HOW TO APPLY THE MULTIPHASE OPTIMIZATION STRATEGY (MOST) IN YOUR INTERVENTION DEVELOPMENT RESEARCH

Module 6

Completing the optimization phase and identifying your next steps

Lesson 2: Introduction to making decisions based on the results of a factorial optimization trial

NYU SCHOOL OF GLOBAL PUBLIC HEALTH

Intervention Optimization Initiative

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In the previous lesson you learned how to:

- Understand what it means to conclude the optimization phase of MOST
- Be aware of the need to stay current with the rapidly changing field of decision-making for intervention optimization

In this lesson you will learn how to:

- Understand what are current best practices for empirically identifying an optimized intervention

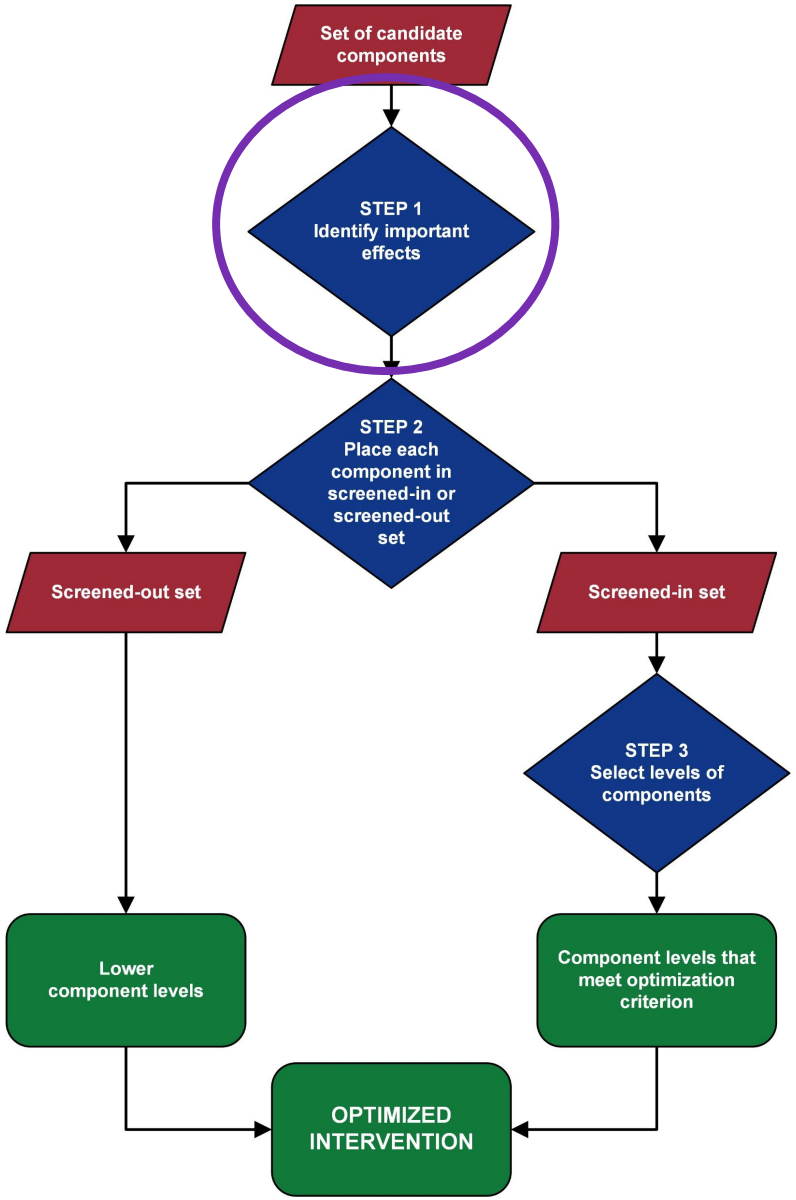
Before you start the decision-making process

- Identify an optimization objective (should have been done in preparation phase)
- Conduct factorial optimization trial, analyze data, obtain estimates of main effects and interactions
- Collect data on cost (if needed; depends on optimization objective)

