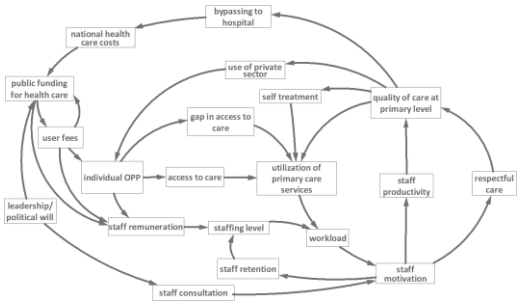
COLUMBIA UNIVERSITY | MAILMAN SCHOOL of PUBLIC HEALTH

Systems Tools for Complex Health Systems: A Guide to Creating Causal Loop Diagrams



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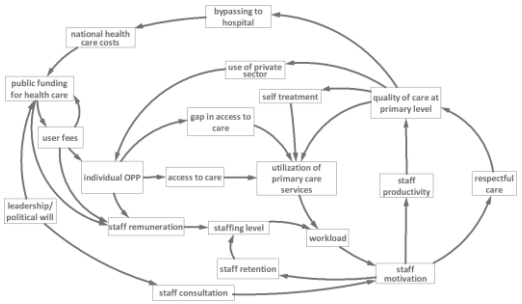
Session Three Interrelationship Digraphs



Session outline

- Identify and define key variables
- Develop an Interrelationship Digraph
- Identify key drivers and outcomes
- Using the Interrelationship Digraph

Interrelationship digraphs

- Explore how variables relate to one another in a complex system.
- Prevents coming to a quick conclusion and serves to surface and test our assumptions.
- Identifies the major drivers and outcomes in our system.

Session outline

- **Identify and define key variables**
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Identify and group the key variables

- List all the variables that if changed would have the biggest effects on your outcome(s) of interest.
- Then collapse or group them as appropriate.
- Aim for a maximum of between 10 – 12 variables.
- Define your variables to ensure there is a common understanding of the construct underpinning your variable.

Definition of a variable

- An element in a situation that may act or be acted upon.
- Its value can vary up or down over time.
- Is not an event.
- Is something you can discuss as "the level of ..."
- Neutral
  - Quality of Care vs. Poor quality of care
- Distinguish between perceived and actual states
  - Perceptions of Quality of care vs. Quality of Care
- **Include outcome of interest**

Your turn: select variables

- Use neonatal mortality in Uganda case study.
- From your rich picture identify key variables.
- Group these in order to narrow down to 10 – 12 key variables.
- Define these variables.
- Justify your selection.

Your turn: reflecting on your variables

- Are they:
  - Measureable (in theory)
  - Clearly defined
  - Neutral
- Do they include the outcome of interest?
- Anything left out? What are the implications?

Example: variables selected from Uganda neonatal case study

health of mothers

level of awareness of MHC and NHC

safe deliveries and PNC

health education by health workers

perceptions and belief in myths

mothers attending ANC, hospital deliveries and PNC

mothers' birth preparedness

resource adequacy (staffing, drugs, logistics and supplies)

