Modeling Human Behavior

Social Science in Bat Research

Who Am I?

Cal Poly Humboldt.

The In-Between

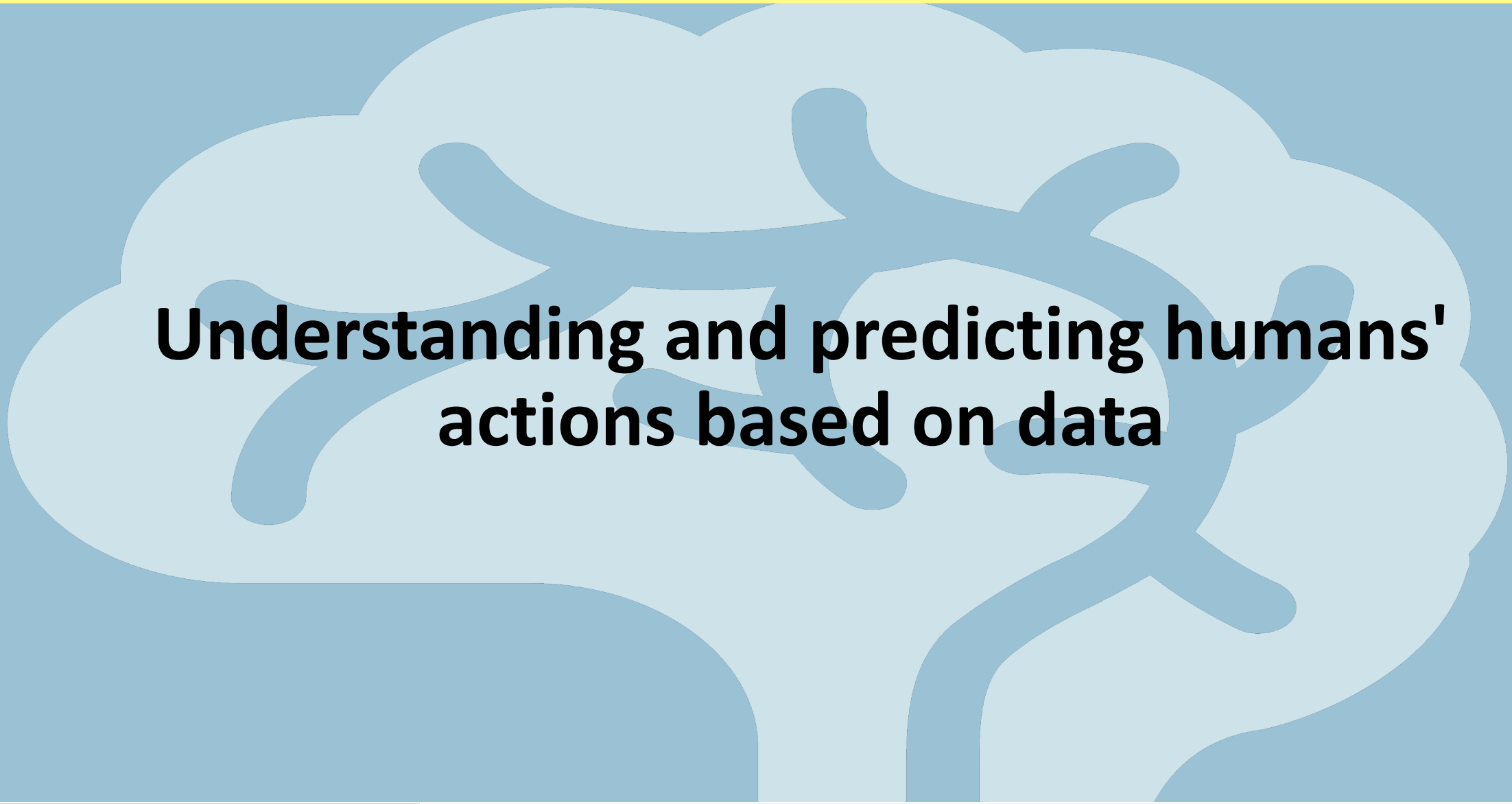
TEXAS TECH UNIVERSITY.

Overview

- Part 1—What is human behavioral modeling and why should we care?
- Part 2—Ok, so I care now, how do I start to use these tools
- Part 3—Human Behavioral Modeling in Bat Research

What is human behavioral modeling and why should we care?

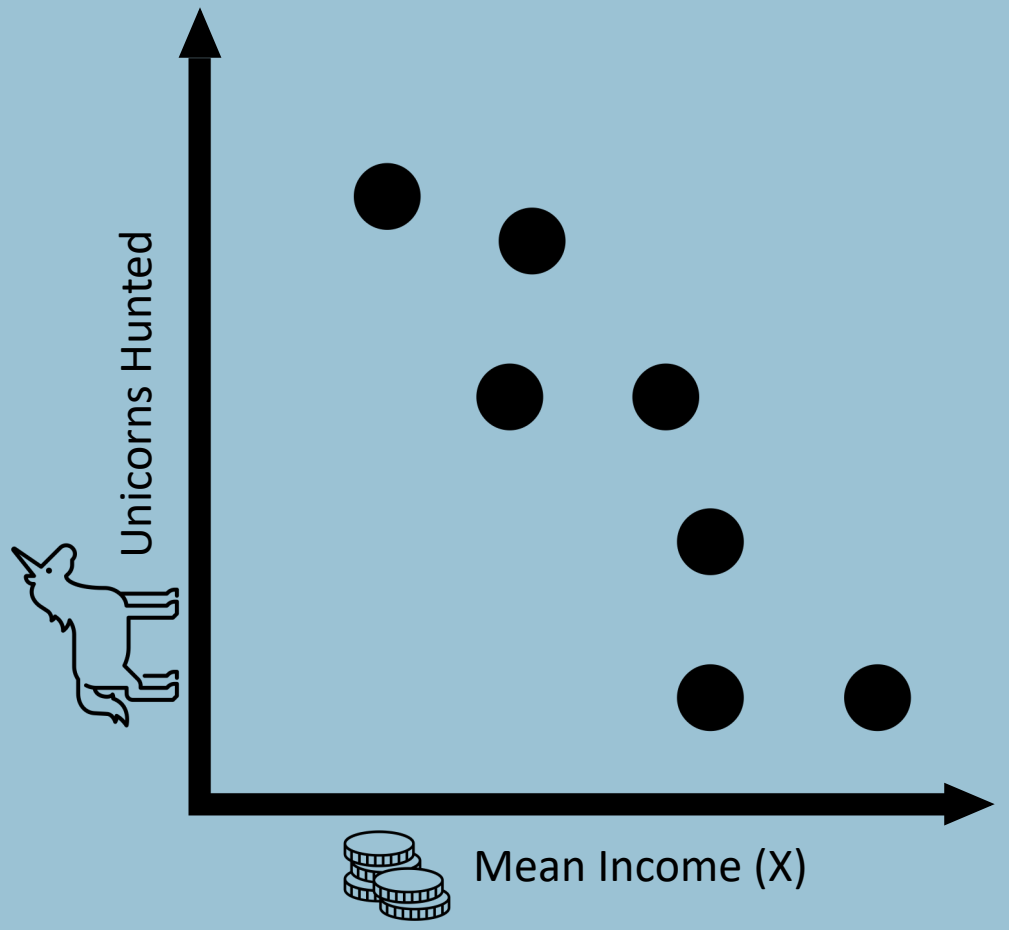
What is Human Behavioral Modeling?



