

# Impact Analysis/Causal Analysis and Equity



**TALKING  
DATA EQUITY**

## **Impact Analysis/Causal Analysis and Equity**

**Did a change happen?**

**Did a change happen because of the thing we care about?**

## **Impact Analysis/Causal Analysis and Equity**

**Did a change happen? (Descriptive)**

**Did a change happen because of the thing we care about? (Causal)**

## **Impact Analysis/Causal Analysis and Equity**

**Did a change happen?**

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**Myth #1: RCTs are the only way we can rigorously answer this question.**

**Myth #2: P-values are the only way to know if the change is caused by chance.**

# Impact Analysis/Causal Analysis and Equity

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**Myth #2: P-values are the only way to know if the change is caused by chance.**

**Suggestion #1: Get very clear about the causal question that you care about.**

**Suggestion #2: Answer that question from the perspective you want to prioritize.**

**Myth #1: RCTs are the only way we can rigorously answer this question.**



**RCTs are good at some things. RCTs are bad at some things. Lots of other designs and methods are better at some things. And worse at some things.**

**So what are RCTs great at?**

**RCTs are great at getting us an unbiased estimate of the average treatment effect of an intervention.**



**We are all on the same team.**



**Myth #2: P-values are the only way to know if the change is caused by chance.**



**A p-value is the probability  
that our results are caused by  
chance, right?**

**Wrong.**



**A p-value is the probability of the data being at least as extreme, given that the null hypothesis is true.**

**Snore.**



## **Impact Analysis/Causal Analysis and Equity**

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## **Identifying Causality**

**Did our initiative create the change we're looking at?**

## **Identifying Mechanisms of Impact**

**Will this type of an initiative cause this change again?**

**Why does our initiative cause a change?**

**What is necessary for this change to happen?**

**Will this change scale?**

## **Understanding the Effects**

**Who does this change happen for?**

**Will this change happen here or for me?**

**What is the distribution of the change across the population?**

**Are the new INDIGO Care  
health programs leading  
to increased correct  
diagnosis for infants?**



**Are the new INDIGO Care health programs leading to an increase of at least 10% correct diagnosis for infants?**

# Identifying Basic Causality

**Did our initiative create the change we had wanted to cause?**

**Are the new INDIGO Care health programs leading to an increase of at least 10% correct diagnosis for infants?**

**For the population average? RCT#1: No**

**For the population average? RCT#2: Yes**

**For the majority of the population? Model #1: Yes**

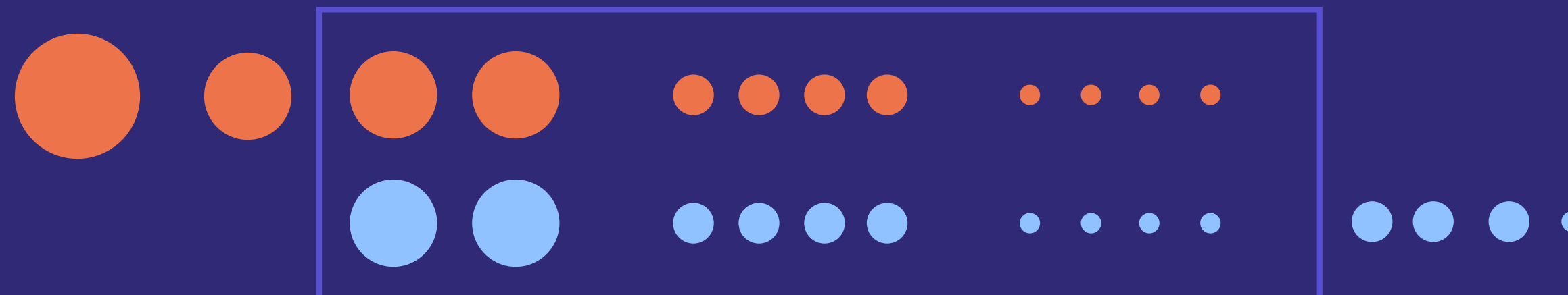
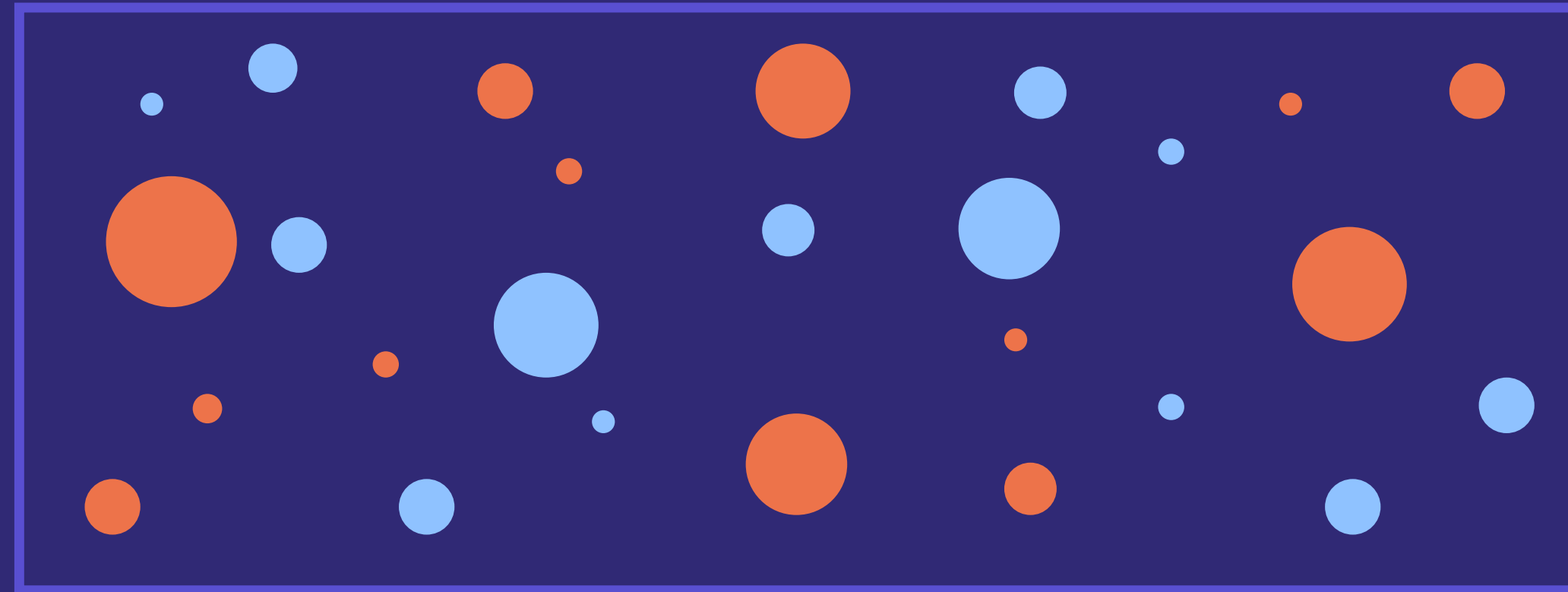
**For the majority of the population? Model #2: No**

**For the population average? Model #3: Yes**

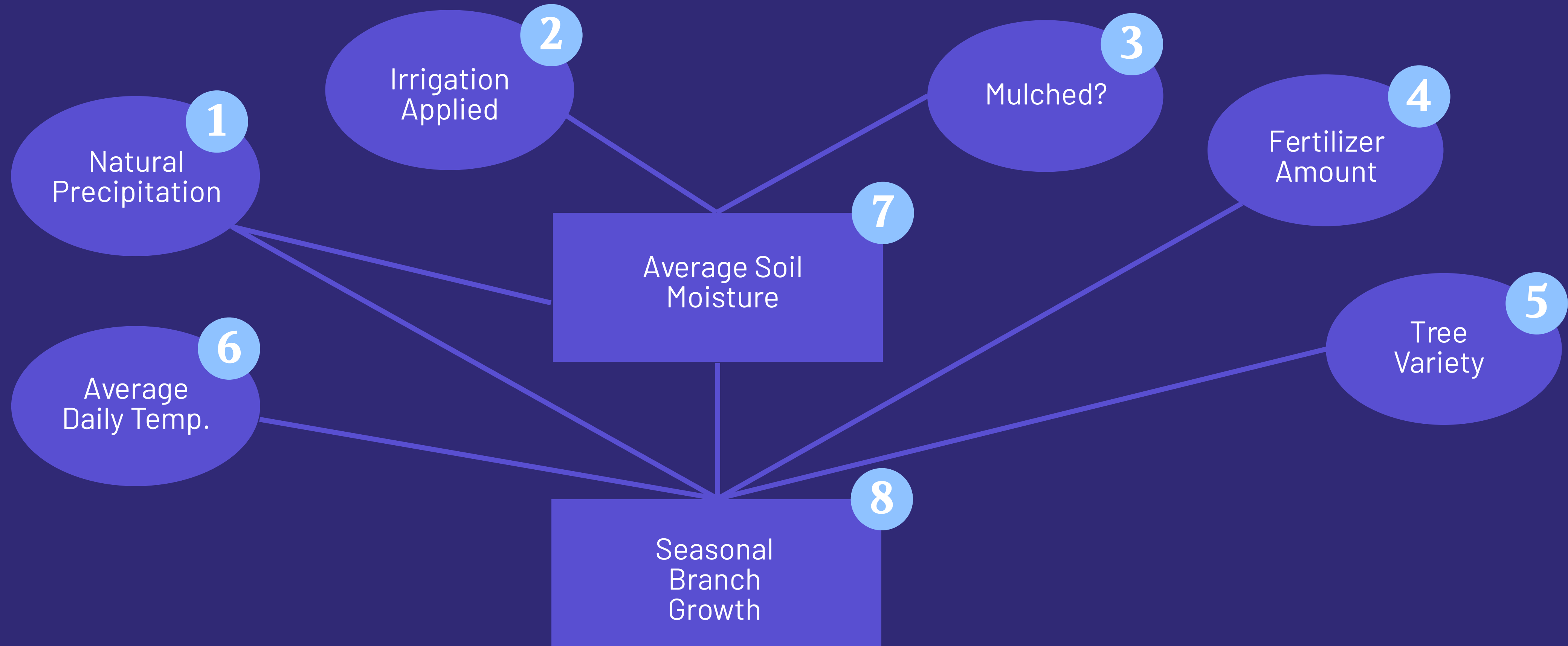
# Identifying Causality: Propensity Score Matching

