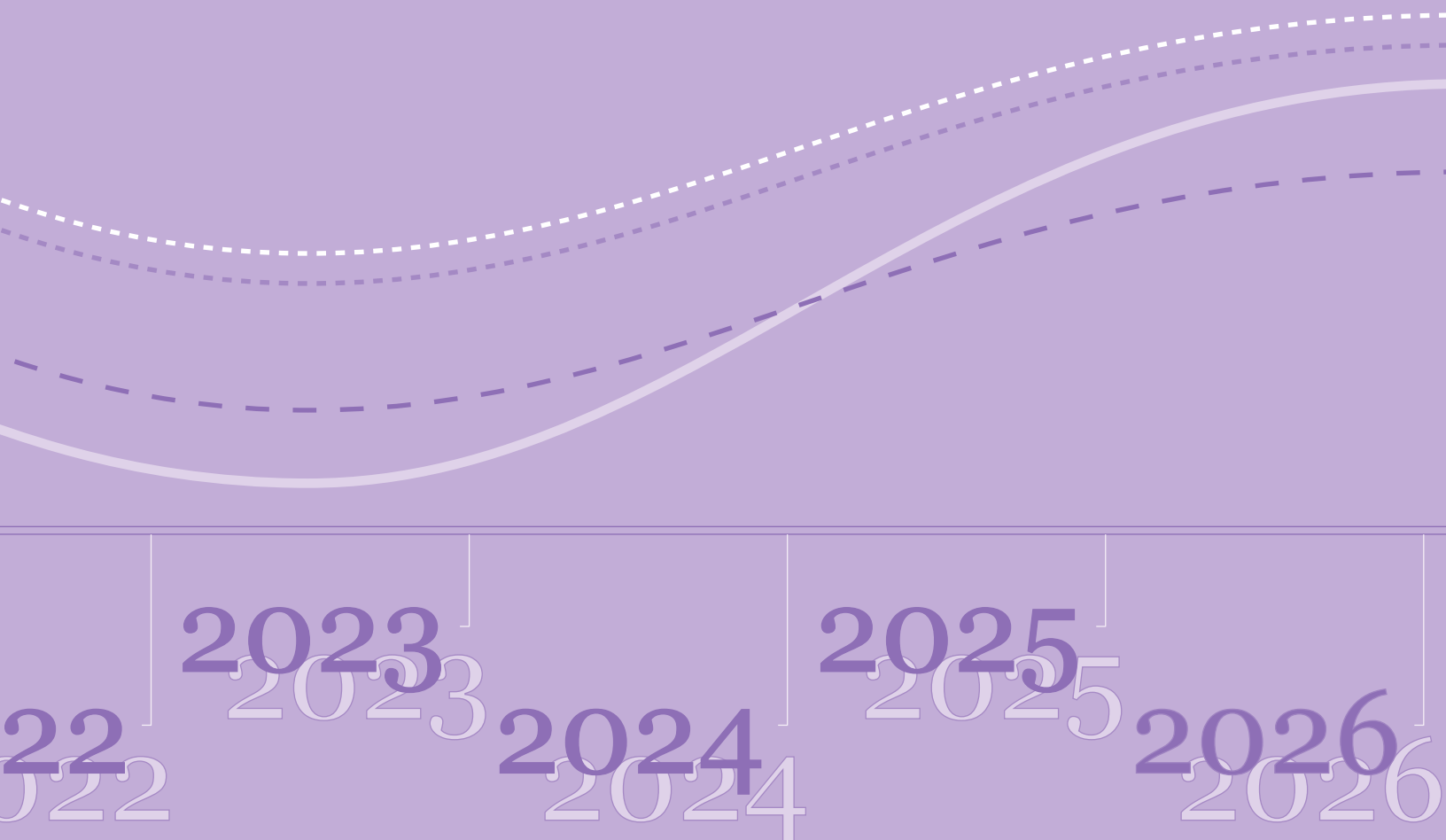


Projections of Education Statistics to 2026

Forty-fifth Edition



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April 2018

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National Center for Education Statistics

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Foreword

Projections of Education Statistics to 2026 is the 45th report in a series begun in 1964. It includes statistics on elementary and secondary schools and degree-granting postsecondary institutions. This report provides revisions of projections shown in *Projections of Education Statistics to 2025* and projections of enrollment, graduates, teachers, and expenditures to the year 2026.

In addition to projections at the national level, the report includes projections of public elementary and secondary school enrollment and public high school graduates to the year 2026 at the state level. The projections in this report were produced by the National Center for Education Statistics (NCES) to provide researchers, policy analysts, and others with state-level projections developed using a consistent methodology. They are not intended to supplant detailed projections prepared for individual states.

Assumptions regarding the population and the economy are the key factors underlying the projections of education statistics. NCES projections do not reflect changes in national, state, or local education policies that may affect education statistics.

Appendix A of this report outlines the projection methodology and describes the models and assumptions used to develop the national and state projections. The enrollment models use enrollment data and population estimates and projections from NCES, the U.S. Census Bureau, and the economic forecasting service IHS Global Inc. The models are based on the mathematical projection of past data patterns into the future. The models also use projections of economic variables from IHS Global Inc.

The projections presented in this report are based on assumptions for the fertility rate, internal migration, net immigration, and mortality rate from the Census Bureau. For further information, see appendix A.

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About This Report

PROJECTIONS

This edition of *Projections of Education Statistics* provides projections for key education statistics, including enrollment, graduates, teachers, and expenditures in elementary and secondary public and private schools, as well as enrollment and degrees conferred at degree-granting postsecondary institutions. Included are national data on enrollment and graduates for at least the past 15 years and projections to the year 2026. Also included are state-level data on enrollment in public elementary and secondary schools and public high schools beginning in 1990, with projections to 2026. This report is organized by the level of schooling with sections 1, 2, 3, and 4 covering aspects of elementary and secondary education and sections 5 and 6 covering aspects of postsecondary education.

There are a number of limitations in projecting some statistics. Because of this, state-level data on enrollment and graduates in private elementary and secondary schools and on enrollment and degrees conferred in degree-granting postsecondary institutions are not included. Neither the actual numbers nor the projections of public and private elementary and secondary school enrollment include homeschooled students. Projections of elementary and secondary school enrollment and public high school graduates by age, state, and race/ethnicity are not included as the projections of the population by age, state, and race/ethnicity are not presently available. While there were enough years of data to produce projections of public elementary and secondary enrollment separately for Asians and Pacific Islanders, there were not enough years of data to produce separate projections for Asians and Pacific Islanders for either public high school graduates or enrollment in degree-granting postsecondary institutions.

Similar methodologies were used to obtain a uniform set of projections for each of the 50 states and the District of Columbia. These projections are further adjusted to agree with the national projections of public elementary and secondary school enrollment and public high school graduates contained in this report.

The summary of projections provides highlights of the national and state data, while the reference tables and figures present more detail. All calculations within *Projections of Education Statistics* are based on unrounded estimates. Therefore, the reader may find that a calculation, such as a difference or percentage change, cited in the text or figure may not be identical to the calculation obtained by using the rounded values shown in the accompanying tables. Most figures in this report present historical and forecasted data from 2001 through 2026. The shaded area of these figures

highlights the projected data and begins at the last year of actual data and ends in 2026. As the last year of historical data differs by survey, the year in which the shaded area begins also differs.

Most statements in sections 1 through 6 examine a single statistic over a period of time. In each case, a trend test using linear regression was conducted to test for structure in the data over that time period. If the p value for the trend variable was less than .05, the text states that the statistic has either increased or decreased. If the p value was greater than 0.05 and the data for both the first and last years of the time period come from a universe sample and/or are projections, then the text compares the first and last years in the time period. However, if the data for at least one of the two years came from a sample survey, a two-tailed t test at the .05 level was conducted to determine if any apparent difference between the data for the two years is not reliably measurable due to the uncertainty around the data. Depending on the results of the test, the text will either include a comparison of the two numbers or say that there was no measurable difference between the two numbers.

Appendix A describes the methodology and assumptions used to develop the projections; appendix B presents supplementary tables; appendix C describes data sources; appendix D is a list of the references; appendix E presents a list of abbreviations; and appendix F is a glossary of terms.

LIMITATIONS OF PROJECTIONS

Projections of a time series usually differ from the final reported data due to errors from many sources, such as the properties of the projection methodologies, which depend on the validity of many assumptions.

The mean absolute percentage error is one way to express the forecast accuracy of past projections. This measure expresses the average of the absolute values of errors in percentage terms, where errors are the differences between past projections and actual data. For example, based on past editions of *Projections of Education Statistics*, the mean absolute percentage errors of public school enrollment in grades prekindergarten through 12 for lead times of 1, 2, 5, and 10 years were 0.3, 0.5, 1.2, and 2.4 percent, respectively. In contrast, mean absolute percentage errors of private school enrollment in grades prekindergarten through 8 for lead times of 1, 2, 5, and 10 years were 3.1, 5.8, 8.3, and 22.2 percent, respectively. For more information on mean absolute percentage errors, see table A-2 in appendix A.

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Section 1

Elementary and Secondary Enrollment

INTRODUCTION

Total public and private elementary and secondary school enrollment was 56 million in fall 2014, representing a 3 percent increase since fall 2001 (table 1). Between fall 2014, the last year of actual public school data, and fall 2026, a further increase of 3 percent is expected. Public school enrollment is projected to be higher in 2026 than in 2014 while private school enrollment is projected to be lower. Public school enrollments are projected to be higher in 2026 than in 2014 for Blacks, Hispanics, Asians/Pacific Islanders, and students of Two or more races (table 6). Enrollment is projected to be lower for Whites and American Indians/Alaska Natives. Public school enrollments are projected to be higher in 2026 than in 2014 for the South and West, and to be lower for the Northeast and Midwest (table 3).

Factors affecting the projections

The grade progression rate method was used to project school enrollments. This method assumes that future trends in factors affecting enrollments will be consistent with past patterns. It implicitly includes the net effect of factors such as dropouts, deaths, nonpromotion, transfers to and from public schools, and state level migration. See appendixes A.0 and A.1 for more details.

Factors that were not considered

The projections do not assume changes in policies or attitudes that may affect enrollment levels. For example, they do not account for changing state and local policies on prekindergarten (preK) and kindergarten programs. Continued expansion of these programs could lead to higher enrollments at the elementary school level. Projections exclude the number of students who are homeschooled.

Students of Two or more races

This is the sixth edition of *Projections of Education Statistics* to include actual and projected numbers for enrollment in public elementary and secondary schools for students of Two or more races. Collection of enrollment data for this racial/ethnic group began in 2008. The actual values from 2008 through 2014 and all the projected values for enrollments of the other racial/ethnic groups are lower than they would have been if this racial/ethnic category had not been added.

Accuracy of Projections

An analysis of projection errors from the past 33 editions of *Projections of Education Statistics* indicates that the mean absolute percentage errors (MAPEs) for lead times of 1, 2, 5, and 10 years out for projections of public school enrollment in grades prekindergarten–12 were 0.3, 0.5, 1.2, and 2.4 percent, respectively. For the 1-year-out prediction, this means that the methodology used by the National Center for Education Statistics (NCES) has produced projections that have, on average, deviated from actual observed values by 0.3 percent. For projections of public school enrollment in grades prekindergarten–8, the MAPEs for lead times of 1, 2, 5, and 10 years out were 0.3, 0.6, 1.4, and 3.0 percent, respectively, while the MAPEs for projections of public school enrollment in grades 9–12 were 0.4, 0.7, 1.2, and 2.4 percent, respectively, for the same lead times. An analysis of projection errors from the past 15 editions of *Projections of Education Statistics* indicates that the MAPEs for lead times of 1, 2, 5, and 10 years out for projections of private school enrollment in grades prekindergarten–12 were 2.8, 5.5, 7.3, and 18.6 percent, respectively. For projections of private school enrollment in grades prekindergarten–8, the MAPEs for lead times of 1, 2, 5, and 10 years out were 3.1, 5.8, 8.3, and 22.2 percent, respectively, while the MAPEs for projections of private school enrollment in grades 9–12 were 2.9, 4.2, 4.1, and 7.2 percent, respectively, for the same lead times. For more information, see table A-2 in appendix A.

NATIONAL

Total elementary and secondary enrollment

- ▲ increased 3 percent between 2001 and 2014 (54.0 million versus 55.6 million); and
- ▲ is projected to increase 2 percent between 2014 and 2026 to 56.8 million.

Enrollment in prekindergarten through grade 8

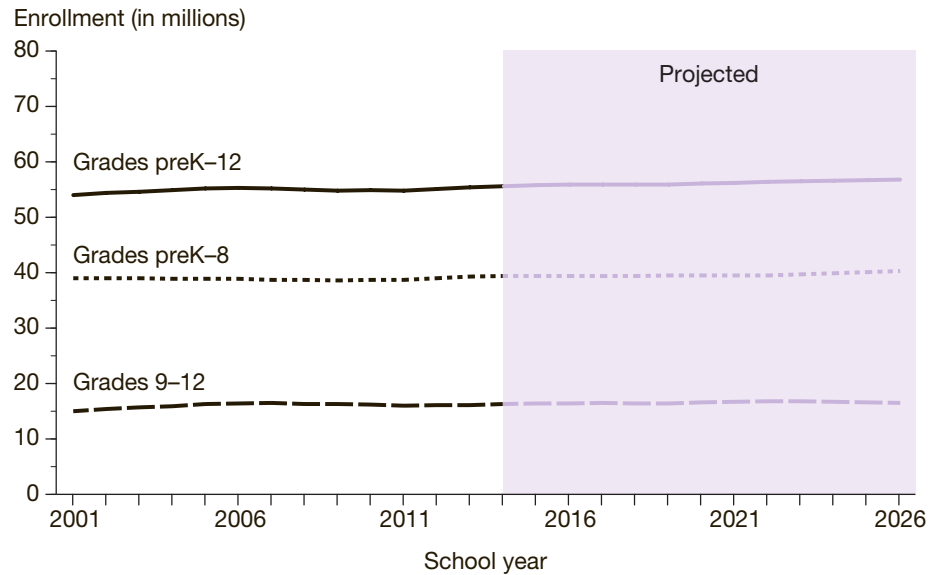
- ▲ was 1 percent higher in 2014 (39.4 million versus 39.0 million) than in 2001; and
- ▲ is projected to increase 2 percent between 2014 and 2026 to 40.3 million.

Enrollment in grades 9–12

- ▲ increased 8 percent between 2001 and 2014 (15.0 million versus 16.3 million); and
- ▲ is projected to increase 2 percent between 2014 and 2026 to 16.5 million.

