

# DESIGNING AN EFFECTIVE WELL-MATCHED COMPARISON GROUP STUDY

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# OVERVIEW

- **Experimental Designs (Randomized Control Trials or RCTs)**
  - Universally accepted as the gold standard for research
  - Randomly assign subjects to treatment and control conditions
  - Ethical, logistical, and financial burdens
- **Quasi-Experimental Designs**
  - Encompass many different approaches including Well-Matched Comparison Groups, Regression Discontinuity, and Interrupted Time Series
  - Some designs are eligible for evidence-based review

# WELL-MATCHED COMPARISON GROUPS

- Well-matched comparison group designs need not involve random assignment
- Comparisons are identified by ensuring that treatment and comparison subjects are as similar as possible before intervention
- Approaches to finding matched comparisons can range:
  - Simple stratified sampling
  - Distance-metric matching
  - Propensity score matching
- Need to establish baseline equivalence
- No serious confounds (e.g., N=1)

# BASELINES AND...

- Amass a comprehensive set of metrics
- Include at least one pre-intervention outcome measure
- Temporally appropriate
- Available for both treatment and potential comparisons
- Collect consistently across both treatment and comparisons
- Appropriate permissions are necessary for access if gathered from extant data source(s)
- May require primary data collection activities

# OUTCOMES

- Not over-aligned with the intervention
- Valid and reliable
- Temporally appropriate
- Available for both treatment and potential comparisons
- Collect consistently across both treatment and comparisons
- Appropriate permissions are necessary for access if gathered from extant data source(s)
- May require primary data collection activities
- Responsive to research questions

# GATHERING AND PROCESSING DATA

- Identify data required to conduct the evaluation, including possible sources and key metrics
- Establish data sharing strategies and agreements
- Link multiple data sources
- Integrate metrics from multiple sources if available
- Set temporal targets for baseline and outcome(s)
- Understand data quality and limitations
  - Select best matching techniques accordingly
- Institutional Review Board (IRB) review

# DATA SOURCES

- Are there extant data sources for the individuals your intervention/initiative is attempting to affect?
  - Are the data publicly available (e.g., US Census, NAEP, Departments of Education or City Planning)?
- How are the data available (aggregate or individual level)?
- How often are the data collected and published/made available?
- Do these data fit your intended purposes (e.g., measure what you are trying to change)?
- Will you need to collect additional data and what methods are most appropriate (e.g., surveys, focus groups)?
  - What are the limitations to these additional data collection procedures (e.g., self-report, response rate, representativeness of sample)?

# ESTABLISHING DATA SHARING STRATEGIES & AGREEMENTS AND DE-IDENTIFIED VS. IDENTIFIED DATA

- Who will be allowed access to the data?
- How will you ensure access to extant data if it is not publicly available?
  - Memoranda of Understanding (MOU) / Non-Disclosure Agreements (NDA)
  - Research/Institutional Review Board (RRB/IRB) Approval
    - Is an informed consent/assent process required to obtain the data?
- Do agencies in your community share data?
  - Are there existing data sharing agreements upon which you could build?
  - Do any of your partner organizations have data sharing agreements through which you can obtain data as an “agent” of the organization?
- Will you need to collect identifiable data?
  - Pros and cons of identifiable data

# DEFINING TARGET POPULATIONS

## USING THEORIES OF CHANGE AND LOGIC MODELS

- What individuals or groups are you attempting to reach with the intervention/initiative?
- What issues will the intervention/initiative address?
- What do you expect the intervention/initiative to change?
- How do you expect the intervention/initiative to change “it”?
- How long will it be before you expect to see the change?
- Are there any other changes (i.e., indirect or secondary) you expect to see as a result of the intervention/ initiative?

# IDENTIFYING COMPARISON POOLS

- **Overlap between treatment and potential comparison samples**
  - Do potential comparisons come from similar geographies?
  - Do potential comparisons need to have similar experiences as treatment group?
  - Are measurements available for potential comparisons at approximately the same time points as treatment group?
- **Potential comparison pool should be large enough to implement matching**
- **Baseline measurement of outcome(s) must be available for potential comparisons**
- **Outcome(s) must be available as well**

# GROUP ACTIVITY

Transfer schools offer a full-day year-round academic program that integrates intensive support services and youth development practices with personalized, standards-based instruction. Focused on serving students who have fallen behind and are unlikely to graduate from high school before they turn 21, these schools typically operate under the partnership of a community based organization and a local education agency. They typically serve students between the ages of 16 and 21 who are over-age and under-credited.

