

MODULE

8

Cluster-Level Assignment

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MODULE

8 Cluster-Level Assignment

This module provides an overview of the standards for reviewing studies that assign clusters to conditions.

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

- ❖ Identify eligible cluster-level assignment studies
- ❖ Describe how compositional changes can affect the rating of cluster RCTs
- ❖ Describe the standards framework for cluster-level assignment studies

What Studies Are Reviewed as Cluster-Level Assignment Studies?

- ❖ Eligible cluster-level assignment studies must meet two conditions:
 1. Individuals are assigned to conditions as groups
 2. Data for analysis are based on individuals within clusters
- ❖ Clusters can be schools, teachers, classrooms, or other groups
- ❖ Analysis method and level of aggregation do not play a role in determining whether the study is reviewed as a cluster-level assignment study

Knowledge Check 1

A study assigned teachers to conditions and examined student achievement outcomes. The study analyzed data aggregated to the classroom level.

This study may be eligible for review as:

- A. An individual-level assignment group design study
- B. A cluster-level assignment group design study

Answer to Knowledge Check 1

- ❑ **A is an incorrect answer.** The study meets both eligibility criteria for cluster-level assignment study.

- **B is the correct answer.** The **unit of assignment** is a cluster and the data for the analysis are based on students within clusters, so the study meets both eligibility criteria for cluster study.

Knowledge Check 2

A study assigned teachers to conditions and examined the effect of an intervention on teacher retention.

This study may be eligible for review as:

- A. An individual-level assignment group design study
- B. A cluster-level assignment group design study

Answer to Knowledge Check 2

- **A is the correct answer.** Teachers are the unit of assignment, and the data for the analysis are based on teachers, so the study is eligible for review as an individual-level group design study.
- **B is an incorrect answer.** The data for the analysis are not based on individuals within clusters. Specifically, the teachers in this example are the individuals being studied and teachers were assigned to conditions as individuals, so the study does not meet one of the eligibility criteria for cluster studies.

Three Compositional Threats in Cluster RCTs

1. **Cluster-level attrition**: loss of one or more clusters after random assignment.

Change in the composition of clusters.

2. **Individual non-response**: loss of individuals who were present in clusters at a specified point in time.

Changes in the composition of individual units within clusters.

3. **Joiners**: individuals who enter clusters after random assignment.

Compositional changes can cause groups to become dissimilar, which can lead to **bias** in the estimated effect of the **intervention**.

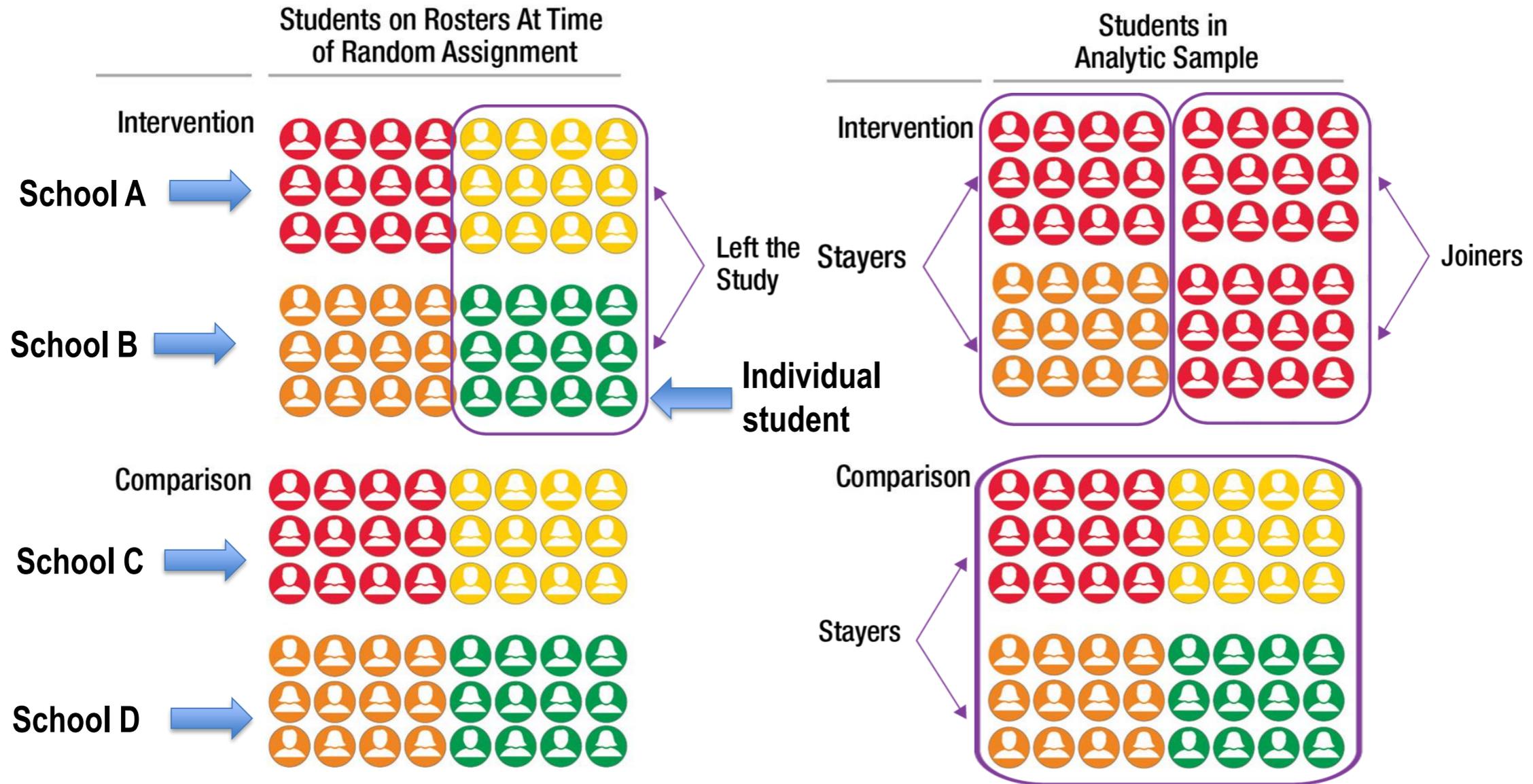
Two Terms the WWC Uses to Describe Compositional Changes within Clusters

Definitions

STAYERS are individuals in clusters at random assignment and who contribute outcome data.

