

Methods: Mind the Gap
Webinar Series

Optimizing Interventions for Equitability: Some Initial Ideas

Presented by:

Linda M. Collins, Ph.D.

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New York University School of Global Public
Health



National Institutes of Health
Office of Disease Prevention

Overview

- A brief introduction to intervention optimization via MOST (Linda)
- Decision-making and optimizing for equitability (Jillian)

A story of two planets: Earth and its twin, Terra



EARTH

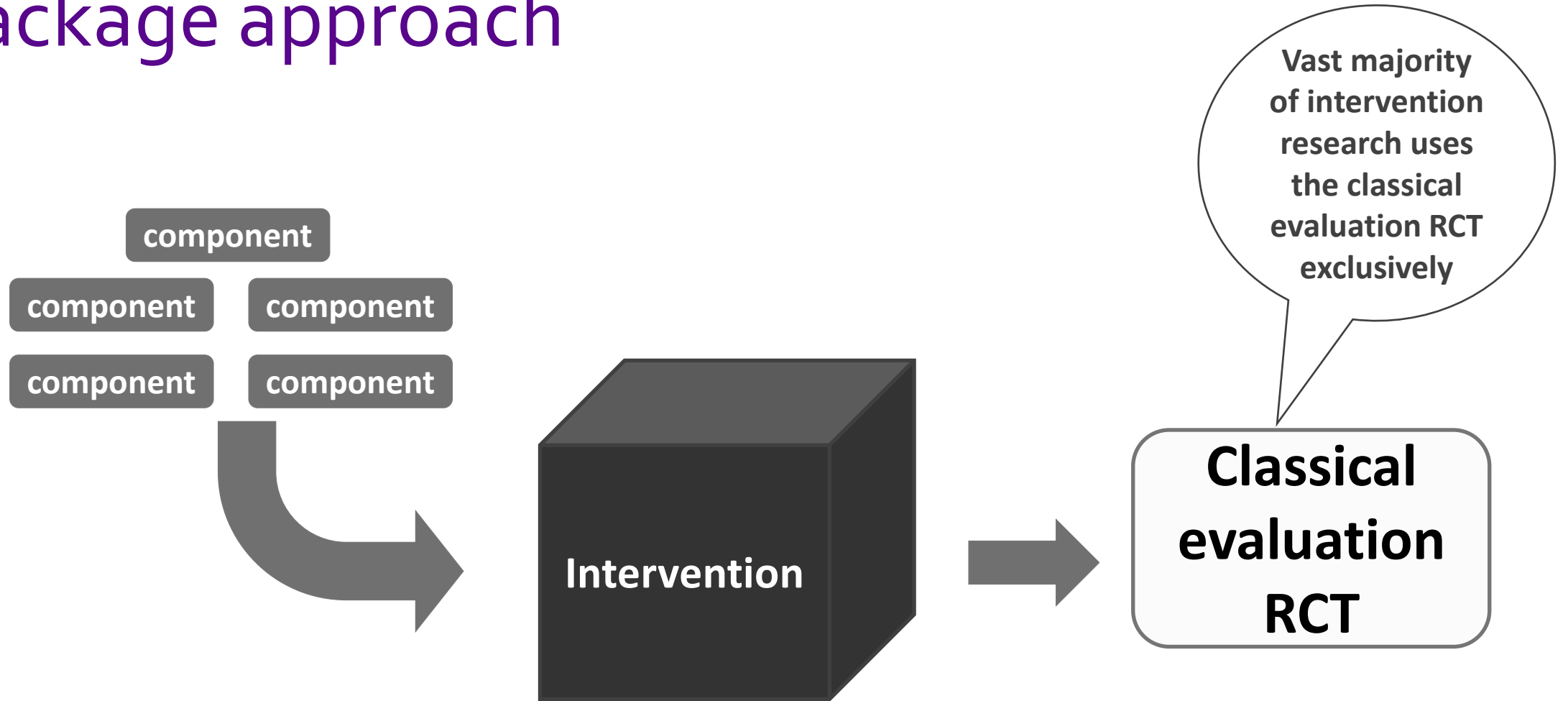
Has
behavioral/biobehavioral
interventions

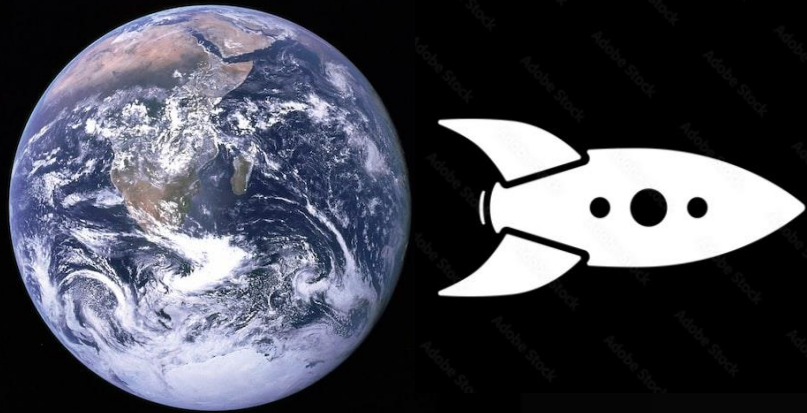


TERRA

No behavioral/biobehavioral
interventions (yet)

Planet Earth uses the Classical Treatment Package approach





EARTH

Has
behavioral/biobehavioral
interventions



TERRA

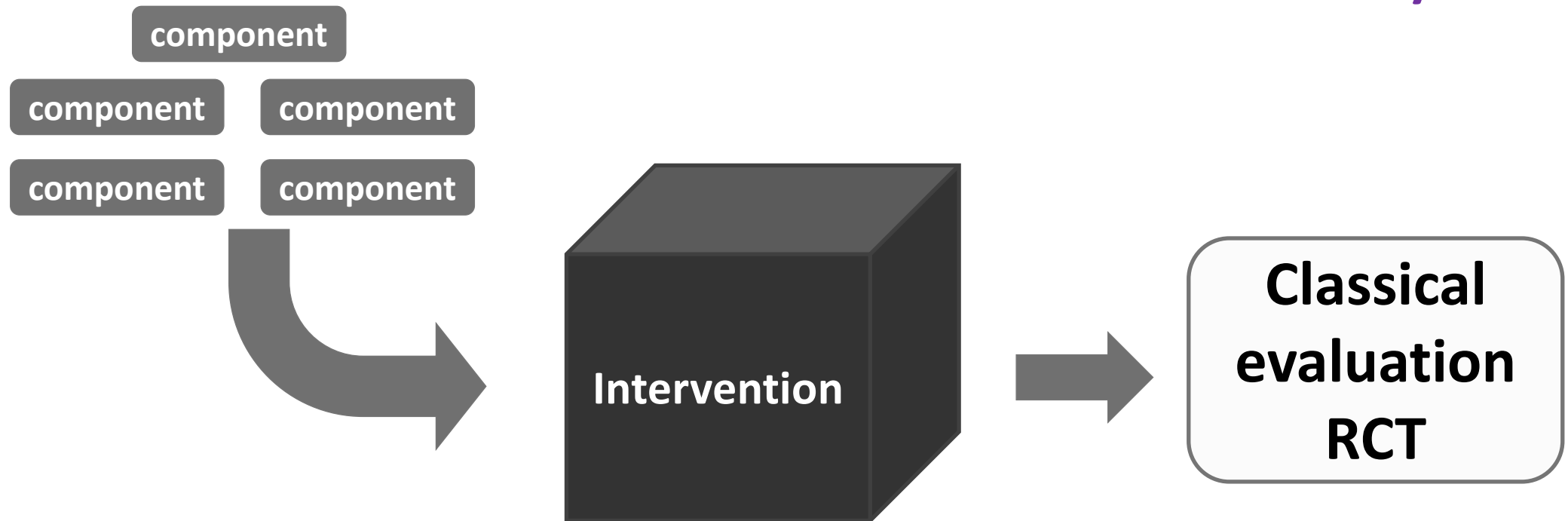
No behavioral/biobehavioral
interventions (yet)

Terra's objectives:

1. Build a **coherent knowledge base** about what intervention strategies work, for whom, and why
2. Use this knowledge to develop interventions that have **immediate high public health impact**
3. Keep making **improvements** in these interventions over time

Terra's plan: Start with the classical treatment package approach...

...then re-evaluate after 5 years



Five years go by...



1169207942

What Terra concluded after 5 years

Objective 1: Coherent knowledge base

- When an intervention demonstrated a detectable effect, it was not clear why it worked
- When an intervention did **not** show a significant effect, it was not clear why it did not work
- **Conclusion: Not successfully building a coherent knowledge base**

Objective 2: Immediate high public health impact

- Most of the interventions developed were too expensive, complex, or burdensome to be implemented
- No way to fix this without risking making them ineffective
- No implementation = zero public health impact
- **Conclusion: Not successfully achieving high public health impact**

Objective 3: Improvements

- Evaluation in a classical evaluation RCT did not reveal an intervention's strong and weak parts
- Next steps to make improvements unclear
- **Conclusion: Not set up to make ongoing improvements**
- **Conclusion: Without improvements, not much hope of achieving Objectives 1 and 2 in the future**

The people of Terra decided they needed
a new research paradigm

Late 20th
century
(mid 1980's)

