

Framework for considering and implementing behavioral interventions

Emily Gurley

Preventing Patient Zero: A Workshop

National Academies of Sciences, Engineering and Medicine

15 January 2025



JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH

Acknowledgements

- Steve Luby
- Nazmun Nahar
- Rebeca Sultana
- Salah Uddin Khan
- Nadia Ali Rimi
- Shahana Parveen
- Mahmudur Rahman
- Hossain MS Sazzad
- Sonia Hegde



#1 Evidence that
suggests a
behavioral target
for intervention

Evidence about spillovers hard to get

- Best case scenario: multiple investigations, over time and space, show that this behavior is associated with spillover infection
 - Good evidence for causal association
 - Mechanistic understanding
- Investigations limited by sample size
- Behavior can be ubiquitous
- The greater the specificity of the behavioral target, and strength of the association, the better the chances of success

Promoting better investigation of spillovers

- One Health Investigation of Outbreaks and Spillovers
- Course launching on Coursera spring 2025



Behavior change for Nipah spillovers

- Investigations from 2001 – 2011
- Date palm sap suspected in 2004; convincing evidence in 2005
 - “Smoking gun” outbreak – reinterpretation of past outbreaks
- Large outbreak from date palm sap in 2011
- Wide acceptance that this behavior should be a target for serious intervention
- Many “could be” behaviors discussed

Date palm sap tree



#1 Evidence that
suggests a
behavioral target
for intervention



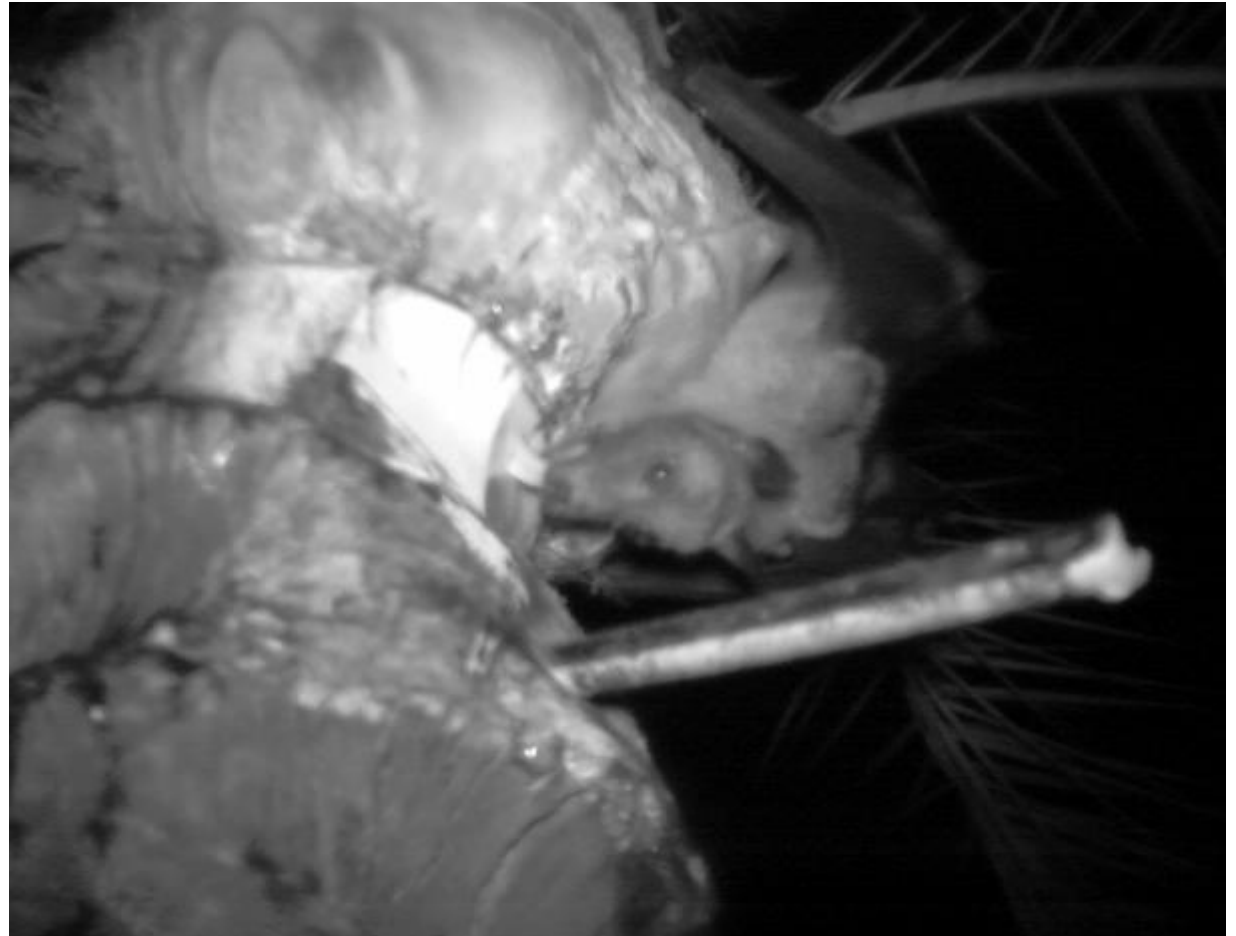
#2 What are the
incentives for this
behavior?