Population  
with varying  
characteristics

- Treatment
- Control

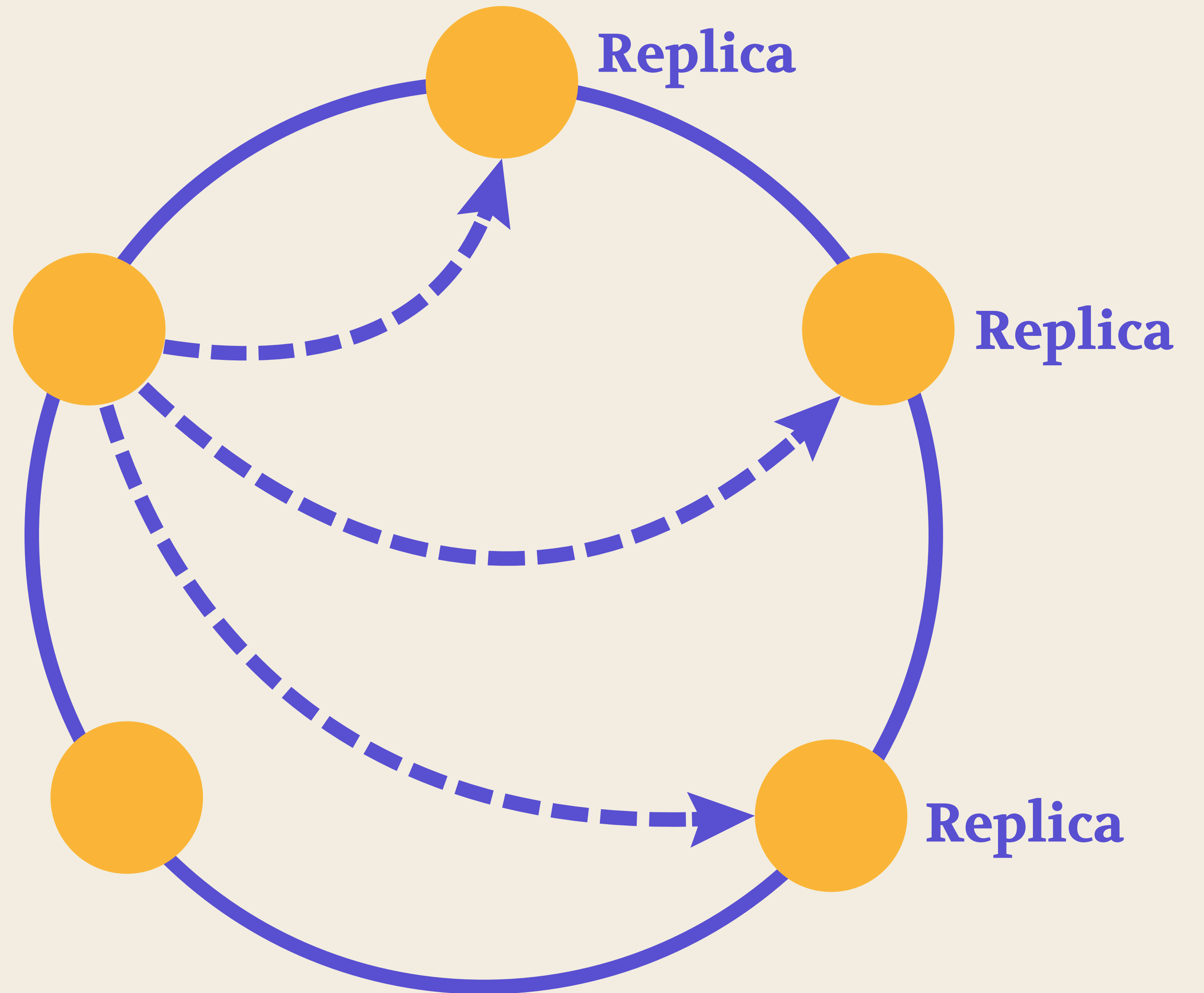


# Identifying Causality: Causation Network Models

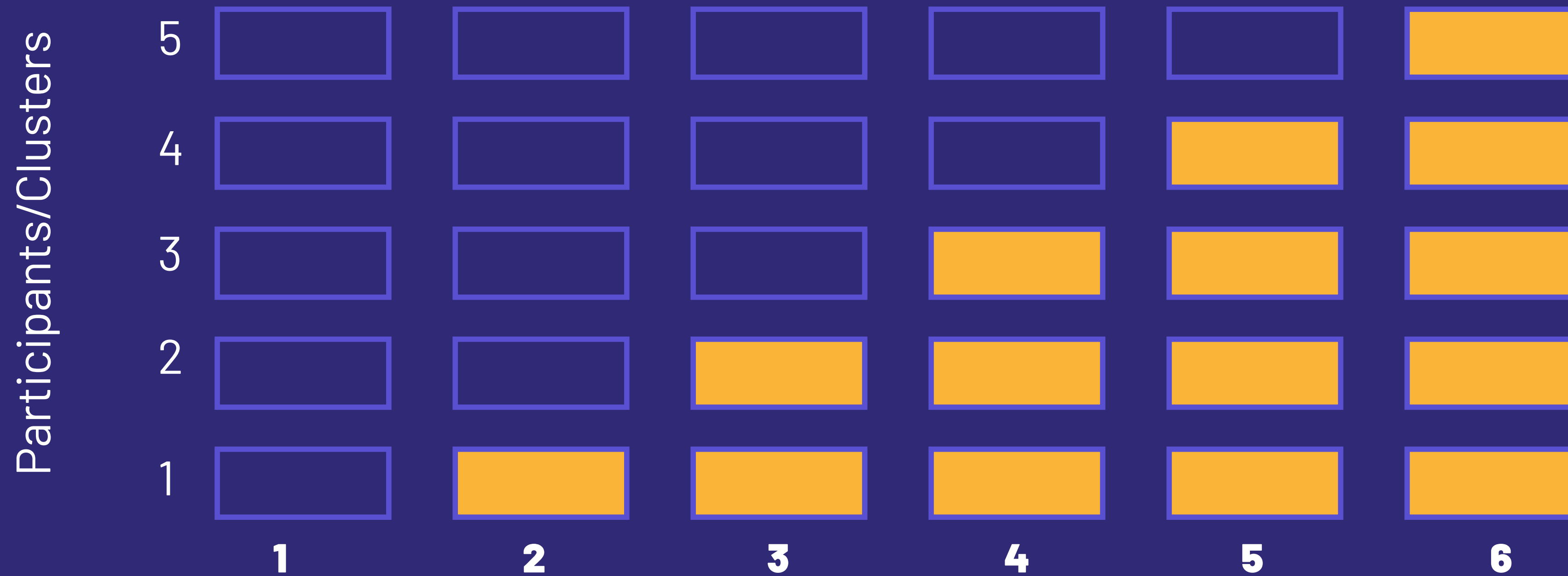


**Identifying  
Causality:**

**Serial Replication**



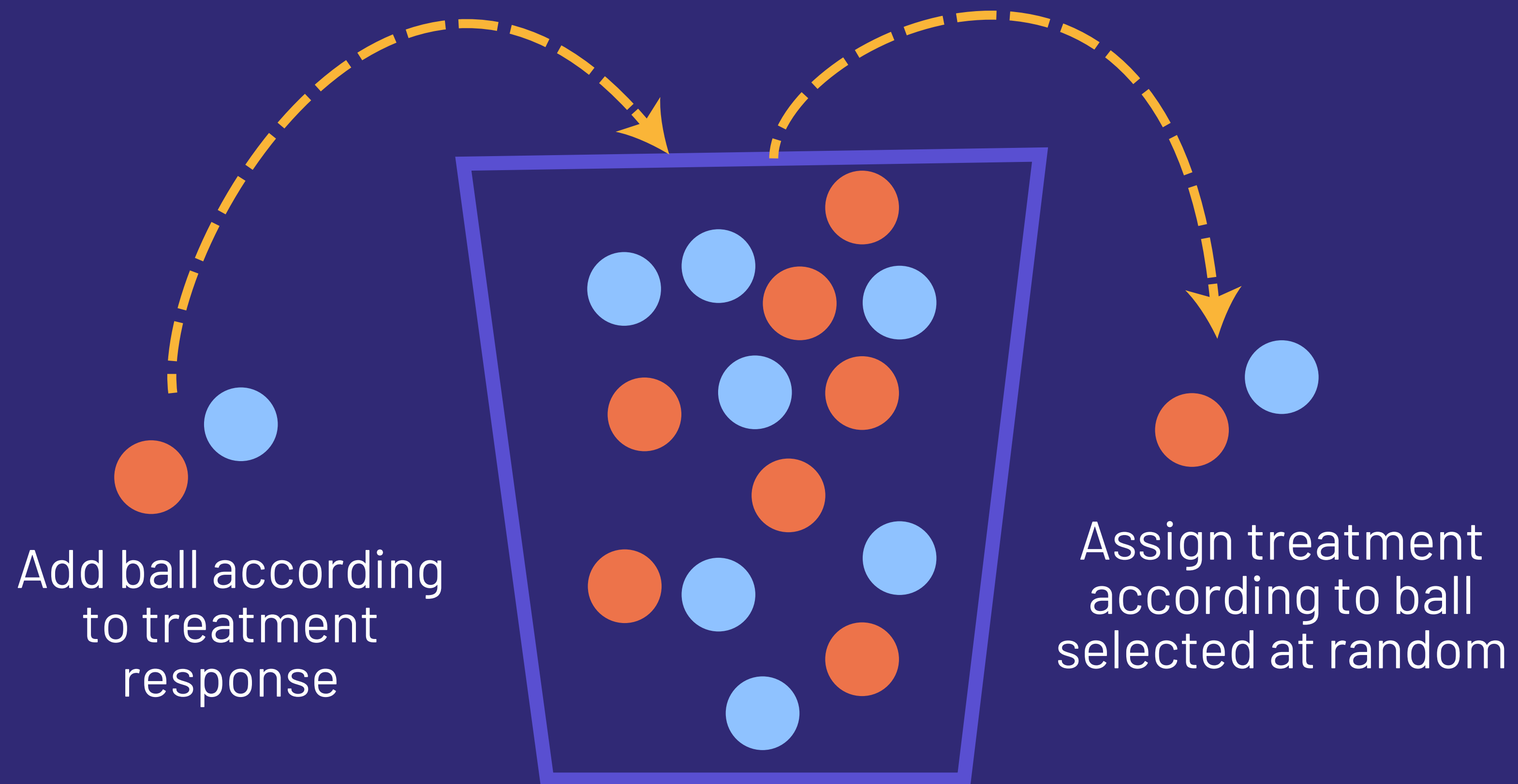
# Identifying Causality: Randomized Roll Out Designs



Shaded cells represent intervention periods.  
Blank cells represent control periods.  
Each cell represents a data collection point.

Time Periods

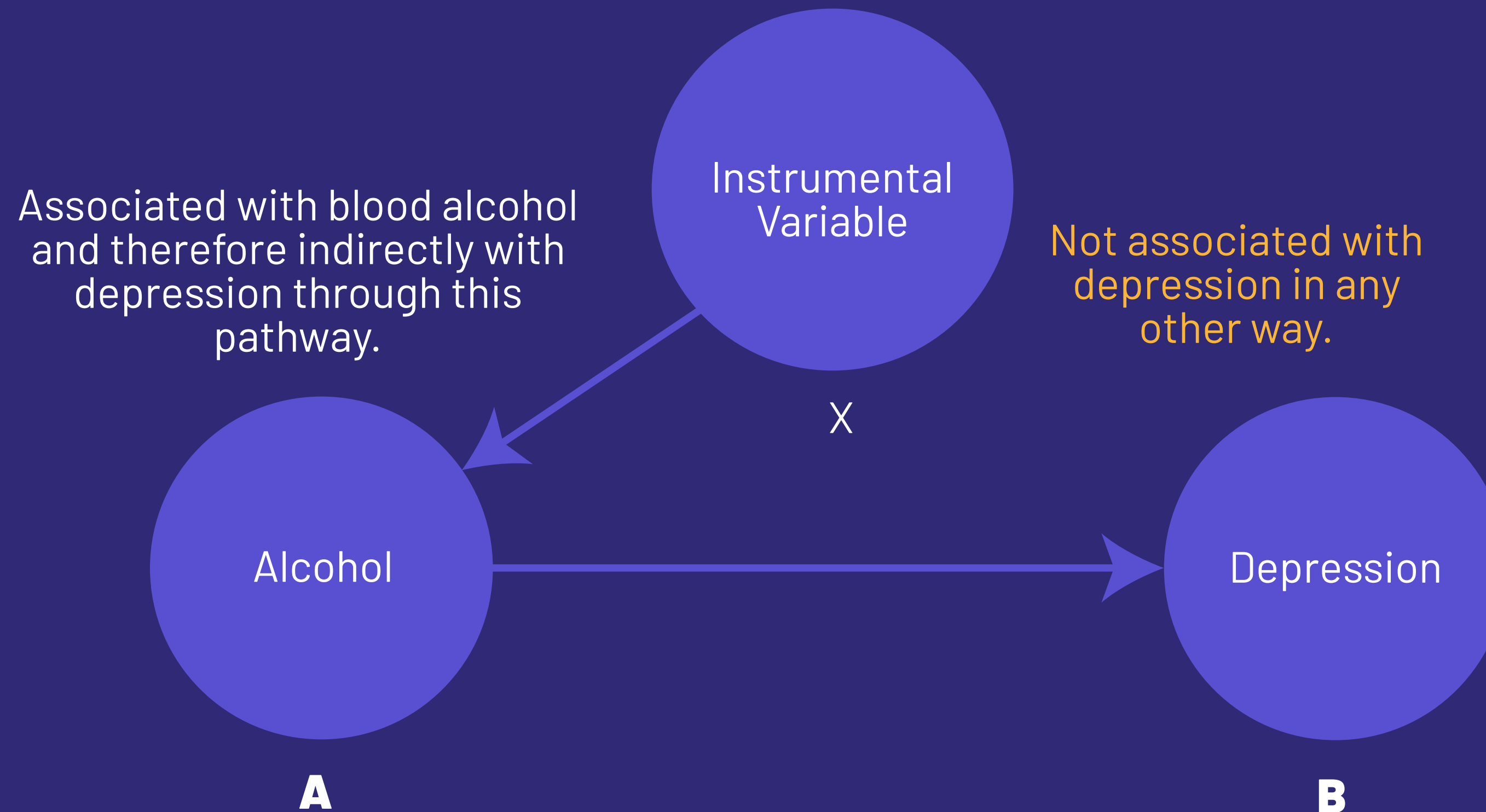
# Identifying Causality: Play the Winner Randomization