JOINERS are individuals not in clusters at random assignment but who enter later.

Example of Compositional Changes in a Cluster RCT



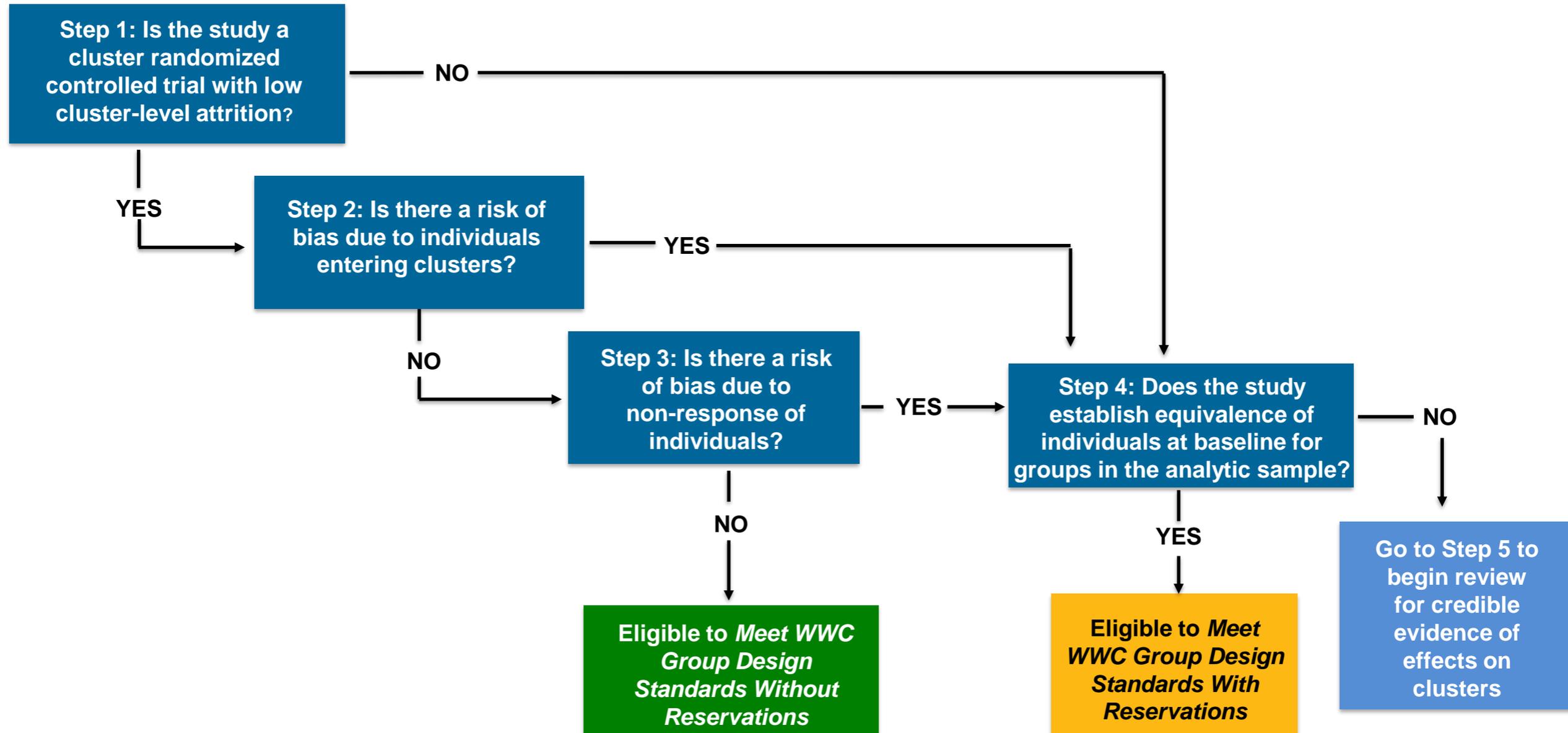
Joiners in Cluster RCTs

- ❖ WWC standards for cluster RCTs include an assessment of the risk of bias from joiners
- ❖ Risk of bias due to joiners is highest when individuals choose clusters (e.g., students choose schools) based on the availability of the intervention
- ❖ When bias due to joiners is unlikely, a cluster-level assignment study can satisfy WWC standards for evidence of **effects on individuals**
 - *Can Meet WWC Group Design Standards With Reservations*
 - *Can Meet WWC Group Design Standards Without Reservations*
- ❖ When there is a risk of bias due to joiners, a cluster-level assignment study might still satisfy WWC standards for evidence of **effects on clusters**
 - *Can Meet WWC Group Design Standards With Reservations*

