

MODULE

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Group Designs

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MODULE

1 Group Designs

This module provides an overview of research designs reviewed under the WWC Group Design Standards.

By the end of this module you will be able to:

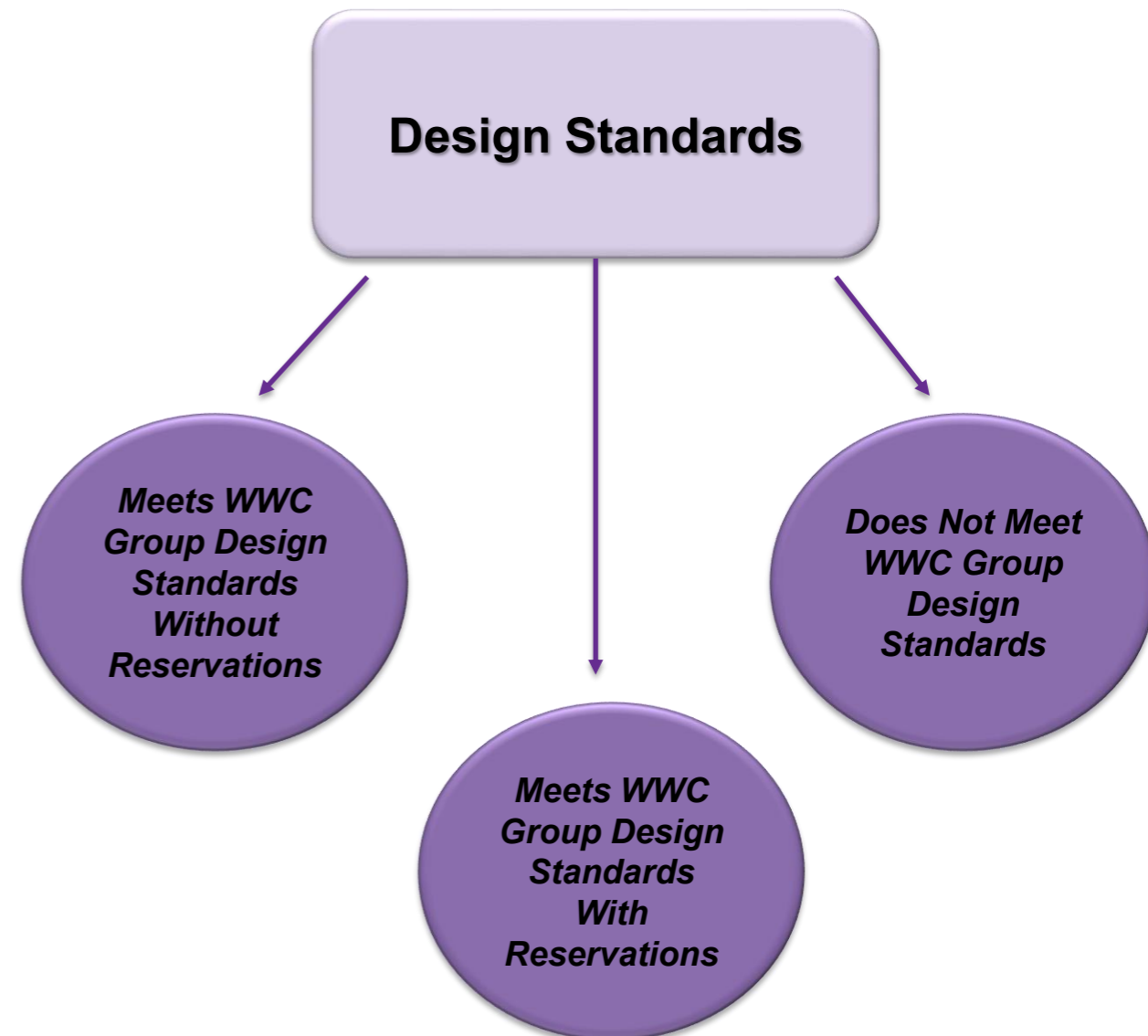
- ❖ Identify eligible randomized controlled trials (RCTs) with well-executed randomization
- ❖ Identify eligible quasi-experimental designs (QEDs)

What is a Group Design Study?