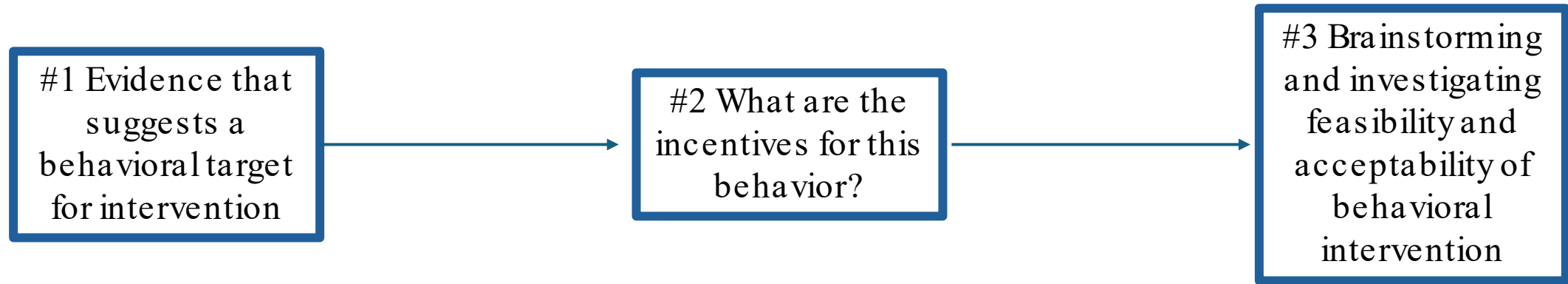
Anthropological research

- Need to understand:
 - Incentive structures (economic and beyond)
 - Cultural and social import
 - Physical realities and infrastructure
- In-depth interviews and observations
 - Pig raising and slaughter
 - Date palm sap collection and consumption
 - Slaughter of moribund cattle
 - Bat hunting
- Ethnography
 - Backyard poultry raising, slaughter of sick animals

Anthropologists and ecological studies provide context

- Fresh sap from date palm trees
- Considered a delicacy
- Late November through March/April
 - A tap is cut into the tree
 - Some sap is sold fresh early in the morning
- Fruit bats are a nuisance
 - Drink sap
 - Defecate into sap
 - Occasionally drown in the pot





Awareness and education as interventions

- Can be an important part of behavioral interventions
- “If they just knew, they would do x, y, z”
 - People usually do things for a reason
 - Not that simple – consider obesity epidemic in US and diet and exercise advice
- Spillovers are rare
 - Risk perception is low
- Misalignment of who acts and who benefits
 - Benefits of preventing large outbreaks or pandemics accrue globally

Increasing chances of success

- Proposed intervention is feasible
- Proposed intervention is acceptable
- Should target the highest level possible to increase chances of scale up
 - Changes to regulation and mass media messages versus individual level counseling
 - Scale up and effectiveness are often competing
- Abstinence only interventions more difficult than alternative behavior approaches

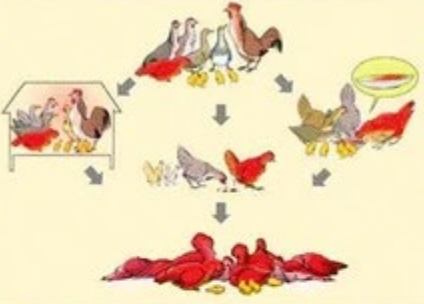
Failed behavior change education campaign

Bird Flu what is it?

Bird flu is a poultry disease. Poultry die very quickly in this disease. They get drowsy, and the wattle and comb become blackish blue. Wattle, comb, head and body swells with water. They get blood spots in legs.



Bird flu can spread from one poultry to another. This is how it spreads:



- Keeping healthy and sick poultry in the same place
- Giving food in the same plate
- Pecking on feces of sick poultry
- From saliva, feces, blood, offal, skin, feathers of sick poultry or poultry died of disease

Bird flu can also spread from poultry to human. This is how it spreads:

- While carrying poultry to market for selling
- While feeding or giving medicine
- While slaughtering
- While defeathering

If people put their hands on their nose, mouth or eyes without washing after handling sick poultry or poultry died from disease. The germ of this disease can go inside the wind pipe and lungs with breathing through nose.