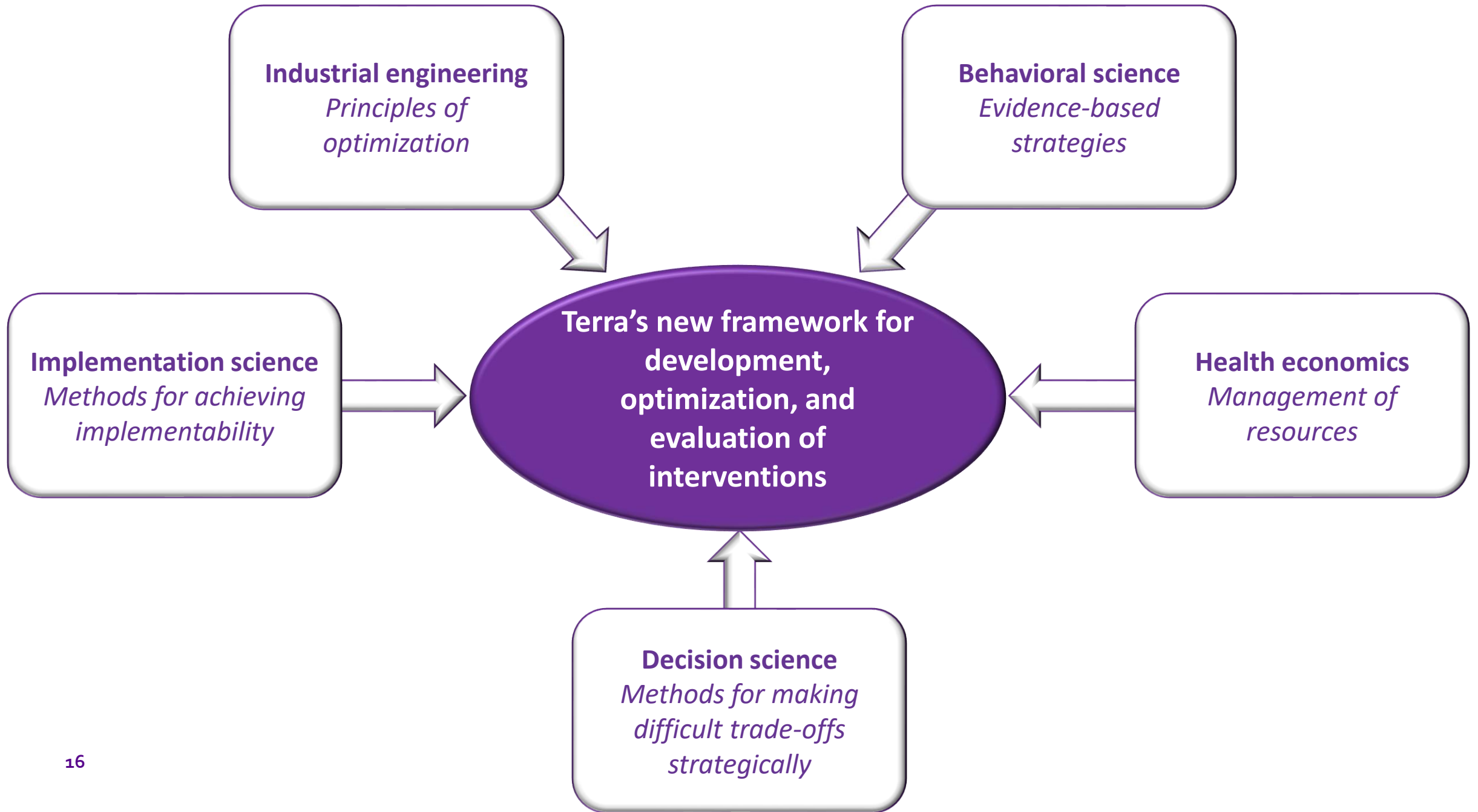


Early 21st
century
(today)



OPTIMIZATION

The process of strategically balancing a set of prioritized criteria in order to achieve the best outcome



Some characteristics of Terra's new framework

- Objective is to develop an intervention that BOTH demonstrates a significant effect AND is immediately implementable
- This requires strategically **BALANCING Effectiveness** against **Affordability, Scalability, and Efficiency** to achieve intervention ***EASE***
- Achieve this balance by **OPTIMIZING**; only then go to evaluation RCT

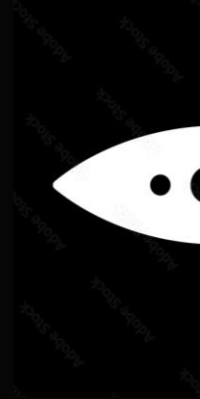
Some characteristics of Terra's new framework

- A discovery-driven, iterative approach
- Uses a variety of experimental designs as needed, including the classical evaluation RCT along with others
- Expectation that intervention improvement is an ongoing process
 - Assign version numbers to interventions

COULD PLANET TERRA'S APPROACH WORK ON EARTH?

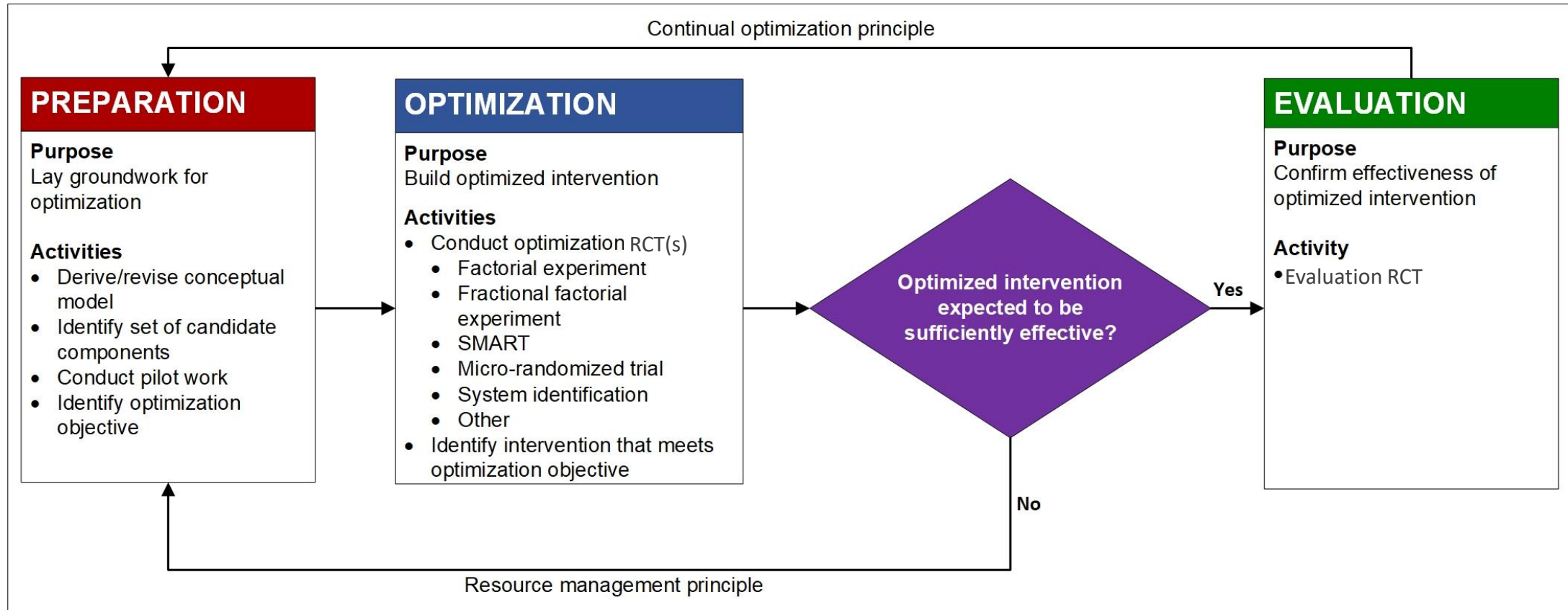


EARTH



TERRA

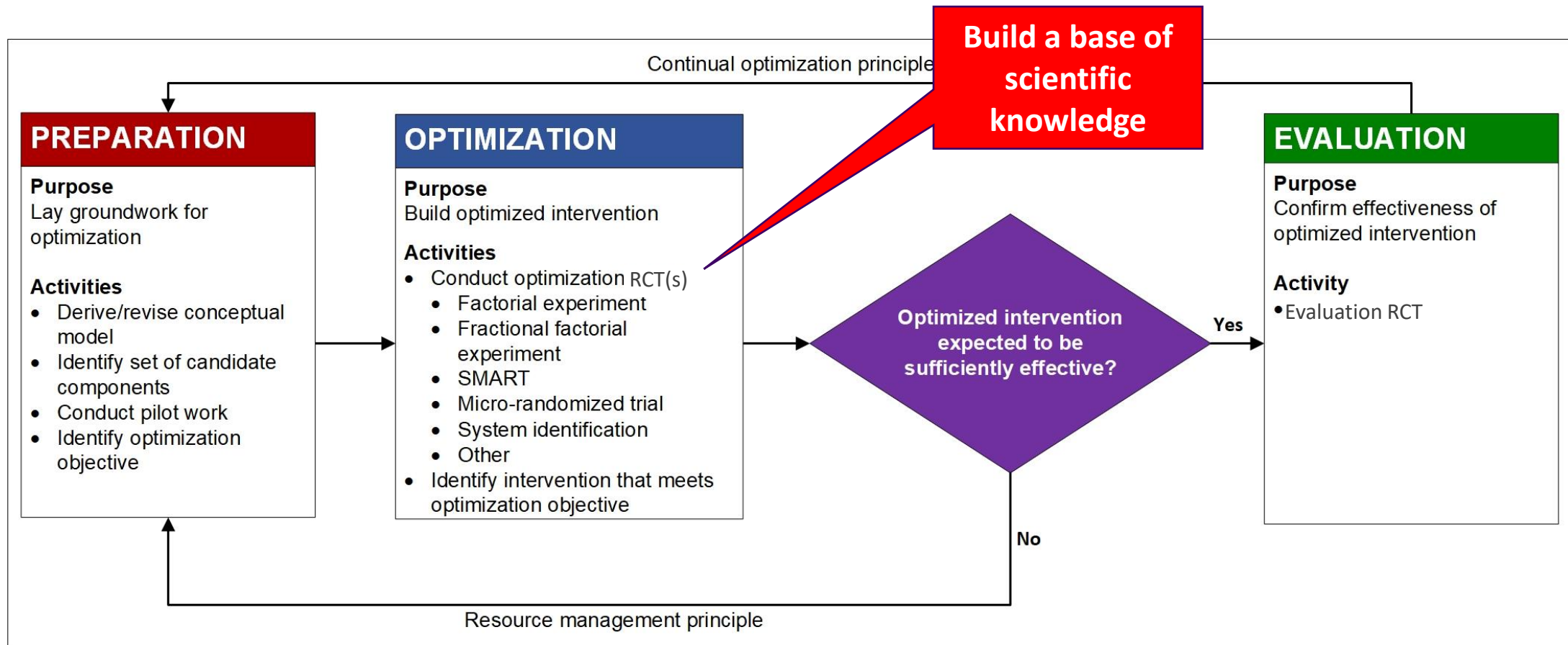
Multiphase optimization strategy (MOST)



Flow chart of the three phases of the multiphase optimization strategy (MOST). Rectangle = action. Diamond = decision.

Source: Figure taken from Collins, L.M. (2018). *Optimization of Behavioral, Biobehavioral, and Biomedical Interventions: The Multiphase Optimization Strategy (MOST)*. New York: Springer.

