Research Design

ESP178 Research Methods
Dr. Susan Handy
1/19/16
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)?
Some survey data...

Times playing outside in last 7 days

- Not cul-de-sac: 2.48
- Cul-de-sac: 3.47
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?
Cross-Sectional Study

Difference in street associated with difference in outdoor play
What I want to know

Type of street causes outdoor play
What else is possible

Desire for outdoor play causes living on cul-de-sac

*If DV causes IV, we have “reverse causality”*
Another thing that is possible

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...
What I want to establish is CAUSALITY

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
So what type of study is better for establishing causality?
Criteria for Causality Validity

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Association</td>
<td>If cause happens, effect happens; if no cause, no effect.</td>
</tr>
<tr>
<td>Non-spurious</td>
<td>No extraneous third variable that can explain association.</td>
</tr>
<tr>
<td>Time order</td>
<td>Cause comes before effect.</td>
</tr>
<tr>
<td>Causal Mechanism</td>
<td>Logical explanation for how cause leads to effect.</td>
</tr>
<tr>
<td>Context</td>
<td>Understand the conditions under which the relationship holds</td>
</tr>
</tbody>
</table>

*How does a cross-sectional study do on these criteria?*

*How does a longitudinal study do on these criteria?*
Why don’t we always do longitudinal studies?
## Treatment of time

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

Repeat cross-sectional

Time 1

Time 2

Panel
# Treatment of time

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

“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
# 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</strong></td>
<td>Have a big enough sample to be able to study the effects of extraneous variables</td>
</tr>
<tr>
<td><strong>Statistical control</strong></td>
<td>Measure extraneous variables and include them as “covariates” in statistical analysis</td>
</tr>
<tr>
<td><strong>Manipulation</strong></td>
<td>Compare treatment group 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>
</tbody>
</table>
Causal Mechanism

Identify and test the intervening variables
Context

Replicate studies in different contexts
*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>Use cross-sectional design. 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 w/statistical control</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 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>
</tbody>
</table>
Fun with Associations

Fun with Associations

New York Times – “Privilege, Pathology and Power” 1/1/16
New York Times – “But will it stop cancer?” 11/1/05
Fun with Associations

New York Times – every other week, it seems
Fun with Associations

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

New York Times – “New hints that red wine may slow aging” 6/4/08
Fun with Associations

New York Times – “Drink to your health (in moderation), the science says” – 12/21/15
Fun with Associations


Note: Study uses state as unit of analysis
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

April fools!
To do

- Me – grading!
- You – reading!
- Thursday – causality exercise!

<table>
<thead>
<tr>
<th>Type of Validity</th>
<th>Definition</th>
<th>An issue in...</th>
</tr>
</thead>
<tbody>
<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>
</tr>
</tbody>
</table>