Conceptualization and Operationalization

ESP 178 - Applied Research Methods
Calvin Thigpen
1/12/17
Research gives us knowledge of how the world works.

Knowledge of how the world works gives us the power to fix things.
Evidence-based policy

Policy draws on research

Research supports policy

Research ↔ Policy
Research ↔ Policy

Example: Street connectivity and cul-de-sacs
Street Connectivity Ordinances

City of Eugene
Maximum Block Size

City of Hercules
Maximum Block Size

“The maximum perimeter of any block shall be no more than 1,600 ft. The minimum dimension of each block face shall be no more than 500 ft. Pedestrian passages leading from the street to the middle of the block shall be provided at intervals no greater than 250ft.”

Source: Handy, Paterson, and Butler 2003
The Suburbs Under Siege

Homeowners Love Cul-de-Sacs, Planners Say They're Perils; Taking Sides in Minnesota

By AMIR EFRATI  
June 2, 2006; Page W1

One of the most popular features of suburbia is under attack.

For many families, cul-de-sac living represents the epitome of suburban bliss: a traffic-free play zone for children, a ready roster of neighbors with extra gas for the lawnmower and a communal gathering space for sharing gin and tonics. But thanks to a growing chorus of critics, ranging from city planners and traffic engineers to snowplow drivers, hundreds of local governments from San Luis Obispo, Calif., to Charlotte, N.C., have passed zoning ordinances to limit cul-de-sacs or even ban them in the future.
MODERN LIFE

Planners go 'round and around over cul-de-sacs

Once a homeowner's dream, the dead-end street is falling out of favor everywhere -- except Southern California.

By Dawn Bonker

Special to The Times

March 24, 2007

CITY planners shun them. New urbanists hate them. Boulder, Colo., all but banned them.

Cul-de-sacs — those once-beloved icons of the suburban good life — have become something of a demonized concept. The growing consensus among urban planners is that these lollipop-shaped streets hurt communities by chopping up neighborhoods, isolating children, intensifying traffic woes and discouraging walking.

Then why are so many still being built here?

Leave it to Southern California to defy the new convention. While cities across the country return to streets laid out on a traditional grid system, cul-de-sacs are springing up from Calabasas to Chula Vista. Yes, homeowners often fall in love with the quiet courts and initial sense of built-in neighborliness. But, experts say, just wait.
“The End of the Road for Cul-de-Sacs?”
dc.streetsblog.org

http://dc.streetsblog.org/2010/02/08/the-end-of-the-road-for-cul-de-sacs/
Village Homes, Davis
Davis Greenbelt System
Reconsidering the Cul-de-sac

By Michael Southworth and Eran Ben-Joseph

For over five decades developers, homebuyers, and traffic engineers have favored the cul-de-sac, a basic building block of the American suburb. Despite its popular success, the “loops and lollipops” street pattern has been repeatedly criticized by many leading architects and planners, particularly New Urbanists, who strongly advocate the interconnected gridiron pattern. The cul-de-sac has come to symbolize all the problems of suburbia—an isolated, insular enclave, set in a formless sprawl of similar enclaves, separated socially and physically from the larger world, and dependent upon the automobile for its survival. Nevertheless, much can be said in favor of the cul-de-sac street as a pattern for neighborhood space.
The Case for Cul-de-Sacs

People who live in them actually have greater social cohesion, according to one sociologist.

EMILY BADGER | Oct 17, 2013 | 66 Comments

In a weird way, Thomas R. Hochschild Jr. actually first encountered the social cohesion of cul-de-sacs in his latest research when he wandered into one in Connecticut with his clipboard and polo shirt, and someone called the cops.

That never happened on the other types of streets he was studying, places where it would turn out the neighbors didn’t know each other as well, and it was less clear who “belonged.” Repeatedly, though, he found at the end of cul-de-sacs families who watched each others’ children and took in each others’ mail, who barbequed and orchestrated the removal of snow together, and who
Do cul-de-sacs promote children’s outdoor play?
Examples

Pollution  →  Health
Driving    →  Pollution
Sprawl     →  Driving
Living on a cul-de-sac

Independent variable

Outdoor play

Dependent variable
What is a theory?
Types of Explanation

Idiographic

Nomethetic
The Research Cycle

Inductive = Theory building

Empirical Generalizations

Descriptive (Usually) Quantitative

Observation

Exploratory (Usually) Qualitative

Theory

Hypothesis

(Usually) Quantitative

Explanatory (Usually) Quantitative

Deductive = Theory testing
At the most basic level...

Quantitative

Qualitative
How things (usually) go together...

<table>
<thead>
<tr>
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How things (usually) go together...
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<td>Data Analysis</td>
<td>Statistical analysis</td>
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<td>Descriptive statistics</td>
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<tr>
<td>Other Qualities...</td>
<td>Nomothetic explanation Focus on proving Dissective</td>
<td>Idiographic explanation Focus on understanding Holistic</td>
<td>Not an explanation Focus on characterizing</td>
</tr>
</tbody>
</table>
### Quantitative...