As a result, people can get fever, cold, coughing, throat ache, and breathing difficulty and may even die even the condition worsens.

Bird Flu: What to do?

- Sick poultry should be kept separated and away from healthy poultry or one's self.
- Sick poultry should not be bought or sold.
- Poultry dead from disease should be buried.

Nose and mouth should be covered well while handling sick and dead poultry and hands should be washed well after handling.



Burying Cleaning slaughtering tools Cleaning slaughtering site Washing hands

Sick poultry should not be slaughtered



If one has to slaughter sick poultry, then one should:

- cover nose and mouth very well
- stop children from coming near the slaughtering site
- cover the blood-smeared slaughtering site with ash or dust and scrape off the soil from that place and bury
- wash slaughtering tools well with soap or soda or ash and water
- bury offal, skin, and feathers
- at the end, wash hands with soap or soda or ash and water by rubbing well

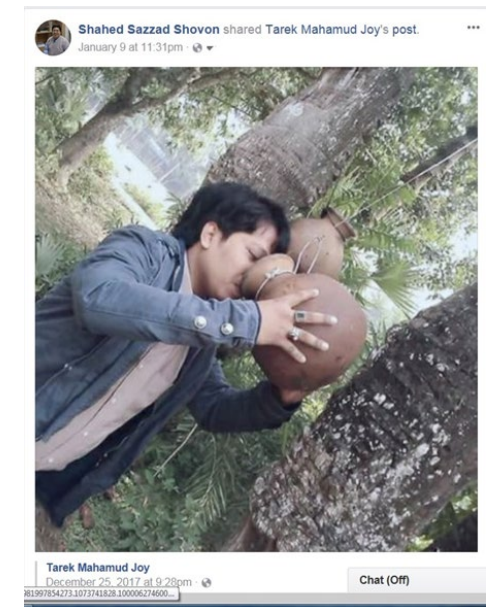
Policy interventions

- Potent
- Weak
- 2011:



Policy interventions

- Potentially very effective – depends on context
- Weak states often cannot implement
- 2011: Don't drink sap!