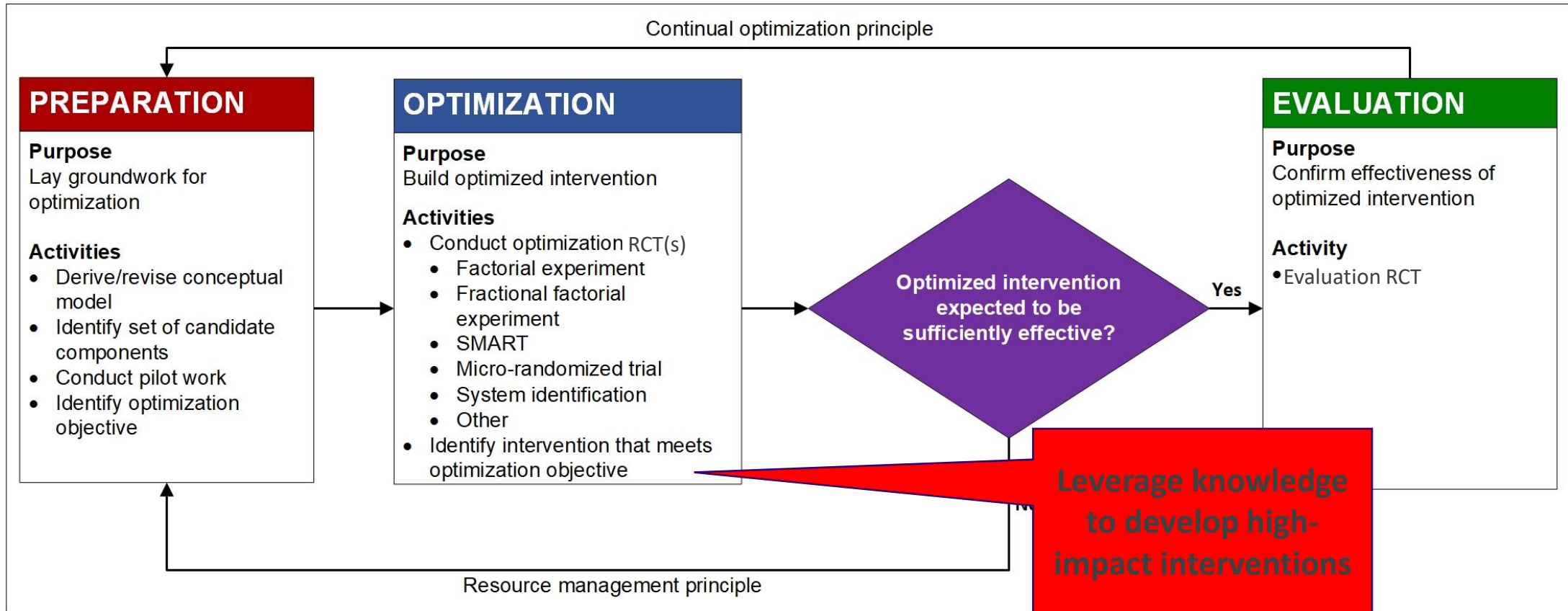
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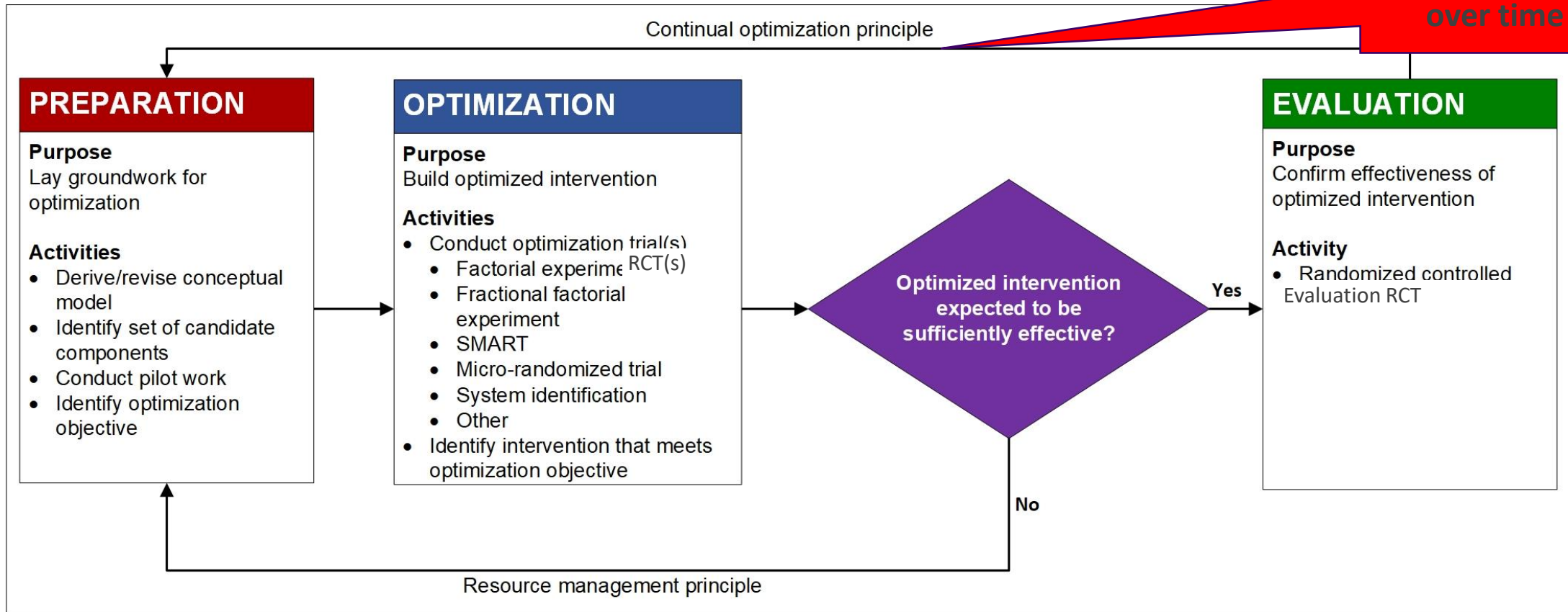


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Multiphase optimization strategy (MOST)

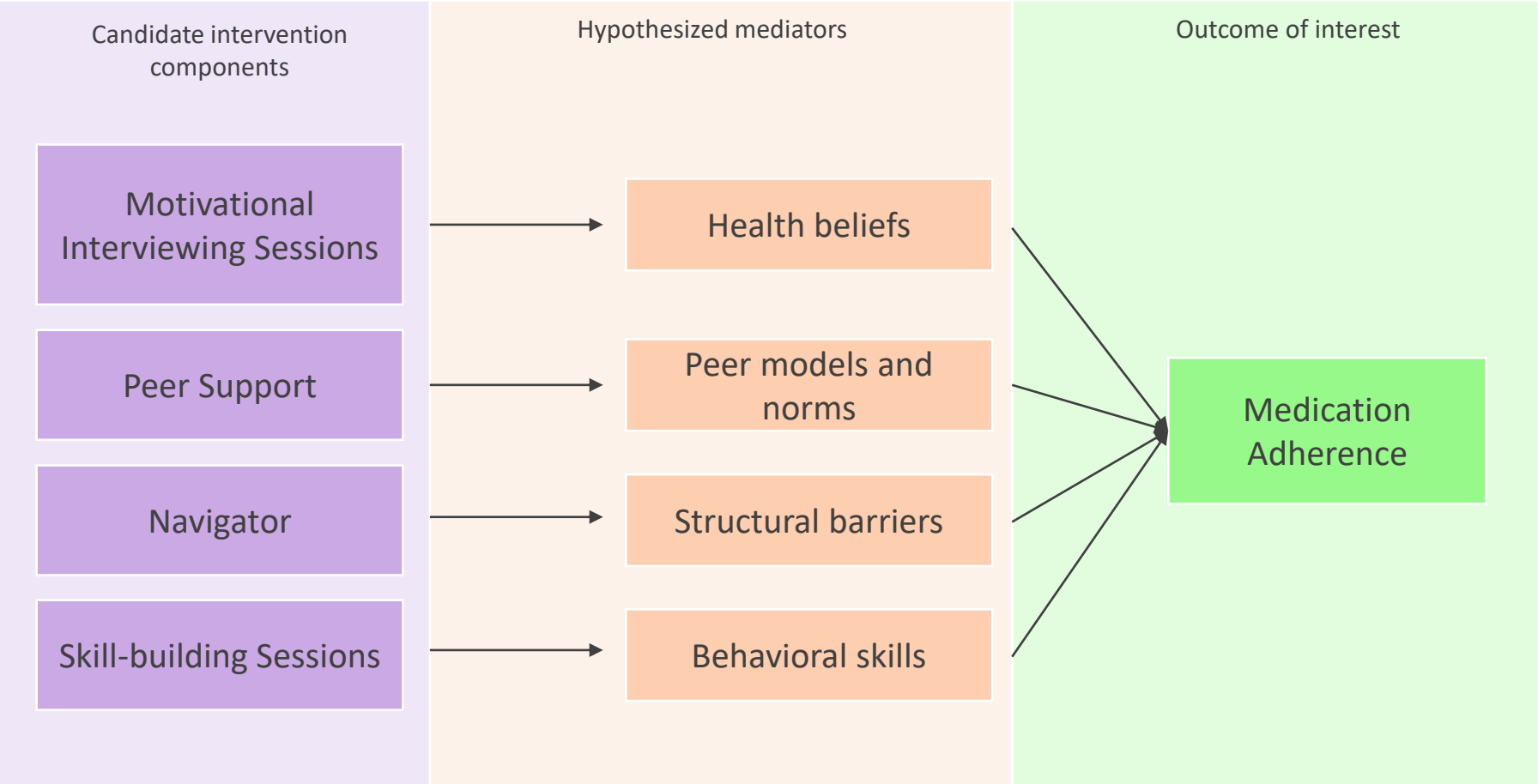
Improve interventions over time



Flow chart of the three phases of the multiphase optimization strategy (MOST). Rectangle = action. Diamond = decision.

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Conceptual model for a hypothetical intervention



A 2⁴ factorial optimization RCT for the hypothetical intervention

| Experimental condition | Motivational Interviewing | Peer Support | Navigator | Skill-building Sessions |
|------------------------|---------------------------|--------------|-----------|-------------------------|
| 1 | On | On | On | On |
| 2 | On | On | On | Off |
| 3 | On | On | Off | On |
| 4 | On | On | Off | Off |
| 5 | On | Off | On | On |
| 6 | On | Off | On | Off |
| 7 | On | Off | Off | On |
| 8 | On | Off | Off | Off |
| 9 | Off | On | On | On |
| 10 | Off | On | On | Off |
| 11 | Off | On | Off | On |
| 12 | Off | On | Off | Off |
| 13 | Off | Off | On | On |
| 14 | Off | Off | On | Off |
| 15 | Off | Off | Off | On |
| 16 | Off | Off | Off | Off |

