Post-School Outcomes: Response Rates and Nonresponse Bias

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Response Rates and Nonresponse Bias

This paper is a non-technical introduction to the concepts of response rates and nonresponse bias relative to Indicator 14. It builds upon concepts, such as “representativeness,” introduced in the National Post-School Outcomes Center’s (NPSO) sampling technical assistance documents.

The paper was written to heighten awareness of the importance of reporting response rates and the need to identify and discuss nonresponse bias; it is not meant to be a statistical cookbook with recipes for adjusting survey data for nonresponse bias.

The audience for this paper includes state special education staff charged with writing about their State Performance Plan and Annual Performance Report (SPP/APR) relative to Indicator 14, as well as state data managers, transition program personnel, district personnel, and others endeavoring to make sense of their post-school outcomes data. Though written specifically for Part B Indicator 14, the concepts covered below apply equally to any of the SPP/APR indicators that rely on survey data.

This paper takes a practical approach to the issues of response rates and nonresponse bias. The collection, analysis, and reporting of post-school outcomes data assists states and districts in their efforts to design and implement program improvement. They must use these data even if response rates are lower than those acceptable for federally funded research studies or when data are known to have measurable nonresponse bias.

As a consequence of its practical approach to these issues, the answers provided in this paper are for the express purpose of addressing Indicator 14 and may not always meet the standards expected for a formal research study; however, they are defensible for the intended purpose.

Indicator 14

Percent of youth who had IEPs, are no longer in secondary school and who have been competitively employed, enrolled in some type of postsecondary school, or both, within one year of leaving high school (U.S. Department of Education, 2006a).

The collection, analysis, and reporting of post-school outcomes data assists states and districts in their efforts to design and implement program improvement.

As explained in the instructions for the SPP and APR, where sampling is permitted, states are required to address problems of response rates, missing data, and bias. Those instructions specify the following:

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1 By “representativeness” we mean that a subset, or sample, of individuals from a larger group, or population, mirrors that larger group on important demographic characteristics. Representativeness, rather than the attainment of a specific number of survey responses, is the objective when collecting survey data. The reader may want to review the NPSO Sampling paper Post-School Outcomes for Youth with Disabilities—Establishing a Representative Sample of Your State to Address Indicator #14 at http://www.psocenter.org.

2 These instructions are located at http://www.ed.gov/policy/speced/guid/idea/bapr/binstsheet1.pdf.
When sampling is used, a description of the sampling methodology outlining how the design will yield valid and reliable estimates must be submitted to OSEP. The description must also include how the State Education Agency addresses any problems with: (1) response rates; (2) missing data; and (3) selection bias (emphasis added) (U.S. Department of Education, 2006).

Although the instructions raise the issue of response rates in the context of sampling, these issues and the importance of representative data are applicable whether states collect data through a sample or a census.

This introduction to response rates and nonresponse bias addresses issues pertaining to Indicator 14 by addressing five general questions on response bias:

- What is a response rate?
- How high does a response rate need to be?
- What is nonresponse bias?
- How do you know if there is nonresponse bias?
- What should you do if you have nonresponse bias?

A response rate is one measure of the level of success or quality achieved in collecting survey data. It is the ratio of the number of completed surveys (the Respondent Group) to the total number of surveys intended to be completed (the Target Leave Group i.e., the number of completed surveys plus the number of surveys that were not completed, minus the number of surveys for school leavers no longer eligible for the survey because they returned to secondary school). The survey response rate is also sometimes called a unit response rate. In its simplest form, the response rate is calculated as follows (American Association for Public Opinion Research [AAPOR], 2006):

\[
RR = \frac{S}{T - I} \\
RR = \frac{S}{S + R + NC}
\]

Where:

- \( RR \) = Response rate
- \( T \) = Total number of surveys to be administered (Target Leaver Group)
- \( S \) = Survey completed (Respondent Group)
- \( R \) = Contact made, but school leaver refused to complete the survey
- \( NC \) = No contact made with school leaver (e.g., moved and location is unknown, phone not in service, attempted contact multiple times with no response)
- \( I \) = Ineligible for survey (e.g., school leaver counted as dropping out, but when contacted a year later were re-enrolled in high school)

**Example.** Assume that 500 students with IEPs left school during the school year. For simplicity, also assume that sampling

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3 The NPSO Response Rate Calculator uses the term Respondent Group to refer to these completed surveys.