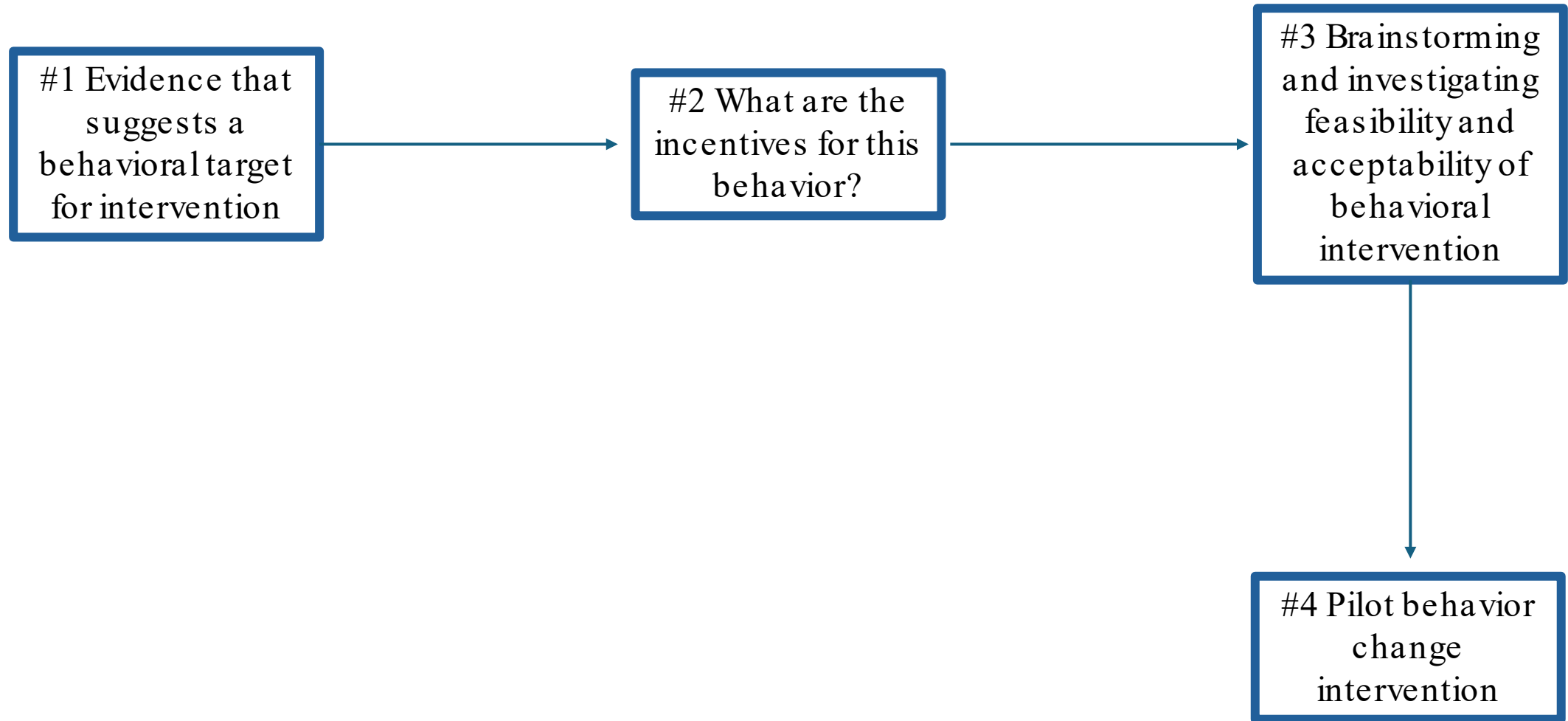


Photos courtesy of Hossain MS Sazzad

Acceptable and feasible interventions for Nipah



Photos courtesy of Nazmun Nahar



Try it and see

- Different from #3 – not just asking if feasible and acceptable, actually measuring what happens if intervention is used
- What are the potential harms or risks of intervention?
- Example of caring for severely ill patients

