

Reader's Guide

The Condition of Education is available in two forms: this print volume for 2002 and a Web version on the NCES Web Site (<http://nces.ed.gov/programs/coe>). The Web version includes special analyses, essays, and indicators from the 2000, 2001, and 2002 print volumes of *The Condition of Education*. (See page xx for a list of all the indicators that appear on *The Condition of Education* Web Site.)

Each section of this print volume of *The Condition of Education* begins with a summary that presents the key points in the indicators to follow. All indicators contain a discussion, a single graph or table on the main indicator page, and one or more supplemental tables. All use the most recent national data available from the National Center for Education Statistics (NCES) or other sources. The icon to the side of the graph or table directs readers to supplemental tables, supplemental notes, or another source for more information.

When the source is an NCES publication, such as *The Digest of Education Statistics 2001* (NCES 2002-130), that publication can be viewed at the NCES Web Site (<http://nces.ed.gov>).

Supplemental notes provide information on the sources of data used, describe how an analysis was conducted, or provide explanations of categories used in an indicator. Supplemental tables provide more detailed breakouts for an indicator, such as household income, students' race/ethnicity, or parents' education. Tables of standard errors (see below) are also included for applicable indicators. A glossary of terms and a comprehensive bibliography of items cited in *The Condition of Education* appear at the end of the volume.

DATA SOURCES

Data reported in this volume are primarily from two types of sources. Some indicators report data from entire populations, such as *indicator 6* (graduate and first-professional enrollments). With these kinds of data, information is collected from every member of the population surveyed. This "universe" could be all colleges and universities in the country, every school district, or all secondary school teachers. Other indicators report data from a statistical sample of the entire population. When a sample is used, the effects of having information from a portion of the entire population must be considered in reporting estimates and making comparisons.

When data on the entire population are available, comparisons among different groups within that population can be made by calculating a total for each group and comparing the group totals. It is not necessary to consider the effects of collecting information on a sample of the population when comparing estimates from a universe survey. Although estimates derived from universe surveys are not affected by sampling, they are affected by a wide range of potential data collection errors such as coverage errors, response errors, coding errors, and data entry errors. These errors may be larger than the error due to collecting data on a sample rather than the entire population.

A universe survey is typically expensive and time consuming, so researchers often collect data from a small sample of the population of interest. Through random sampling and other methods, researchers seek to ensure that this sample accurately represents the larger population to which they wish to generalize. The National Education Longitudinal Study of 1988, for example, surveyed a representative sample of nearly 25,000 8th-graders from among

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all 8th-graders across the country. Based on this sample, conclusions can be drawn about all 8th-graders, such as their family background, characteristics of the schools they attend, their mathematical achievement (as measured with a test administered as part of the survey), and their activities outside of school (NCES 90–458).

Most indicators in *The Condition of Education* summarize data from sample surveys conducted by NCES or the Bureau of the Census with support from NCES. Detailed explanations of NCES surveys can be obtained at the Web site noted above, under “Survey and Program Areas.” Information about the Current Population Survey, another frequent source of survey data used in *The Condition of Education*, can be obtained at <http://www.bls.census.gov/cps/cpsmain.htm> (and also in *Supplemental Note 2*).

DATA ANALYSIS AND INTERPRETATION

Once data from a census or a sample survey are collected, it is necessary to summarize them in a meaningful way. Estimating the true population average, or mean, is a common way of summarizing data. The mean is obtained by adding together the values for all members of the sample population and dividing the sum by the sample size. An example of this would be the annual mean salaries of professors at 4-year universities. A second kind of estimate is the median, which is the “middle” value among all members of a sample or population. Half of all values in the population are above the median, and half are below. As an illustration, *indicator 16* discusses the median annual earnings of people ages 25–34. The percentage of the population having a certain characteristic, such as the percentage of graduates who are female, provides still another kind of estimate.