*For more information:
Tables 1 and 2*

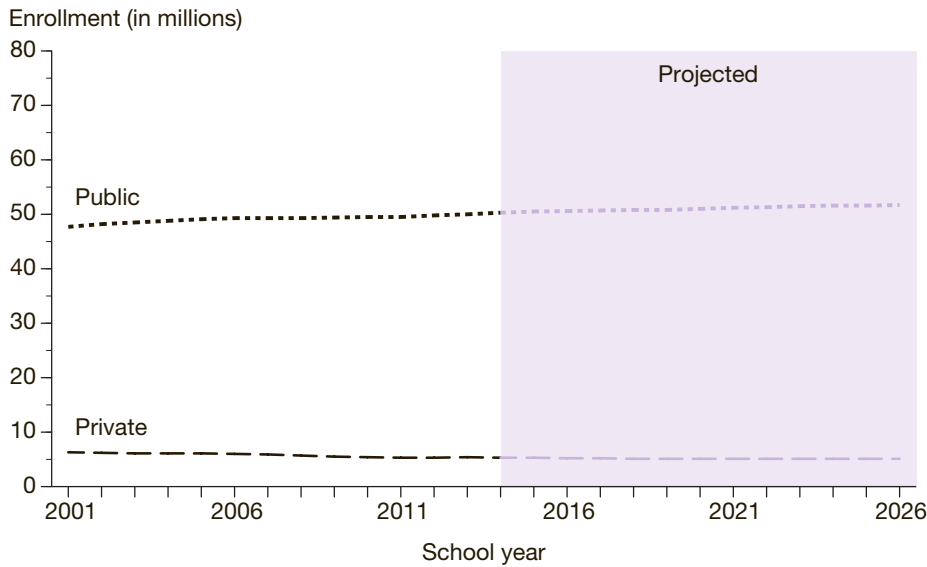
Figure 1. Actual and projected numbers for enrollment in elementary and secondary schools, by grade level: Fall 2001 through fall 2026



NOTE: PreK = prekindergarten. Enrollment numbers for prekindergarten through 12th grade and prekindergarten through 8th grade include private nursery and prekindergarten enrollment in schools that offer kindergarten or higher grades. Since the biennial Private School Universe Survey (PSS) is collected in the fall of odd-numbered years, private school numbers for alternate years are estimated based on data from the PSS. Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "State Nonfiscal Survey of Public Elementary/Secondary Education," 2001–02 through 2014–15; Private School Universe Survey (PSS), selected years 2001–02 through 2013–14; and National Elementary and Secondary Enrollment Projection Model, 1972 through 2026. (This figure was prepared April 2017.)

Figure 2. Actual and projected numbers for enrollment in elementary and secondary schools, by control of school: Fall 2001 through fall 2026



NOTE: Private school numbers include private nursery and prekindergarten enrollment in schools that offer kindergarten or higher grades. Since the biennial Private School Universe Survey (PSS) is collected in the fall of odd-numbered years, private school numbers for alternate years are estimated based on data from the PSS. Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "State Nonfiscal Survey of Public Elementary/Secondary Education," 2001–02 through 2014–15; Private School Universe Survey (PSS), selected years 2001–02 through 2013–14; and National Elementary and Secondary Enrollment Projection Model, 1972 through 2026. (This figure was prepared April 2017.)

Enrollment by control of school

Enrollment in public elementary and secondary schools

- ▲ increased 6 percent between 2001 and 2014 (47.7 million versus 50.3 million); and
- ▲ is projected to increase 3 percent between 2014 and 2026 to 51.7 million.

Enrollment in private elementary and secondary schools

- ▼ decreased 16 percent between 2001 and 2014 (6.3 million versus 5.3 million); and
- ▼ is projected to decrease by 4 percent between 2014 and 2026 to 5.1 million.

*For more information:
Table 1*

STATE AND REGIONAL (PUBLIC SCHOOL DATA)

Enrollment by state

The expected 3 percent national increase in public school enrollment between 2014 and 2026 plays out differently among the states.

▲ Enrollments are projected to be higher in 2026 than in 2014 for 31 states and the District of Columbia, with projected enrollments

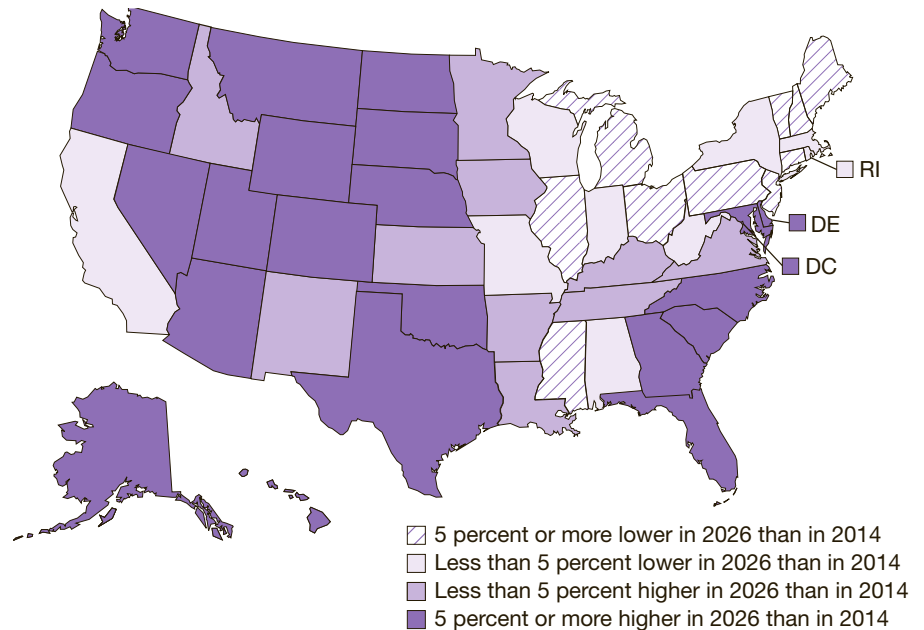
- 5 percent or more higher in 21 states and the District of Columbia; and
- less than 5 percent higher in 10 states.

▼ Enrollments are projected to be lower in 2026 than in 2014 for 19 states, with projected enrollments

- 5 percent or more lower in 10 states; and
- less than 5 percent lower in 9 states.

*For more information:
Tables 3 through 5*

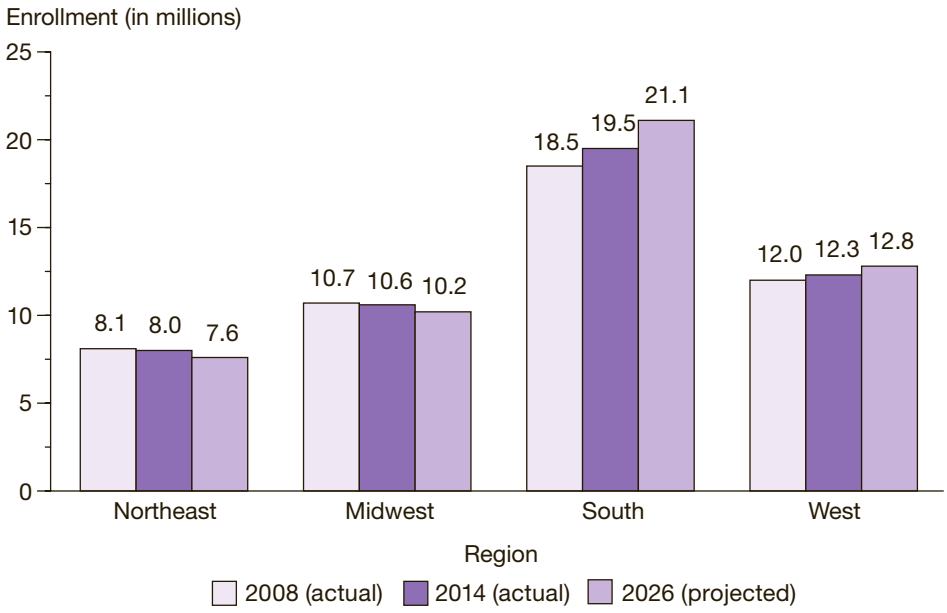
Figure 3. Projected percentage change in enrollment in public elementary and secondary schools, by state: Fall 2014 and fall 2026



NOTE: Mean absolute percentage errors of enrollment in public elementary and secondary schools by state and region can be found in table A-7, appendix A. Although rounded numbers are displayed, the figures are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "State Nonfiscal Survey of Public Elementary/Secondary Education," 2014–15; and State Public Elementary and Secondary Enrollment Projection Model, 1980 through 2026. (This figure was prepared April 2017.)

Figure 4. Actual and projected numbers for enrollment in public elementary and secondary schools, by region: Fall 2008, fall 2014, and fall 2026



NOTE: Calculations are based on unrounded numbers. See the glossary for a list of the states in each region. Mean absolute percentage errors of enrollment in public elementary and secondary schools by state and region can be found in table A-7, appendix A. Although rounded numbers are displayed, the figures are based on unrounded estimates. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "State Nonfiscal Survey of Public Elementary/Secondary Education," 2008–09 and 2014–15; and State Public Elementary and Secondary Enrollment Projection Model, 1980 through 2026. (This figure was prepared April 2017.)

Enrollment by region

Public elementary and secondary enrollment is projected to

- ▼ decrease 5 percent between 2014 and 2026 for students in the Northeast;
- ▼ decrease 3 percent between 2014 and 2026 for students in the Midwest;
- ▲ increase 8 percent between 2014 and 2026 in the South; and
- ▲ increase 4 percent between 2014 and 2026 in the West.

*For more information:
Tables 3 through 5*

RACE/ETHNICITY (PUBLIC SCHOOL DATA)

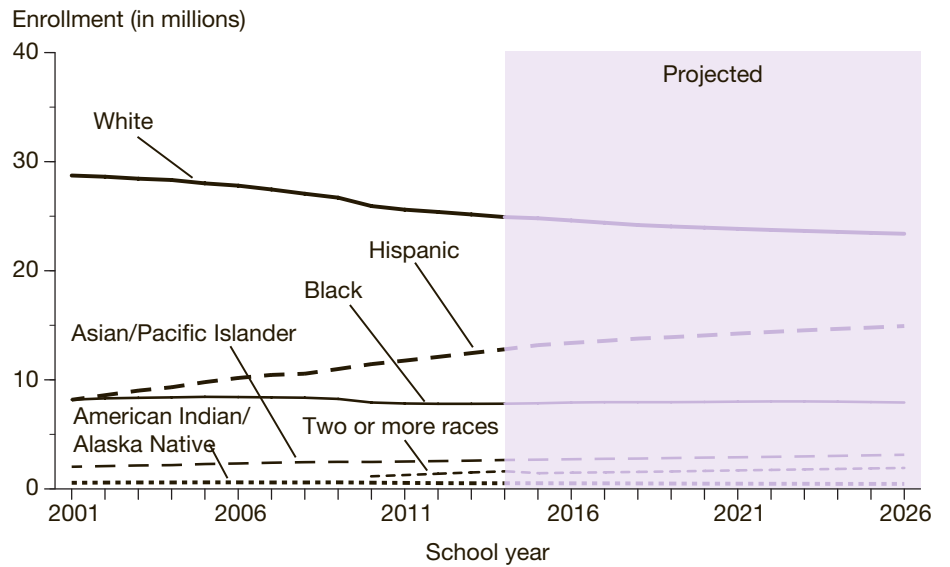
Enrollment by race/ethnicity

Enrollment in public elementary and secondary schools is projected to

- ▼ decrease 6 percent between 2014 and 2026 for students who are White;
- ▲ increase 1 percent between 2014 and 2026 for students who are Black;
- ▲ increase 17 percent between 2014 and 2026 for students who are Hispanic;
- ▲ increase 18 percent between 2014 and 2026 for students who are Asian/Pacific Islander;
- ▼ decrease 12 percent between 2014 and 2026 for students who are American Indian/Alaska Native; and
- ▲ increase 19 percent between 2014 and 2026 for students who are of Two or more races. (The line for this racial/ethnic group in figure 5 begins in 2010 when data for that group became available for all 50 states and the District of Columbia.)

*For more information:
Tables 6 and 7*

Figure 5. Actual and projected numbers for enrollment in public elementary and secondary schools, by race/ethnicity: Fall 2001 through fall 2026



NOTE: Race categories exclude persons of Hispanic ethnicity. Enrollment data for students not reported by race/ethnicity were prorated by state and grade to match state totals. Data on students of Two or more races were not collected separately prior to 2008 and data on students of Two or more races from 2008 and 2009 were not reported by all states. Only in 2010 and later years were those data available for all 50 states. Total counts of ungraded students were prorated to prekindergarten through grade 8 and grades 9 through 12 based on prior reports. Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A. SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "State Nonfiscal Survey of Public Elementary/Secondary Education," 2001-02 through 2014-15; and National Public Elementary and Secondary Enrollment by Race/Ethnicity Projection Model, 1994 through 2026. (This figure was prepared April 2017.)

Section 2

Elementary and Secondary Teachers

INTRODUCTION

Between fall 2014, the last year of actual public school data, and fall 2026, the number of teachers in elementary and secondary schools is projected to rise (table 8). The increase is projected to occur in public schools. The number of teachers in private schools in 2026 is projected to be about the same as 2014. Both public and private schools are projected to experience a decline in pupil/teacher ratios. The annual number of new teacher hires is projected to be higher in 2026 than in 2014 in public and private schools.

Factors affecting the projections

The projections of the number of elementary and secondary teachers are related to projected levels of enrollments and education revenue receipts from state sources per capita. For more details, see appendixes A.0 and A.2.

Factors that were not considered

The projections do not take into account possible changes in the number of teachers due to the effects of government policies.

About pupil/teacher ratios

The overall elementary and secondary pupil/teacher ratio and pupil/teacher ratios for public and private schools were computed based on elementary and secondary enrollment and the number of classroom teachers by control of school.

About new teacher hires

A teacher is considered to be a new teacher hire for a certain control of school (public or private) for a given year if the teacher teaches in that control that year but had not taught in that control in the previous year. A teacher who moves from teaching in one control of school to the other control is considered a new teacher hire, but a teacher who moves from one school to another school in the same control is not considered a new teacher hire.

Accuracy of Projections

An analysis of projection errors from the past 27 editions of *Projections of Education Statistics* that included projections of teachers indicates that the mean absolute percentage errors (MAPEs) for projections of classroom teachers in public elementary and secondary schools were 0.7 percent for 1 year out, 1.4 percent for 2 years out, 3.1 percent for 5 years out, and 6.1 percent for 10 years out. For the 1-year-out prediction, this means that one would expect the projection to be within 0.7 percent of the actual value, on average. For more information on the MAPEs of different National Center for Education Statistics (NCES) projection series, see table A-2 in appendix A.