Understanding and predicting humans' actions based on data

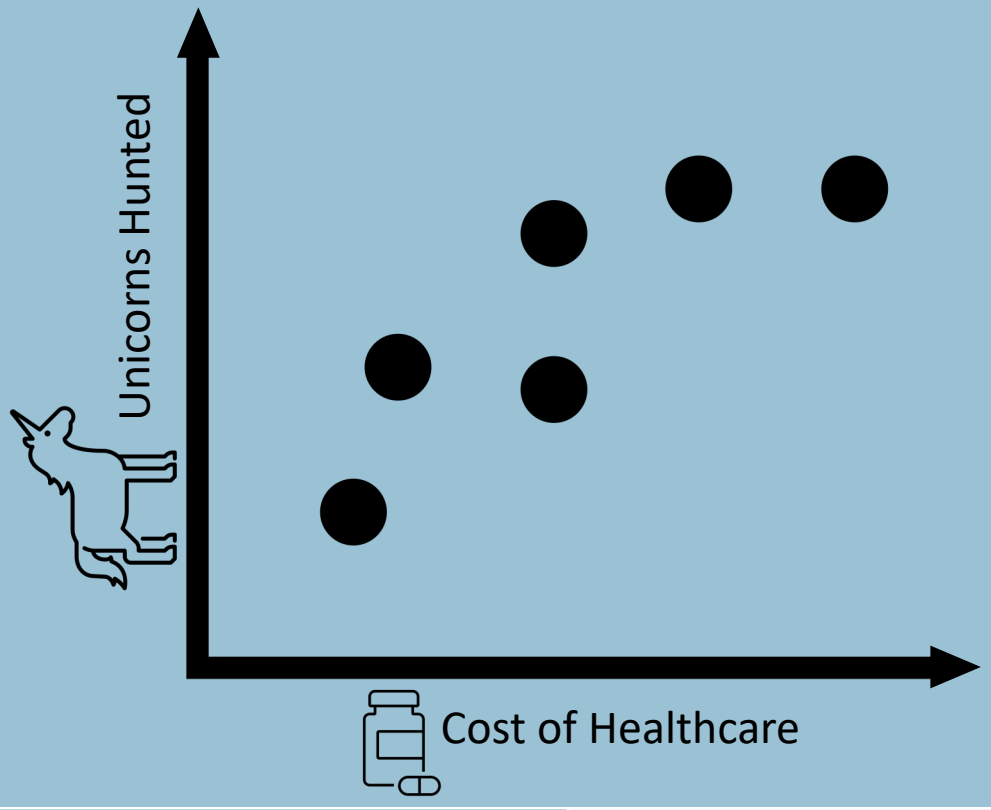
What is Human Behavioral Modeling

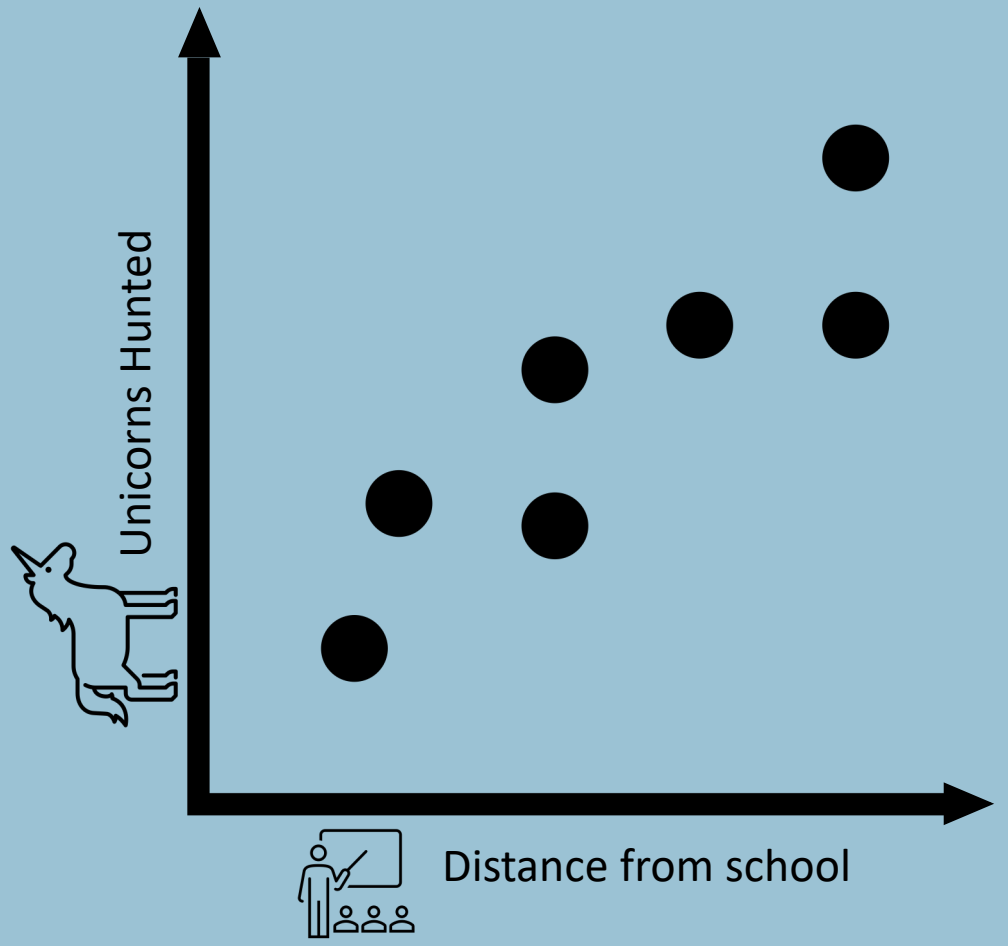
- Prediction and explanation of behavior
  - Simple linear regression to a complex multifactorial model
  - Y axis is conservation-relevant human behavior
    - Need X axis to explain Y
      - Unicorns are poached for their horns (Y)
      - Because people need money (X)



