Research Design

ESP 178 Applied Research Methods
Calvin Thigpen
1/19/17
What have we focused on so far?

What is still to come?
My hypothesis

Living on a cul-de-sac → Outdoor play

How true is the following?
“Living unit on cul-de-sac rather than through street”
1= not at all true
4=entirely true

If you live with children under the age of 16, how many days in the last 7 days did they play outdoors somewhere in your neighborhood (besides your backyard)?
Cross-Sectional Study

Difference in street associated with difference in outdoor play
Some survey data...

Times playing outside in last 7 days

<table>
<thead>
<tr>
<th>Not cul-de-sac</th>
<th>Cul-de-sac</th>
</tr>
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<tbody>
<tr>
<td>2.48</td>
<td>3.47</td>
</tr>
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</table>
Does this mean my hypothesis is right?

If we move everyone to cul-de-sacs, will children play outside more?

Is there a causal relationship?
What else could be going on?
What I want to know

Type of street causes outdoor play
Causality Criterion #1: Association
Is there an association between living on a cul-de-sac and outdoor play?

Times playing outside in last 7 days

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The graph shows the number of times playing outside in the last 7 days for children living on a not cul-de-sac compared to those living on a cul-de-sac.
Now what do you think?

Times playing outside in last 7 days

- **Not cul-de-sac**: 2.48
- **Cul-de-sac**: 3.47
Causality Criterion #2: Non-spuriousness
What else might explain the association?

Something else causes both living on cul-de-sac and outdoor play

If IV and DV both caused by a third factor, then relationship is “spurious”
Another example of a spurious relationship...
Another example of a spurious relationship...
Another example of a spurious relationship...
## Controlling for third variables

<table>
<thead>
<tr>
<th>Type</th>
<th>Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Elimination</strong></td>
<td>Restrict study to specific subset of the extraneous variable, e.g. only one gender or income group</td>
</tr>
<tr>
<td><strong>Inclusion (&quot;statistical&quot;)</strong></td>
<td>Measure extraneous variables and include them as “covariates” in statistical analysis – MORE WHEN WE GET TO QUANTITATIVE ANALYSIS</td>
</tr>
<tr>
<td><strong>Manipulation</strong></td>
<td>Control levels of treatment, and compare treatment group(s) to control group – MORE WHEN WE GET TO EXPERIMENTS</td>
</tr>
<tr>
<td><strong>Randomization</strong></td>
<td>Random selection: see SAMPLING! Random assignment: see EXPERIMENTS!</td>
</tr>
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</table>
Causality Criterion #3: Time Order
So let’s say we re-do the study. We again find an association between cul-de-sacs and outdoor play, and we included other variables to address possible spurious relationships.

We *still* don’t have an especially strong case for CAUSALITY... We can’t say:

“If we move everyone to cul-de-sacs, children will play outside more”
What I need to show

Change in type of street leads to change outdoor play
Or the other way around

Change in type of street leads to change outdoor play
Basic types of designs

• Cross sectional
  Comparison of different groups at one point in time

• Longitudinal
  Comparison of different points in time for same group
Why don’t we always do longitudinal studies?
## Treatment of time

<table>
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<tr>
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<th>Description</th>
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<tr>
<td>Cross-sectional</td>
<td>Comparison of groups of people that differ on IV at <strong>one point in time</strong></td>
</tr>
<tr>
<td>Longitudinal – Repeat cross-sectional</td>
<td>Comparison of <strong>different groups of people</strong> that differ on IV at <strong>two (or more) points in time</strong></td>
</tr>
<tr>
<td>Longitudinal – Panel</td>
<td>Comparison of <strong>same groups of people</strong> that differ on IV at <strong>two (or more) points in time</strong></td>
</tr>
<tr>
<td>Experimental</td>
<td>Comparison of “treatment” group and “control” group, before and after treatment – MORE NEXT WEEK</td>
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Longitudinal options

Repeat cross-sectional

Panel

Time 1

Time 2
### Treatment of time

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**“Treatment” can be a policy or program “intervention”**
Study progression

Cross-sectional studies
Establish associations
Basis for designing interventions

Intervention studies
Before-and-after measures
Establish causal relationship
Causality Criterion #4: Causal Mechanism
What might be a compelling causal story?

Identify and test the moderating/intervening variables
Causality Criterion #5: Context
Context

Replicate studies in different contexts
*Related to moderating variables*
*Also related to external validity - generalizability*
## Recap – Causal Validity

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Explanation</th>
<th>How to address it</th>
</tr>
</thead>
<tbody>
<tr>
<td>Association</td>
<td>If cause happens, effect happens; if no cause, no effect.</td>
<td>Measure outcome across groups with different levels of treatment. Test for statistical correlation.</td>
</tr>
<tr>
<td>Non-spurious</td>
<td>No extraneous third variable that can explain association.</td>
<td>Control for third variable: e.g. elimination or inclusion</td>
</tr>
<tr>
<td>Time order</td>
<td>Cause comes before effect.</td>
<td>Use longitudinal design or experiment</td>
</tr>
<tr>
<td>Causal Mechanism</td>
<td>Logical explanation for how cause leads to effect.</td>
<td>Identify and test mediating/intervening variables.</td>
</tr>
<tr>
<td>Context</td>
<td>Understand the conditions under which the relationship holds</td>
<td>Replicate study in different contexts.</td>
</tr>
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</table>
Let’s try the causality criteria on some examples from the news...
Fun with Associations

Fun with Associations

New York Times – “Privilege, Pathology and Power” 1/1/16
Fun with Associations

New York Times – “To improve a memory consider chocolate” 10/26/14
Fun with Associations

National Public Radio – “The family dinner deconstructed” 2/7/08
Fun with Associations

Planetizen – “New study finds asthmatic children cause inner city traffic congestion” 4/1/13

(early) April fools!
Walk-out and Teach-in tomorrow

• Walk-out for Donald Trump’s inauguration
• Teach-in regarding possible impacts of Pres. Trump’s policies (civil rights, science funding, etc.)
  • Multipurpose Room, SCC
  • Starting 8:45 going through 5 pm
• If you choose to miss discussion section to participate, we ask that you write a 300 word description of how you would use research design principles to evaluate one of Trump’s proposed policies
  • (https://www.donaldjtrump.com/policies)
  • Provide brief background to policy, come up with a simple conceptual model, describe how you would operationalize it, and consider construct and internal validity.
  • Email to your discussion lead, due 1/24 by 4:30 pm
To do

• Assignment #1:
  • Have your proposal topic ready to discuss on Friday
  • Full assignment due Tuesday, 1/24

• Tuesday – causality in-class exercise!
  • Read ecological fallacy explanations

<table>
<thead>
<tr>
<th>Type of Validity</th>
<th>Definition</th>
<th>An issue in...</th>
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<tr>
<td>Measurement Validity</td>
<td>Measure of a variable is accurate</td>
<td>... operationalization and measurement</td>
</tr>
<tr>
<td>Internal (causal) Validity</td>
<td>Relationships revealed by study are real</td>
<td>... research design</td>
</tr>
<tr>
<td>External Validity (generalizability)</td>
<td>Results of study can be generalized to other populations</td>
<td>... sampling</td>
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