TEACHERS IN ELEMENTARY AND SECONDARY SCHOOLS

Number of teachers

The total number of elementary and secondary teachers

- ▲ was 4 percent higher in 2014 than in 2001 (3.6 million versus 3.4 million), a period of 13 years; and
- ▲ is projected to increase 6 percent between 2014 and 2026 to 3.8 million, a period of 12 years.

The number of teachers in public elementary and secondary schools

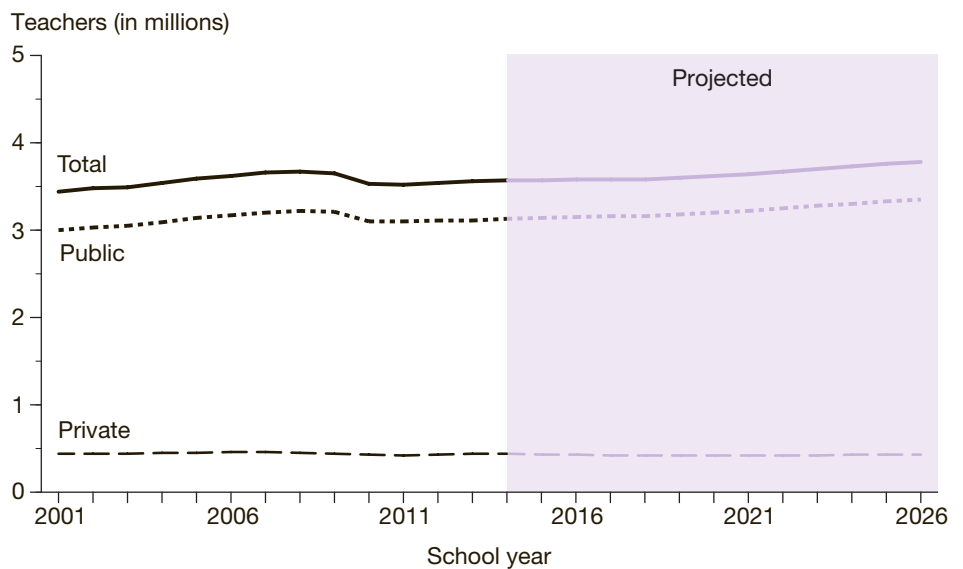
- ▲ was 4 percent higher in 2014 than in 2001 (3.1 million versus 3.0 million); and
- ▲ is projected to increase 7 percent between 2014 and 2026 to 3.3 million.

The number of teachers in private elementary and secondary schools

- was not measurably different in 2014 (436,000 versus 441,000) than in 2001; and
- is projected to be about the same in 2026 (434,000) as in 2014.

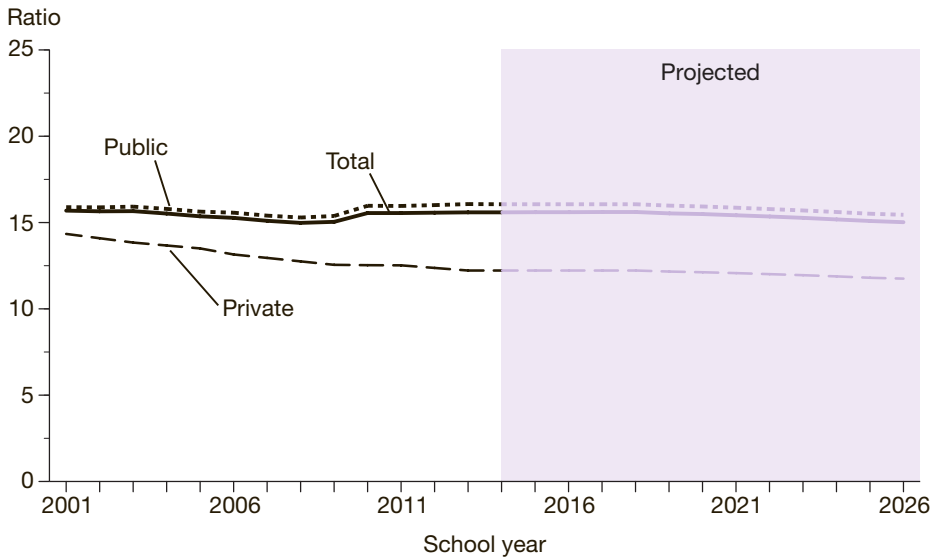
*For more information:
Table 8*

Figure 6. Actual and projected numbers for elementary and secondary teachers, by control of school: Fall 2001 through fall 2026



NOTE: Since the biennial Private School Universe Survey (PSS) is collected in the fall of odd-numbered years, private school numbers for alternate years are estimated based on data from the PSS. Data for teachers are expressed in full-time equivalents (FTE). Counts of private school teachers include prekindergarten through grade 12 in schools offering kindergarten or higher grades. Counts of public school teachers include prekindergarten through grade 12. Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "State Nonfiscal Survey of Public Elementary/Secondary Education," 2001-02 through 2014-15; Private School Universe Survey (PSS), selected years, 2001-02 through 2013-14; Elementary and Secondary Teacher Projection Model, 1973 through 2026. (This figure was prepared April 2017.)

Figure 7. Actual and projected numbers for the pupil/teacher ratios in elementary and secondary schools, by control of school: Fall 2001 through fall 2026



NOTE: Since the biennial Private School Universe Survey (PSS) is collected in the fall of odd-numbered years, private school numbers for alternate years are estimated based on data from the PSS. Data for teachers are expressed in full-time equivalents (FTE). Counts of private school teachers and enrollment include prekindergarten through grade 12 in schools offering kindergarten or higher grades. Counts of public school teachers and enrollment include prekindergarten through grade 12. Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A. SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "State Nonfiscal Survey of Public Elementary/Secondary Education," 2001-02 through 2014-15; Private School Universe Survey (PSS), selected years, 2001-02 through 2013-14; National Elementary and Secondary Enrollment Projection Model, 1972 through 2026; and Elementary and Secondary Teacher Projection Model, 1973 through 2026. (This figure was prepared April 2017.)

Pupil/teacher ratios

The pupil/teacher ratio in all elementary and secondary schools

- ▼ was lower in 2014 than in 2001 (15.6 versus 15.7); and
- ▼ is projected to decrease to 15.0 in 2026.

The pupil/teacher ratio in public elementary and secondary schools

- ▲ was higher in 2014 than in 2001 (16.1 versus 15.9); and
- ▼ is projected to decrease to 15.4 in 2026.

The pupil/teacher ratio in private elementary and secondary schools

- ▼ decreased from 14.3 to 12.2 between 2001 and 2014; and
- ▼ is projected to decrease to 11.8 in 2026.

*For more information:
Table 8*

New teacher hires

The total number of new teacher hires

- ▲ was 10 percent higher in 2014 than in 1999 (336,000 versus 305,000); and
- ▲ is projected to increase 5 percent between 2014 and 2026, to 353,000.

The number of new teacher hires in public schools

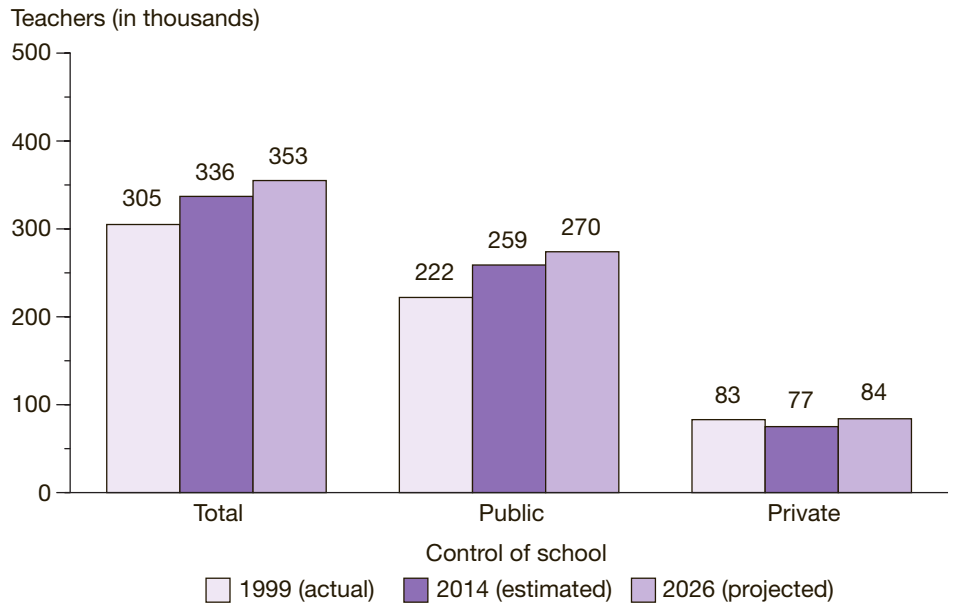
- ▲ was 17 percent higher in 2014 than in 1999 (259,000 versus 222,000); and
- ▲ is projected to increase 4 percent between 2014 and 2026, to 270,000.

The number of new teacher hires in private schools

- ▼ was 8 percent lower in 2014 than in 1999 (77,000 versus 83,000); and
- ▲ is projected to increase 9 percent between 2014 and 2026, to 84,000.

*For more information:
Table 8*

Figure 8. Actual and projected numbers for elementary and secondary new teacher hires, by control of school: Fall 1999, fall 2014, and fall 2026



NOTE: Data for teachers are expressed in full-time equivalents (FTE). A teacher is considered to be a new hire for a public or private school if the teacher had not taught in that control of school in the previous year. A teacher who moves from a public to private or a private to public school is considered a new teacher hire, but a teacher who moves from one public school to another public school or one private school to another private school is not considered a new teacher hire. For more information about the New Teacher Hires Model, see appendix A.2. Calculations are based on unrounded numbers. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "State Nonfiscal Survey of Public Elementary/Secondary Education," 2000–01 and 2014–15; Private School Universe Survey (PSS), 1999–2000 and 2013–14; Schools and Staffing Survey (SASS), "Public School Teacher Data File," and "Private School Teacher Data File," 1999–2000 and 2011–12; Elementary and Secondary Teacher Projection Model, 1973 through 2026, and New Teacher Hires Projection Model, 1988 through 2026. (This figure was prepared April 2017.)

Section 3

High School Graduates

INTRODUCTION

The number of high school graduates increased nationally by 20 percent between 2001–02 and 2012–13, the last year of actual data for public schools (table 9). The number of high school graduates is projected to be 3 percent higher in 2026–27 than in 2012–13. The number of public high school graduates is projected to be higher in 2026–27 than in 2012–13 while the number of private high school graduates is projected to be lower. The numbers of public high school graduates are projected to be higher in 2026–27 than in 2012–13 in the South and West and lower in the Northeast and Midwest (table 10).

Factors affecting the projections

The projections of high school graduates are related to projections of 12th-graders and the historical relationship between the number of 12th-graders and the number of high school graduates. The methodology implicitly includes the net effect of factors such as dropouts, transfers to and from public schools, and state-level migration. For more details, see appendixes A.0 and A.3.

About high school graduates

A high school graduate is defined as an individual who has received formal recognition from school authorities, by the granting of a diploma, for completing a prescribed course of study. This definition does not include other high school completers or high school equivalency recipients. Projections of graduates could be affected by changes in policies influencing graduation requirements.

High school graduates of Two or more races

This is the fourth edition of *Projections of Education Statistics* to include actual and projected numbers for high school graduates of Two or more races. Collection of high school graduate data for this racial/ethnic group began in 2008–09. The actual values from 2008–09 through 2012–13 and all the projected values for high school graduates of the other racial/ethnic groups are lower than they would have been if this racial/ethnic category had not been added.

Accuracy of Projections

For National Center for Education Statistics (NCES) projections of public high school graduates produced over the last 26 editions, the mean absolute percentage errors (MAPEs) for lead times of 1, 2, 5, and 10 years out were 1.0, 1.1, 2.5, and 5.1, respectively. For the 1-year-out prediction, this means that one would expect the projection to be within 0.9 percent of the actual value, on average. For NCES projections of private high school graduates produced over the last 15 editions, the MAPEs for lead times of 1, 2, 5, and 10 years out were 1.8, 1.5, 4.9, and 4.9 percent, respectively. For more information, see table A-2 in appendix A.

NATIONAL

The total number of high school graduates

- ▲ increased 20 percent between 2001–02 and 2012–13 (2.9 million versus 3.5 million), a period of 11 years; and
- ▲ is projected to increase 3 percent between 2012–13 and 2026–27 to 3.6 million.

The number of public high school graduates

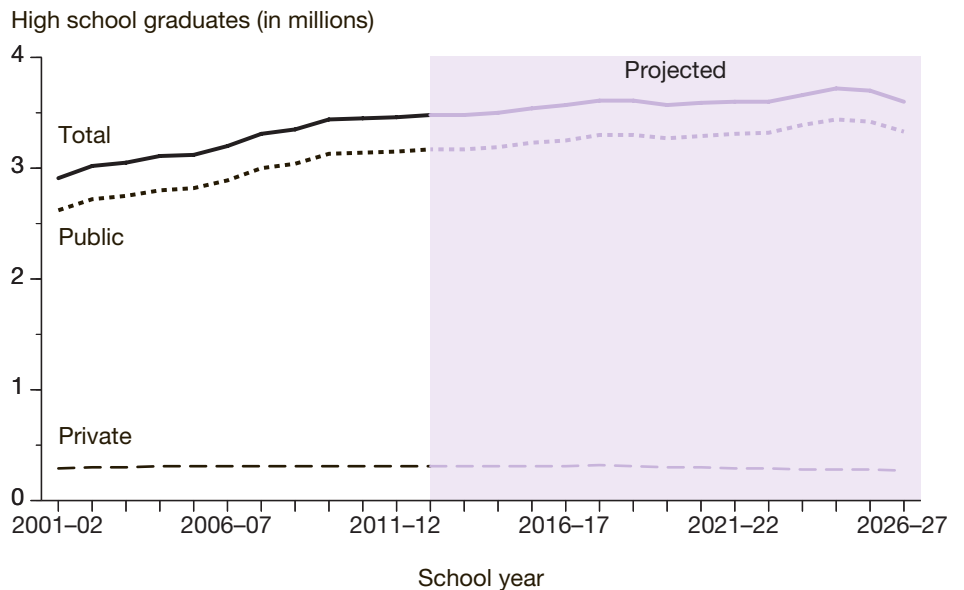
- ▲ increased 21 percent between 2001–02 and 2012–13 (2.6 million versus 3.2 million); and
- ▲ is projected to increase 5 percent between 2012–13 and 2026–27 to 3.3 million.

The number of private high school graduates

- ▲ increased 8 percent between 2001–02 and 2012–13 (285,000 versus 309,000); and
- ▼ is projected to decrease 13 percent between 2012–13 and 2026–27 to 270,000.

