization methods**:

- Randomization (single random draw)
- Stratification
- Pair-wise matching
- Rerandomization: redraw if anything is significant
- Rerandomization: minimum maximum t statistic

Bruhn and McKenzie - Approach

Really important: **choosing the variables.**

> "The set of outcomes we have chosen spans a range of the ability of the baseline variables to predict future outcomes. At one end is microenterprise profits in Sri Lanka, where baseline profits and 6 baseline individual and firm characteristics explain only 12.2 percent of the variation in profits 6 months later. ... The math test scores and height z-scores in the LEAPS data have the most variation explained by baseline characteristics, with 43.6 percent of the variation in follow-up test scores explained by the baseline test score and 6 baseline characteristics."

Bruhn and McKenzie - Recommendation 1

"Better reporting of the **method of random assignment** is needed.
This should include a description of:
a. Which randomization method was used and why.
b. Which variables were used for balancing?
c. For stratification, how many strata were used?
d. For rerandomization, which cutoff rules were used?
This is particularly important for experiments with small samples, where the randomization method makes more difference."

(Obvious in retrospect?)

Bruhn and McKenzie - Recommendation 2

"Clearly describe **how the randomization was carried out** in practice.
a. Who performed the randomization?
b. How was the randomization done (coin toss, random number generator, etc.)?
c. Was the randomization carried out in public or private?"

Bruhn and McKenzie - Recommendation 3

"**Re-think the common use of rerandomization.**
Our simulations find pair-wise matching to generally perform as well, or better, than rerandomization in terms of balance and power, and like rerandomization, matching allows balance to be sought on more variables than possible under stratification. Adjusting for the method of randomization is statistically cleaner with matching or stratification than with rerandomization."

Bruhn and McKenzie - Recommendation 4

"When deciding which variables to balance on, strongly consider the **baseline outcome variable and geographic region dummies, in addition to variables desired for subgroup analysis.**"

Bruhn and McKenzie - Recommendation 5

"**Be aware that over-stratification can lead to a loss of power** in extreme cases. This is because using a large number of strata involves a downside in terms of loss in degrees of freedom when estimating standard errors, possibly more cases of missing observations, and odd numbers within strata when stratification is used."

Bruhn and McKenzie - Recommendation 6

"**As ye randomize, so shall ye analyze.**" (Include dummies for strata in analysis.) "Similarly, pair dummies should be included for matched randomization, or linear variables used for rerandomizations."

Bruhn and McKenzie - Recommendation 7

"In the ex post analysis, **do not automatically control for baseline variables that show a statistically significant difference in means.** The previous literature, and our simulations, suggest that it is a better rule to control for variables that are thought to influence follow-up outcomes, independent of whether their difference in means is statistically significant or not. ... One should still be cautious in the use of ex post controls, given the potential for finite-sample bias if treatment heterogeneity is correlated with the square of these covariates."

McKenzie (2012)

"The vast majority of randomized experiments in economics rely on a single baseline and single follow-up survey. While such a design is suitable for study of highly autocorrelated and relatively precisely measured outcomes in the health and education domains, it is unlikely to be optimal for measuring noisy and relatively less autocorrelated outcomes such as business profits, and household incomes and expenditures. Taking multiple measurements of such outcomes at relatively short intervals allows one to average out noise, increasing power. When the outcomes have low autocorrelation and budget is limited, it can make sense to do no baseline at all. Moreover, I show how for such outcomes, more power can be achieved with multiple follow-ups than allocating the same total sample size over a single follow-up and baseline. I also highlight the large gains in power from ANCOVA analysis rather than difference-in-differences analysis when autocorrelations are low."