4 The NPSO Response Rate Calculator uses the term Target Leaver Group to refer to total number of surveys that were intended to be completed.

5 Unit nonresponse refers to the survey as a whole. In contrast, item nonresponse refers to the noncompletion of specific survey questions. If a completed survey is missing responses to critical questions, you may want to treat the entire survey as a nonresponse, which would constitute a state decision.
was not used. Instead, the survey intends to collect post-school outcomes data from all 500 school leavers (census). Of the 400 school leavers contacted, 5 were back in high school and therefore ineligible for the post-school outcomes survey (I). Another 50 of the 400 refused to complete the survey (R). At the end of the survey period, there were 345 completed surveys (S) to analyze for Indicator 14. We were unable to locate 100 of the school leavers (NC). Table 1 summarizes what we know about the 500 school leavers we intended to survey.

<table>
<thead>
<tr>
<th>Total School Leavers</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Made Contact</td>
<td>400</td>
</tr>
<tr>
<td>Ineligible (I)</td>
<td>5</td>
</tr>
<tr>
<td>Eligible Refused (R)</td>
<td>50</td>
</tr>
<tr>
<td>Eligible Completed Survey (S)</td>
<td>345</td>
</tr>
<tr>
<td>No Contact/Lost to follow up (NC)</td>
<td>100</td>
</tr>
</tbody>
</table>

When we apply the basic response rate formula to these counts, we calculate a response rate of 0.697 or 70%.

\[
RR = \frac{345}{345 + 50 + 100} \\
RR = \frac{345}{495} = 0.697 \times 100 = 70\%
\]

A Second Example. The example above demonstrates the most direct and simplest form of calculating a response rate. Although it is the most practical calculation for states to use, we must note its limitations. If we sampled school leavers (i.e., students) for the survey, at either the district or student level, then each survey respondent represents other school leavers. Likewise, every nonrespondent represents other school leavers. Therefore, if we sampled a set of school leavers, we should adjust the response rate calculation to account for each respondent’s and nonrespondent’s probability of selection for the post-school outcome survey. This adjustment can be quite complex, especially when different groups of students have different probabilities of selection. The American Association for Public Opinion Research (AAPOR) has a response rate calculator on its website that you might find useful, particularly if you used a multistage sampling process that involved sampling districts and student leavers.

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6 If you know that some nonrespondents are back in high school (ineligible), subtract them from the number of nonrespondents.

7 Response rates must be adjusted using sample weights. Sample weights are the inverse of the school leaver’s probability of selection for the post-school outcome survey. The AAPOR (2006) document presents response rate calculations for several sample designs with unequal probability of selection and for designs with multiple stages of sampling.

8 For further reading on this topic, see The Council of American Survey Research Organizations' document On the Definition of Response Rates and The Office of Management and Budget's Standards and Guidelines for Statistical Surveys.
How high does a response rate need to be?

The U.S. Department of Education, Office of Special Education Programs (OSEP) has not set a response rate standard for this indicator and there is no magic response rate number. High response rate help to ensure that the results from the survey are representative of the target population as a whole; but achieving such high response rates can be extremely costly. Conversely, lower response rates increase the possibility that the survey results cannot be generalized to the population as a whole. Suggestions for increasing response rates are included in the document Collecting Post-School Outcome Data Strategies for Increasing Response Rates available on the NPSO website.