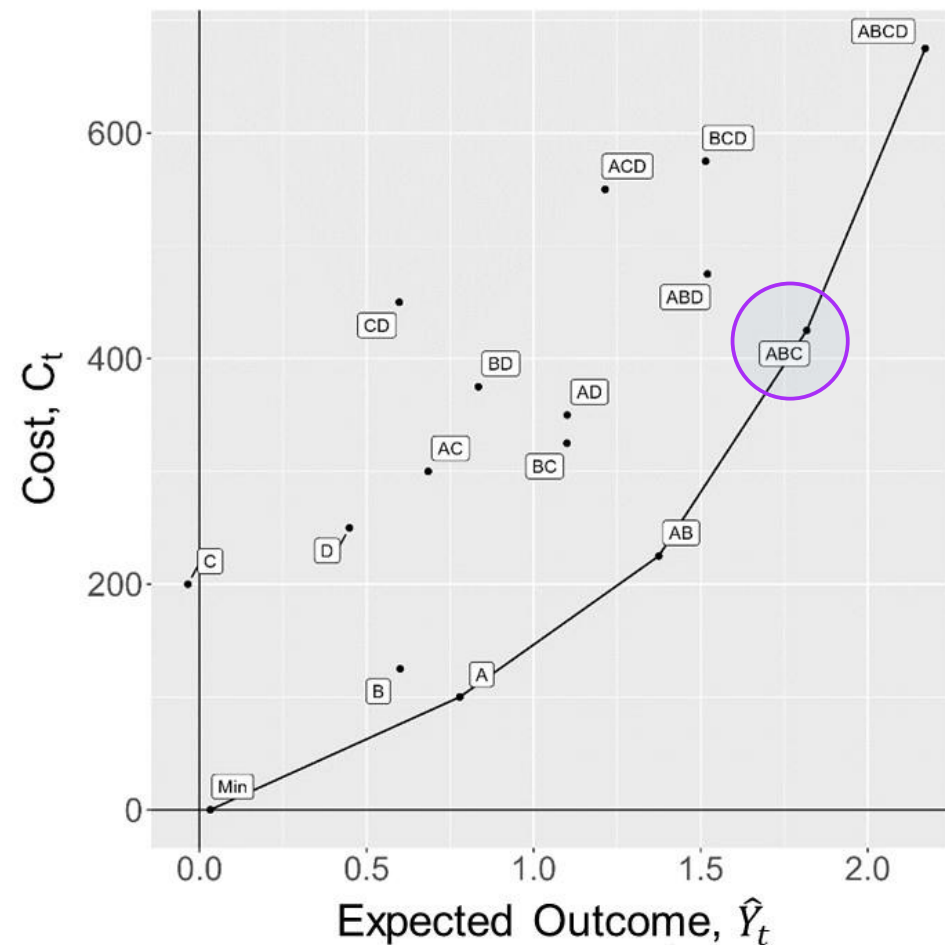
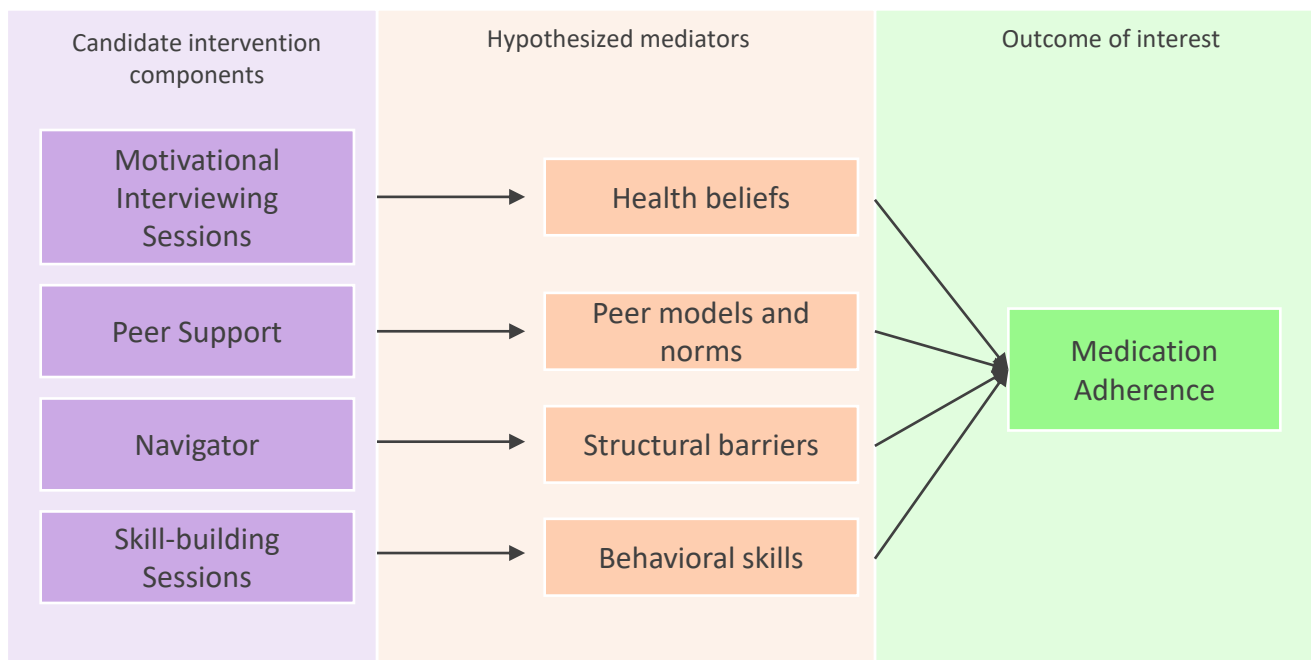
A 2⁴ factorial optimization RCT for the hypothetical intervention

| Experimental condition | Motivational Interviewing | Peer Support | Navigator | Skill-building Sessions |
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Simulated ORCT results





AMERICAN
PSYCHOLOGICAL
ASSOCIATION



Society for
HEALTH PSYCHOLOGY

Health Psychology

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Using Decision Analysis for Intervention Value Efficiency to Select Optimized Interventions in the Multiphase Optimization Strategy

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Marya Gwadz⁶, and Linda M. Collins⁷

¹ Department of Social and Behavioral Sciences, School of Global Public Health, New York University

² Department of Population Health, New York University Grossman School of Medicine

³ Department of Health Policy and Administration, Pennsylvania State University

⁴ Department of Human Development, State University of New York at Binghamton

⁵ Faculty of Humanities, University of Johannesburg

⁶ New York University Silver School of Social Work

⁷ Department of Social and Behavioral Sciences, New York University School of Global Public Health

An important challenge

Many behavioral, biobehavioral, and biomedical interventions are intended to be disseminated broadly—i.e., delivered to participants who vary in their social, environmental, and economic advantage.

An important challenge

When interventions are intended to be disseminated widely across a population, there are at least two key goals:

1. To achieve effectiveness overall (mean outcome)
2. To achieve effectiveness **equitably** (distribution of outcomes)

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An important challenge

When interventions are intended to be disseminated widely across a population, there are at least two key goals:

- 1. To achieve effectiveness overall (mean outcome)**
- ~~2. To achieve effectiveness equitably (distribution of outcomes)~~
 - Broad dissemination carries an important risk: *That existing health disparities will increase.*

An important challenge

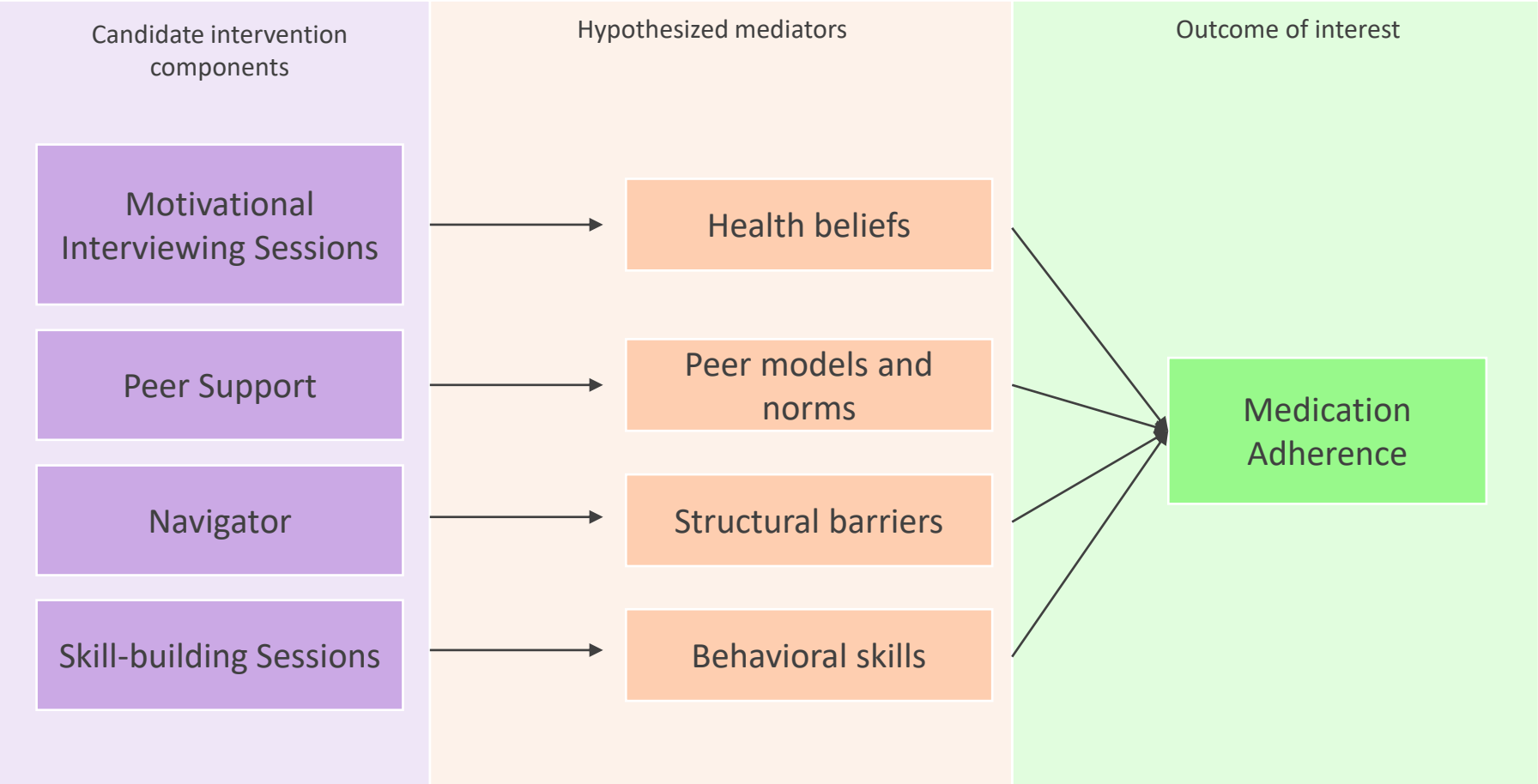
When interventions are intended to be disseminated widely across a population, there are at least two key goals:

1. **To achieve effectiveness overall (mean outcome)**

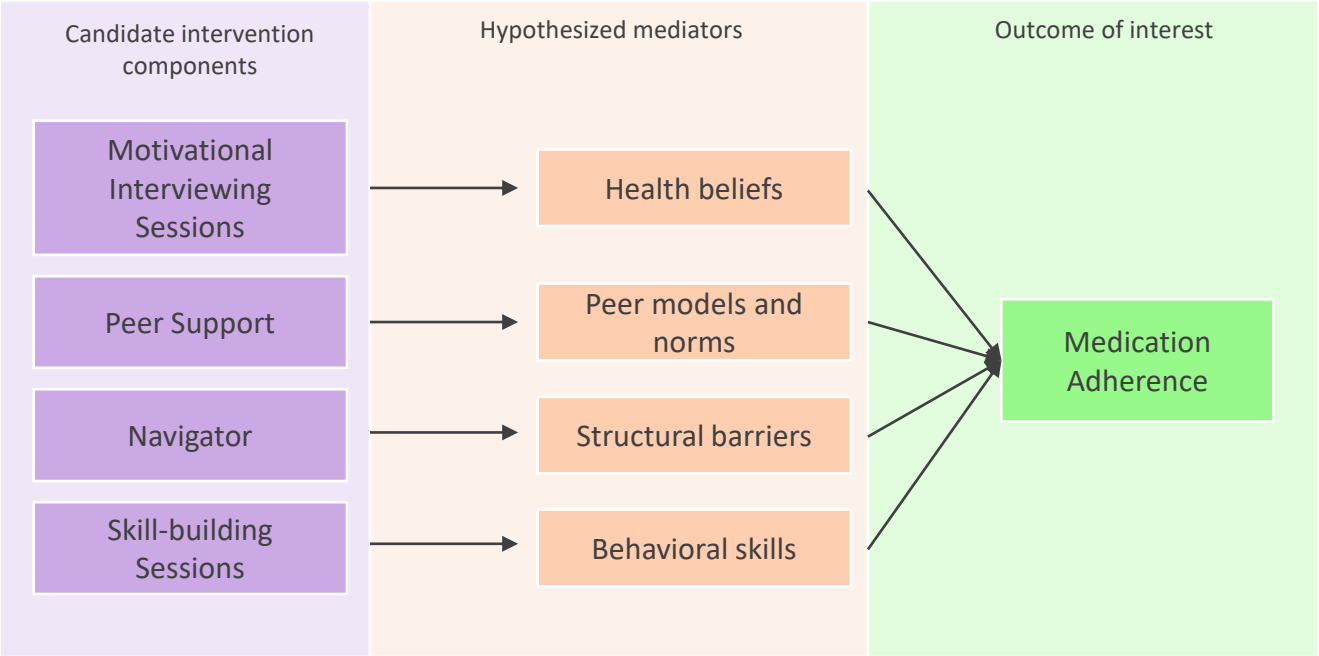
~~2. To achieve effectiveness equitably (distribution of outcomes)~~

- Broad dissemination carries an important risk: *That existing health disparities will increase.*
- ***Intervention generated inequality:*** *When an intervention is effective on a population level but increases a health disparity.*

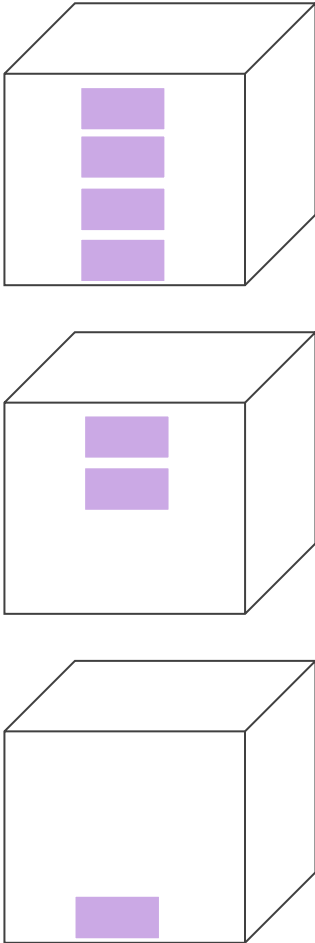
Conceptual model for a hypothetical intervention



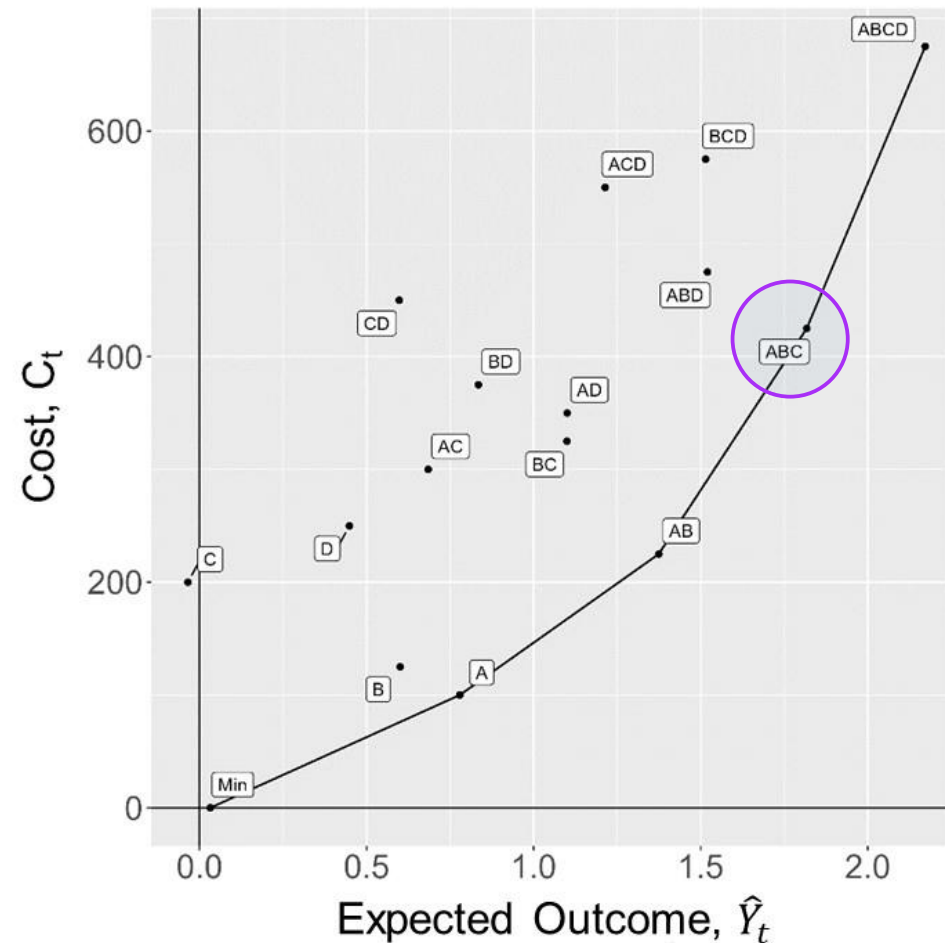
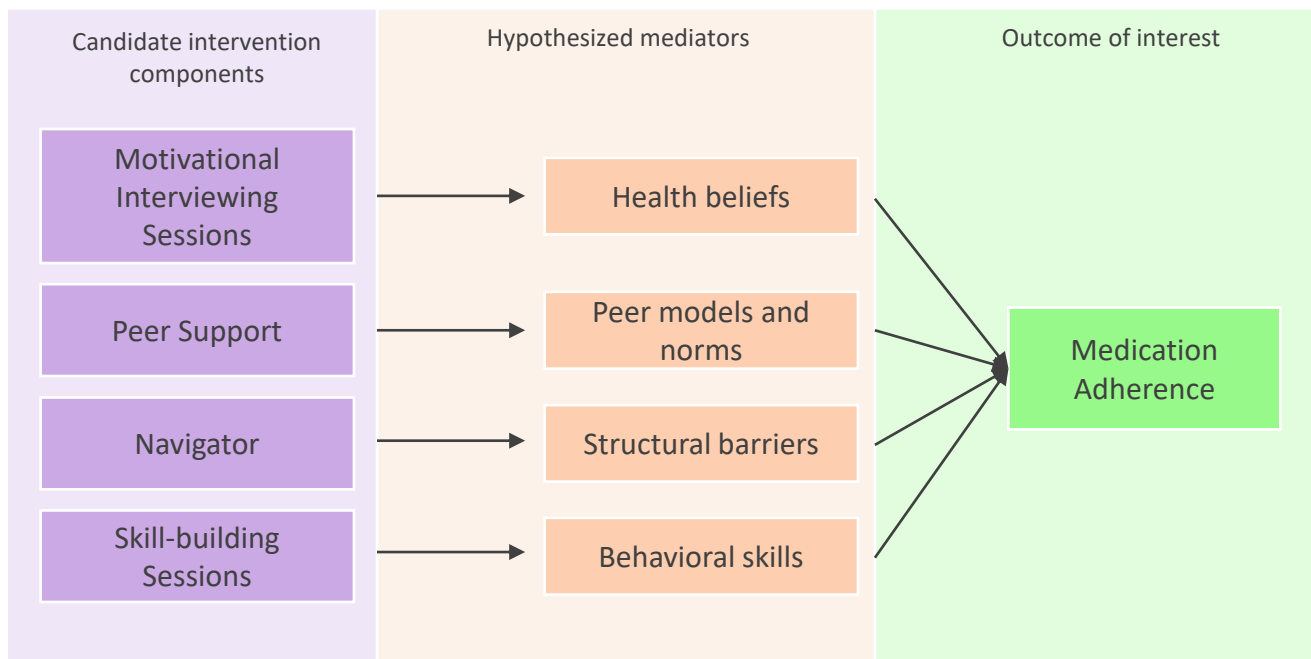
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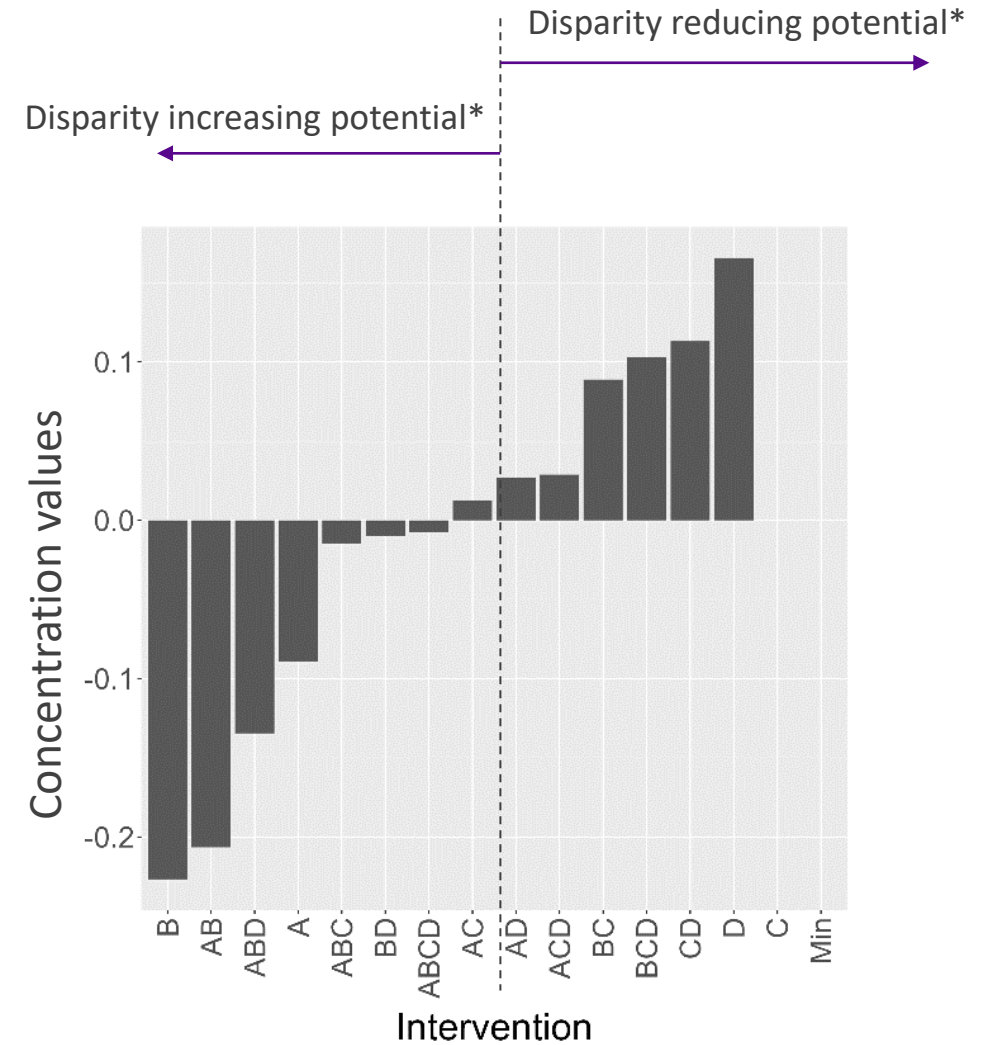
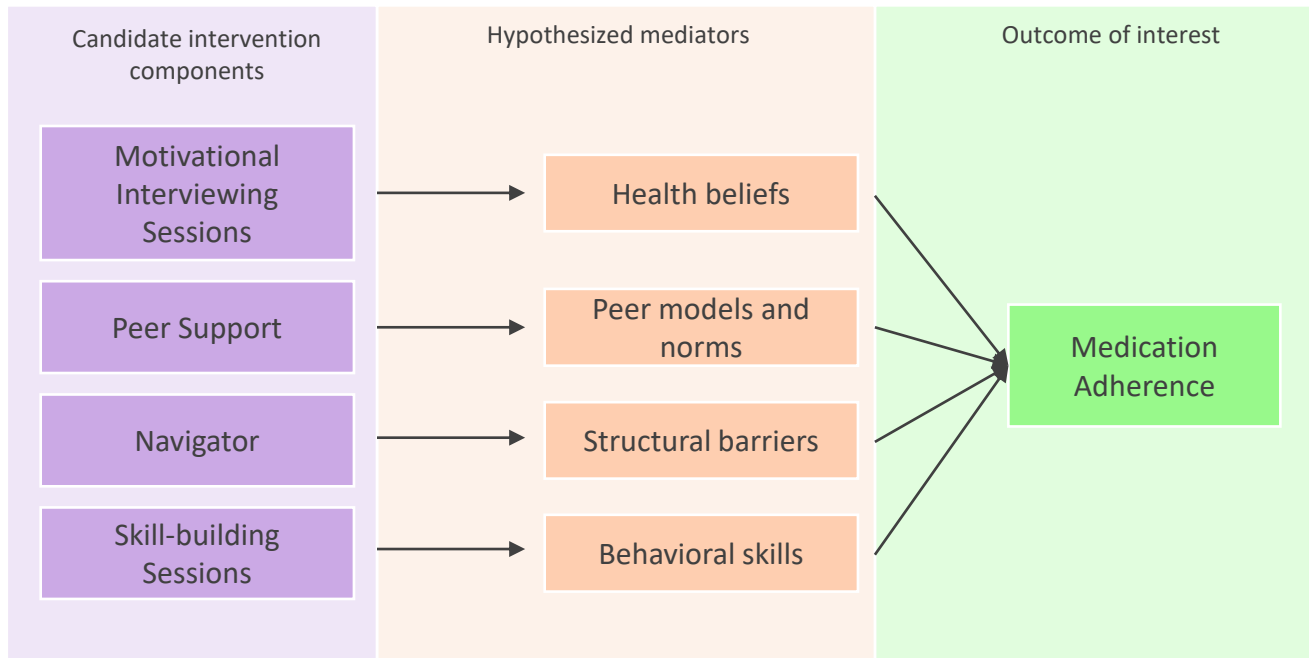
There are $2^4 = 16$ different possible versions of an intervention package. Here are three:



Simulated ORCT results

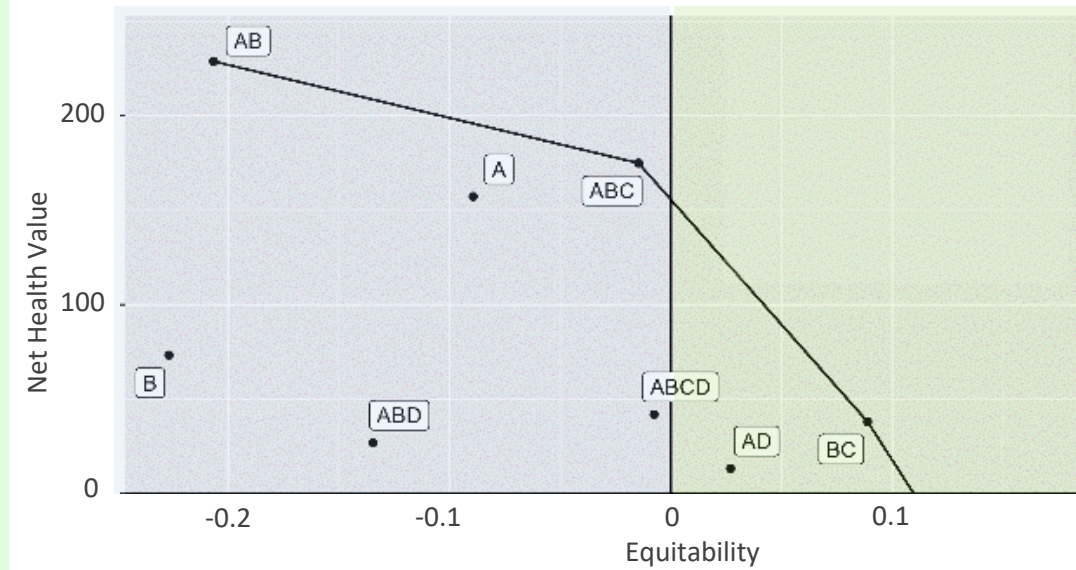
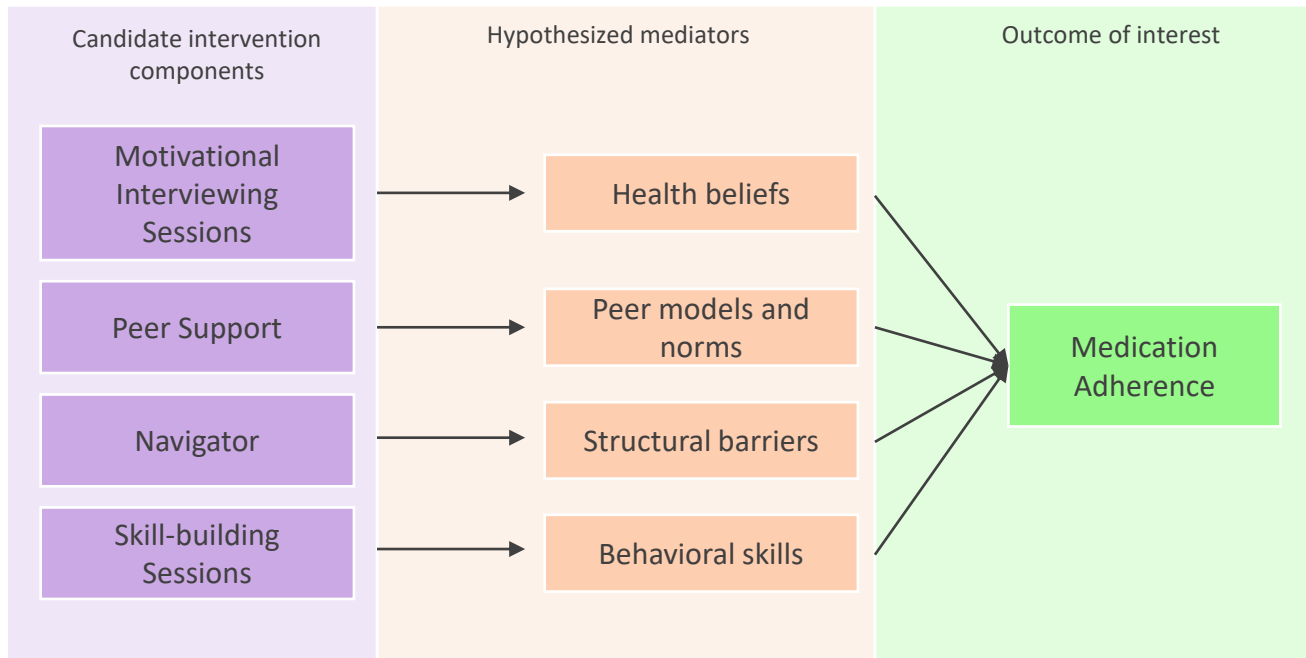