For more information:
Table 9

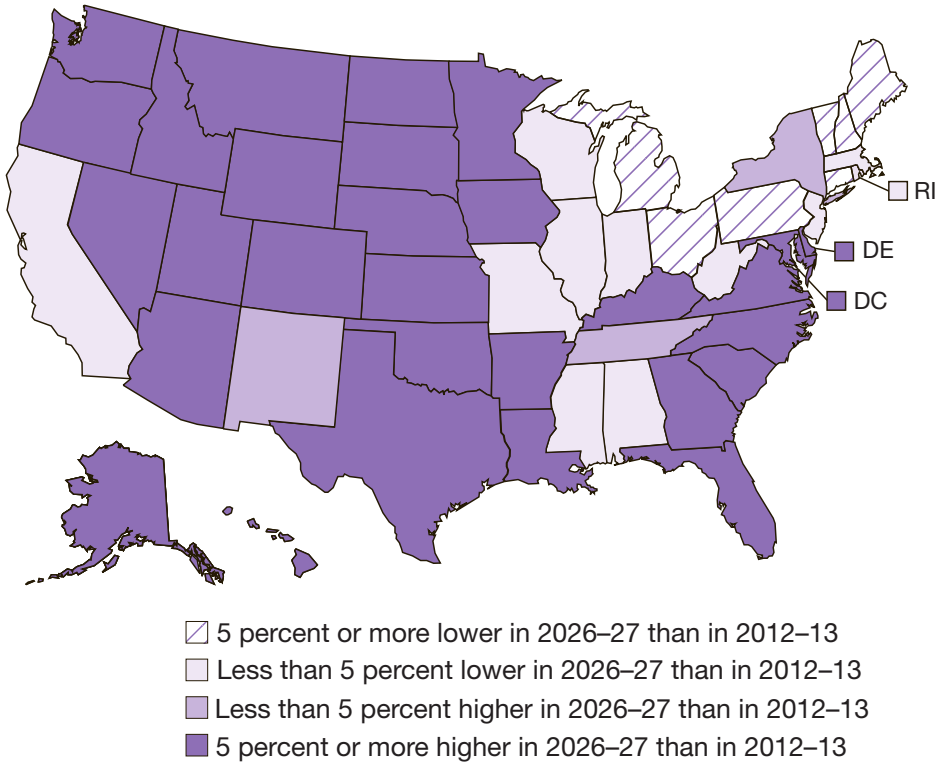
Figure 9. Actual and projected numbers for high school graduates, by control of school: School years 2001–02 through 2026–27



NOTE: Since the biennial Private School Universe Survey (PSS) is collected in the fall of odd-numbered years and the numbers collected for high school graduates are for the preceding year, private school numbers for odd years are estimated based on data from the PSS. Includes graduates of regular day school programs. Excludes graduates of other programs, when separately reported, and recipients of high school equivalency certificates. Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), “State Nonfiscal Survey of Public Elementary/Secondary Education,” 2002–03 through 2009–10; “State Dropout and Completion Data File,” 2010–11 through 2013–14; Private School Universe Survey (PSS), selected years, 2001–02 through 2013–14; and National High School Graduates Projection Model, 1972–73 through 2026–27. (This figure was prepared April 2017.)

Figure 10. Projected percentage change in the number of public high school graduates, by state: School years 2012–13 and 2026–27



NOTE: Includes graduates of regular day school programs. Excludes graduates of other programs, when separately reported, and recipients of high school equivalency certificates. Calculations are based on unrounded numbers. Mean absolute percentage errors of public high school graduates by state and region can be found in table A-14, appendix A. SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), “State Dropout and Completion Data File,” 2013–14; and State Public High School Graduates Projection Model, 1980–81 through 2026–27. (This figure was prepared April 2017.)

High school graduates by state

The number of public high school graduates is projected to be higher in 2026–27 than in 2012–13. This plays out differently among the states.

- ▲ High school graduates are projected to be higher in 2026–27 than in 2012–13 for 32 states and the District of Columbia, with projected high school graduates
 - 5 percent or more higher in 29 states and the District of Columbia; and
 - less than 5 percent higher in 3 states.
- ▼ High school graduates are projected to be lower in 2026–27 than in 2012–13 for 18 states, with projected high school graduates
 - 5 percent or more lower in 7 states; and
 - less than 5 percent lower in 11 states.

*For more information:
Table 10*

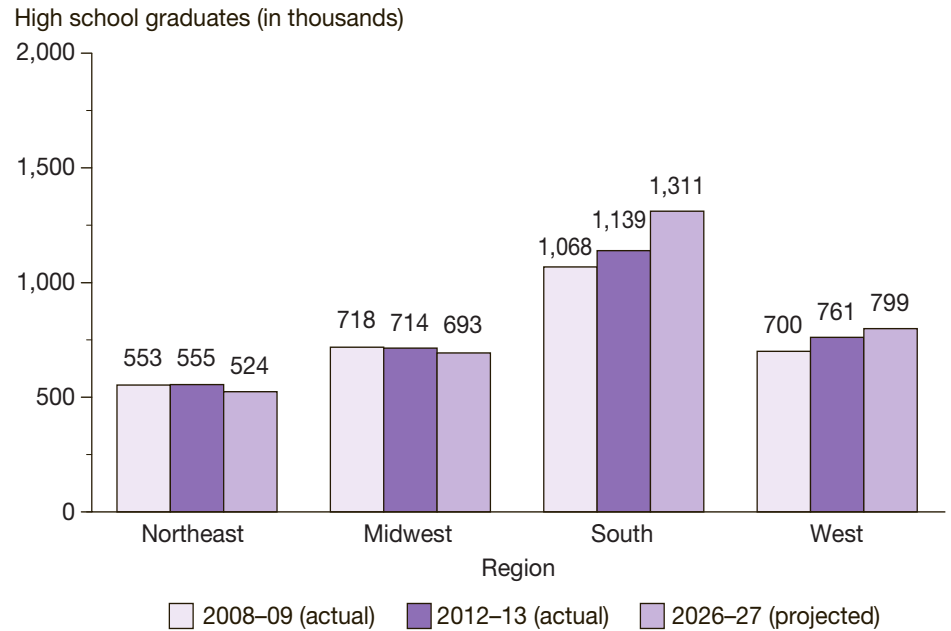
High school graduates by region

The number of public high school graduates is projected to

- ▼ decrease 6 percent between 2012–13 and 2026–27 in the Northeast;
- ▼ be 3 percent lower in 2026–27 than in 2012–13 in the Midwest;
- ▲ increase 15 percent between 2012–13 and 2026–27 in the South; and
- ▲ increase 5 percent between 2012–13 and 2026–27 in the West.

*For more information:
Table 10*

Figure 11. Actual and projected numbers for public high school graduates, by region: School years 2008–09, 2012–13, and 2026–27

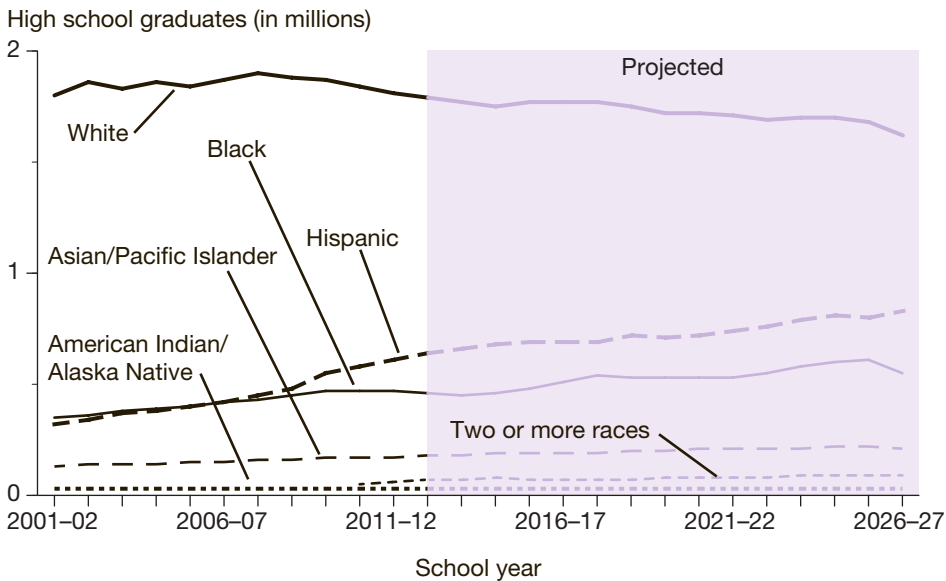


NOTE: Includes graduates of regular day school programs. Excludes graduates of other programs, when separately reported, and recipients of high school equivalency certificates. See the glossary for a list of states in each region. Mean absolute percentage errors of public high school graduates by state and region can be found in table A-14, appendix A. Calculations are based on unrounded numbers. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), “State Nonfiscal Survey of Public Elementary/Secondary Education,” 2008–09; “State Dropout and Completion Data,” 2013–14; and State Public High School Graduates Projection Model, 1980–81 through 2026–27. (This figure was prepared April 2017.)

RACE/ETHNICITY (PUBLIC SCHOOL DATA)

Figure 12. Actual and projected numbers for public high school graduates, by race/ethnicity: School years 2001–02 through 2026–27



NOTE: Race categories exclude persons of Hispanic ethnicity. Data on students of Two or more races were not collected separately prior to 2007–08, and data on students of Two or more races from 2007–08 through 2009–10 were not reported by all states. Therefore, the data are not comparable to figures for 2010–11 and later years. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), “State Nonfiscal Survey of Public Elementary/Secondary Education,” 2001–02 through 2009–10; “State Dropout and Completion Data File,” 2010–11 and 2013–14; and National Public High School Graduates by Race/Ethnicity Projection Model, 1995–96 through 2026–27. (This figure was prepared April 2017.)

High school graduates by race/ethnicity

The number of public high school graduates is projected to

- ▼ decrease 10 percent between 2012–13 and 2026–27 (1,791,000 versus 1,617,000) for students who are White;
- ▲ increase 19 percent between 2012–13 and 2026–27 (462,000 versus 549,000) for students who are Black;
- ▲ increase 30 percent between 2012–13 and 2026–27 (640,000 versus 830,000) for students who are Hispanic;
- ▲ increase 18 percent between 2012–13 and 2026–27 (179,000 versus 211,000) for students who are Asian/Pacific Islander;
- ▼ decrease 13 percent between 2012–13 and 2026–27 (31,000 versus 27,000) for students who are American Indian/Alaska Native; and
- ▲ increase 42 percent between 2012–13 and 2026–27 (66,000 versus 93,000) for students who are of Two or more races.

For more information:
Table 11

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Section 4

Expenditures for Public Elementary and Secondary Education

INTRODUCTION

Current expenditures (e.g., instruction and support services) for public elementary and secondary education are projected to increase 19 percent in constant dollars (adjusted for inflation) between school years 2013–14, the last year of actual data, and 2026–27 (table 12).

Factors affecting the projections

The projections of current expenditures are related to projections of economic growth as measured by disposable income per capita and assistance by state governments to local governments. For more details, see appendixes A.0 and A.4.

Factors that were not considered —————

Many factors that may affect future school expenditures were not considered in the production of these projections. Such factors include policy initiatives as well as potential changes in the age distribution of elementary and secondary teachers as older teachers retire and are replaced by younger teachers, or as older teachers put off retirement for various reasons.

About constant dollars and current dollars —————

Throughout this section, projections of current expenditures are presented in constant 2015–16 dollars. The reference tables, later in this report, present these data both in constant 2015–16 dollars and in current dollars. The projections were developed in constant dollars and then placed in current dollars using projections for the Consumer Price Index (CPI) (table B-5 in appendix B).

Accuracy of Projections

An analysis of projection errors from similar models used in the past 26 editions of *Projections of Education Statistics* that contained expenditure projections indicates that mean absolute percentage errors (MAPEs) for total current expenditures in constant dollars were 1.7 percent for 1 year out, 2.5 percent for 2 years out, 2.8 percent for 5 years out, and 6.2 percent for 10 years out. For the 1-year-out prediction, this means that one would expect the projection to be within 1.7 percent of the actual value, on average. MAPEs for current expenditures per pupil in fall enrollment in constant dollars were 1.7 percent for 1 year out, 2.4 percent for 2 years out, 2.9 percent for 5 years out, and 6.9 percent for 10 years out. See appendix A for further discussion of the accuracy of recent projections of current expenditures, and see table A-2 in appendix A for the MAPEs of these projections.

CURRENT EXPENDITURES

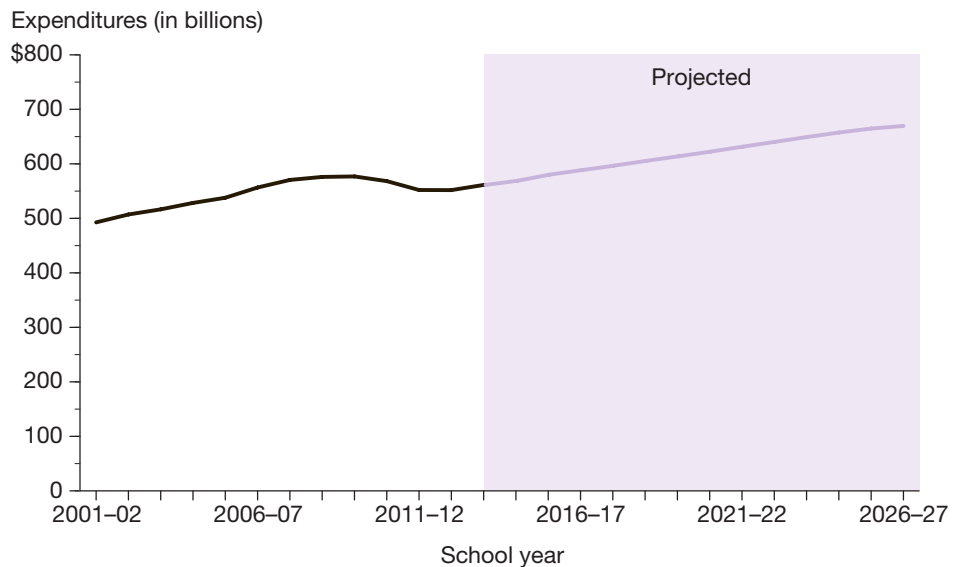
Current expenditures

Current expenditures in constant 2015–16 dollars

- ▲ increased 14 percent from 2001–02 to 2013–14 (\$493 billion versus \$561 billion), a period of 12 years; and
- ▲ are projected to increase 19 percent, to \$670 billion, from 2013–14 to 2026–27, a period of 13 years.