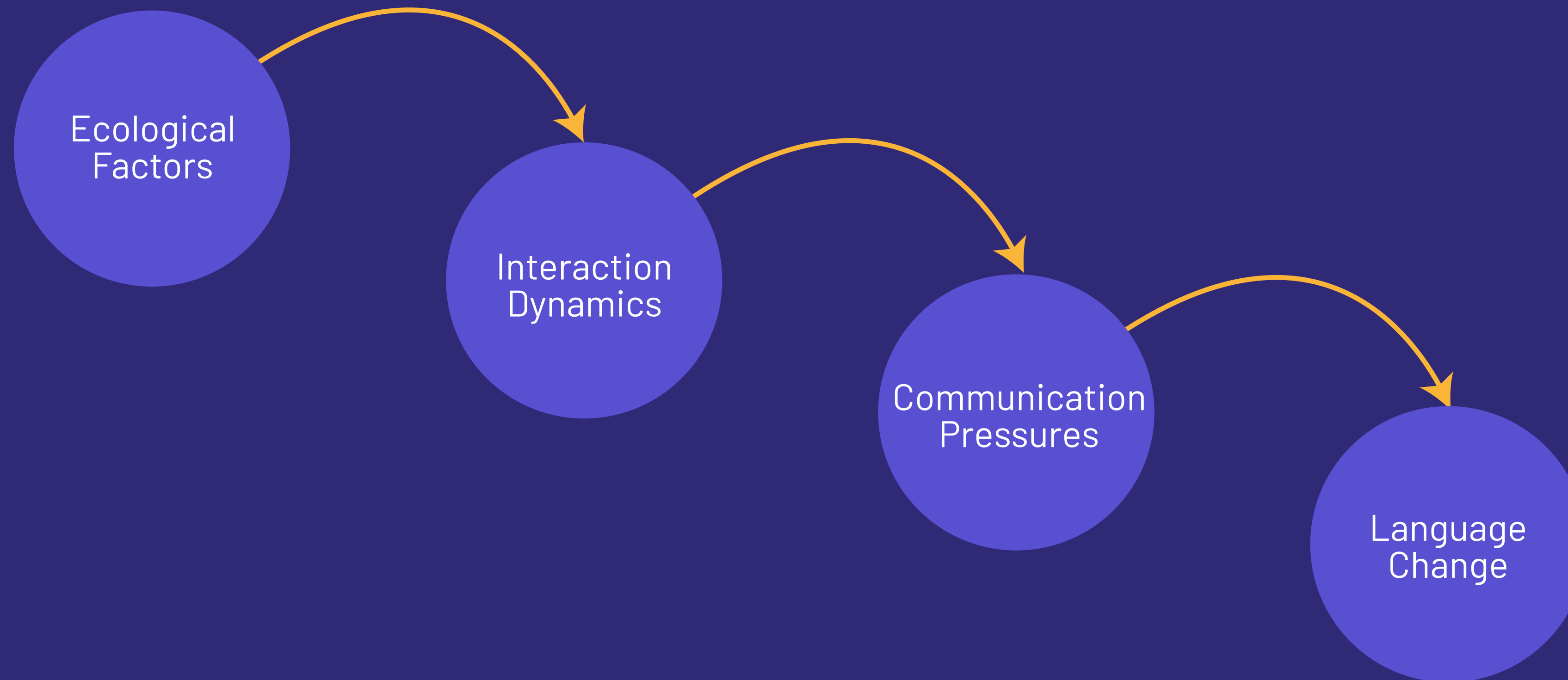




# Identifying Causality: Instrumental Variables



# Mechanisms of impact: Hierarchical Bayesian Analysis



# Understanding the Effects

**Who does this change happen for?**

**Does the INDIGO health program reduce the disparity in successful infant diagnoses between BIPOC infants and white infants?**

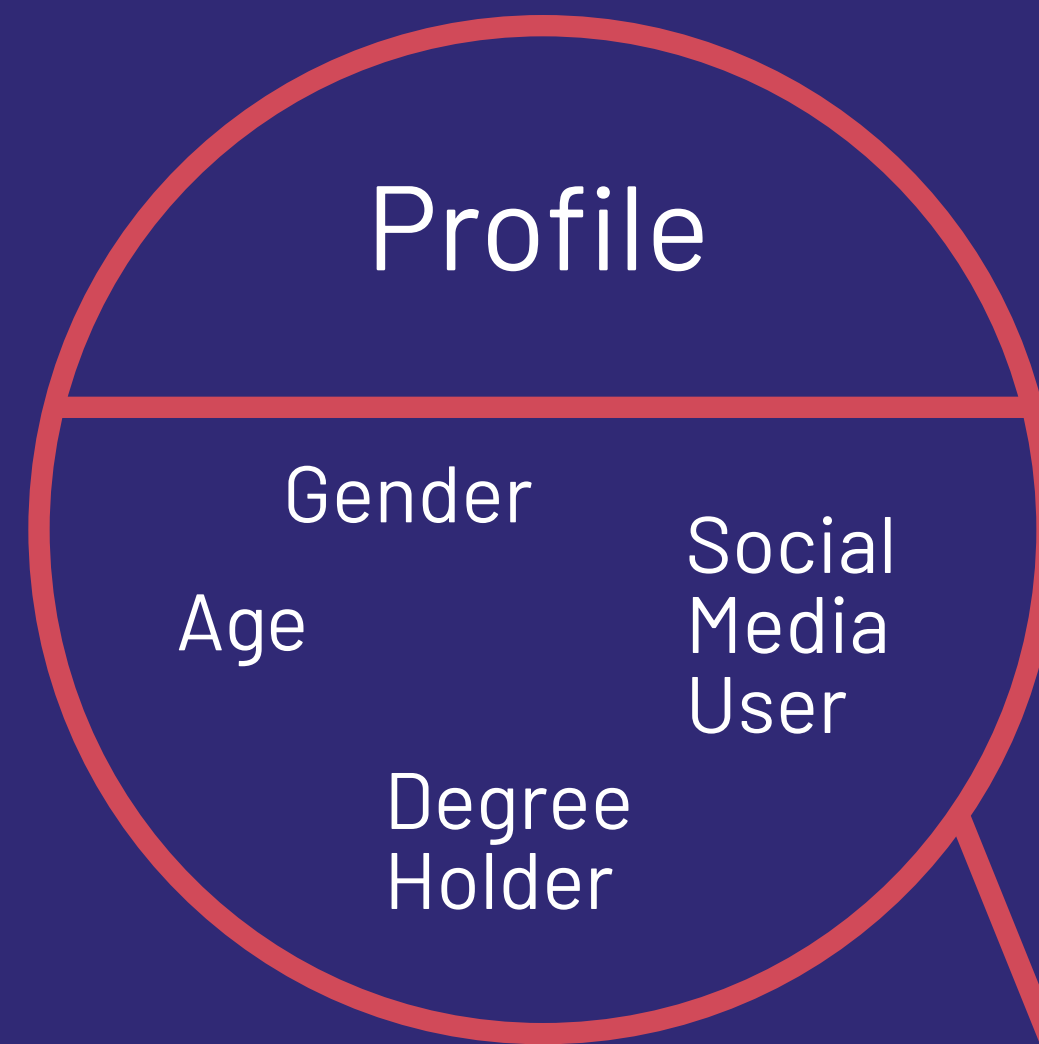
**How does the INDIGO program impact different economic groups of infants?**