When you hug and comfort your patient, put your head to their chest



Or, put their head to your chest

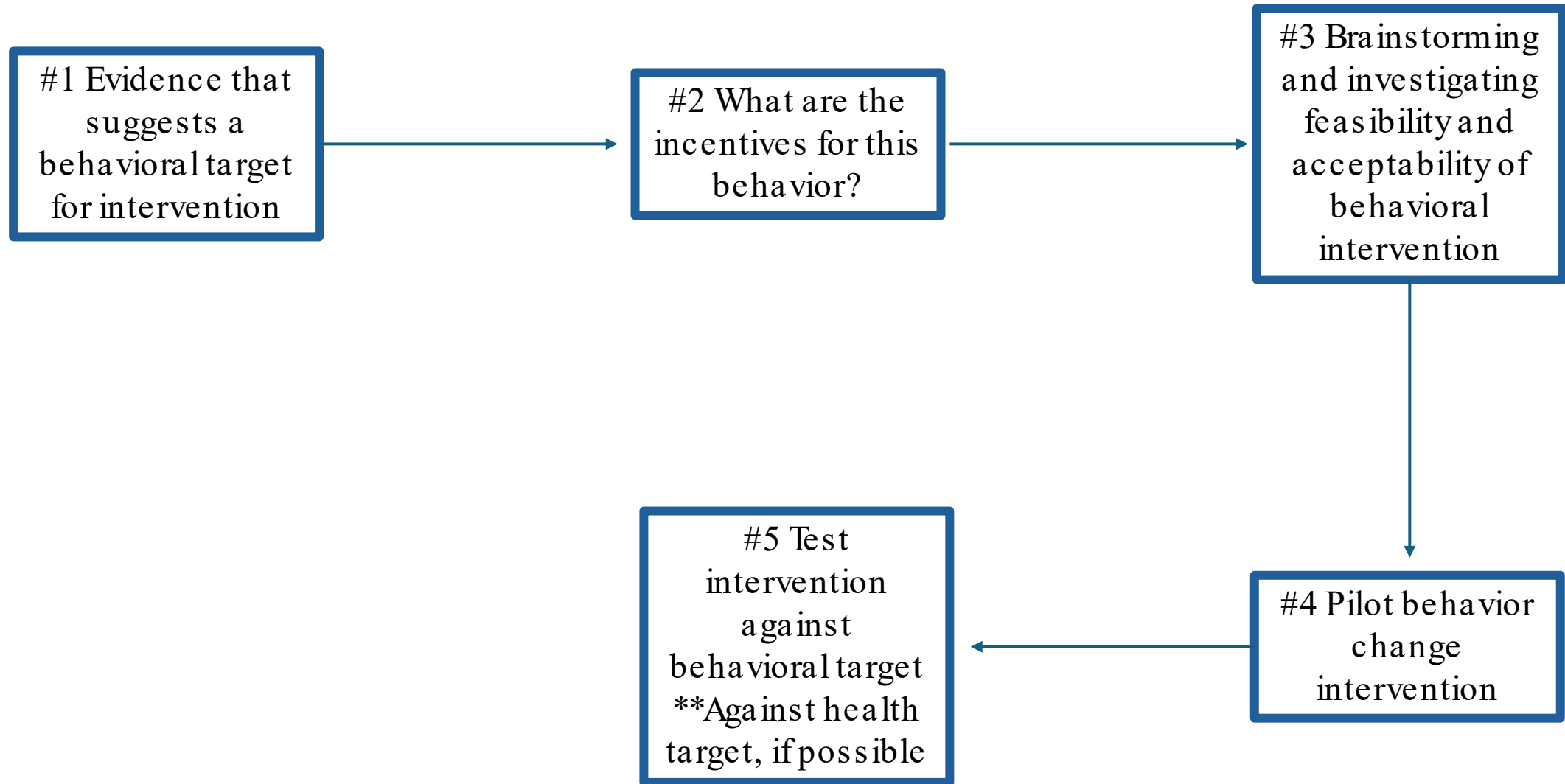


Keep your face less than 1 hand's distance from your patient's face



Piloting use of skirts

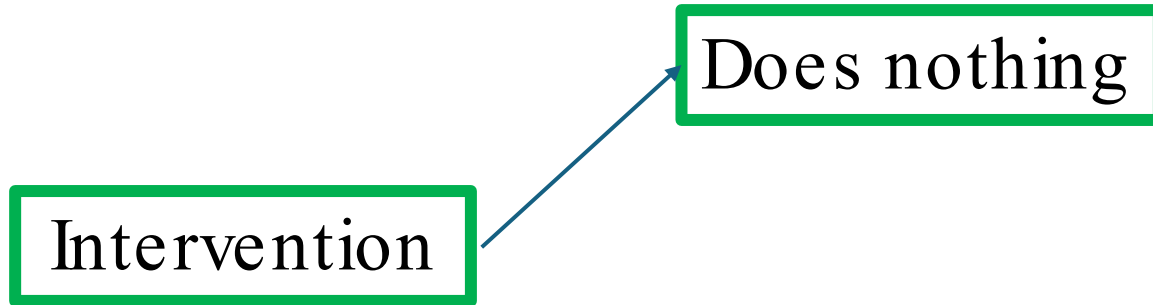
- How long it took to use
 - Was this disruptive to their workflow?
 - How long to make? How much was the cost?
 - Problem solving: use skirts only on trees where sap would be consumed fresh
- Possible harms
 - Stigma against sap harvesters
 - Over burdening sap harvesters with this requirement
- Possible co-benefits
 - Cleaner sap, more sap, increases profits
 - Reputation