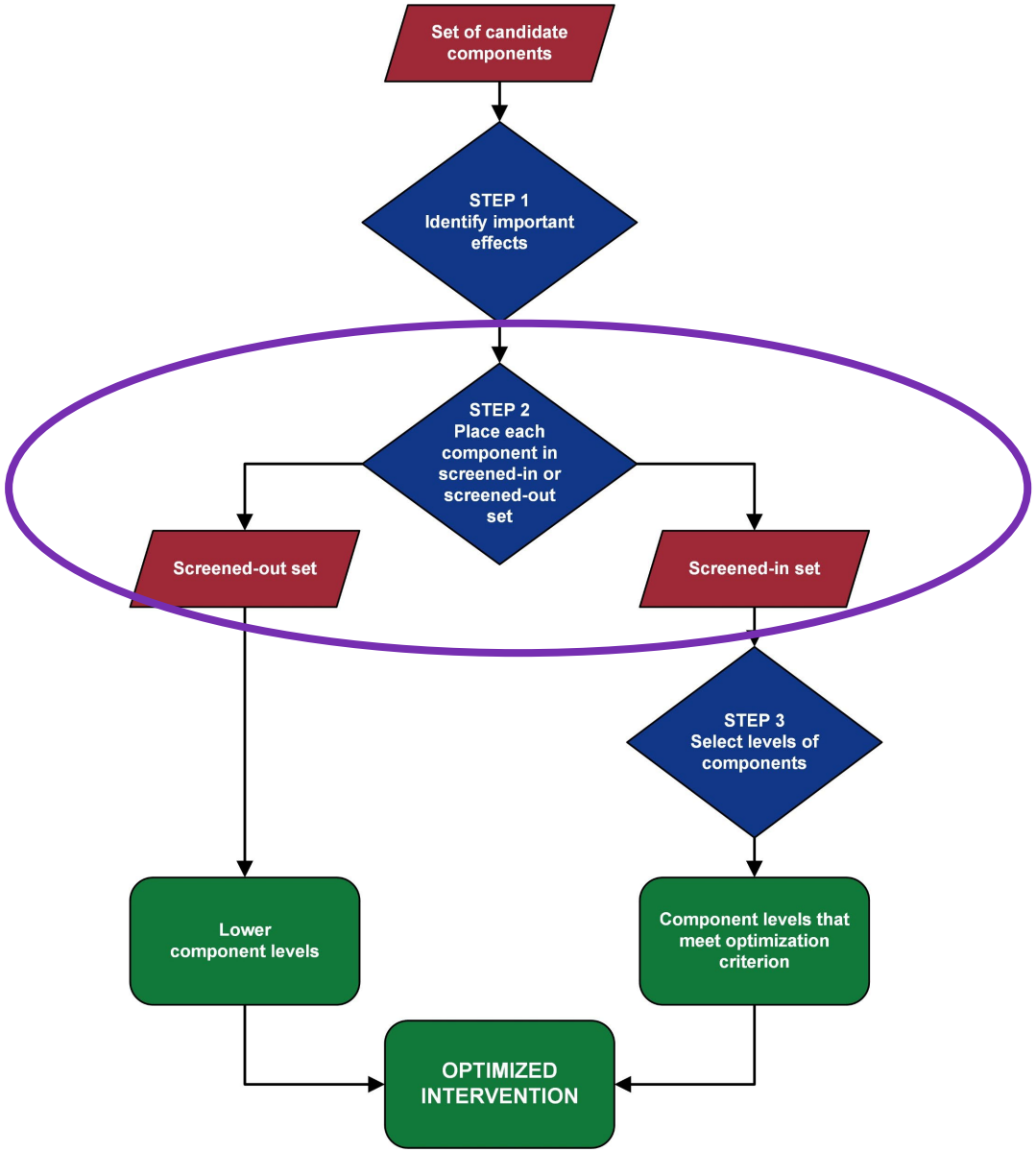
Overview of decision-making

- In Step 1, identify important effects
- In Step 2, place each candidate component in the screened-in or screened-out set
- In Step 3, select, from the screened-in set, the components/component levels that best meet the optimization objective