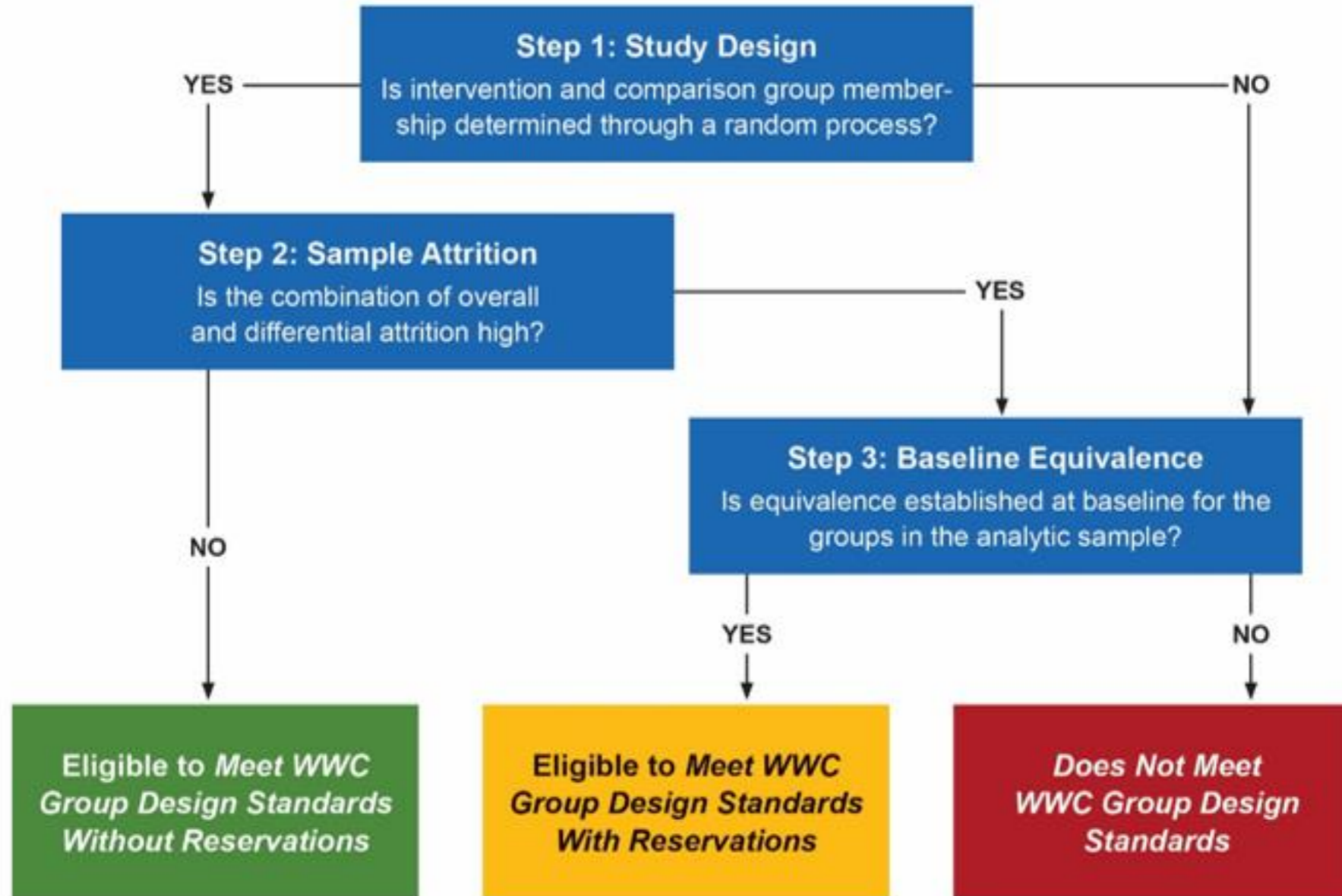
- ❖ Group design studies compare outcomes between units—such as students, teachers or schools—in two or more groups.
- ❖ Units in at least one group receive the **intervention**—the programs, policies, products or practices that is the focus of the WWC’s review.
- ❖ At least one other group is a **comparison group**, which did not implement the intervention.

How Does the Study Design Affect the Study Rating?

- ❖ The WWC has standards it uses to evaluate studies and assign them one of three ratings.
- ❖ The **design** of the study (how the intervention and comparison groups are determined) is a key consideration for the WWC when reviewing studies.
- ❖ This module discusses the two types of study designs that are eligible for review under the WWC Group Design Standards: RCTs and QEDs.