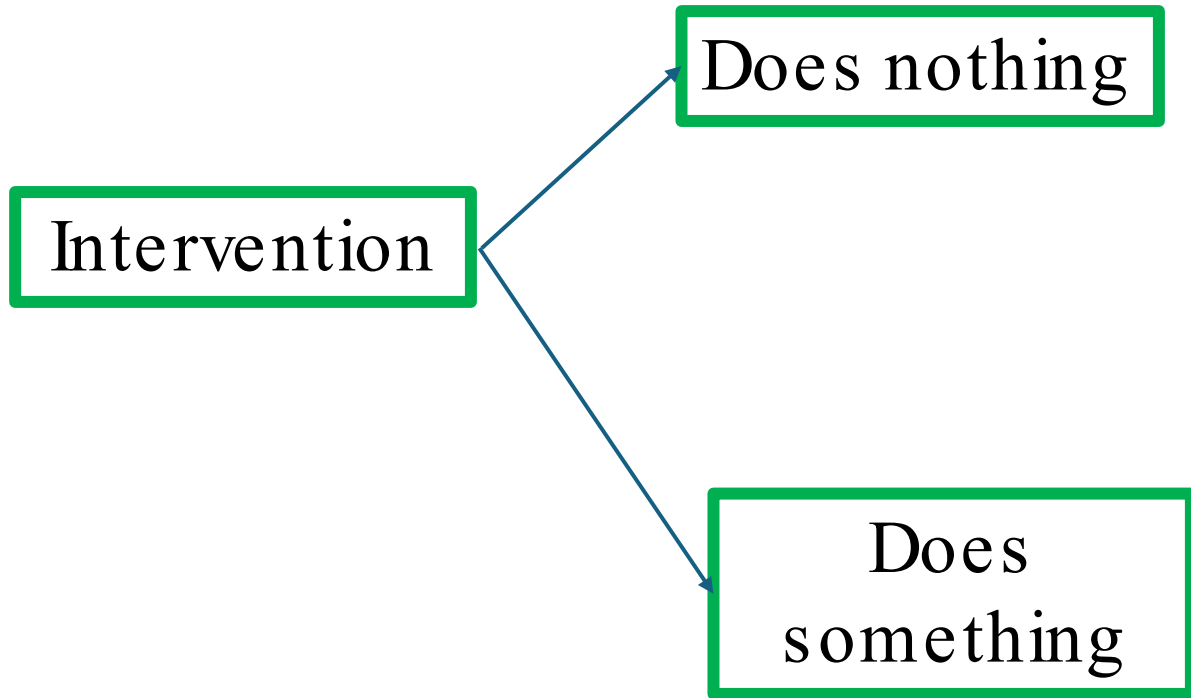
Rigorous study designs

Intervention

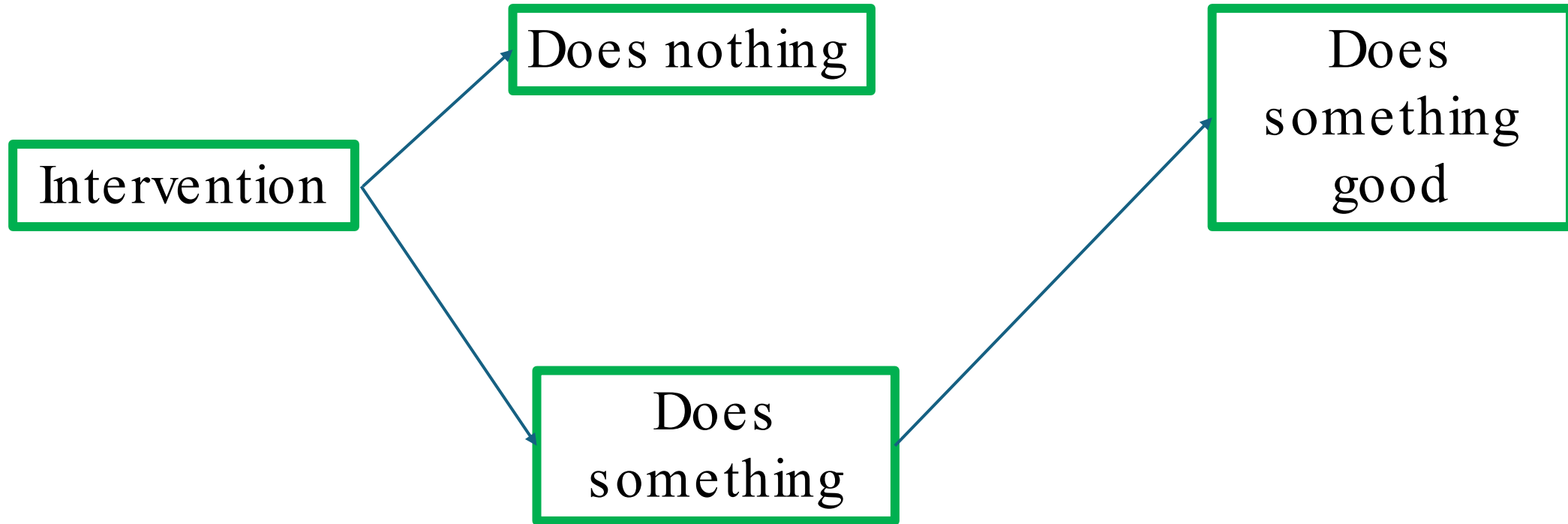
Rigorous study designs



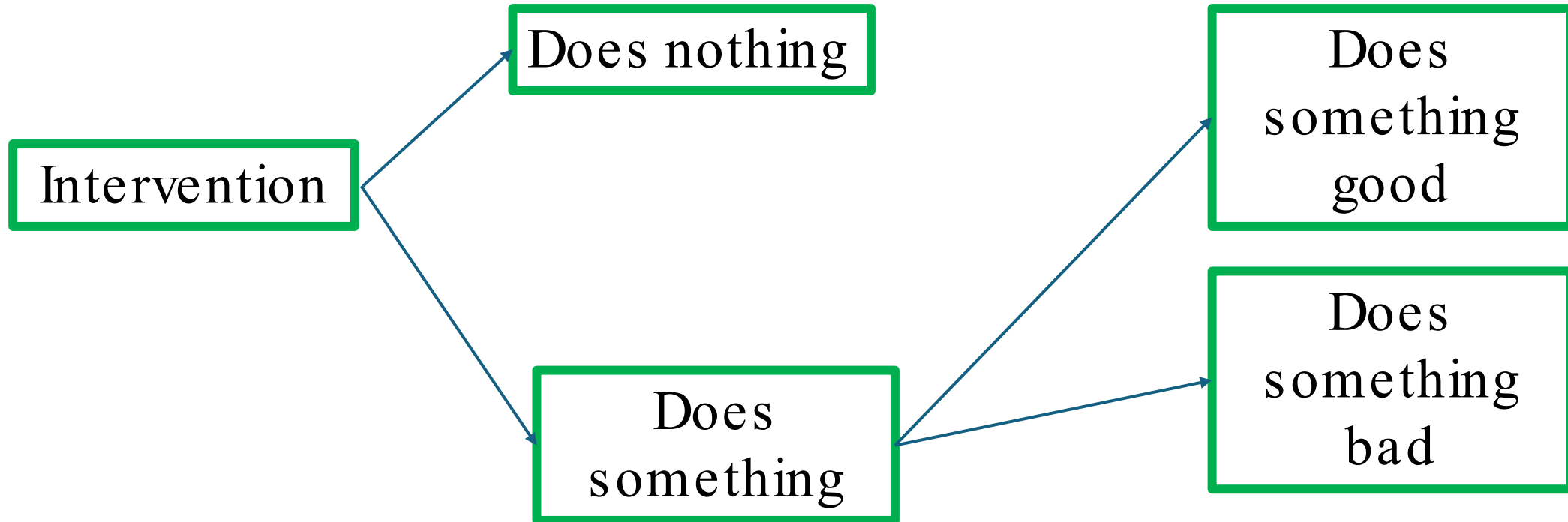