death risk of neonate

neonatal survival

socio-economic status

care of newborns

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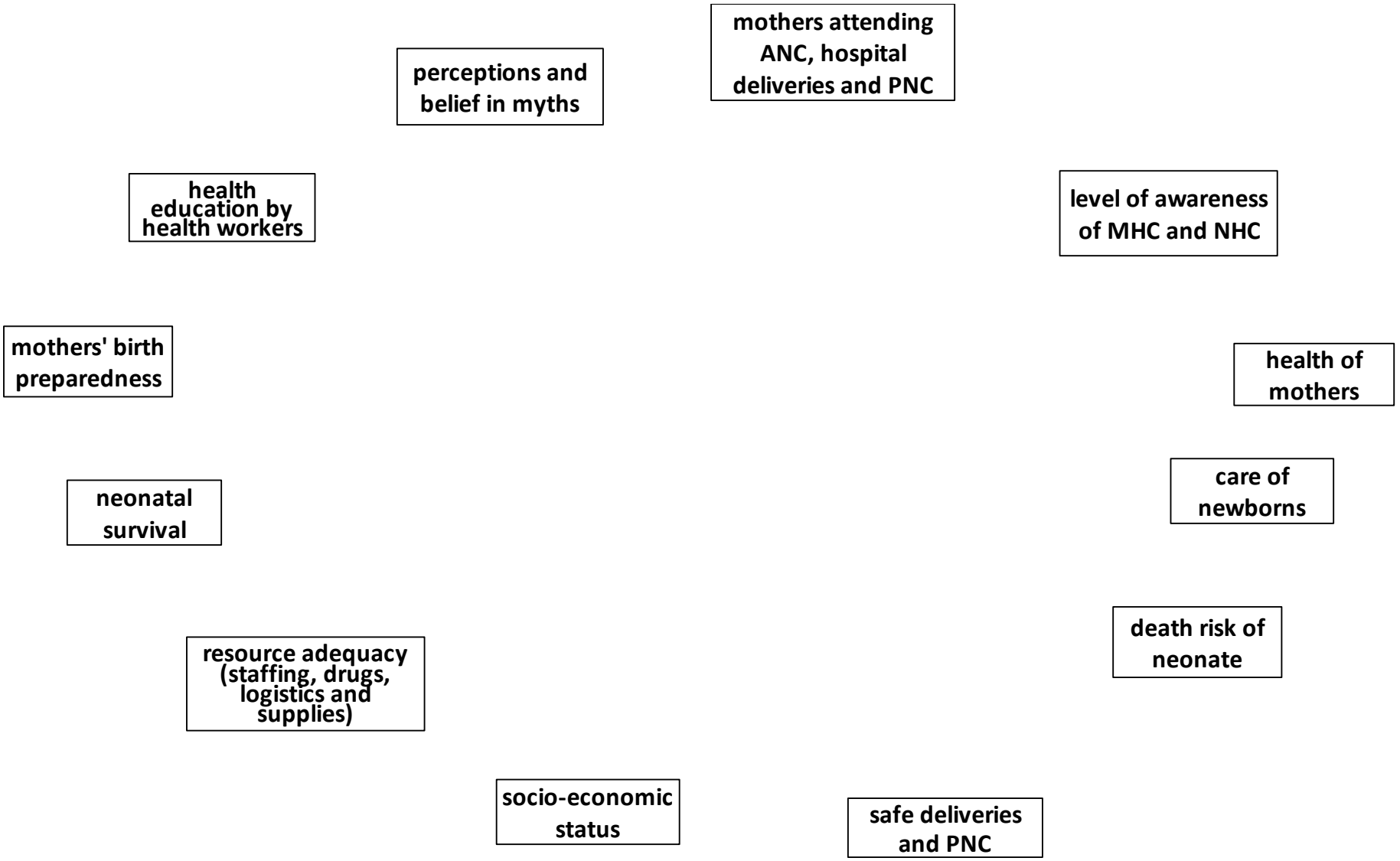
Develop the IRD (1)

- Agree on the issue or question – which informed your rich picture and variable selection.
- Arrange the 10 – 12 selected variables in circle.
- Compare each variable to all others.
- Decide if there is an ‘influence’ between two variables.
- If yes – decide the direction of the influence.
- Use an "influence" arrow to connect related variables.