*For more information:
Table 12*

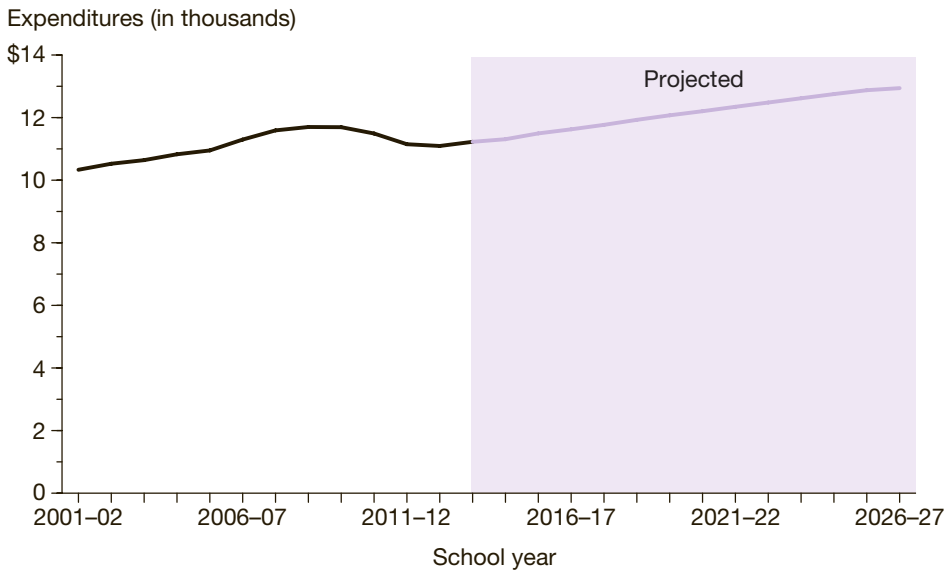
Figure 13. Actual and projected current expenditures for public elementary and secondary schools (in constant 2015–16 dollars): School years 2001–02 through 2026–27



NOTE: Numbers were placed in constant dollars using the Consumer Price Index (CPI) for all urban consumers, Bureau of Labor Statistics, U.S. Department of Labor. For more detail about CPI, see table B-5 in appendix B. Current expenditures include instruction, support services, food services, and enterprise operations. Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "National Public Education Financial Survey," 2001–02 through 2013–14; Public Elementary and Secondary School Current Expenditures Projection Model, 1969–70 through 2026–27. (This figure was prepared April 2017.)

Figure 14. Actual and projected current expenditures per pupil in fall enrollment in public elementary and secondary schools (in constant 2015–16 dollars): School years 2001–02 through 2026–27



NOTE: Numbers were placed in constant dollars using the Consumer Price Index (CPI) for all urban consumers, Bureau of Labor Statistics, U.S. Department of Labor. For more detail about CPI, see table B-5 in appendix B. Current expenditures include instruction, support services, food services, and enterprise operations. Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A. SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), “State Nonfiscal Survey of Public Elementary/Secondary Education,” 2001–02 through 2014–15; “National Public Education Financial Survey,” 2001–02 through 2013–14; National Elementary and Secondary Enrollment Projection Model, 1972 through 2026; and Elementary and Secondary School Current Expenditures Projection Model, 1969–70 through 2026–27. (This figure was prepared April 2017.)

Current expenditures per pupil

Current expenditures per pupil in fall enrollment in constant 2015–16 dollars

- ▲ increased 9 percent from 2001–02 to 2013–14 (\$10,300 versus \$11,200); and
- ▲ are projected to increase 15 percent, to \$12,900, from 2013–14 to 2026–27.

*For more information:
Table 12*

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Section 5

Enrollment in Degree-Granting Postsecondary Institutions

INTRODUCTION

Total enrollment in degree-granting postsecondary institutions is expected to increase 13 percent between fall 2015, the last year of actual data, and fall 2026 (table 13). Degree-granting institutions are postsecondary institutions that provide study beyond secondary school and offer programs terminating in an associate’s, baccalaureate, or higher degree and participate in federal financial aid programs. Differential growth is expected by student characteristics such as age, sex, and attendance status (part-time or full-time). Enrollment is expected to increase in both public and private degree-granting postsecondary institutions.

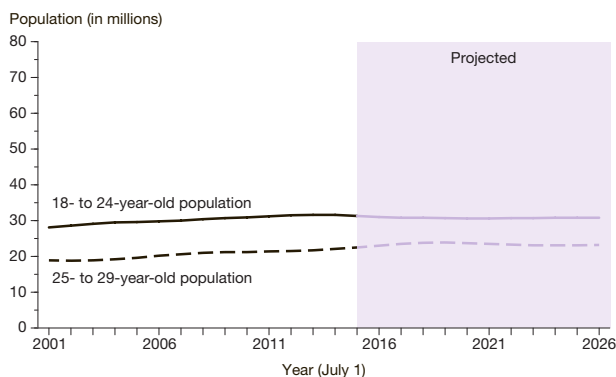
Factors affecting the projections

The projections of enrollment levels are related to projections of college-age populations, disposable income, and unemployment rates. For more details, see appendixes A.0 and A.5. An important factor in the enrollment projections is the expected change in the population of 18- to 29-year-olds from 2001 through 2026 (table B-3 in appendix B).

Factors that were not considered

The enrollment projections do not take into account such factors as the cost of a college education, the economic value of an education, and the impact of distance learning due to technological changes. These factors may produce changes in enrollment levels. The racial/ethnic backgrounds of nonresident aliens are not known.

Figure 15. Actual and projected population numbers for 18- to 24-year-olds and 25- to 29-year-olds: 2001 through 2026



NOTE: Some data have been revised from previously published figures. Projections are from the U.S. Census Bureau’s 2014 National Population Projections, ratio-adjusted to line up with the most recent historical estimate. SOURCE: U.S. Department of Commerce, Census Bureau, Population Estimates, retrieved August 4, 2015, from <https://www2.census.gov/programs-surveys/popest/datasets/2010-2015/>; and Population Projections, retrieved August 4, 2015, from <https://www.census.gov/programs-surveys/popproj.html>; and IHS Global Inc., “U.S. Quarterly Macroeconomic Model, November 2016 Short-Term Baseline Projections.” (This table was prepared April 2017.)

Accuracy of Projections

For projections of total enrollment in degree-granting postsecondary institutions, an analysis of projection errors based on the past 19 editions of *Projections of Education Statistics* indicates that the mean absolute percentage errors (MAPEs) for lead times of 1, 2, 5, and 10 years out were 1.5, 2.6, 5.9, and 10.3 percent, respectively. For the 1-year-out prediction, this means that one would expect the projection to be within 1.5 percent of the actual value, on average. For more information, see table A-2 in appendix A.

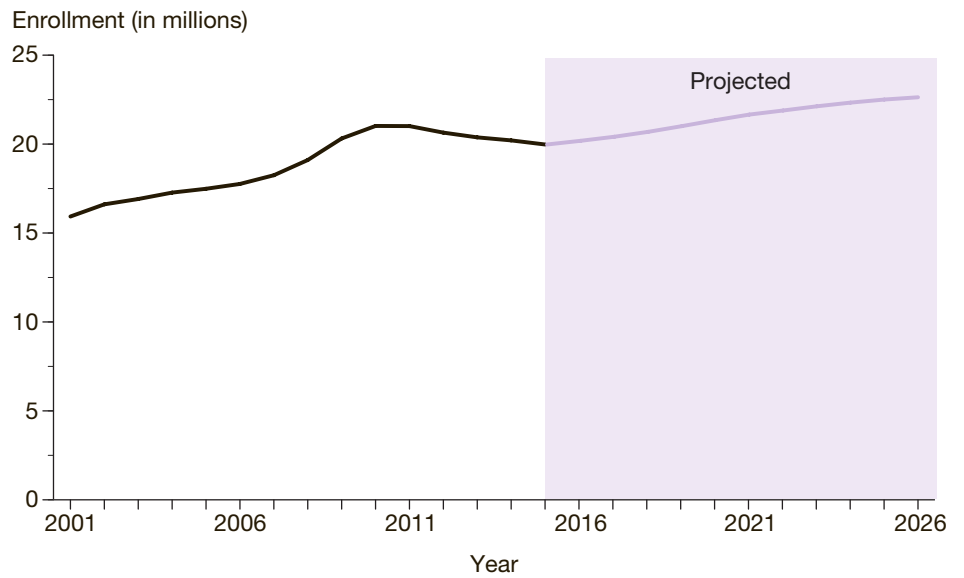
TOTAL ENROLLMENT

Total enrollment in degree-granting postsecondary institutions

- ▲ increased 25 percent from 2001 to 2015 (15.9 million versus 20.0 million), a period of 14 years; and
- ▲ is projected to increase 13 percent, to 22.6 million, from 2015 to 2026, a period of 11 years.

*For more information:
Table 13*

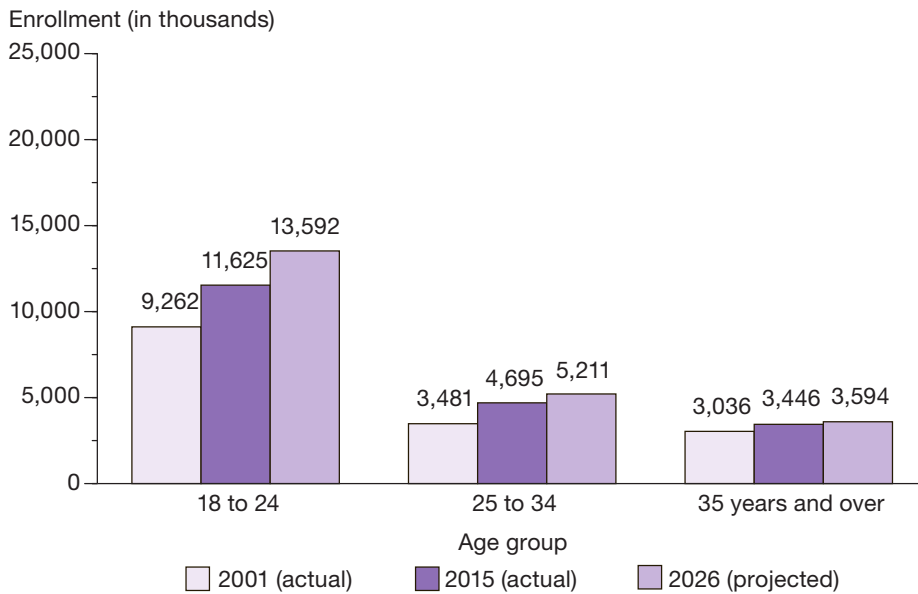
Figure 16. Actual and projected numbers for total enrollment in all degree-granting postsecondary institutions: Fall 2001 through fall 2026



NOTE: Degree-granting institutions grant associate's or higher degrees and participate in Title IV federal financial aid programs. Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A. SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Spring 2001 through Spring 2016, Fall Enrollment component; and Enrollment in Degree-Granting Institutions Projection Model, 2000 through 2026. (This figure was prepared April 2017.)

ENROLLMENT BY SELECTED CHARACTERISTICS AND CONTROL OF INSTITUTION

Figure 17. Actual and projected numbers for total enrollment in all degree-granting postsecondary institutions, by age group: Fall 2001, fall 2015, and fall 2026



NOTE: Degree-granting institutions grant associate's or higher degrees and participate in Title IV federal financial aid programs. Distributions by age are estimates based on samples of the civilian noninstitutional population from the U.S. Census Bureau's Current Population Survey. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A. Calculations are based on unrounded numbers.
 SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Spring 2002 and Spring 2016, Fall Enrollment component; Enrollment in Degree-Granting Institutions Projection Model, 2000 through 2026; and U.S. Department of Commerce, Census Bureau, Current Population Reports, "Social and Economic Characteristics of Students," various years. (This figure was prepared April 2017.)

Enrollment by age of student

Enrollment in degree-granting postsecondary institutions of students who are 18 to 24 years old

- ▲ increased 26 percent between 2001 and 2015; and
- ▲ is projected to increase 17 percent between 2015 and 2026.

Enrollment in degree-granting postsecondary institutions of students who are 25 to 34 years old

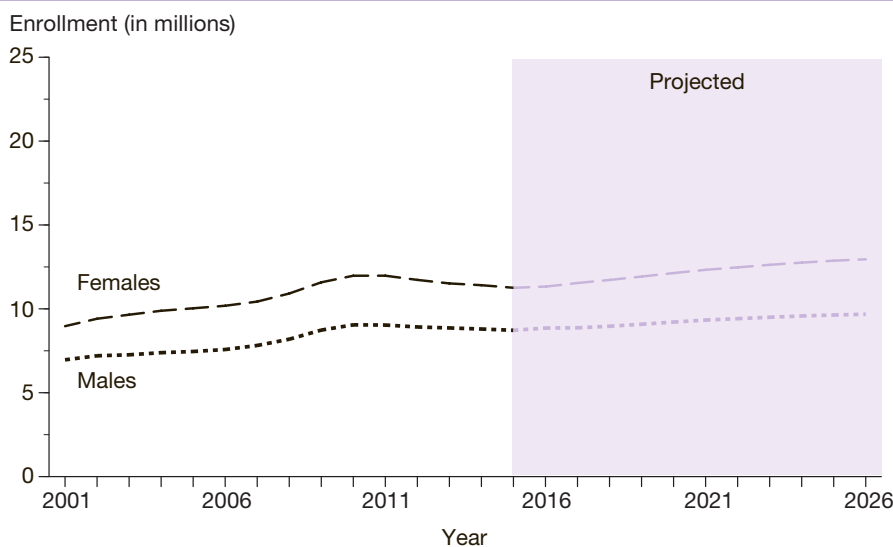
- ▲ increased 35 percent between 2001 and 2015; and
- ▲ is projected to increase 11 percent between 2015 and 2026.

Enrollment in degree-granting postsecondary institutions of students who are 35 years old and over

- ▲ increased 13 percent between 2001 and 2015; and
- ▲ is projected to increase 4 percent between 2015 and 2026.

For more information:
 Table 15

Figure 18. Actual and projected numbers for enrollment in all degree-granting postsecondary institutions, by sex: Fall 2001 through fall 2026



NOTE: Degree-granting institutions grant associate's or higher degrees and participate in Title IV federal financial aid programs. Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A.
 SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Spring 2002 through Spring 2016, Fall Enrollment component; and Enrollment in Degree-Granting Institutions Projection Model, 2000 through 2026. (This figure was prepared April 2017.)

Enrollment by sex of student

Enrollment of males in degree-granting postsecondary institutions

- ▲ increased 25 percent between 2001 and 2015 (7.0 million versus 8.7 million); and
- ▲ is projected to increase 11 percent between 2015 and 2026 to 9.7 million.