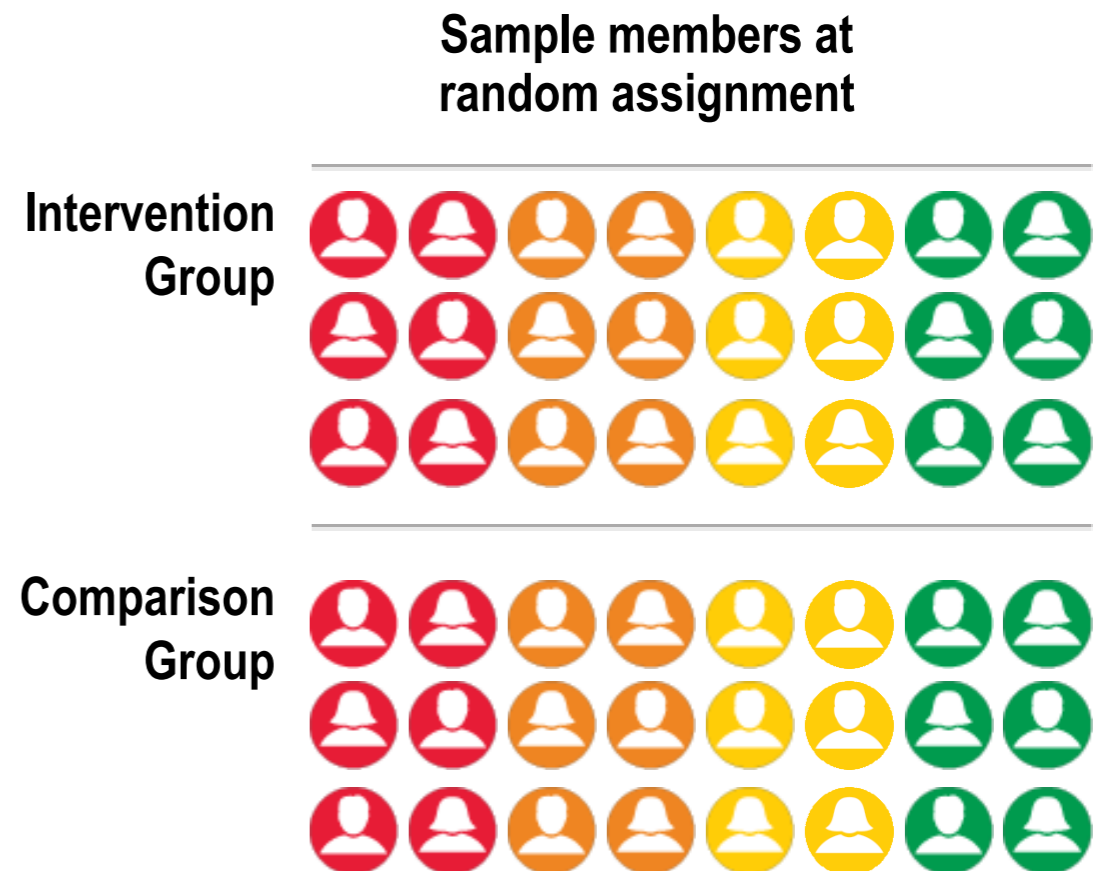


Group Design Standards Framework



Randomized Controlled Trials (RCTs)

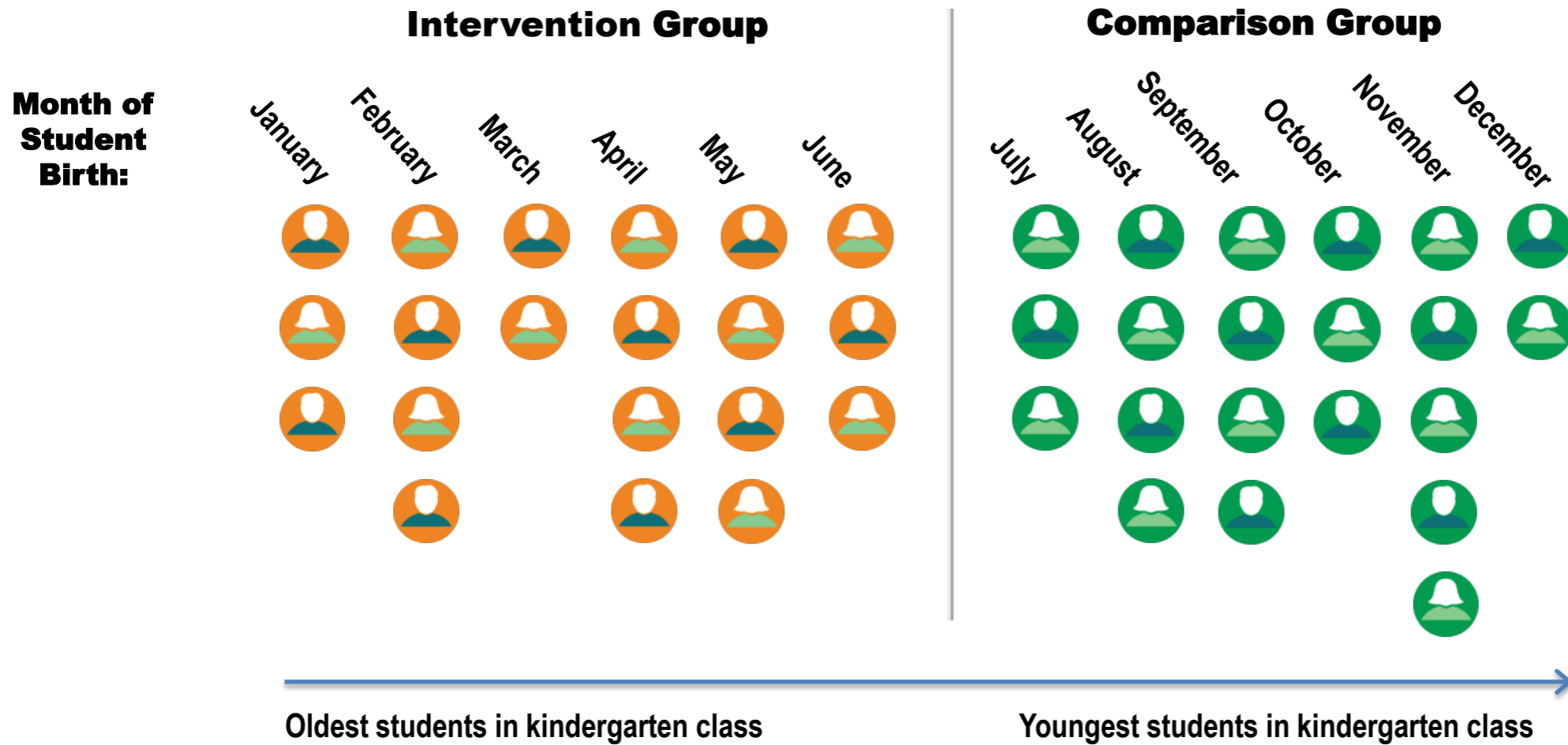
- ❖ **RCTs use a random process to assign units. Types of units include:**
 - Individuals such as teachers or students
 - Clusters of individuals such as classes or schools
- ❖ **Well-executed randomization creates groups that are similar on observed and unobserved characteristics.**
 - Therefore, observed differences in outcomes are due to the intervention, not preexisting differences between groups.



What Is Well-Executed Randomization?

- ❖ The study assigns units entirely by chance.

Assignment Based on Month of Birth



What Is Well-Executed Randomization?

- ❖ The study assigns units entirely by chance.
 - Assignment based on factors such as last name, birthday, or class schedule is *not* random; these factors do not rely solely on chance.

- ❖ Every unit has a chance of being assigned to each group.
 - Purposeful group assignment made to accommodate specific factors such as students' needs *do not* meet this criterion.

How Does the WWC Know Randomization Was Well-Executed?

The WWC tends to accept authors' claims of random assignment.