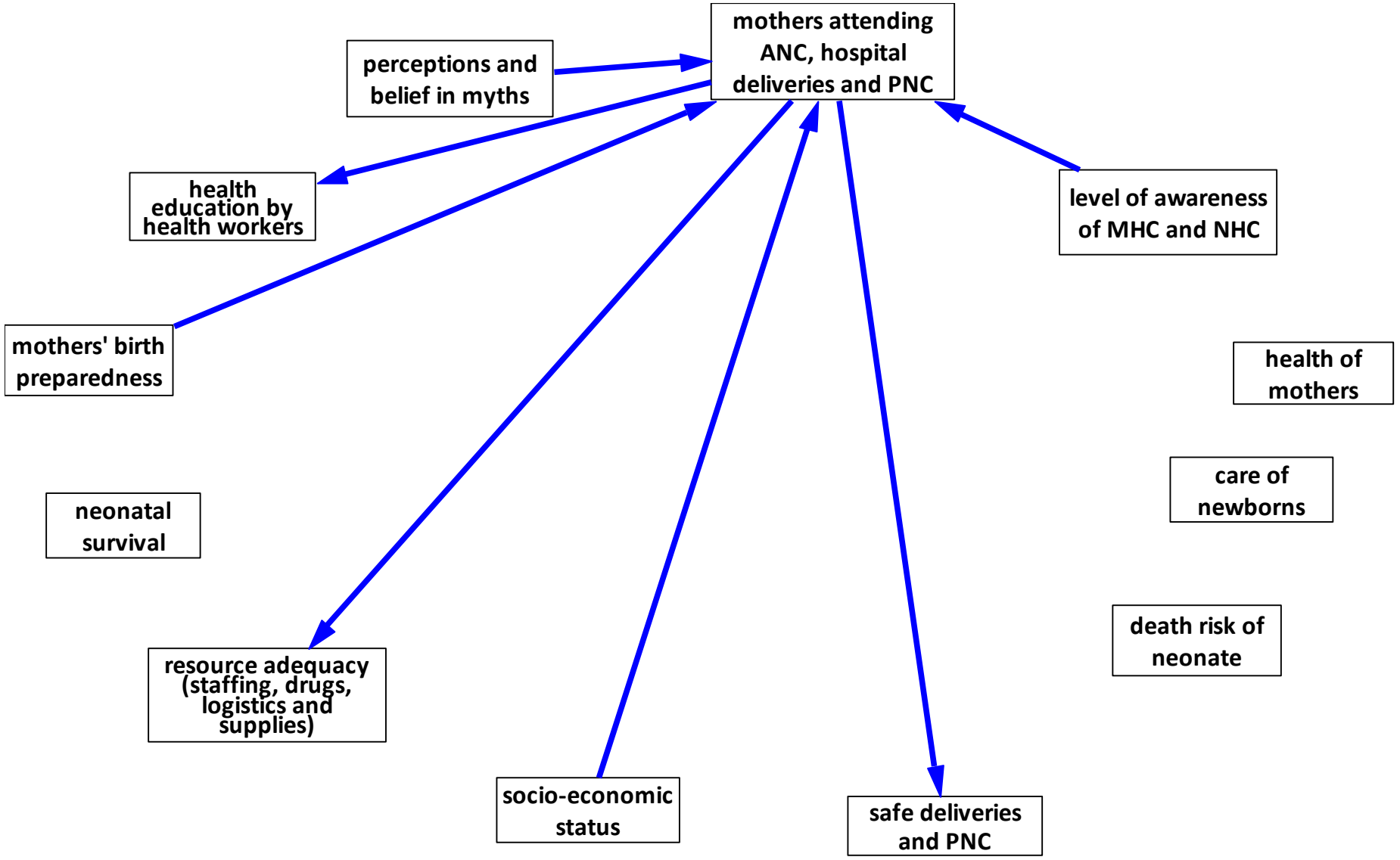
Develop the IRD (2)

- The arrows should be drawn from the element that influences to the one influenced.
- If two variables influence each other, the arrow should be drawn to reflect the stronger influence.
- Arrows can only be drawn IN ONE DIRECTION.
- The relationship should be a direct relationship and not via another variable.