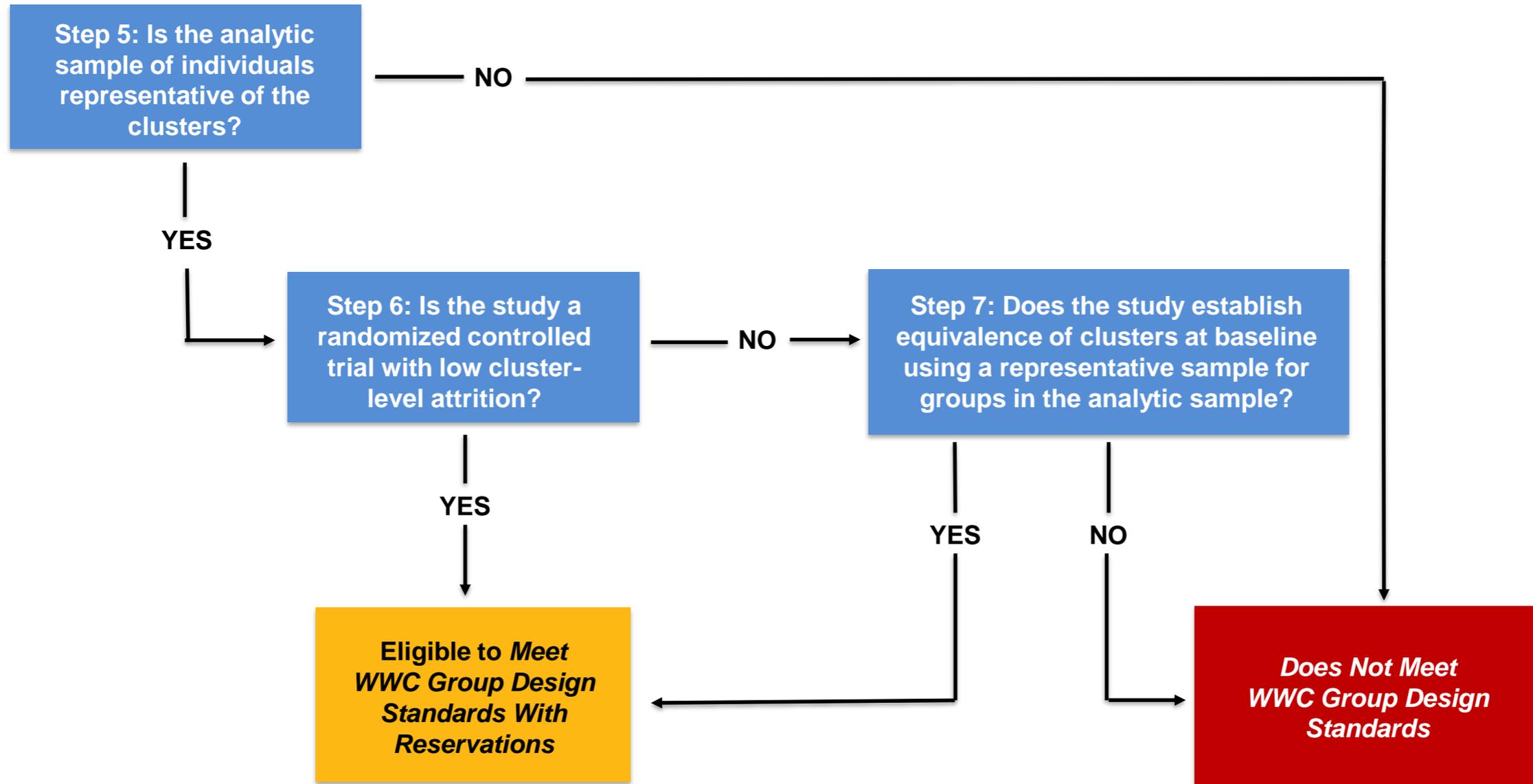
Review Process for Cluster-Level Assignment Studies

- ❖ A cluster study is first reviewed for evidence of **effects on individuals** (steps 1 to 4)
- ❖ If the study cannot satisfy WWC standards for evidence of effects on individuals, then it is also reviewed for evidence of **effects on clusters** (steps 5 to 7)
- ❖ A study that does not satisfy WWC standards for evidence of either type of effect *Does Not Meet WWC Group Design Standards*

Review Process for Cluster-Level Assignment Studies: Steps 1-4



Review Process for Cluster-Level Assignment Studies: Steps 5-7



Review for Credible Evidence of Effects on Individuals (Steps 1 to 4)

- ❖ A cluster RCT is eligible to *Meet WWC Group Design Standards Without Reservations* if it meets three requirements:
 - Has low cluster-level attrition
 - Limits the risk of bias due to joiners
 - Has low individual-level non-response
- ❖ Other cluster RCTs and cluster **quasi-experimental designs** (QEDs) must establish equivalence of individuals to *Meet WWC Group Design Standards With Reservations* and satisfy WWC standards for evidence of effects on individuals
- ❖ Studies that cannot establish equivalence of individuals can still *Meet WWC Group Design Standards With Reservations* by satisfying WWC standards for evidence of effects on clusters (steps 5 to 7)

Step 1: Is the Study a Cluster RCT with Low Cluster-Level Attrition?

- ❖ Same attrition standard used for individual-level group design studies, but applied to clusters
- ❖ Same optimistic and cautious boundaries for attrition
- ❖ First of three requirements for cluster RCTs to be eligible to *Meet WWC Group Design Standards Without Reservations*

Example: Calculating Cluster-Level Attrition

A study randomly assigned 10 schools to a reading intervention and 10 schools to the comparison condition. There were 50 second graders in each school at the time of random assignment. The study team collected outcome data from only these students. All of the intervention schools contributed outcome data to the analysis, but one of the comparison group schools refused to allow the researchers to collect outcome data. In total, the researchers collected posttest data from 500 intervention group students and 375 comparison group students. The review protocol uses the optimistic boundary for attrition.

- What is the overall attrition rate for the clusters?
- What is the differential attrition rate for the clusters?
- Does this example have low cluster-level attrition?

Example: Picturing the Cluster Attrition

Sample groups	Number of schools assigned	Number of schools that contribute outcome data
Intervention group	10	10
Comparison group	10	9
Total	20	19

Example: Calculating Cluster-Level Attrition

Overall Attrition

- Total cluster sample size: 20
- Total number of clusters with observed data: 19
- Overall attrition: $(20 - 19)/20 = 5\%$

Differential Attrition

Intervention Group

- Total cluster sample size: 10
- Total number of clusters with observed data: 10
- Attrition for the intervention group: $(10 - 10)/10 = 0\%$

