

Reader's Guide

The Condition of Education is available in two forms: this print volume for 2004 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 this and earlier print volumes of *The Condition of Education*. (See page xxii for a list of all the indicators that appear on *The Condition of Education* web site.)

Each section of the print volume of *The Condition of Education* begins with a summary of the general topic areas covered by the indicators in this volume and on *The Condition of Education* web site. 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 serving the purposes of the indicator. The icon to the side of the graph or table directs readers to supplemental notes, supplemental tables, or another source for more information.

When the source is an NCES publication, such as *The Digest of Education Statistics 2002* (NCES 2003–060), that publication can be viewed at the NCES web site (<http://nces.ed.gov>).

The supplemental tables provide more detailed breakouts for an indicator, such as household income, students' race/ethnicity, or parents' education (appendix 1). Supplemental notes provide information on the sources of data used, describe how analyses were conducted, or provide explanations of categories used in an indicator (appendix 2). 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 AND ESTIMATES

The data in this report were obtained from many different sources, including state education agencies, local schools, and colleges and universities using surveys and compilations of administrative records. Users of *The Condition of Education* should be cautious when comparing data from different sources. Differences in procedures, timing, question phrasing, interviewer training, and so forth can all affect the comparability of results.

Data reported in this volume are primarily from two types of sources. Some indicators report data from entire populations, such as *indicator 35* (public elementary and secondary expenditures per student). With these kinds of data, information is collected from every member of the population surveyed. This “universe” could be all colleges and universities or every school district in the country. Other indicators report data from a statistical sample of the entire population. When a sample is used, the statistical uncertainty introduced from having data from only a portion of the entire population must be considered in reporting estimates and making comparisons.

In contrast, when data on an entire population are available, estimates of the size of the total population or a subpopulation are made simply by counting, or summing, the units in the population or subpopulation. In the case of subpopulations, the size is usually reported as a percentage of the total population. In addition, estimates of the average (or mean) values of some characteristic of the population or subpopulation may be reported. The mean is obtained by summing the values for all members of the subpopulation and dividing the sum by the size of the subpopulation. Examples include the annual mean salaries of professors at 4-year colleges and universities.

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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 on data sets with the entire population may be larger than the error due to collecting data on a sample of the population. Estimates of the size of these errors are typically not available.

A universe survey is usually expensive and time consuming, so researchers often collect data from a small sample of the population of interest. Through (stratified) random sampling and other methods, researchers seek to ensure that this sample accurately represents the larger population to which they wish to generalize. As an illustration, the Education Longitudinal Study of 2002, upon which *indicator 15* is in part based, surveyed a representative sample of nearly 15,000 10th-graders from among all 10th-graders across the country. Based on this sample, conclusions can be drawn about all 10th-graders, such as their family background, characteristics of the schools they attend, and their activities outside of school.

Estimating the size of the total population or subpopulations from a data source based on a sample of the entire population requires consideration of several factors before the estimates become meaningful. 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 size of the actual total population or subpopulation because the data are available from only a portion of the total population. 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.¹ The magnitude of this margin of error is measured by what statisticians call the “standard error” of an estimate.

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. Brief explanations of the major NCES surveys can be found in *supplemental notes 3* and *4* of this volume. More detailed explanations 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*).

STANDARD ERRORS

When data from samples are reported, as is the case with most of the indicators in *The Condition of Education*, the standard error is calculated for each estimate provided in order to determine the “margin of error” for these estimates. 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 at <http://nces.ed.gov/programs/coe>

The standard errors of the estimates for different subpopulations in an indicator can vary considerably. As an illustration, *indicator 15* reports on the postsecondary expectations of 10th-graders. Among White students, 40 percent expected to earn a bachelor's degree, while among American Indian students, 36 percent expected to do so (see supplemental table 15-1). In contrast to the similarity of these percentages, their standard errors were .64 and 6.94 percent, respectively (see table S15-1 in

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<http://nces.ed.gov/programs/coe/2004/section3/table.asp?tableID=213>).