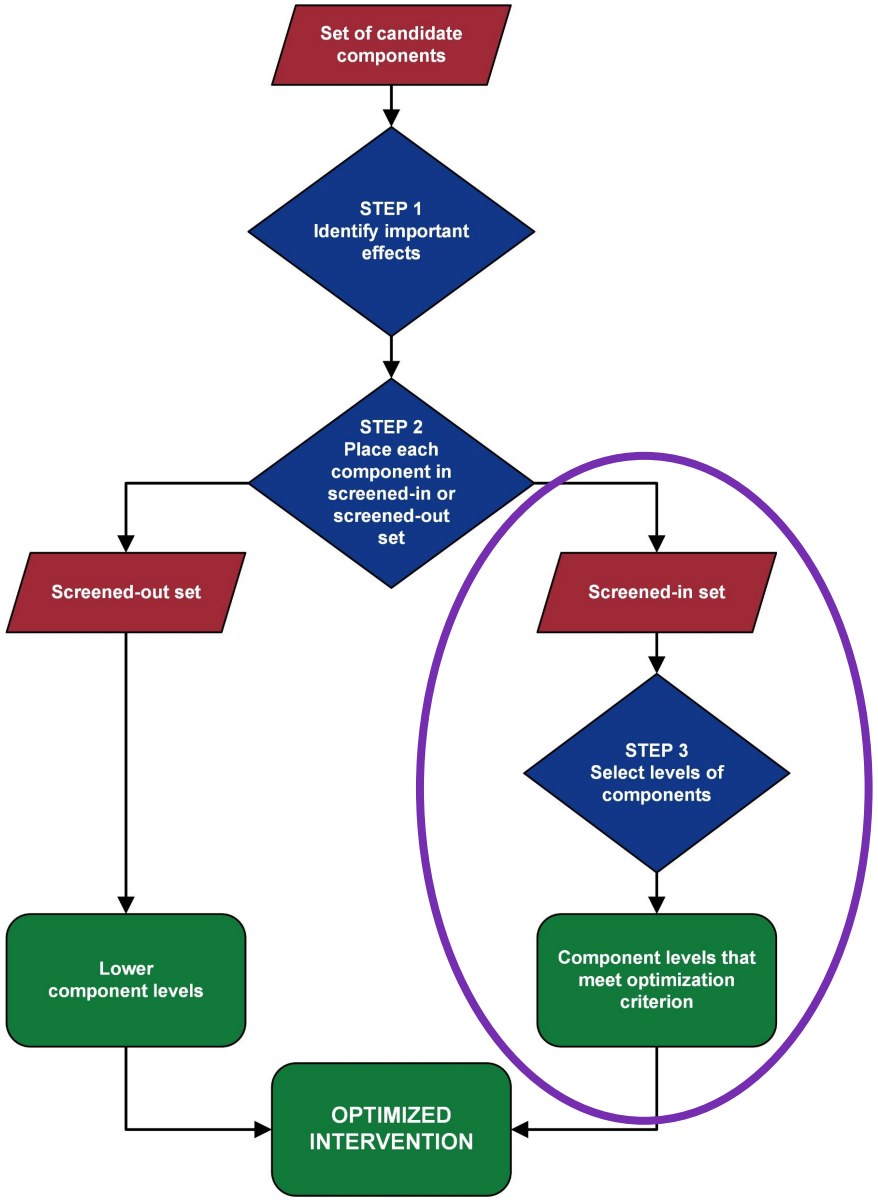
Step 1: Identify important effects



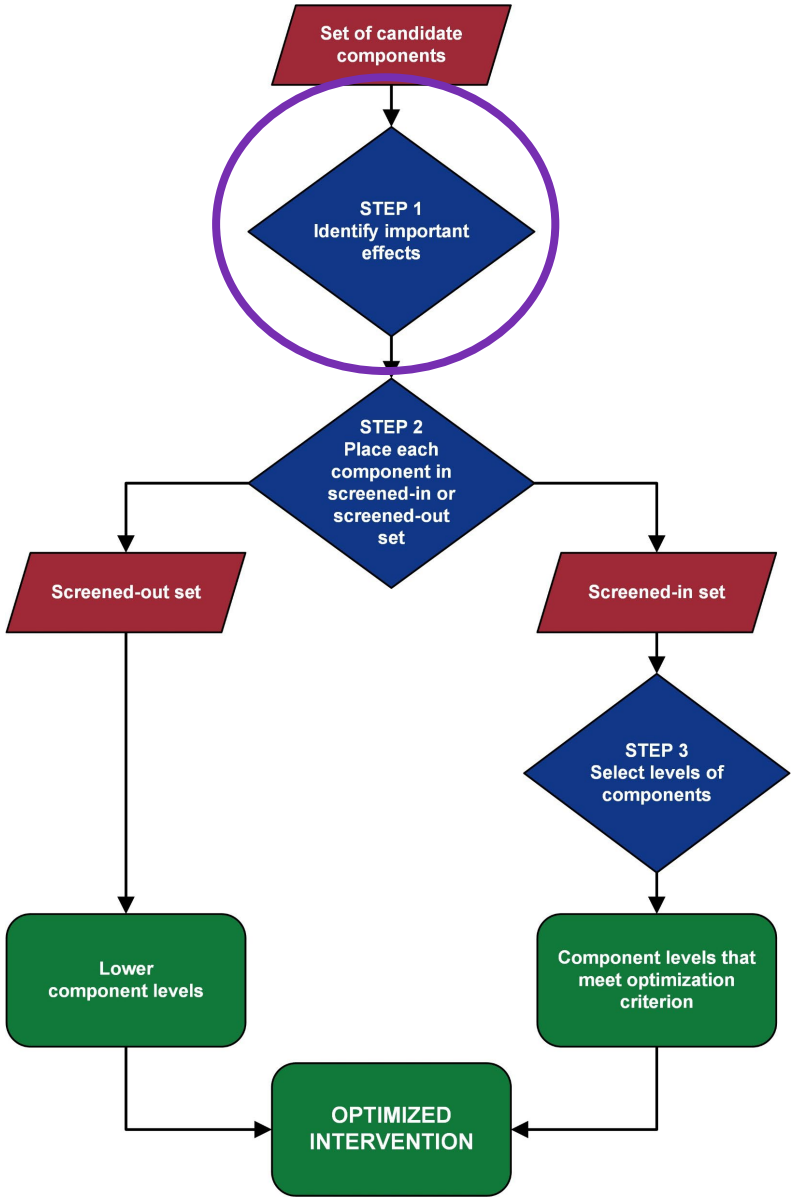
Step 2: Place each component in the screened-in or screened-out set



Step 3:
Select, from the screened-in set, components/ component levels that best meet the optimization objective



Step 1: Identify important effects



To identify important effects, start by defining them via cut-off

- Cut-off says “effects equal to or greater than this cut-off are considered important for decision-making”
  - In the Collins (2018) book called the main effect criterion and interaction effect criterion
- A cut-off can be expressed as either (these are equivalent for a given application)
  - Statistical significance
  - Effect size