Comparison Group

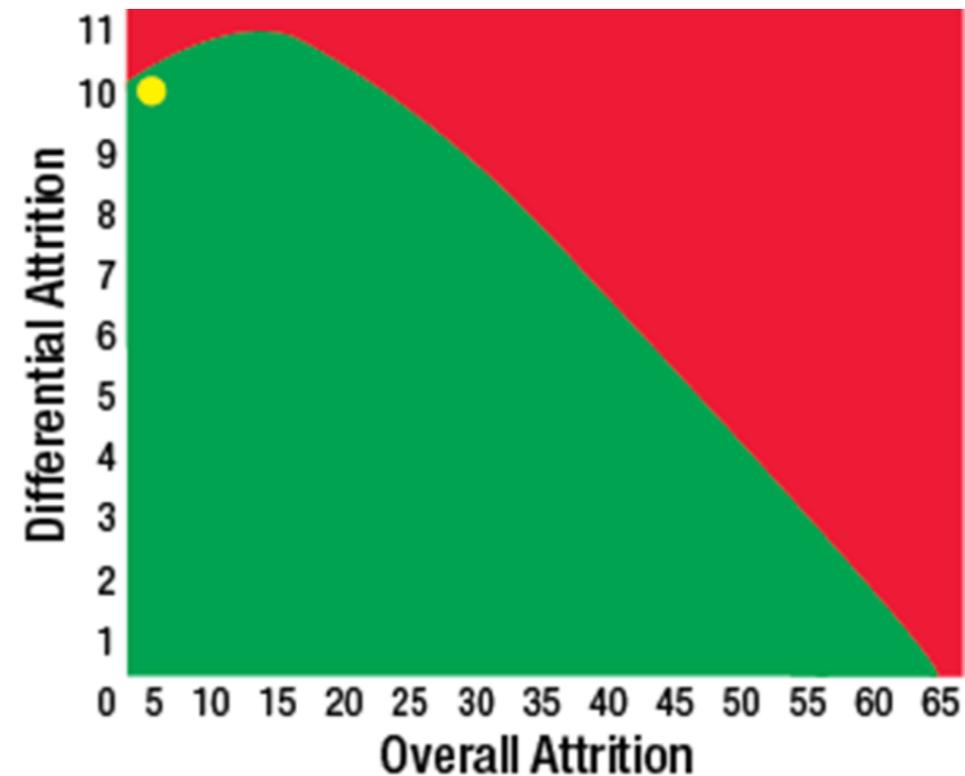
- Total cluster sample size: 10
- Total number of clusters with observed data: 9
- Attrition for the comparison group: $(10 - 9)/10 = 10\%$

To calculate differential attrition: $| 0 - 10 | = 10$ percentage points

Example: Applying the Attrition Threshold, Cluster

- ❖ Our example has 5% overall and 10 percentage point differential attrition at the cluster level.

Overall Attrition	Differential Attrition	
	Cautious Boundary	Optimistic Boundary
0	5.7	10.0
1	5.8	10.1
2	5.9	10.2
3	5.9	10.3
4	6.0	10.4
5	6.1	10.5



Step 2: Do Joiners Represent a Risk of Bias?

❖ Review protocol specifies which joiners pose a risk bias

All joiners after the results of random assignment are known pose a risk of bias

- Appropriate for interventions that are likely to influence placement or enrollment
- Joiners who enter intervention clusters are likely different from those who enter comparison clusters

Late joiners pose a risk of bias

- Appropriate for studies in which joiners who enter soon after the study begins are not likely to be a threat, but later joiners may be
- Early joiners are as good as randomly assigned, but late joiners are a concern

No joiners pose a risk of bias

- Appropriate for interventions with a very low profile
- Both early and late joiners are as good as randomly assigned

Step 2: Do Joiners Represent a Risk of Bias?

- ❖ A study must satisfy one of the following conditions to be eligible for the highest rating:
 - Excludes joiners from the analytic sample (analyzes stayers only)
 - Includes in the analytic sample only joiners who enter during periods not associated with a risk of bias

- ❖ Second of three requirements for cluster RCTs to be eligible to *Meet WWC Group Design Standards Without Reservations*

- ❖ A study with any joiners in the analytic sample who entered during a period associated with a risk of bias is not eligible for the highest rating

Step 3: Does the Study Have a Low Rate of Individual Non-Response?

- ❖ Same attrition standard used for individual-level group design studies, but with two differences:
 - Applied only to individuals within **remaining** (non-attriting) clusters
 - **Reference sample** used for denominator of calculation depends on risk associated with joiners specified in protocol

Joiners associated with a risk of bias as specified in protocol	Allowable reference samples
All joiners after the results of random assignment are known pose a risk of bias	(1) Individuals present in non-attriting clusters prior to the announcement of the intervention
Only late joiners pose a risk of bias	Either (1), or (2) Individuals present in non-attriting clusters in early period
No joiners pose a risk of bias	Either (1), (2), or (3) Individuals in non-attriting clusters at follow-up

Step 3: Does the Study Have a Low Rate of Individual Non-Response?

- ❖ For the WWC to consider a reference sample acceptable, it must include all members of the analytic sample
- ❖ The WWC calculates individual non-response using the earliest acceptable reference sample reported in a study
- ❖ Low rate of non-response is third and final requirement for cluster RCTs to be eligible to *Meet WWC Group Design Standards Without Reservations*

Step 4: Is Baseline Equivalence Demonstrated for Individuals?

- ❖ To *Meet WWC Group Design Standards With Reservations* and satisfy WWC standards for evidence of effects on individuals, cluster RCTs that do not meet all of the three previous conditions and cluster QEDs must establish equivalence of the analytic sample of individuals
- ❖ Baseline standard deviations must be individual-level, not cluster-level
- ❖ The WWC requires that baseline equivalence of individuals be assessed on the exact analytic sample of individuals
- ❖ Studies that cannot establish equivalence of individuals can still *Meet WWC Group Design Standards With Reservations* by satisfying WWC standards for evidence of effects on clusters (steps 5 to 7)

Knowledge Check 3

Before the school year started, 14 ninth-grade classrooms were randomly assigned to receive either a supplemental science intervention (200 students) or business-as-usual instruction (175 students). Due to scheduling changes, 30 students left the intervention classrooms and 30 new students joined in the second week of school. In the comparison classrooms, 45 students left and 35 students joined in the second week of school. A standardized science test was administered as the outcome measure, and all students in the classrooms took the test and were included in the researchers' analysis. The study is reviewed with a protocol that uses the cautious boundary for attrition and specifies that all joiners pose a risk of bias.

What is the highest rating this study is eligible to receive from the review to satisfy WWC standards for evidence of effects on individuals?

- A. *Meets WWC Group Design Standards Without Reservations*
- B. *Meets WWC Group Design Standards With Reservations*
- C. *Does Not Meet WWC Group Design Standards*

Answer to Knowledge Check 3

- ❑ **A and C are incorrect answers.** Because the protocol specifies that all joiners pose a risk of bias, the presence of joiners in the analysis prevents the study from being eligible for the highest rating of *Meets WWC Group Design Standards Without Reservations*—Choice A is incorrect. However, the study could potentially *Meet WWC Group Design Standards With Reservations* in the review for credible evidence of effect on individuals if it demonstrates equivalence on the full analytic sample of students, so Choice C (*Does Not Meet WWC Group Design Standards*) is also incorrect.
- **B is the correct answer.** The study is a cluster RCT but does not meet all requirements needed to receive the highest rating. The analytic sample included students present in the study at the time of random assignment and those who joined after random assignment. Because the protocol specifies that all joiners pose a risk of bias, the presence of joiners in the analysis prevents the study from being eligible for the highest rating. The study could potentially *Meet WWC Group Design Standards With Reservations* in the review to satisfy WWC standards for evidence of effects on individuals if the students in the analytic intervention and comparison groups, including students who joined the classes after random assignment, satisfy the baseline equivalence requirement.