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

DATA ANALYSIS AND INTERPRETATION

Due to standard errors, caution is warranted when drawing conclusions about the size of one population estimate in comparison to another or whether a time series of population estimates is increasing, decreasing, or staying about the same. Although one estimate of the population size may be larger than another, a statistical test may find that there is no discernible difference between the two estimates due to their uncertainty.

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; for example, it might be about 5 times out of 100. Some details about the method primarily used in *The Condition of Education* for determining whether the difference between two means is statistically significant are presented 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 typically used. The *t*-test formula for determining statistical significance is adjusted when the samples being compared are dependent. When the variables to be tested are postulated to form a trend, the relationship may be tested using linear regression, logistic regression, or ANOVA trend analysis instead of a series of *t*-tests. These other methods of analysis test for specific relationships (e.g., linear, quadratic, or cubic) among variables.

Discussion of several indicators illustrates the consequences of these considerations. *Indicator 13* reports that a smaller percentage of persons ages 16–24 were neither enrolled in school nor working in 2003 (13 percent) than in 1986 (16 percent) (see supplemental table 13-1). Although the difference of 3 percentage points is relatively small, so are the standard errors associated with each estimate (0.27 and 0.29 for 2003 and 1986, respectively) (see table S13-1), and the difference is statistically significant and supports the statement. In contrast, *indicator 34* discusses the percentage of children participating in activities after school in 2001. The data in supplemental table 34-1 indicate that 29 percent of all children participated in academic activities for the purposes of supervision, compared with 23 percent participating in clubs. This difference of 6 percentage points is larger than in the previous example, but the standard errors are also larger (2.32 and 2.27, respectively) (see table S34-1). The difference is not statistically significant, and therefore, the data do not support a conclusion that children are more likely to participate in academic programs than clubs for the purposes of supervision. The introduction to appendix 3 explains in some detail how the statistical significance of the difference between two estimates is determined.

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VARIATION IN POPULATIONS

In considering the estimated means in the tables and figures shown in this volume and on the web site, it is important to keep in mind that there may be considerable variation among the members of a population in the characteristic or variable represented by the population mean. For example, the estimated average 3rd-grade mathematics score of children who entered kindergarten in fall 1998 was 85 scale score points (see supplemental table 8-1). In reality, many students scored above 85 points and many scored below 85 points. Likewise, not all postsecondary institutions provided the same amount of remedial education to entering freshmen in fall 2000.

Because of this variation, there may be considerable overlap among the members of two populations that are being compared. Although the difference in the estimated means of the two populations may be statistically significant, many members of the population with the lower estimated mean may be above the estimated mean of the other population and vice versa. For example, some percentage of young adults with a high school diploma or GED have higher earnings than young adults with a bachelor's degree or higher (see *indicator 14*). The extent of such overlap is not generally considered in the indicators in this volume.

Estimates of the extent of variation in such population characteristics can be computed from the NCES survey data sets or are available in published reports. For example, estimates of the variation in students' assessment scores can be found using the NAEP Data Tool at <http://nces.ed.gov/nationsreportcard/naepdata/> or in the appendices to most NAEP reports.

ROUNDING AND OTHER CONSIDERATIONS

Although values reported in the supplemental tables are generally rounded to one decimal place (e.g., 76.5 percent), values reported in each indicator are 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.

In accordance with the recently revised NCES Statistical Standards, many tables in this volume use a series of symbols to alert the reader to special statistical notes. These symbols, and their meaning, are as follows:

- Not available.
Data were not collected or not reported.
- † Not applicable.
Category does not exist.
- # Rounds to zero.
The estimate rounds to zero.
- ! Interpret data with caution.
Estimates are unstable (because standard errors are large compared with the estimate).
- ‡ Reporting standards not met.
Did not meet reporting standards.
- * $p < 0.05$ Significance level.²

NOTES

¹If 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 the results for the entire sample because there are fewer people in the subgroup than in the population.

²The chance that the difference found between two estimates when no real difference exists is less than 5 out of 100.