Calculating and reporting your response rate is an important first step to understanding your data. Ultimately, however, what is important is not the specific response rate attained, but whether the results are representative of all school leavers. If the characteristics of survey respondents (e.g., their gender, race/ethnicity, disability category, and type of exit) are different from those of all school leavers, then your data should not be generalized to the entire population of school leavers even if your response rate was high (e.g., 80%). Likewise, if the characteristics of survey respondents are the same as those of all school leavers, it is acceptable to generalize your results to the entire school-leaver population — even if your response rate was low.

What is nonresponse bias?

When the people who responded to the survey are different from the people who did not respond, that is nonresponse bias. As a consequence of nonresponse bias your respondents are different from the entire population targeted by the survey. That is, your survey respondents are not representative of all school leavers. Nonresponse bias damages your ability to use your data to make inferences about your population. You cannot generalize your post-school outcomes survey results to the entire target population of school leavers. The example below describes a survey response scenario that makes clear why, when you have nonresponse bias, you should not generalize your results to the target population.

Example: Assume that 55% of school leavers received a regular high school diploma, 15% received a certificate of completion, and the remaining 30% dropped out of high school. If all of your survey respondents were high...
school graduates, it is unlikely that your survey results are representative of all school leavers. In such a situation, were you to report your survey results without describing how survey respondents compared to the entire exiting population you would be implying that the post-school outcomes of dropouts and those who left school with a certificate of completion are the same as those who left school with a regular high school diploma.

**How do you know if there is a nonresponse bias?**

To determine whether you have nonresponse bias, assess the degree to which post-school outcomes survey respondents are different from all school leavers. That is, attempt to determine whether the surveys are missing at random and, if not, determine the size of the difference. At a minimum, you should compare the known characteristics of survey respondents with those of all school leavers to determine whether they are the same.\(^\text{11}\)

For Indicator 14, the characteristics you should compare include, but are not limited to, the student’s gender, race/ethnicity, disability category, and type of exit. (Other characteristics, such as socio-economic status or English language proficiency status, may also be of interest to you and your particular state but are not required by the Office of Special Education Programs). The example below demonstrates one method for assessing the degree to which post-school outcomes survey respondents are different from all school leavers.

\(^{11}\text{This basic approach to identifying nonresponse bias is acceptable because, as indicated above, these data collection efforts are not research studies. For an example of how this method was used to evaluate nonresponse bias, see the Leslie, Raglin, and Braker analysis of the American Community Survey. NCES’ 2002 Statistical Standards includes a brief discussion of other methods of nonresponse bias analysis (e.g., multivariate modeling).} \text{See Standard 4-4.}\)

**Example.** Calculate the percentage of survey respondents who dropped out of high school and compare that percentage to the percentage of dropouts among all school leavers. If these two percentages are notably different (notable differences may be determined statistically or by setting certain differences as meaningful for a particular issue), then you have nonresponse bias. Table 2 (page 8) uses a hypothetical example to demonstrate how you might compare the characteristics of eligible survey respondents with those of all school leavers to determine whether the survey results are biased as the result of nonresponse.

**To determine whether you have nonresponse bias, assess the degree to which post-school outcomes survey respondents are different from all school leavers.**

The NPSO Response Calculator for Indicator #14, can help you establish whether your respondents (respondent group) are equivalent to your original, representative sample or census of all school leavers (target leaver group) on various demographic characteristics. Since it is unlikely that the percentage of respondents in each demographic category will be exactly equal to the percentage of the population in that category, you need a rule for identifying and flagging notable differences. The NPSO Response Calculator uses a relative
Table 2. Comparing the characteristics of eligible respondents with those of all school leavers