Knowledge Check 4

You are reviewing a cluster RCT under a protocol that specifies that late joiners pose a risk of bias and that individuals who join clusters six weeks or later after the start of the school year are considered late joiners. The study randomly assigned classrooms to conditions on August 1, before the school year begins. The study authors administered a pre-test to all students present in the classrooms, on August 31, during the first week of school. Study authors did not collect information on the students present in the classrooms before the date of pretest. The intervention was implemented throughout the school year, and students were administered a student achievement assessment at the end of the year on May 31. Although some students joined schools after random assignment, the study limited the analysis to include only students who were on school rosters collected at the time of random assignment. There was no cluster attrition.

When calculating the rate of individual non-response, what reference sample should you use?

- A. Students present in clusters at the beginning of the school year (August 31).
- B. Students present in clusters at the end of the school year (May 31).
- C. Individual non-response cannot be assessed because the study does not report on an allowable reference sample.

Answer to Knowledge Check 4

- **A is the correct answer.** Recall that the reference sample depends on risk associated with joiners specified in protocol. The review protocol specified that late joiners pose a risk of bias, so the WWC standards would allow one of two reference samples: students subject to random assignment and students present in clusters in the early period. In this study, the study collected August 31 rosters, which is during the early period, so the WWC would use students present in clusters at the beginning of the school year when calculating the rate of individual non-response.
- **B and C are incorrect answers.** B is incorrect because students present in clusters at follow-up is not an acceptable reference sample when late joiners pose a risk of bias. C is incorrect because students present in clusters at the beginning of the school year is an acceptable reference sample when only late joiners pose a risk of bias.

Review for Credible Evidence of Effects on Clusters (Steps 5 to 7)

- ❖ A cluster-level assignment study that did not satisfy WWC standards for evidence of effects on individuals can *Meet WWC Group Design Standards With Reservations* if it meets two requirements:
 1. The individuals in the analytic sample are **representative** of clusters
 2. The study either is an RCT with low cluster-level attrition, or demonstrates equivalence of the analytic sample of clusters

- ❖ Otherwise, the study *Does Not Meet WWC Group Design Standards*

Step 5: Are Individuals Representative of Clusters?

- ❖ Studies with poor response rates at follow-up cannot satisfy WWC standards for effects on clusters
- ❖ To satisfy this requirement, response rates must be high according to the attrition standard
 - Numerator: number of individuals in the analytic sample (i.e., those who contributed outcome data to the analysis)
 - Denominator: number of individuals in **remaining** clusters at follow-up (i.e., those who could have contributed outcome data to the analytic sample, but did not)
- ❖ A study that is not representative and did not satisfy WWC standards for evidence of effects on clusters *Does Not Meet WWC Group Design Standards*

Example: Assessing Cluster Representativeness

- ❖ A cluster QED compared student achievement outcomes in five classrooms using a new reading curriculum and five using business-as-usual curriculum
- ❖ At the time students received the baseline assessment, 130 intervention students and 115 comparison students were enrolled in the 10 classrooms, but over the course of the study year, 10 students left the classrooms (5 from each condition) and 8 students joined the classrooms (all in the intervention group)
- ❖ 125 intervention students and 91 comparison students across the 10 classrooms completed the follow-up test and were included in the study's analytic sample
- ❖ The study is reviewed under a protocol using the optimistic boundary for attrition and specifies that no joiners pose a risk of bias

Note: The text above is correct; the protocol specifies that no joiners pose a risk of bias.

Example: Picturing Cluster Representativeness

Are the students included in the analysis of outcome data representative of the clusters?

Sample groups	Number of students at baseline	Number of students enrolled at follow-up	Number of students with observed data
Intervention group	130	133	125
Comparison group	115	110	91
Total	245	243	216

Example: Assessing Cluster Representativeness

Overall Representativeness

- Total number of students enrolled at follow-up: 243
- Total number of students with observed data: 216
- Overall representativeness: $(243 - 216)/243 = 11.1\%$

Differential Representativeness

Intervention Group

- Students enrolled at follow-up: 133
- Students with observed data: 125
- Representativeness for the intervention group: $(133 - 125)/133 = 6.0\%$

Comparison Group

- Students enrolled at follow-up: 110
- Students with observed data: 91
- Representativeness for the comparison group: $(110 - 91)/110 = 17.3\%$

To calculate differential representativeness: $| 17.3 - 6 | = 11.3$ percentage points

The students included in the analysis of outcome data are not representative of the clusters.

Step 6: Is this a Cluster RCT with Low Cluster-Level Attrition?

- ❖ This step is identical to step 1 in the review to satisfy WWC standards for evidence of effects on individuals
- ❖ One of two ways to meet second requirement to satisfy WWC standards for evidence of effects on clusters

Step 7: Is Baseline Equivalence Established for Clusters?

- ❖ Second of two ways to meet second requirement for satisfying WWC standards for evidence of effects on clusters