What is Human Behavioral Modeling

- (Y) = often explained by more than one predictor (X)
  - But why do they need the money?
  - Multiple reasons or potential hypotheses

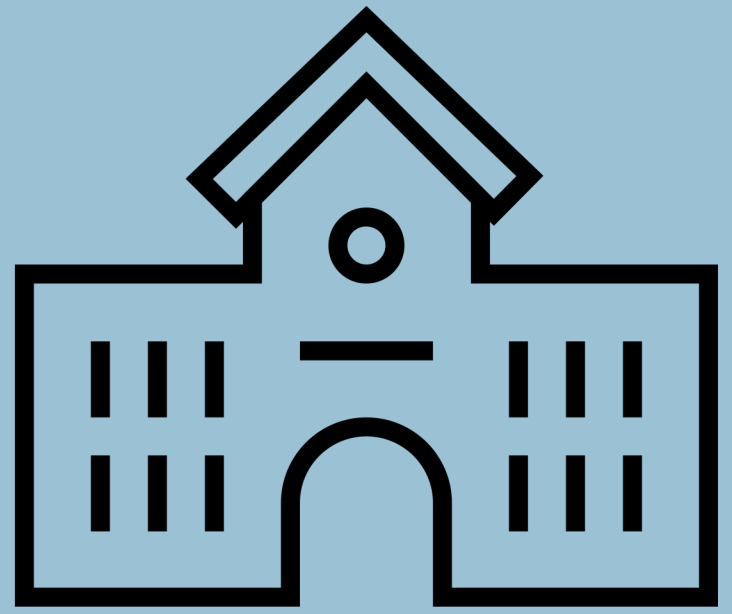




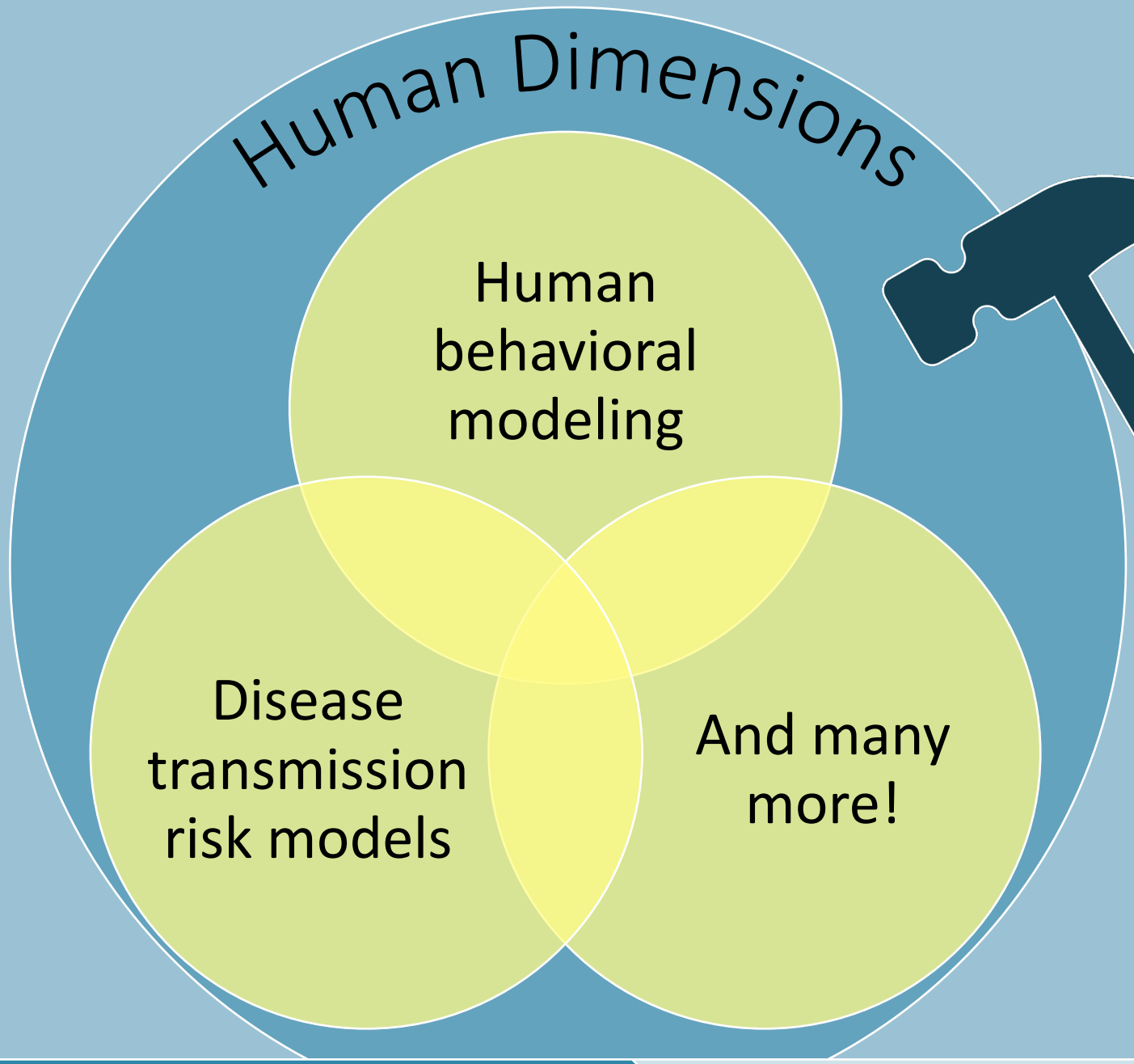
What is Human Behavioral Modeling

- Multiple reasons mean multiple possible solutions

Fund the Free Clinic



Build a School



- Human Dimensions
  - Wide range of tools
  - Wide range of expertise
  - Very broad definition
- Human Behavioral Modeling
  - Specific tool of human dimensions research
  - Focuses on understanding the “who” and “why” behind human actions