**Will this change happen here or for me?**

**If I enroll in the INDIGO program will my baby have a better chance of being diagnosed properly?**

**What is the distribution of the change across the population?**

# Understanding changes: Structural Modelling



## Key Performance Indicators

Likelihood to renew subscription

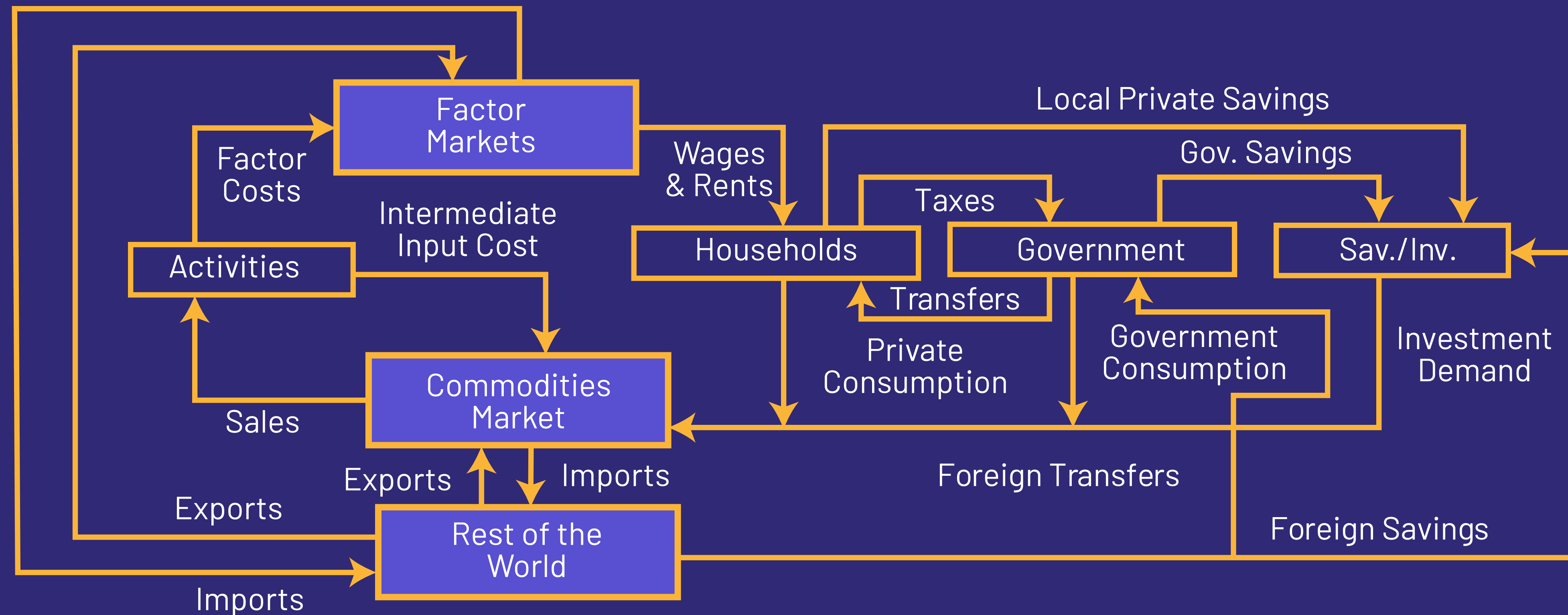
Likelihood to become a donor

Overall customer satisfaction

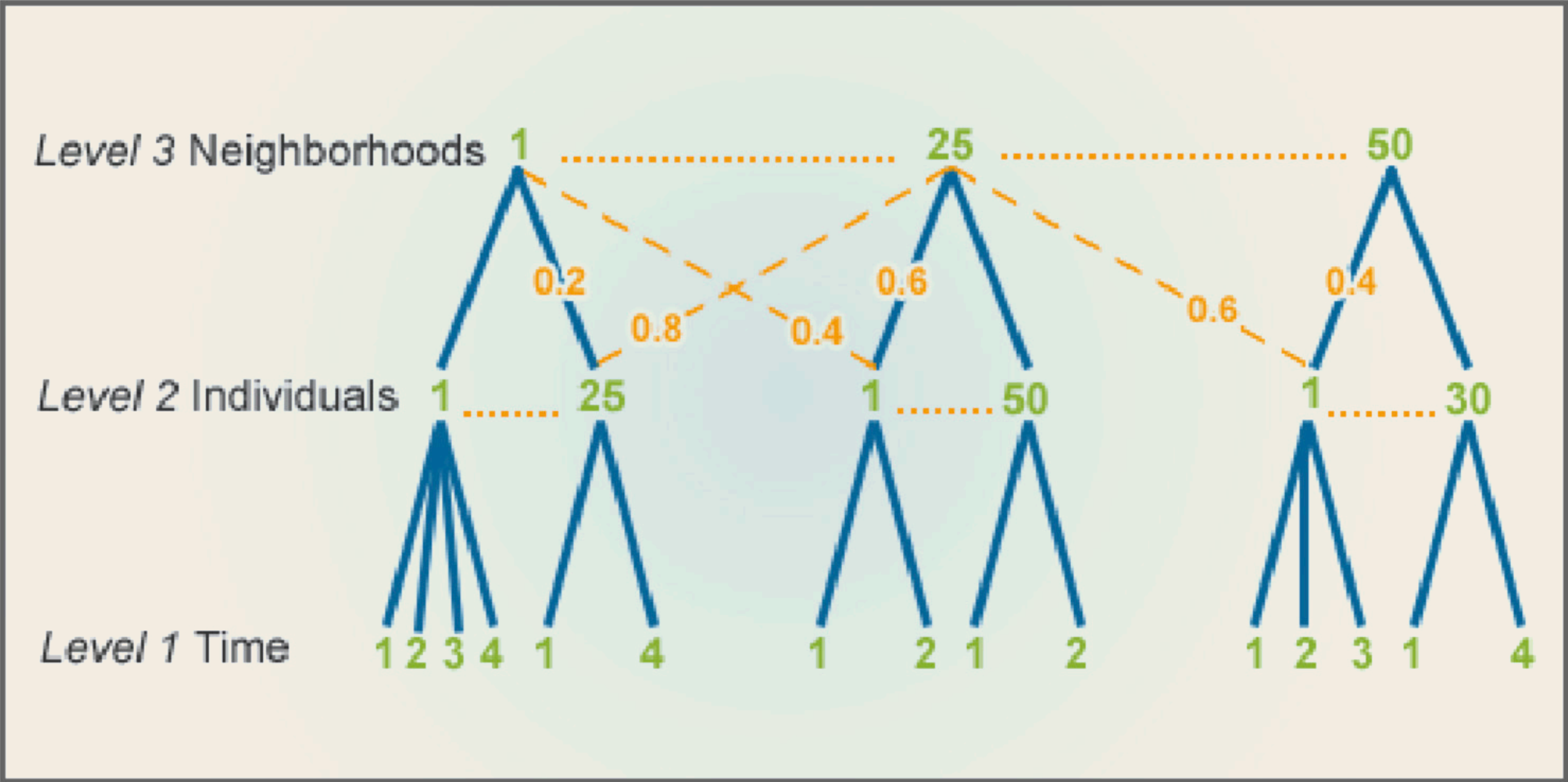
Likelihood to reccomend

Likelihood to become a frequent user

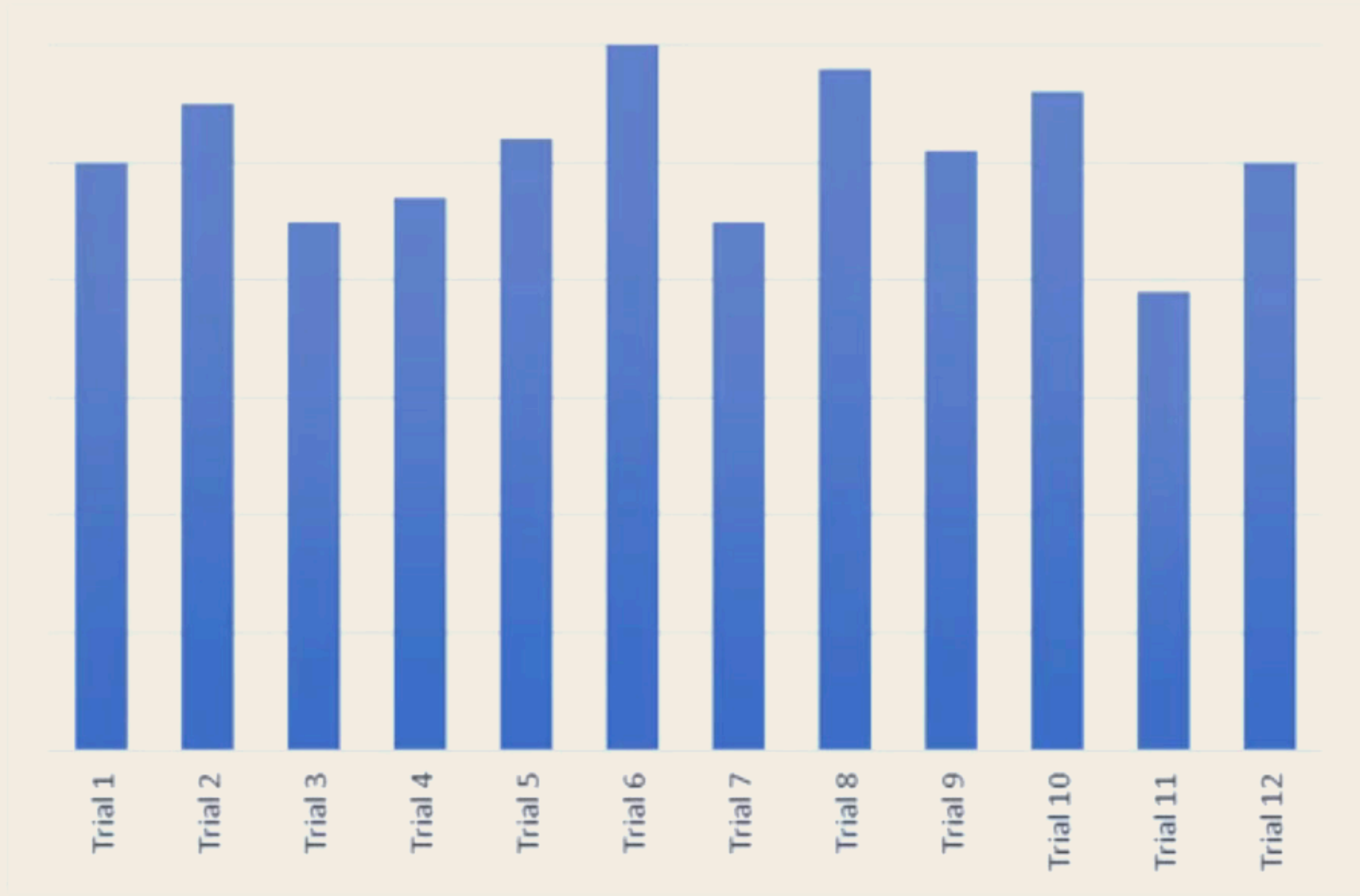
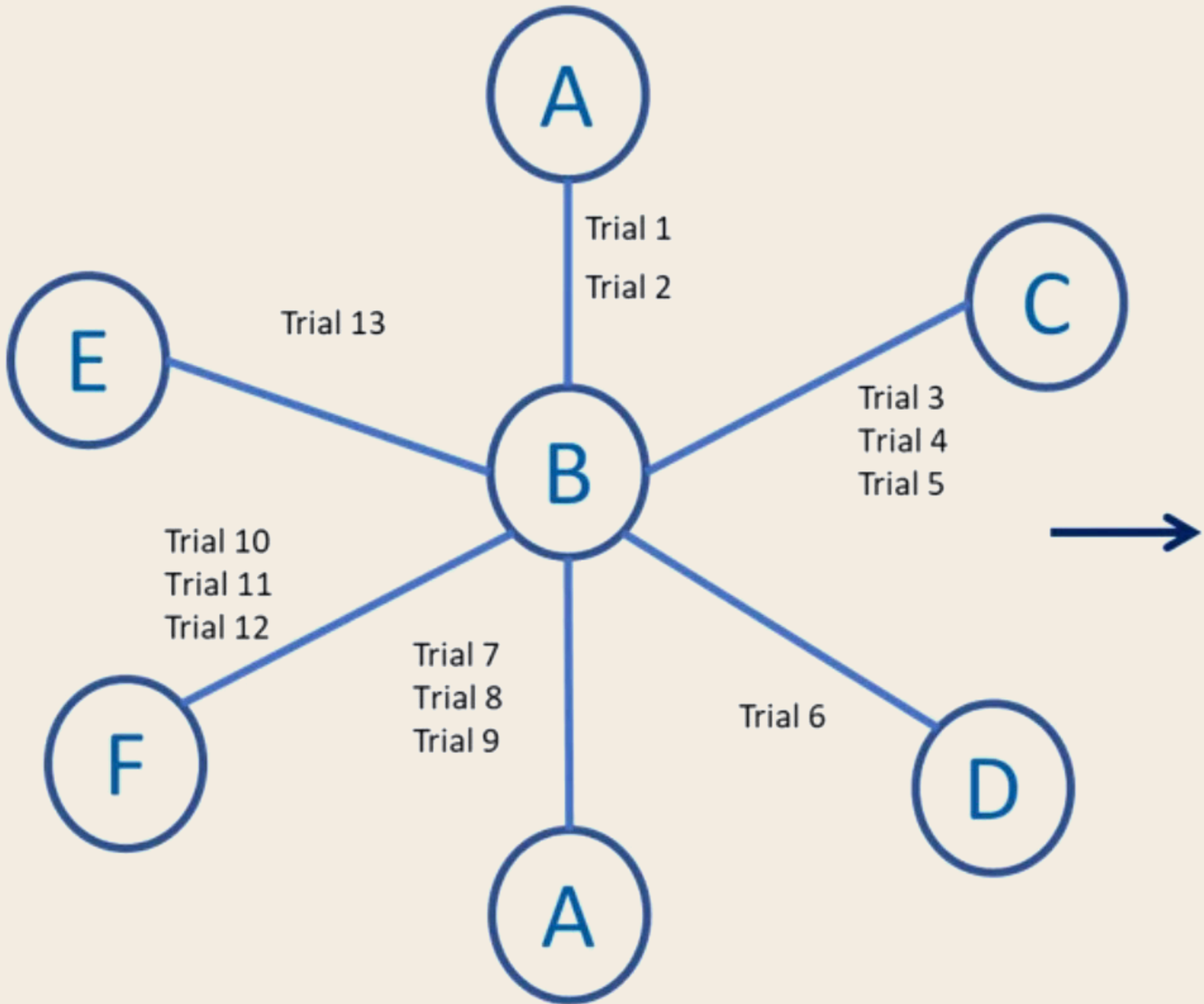
# Understanding changes: General Equilibrium Modelling