Cut-offs to define important effects

- How do you select a cut-off?
- There are no established conventions
- Think about
  - Reasonable hopes and expectations for effectiveness of intervention package
  - Number of components that will be contributing
  - Effect size you are powered to detect

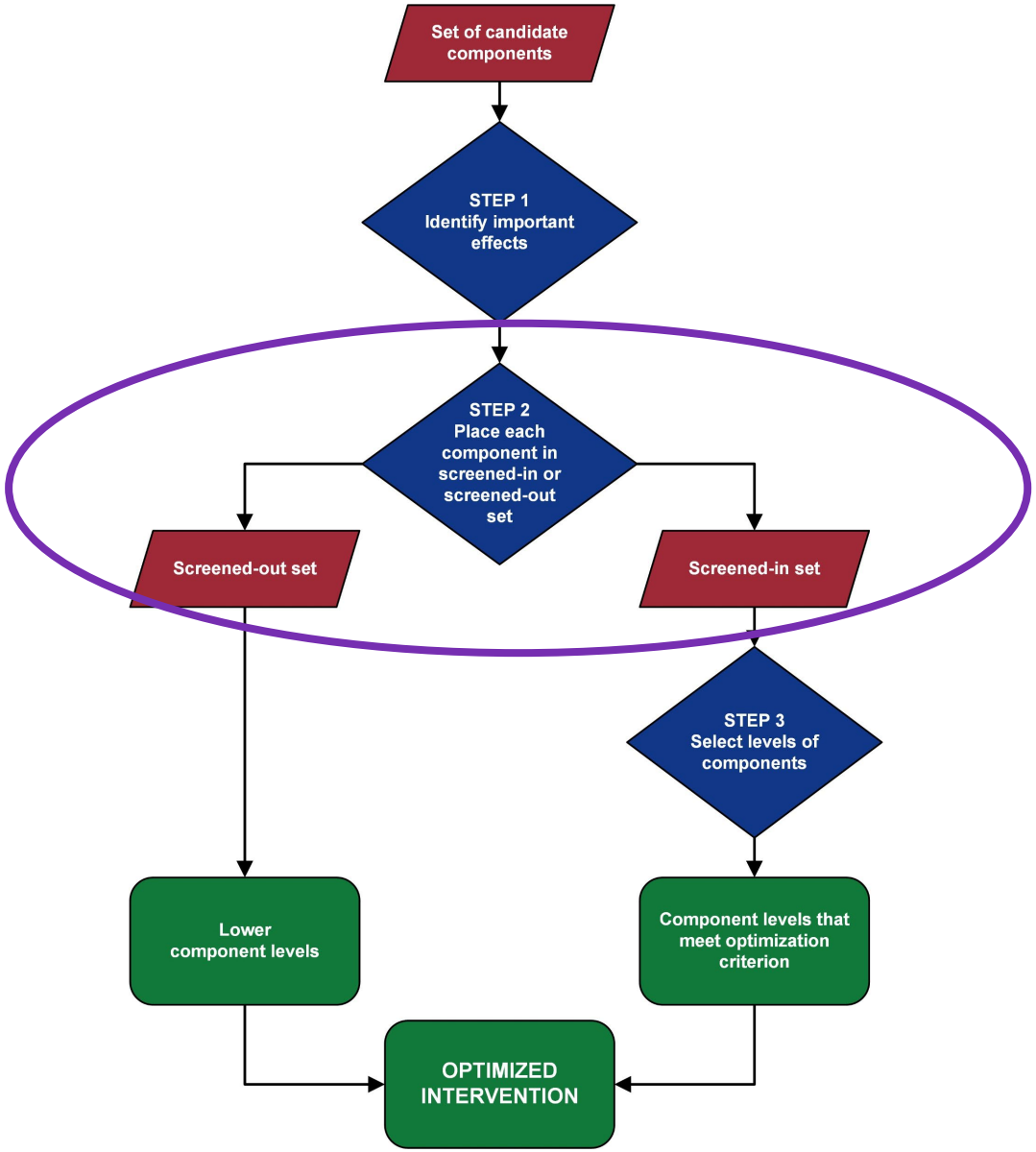
Cut-offs to define important effects

- For example, suppose:
- You hope and expect to develop an intervention that will have an effect of $d \geq .5$
- You have conducted an optimization trial to examine 5 components

Cut-offs to define important effects

- One possible rationale:
- Anticipate some antagonistic interactions
- Then you might be interested in any component that demonstrates an effect of, say, $d \geq .2$
- Any rational approach to selecting the cut-off is acceptable