Simulated ORCT results

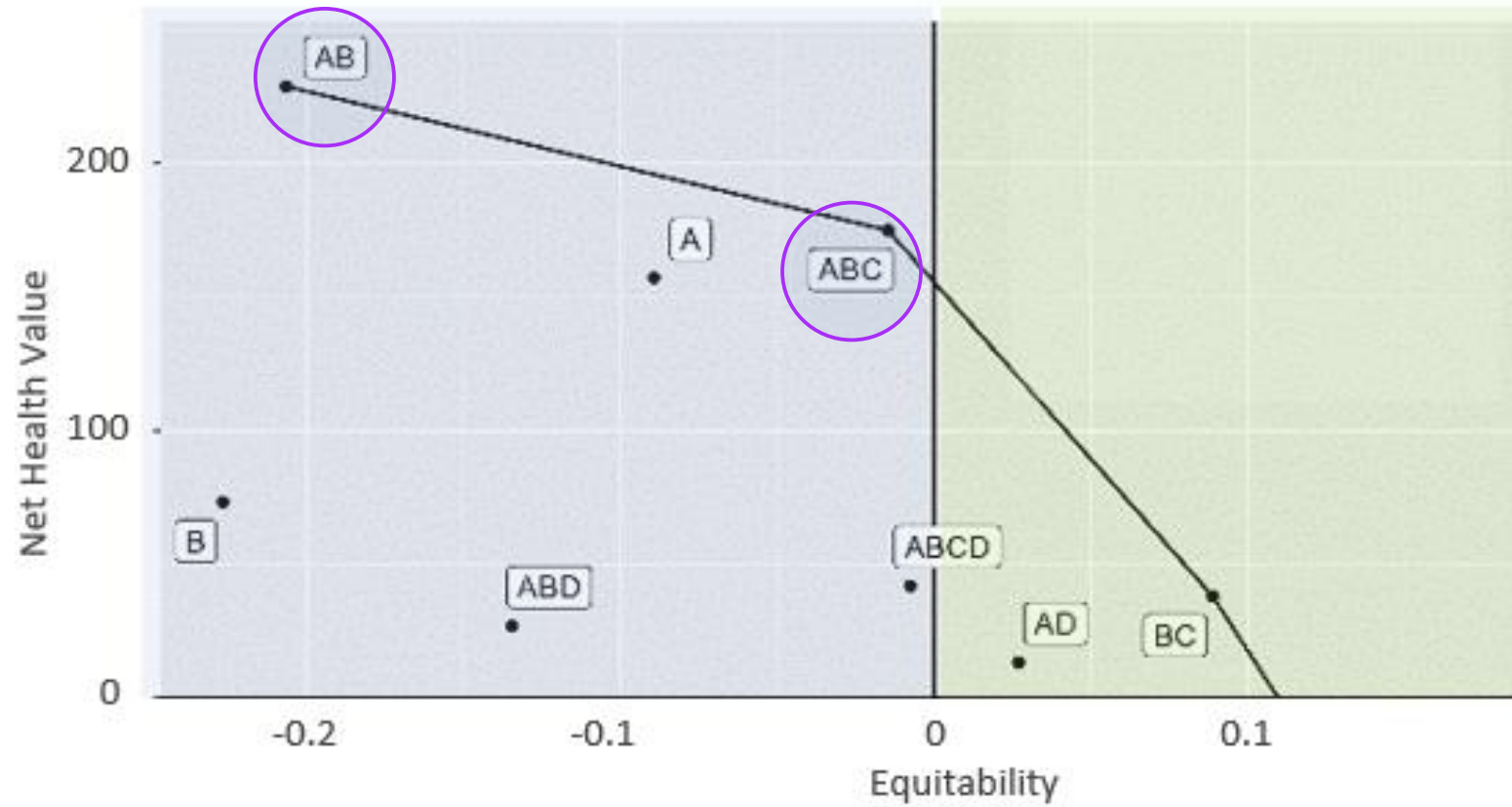


**Maybe!* Some caveats: (1) Advantage versus disadvantage is defined using a continuous spectrum. (2) Equitability in outcomes is quantified using the outcome variable as defined and operationalized in the conceptual model.