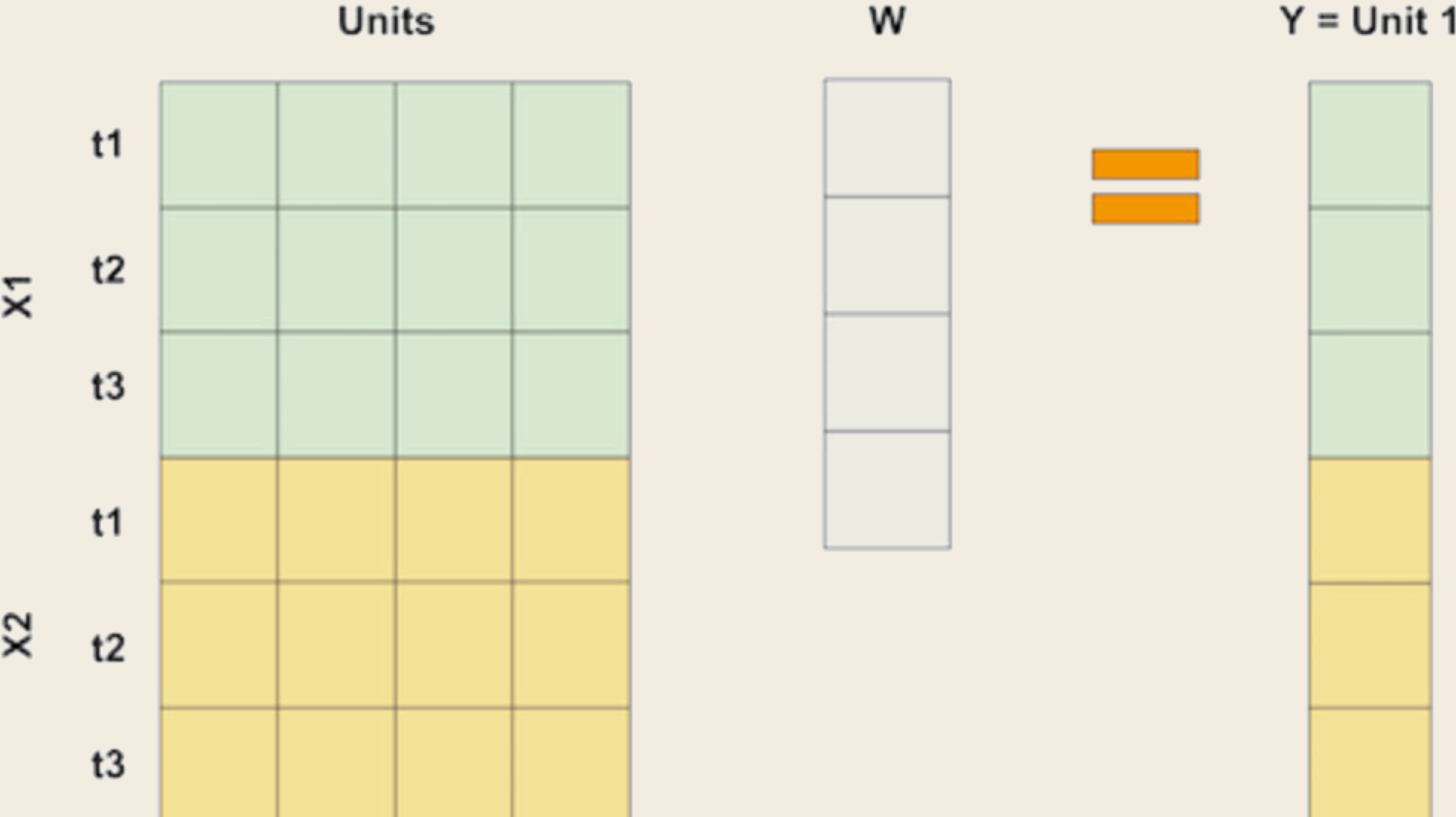
# Mixed-Effects or Multilevel Modeling



# Meta-Analysis



# Synthetic Controls





# Identifying Mechanisms of Impact

**Will this type of an initiative cause this change again?**

**Does INDIGO produce similar results next year?**

**Why does our initiative cause a change?**

**Is INDIGO successful in health centres that cannot vary the accessibility of the appointments?**

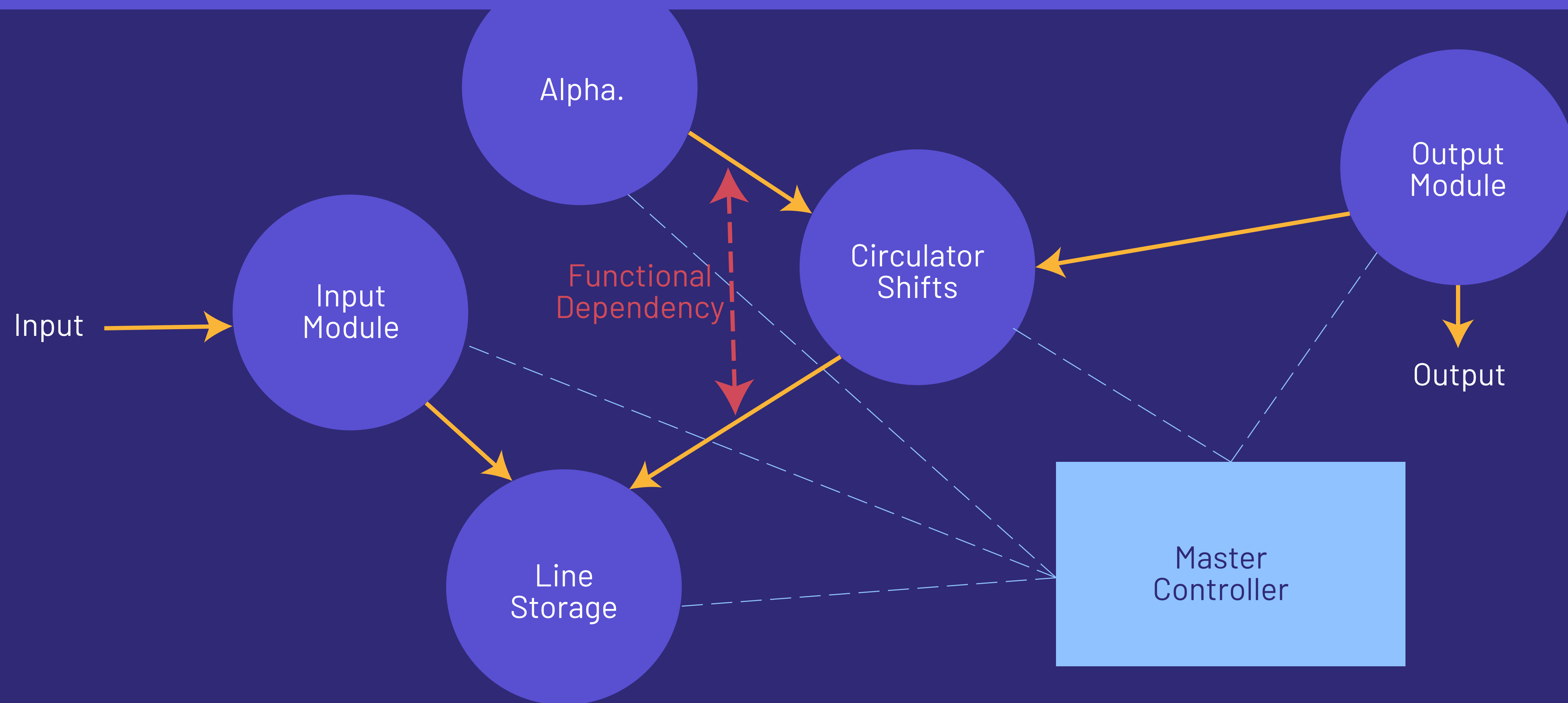
**What is necessary for this change to happen?**