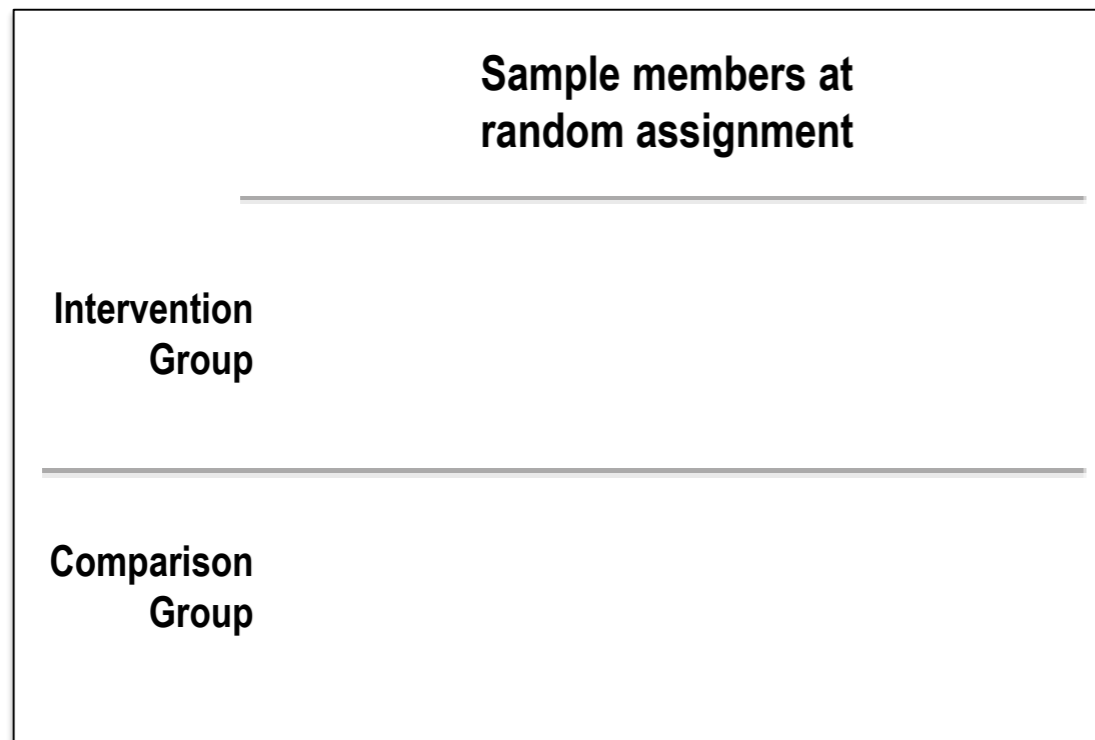
- ❖ The WWC doesn't accept the claim if the study raises specific concerns.
- ❖ The study authors must explicitly say they used random assignment.
- ❖ It doesn't matter who executed the random assignment process.

Does Study Maintain Integrity of the Random Assignment?

- ❖ The study must randomly assign all units in the analytic sample.
- ❖ The study must analyze units according to their original assigned condition (intent-to-treat).
- ❖ If the probability of assignment differs across units, the analysis must account for the different probabilities (more on this shortly).
- ❖ Researchers must not include or exclude units for reasons potentially related to the intervention (see attrition module).