Human Behavioral Modeling in Social Science

- Tool used in social science for decades
  - Theory of Planned Behavior—Ajzan 1991
  - Social-Ecological Networks—Bodin & Tengö 2012
  - Theory of Change—Weiss 1995
  - Many more foundational papers

Social Science in Conservation Science

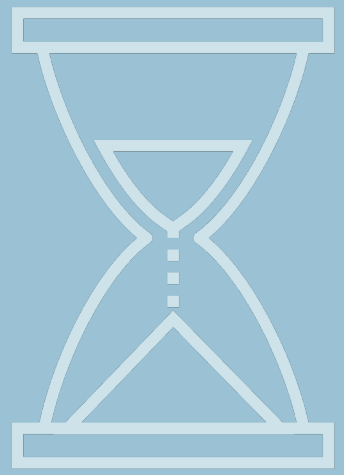
- When did modeling people start?
  - On and off for ages, but poorly
  - St John & Jones 2010 foundational paper
  - Emphasis on integrating social science frameworks into conservation
- Conservation as a biological AND sociological challenge

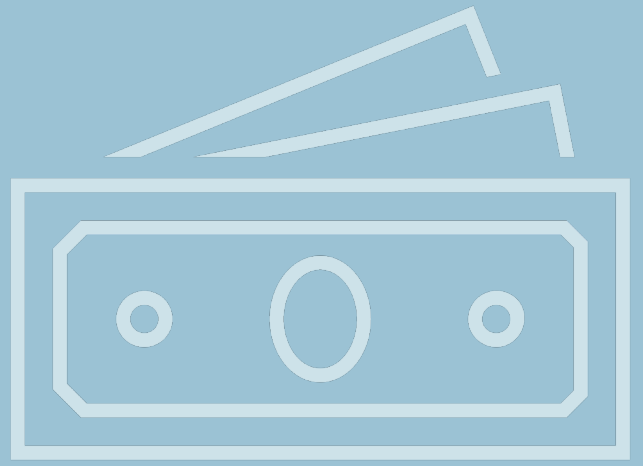
Important Terms

- Terms with different meanings in social science than common use
  - **Attitude:** beliefs about the likely consequences and experiences associated with the behavior (Ajzen 2019)
  - **Behavior:** An action carried out in response to a particular situation or stimulus
  - **Intention:** a person's plan to perform the behavior

Why Should I Care?

- Impacts conservation actions and their effectiveness
  - Time is critical, use the best approaches first
  - Money is limited, use it more effectively





Ok, so I care now, how do I start to use these tools

Social Science is Still Science

- Using data to answer a question
- Hypotheses and predictions
- Have theoretical frameworks
- Standardized protocols and analyses

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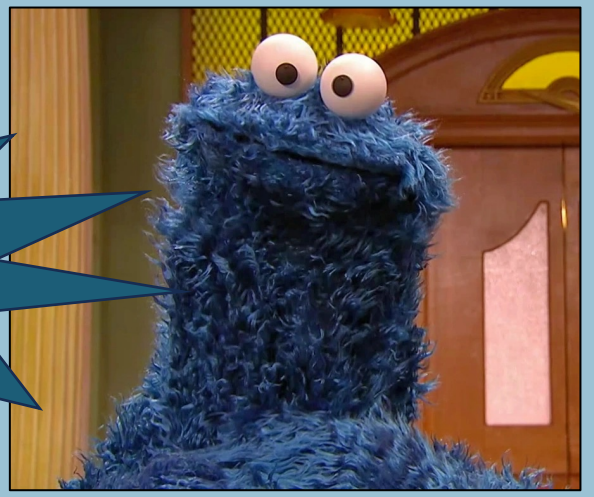
Social Science is Still Science

1971

- Why are the cookies gone?
- Someone ate them
- Past data on cookie thieves
- Ask Cookie Monster if he ate the cookies



2024

Social Science is Still Science

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1971

2024

Social Science is Still Science

- Why does Cookie Monster eat cookies?
- Cookie Monster eats cookies because they are tasty
- Use the Theory of Planned Behavior
- Interview Cookie Monster about why he eats cookies