**What enabling environment is necessary for the INDIGO impact to succeed?**

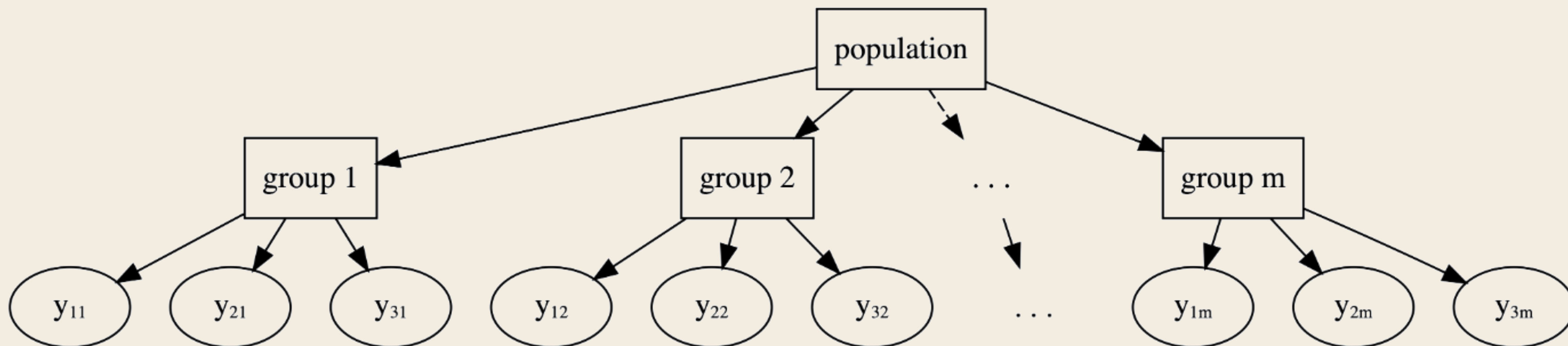
**Will this change scale?**

**Will INDIGO programs work in other states?**

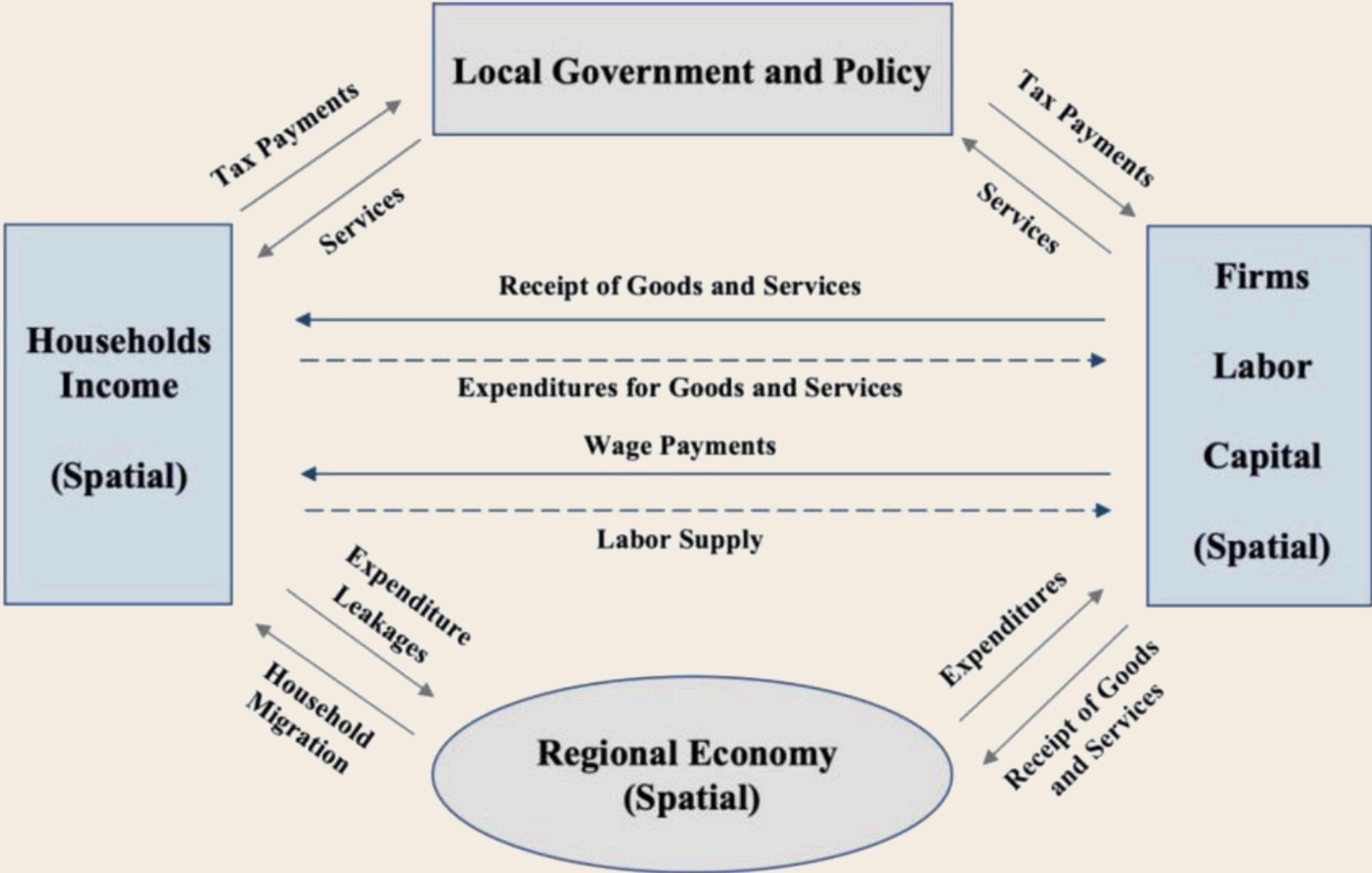
# Mechanisms of impact: Decomposition



# Hierarchical Bayesian Analysis



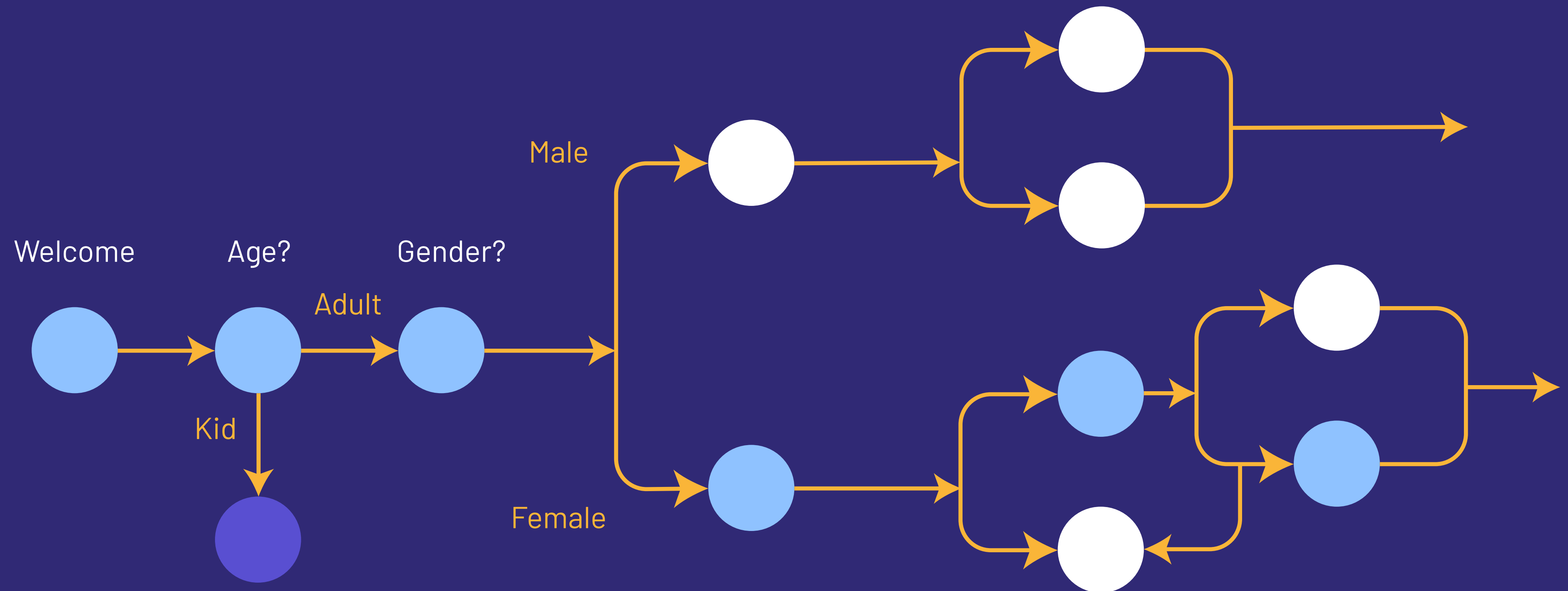
# General Equilibrium Model



# Mechanisms of impact: Longitudinal Analysis



# Mechanisms of impact: Directed Acyclic Graphs



# Impact Analysis/Causal Analysis and Equity

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**Myth #1: RCTs are the only way we can rigorously answer this question.**

**Myth #2: P-values are the only way to know if the change is caused by chance.**

**Suggestion #1: Get very clear about the causal question that you care about.**

**Suggestion #2: Answer that question from the perspective you want to prioritize.**

**Did a change happen? (Descriptive)**

**Did a change happen because of the thing we care about? (Causal)**

**One big difference is whether or not we can account for the other things happening.**



**Did a change happen? (Descriptive)**

**People in the county became less food insecure last year.**

**Did a change happen because of the thing we care about?  
(Causal) Our foodbank network reduced food insecurity in  
the county last year.**

**One big difference is whether or not we can account for the  
other things happening.**

**Did a change happen? (Descriptive)**

**People in the county became less food insecure last year.**

**Did a change happen because of the thing we care about? (Causal) Our foodbank network reduced food insecurity in the county last year.**

**One big difference is whether or not we can account for the other things happening.**

**“Controlling for”**

**Did a change happen? (Descriptive)**

**People in the county became less food insecure last year.**

**Did a change happen because of the thing we care about? (Causal) Our foodbank network reduced food insecurity in the county last year.**

**One big difference is whether or not we can account for the other things happening.**

**“Controlling for” = A large amount of subjectivity**

**Did our foodbank network reduced food insecurity in the county last year.**

**“Controlling for” = Subjectivity and equity issues**

**If we “control for” the racial composition of counties then no.**

**If we “control for” the race of a household then no.**

**If we “control for” the race of a household within the racial composition of a county, then yes.**

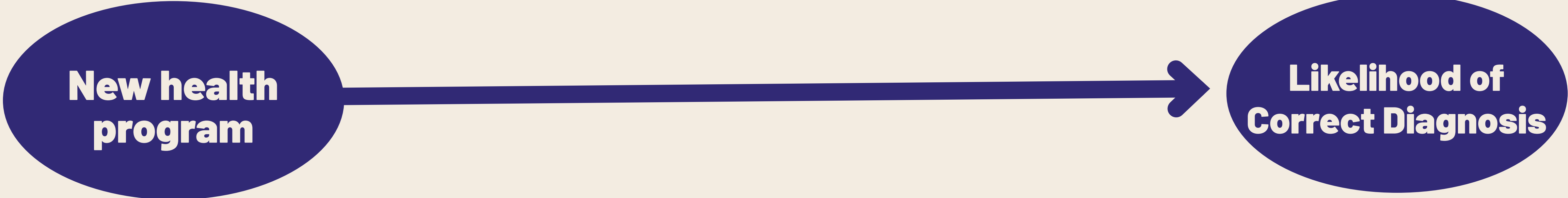
**What you want to control for depends on how you think the world works.**

**Who your program changed, what you think your program changed, how your program worked, what other factors in the world influence all of the above.**

**Are the new INDIGO Care health programs leading to at least 10% increased correct diagnosis for the infant population?**

**What other elements in the world are impacting our program and whether or not an infant gets a correct diagnosis?**

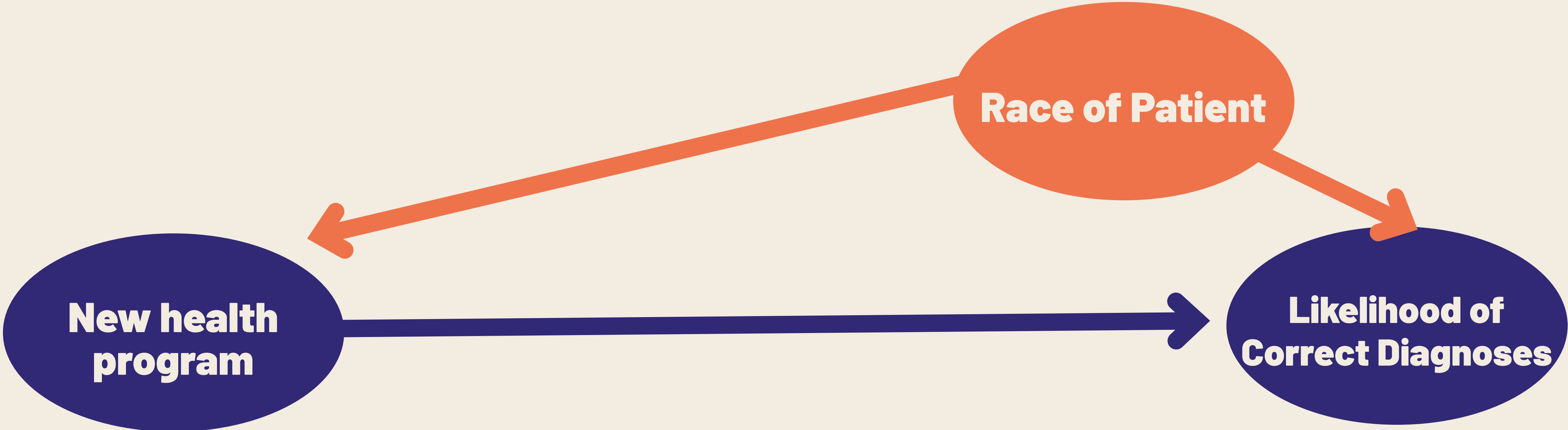
**Are the new INDIGO Care health programs leading to at least 10% increased correct diagnosis for the infant population? (This model says YES)**