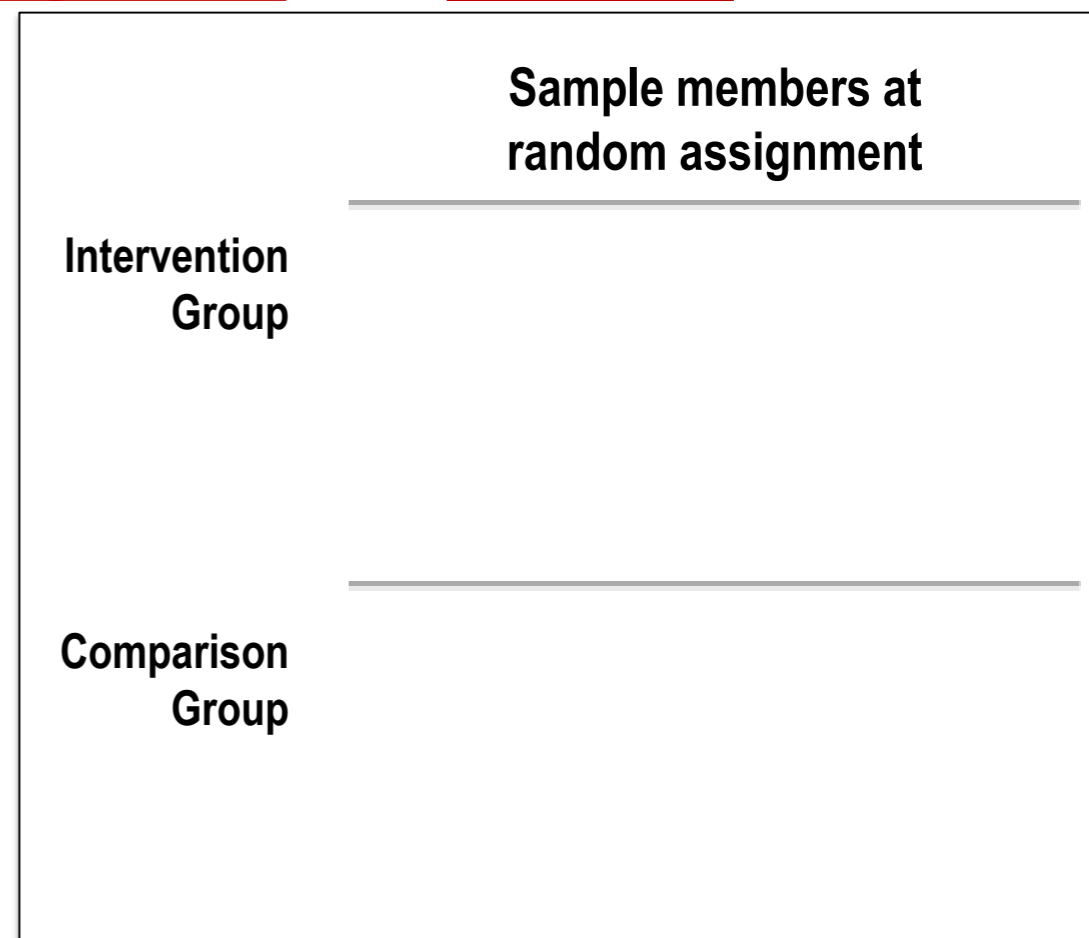
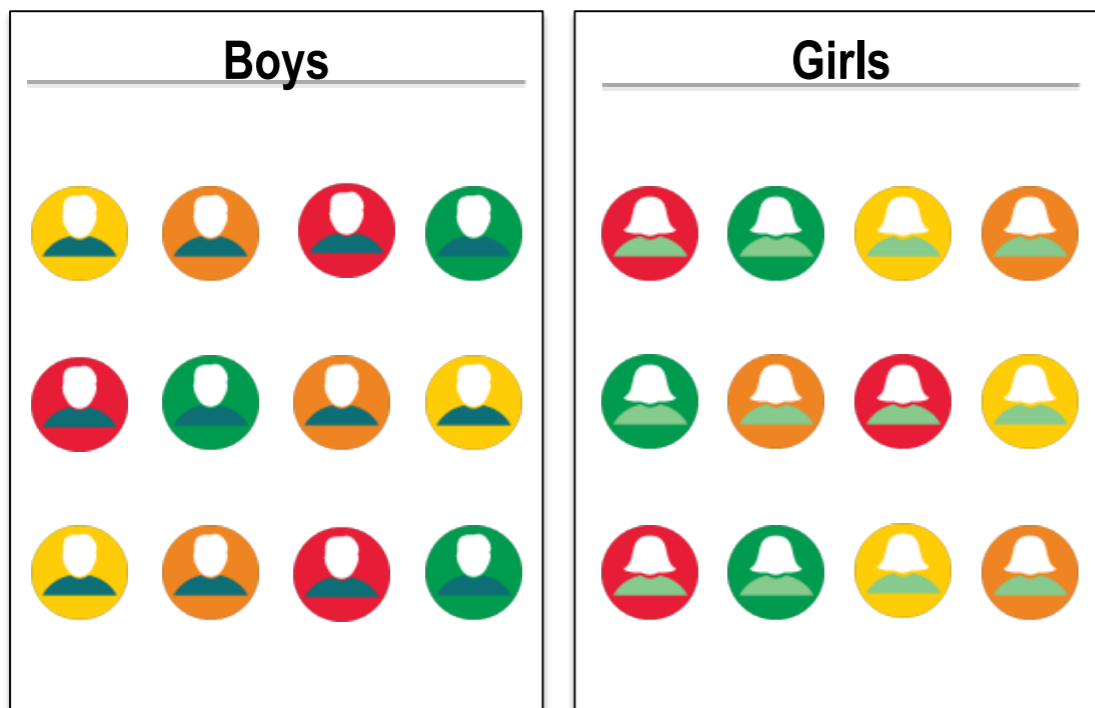
Examples of Acceptable RCT Designs

Units volunteer to participate and then the study randomly assigns them.