Step 2: Place each component in the screened-in or screened-out set

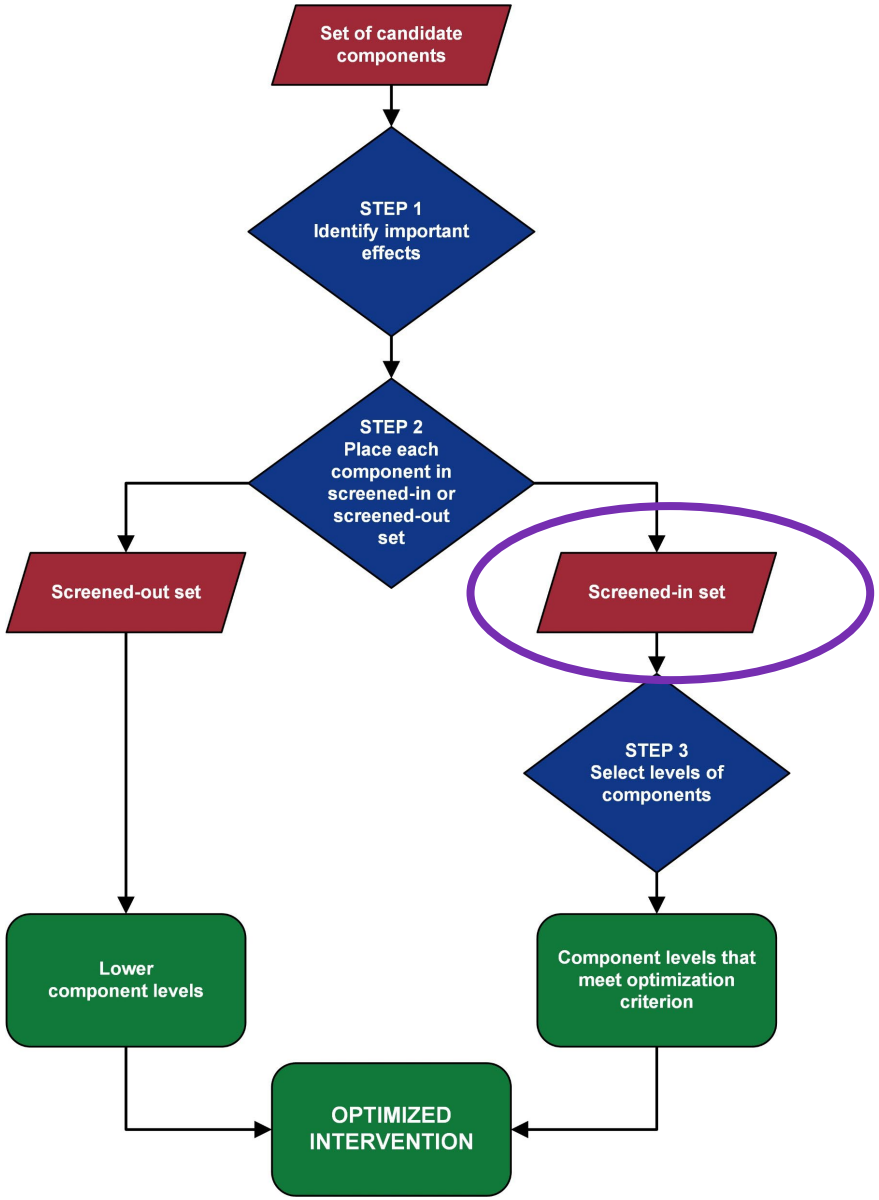


The screened-in set of components is…

…the subset of candidate intervention components that remains after components have been eliminated based on an optimization trial. These components may be included in the intervention at either the higher or lower level, depending on the optimization criterion.