Develop the Interrelationship Digraph



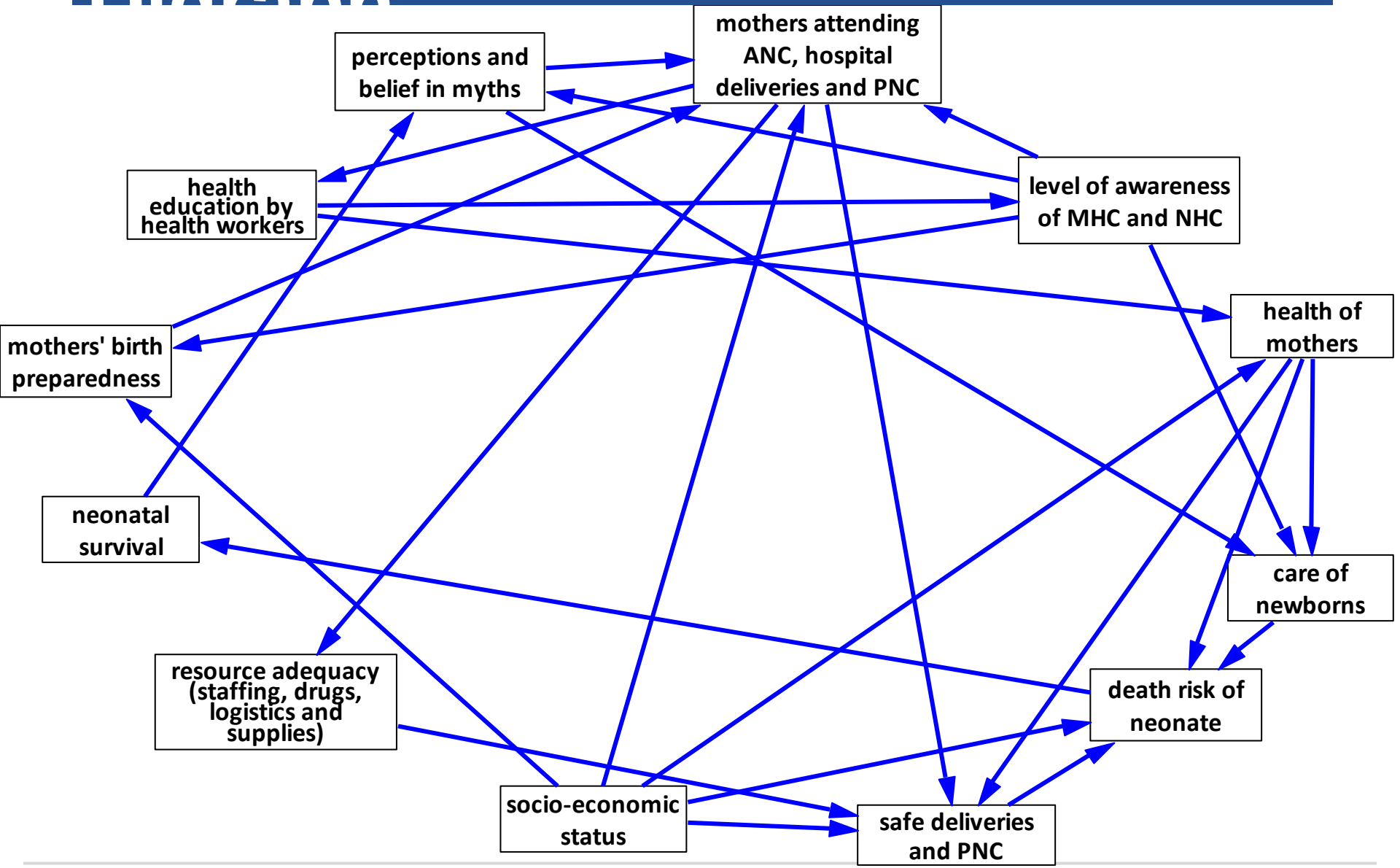
Develop the Interrelationship Digraph



Your turn: complete the IRD

- Use the neonatal IRD template and in your groups complete the IRD.

Develop the Interrelationship Digraph



As you develop the IRD

- Consider short term effects, long term effects, and unintended consequences.
- Abandon your mental model and think about associations you might not have initially identified.
- Be aware of your own assumptions.
- Where possible base your decision on existing evidence, or consensus amongst experts.

The Interrelationship Digraph is a visual tool that…

- Builds on the rich picture.
- Helps make use of team knowledge in the absence of hard data.
- Plots the complexity of causal relationships.
- Builds team consensus on priorities.