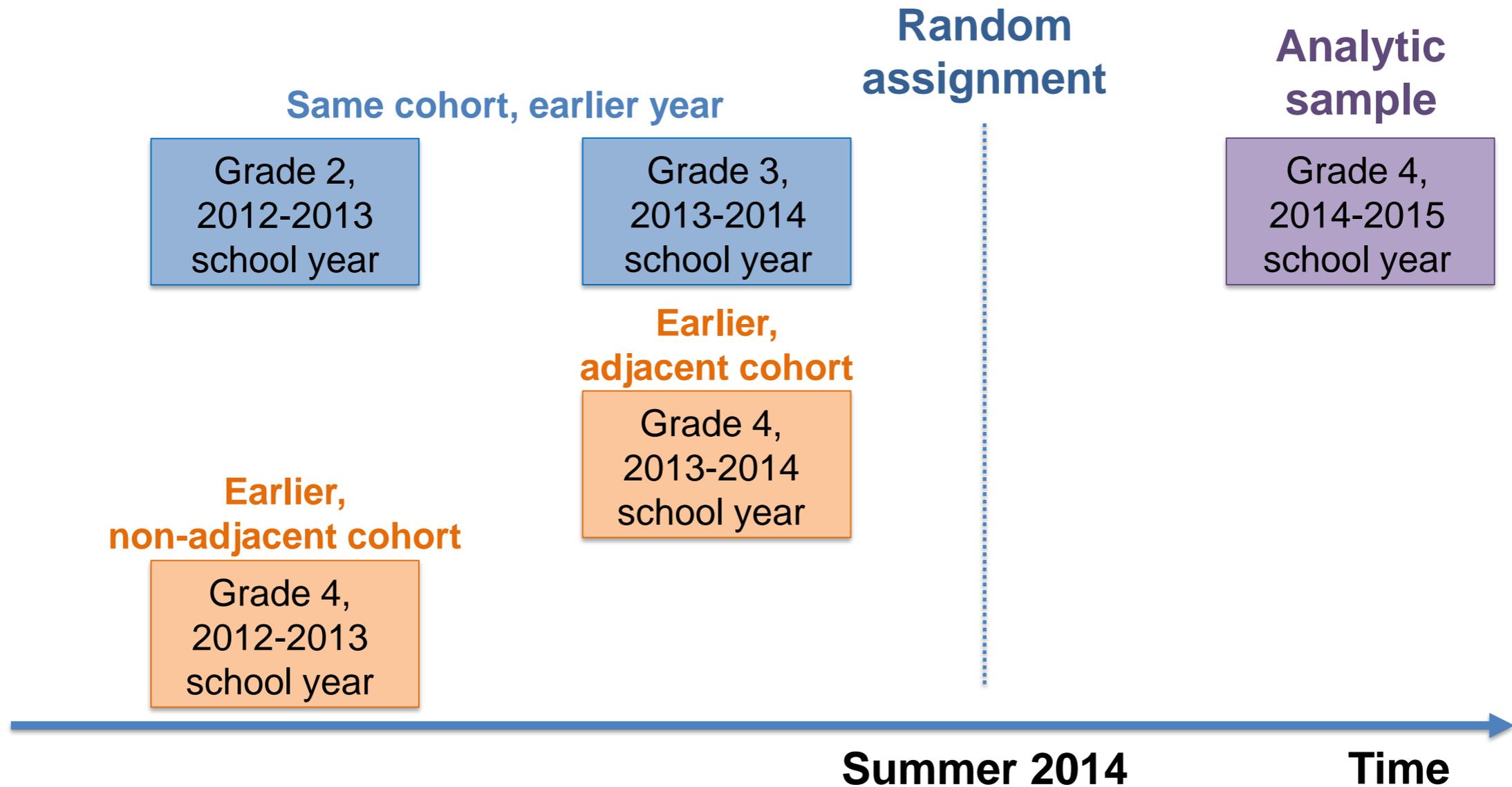
- ❖ Three differences from establishing equivalence of individuals (step 4):
 1. Establish equivalence on analytic sample of clusters, rather than individuals
 2. Baseline standard deviations can be individual level or cluster level
 3. Individuals with baseline data must be representative of the clusters in the analytic sample

Step 7: Is Baseline Equivalence Established for Clusters?

Establish equivalence of clusters, rather than individuals, in the analytic intervention and comparison groups at baseline.

- ❖ Review protocol specifies requirements for cluster equivalence
- ❖ For example, consider a study that randomly assigned schools to conditions in summer 2014 and analyzed outcomes for grade 4 students in 2015. Suppose that the school administered the same standardized test to students in several previous years, and to all students in the schools, not just to the grade 4 students.

Step 7: Is Baseline Equivalence Established for Clusters?



Step 7: Is Baseline Equivalence Established for Clusters?

Baseline standard deviations can be individual level or cluster level.

- ❖ When both are available, use individual-level standard deviations

Students with baseline data must be representative of the clusters in the analytic sample.

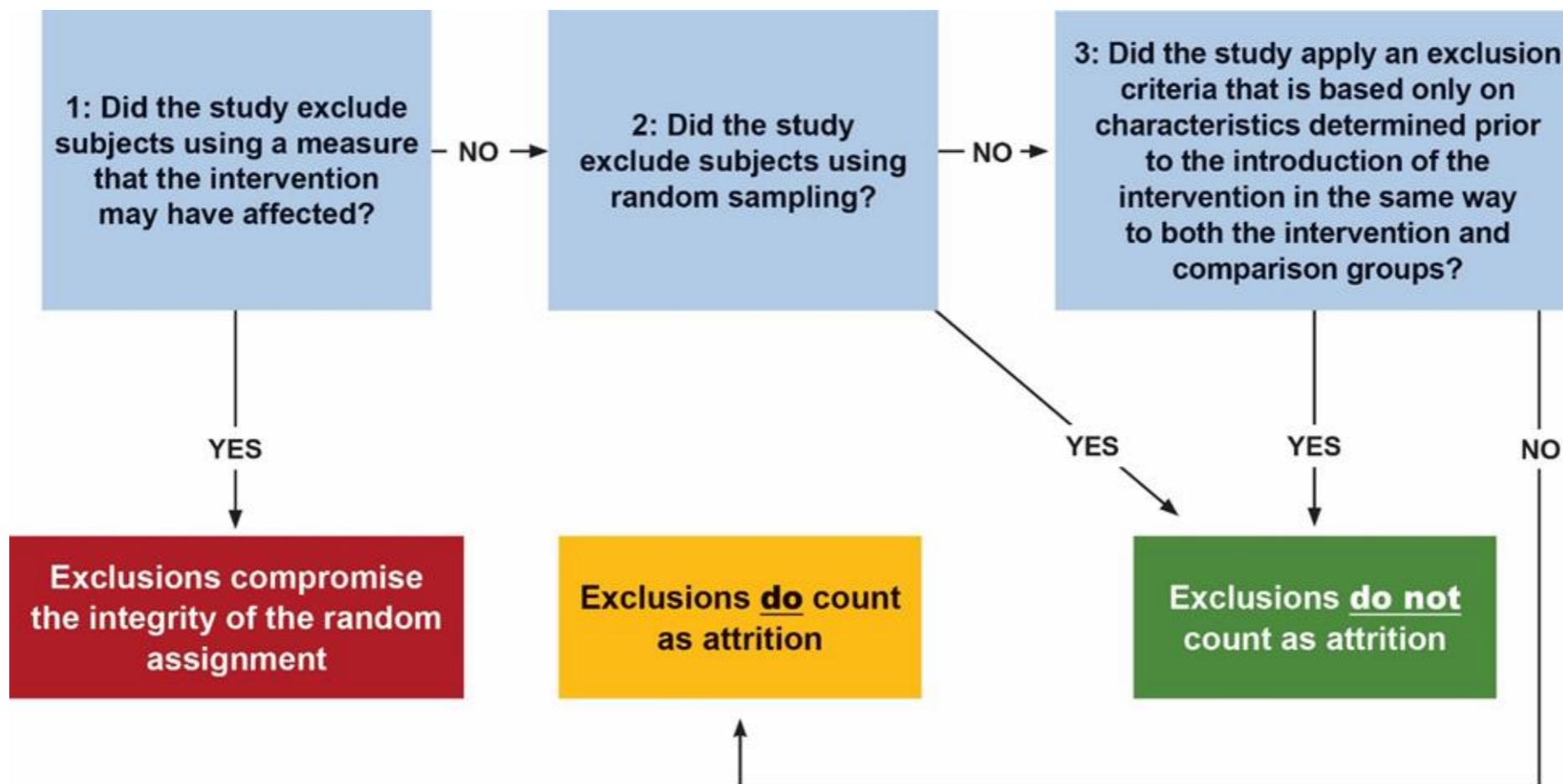
- ❖ Analogous to the representative requirement in step 5
- ❖ Numerator: number of individuals contributing to baseline assessment
- ❖ Denominator: number of individuals in clusters at or near the time of the baseline assessment, only including clusters in the analytic sample