<table>
<thead>
<tr>
<th>School leaver characteristics</th>
<th>Total school leavers(^a) (%)</th>
<th>Completed survey eligible respondents(^b) (%)</th>
<th>Percent difference(^c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>65</td>
<td>50</td>
<td>23</td>
</tr>
<tr>
<td>Female</td>
<td>35</td>
<td>50</td>
<td>43</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian/Alaska Native</td>
<td>2</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>2</td>
<td>5</td>
<td>150</td>
</tr>
<tr>
<td>Black (not Hispanic)</td>
<td>22</td>
<td>19</td>
<td>14</td>
</tr>
<tr>
<td>Hispanic</td>
<td>14</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>White (not Hispanic)</td>
<td>60</td>
<td>61</td>
<td>2</td>
</tr>
<tr>
<td>Disability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specific learning disabilities</td>
<td>61</td>
<td>58</td>
<td>5</td>
</tr>
<tr>
<td>Speech or language impairments</td>
<td>2</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>Mental retardation</td>
<td>12</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Emotional disturbance</td>
<td>12</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>Other health impairments</td>
<td>7</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>Other disabilities</td>
<td>6</td>
<td>8</td>
<td>33</td>
</tr>
<tr>
<td>Type of exit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school diploma</td>
<td>55</td>
<td>57</td>
<td>4</td>
</tr>
<tr>
<td>Certificate of completion</td>
<td>15</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>Dropped out</td>
<td>30</td>
<td>26</td>
<td>13</td>
</tr>
</tbody>
</table>

\(^a\)The Target Leaver Group in the NPSO Response Rate Calculator.

\(^b\)The Respondent Group in the NPSO Response Rate Calculator.

\(^c\)Percent difference is the absolute (unsigned) difference between the total school leavers percentage and the completed survey eligible respondents percentage represented as a percentage of the total school leavers percentage. For example, the total school leaver percentage male is 65 and the completed survey eligible respondents percentage male is 50. The difference between these two is 15 percentage points, which is a relative difference of 23 percent of the total school leavers percentage \((65 - 50 / 65 = 0.23*100 = 23\%)\).

difference of plus or minus 3 percent to identify acceptable differences.\(^{12}\) Differences outside this range are flagged as an indication of nonresponse bias. In the table above, such notable response differences are marked with italics.

To determine whether you have nonresponse bias, you may also want to examine your data for interactions between specific combinations of characteristics and nonresponse. This is particularly important if you have reason to believe that school leavers with certain

\(^{12}\) A relative difference is calculated by subtracting the sample percentage from the respondent percentage, dividing the result by the sample percentage, and multiplying the result by 100 to get a percentage.
combinations of characteristics have different post-school outcomes from other school leavers, or if you identified individual characteristics that appear to be related to nonresponse. For example, you might compare the percentage of respondents who have a learning disability and dropped out of school with the percentage of learning disabled dropouts in your total exiting population (including nonrespondents).

Some words of caution. You can use any available data about your school leaver population to assess the degree to which survey respondents are different from all school leavers. However, these known characteristics of school leavers are not the only characteristics on which respondents and nonrespondents may differ. It is possible that characteristics such as a student’s gender, race/ethnicity, disability category, and type of exit may be weakly related to, or even unrelated to, post-school outcomes. If these characteristics are only weakly related to post-school outcomes, then these nonresponse bias analyses will tell you little about whether your survey results can be generalized to the school leaver population. What these analyses cannot determine is whether survey respondents have different (more or less positive) post-school outcomes than nonrespondents and, therefore, different post-school outcomes from the entire population of school leavers. This is something you can never know with certainty and is one reason why a high response rate is so important.

Nonresponse bias damages your ability to use your post-school outcomes data to make inferences about your population. If you identified nonresponse bias, the following suggestions will help you use your data appropriately. They are also appropriate if you did not identify nonresponse bias. The goal of providing these suggestions is to help you use your post school outcomes data without making statements that your data cannot support.

13 The goal of providing these suggestions is to help you use your post school outcomes data without making statements that your data cannot support.

14 That is, unless your sample was self weighting. A sample is not self weighting if sampled elements (e.g., school districts) were selected with unequal probabilities.

15 For example, through nonresponse cell weighting and response propensity modeling.
well beyond the scope of this introductory document. If you want to make inferences about your exiting population, then enlist the services of the statistician who designed your sample. He or she will be familiar with these procedures and can help you ensure that they are appropriately applied. For those interested in more information about weighting for non-response, the reference list includes David Elliot’s (1991) frequently cited guide to the topic.