Enrollment of females in degree-granting postsecondary institutions

- ▲ increased 26 percent between 2001 and 2015 (9.0 million versus 11.3 million); and
- ▲ is projected to increase 15 percent between 2015 and 2026 to 13.0 million.

For more information:
 Tables 13 and 15

Enrollment by attendance status

Enrollment of full-time students in degree-granting postsecondary institutions

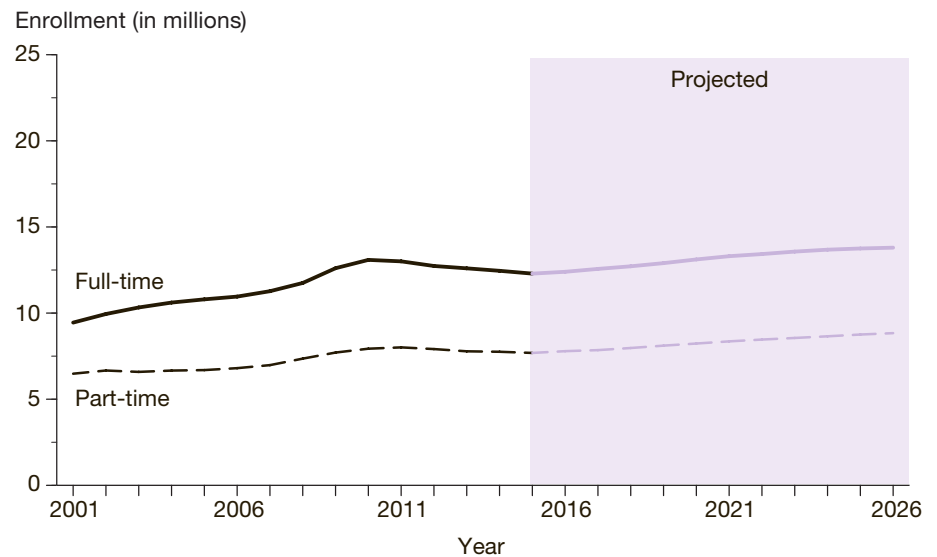
- ▲ increased 30 percent between 2001 and 2015 (9.4 million versus 12.3 million); and
- ▲ is projected to increase 12 percent between 2015 and 2026 to 13.8 million.

Enrollment of part-time students in degree-granting postsecondary institutions

- ▲ increased 19 percent between 2001 and 2015 (6.5 million versus 7.7 million); and
- ▲ is projected to increase 15 percent between 2015 and 2026 to 8.8 million.

*For more information:
Tables 13–15*

Figure 19. Actual and projected numbers for enrollment in all degree-granting postsecondary institutions, by attendance status: Fall 2001 through fall 2026



NOTE: Degree-granting institutions grant associate's or higher degrees and participate in Title IV federal financial aid programs. Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A. SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Spring 2002 through Spring 2016, Fall Enrollment component; and Enrollment in Degree-Granting Institutions Projection Model, 2000 through 2026. (This figure was prepared April 2017.)

Enrollment by level of student

Enrollment of undergraduate students in degree-granting postsecondary institutions

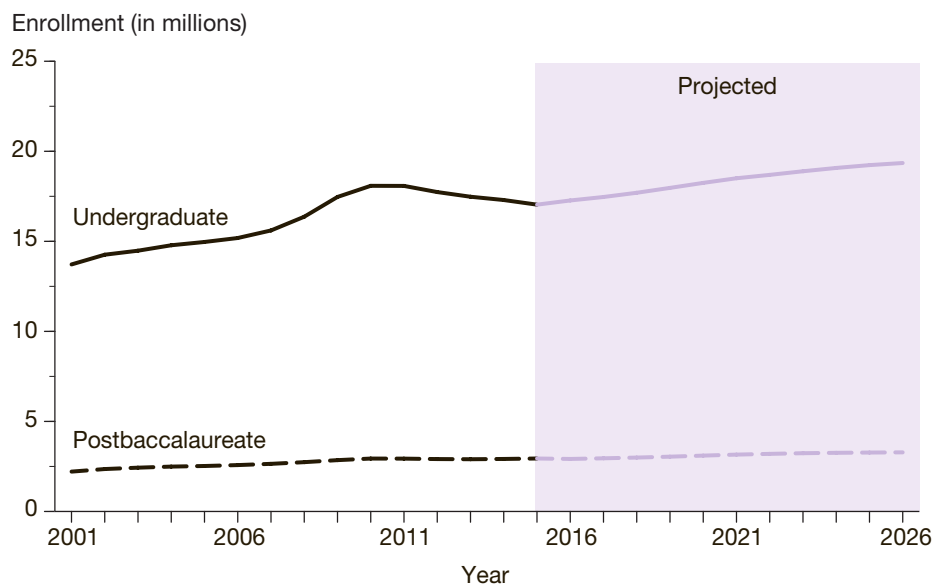
- ▲ increased 24 percent between 2001 and 2015 (13.7 million versus 17.0 million); and
- ▲ is projected to increase 14 percent between 2015 and 2026 to 19.3 million.

Enrollment of postbaccalaureate students in degree-granting postsecondary institutions

- ▲ increased 33 percent between 2001 and 2015 (2.2 million versus 2.9 million); and
- ▲ is projected to increase 12 percent between 2015 and 2026 to 3.3 million.

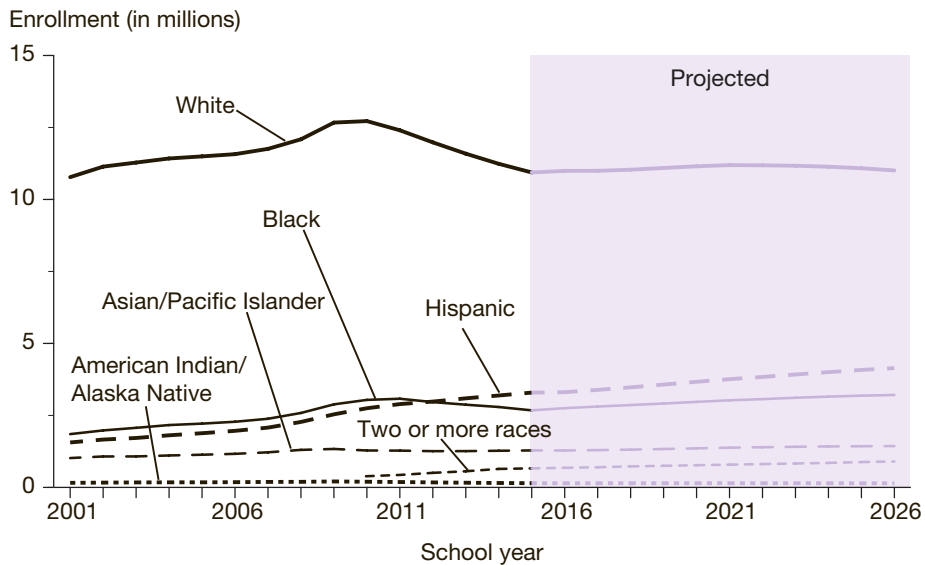
*For more information:
Tables 16–17*

Figure 20. Actual and projected numbers for enrollment in all degree-granting postsecondary institutions, by level of enrollment: Fall 2001 through fall 2026



NOTE: Degree-granting institutions grant associate's or higher degrees and participate in Title IV federal financial aid programs. Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A. SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Spring 2002 through Spring 2016, Fall Enrollment component; and Enrollment in Degree-Granting Institutions Projection Model, 2000 through 2026. (This figure was prepared April 2017.)

Figure 21. Actual and projected numbers for enrollment of U.S. residents in all degree-granting postsecondary institutions, by race/ethnicity: Fall 2001 through fall 2026



NOTE: Degree-granting institutions grant associate's or higher degrees and participate in Title IV federal financial aid programs. Race categories exclude persons of Hispanic ethnicity. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A. Some data have been revised from previously published figures.
 SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Spring 2002 through Spring 2016, Fall Enrollment component; and Enrollment in Degree-Granting Institutions by Race/Ethnicity Projection Model, 1980 through 2026. (This figure was prepared April 2017.)

Enrollment by race/ethnicity

Enrollment of U.S. residents is projected to

- ▲ be 1 percent higher in 2026 for students who are White than in 2015 (11.0 million versus 10.9 million);
- ▲ increase 20 percent for students who are Black between 2015 and 2026 (2.7 million versus 3.2 million);
- ▲ increase 26 percent for students who are Hispanic between 2015 and 2026 (3.3 million versus 4.1 million);
- ▲ increase 12 percent for students who are Asian/Pacific Islander between 2015 and 2026 (1.3 million versus 1.4 million);
- ▼ be 3 percent lower in 2026 than in 2015 (143,000 versus 146,000) for students who are American Indian/Alaska Native; and
- ▲ increase 37 percent for students who are of Two or more races between 2015 and 2026 (660,000 versus 904,000).

*For more information:
Table 19*

Enrollment in public and private institutions

Enrollment in public degree-granting postsecondary institutions

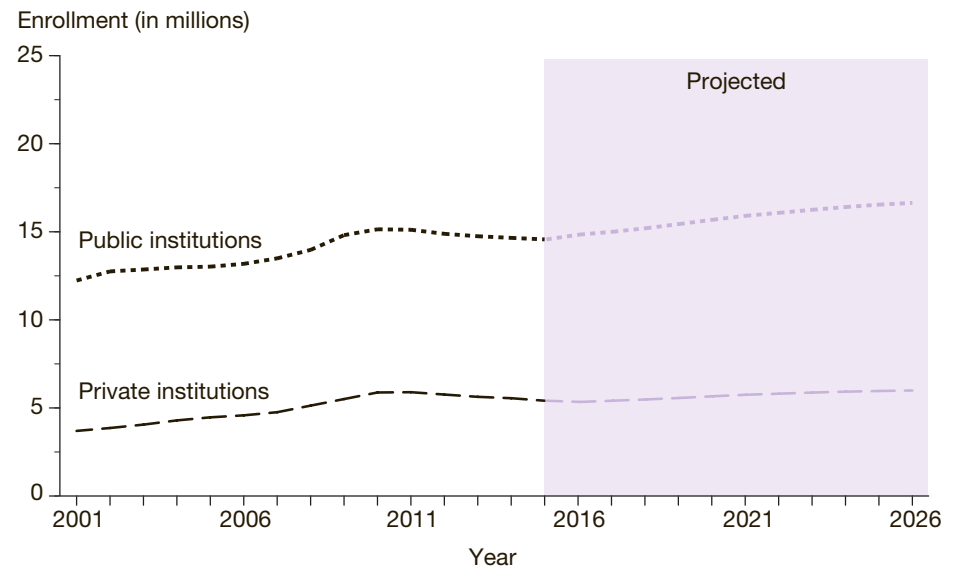
- ▲ increased 19 percent between 2001 and 2015 (12.2 million versus 14.6 million); and
- ▲ is projected to increase 14 percent between 2015 and 2026 to 16.6 million.

Enrollment in private degree-granting postsecondary institutions

- ▲ increased 46 percent between 2001 and 2015 (3.7 million versus 5.4 million); and
- ▲ is projected to increase 11 percent between 2015 and 2026 to 6.0 million.

*For more information:
Table 13*

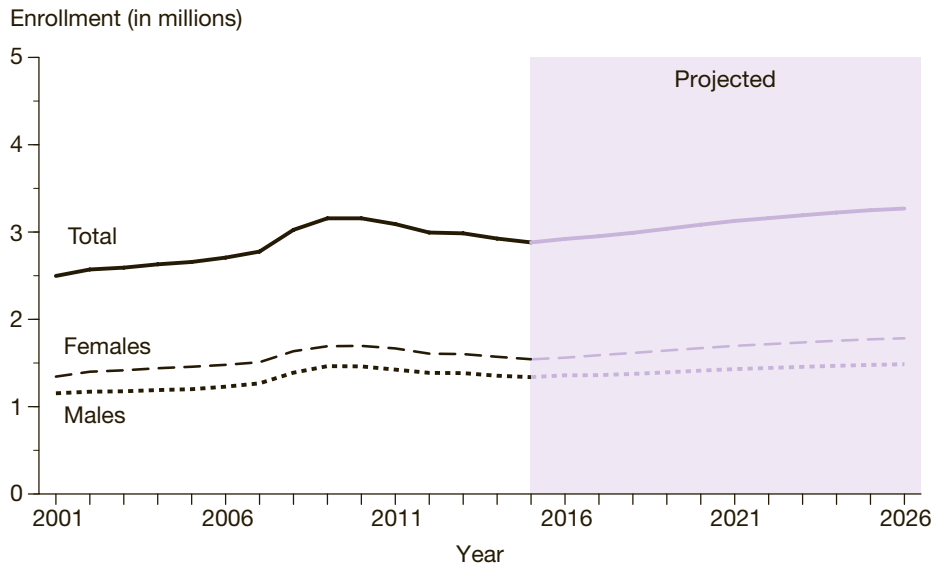
Figure 22. Actual and projected numbers for enrollment in all degree-granting postsecondary institutions, by control of institution: Fall 2001 through fall 2026



NOTE: Degree-granting institutions grant associate's or higher degrees and participate in Title IV federal financial aid programs. Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A. SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Spring 2002 through Spring 2016, Fall Enrollment component; Enrollment in Degree-Granting Institutions Projection Model, 2000 through 2026. (This figure was prepared April 2017.)

FIRST-TIME FRESHMEN ENROLLMENT

Figure 23. Actual and projected numbers for total first-time freshmen fall enrollment in all degree-granting postsecondary institutions, by sex: Fall 2001 through fall 2026



NOTE: Degree-granting institutions grant associate's or higher degrees and participate in Title IV federal financial aid programs. Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A. SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Spring 2002 through Spring 2016, Fall Enrollment component; and First-Time Freshmen Projection Model, 1980 through 2026. (This figure was prepared April 2017.)

First-time freshmen fall enrollment

Total first-time freshmen fall enrollment in all degree-granting postsecondary institutions

- ▲ increased 15 percent from 2001 to 2015 (2.5 million versus 2.9 million); and
- ▲ is projected to increase 13 percent between 2015 and 2026 to 3.3 million.

First-time freshmen fall enrollment of males in all degree-granting postsecondary institutions

- ▲ increased 16 percent from 2001 to 2015 (1.2 million versus 1.3 million); and
- ▲ is projected to increase 11 percent between 2015 and 2026 to 1.5 million.

First-time freshmen fall enrollment of females in all degree-granting postsecondary institutions

- ▲ increased 15 percent from 2001 to 2015 (1.3 million versus 1.5 million); and
- ▲ is projected to increase 16 percent between 2015 and 2026 to 1.8 million.