Rigorous study designs



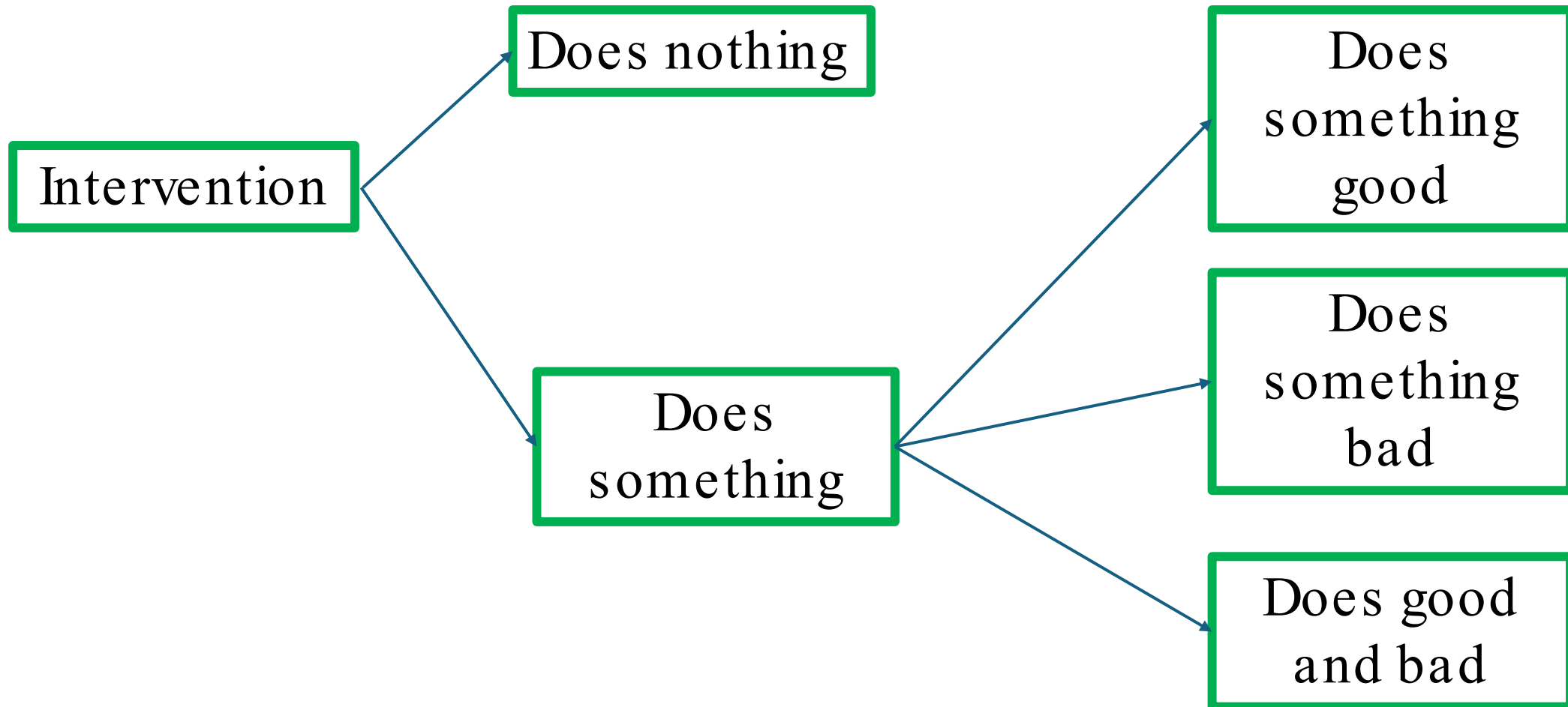
Rigorous study designs



Rigorous study designs



Rigorous study designs



Do skirts keep bats out?