<table>
<thead>
<tr>
<th>Factor</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What is the distribution of the factor?</strong></td>
<td><strong>What is the distribution of the outcome?</strong></td>
</tr>
<tr>
<td>How big is it?</td>
<td>How much time do kids play outdoors on average?</td>
</tr>
<tr>
<td><strong>What share of streets are cul-de-sacs?</strong></td>
<td><strong>How much more time do children spend playing outdoors if they live on a cul-de-sac?</strong></td>
</tr>
<tr>
<td><strong>What share of households live on cul-de-sacs?</strong></td>
<td><strong>What share of kids play outdoors at least once per week?</strong></td>
</tr>
</tbody>
</table>

**DESCRIPTIVE** | **EXPLANATORY** | **DESCRIPTIVE**
<table>
<thead>
<tr>
<th>Qualitative...</th>
<th>What is the nature of the factor? Are there others?</th>
<th>What is the nature of the relationship? How does it work?</th>
<th>What Is the nature of the outcome? Are there others?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are there different kinds of cul-de-sacs? What are key characteristics of cul-de-sacs?</td>
<td>What is it about cul-de-sacs that influences children’s outdoor play?</td>
<td>What kinds of things do children do when playing outside? How do they use the street versus sidewalks?</td>
<td></td>
</tr>
</tbody>
</table>
Thinking like a researcher
Unit of Analysis

Unit of Analysis vs. Unit of Observation

INDIVIDUAL
Children

GROUP
Households

GEOGRAPHIC UNIT
Neighborhoods

INDIVIDUAL
Children

INDIVIDUAL
Children

INDIVIDUAL
Children
From Conceptual to Operational
From Conceptual to Operational

**Concept**
- Cul-de-sacs

**Proposition**
- leads to more

**Concept**
- outdoor play for children

**Variable**
- Living on a cul-de-sac

**Hypothesis**
- is positively associated with

**Variable**
- number of days children play outside
“Explanations require development of **concepts** or generalizable properties or characteristics associated with objects, events, or people. While objects such as a person, a firm, or a car are not concepts, their specific characteristics or behavior such as a person’s attitude toward immigrants, a firm’s capacity for innovation, and a car’s weight can be viewed as concepts.”

“A **construct** is an abstract concept that is specifically chosen (or “created”) to explain a given phenomenon. A construct may be a simple concept, such as a person’s *weight*, or a combination of a set of related concepts such as a person’s *communication skill*, which may consist of several underlying concepts such as the person’s *vocabulary*, *syntax*, and *spelling*. The former instance (weight) is a **unidimensional construct**, while the latter (communication skill) is a **multi-dimensional construct** (i.e., it consists of multiple underlying concepts).”
### Note: Variables by Unit of Analysis

<table>
<thead>
<tr>
<th>Unit of Analysis</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INDIVIDUAL</strong></td>
<td></td>
</tr>
<tr>
<td>Children</td>
<td>Number of days child played outside per week</td>
</tr>
<tr>
<td><strong>GROUP</strong></td>
<td></td>
</tr>
<tr>
<td>Households</td>
<td>Share of children in household who played outside at least once per week</td>
</tr>
<tr>
<td><strong>GEOGRAPHIC UNIT</strong></td>
<td></td>
</tr>
<tr>
<td>Neighborhoods</td>
<td>Share of households in neighborhood who had children who played outside at least once per week</td>
</tr>
</tbody>
</table>
Conceptual Model = Nomological Network

Field of Study
Control variable
It’s all relative...

1. sprawl → driving → pollution → health
2. sprawl → driving
3. driving → pollution
4. pollution → health
5. sprawl → driving → pollution
It’s all relative...
Theory versus Conceptual Model

Theory of Planned Behavior

Attitude  \rightarrow  Subjective Norms  \rightarrow  Perceived Behavior Control  \rightarrow  Behavioral Intention  \rightarrow  Behavior

Conceptual Model

Attitude about outdoor play

Is outdoor play normal?

Intention to have kid play

Can my kid do it?

Outdoor play

Note: could do kid’s perspective or parent’s perspective or both
From Conceptual to Operational

**Theoretical Plane**
- Construct A → Proposition → Construct B

**Empirical Plane**
- Independent Variable → Hypothesis → Dependent Variable

**Indicator/measure**
- Indicated/measure
From Conceptual to Operational

**Concept**
- Cul-de-sacs

**Proposition**
- lead to more

**Concept**
- outdoor play for children

**Variable**
- Living on a cul-de-sac

**Hypothesis**
- is positively associated with

**Variable**
- number of days children play outside

**Indicator/Measure**
- “What type of street do you live on?”

**Indicator/Measure**
- “How many days last week did your oldest child play outside?”
## Levels of measurement

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<th>Definition</th>
<th>Example</th>
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<td>Categorical, no order</td>
<td>Outdoor play or not: yes, no</td>
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<td></td>
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<td>Type of outdoor play: active, passive</td>
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<tr>
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<td>Categorical, with order</td>
<td>Frequency of play: low, medium, high</td>
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Levels of measurement

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<td>Interval</td>
<td>Continuous, with no fixed 0 point</td>
<td>Rare in social sciences... e.g. IQ</td>
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<tr>
<td>Ratio</td>
<td>Continuous variable</td>
<td>Frequency of play: # times children played outside</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amount of play: # minutes children played outside</td>
</tr>
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</table>
Deriving one kind of variable from another...