*For more information:
Table 18*

FULL-TIME-EQUIVALENT ENROLLMENT, BY CONTROL OF INSTITUTION

Full-time-equivalent fall enrollment

Total full-time-equivalent fall enrollment in degree-granting postsecondary institutions

- ▲ increased 28 percent between 2001 and 2015 (11.8 million versus 15.1 million); and
- ▲ is projected to increase 13 percent between 2015 and 2026 to 17.0 million.

Full-time-equivalent fall enrollment in public degree-granting postsecondary institutions

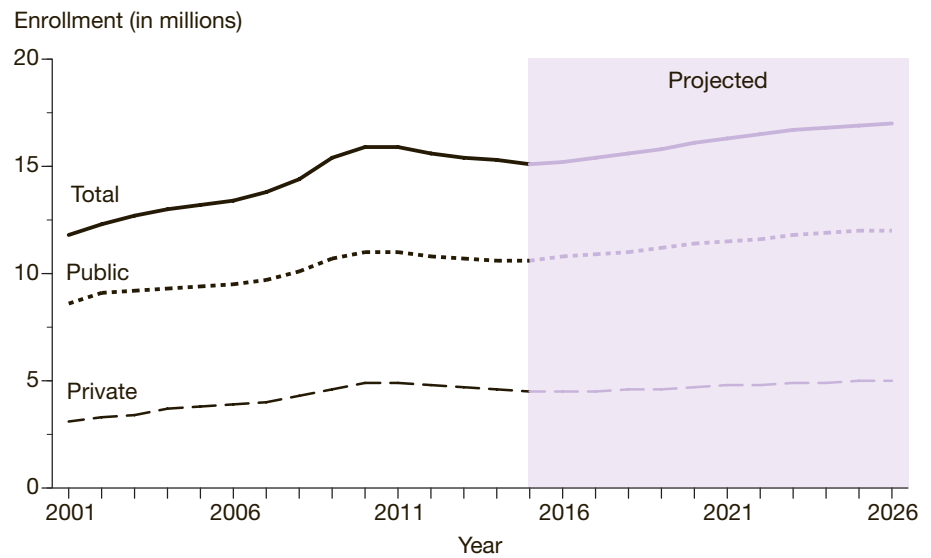
- ▲ increased 22 percent between 2001 and 2015 (8.6 million versus 10.6 million); and
- ▲ is projected to increase 14 percent between 2015 and 2026 to 12.0 million.

Full-time-equivalent fall enrollment in private degree-granting postsecondary institutions

- ▲ increased 44 percent between 2001 and 2015 (3.1 million versus 4.5 million); and
- ▲ is projected to increase 10 percent between 2015 and 2026 to 5.0 million.

For more information:
Table 20

Figure 24. Actual and projected numbers for full-time-equivalent fall enrollment in degree-granting postsecondary institutions, by control: Fall 2001 through fall 2026



NOTE: Full-time-equivalent fall enrollment is the full-time enrollment, plus the full-time-equivalent of the part-time students. Degree-granting institutions grant associate's or higher degrees and participate in Title IV federal financial aid programs. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) Spring 2002 through Spring 2016, Fall Enrollment component; Enrollment in Degree-Granting Institutions Projection Model, 2000 through 2026. (This figure was prepared April 2017.)

Section 6

Postsecondary Degrees Conferred

INTRODUCTION

Long-term growth in enrollment in degree-granting postsecondary institutions has been reflected by increases in the numbers of associate's, bachelor's, master's, and doctor's degrees conferred (tables 13 and 21). Increases in the number of degrees conferred are expected to continue between academic year 2014–15, the last year of actual data, and academic year 2026–27.

Factors affecting the projections

The projections of the number of degrees conferred are related to projections of the college-age populations developed by the Census Bureau and college enrollments from this report. For more details, see appendixes A.0 and A.6.

Factors that were not considered

Some factors that may affect future numbers of degrees, such as choice of degree and labor force requirements, were not included in the projection models.

Changes in degree classifications

The National Center for Education Statistics (NCES) no longer uses the first-professional degree classification. Beginning with academic year 2009–10, most degrees formerly classified as first-professional—such as M.D., D.D.S., and law degrees—are classified as doctor's degrees. However, master's of divinity degrees are now classified as master's degrees. This is the fifth edition of *Projections of Education Statistics* to use these new classifications. With this change, the actual numbers of master's and doctor's degrees conferred are higher than the actual numbers in *Projections of Education Statistics to 2020* and earlier editions of this report. The revisions of actual numbers are reflected in the projections.

Accuracy of Projections

An analysis of projection errors from the past eight editions of *Projections of Education Statistics* indicates that the mean absolute percentage errors (MAPEs) for lead times of 1, 2, and 5 years out for projections of associate's degrees conferred were 2.8, 5.5, and 12.9 percent, respectively. For the 1-year-out prediction, this means that the methodology used by the National Center for Education Statistics (NCES) has produced projections that have, on average, deviated from actual observed values by 2.8 percent. For projections of bachelor's degrees conferred, the MAPEs for lead times of 1, 2, and 5 years out were 0.6, 0.6, and 3.6 percent. For projections of master's degrees conferred, the MAPEs for lead times of 1, 2, and 5 years out were 0.9, 3.4, and 5.8 percent. For projections of doctor's degrees conferred, the MAPEs for lead times of 1, 2, and 5 years out were 0.2, 0.1, and 0.8 percent. For more information, see table A-2 in appendix A.

DEGREES, BY LEVEL OF DEGREE AND SEX OF RECIPIENT

Associate's degrees

The total number of associate's degrees

- ▲ increased 70 percent between 2001–02 and 2014–15; and
- ▲ is projected to increase 27 percent between 2014–15 and 2026–27.

The number of associate's degrees awarded to males

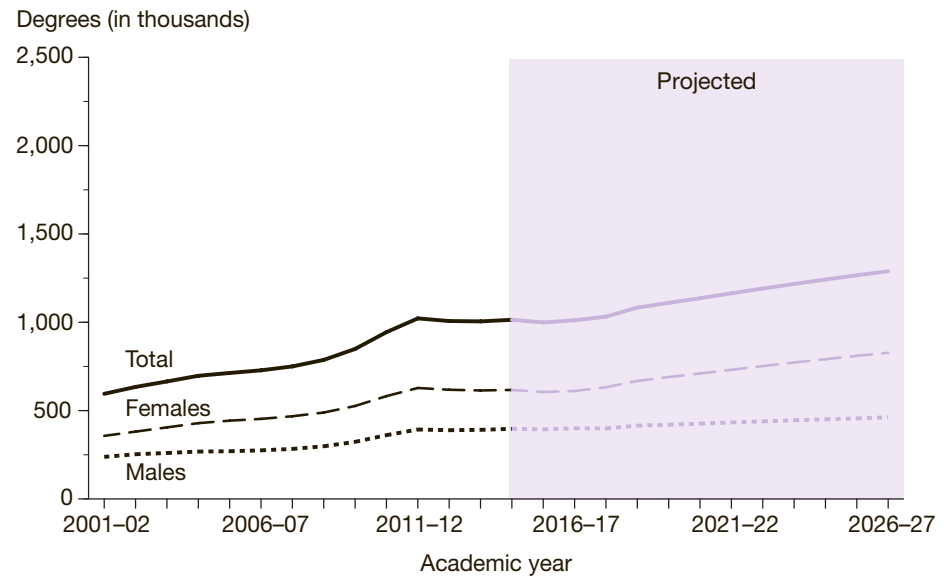
- ▲ increased 67 percent between 2001–02 and 2014–15; and
- ▲ is projected to increase 16 percent between 2014–15 and 2026–27.

The number of associate's degrees awarded to females

- ▲ increased 73 percent between 2001–02 and 2014–15; and
- ▲ is projected to increase 34 percent between 2014–15 and 2026–27.

For more information:
Table 21

Figure 25. Actual and projected numbers for associate's degrees conferred by degree-granting postsecondary institutions, by sex of recipient: Academic years 2001–02 through 2026–27



NOTE: Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A. SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS); IPEDS Fall 2002 through Fall 2015 Completions component; and Degrees Conferred Projection Model, 1980–81 through 2026–27. (This figure was prepared April 2017.)

Bachelor's degrees

The total number of bachelor's degrees

- ▲ increased 47 percent between 2001–02 and 2014–15; and
- ▲ is projected to increase 10 percent between 2014–15 and 2026–27.

The number of bachelor's degrees awarded to males

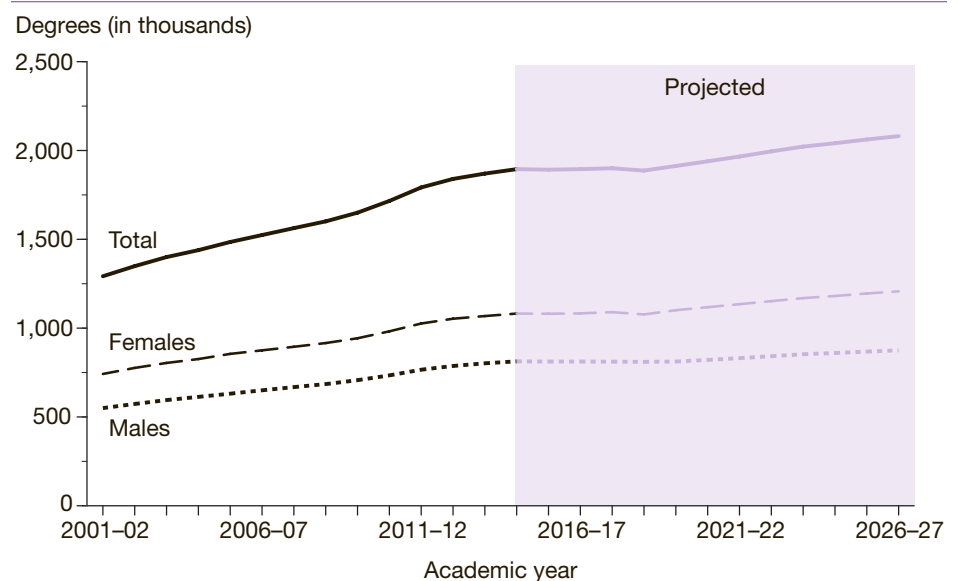
- ▲ increased 48 percent between 2001–02 and 2014–15; and
- ▲ is projected to increase 8 percent between 2014–15 and 2026–27.

The number of bachelor's degrees awarded to females

- ▲ increased 46 percent between 2001–02 and 2014–15; and
- ▲ is projected to increase 11 percent between 2014–15 and 2026–27.

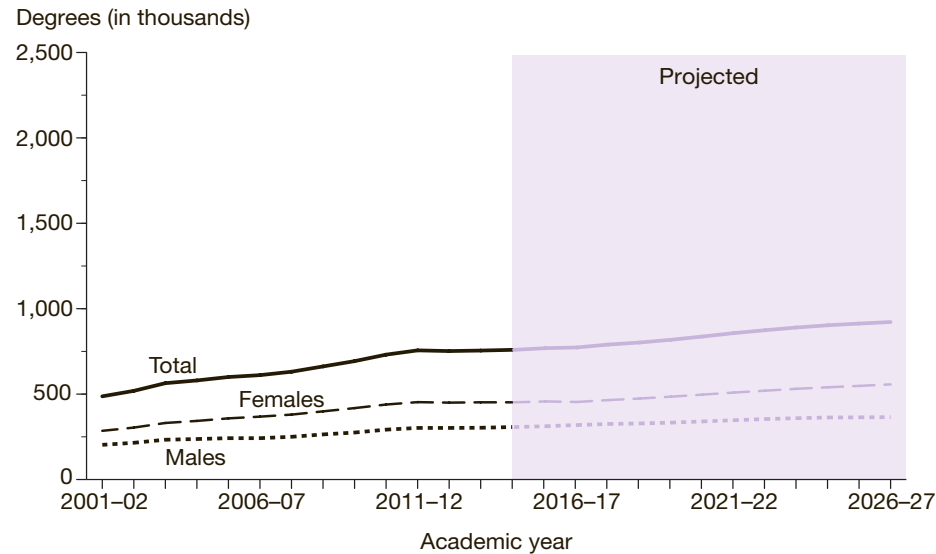
For more information:
Table 21

Figure 26. Actual and projected numbers for bachelor's degrees conferred by degree-granting postsecondary institutions, by sex of recipient: Academic years 2001–02 through 2026–27



NOTE: Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A. SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS); IPEDS Fall 2002 through Fall 2015 Completions component; and Degrees Conferred Projection Model, 1980–81 through 2026–27. (This figure was prepared April 2017.)

Figure 27. Actual and projected numbers for master's degrees conferred by degree-granting postsecondary institutions, by sex of recipient: Academic years 2001–02 through 2026–27



NOTE: Includes some degrees formerly classified as first-professional such as divinity degrees (M.Div. and M.H.L./Rav). Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A. SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS); IPEDS Fall 2002 through Fall 2015 Completions component; and Degrees Conferred Projection Model, 1980–81 through 2026–27. (This figure was prepared April 2017.)

Master's degrees

The total number of master's degrees

- ▲ increased 56 percent between 2001–02 and 2014–15; and
- ▲ is projected to increase 22 percent between 2014–15 and 2026–27.

The number of master's degrees awarded to males

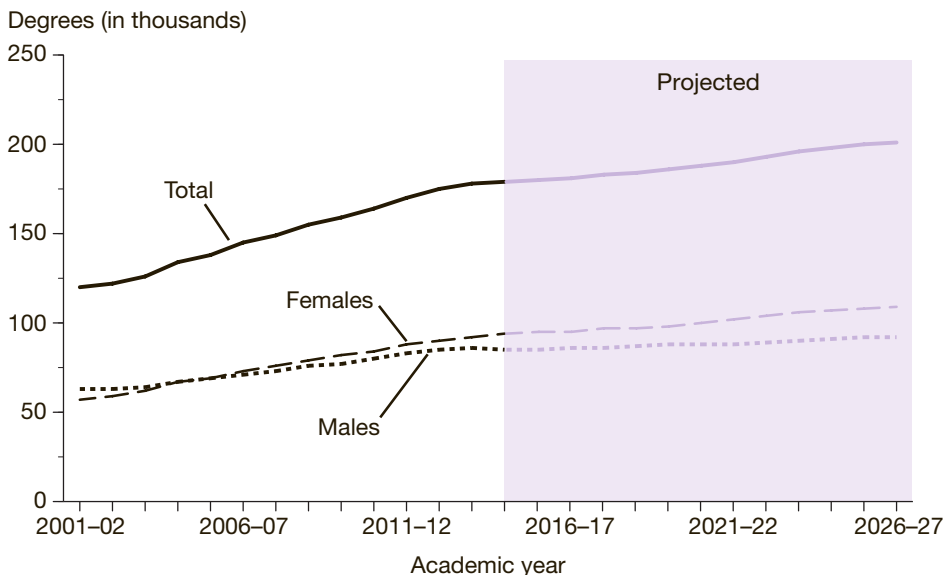
- ▲ increased 51 percent between 2001–02 and 2014–15; and
- ▲ is projected to increase 19 percent between 2014–15 and 2026–27.