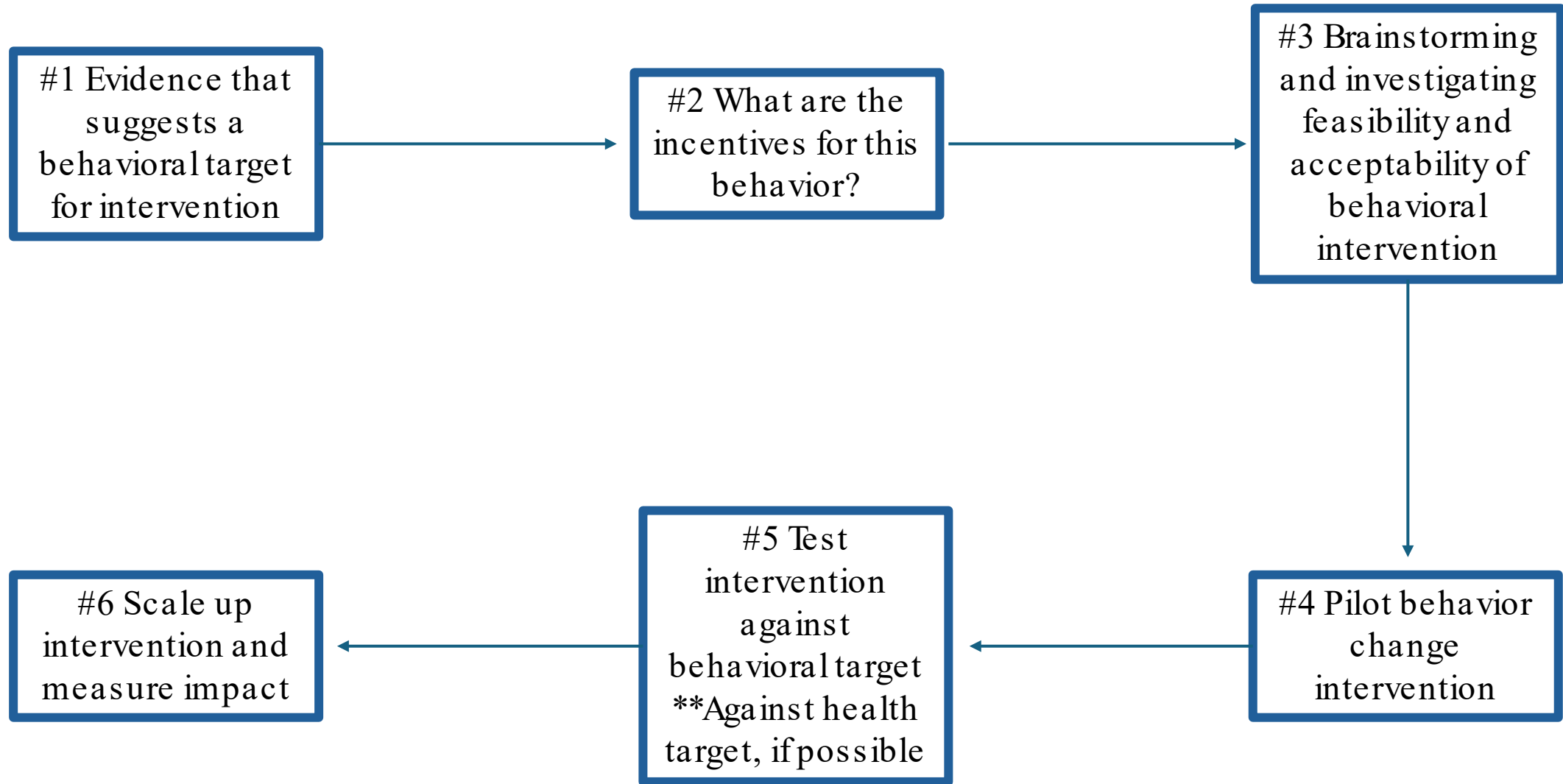
- Randomized controlled trial
- 2010
- 160 intervention and 60 control trees
- Bats visited control trees but could contact sap in only 1 intervention tree



Behavior change to prevent Nipah, 2012 – 2014

- Three communities: 2 intervention, 1 control
- Intensive community counseling and meetings + mass media
- ‘No sap’ and ‘Only safe sap’ interventions
- Sap consumption reduced in all areas
- Knowledge increased in intervention areas
- Only safe sap reduced risk
 - Drinking sap from safe source
 - OR 2.0, 95% CI 1.5-2.6





Same rigorous evidence required

- Reach
- Ideally, ability to demonstrate changes in health outcomes (spillovers)
- Longevity of support and funding should be tied to evidence
 - Cost-benefit of the intervention
 - Who benefits and who pays?
- Ongoing evaluation of potential harms

No scale up of skirt use in Bangladesh

- Costed out components for scale up:
 - US\$2.6-3.5 million per year for full intervention in 30 districts
 - Posters and showing the mass media short movies would be ~\$130,000
- No long-term funding for scale up
- Lack of government support for skirts
 - Potential harms – what if someone drank sap and got Nipah?