Outcomes and Confounding Factors in Cluster Studies

- ❖ All standards related to confounding factors discussed in the Confounding Factors Module (module 4) also apply to cluster studies
- ❖ All requirements for outcomes discussed in the Outcomes Module (module 5) also apply to cluster studies

Excluding Sample Members in Cluster Studies

When cluster studies exclude sample members, the same rules apply as those in individual-level group design studies: **The WWC treats exclusions in one of three ways, depending on the answers to three questions:**



Excluding Sample Members in Cluster Studies

When sample exclusions in cluster studies (1) do not compromise random assignment and (2) are either random or based on baseline characteristics:

- ❖ In RCTs it is acceptable to limit the denominator in all attrition, non-response, and representativeness calculations to individuals in the subgroup
- ❖ In QEDs it is acceptable to limit the denominator in representativeness calculations to individuals in the subgroup

In these situations, the WWC treats the study as if the clusters only included individuals in the subgroup.

Reporting Statistical Significance from Cluster-Level Assignment Studies

- ❖ Researchers may analyze data from cluster-level assignment studies using cluster-level records (e.g., one record per school) or individual-level records (e.g., one record per student)
- ❖ The **unit of analysis** does not affect the rating of a cluster study but can affect how the WWC reports on statistical significance
- ❖ Individuals within the same cluster are more likely to be more similar to one another than they are to individuals in another cluster
- ❖ An analysis that does not appropriately adjust for the similarity arising from clustering could overestimate the statistical significance of estimated impacts

When Does the WWC Make Clustering Corrections?

- ❖ The WWC makes a clustering correction to statistical significance when two conditions hold:
 1. When the unit of assignment differs from the unit of analysis, and
 2. The study authors did not statistically correct for this mismatch in their original analysis.

- ❖ **Example:** In a cluster QED, the intervention group included schools with computer labs and the comparison group included schools without computer labs. Researchers gave the intervention schools a computer-based reading curriculum and estimated the effects of the reading curriculum by analyzing individual student test scores from the district's reading test. The analysis reported in the study did not attempt to adjust the standard errors in the impact analysis, even though schools were the unit of assignment. The WWC would apply a clustering correction, as there is a mismatch between the units of assignment (school) and analysis (student) for which the analysis did not account.

How Does the WWC Make Clustering Corrections?

- ❖ The WWC applies a series of calculations to adjust the statistical significance of a finding
- ❖ The adjustment is performed using information from the study:
 - A *t*-statistic based on the study's analysis that ignores the clustering
 - The number of clusters
 - The number of individuals
 - An **intra-class correlation (or ICC)** either from the study or from the WWC (the WWC's default ICC is 0.20 for academic outcomes and 0.10 for behavioral outcomes)

Knowledge Check 5

Under what circumstances would you apply a cluster correction?

- A. A study that randomly assigned schools to take part in a new behavioral intervention and analyzed the effects on mean school suspension rates using school-level data.
- B. A study that compared the effects on reading achievement for students of teachers who implemented a new reading curriculum to the effects on students whose teachers continued using the regular curriculum. The authors analyzed effects using a hierarchical linear model with students nested within teachers.
- C. A study that randomly assigned students within each classroom to a new computer-based reading program or to a comparison group. The study measured student outcomes using a multiple regression analysis.
- D. None of the above.

Answer to Knowledge Check 5

- ❑ **A, B, and C are incorrect answers.** In choice A, the school is both the unit of assignment and the unit of analysis. In choice B, the authors account for clustering in their analysis. In choice C, students are both the unit of assignment and the unit of analysis.
- **D is the correct answer.** The WWC would apply a cluster adjustment only if there is a mismatch between the unit of assignment and unit of analysis, and the study does not make a cluster adjustment in its reported analysis.

Knowledge Check 6

A QED study included 10 classrooms using computer-aided math instruction and 10 using the standard curriculum. No students joined the 20 classrooms during the school year. The authors reported classroom means and standard deviations for a standardized math test at baseline and follow-up. At baseline, intervention and comparison group classrooms differed by 0.04 standard deviations.

Which of the following is true?

- A. This study could *Meet WWC Group Design Standards With Reservations* if the students are shown to be representative of their classrooms at baseline.
- B. This study *Does Not Meet WWC Group Design Standards* because a QED cannot demonstrate baseline equivalence using classroom-level standard deviations.
- C. This study could *Meet WWC Group Design Standards With Reservations* if the students are shown to be representative of their classrooms at baseline and at follow-up.