Reflect on sources of bias. Before writing about your data, even before you finish collecting data, spend time identifying possible sources of nonresponse bias for your particular state. If you do not weight your data or adjust your weights for nonresponse bias, that’s one source of bias. What else might result in bias? Are there situations when nonresponse is more likely? Can you address the problem through further field efforts (e.g., refusal conversion, additional resources for finding school leavers, incentives)? Do you have additional data sources available to investigate these potential sources of bias? Consider how various assumptions about nonrespondents affect your results (i.e., sensitivity analyses\(^{16}\)). Finally, reflect on the effects of any unmeasured sources of nonresponse bias. For example, all other student characteristics being equal, it might be the case that students with less positive post-school outcomes were more (or less) likely to respond to the survey. If that is the case, then your survey results will overestimate the post-school outcomes of children with disabilities.

Share what you know. When disseminating your survey results, be sure to: report your response rate, address how (or whether) the data were weighted; and describe the specific efforts made to locate nonrespondents, the results of the nonresponse bias analysis, and any nonresponse bias adjustments applied. Full disclosure of this information is good practice and will help the reader to understand the survey results and any limits to the generalizability of the data. If post-school survey respondents are different from all school leavers, then caution your reader to interpret the results accordingly. Describe which groups are under represented among survey respondents and which are over represented. This disclosure also will be useful for identifying where future improvement activities are needed to improve the data collection system.

Discuss results in the context of bias. Describe the degree to which the respondents are the same and different from all the school leavers. Explain that nonresponse bias limits what conclusions can be made about the population of all school leavers. By acknowledging the limitations of your data and framing the discussion of your survey results in terms of those limitations, it is possible to use your survey data even if you identified nonresponse bias or chose not to weight your sample data. When you have nonresponse biases, you should talk about your survey results in terms of survey

\(^{16}\) See, for example, William Cochran’s discussion in Sampling Techniques.
respondents rather than in terms of the entire population of school leavers. It also is advisable that you remind your reader that the results may not hold for the population as a whole. For example:

Among those who completed the post-school survey, 65% were competitively employed, enrolled in postsecondary school, or both, within 1-year of leaving high school. However, because those who completed the survey (55%) may not be representative of all the students with IEPs who left school during the 2005-06 school year, the actual percentage of school leavers with positive post-school outcomes may be different.

Disaggregating your results along the dimensions where you identified nonresponse bias will make it easier for you to talk about your data in terms of the response biases you identified. For example:

Among survey respondents, females were more likely than males to be competitively employed, enrolled in postsecondary school, or both within 1 year of leaving high school. However, because females were also more likely than males to respond to the post-school survey (70% for females compared with 45% for males), these results may not be generalizable to all students with IEPs who left school during the 2005-06 school year.

The U.S. Department of Education, Office of Special Education Programs (OSEP) requires states to report on their post-school outcomes data about students with disabilities regardless of the response rate or representativeness of the data. The challenge, then, is to gather post-school outcomes data in a way that is meaningful and does not attempt to say more with the data than is appropriate. Calculating and reporting the response rate is an important first step towards meeting this challenge. More important is an awareness of the limitations to the generalizability of the survey results to the entire population of students with IEPs who left school during the school year. Analyzing your data for nonresponse bias will provide the insight that will allow you to discuss your survey data within the context of any bias identified and avoid making unsupported statements about the survey population as a whole. We offer the checklist to the right as a guide for addressing the issue of response bias.

1. Do everything you can to increase your response rate.
2. Remove surveys for any students who returned to secondary school (ineligibles).
3. Calculate and report your response rate.
4. Examine your data for nonresponse bias. At a minimum, compare the distribution of gender, race/ethnicity, disability category, and type of exit among respondents with the distribution in the target population. Is there bias? If so, what groups?
5. If you sampled, was the sample weighted? If weighting was used, analyze your data using sample weights appropriately adjusted for nonresponse.
6. Discuss your survey results in the context of your response rate and any nonresponse bias identified.