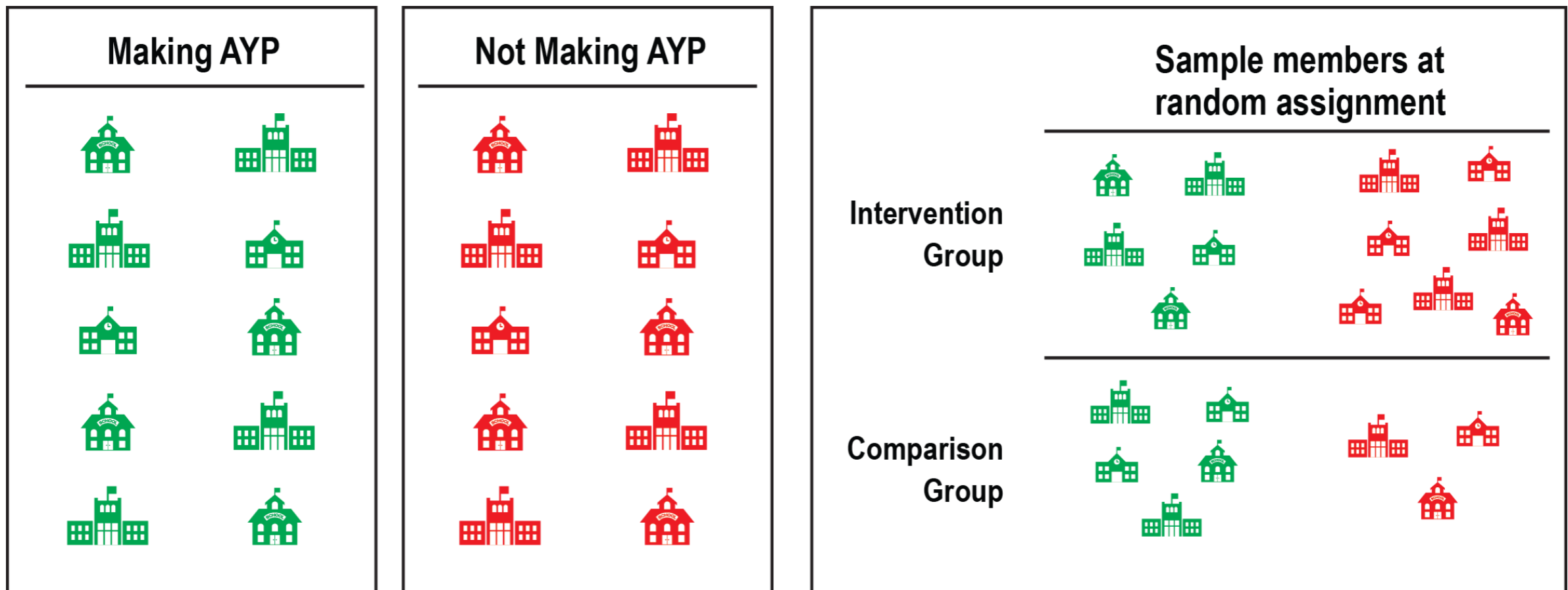
Examples of Acceptable RCT Designs

The study places units into groups (or strata) based on certain characteristics, and random assignment occurs within strata. Other terms for this are stratified random assignment and blocking.



Using Different Probabilities for Randomization

Studies can randomly assign units with different probabilities. For example, a researcher might decide to use a 50:50 probability for schools that are making adequate yearly progress (AYP) and a 70:30 probability for schools that are not making AYP.



Using Different Probabilities for Randomization

- ❖ The analysis must account for different probabilities to preserve the integrity of the random assignment.

- ❖ Studies can do this in one of three ways:
 - Use **inverse probability weights**
 - Include an **indicator (or dummy) variable** in the analysis for each **subsample** with a different probability
 - Combine impacts estimated separately for each subsample

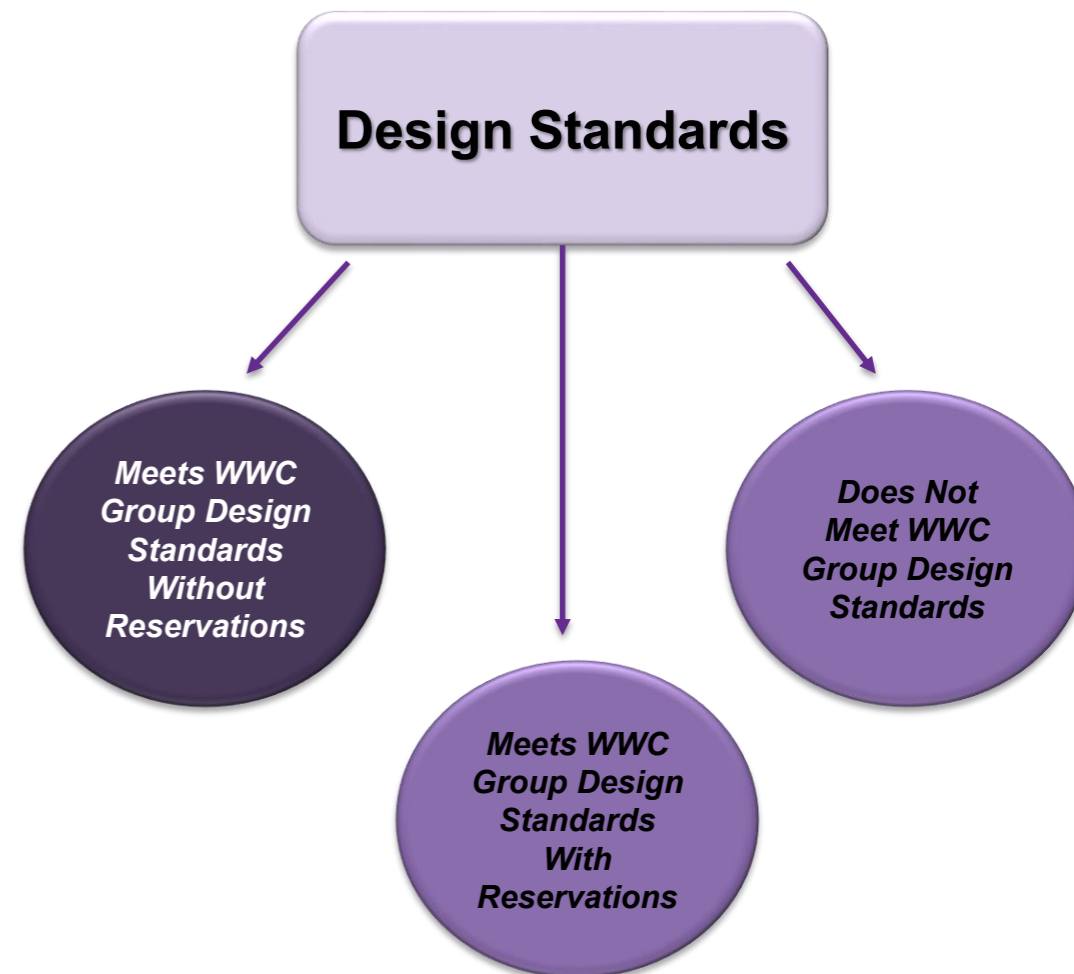
- ❖ Otherwise, the WWC views the randomization as compromised.