1971

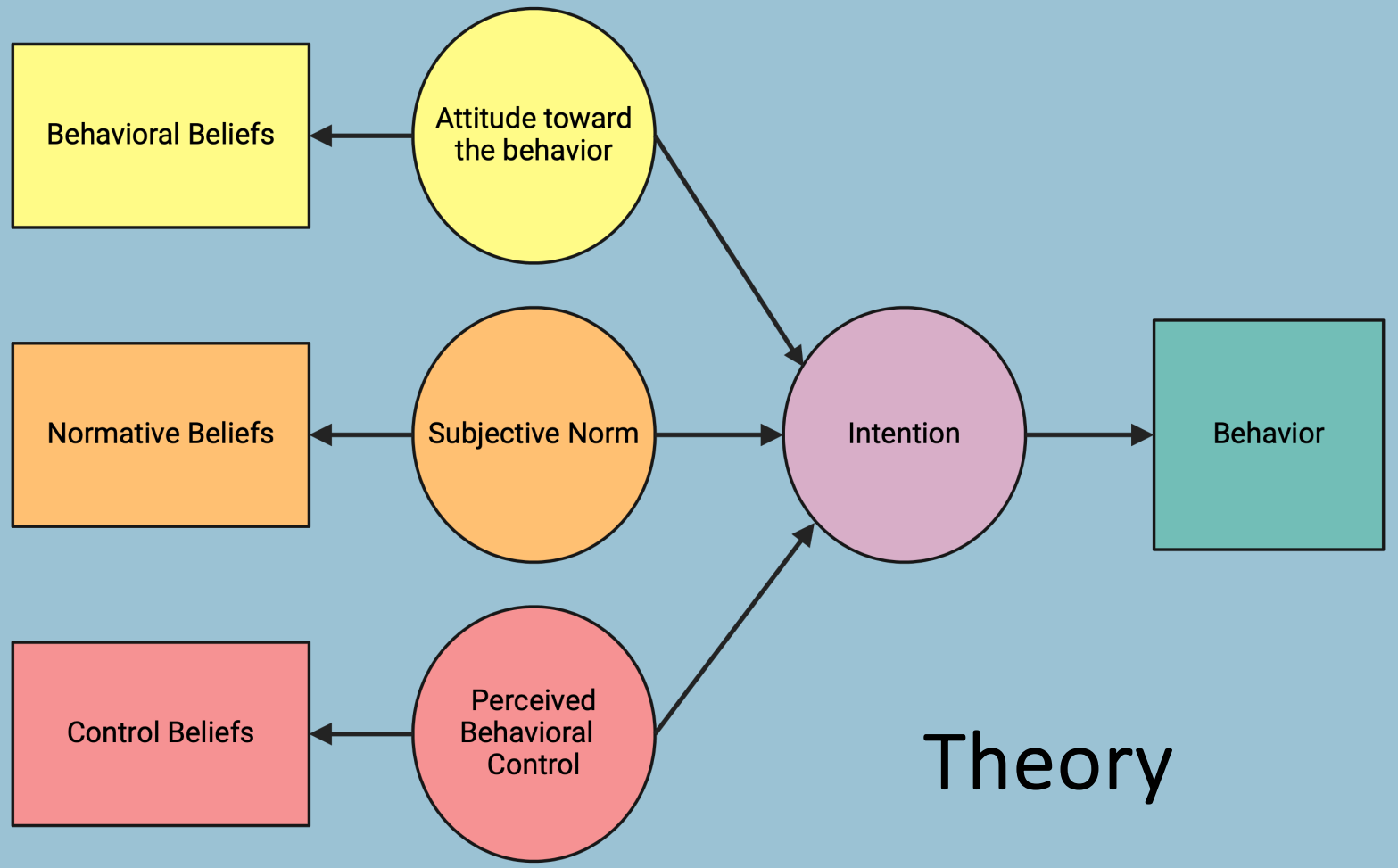
2024

Theoretical Foundations

- Please don’t reinvent the wheel, steal it from social scientists
- Behavioral modeling also has theories specific to their sub-discipline
  - Theory of Planned Behavior (Kingston 2016; Ajzen 2019)
  - Socio-Ecological Networks (Dee et al. 2017; Kluger et al. 2020)
  - Theory of change (Mayne 2015)
  - Many others

Theory of Planned Behavior

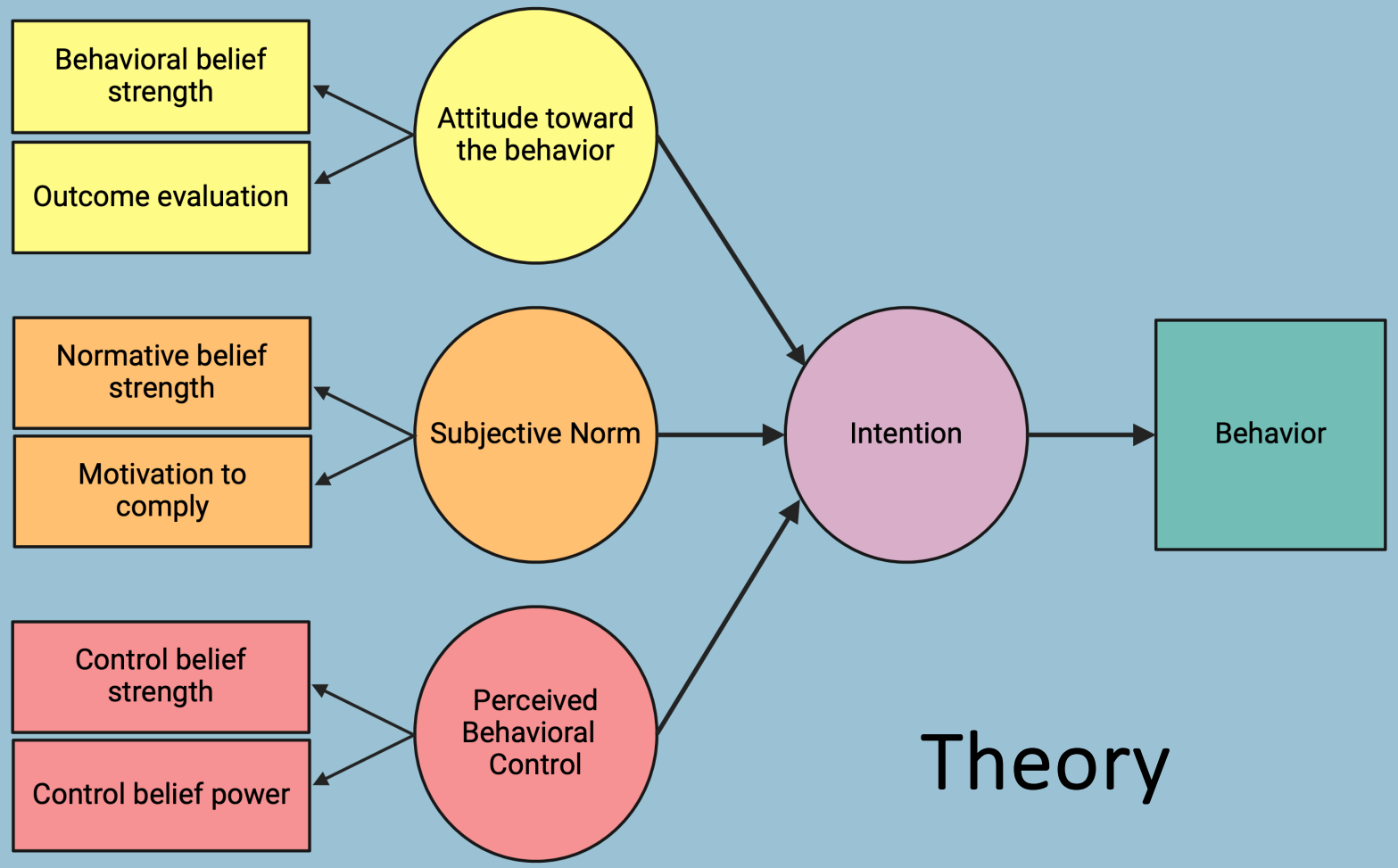
- **Attitude:** beliefs about the outcome of performing a behavior
- **Subjective Norm:** Perceived social pressure
- **Perceived Behavioral Control:** beliefs about the ability to perform a behavior successfully
- **Intention:** Plan to perform the behavior