Answer to Knowledge Check 6

- ❑ **A is an incorrect answer.** Choice A is incorrect because the study must establish that students are representative of their classrooms at baseline and at follow-up in order to *Meet WWC Group Design Standards With Reservations*.
- ❑ **B is an incorrect answer.** Choice B is incorrect because although cluster-level standard deviations cannot be used to establish equivalence of individuals, they can be used to establish equivalence of clusters.
- ❑ **C is the correct answer.** The study is a cluster QED. To satisfy WWC standards for effects on individuals, a cluster QED must establish equivalence of the individuals in the analytic intervention and comparison groups. However, the study only provides classroom-level standard deviations, so it is not possible to assess baseline equivalence of individuals. Moving to Steps 5 to 7 for the review to satisfy WWC standards for effects on clusters, a cluster QED must establish representativeness and baseline equivalence of clusters. The baseline difference of 0.04 standard deviations establishes baseline equivalence of clusters, as long as the authors can demonstrate that the sample is representative of the clusters at baseline. Therefore, the study can *Meet WWC Group Design Standards With Reservations*, as long as the authors can demonstrate that the sample is representative of the clusters at both baseline and follow-up.

Knowledge Check 7

A study examined the effect of an intervention on student achievement in classrooms by randomly assigning 10 classrooms with a total of 250 students (at assignment) to the intervention group and 10 classrooms with 210 students (at assignment) to the comparison group. One intervention group classroom with 21 students withdrew from the study after random assignment. The analytic sample included 195 of the assigned students in the intervention group and 185 of the assigned students in the comparison group. The study analyzed classroom-level data.

7.1. True or false: This is a cluster-level RCT.

- A. True
- B. False

7.2. What are the overall and differential cluster-level attrition rates?

- A. Overall attrition is 5% and differential attrition is 10 percentage points
- B. Overall attrition is 13% and differential attrition is 3 percentage points
- C. Overall attrition is 17% and differential attrition is 10 percentage points

7.3. What numbers would the WWC use to calculate differential individual non-response?

- A. 1 of 10 intervention group classrooms left the study and 0 of 10 comparison group classrooms left.
- B. 55 of 250 intervention group students left the study and 25 of 210 comparison group students left.
- C. 34 of 229 intervention group students left the study and 25 of 210 comparison group students left.

Answer to Knowledge Check 7.1

- **This statement is true.** The study is a cluster RCT because it assigned groups of individuals to conditions and the data are based on individuals within the groups. The clusters are classrooms. The outcome of interest is student achievement, which is measured for students within classrooms. The level of aggregation for the data used in the analysis does not affect whether the WWC considers the study to be eligible for review as a cluster study.

Answer to Knowledge Check 7.2

- **A is the correct answer.** The unit of assignment is the classroom. For overall attrition, the study assigned 20 classrooms and 19 contributed outcome data. Thus, overall attrition is $(20 - 19)/20$, or 5%. For differential attrition, focus first on intervention group attrition, which is 10% ($[10 - 9]/10$). Then focus on the comparison group attrition, which is 0, since no comparison classrooms left the sample. The differential attrition rate is the difference between the two, or 10 percentage points.
- **B and C are incorrect answers.**

Answer to Knowledge Check 7.3

- A is an incorrect answer.** The numbers in this answer choice relate to the number of clusters (classrooms), not individuals (students).
- B is an incorrect answer.** Using 250 in the denominator for the intervention group is incorrect because the 21 students in the classroom that left the study should be excluded.
- C is the correct answer.** The study did not include any joiners, so it is acceptable to use data from the time of random assignment as the reference sample. Initially, the study assigned 250 students to the intervention; however, 21 were in a classroom that left the study and are removed from the denominator because individual non-response is only calculated within the remaining clusters. This means the denominator for the intervention group is the 229 ($250 - 21$) students who were assigned to the intervention condition in remaining clusters. The analytic sample included 195 of these students, so the numerator for the intervention group is 34 ($229 - 195$). The denominator for the comparison group is the 210 students who were assigned to the comparison condition. The analytic sample included 185 comparison students, so 25 students left the comparison group ($210 - 185$).

Knowledge Check 8

A study examined the effectiveness of a new reading curriculum by comparing a reading achievement outcome in five classrooms using a new reading curriculum and five classrooms using business-as-usual curriculum. The study authors used classroom-level data from all 10 classrooms to report means and standard deviations for the reading test at baseline and follow-up. The study reported baseline data for the 123 intervention group students and 108 comparison group students who completed the baseline test. Baseline differences for this sample were smaller than 0.05 standard deviations. The study reported outcome data based on 125 intervention group students and 91 comparison group students who completed the follow-up test. No information about the total number of students enrolled in the classrooms at baseline or follow-up is available. The study is reviewed under a protocol using the optimistic boundary for attrition and specifies that no joiners pose a risk of bias.

8.1. True or false: The study satisfies WWC standards for evidence of effects on individuals.

- A. True
- B. False

8.2. Which of the following is true?

- A. This study *Meets WWC Group Design Standards With Reservations* because the study establishes that the sample was representative of the clusters at baseline and follow-up, and establishes equivalence of clusters.
- B. This study *Meets WWC Group Design Standards With Reservations* because the study establishes baseline equivalence of clusters.
- C. This study *Does Not Meet WWC Group Design Standards* because representativeness of the individuals within clusters is necessary and not demonstrated.

Answer to Knowledge Check 8.1

- **This statement is false.** This study is a cluster QED that does not satisfy WWC standards for evidence of effects on individuals for two reasons: the study does not provide baseline data for the analytic sample of individuals used to assess outcomes, and the study did not provide individual-level standard deviations.

Answer to Knowledge Check 8.2

- ❑ **A and B are incorrect answers.** The study cannot *Meet WWC Group Design Standards With Reservations* because it does not demonstrate equivalence of the individuals in the analytic sample, and the study does not demonstrate that the analytic sample is representative of the clusters.
- **C is the correct answer.** Because this is a cluster QED that does not satisfy WWC standards for evidence of effects on individuals or clusters, reviewers must use steps 5-7 to review the study's evidence of effects on clusters. However, the study does not provide the enrollment data required to assess representativeness. Therefore, the study receives a rating of *Does Not Meet WWC Group Design Standards*.

MODULE

8

Cluster-Level Assignment

Conclusion

MODULE

8 Cluster-Level Assignment

- ❖ 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!