Ratings for RCTs

- ❖ Certain RCTs are eligible for the highest rating: **Meets WWC Group Design Standards Without Reservations**.
- ❖ This rating means the WWC has the highest level of confidence that the intervention caused the observed effect.

RCTs fall into one of two groups:

- ❖ Those eligible for the highest rating.
 - The study must maintain the integrity of the random assignment.
 - The study must have low **attrition**.
- ❖ Those that must demonstrate **equivalence** to receive the **Meets WWC Group Design Standards With Reservations** rating.



Quasi-Experimental Designs (QEDs)

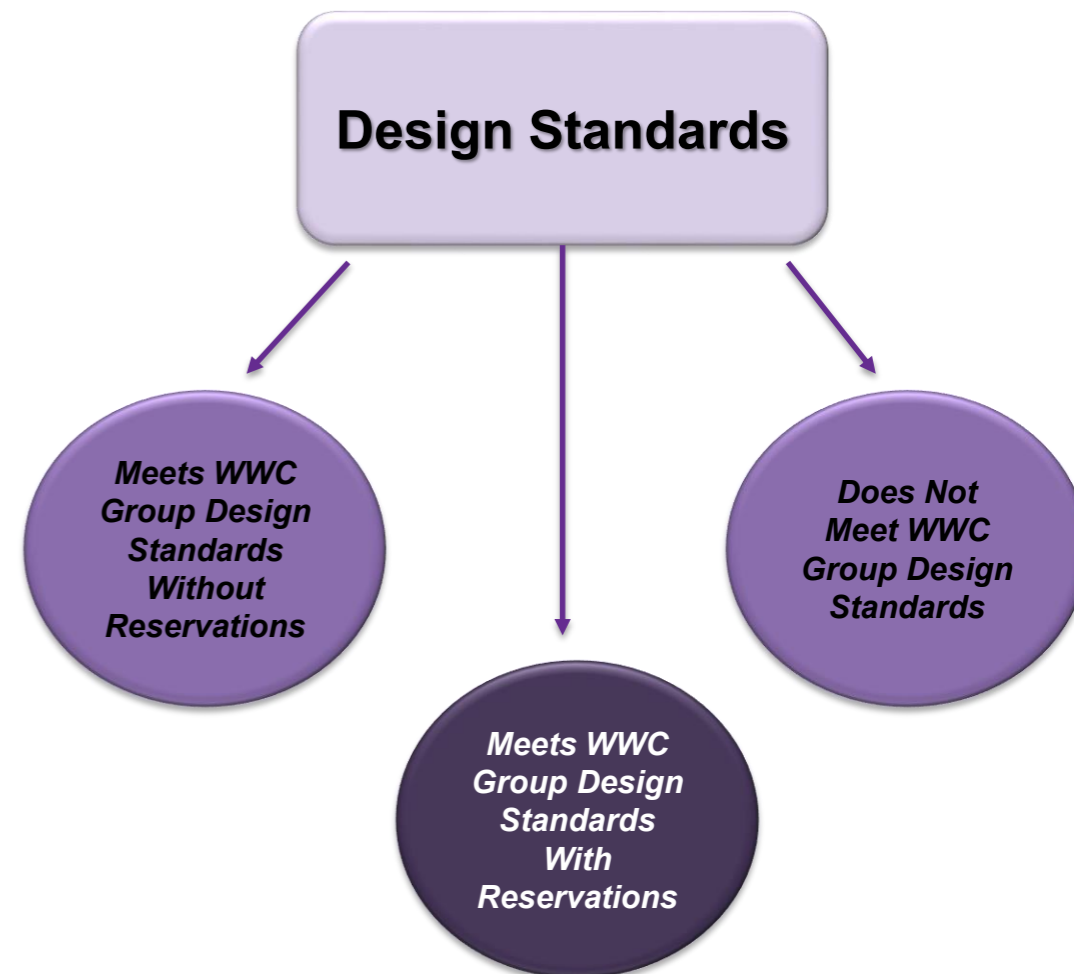
- ❖ QEDs compare distinct (non-overlapping) groups formed using a nonrandom process.
- ❖ Researchers use many approaches to identify groups.
- ❖ QEDs must demonstrate equivalence because they may have observed or unobserved differences between groups.

Eligible Quasi-Experimental Designs

- ❖ Convenience samples: nonparticipants who are nearby and available.
- ❖ Groups formed for another purpose, such as a district average, as long as the groups do not overlap.
- ❖ Nonparticipants matched to participants on baseline data using statistical techniques.
- ❖ Study can form groups before or after collecting outcomes.

Ratings for QEDs

- ❖ QEDs are eligible to *Meet WWC Group Design Standards With Reservations*.
- ❖ This rating means that the WWC has a lower degree of confidence that the intervention caused the observed effect.
- ❖ To receive this rating, the study must demonstrate equivalence of the intervention and comparison groups.
- ❖ Otherwise the study **Does Not Meet WWC Group Design Standards**.



Key Questions to Ask About Design

- ❖ **Do the authors say they used random assignment or call the study an RCT?**
 - Did each unit appear to have a non-zero probability of assignment to every condition?
 - If the authors used different assignment probabilities for different groups, does the analysis account for that?
- ❖ Pay attention to how the authors describe group formation, not only to the labels they use.

Matching Game: Study Design

Match a phrase in the **left column** with a phrase in the **right column**.

1. Randomized controlled trial

A. Examines the fall and spring test scores of a 7th-grade physical science class.

2. Quasi-experimental design

B. Researchers flip a coin to determine whether they are in the intervention condition or the comparison condition.

3. Not eligible for review

C. Uses existing sections of algebra: students in 1st-, 3rd-, and 5th-period algebra classes are in comparison group; students in 2nd-, 4th-, and 6th-period algebra are in intervention group.