Theory

Theory of Planned Behavior

- **Behavioral belief strength:** Impact of the behavior
- **Outcome evaluation:** Importance of the result of the behavior
- **Normative belief strength:** Understanding of others' beliefs/actions
- **Motivation to comply:** Importance of behaving like others
- **Control belief strength:** Belief that a barrier or advantage is likely to be present
- **Control belief power:** The ability to help or stop the performance of a behavior



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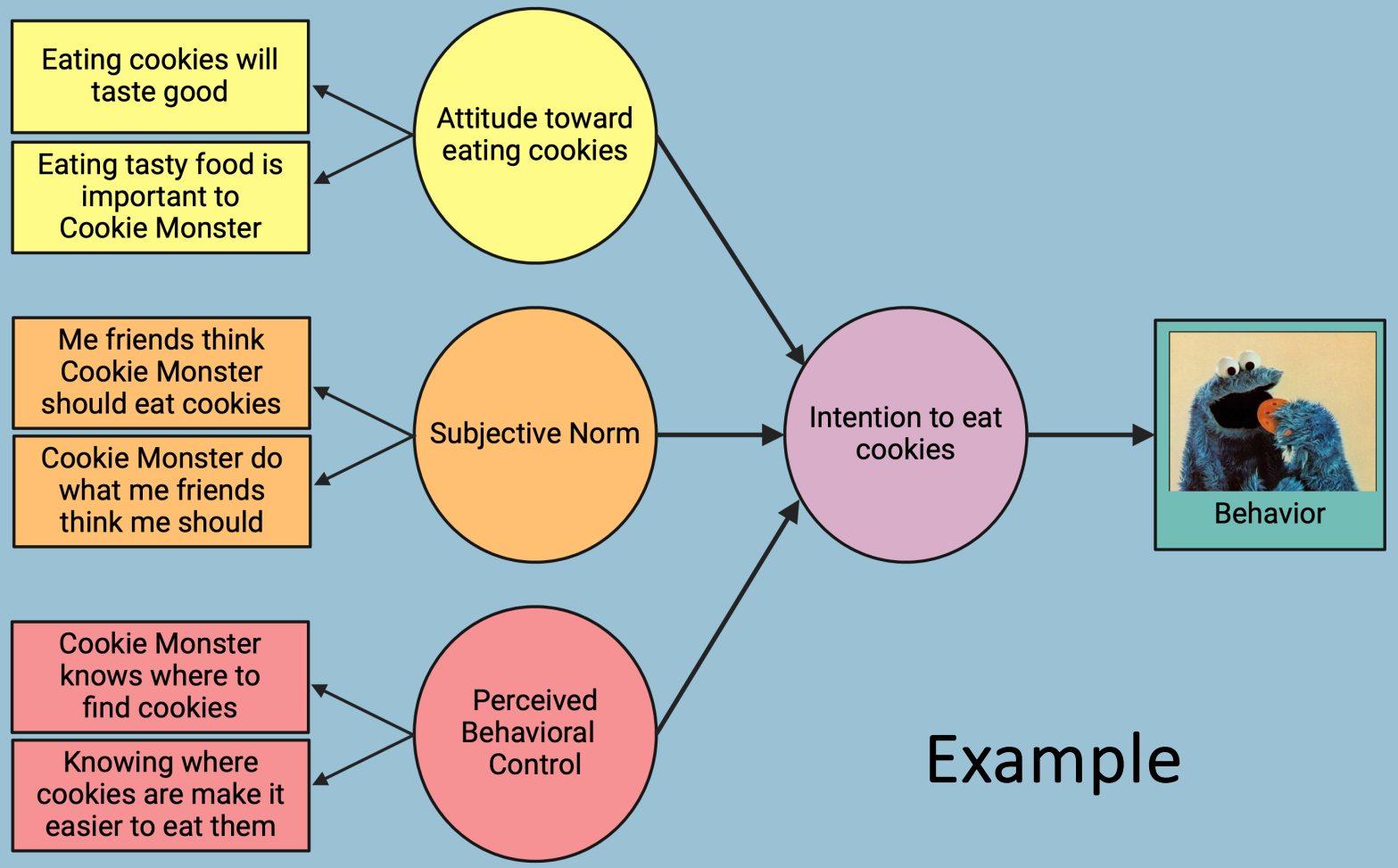