Collins (2018), p. 293

Step 2: Place each component in the screened-in or screened-out set

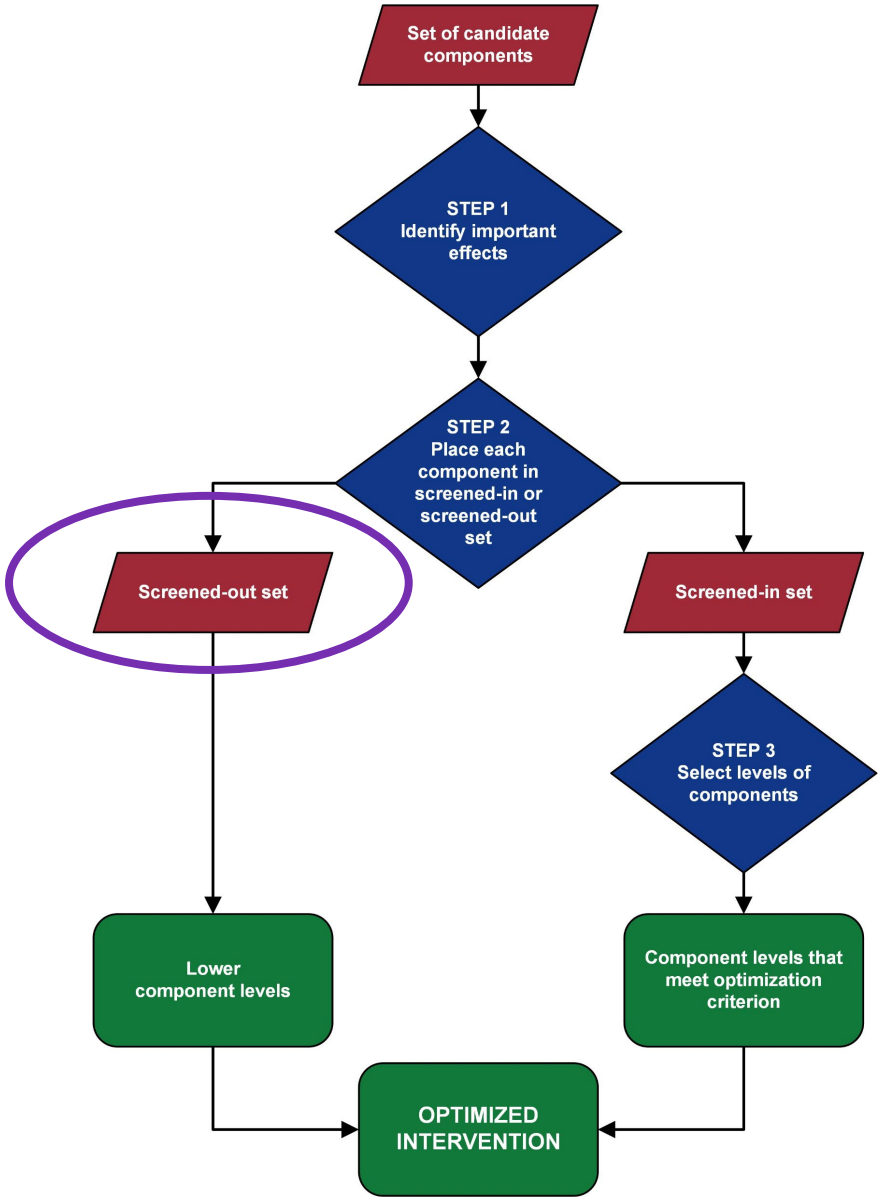


The screened-out set of components is…

…The subset of candidate intervention components that have been eliminated based on the results of an optimization trial. These components will be set to their lower levels.

Collins, 2018 (p. 293)

Step 2: Place each component in the screened-in or screened-out set



In other words…

- Assume for the moment that all the components have levels yes or no. Then results of the optimization trial are used to divide the candidate components into two sets:
  - The **screened-in set**, made up of the components that performed well enough to be eligible for inclusion in the optimized intervention
  - Whether they will be included depends on the optimization objective

In other words…

- Assume for the moment that all the components have levels yes or no. Then results of the optimization trial are used to divide the candidate components into two sets:
  - The **screened-out set**, made up of the components that did not perform well enough to be eligible for inclusion in the optimized intervention
  - **These will not be considered further**

What if the levels of the components are high and low?

- The screened-in set is made up of the components that performed well enough to be eligible for inclusion in the optimized intervention *set to the high level*
- Whether they will be included at the high or low level depends on the optimization objective

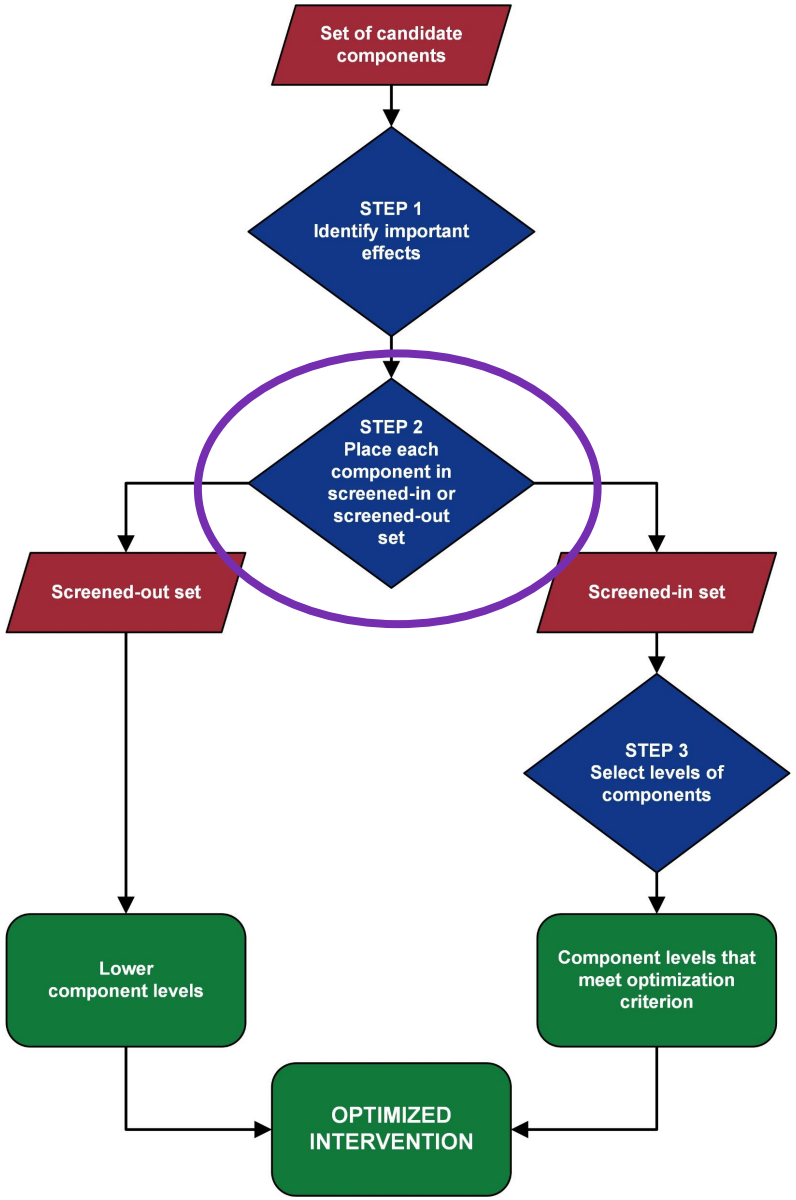
What if the levels of the components are high and low?