Number of days in last 7 days that child played outside

Child played: infrequently, moderately frequently, frequently

Child played: yes, no

What kind of variable is it?
How could you convert the variable?
Why might you want to do this?
Why might you not want to do this?
How do we know our measures are good?

Reliable = Precise/Consistent  
Valid = Accurate
Reliability testing...

Do you get the same answer the second time?

Why might you get different answers?

What’s close enough?
Validity testing...

**Translational** – How well is theoretical concept translated into measure?

**Face Validity**
makes sense “on its face”

**Content Validity**
fully covers the concept within the domain you are considering
Validity testing...

**Criterion:** Does measure behave the way it should?

**Convergent Validity:** Compare measure to a different measure of the same concept

“Does your child play outside frequently or infrequently?” vs. “How many times did your child play outside last week?” vs. 24-7 observations of outdoor play OR GPS + accelerometer

*Second question in the survey*
<table>
<thead>
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<th>Definition</th>
<th>Criteria/Tests</th>
<th>Example</th>
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<tbody>
<tr>
<td>Reliability</td>
<td>Repeated measures of a variable yield consistent results</td>
<td>Test-Retest</td>
<td>Ask children how often they play in the street in a typical week, then ask them again two weeks later; compare responses for each individual</td>
</tr>
<tr>
<td>Measurement Validity</td>
<td>The measure of a variable is accurate (passes at least one test)</td>
<td>Translational</td>
<td>How well is theoretical construct translated into measure? The number of times a child played in the street in the last week is clearly related to the concept of street play</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Face Validity – makes sense “on its face”</td>
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<td></td>
<td></td>
<td>Content validity – fully covers the concept</td>
<td>Asking about playing basketball and playing hopscotch doesn’t add up to total street play</td>
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<td><strong>Criterion</strong> Does measure behave the way it should?</td>
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<td>Convergent validity - compare measure to a different measure of the same concept</td>
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<td>Compare the reported frequency of street play in the last week to a question on whether they play in the street frequently or infrequently</td>
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<td>“Gold standard” – compare to the most accurate possible measure</td>
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<td>Do a test that compares reported street play to observed street play for a small sample of children</td>
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For the class exercises: Bicycling!
Benefits of a Bicycle

shapes up that boodie

Puts a big fat smile on your face

zero emissions

it carries your goodies home

slows global warming

faster and easier than walking

Whizzes past traffic jams

It feels like flying

Gives you legs of steel

if's as quiet as a mouse

No need to pay for gas, parking fees, or auto insurance...hurray!

the Earth sends a lil extra luv to those on bicycles (this is scientifically documented)

www.cicle.org
A Global High Shift Cycling Scenario:
The Potential for Dramatically Increasing Bicycle and E-bike Use in Cities Around the World, with Estimated Energy, CO2, and Cost Impacts

12 November 2015

By the Institute for Transportation & Development Policy and the University of California, Davis

Jacob Maron, Lew Fulton, Zane McDonald

Research commissioned by the Union Cycliste Internationale (UCI), the European Cyclists' Federation (ECF), and the Bicycle Product Suppliers Association (BPSA)

https://www.itdp.org/the-benefits-of-shifting-to-cycling/
If we shift to a modest 23% of trips taken by bicycle or e-bikes by 2050 as part of a comprehensive shift toward sustainable transport (mass transit, walking, and biking), and away from cars, then...

2050 EMISSIONS FROM URBAN TRANSPORT

We could avoid ~300 megatonnes of global CO₂ emissions, a 7% reduction in urban transport emissions over BAU due to cycling, as part of a 47% total reduction in the comprehensive HSC scenario.

2015-2050 CUMULATIVE COSTS OF TRANSPORT

And save cities $25 trillion USD over the next 35 years due to cycling.
Percent of Trips by Bicycle

Source: Pucher and Buehler 2008
Boom in Cycling to Work

* 2011 figures for Canadian cities are preliminary estimates

Percent Biking to Work in Smaller Cities

Source: Handy, Heinen, and Krizek, 2012
Bicycling in Davis

![Bar chart showing bicycling rates in Davis for different groups: Davis workers, UCD staff in Davis, UCD faculty in Davis, UCD students in Davis, Davis residents.]
Not Bicycling in Davis

Not bicycling!

Source: Handy, Access, 2012
Policy question:
How do we get more people bicycling?

Research question:
Why do or don’t people bicycle?
To do

• Read proposal assignment – overall and stage 1
  • Think about possible topics for proposal
• Readings – catch up on assigned readings if you didn’t read them yet.
• Take the course overview and syllabus quiz on Canvas (by 8 pm tonight!)... 1% of your grade
• Attend section tomorrow!