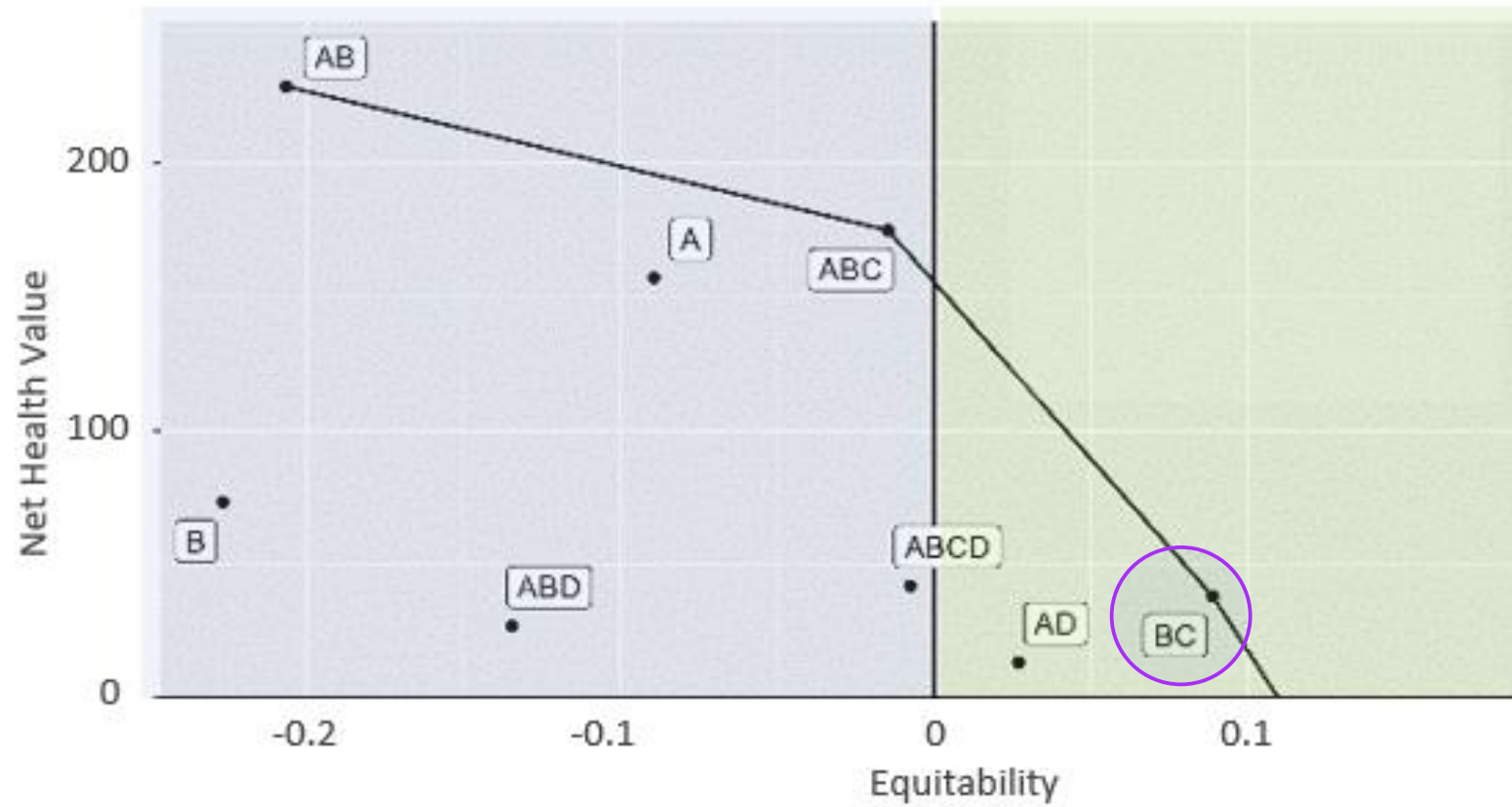
Simulated ORCT results



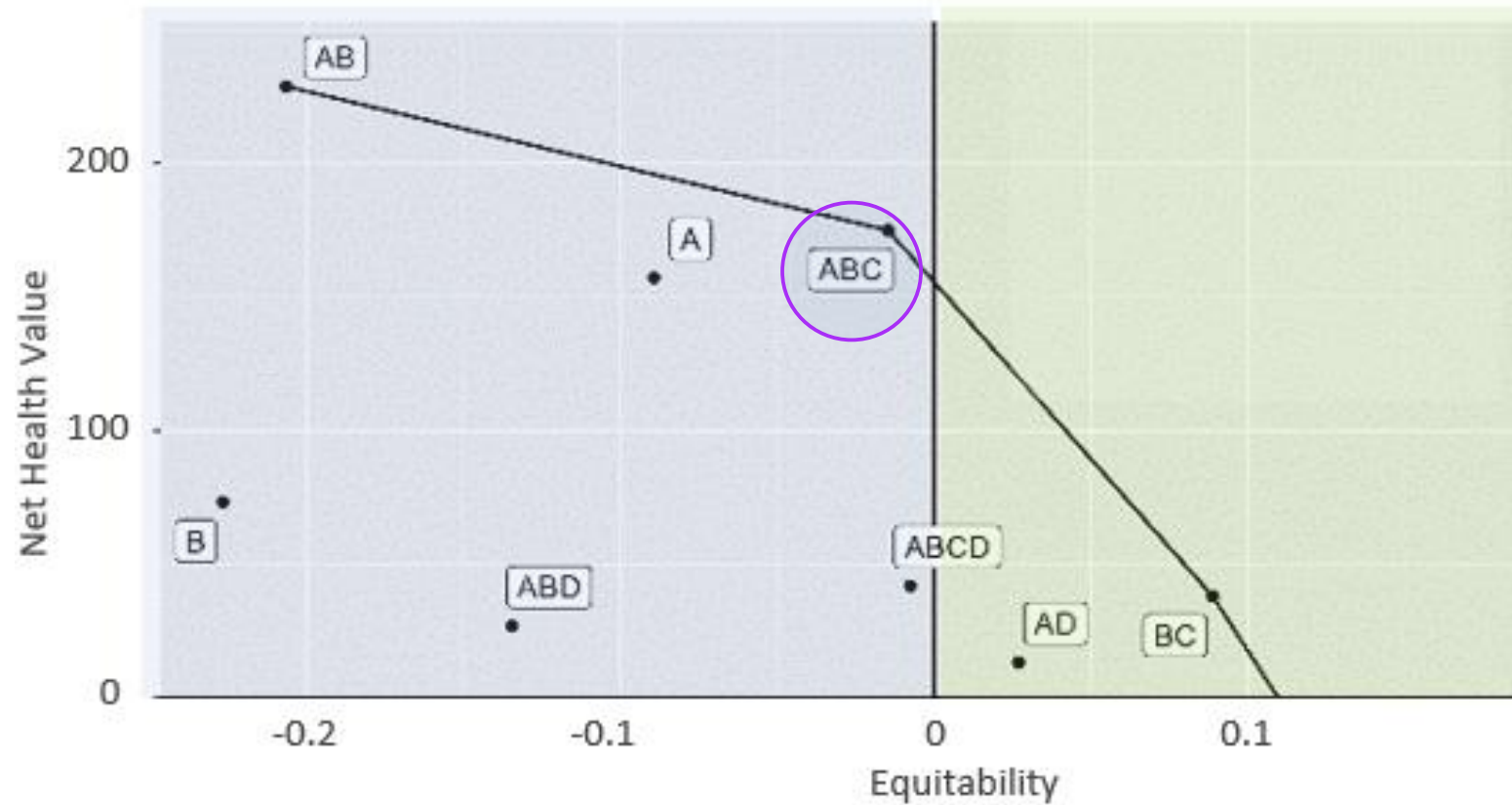
Simulated ORCT results



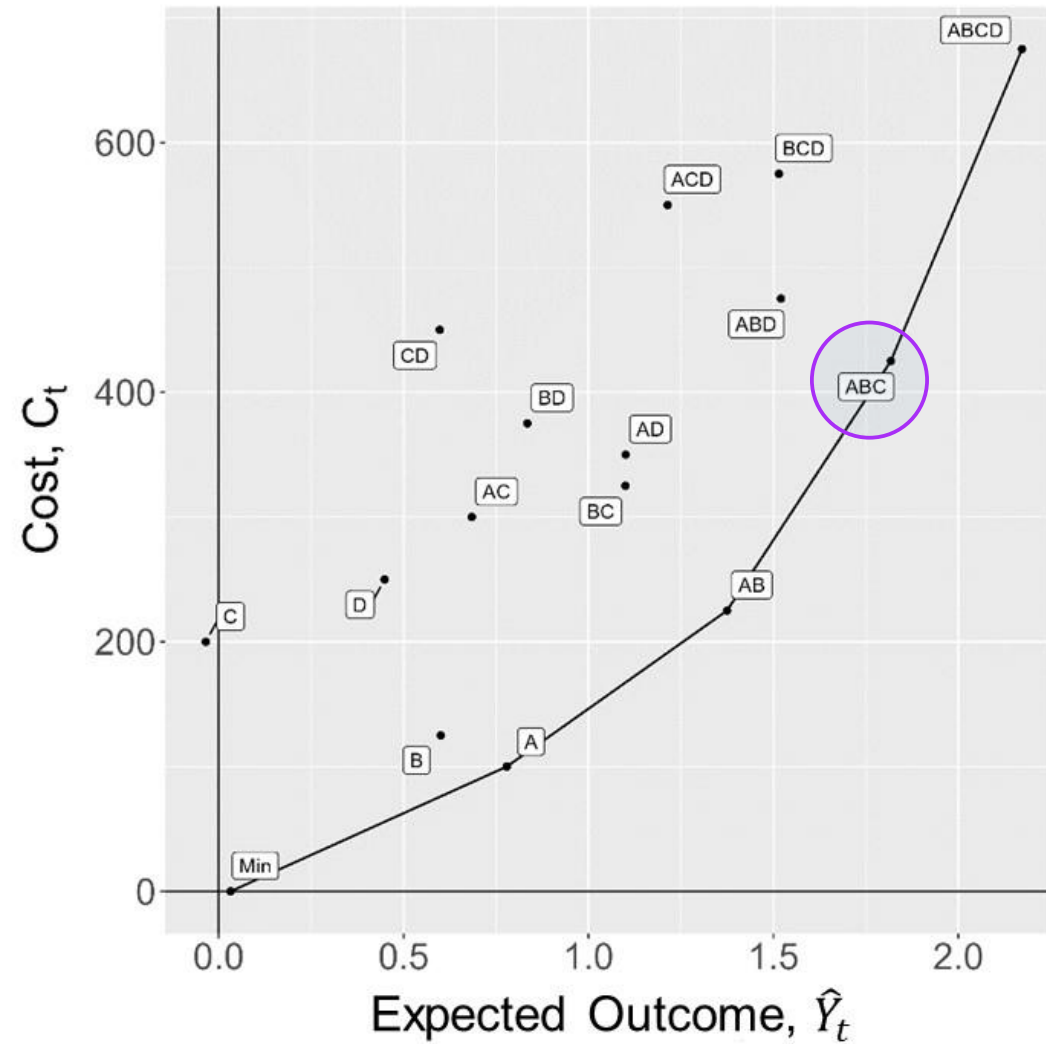
Simulated ORCT results



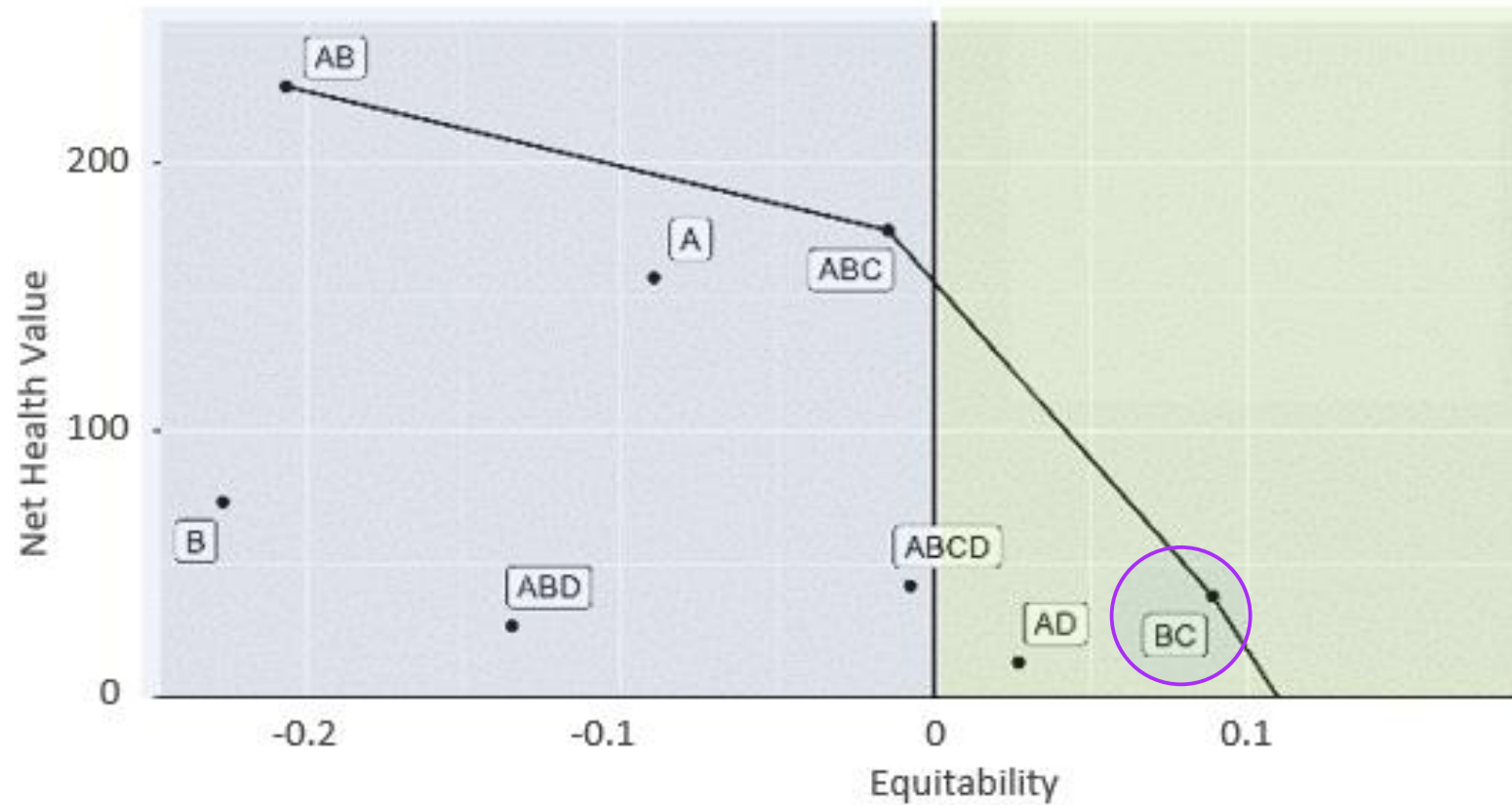
A “what if” interventions for ABC



Simulated ORCT results



A “what if” interventions for BC



Concluding notes

- MOST is being applied to optimize multicomponent interventions across various areas of public health.
- The methodology for the strategic balancing that goes into selecting optimized interventions is in active development, to enable optimization to achieve newly complex objects.
 - For example, to enable the identification of optimized interventions that are *high-impact and equitable*.

An acknowledgment

- Our thanks to our key collaborator in this work, David J. Vanness, PhD; Pennsylvania State University.



Resources at <https://cadio.org/>

The screenshot shows the homepage of the Center for Advancement and Dissemination of Intervention Optimization (CADIO). The website has a purple and black color scheme. At the top, there is a navigation bar with links for 'About', 'People', 'News', and 'Newsletter Sign Up'. Below this is a secondary navigation bar with the CADIO logo and links for 'Intervention Optimization', 'cadio Academy', 'Resources', and 'Events'. The main content area features a large heading for the center, a brief description of the field, and a 'Learn More' button. To the right of the text is a graphic of interlocking gears. Below this is a dark purple banner for the 'Introduction to the Multiphase Optimization Strategy (MOST)' course, with a 'View Course Details' button. The bottom section contains four white boxes, each with an icon and a title: 'Intervention Optimization' (gear icon), 'Cadio Academy' (graduation cap icon), 'Resources' (briefcase icon), and 'Events' (calendar icon). Each box includes a short description and a 'Learn More' button.

Center for Advancement and Dissemination of Intervention Optimization (cadio)

Intervention optimization is an emerging scientific field. In this field ideas from behavioral science, engineering, public health, quantitative and qualitative methods, economics, and decision science are integrated to produce innovative approaches for empirical development and optimization of interventions.

[Learn More](#)

Introduction to the Multiphase Optimization Strategy (MOST) [View Course Details](#)

Intervention Optimization

Intervention optimization is a different way of thinking for intervention scientists. Here you'll understand the rationale behind and the goal(s) of intervention optimization.

[Learn More](#)

Cadio Academy

Increasing capacity of scientists working in the intervention optimization space across a variety of disciplines is central to cadio's mission.

[Learn More](#)

Resources

This is your one stop shop for tools and information to navigate through the intervention optimization process.

Events

Watch this space for announcements for upcoming workshops, webinars, and other learning opportunities.

Resources at <https://d3c.isr.umich.edu/>



We are the Data Science for Dynamic Intervention Decision-Making Center

Our mission is to improve health and education outcomes by developing, demystifying, and disseminating data science tools for making better sequential intervention decisions.



[Intervention Designs](#)

[Trial Designs](#)

Upcoming Events

[View All Events](#)

Multimodal Adaptive Interventions
Tuesday March 14, 2023
[Learn More](#)

Getting SMART
Wednesday, March 15, 2023 to Friday, March 17, 2023
d3center - Institute for Social Research Building
[Learn More](#)

Advancing Intervention Data Science, by Design

Located in the Institute for Social Research at the University of Michigan, the d3c connects scientists and methodologists to advance the field of intervention science.

CADIO academy <https://cadio.org/cadio-academy/>

Asynchronous and synchronous online training

The screenshot shows the Coursera interface for a course by NYU. At the top, there is the Coursera logo, an 'Explore' dropdown menu, a search bar with the text 'What do you want to learn?', and navigation links for 'Online Degrees', 'Find your New Career', 'Log In', and a 'Join for Free' button. The course title is 'MOST from a Conceptual Perspective' by NYU, with a note that it is 'Taught in English'. The course description is 'Gain insight into a topic and learn the fundamentals'. The instructors listed are Linda M Collins and one other person. A 'PLUS' badge indicates the course is included with Coursera Plus. Below the course details, three key features are highlighted: 'Intermediate level' (Recommended experience), '15 hours to complete' (3 weeks at 5 hours a week), and 'Flexible schedule' (Learn at your own pace).

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