Analysis of data from a sample of a population requires consideration of several factors before the analysis becomes meaningful. For example, however conscientious an organization may be in collecting data from a sample of a population, there will always be some margin of error in estimating the population mean, median, or any other such statistic from the data. Consequently, data from samples can provide only an estimate of the true or actual value. The margin of error or the range of the estimate depends on several factors, such as the amount of variation in the responses, the size and representativeness of the sample, and the size of the subgroup for which the estimate is computed.*

When data from samples are reported, as is the case with most of the indicators in *The Condition of Education*, the magnitude of this margin of error is measured by what statisticians call the “standard error” of an estimate. The standard errors for all the estimated means, medians, or percentages reported in the graphs and text tables of *The Condition of Education* can be found in appendix 3, Standard Error Tables. The corresponding standard errors for the supplemental tables can be viewed at the NCES Web Site (<http://nces.ed.gov>).

As an illustration, *indicator 7* reports on the reading performance of students in 4th grade in 2000. For Hispanic students, the average scale score was 197; for American Indian/Alaska Native students, the average scale score was 196 (see supplemental table 7-2). In contrast to the similarity in these scale scores, the standard errors were considerably different: 1.7 for Hispanics and 4.7 for American Indian/Alaska Natives.

The percentage or mean score with the smaller standard error provides a more reliable estimate of the true value than does the percent-

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age or mean score with a higher standard error. Standard errors tend to diminish in size as the size of the sample (or subsample) increases. Consequently, for the same kinds of data, such as enrollment rates in postsecondary education sample surveys (like the National Postsecondary Student Aid Study) or scores on the National Assessment of Educational Progress, standard errors will almost always be larger for Blacks and Hispanics than for Whites, who represent a larger proportion of the population.

When data from samples are reported, some caution is warranted in making comparisons. Although one mean or percentage may be larger than another, a statistical test may find that there is no difference between estimates due to the precision of the estimates.

Whether differences in means or percentages are statistically significant can be determined using the standard errors of the estimates. When differences are statistically significant, the probability that the difference occurred by chance is usually small, occurring about 5 times out of 100. The method primarily used here for determining whether the difference between two means is statistically significant is described in the introduction to appendix 3, Standard Error Tables.

For all indicators in *The Condition of Education* based on samples, differences between means or percentages (including increases or decreases) are stated only when they are statistically significant. To determine whether differences reported are statistically significant, two-tailed *t*-tests, at the .05 level, are used. Bonferroni adjustments are typically used when more than two groups are compared simultaneously (e.g., Blacks, Whites, and Hispanics). The formula for determining statistical significance is also adjusted when the samples being compared are dependent. Some comparisons

were also made using ANOVA trend analysis, which tests for specific relationships (e.g., linear, quadratic, or cubic) between variables.

Discussion of several indicators illustrates the consequences of these considerations. *Indicator 38* reports that 9 percent of female undergraduates and 7 percent of male undergraduates participated in distance education programs in 1999–2000. Although the difference of 2 percentage points is relatively small, as are the standard errors associated with each estimate (0.4 in each instance), the difference is statistically significant and supports the conclusion that females were more likely to participate in distance education programs than males. In contrast, *indicator 2* discusses enrollment in preprimary education. The data in supplemental table 2-1 indicate that 59 percent of Black children and 47 percent of White children living below poverty were enrolled in preprimary education programs in 2001. The difference of 12 percentage points is larger than in the previous example, but the standard errors are also larger (5.4 and 4.1, respectively). The difference is not statistically significant; the data do not support a conclusion that Black children living in poverty were more likely than their White peers to be enrolled in these programs. *Indicator 13* provides a similar example. The average score of U.S. 8th-grade students on an international test of achievement in science was 515 in 1999, which was 20 points lower than the score in Finland and 12 points higher than that in Latvia. Again, however, the differences are not statistically significant; it is thus proper to indicate that the average scores of U.S., Finnish, and Latvian students are similar.

Although values reported in the supplemental tables are often rounded to one decimal place (e.g., 76.5 percent), values reported in each indicator are typically rounded to whole numbers (with any value of 0.5 or above

rounded to the next highest whole number). Due to rounding, cumulative percentages may sometimes equal 99 or 101 percent, rather than 100.

*If there are five racial/ethnic groups in a sample of 1,500, the researcher would have less confidence in the results for each group individually than in those for the entire sample because there are fewer people in the subgroup.

STANDARD ERROR TABLES

The standard errors for each graph or table on the main indicator page can be found in appendix 3 of this volume. The standard errors for the supplemental tables can be found in the Web version of *The Condition of Education* on the NCES Web Site (<http://nces.ed.gov>).