- The screened-out set is made up of the components that did not show a difference between the high and low level. Thus they will be set to the low level
- **These will not be considered further**

Remember, you are really always deciding between the high and low level

- If the levels are yes and no:
  - Selecting the high level (yes) means the component is included
  - Selecting the low level (no) means the component is not included

Step 2: Place each component in the screened-in or screened-out set



How to decide on the screened-in and screened-out sets

First, preliminarily select all components corresponding to factors with important main effects (according to the cut-off you identified) **in the desired direction** into the screened-in set of components

Then, reconsider these selections in light of any important interactions

Why reconsider selections in light of important interactions?

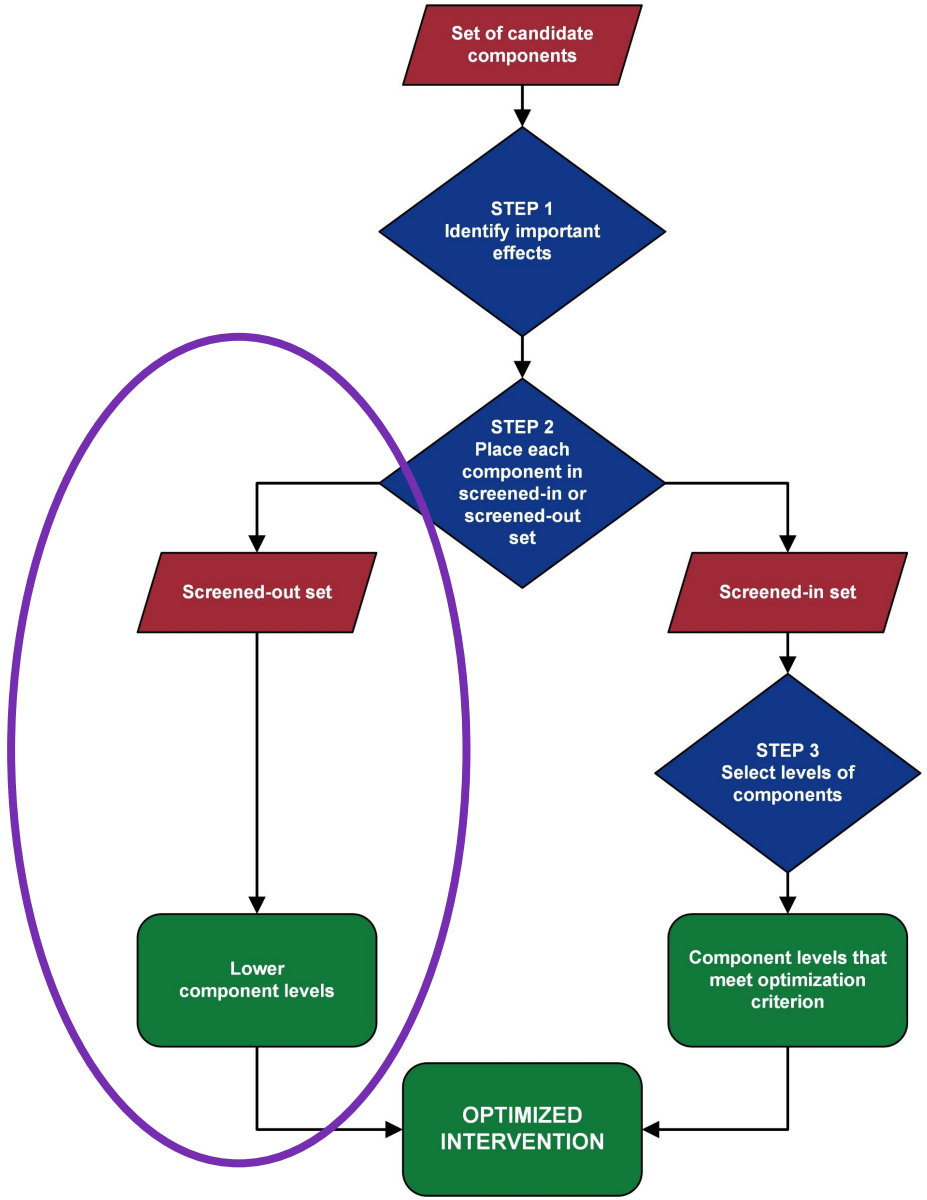
- Suppose a component has been placed in the screened-out set
- BUT synergistic interaction suggests it might boost the effectiveness of a component in the screened-in set

Why reconsider selections in light of important interactions?