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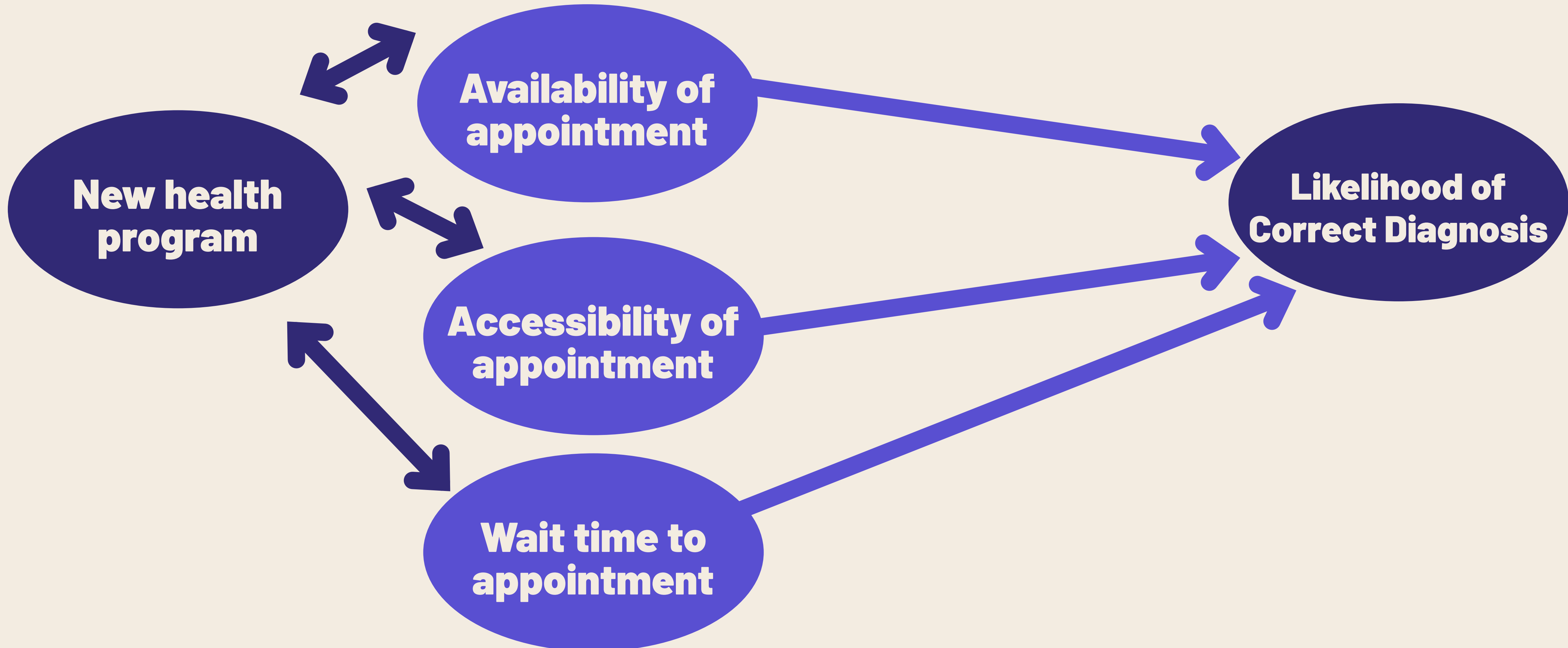


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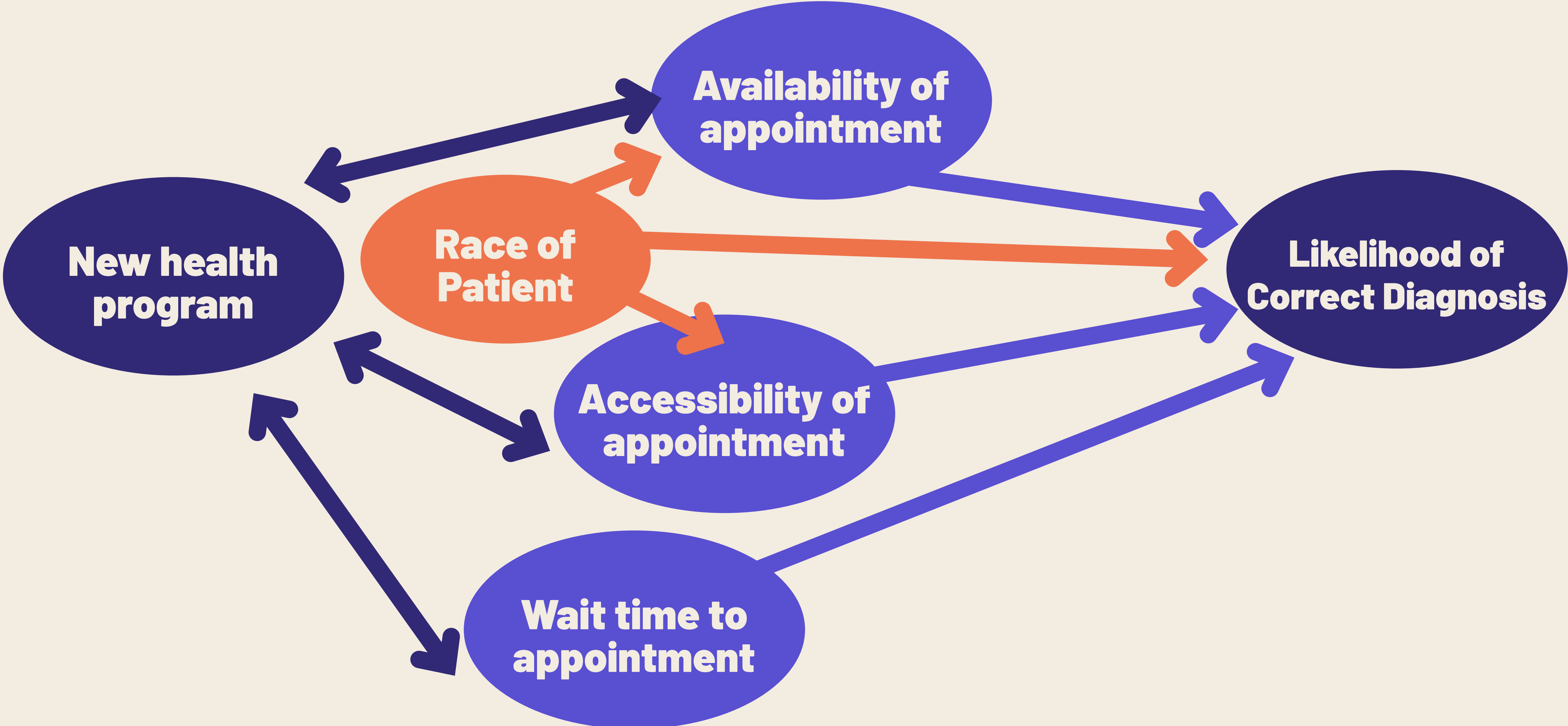




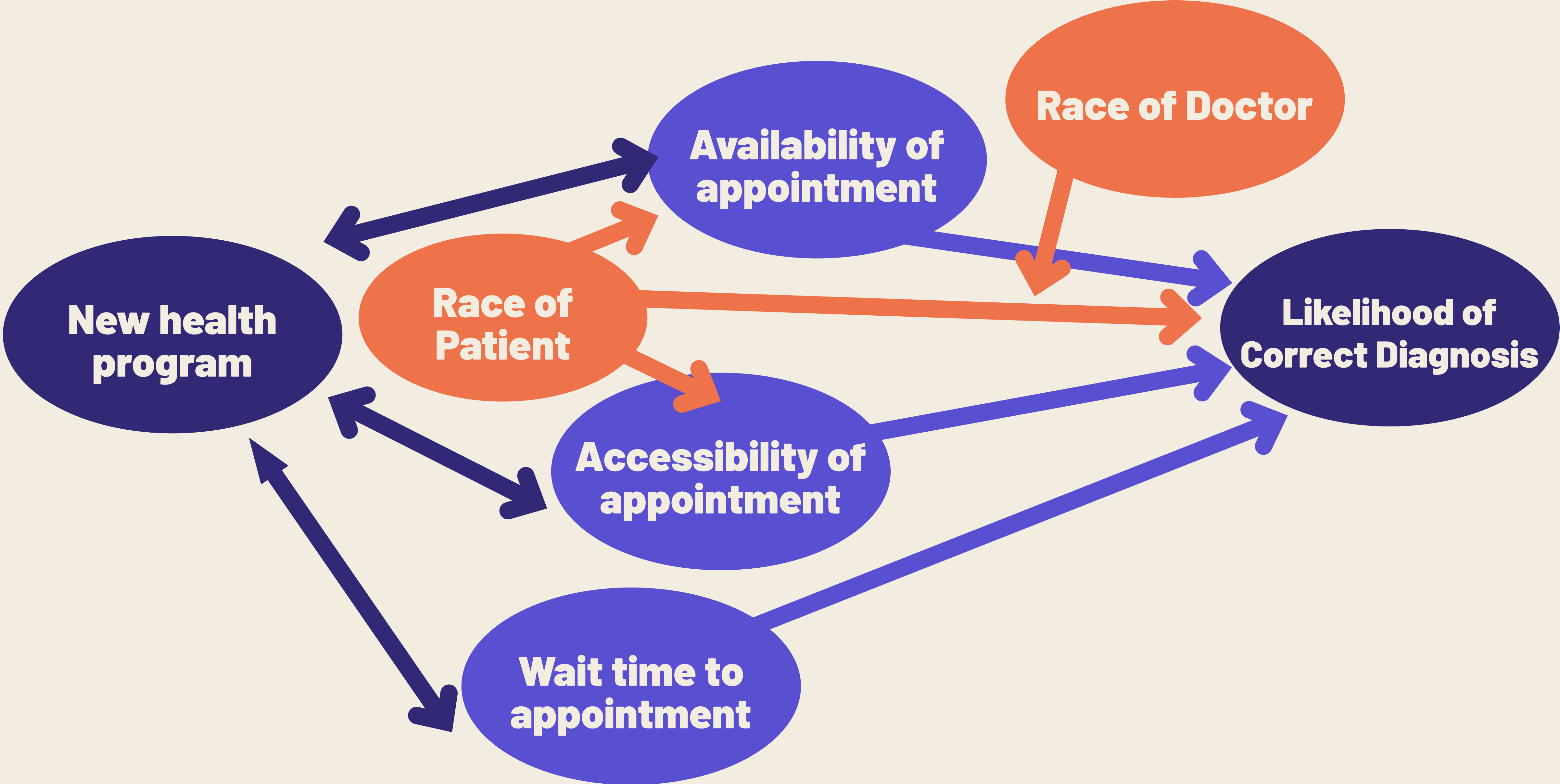
**Are the new INDIGO Care health programs leading to at least 10% increased correct diagnosis for the infant population? (This model says NO)**



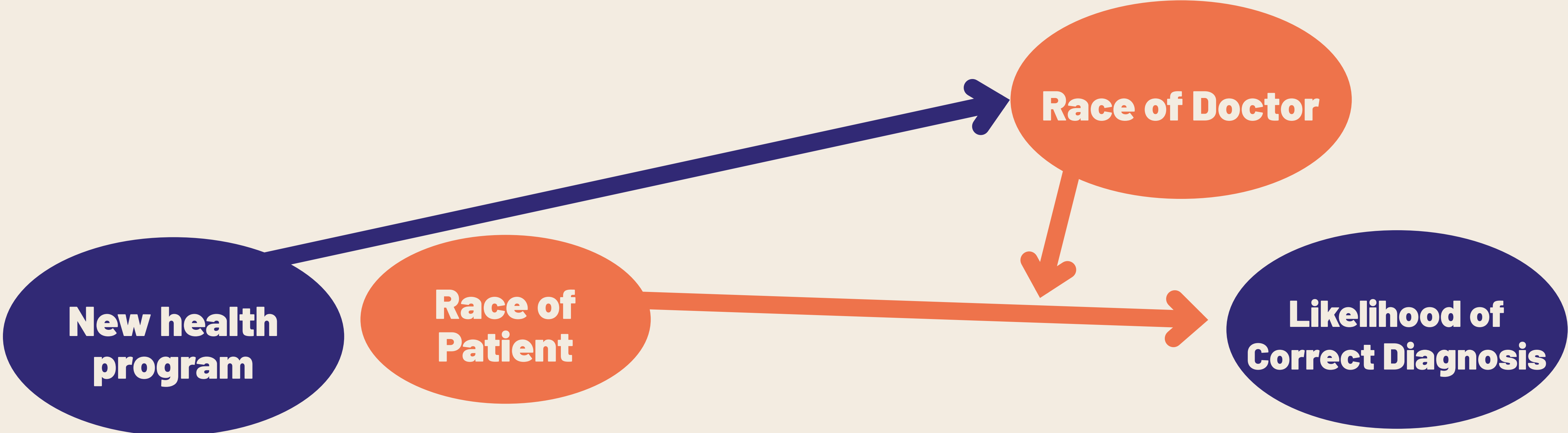
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**Are the new INDIGO Care health programs leading to at least 10% increased correct diagnosis for the infant population? (This model says YES)**