# GROUP ACTIVITY

Using a well-matched comparison group design, develop an evaluation plan to determine the impact of a transfer school program on students.

- What is the target population?
- Where can you find possible comparison pool(s)?
- What are some key baseline characteristics?
- What are the potential target outcomes and when would you expect to see a change?
- What are the possible data sources? Do you need to collect any data via primary collection methods? Do you need identifiable data?
- What other details about implementation or the transfer school model might you need?

# GROUP ACTIVITY

College Count\$	Palm Beach CSC	Good Shepherd Transfer Schools	Single Stop USA
<b>Outcomes</b>			
Wages, Higher Education Certificates, Higher Education Degrees	Infant health, postnatal depression, tobacco/alcohol use during pregnancy, prenatal care, father involvement	School attendance, suspensions, credits earned, core HS exams passed, persistence in school, graduation	Semester to semester persistence, Degree-bearing credit pass rate, Grade point average
<b>Treatment Group N(s)</b>			
169 to 5,023	143 to 211	429	367 to 785
<b>Matching Variables</b>			
<b>Baseline outcome metric</b> Sex Race/Ethnicity Age	<b>Baseline outcome metric</b> Race/Ethnicity Age Marital Status Obtained High School Diploma or GED Personal Income Ability to pay bills Prenatal risk screen score	<b>Baseline outcome metric</b> Sex Race/Ethnicity Years overage when first enrolled in Grade 9 Eligibility for free/reduced price meals English Language Learner (ELL) status Special education status 8th grade Math exam scores 8th grade English Language Arts scores Credits earned in grade 9 School attendance in grade 9	<b>Baseline outcome metric</b> Sex Race/Ethnicity Age Marital Status Obtained High School Diploma or GED Personal Income (FAFSA) Household Income (FAFSA) Placement test score Full time/Part Enrollment Status Filed for FAFSA FAFSA financial dependent status Received financial aid Received student loan First generation to attend college Enrolled in remediation courses Academic/Occupational focus Area of focus (e.g., Health Careers) Number of years since first enrolled in college Prior cumulative GPA Prior cumulative credits passed

# GROUP EQUIVALENCE

- Treatment and matched comparisons must be equivalent on ***all*** key baseline characteristics in ***each*** analytic sample
- Prior to matching, conduct covariate balance checks to determine group similarity
  - Independent samples *t*-tests or *chi*-squares ( $p$ -value > 0.05)
  - Standardized group mean differences (< or = 0.25 SDs)
- Degree of similarity will help determine appropriate matching technique

# MATCHING

- Use the most appropriate matching strategy based on covariate balance needs
- Multiple matches may be necessary
  - Multiple outcomes with different data availability
  - A single outcome measured at different time points (attrition)
- Ultimate aim: achieve high internal validity by minimizing overt bias
  - Try to include as many matching variables as possible
  - Conduct sensitivity analysis to gauge potential hidden bias

# OUTCOME ANALYSES

- **Confirmatory vs. exploratory analyses**
  - **Confirmatory: evidence-based, rigorous, drawing impact-related conclusions**
    - Appropriate to level of measurement and data structure
    - Conducted on samples wherein baseline equivalence has been established
    - Conducted on validated measures
    - Adjustments must be applied when conducting multiple tests under the same outcome domain
  - **Exploratory: everything else**
    - Correlational, pre-post, dosage, subgroups
    - Do not have to include comparison groups
    - Do not have to include a baseline measurement of outcome

# CONFIRMATORY ANALYSIS CONSIDERATIONS

- Level of measurement for outcomes (continuous vs. categorical)
- Unit of analysis vs. unit of assignment
- Analytic data structure (single level vs. multi-level nested)
- Appropriate Confirmatory Analysis Techniques
  - Regression-type models (multiple linear/logistic regression, hierarchical linear modeling, mixed-effects modeling)
  - Analysis of Covariance (ANCOVA or MANCOVA)
- Matching procedure
- Sample size & statistical power
- Missing data

# REPORTING

- Describe intervention, treatment group and potential comparisons
- Describe the matching procedure in detail
- Present baseline equivalence information for each analytic sample
- Interpret impact estimates
  - Descriptive and adjusted means for outcome measures
  - Positive vs. negative association
  - Statistical significance ( $p$ -value)
  - Practical importance (effect size)
  - Multiple testing adjustment results

# QUESTIONS?

If you have any questions or would like an electronic copy of this presentation, please direct all correspondence to Michael Scuello at Metis Associates: [m SCUello@metisassoc.com](mailto:m SCUello@metisassoc.com).

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