Example

Theory of Planned Behavior

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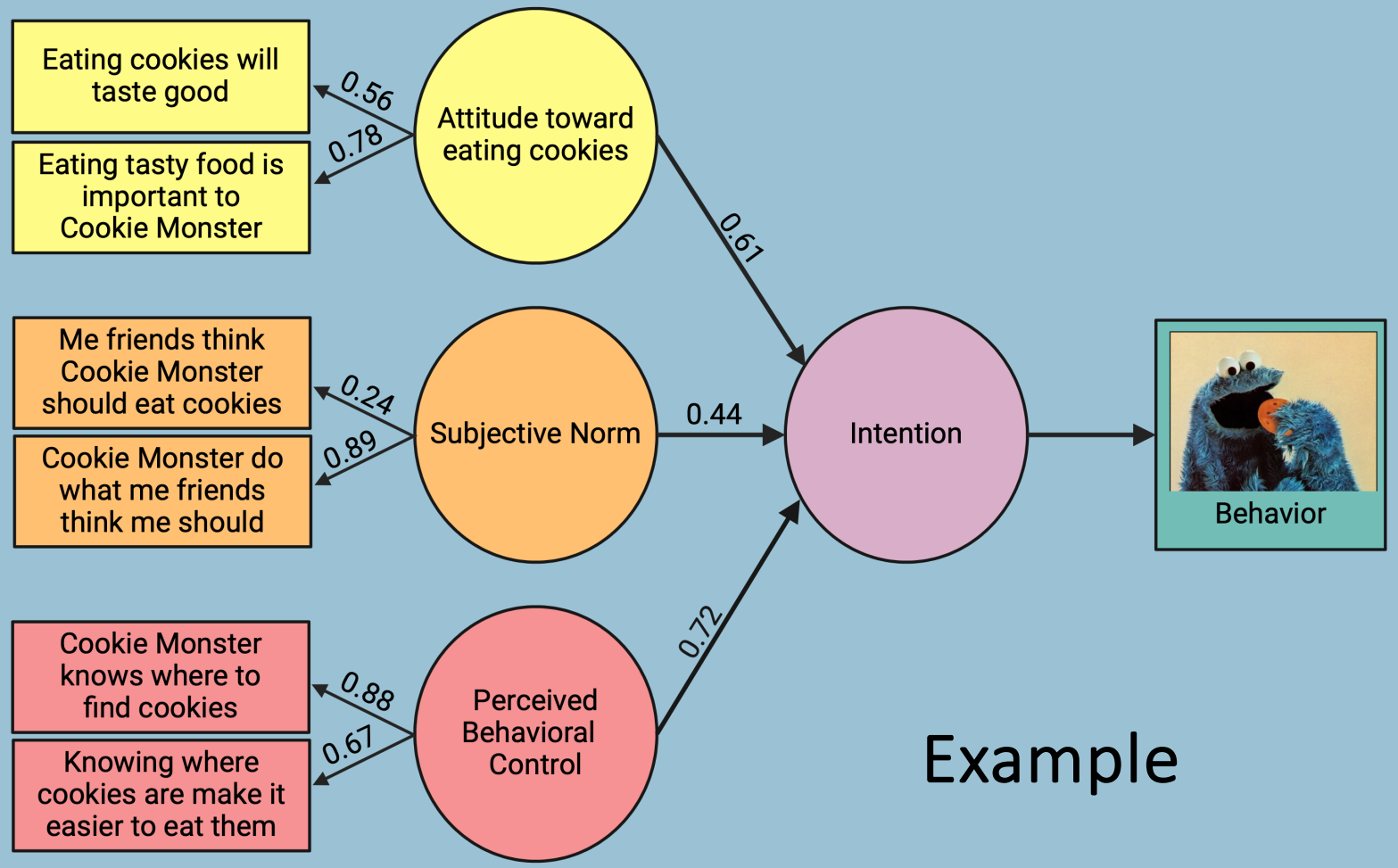