- Suppose a component has been placed in the screened-in set
- BUT antagonistic interaction suggests it might reduce the effectiveness of another component in the screened-in set

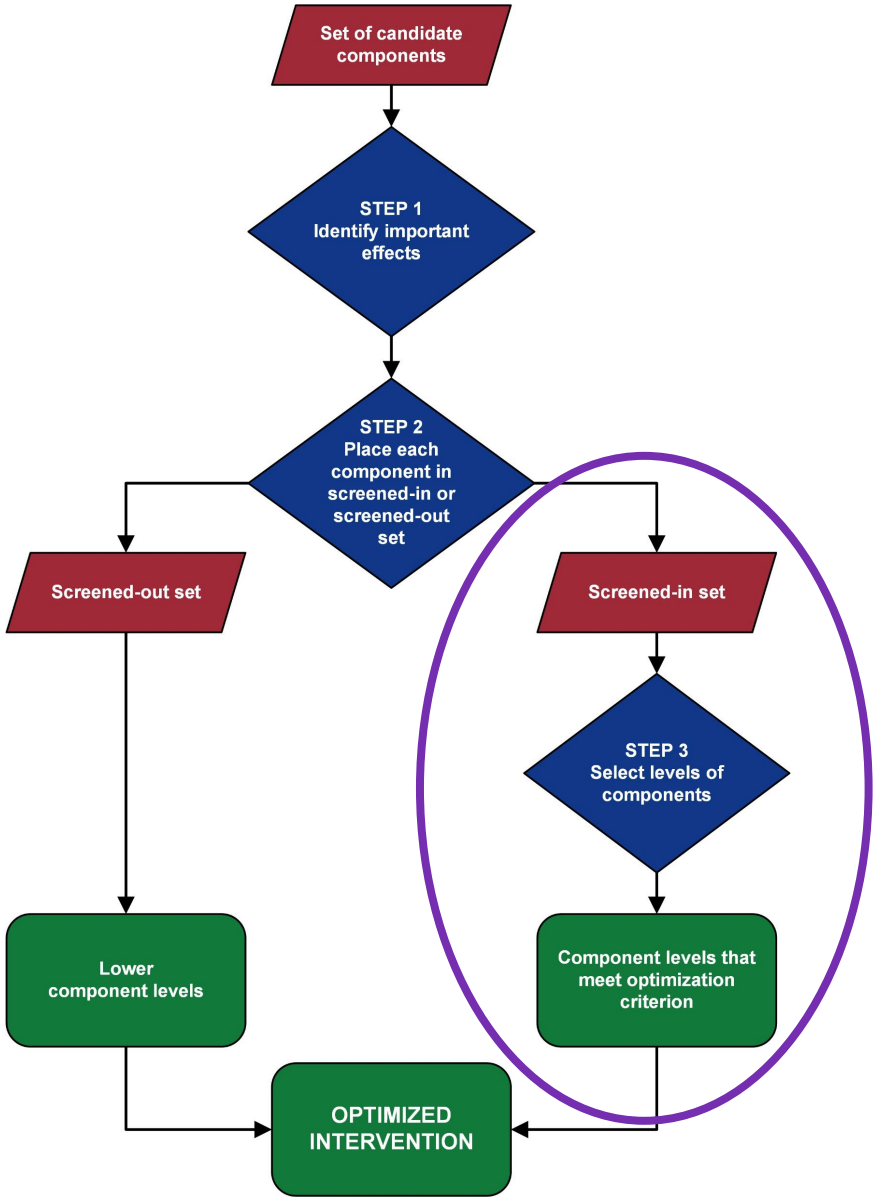
- At conclusion of Step 2, components have been divided into the screened-in and screened-out sets
- Screened-out components are set to their lower levels and not considered further

Step 2: Place each component in the screened-in or screened-out set



- At conclusion of Step 2, components have been divided into the screened-in and screened-out sets
- Screened-out components are set to their lower levels and not considered further
  - If the lower level of a component = no, the component will not be included in the intervention.
  - If the lower level = lower intensity rather than no, the component will be included at the lower intensity.

Step 3:
Select, from the screened-in set, components/ component levels that best meet the optimization objective



Step 3: Select components/component levels to make up the optimized intervention

- Suppose the optimization objective is “all active components”: Cost IS NOT an explicit consideration
  - Want to screen out inactive components
  - Then you are done! Your intervention = the screened-in set of components, all set to the higher level

Step 3: Select components/component levels to make up the optimized intervention

- Suppose your optimization objective DOES involve cost as an explicit consideration
  - Then there are additional steps
  - You need data on what each combination of components/component levels in the screened-in set costs

Step 3: Select components/component levels to make up the optimized intervention

1. Eliminate combinations that exceed upper limit on cost
2. Of remaining, select combination that produces best expected outcome in terms of $\hat{Y}$

In this lesson you learned how to:

- Understand what are current best practices for empirically identifying an optimized intervention

In the next lesson you will learn how to:

- Implement current practices in an example
- Relate the decision-priority perspective to identification of the optimized intervention