**Are the new INDIGO Care health programs leading to at least 10% increased correct diagnosis for the infant population? (This model says YES)**



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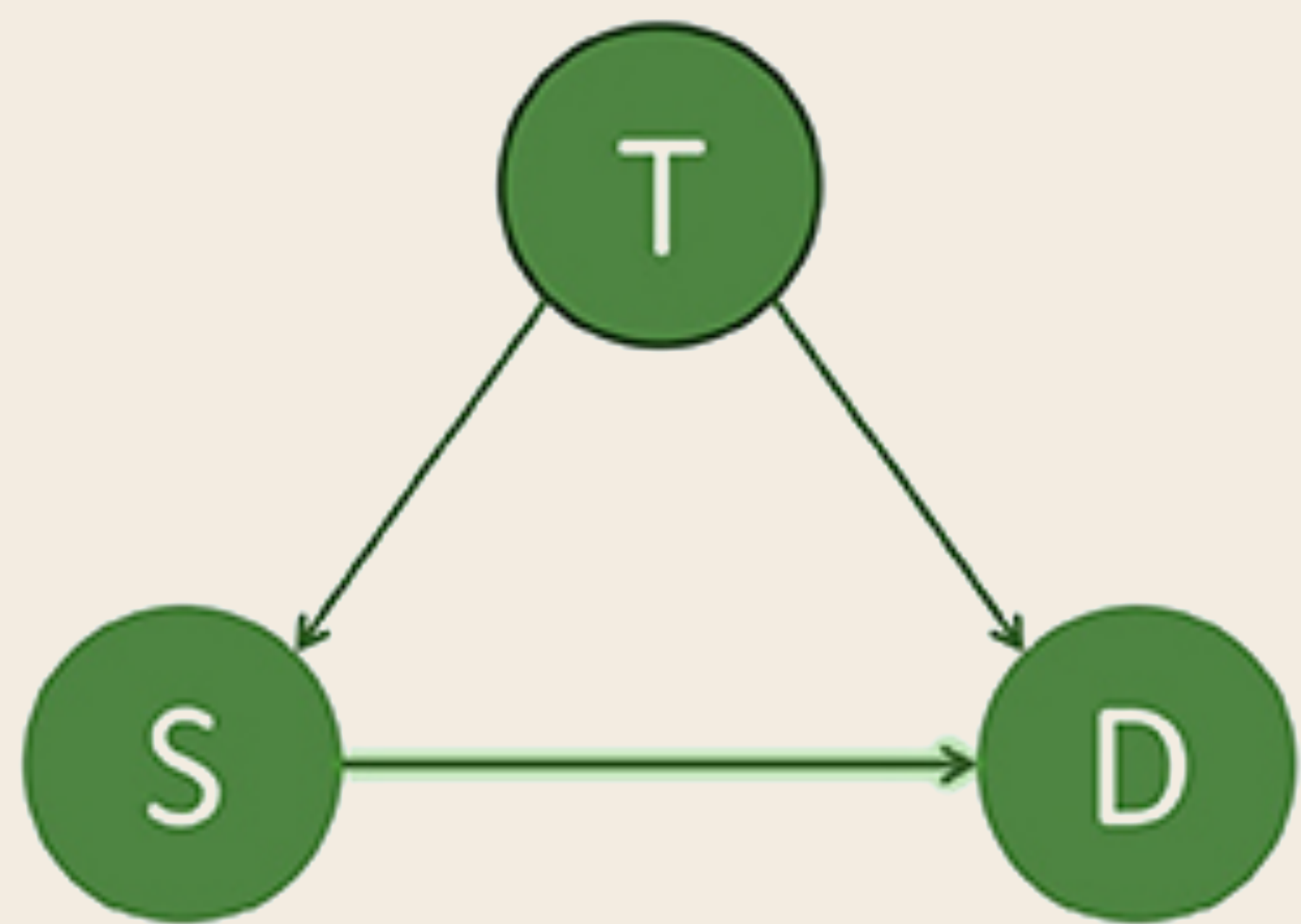
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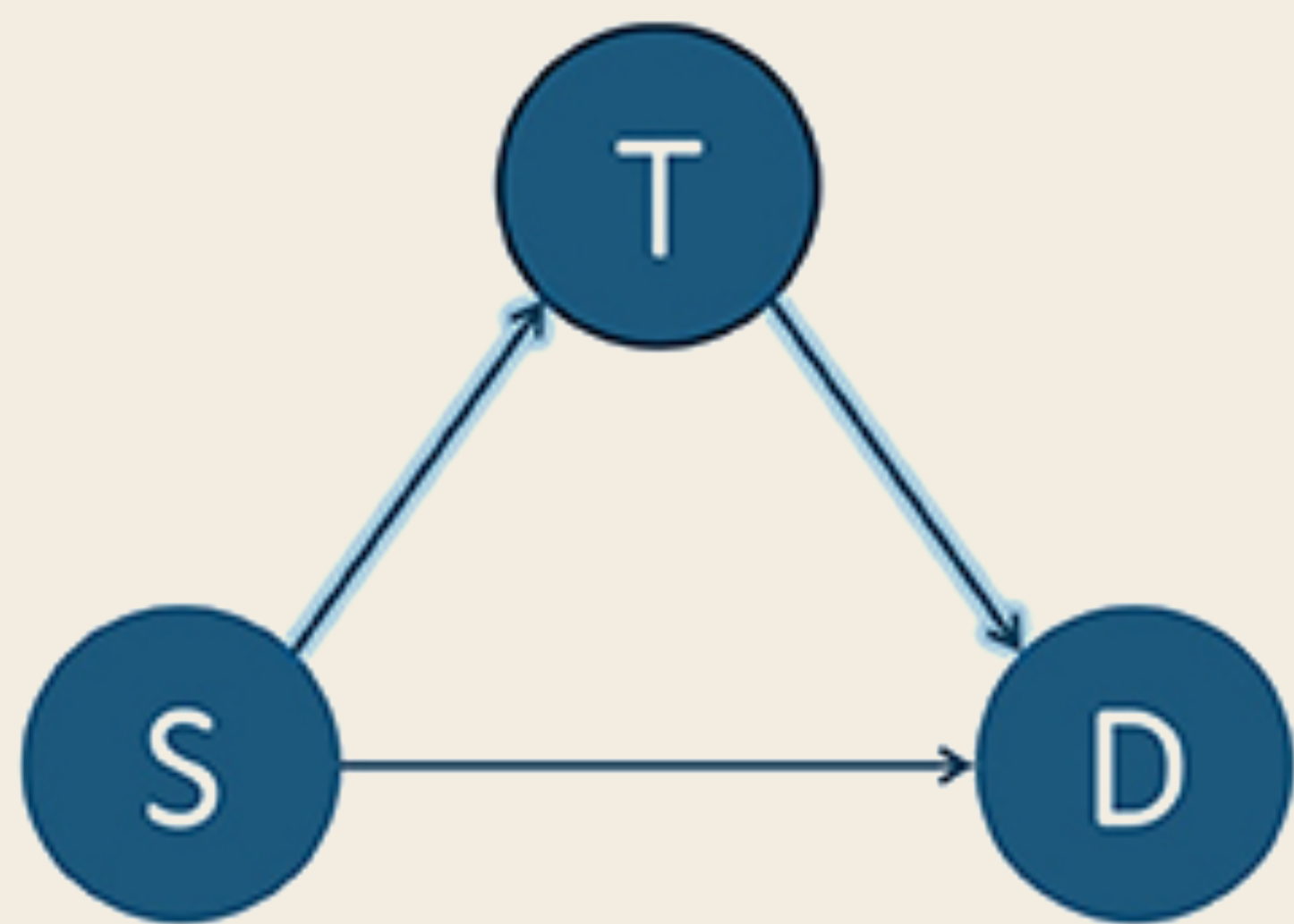
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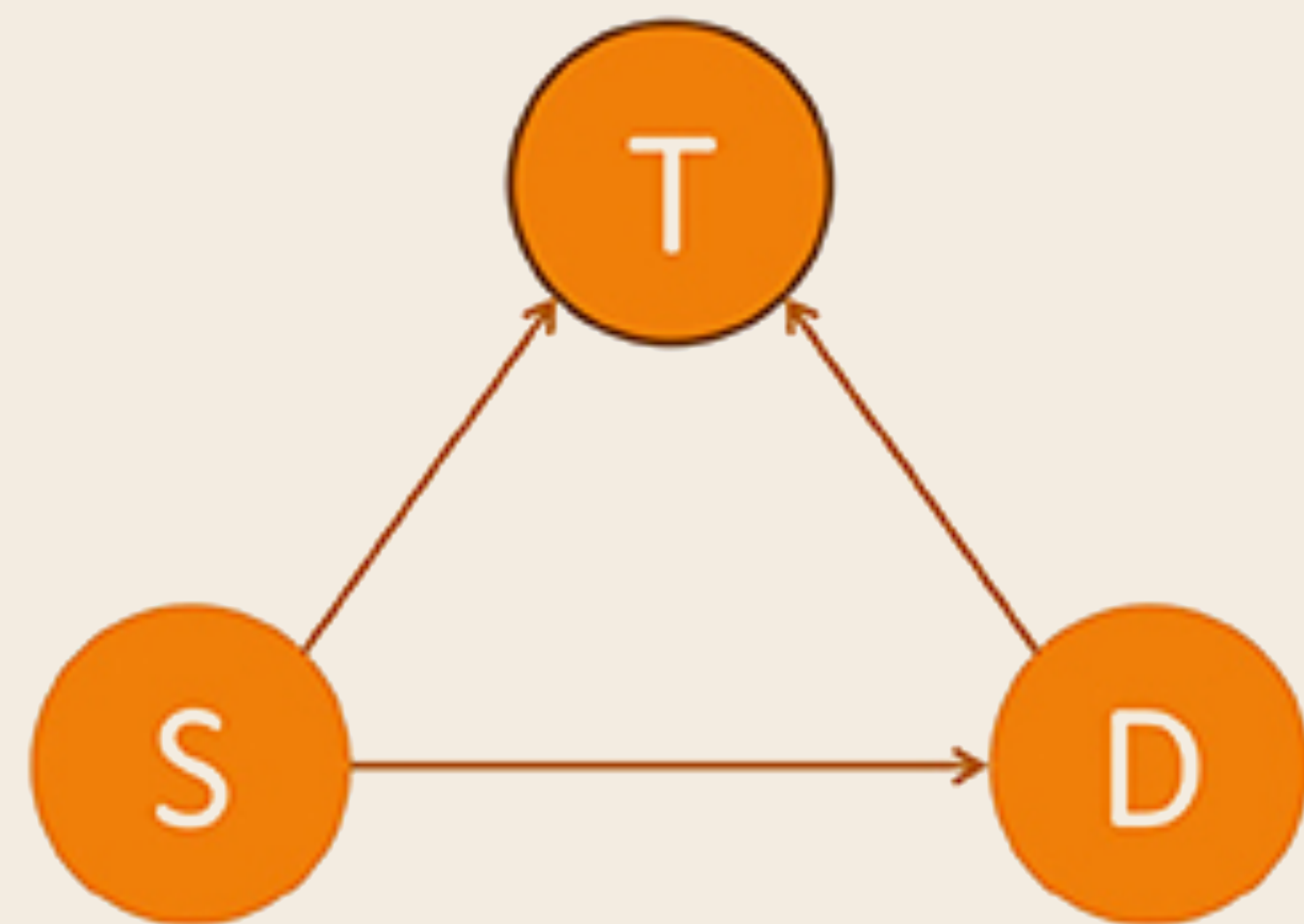




**A** Confounder



**B** Mediator



**C** Collider