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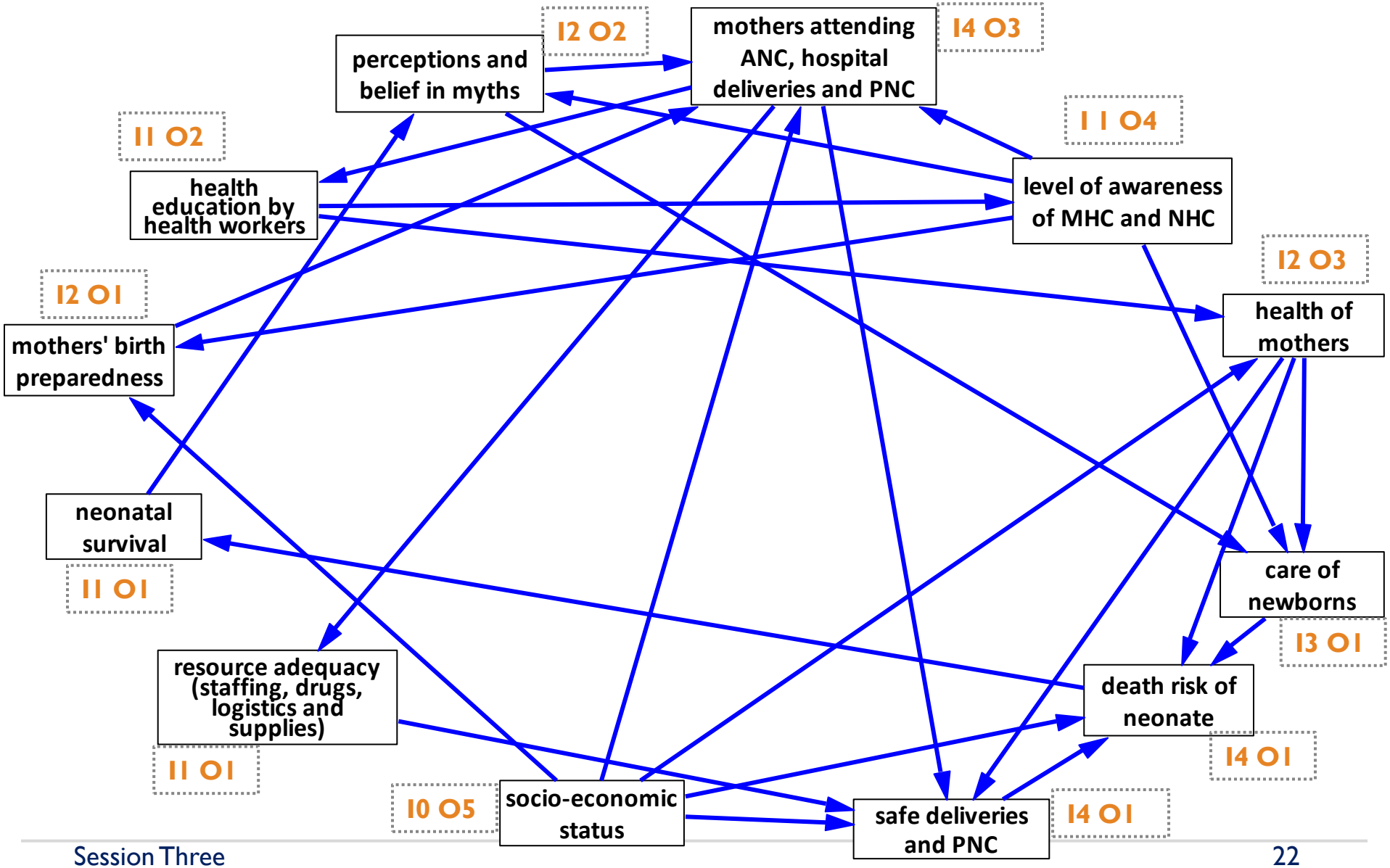
Determine drivers and outcomes