Knowledge Check 1

A study assesses the effects of a new curriculum for elementary school students by examining differences between school-level test scores in the fall before the intervention and in the spring after implementation of the intervention.

This study is:

- A.** A randomized controlled trial (RCT)
- B.** A quasi-experimental design (QED) study
- C.** Neither; that is, it is not eligible for review under the WWC Group Design Standards.

Answer to Knowledge Check 1

- **A and B are incorrect answers.** The description does not suggest that the study had a randomly created comparison group, and the study did not compare two or more distinct groups.

- **C is the correct answer.** The study appears to be a pre-post design, which is not eligible for review under the WWC Group Design Standards.

Knowledge Check 2

An RCT study estimates program impacts separately for subsamples with different assignment probabilities. It averages the subsample-specific impacts to calculate an overall program impact estimate.

Would the WWC accept this method of accounting for the different random assignment probabilities?

- A. Yes, this is an appropriate approach.
- B. No, the authors must either use dummy variables for the different subsamples in a **regression model** or use inverse probability weights.
- C. No, the WWC would need to ask the authors for the subsample-specific results.
- D. There is not enough information to determine whether this approach is acceptable.

Answer to Knowledge Check 2

- **A is the correct answer.** Calculating separate effects for each probability subgroup and averaging them is one of three acceptable ways to account for different assignment probabilities.
- **B is an incorrect answer.** The WWC accepts three methods of accounting for different assignment probabilities. The authors used one of these three approaches.
- **C is an incorrect answer.** The WWC does not need the subsample-specific estimates.
- **D is an incorrect answer.** There is sufficient information to confirm that the authors calculated separate effects and averaged them.

Knowledge Check 3

Study authors randomly assigned students to intervention and comparison groups. However, the authors purposefully assigned one student to the intervention condition based on the student's needs.

In what situations can such a design receive the *Meets WWC Group Design Standards Without Reservations* rating, if at all?

- A.** The study identifies the unit, assigns it before the random assignment process, and includes it in the analytic sample.
- B.** The study identifies the unit, assigns it before the random assignment process, and excludes it from the analytic sample.
- C.** The study identifies the unit after random assignment ends, and the study authors change the group of the unit.
- D.** This design compromises the random assignment process. The study cannot receive the *Meets WWC Group Design Standards Without Reservations* rating.

Answer to Knowledge Check 3

- A is an incorrect answer.** Including units that the study did not randomly assign in the analytic sample compromises the random assignment process.
- B is the correct answer.** If researchers exclude units from the random assignment process, they should exclude them from the analytic sample.
- C is an incorrect answer.** Changing the condition of units after random assignment compromises the random assignment process.
- D is an incorrect answer.** The existence of units the study did not randomly assign does not compromise random assignment, provided the study identifies the units before random assignment and excludes them from the analytic sample.

Knowledge Check 4

To evaluate a pull-out computer-based reading program, researchers select a class of 20 students. The researchers select 10 students at random to use the program; the other 10 participate in the normal class activities.

The WWC would consider this study:

- A.** A randomized controlled trial (RCT)
- B.** A quasi-experimental design (QED) study
- C.** A study that is not eligible for review under the WWC Group Design Standards

Answer to Knowledge Check 4

- **A is the correct answer.** The researchers used a random process to form the two groups, so this is an RCT.
- **B and C are incorrect answers.** The researchers used a random process to form the two groups, so this is not a QED, and it is eligible for review as an RCT.

Knowledge Check 5

Authors evenly grouped 90 schools into urban, suburban, and rural. From each of these groups of 30 schools, the authors randomly selected 4 schools. In each group of 4 schools, the authors randomly assigned schools to one of the following conditions: instruction at home, instruction at home and school, instruction at school, and no instruction control.

The WWC would consider this study:

- A.** A randomized controlled trial (RCT) with stratified (or blocked) assignment
- B.** A quasi-experimental design (QED) study
- C.** A study that is not eligible for review under the WWC Group Design Standards

Answer to Knowledge Check 5

- **A is the correct answer.** The researchers used a stratified randomization process. First, they grouped schools into strata based on the area type. Next, they randomly selected four schools from those strata. Finally, within strata, they randomly assigned the schools to one of four conditions.

- **B and C are incorrect answers.** The researchers used a random process to form the four groups, so this study does not use a QED design, and it is eligible for review as an RCT.

Knowledge Check 6

An author uses Early Childhood Longitudinal Study–Kindergarten Cohort data to estimate the impact of preschool attendance. In these data, some children attended preschool and some did not. The author compared outcomes between these two groups.

The WWC would consider this study:

- A. A randomized controlled trial (RCT) with stratified (or blocked) assignment
- B. A quasi-experimental design (QED) study
- C. A study that is not eligible for review under the WWC Group Design Standards

Answer to Knowledge Check 6

- A is an incorrect answer.** The study does not indicate that it used random assignment.
- B is the correct answer.** The study authors compared two distinct groups—children who did and did not attend preschool. The study did not use a random process to form these groups.
- C is an incorrect answer.** The study used a distinct comparison group.

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Conclusion

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- ❖ You can access all the resources mentioned in this module through the WWC website, **whatworks.ed.gov**.
- ❖ The full slide deck for this module, including detailed responses to the knowledge check questions, is available on the WWC website.
- ❖ To receive a certificate of completion for viewing these training modules, you must view the videos on the WWC website.

Thank you!