What Works Clearinghouse™

ies INSTITUTE OF EDUCATION SCIENCES

WWC STANDARDS Brief

The What Works Clearinghouse (WWC) is an initiative of the U.S. Department of Education's Institute of Education Sciences. The WWC evaluates research studies that look at the effectiveness of education programs, policies, and practices, which the WWC calls "interventions." WWC Standards Briefs explain the rules the WWC uses to assess the quality of studies. For more information, visit the WWC's webpage at http://whatworks.ed.gov.

Attrition Standard

What is attrition?

"Attrition" is the loss of sample during the course of a study. It occurs when individuals initially randomly assigned in a study are not included when researchers examine the outcome of interest. Attrition is a common issue in education research, and it occurs for many reasons, as illustrated in Figure 1.

Why does attrition matter?

Randomly assigning study participants to intervention and comparison groups creates groups with similar characteristics at the start of the study (baseline), as illustrated in Figure 2. When the two groups have similar characteristics at baseline, differences in outcomes between the groups at follow-up can be attributed to the intervention. However, if attrition occurs, the members of the intervention and comparison groups used in the analysis may not have had similar characteristics at baseline, preventing us from being able to attribute any differences in outcomes solely to the intervention.

Figure 1: Common causes of attrition

Figure 2 shows an example of attrition after random assignment. At the time of the follow-up assessment, attrition has resulted in groups that look different from the initial groups and from each other: the intervention group is mostly red and orange, while the comparison group is mostly green and yellow.

To understand why attrition is important, imagine that students represented by the red circles in Figure 2 typically score higher than other students. Having more high-achieving students in the intervention group at follow-up implies we would likely find a higher average score for the intervention group than for the comparison group—even if the intervention was not effective at changing student performance. Therefore, the observed effect of the intervention is biased: some of the differences in outcomes stem from differences between the intervention and comparison groups due to attrition.
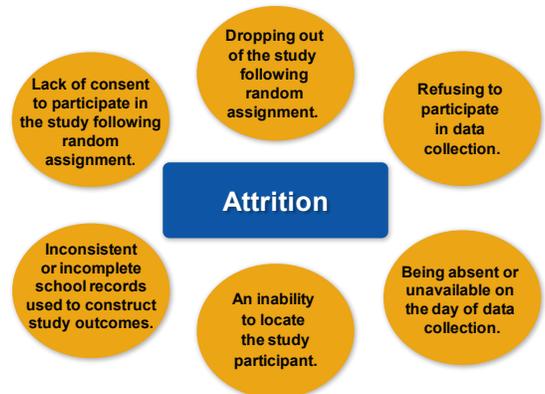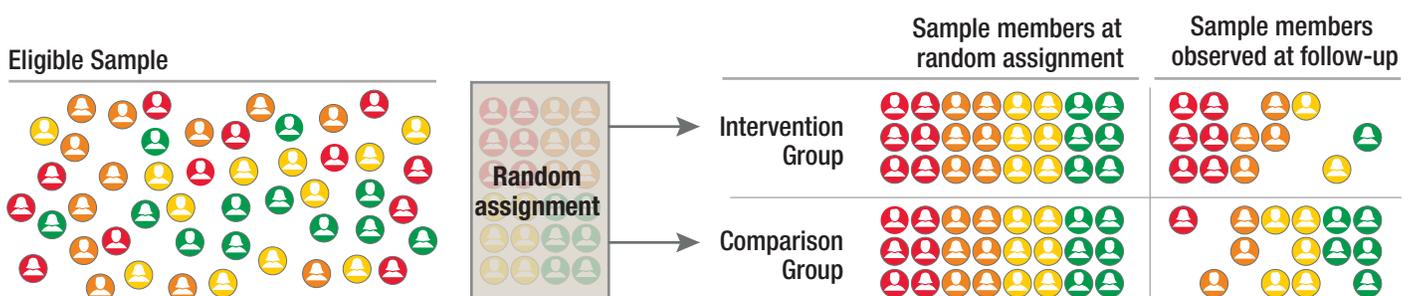

Figure 2: Illustration of non-equivalence of baseline characteristics due to sample attrition

How does the WWC handle attrition?

The WWC examines two kinds of attrition in its reviews: attrition for all study participants (overall attrition) and differences in attrition between the intervention and comparison groups (differential attrition), as illustrated in Figure 3. The WWC used a theoretical model and empirical data to estimate how much bias might occur under different combinations of overall and differential attrition. The WWC then determined which combinations of overall and differential attrition were acceptable because they would imply limited bias. The WWC uses two attrition standards. WWC protocols indicate whether reviewers should use the *conservative* (Figure 4) or the *liberal* (Figure 5)

Figure 3: An example of calculating attrition

attrition standard based on the type of interventions being studied. When attrition is likely to be related to the intervention, such as with a voluntary high school dropout prevention program, the conservative attrition standard is used. When an intervention is unlikely to affect attrition, such as with a first-grade reading program, the liberal attrition standard is used.

The overall and differential attrition rates, plotted in Figures 4 and 5, are associated with colors that indicate potential bias.[1] The green area has low attrition and low expected bias; the red area has high attrition and high expected bias. In Figure 3 above, the combination of 15% overall and 10% differential attrition would place this study in the red area (where the yellow dot is) using the conservative attrition standard and the green area using the liberal attrition standard.

Figure 4: Conservative attrition standard

Figure 5: Liberal attrition standard

A study with low attrition is expected to have low levels of bias and can receive the highest possible rating of *Meets WWC Group Design Standards Without Reservations*. A study with high attrition cannot receive this highest rating because of the threat of potential bias due to sample attrition. In order to *Meet WWC Group Design Standards With Reservations*, a study with high attrition has to show that even after attrition, the sample members who remain in the intervention and comparison groups in the analysis were similar on important characteristics at baseline.[2]

Glossary

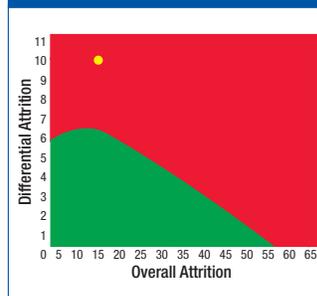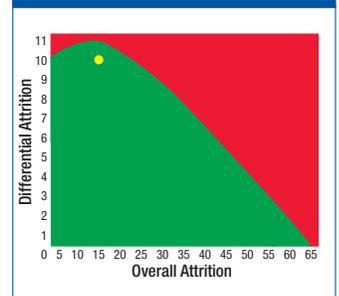- The **baseline** is the point in time before the intervention was implemented.
- **Bias** is the difference between the impact estimated using data from a sample experiencing attrition and the true impact that would have been estimated had there been no attrition.
- **Differential attrition** is the difference in attrition between the intervention group and the comparison group.

- The **follow-up** is the point in time after the intervention was implemented when assessment or outcome data are collected.
- **Overall attrition** is the level of attrition calculated for all study participants.

For more information about the attrition standard and other WWC standards, please download a copy of the *WWC Procedures and Standards Handbook*.

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[1] For more information on the WWC's model of attrition bias, please see the *Assessing Attrition Bias* white paper.
[2] The WWC Standards Brief for Baseline Equivalence provides more information on this topic.