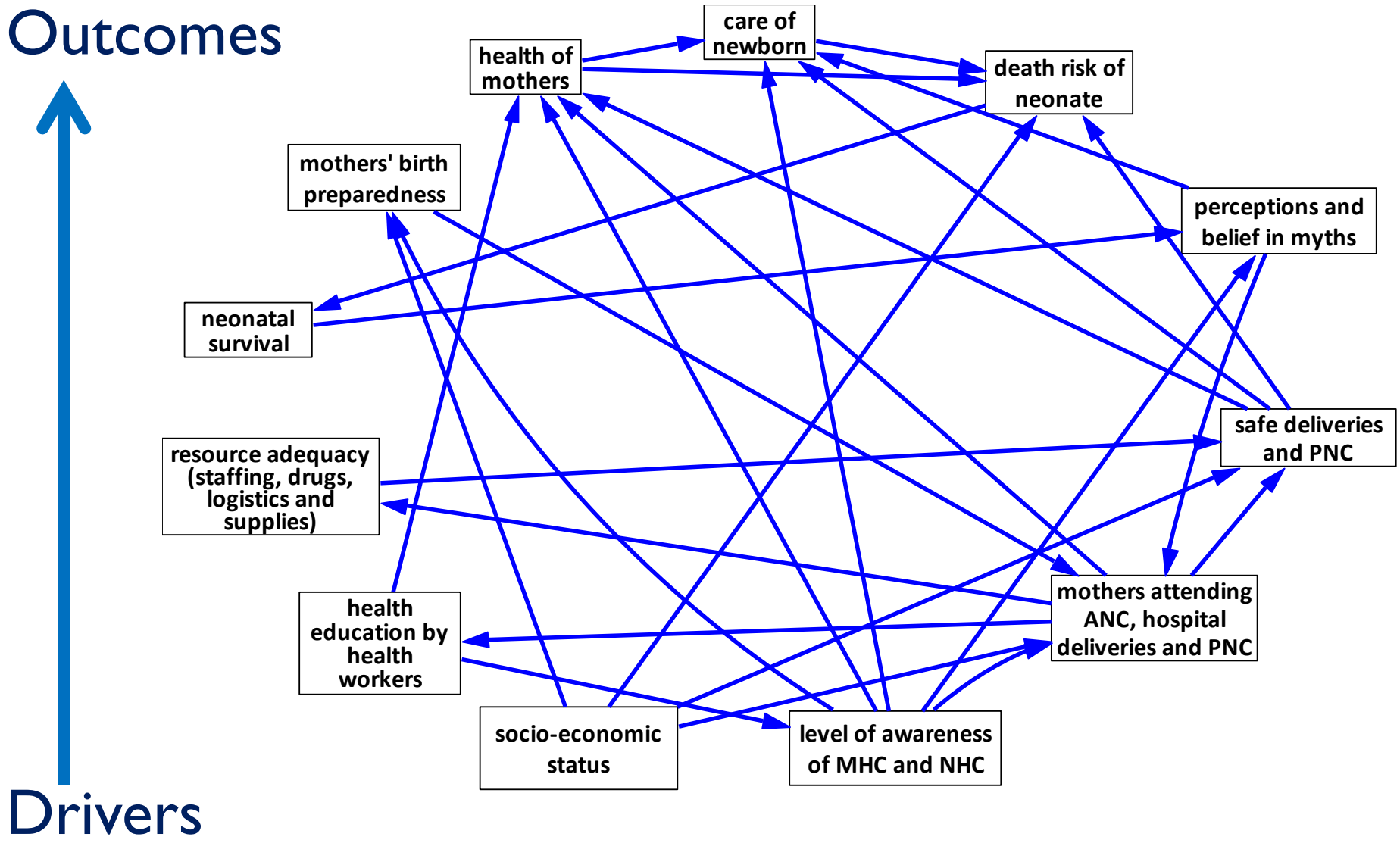
For each variable, count the number of arrows coming in and going out:

- Outcomes: Variables with more arrows coming in than out
  - Key Outcomes or Results: Variables with the most incoming arrows
- Drivers: Variables with more arrows going out than in
  - Root Causes: Variables with the most outgoing arrows

Determine drivers and outcomes



Identify key drivers and outcomes



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Purpose of Interrelationship Digraphs

- Force us to consider all possible interactions amongst the variables.
- Challenges our mental models.
- Identifies key outcomes and drivers in a complex system.
- Forms the basis from which we can identify feedback loops and surface a systems map.

Thank you

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