Example

Theory of Change/Result Chain

Theory of Change/Result Chain

Theory of Change/Result Chain

Hide the cookies

Theory of Change/Result Chain

Make more cookies

Look for a hiding spot

Hide the cookies

Eat healthy food

Cook dinner

Eat dinner

Retrieve container

Go to the store

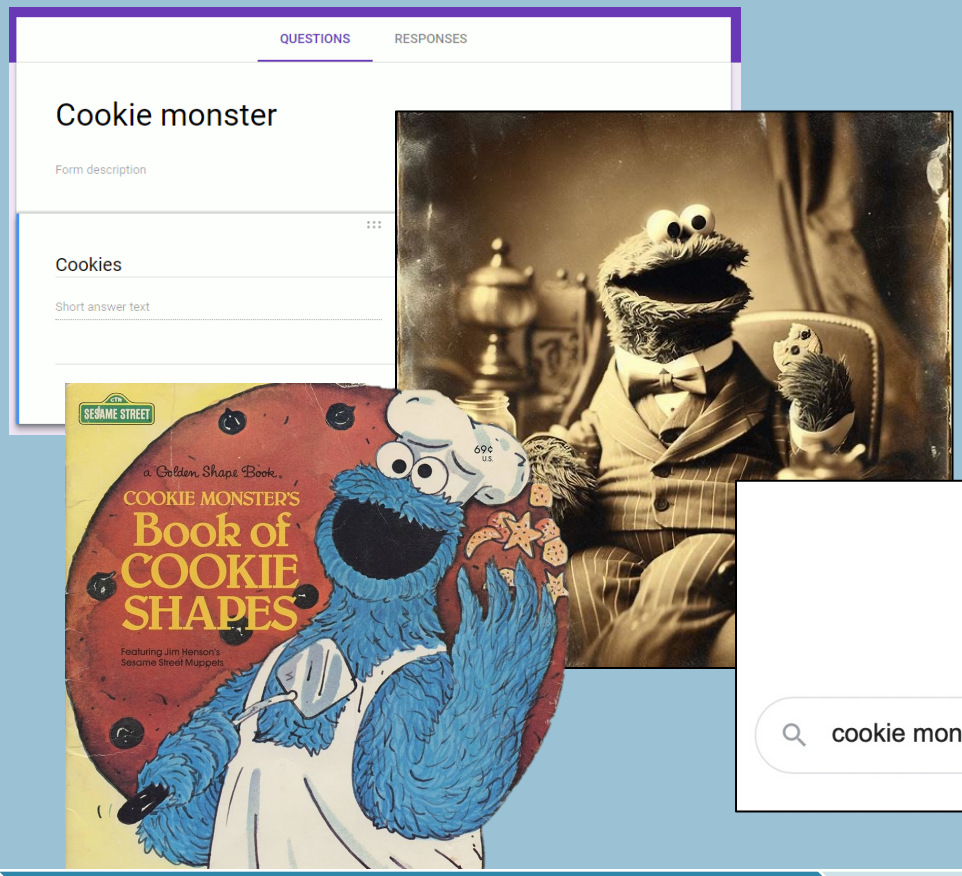
Buy cookies

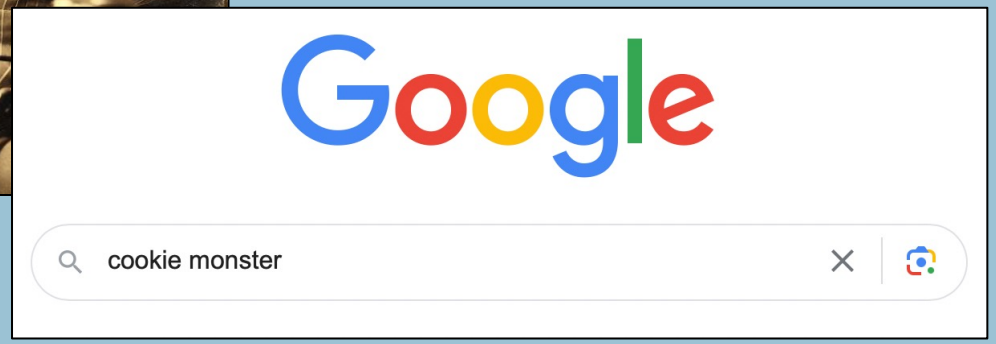
Question/Hypothesis

- **Setting up the system**
  - **Who** are you studying → Cookie Monster
  - **What** are you measuring → Intent to eat cookies
  - **When** are you studying → 1971-Present
  - **Where** are your subjects → Sesame Street
  - **Why** are you studying this → Because we want cookies too
  - **How** will you collect the data → Interview Cookie Monster

Data Collection

- Theoretical foundation determines the data source
  - Surveys
  - Historical reports
  - Web scraping
  - Legal records
  - Gray literature
  - Etc, etc, etc…





Surveys

- Pitfalls, challenges and recommendations
  - Takes time and thought
    - Frequently needs to be designed for a specific project
      - Written or given orally?
      - In what language?
      - Sensitivity of topic?
- Often recommend a “mixed methods approach”
  - Focus groups or targeted interviews to develop and test the survey questions
    - Pilot/intellectual load testing
    - Even available surveys need to be tested and modified
    - Cannot assume surveys and understanding are universal
  - Survey then given to larger target group

Focus Group

Targeted Interviews

For interventions/true experiments

- Define the metric of success → Enough cookies to share
- Determine how is it measured → Number of cookies left in the cookie jar
- Include a control group → House with unhidden cookies

Quantitative Analysis

- Methods to analyze the data and framework
  - Basic Stats—Musila et al. 2018
  - Network analysis—Kluger et al. 2019
  - Structural Equation Models—Reid 2016
  - Combination—Struebig et al. 2018
  - Lots of others

Reporting Results

- Fully describe the summary statistics for your study population
  - Publish the questionnaire and, if possible, the deidentified data in an appendix
- What to include
  - Basic demographic, timeline, and location data
  - Survey instrument validity and reliability
  - Results of analyses

Discussion

- Link the discussion (applications/recommendations) to your findings
- Be clear, specific, and actionable
  - Good: Further work should focus on determining what makes an effective cookie hiding place
  - Bad: More research is needed
  - Good: Cookie conservation interventions should pay special attention to hiding the cookies well
  - Bad: This research will inform the actions of cookie conservation interventions

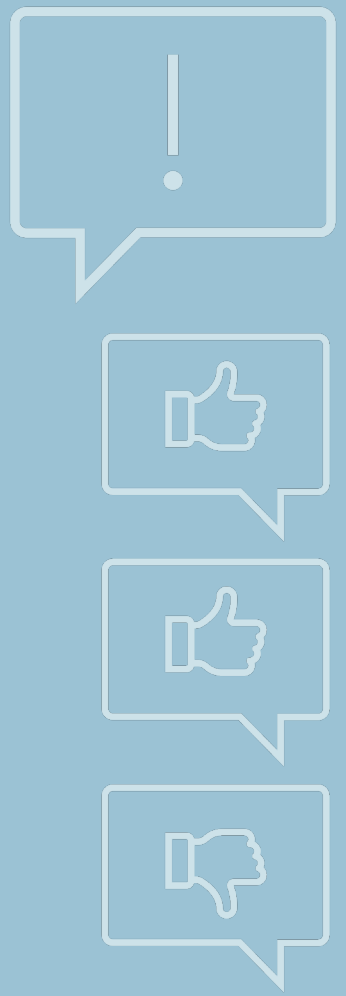
Recommendations for Good Social Science

- Get a social scientist on board early
- Consider groundwork for longitudinal work
- Expand the dissemination of the paper to other stakeholders (e.g., press releases, meetings with authority figures)
- Create secondary products (e.g., policy briefs, informational flyers)

Human Behavioral Modeling: Examples in Bat Research

Batrice et al. (Revised Review)

- Does sentiment toward bat exploitation vary by region in Asia?
- Sentiment analysis
- Social media survey
  - Gathered posts from multiple sites in multiple languages
  - Analyzed text, images, and emoji to determine sentiment
- Found that posts from Southeast Asia were more accepting of bat exploitation whereas comments on posts from South Asia were more negative
- The sentiment of the first post drew comments with similar sentiments

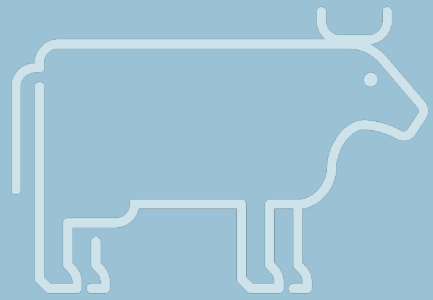


Straka et al. 2023

- What emotions do Germans have about bats?
- Emotional response framework
- Repeated survey approach
  - Survey given once and then again one year later
  - Analyzed questionnaire with basic statistics
- Found that most people felt positively about bats
- Emotions did not change between early in the COVID-19 pandemic vs the late pandemic

Reid 2016

- What predicts bat killing in Costa Rica?
- Theory of Planned Behavior framework
- Mixed methods approach
  - Used focus groups and targeted interviews to develop a questionnaire
  - Gave tailored questionnaire to a larger group
  - Analyzed questionnaire with Structural Equation Models
- Found that men with greater natural history knowledge or environmental education were less likely to intend to kill bats



Ongoing Work

- Determining the drivers of bat hunting Nigeria
- Trilateral work on bat hunting in Southeast Asia
- IUCN Bat Specialist Group—Field hygiene practices of bat researchers
- Modeling bat hunting around the world

Questions?

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