The number of master's degrees awarded to females

- ▲ increased 59 percent between 2001–02 and 2014–15; and
- ▲ is projected to increase 23 percent between 2014–15 and 2026–27.

For more information:
Table 21

Figure 28. Actual and projected numbers for doctor's degrees conferred by degree-granting postsecondary institutions, by sex of recipient: Academic years 2001–02 through 2026–27



NOTE: Doctor's degrees include Ph.D., Ed.D., and comparable degrees at the doctoral level. Includes most degrees formerly classified as first-professional, such as M.D., D.D.S., and law degrees. Some data have been revised from previously published figures. Mean absolute percentage errors of selected education statistics can be found in table A-2, appendix A. SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS); IPEDS Fall 2002 through Fall 2015 Completions component; and Degrees Conferred Projection Model, 1980–81 through 2026–27. (This figure was prepared April 2017.)

Doctor's degrees

The total number of doctor's degrees

- ▲ increased 49 percent between 2001–02 and 2014–15; and
- ▲ is projected to increase 13 percent between 2014–15 and 2026–27.

The number of doctor's degrees awarded to males

- ▲ increased 35 percent between 2001–02 and 2014–15; and
- ▲ is projected to increase 8 percent between 2014–15 and 2026–27.

The number of doctor's degrees awarded to females

- ▲ increased 64 percent between 2001–02 and 2014–15; and
- ▲ is projected to increase 17 percent between 2014–15 and 2026–27.

For more information:
Table 21

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Reference Tables

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Table 7. Enrollment and percentage distribution of enrollment in public elementary and secondary schools, by race/ethnicity and level of education: Fall 1999 through fall 2026—Continued

Level of education and year	Enrollment (in thousands)									Percentage distribution								
	Total	White	Black	Hispanic	Asian/Pacific Islander			American Indian/Alaska Native	Two or more races	Total	White	Black	Hispanic	Asian/Pacific Islander			American Indian/Alaska Native	Two or more races
					Total	Asian	Pacific Islander							Total	Asian	Pacific Islander		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Grades 9 through 12																		
1999.....	13,371	8,708	2,114	1,815	584	—	—	151	—	100.0	65.1	15.8	13.6	4.4	†	†	1.1	†
2000.....	13,517	8,747	2,119	1,896	601	—	—	153	—	100.0	64.7	15.7	14.0	4.4	†	†	1.1	†
2001.....	13,736	8,774	2,173	2,011	619	—	—	159	—	100.0	63.9	15.8	14.6	4.5	†	†	1.2	†
2002.....	14,069	8,854	2,257	2,148	642	—	—	168	—	100.0	62.9	16.0	15.3	4.6	†	†	1.2	†
2003.....	14,339	8,884	2,334	2,282	663	—	—	177	—	100.0	62.0	16.3	15.9	4.6	†	†	1.2	†
2004.....	14,618	8,950	2,403	2,408	679	—	—	178	—	100.0	61.2	16.4	16.5	4.6	†	†	1.2	†
2005.....	14,909	8,954	2,490	2,570	709	—	—	186	—	100.0	60.1	16.7	17.2	4.8	†	†	1.2	†
2006.....	15,081	8,938	2,540	2,701	720	—	—	181	—	100.0	59.3	16.8	17.9	4.8	†	†	1.2	†
2007.....	15,086	8,775	2,571	2,821	736	—	—	183	—	100.0	58.2	17.0	18.7	4.9	†	†	1.2	†
2008.....	14,980	8,556	2,565	2,874	746	731	15	179	59 ¹	100.0	57.1	17.1	19.2	5.0	4.9	0.1	1.2	0.4 ¹
2009.....	14,952	8,385	2,532	3,014	754	738	16	182	84 ¹	100.0	56.1	16.9	20.2	5.0	4.9	0.1	1.2	0.6 ¹
2010.....	14,860	8,109	2,422	3,125	755	707	49	171	277	100.0	54.6	16.3	21.0	5.1	4.8	0.3	1.2	1.9
2011.....	14,749	7,948	2,357	3,202	769	719	50	163	309	100.0	53.9	16.0	21.7	5.2	4.9	0.3	1.1	2.1
2012.....	14,753	7,851	2,330	3,300	779	727	51	158	335	100.0	53.2	15.8	22.4	5.3	4.9	0.3	1.1	2.3
2013.....	14,794	7,770	2,322	3,398	784	733	51	156	363	100.0	52.5	15.7	23.0	5.3	5.0	0.3	1.1	2.5
2014.....	14,943	7,730	2,336	3,532	804	753	52	156	385	100.0	51.7	15.6	23.6	5.4	5.0	0.3	1.0	2.6
2015 ²	15,070	7,735	2,414	3,599	816	763	53	156	351	100.0	51.3	16.0	23.9	5.4	5.1	0.4	1.0	2.3
2016 ²	15,111	7,678	2,463	3,625	828	774	54	155	362	100.0	50.8	16.3	24.0	5.5	5.1	0.4	1.0	2.4
2017 ²	15,148	7,621	2,483	3,669	852	797	54	154	369	100.0	50.3	16.4	24.2	5.6	5.3	0.4	1.0	2.4
2018 ²	15,166	7,553	2,469	3,742	870	815	55	154	378	100.0	49.8	16.3	24.7	5.7	5.4	0.4	1.0	2.5
2019 ²	15,186	7,478	2,486	3,792	886	829	57	152	391	100.0	49.2	16.4	25.0	5.8	5.5	0.4	1.0	2.6
2020 ²	15,329	7,444	2,542	3,887	898	842	57	151	406	100.0	48.6	16.6	25.4	5.9	5.5	0.4	1.0	2.7
2021 ²	15,513	7,420	2,621	3,995	905	848	57	150	422	100.0	47.8	16.9	25.8	5.8	5.5	0.4	1.0	2.7
2022 ²	15,641	7,375	2,706	4,062	910	854	56	148	439	100.0	47.2	17.3	26.0	5.8	5.5	0.4	0.9	2.8
2023 ²	15,640	7,286	2,700	4,144	909	854	55	146	455	100.0	46.6	17.3	26.5	5.8	5.5	0.3	0.9	2.9
2024 ²	15,579	7,183	2,658	4,215	915	860	54	144	466	100.0	46.1	17.1	27.1	5.9	5.5	0.3	0.9	3.0
2025 ²	15,476	7,071	2,600	4,267	922	868	54	141	475	100.0	45.7	16.8	27.6	6.0	5.6	0.3	0.9	3.1
2026 ²	15,376	6,979	2,532	4,318	928	874	54	139	480	100.0	45.4	16.5	28.1	6.0	5.7	0.4	0.9	3.1

—Not available.

†Not applicable.

¹For this year, data on students of Two or more races were reported by only a small number of states. Therefore, the data are not comparable to figures for 2010 and later years.

²Projected.

NOTE: Race categories exclude persons of Hispanic ethnicity. Enrollment data for students not reported by race/ethnicity were prorated by state and grade to match state totals. Prior to 2008, data on students of Two or more races were not collected. Total counts of

ungraded students were prorated to prekindergarten through grade 8 and grades 9 through 12 based on prior reports. Some data have been revised from previously published figures. Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "State Nonfiscal Survey of Public Elementary and Secondary Education," 1998–99 through 2014–15; and National Elementary and Secondary Enrollment by Race/Ethnicity Projection Model, 1972 through 2026. (This table was prepared November 2016.)

Table 11. Public high school graduates, by race/ethnicity: 1998–99 through 2026–27

Year	Number of high school graduates							Percentage distribution of graduates						
	Total	White	Black	Hispanic	Asian/ Pacific Islander	American Indian/ Alaska Native	Two or more races	Total	White	Black	Hispanic	Asian/ Pacific Islander	American Indian/ Alaska Native	Two or more races
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1998–99.....	2,485,630	1,749,561	325,708	270,836	115,216	24,309	—	100.0	70.4	13.1	10.9	4.6	1.0	†
1999–2000.....	2,553,844	1,778,370	338,116	289,139	122,344	25,875	—	100.0	69.6	13.2	11.3	4.8	1.0	†
2000–01.....	2,569,200	1,775,036	339,578	301,740	126,465	26,381	—	100.0	69.1	13.2	11.7	4.9	1.0	†
2001–02.....	2,621,534	1,796,110	348,969	317,197	132,182	27,076	—	100.0	68.5	13.3	12.1	5.0	1.0	†
2002–03.....	2,719,947	1,856,454	359,920	340,182	135,588	27,803	—	100.0	68.3	13.2	12.5	5.0	1.0	†
2003–04.....	2,753,438	1,829,177	383,443	374,492	137,496	28,830	—	100.0	66.4	13.9	13.6	5.0	1.0	†
2004–05.....	2,799,250	1,855,198	385,987	383,714	143,729	30,622	—	100.0	66.3	13.8	13.7	5.1	1.1	†
2005–06.....	2,815,544	1,838,765	399,406	396,820	150,925	29,628	—	100.0	65.3	14.2	14.1	5.4	1.1	†
2006–07.....	2,893,045	1,868,056	418,113	421,036	154,837	31,003	—	100.0	64.6	14.5	14.6	5.4	1.1	†
2007–08.....	3,001,337	1,898,367	429,840	448,887	159,410	32,036	32,797 ¹	100.0	63.3	14.3	15.0	5.3	1.1	1.1 ¹
2008–09.....	3,039,015	1,883,382	451,384	481,698	163,575	32,213	26,763 ¹	100.0	62.0	14.9	15.9	5.4	1.1	0.9 ¹
2009–10.....	3,128,022	1,871,980	472,261	545,518	167,840	34,131	36,292 ¹	100.0	59.8	15.1	17.4	5.4	1.1	1.2 ¹
2010–11.....	3,144,100	1,835,332	471,461	583,907	168,875	32,768	51,748	100.0	58.4	15.0	18.6	5.4	1.0	1.6
2011–12.....	3,149,185	1,807,528	467,932	608,726	173,835	32,450	58,703	100.0	57.4	14.9	19.3	5.5	1.0	1.9
2012–13.....	3,169,257	1,791,147	461,919	640,413	179,101	31,100	65,569	100.0	56.5	14.6	20.2	5.7	1.0	2.1
2013–14 ²	3,168,450	1,771,700	453,800	657,520	183,010	30,230	72,190	100.0	55.9	14.3	20.8	5.8	1.0	2.3
2014–15 ²	3,187,000	1,753,050	458,850	682,300	186,300	30,100	76,400	100.0	55.0	14.4	21.4	5.8	0.9	2.4
2015–16 ²	3,225,160	1,765,020	483,000	691,180	188,050	30,340	67,560	100.0	54.7	15.0	21.4	5.8	0.9	2.1
2016–17 ²	3,253,730	1,769,620	511,300	687,500	185,460	29,970	69,870	100.0	54.4	15.7	21.1	5.7	0.9	2.1
2017–18 ²	3,297,050	1,771,600	543,540	686,200	194,720	29,020	71,980	100.0	53.7	16.5	20.8	5.9	0.9	2.2
2018–19 ²	3,299,910	1,749,570	529,540	721,800	195,970	29,630	73,390	100.0	53.0	16.0	21.9	5.9	0.9	2.2
2019–20 ²	3,265,550	1,718,830	528,590	712,440	199,840	29,890	75,970	100.0	52.6	16.2	21.8	6.1	0.9	2.3
2020–21 ²	3,287,230	1,718,740	529,760	723,120	208,060	29,300	78,250	100.0	52.3	16.1	22.0	6.3	0.9	2.4
2021–22 ²	3,309,540	1,711,660	531,690	744,120	212,500	29,150	80,430	100.0	51.7	16.1	22.5	6.4	0.9	2.4
2022–23 ²	3,316,280	1,687,420	545,590	760,620	211,480	28,560	82,610	100.0	50.9	16.5	22.9	6.4	0.9	2.5
2023–24 ²	3,386,980	1,695,180	577,510	787,910	212,340	28,720	85,330	100.0	50.0	17.1	23.3	6.3	0.8	2.5
2024–25 ²	3,443,430	1,702,470	599,190	810,220	215,260	28,530	87,750	100.0	49.4	17.4	23.5	6.3	0.8	2.5
2025–26 ²	3,424,140	1,676,630	607,630	802,500	218,310	28,230	90,850	100.0	49.0	17.7	23.4	6.4	0.8	2.7
2026–27 ²	3,327,500	1,617,250	548,730	830,000	211,420	27,090	93,010	100.0	48.6	16.5	24.9	6.4	0.8	2.8

—Not available.

†Not applicable.

¹Data on students of Two or more races were not reported by all states; therefore, the data are not comparable to figures for 2010–11 and later years.

²Projected.

NOTE: Race categories exclude persons of Hispanic ethnicity. Prior to 2007–08, data on students of Two or more races were not collected separately. Some data have been revised

from previously published figures. Detail may not sum to totals because of rounding and statistical methods used to prevent the identification of individual students.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), “State Nonfiscal Survey of Public Elementary/Secondary Education,” 1999–2000 through 2005–06; “State Dropout and Completion Data File,” 2005–06 through 2012–13; and National Public High School Graduates by Race/Ethnicity Projection Model, 1995–96 through 2026–27. (This table was prepared May 2017.)

Table 12. Current expenditures and current expenditures per pupil in public elementary and secondary schools: 1989–90 through 2026–27

School year	Current expenditures in unadjusted dollars ¹			Current expenditures in constant 2015–16 dollars ²					
	Total, in billions	Per pupil in fall enrollment	Per pupil in average daily attendance (ADA)	Total current expenditures		Per pupil in fall enrollment		Per pupil in average daily attendance (ADA)	
				In billions	Annual percentage change	Per pupil enrolled	Annual percentage change	Per pupil in ADA	Annual percentage change
1	2	3	4	5	6	7	8	9	10
1989–90.....	\$188.2	\$4,643	\$4,980	\$353.2	3.8	\$8,712	2.9	\$9,345	2.3
1990–91.....	202.0	4,902	5,258	359.5	1.8	8,722	0.1	9,355	0.1
1991–92.....	211.2	5,023	5,421	364.1	1.3	8,660	-0.7	9,346	-0.1
1992–93.....	220.9	5,160	5,584	369.4	1.4	8,626	-0.4	9,335	-0.1
1993–94.....	231.5	5,327	5,767	377.3	2.1	8,681	0.6	9,399	0.7
1994–95.....	243.9	5,529	5,989	386.4	2.4	8,758	0.9	9,488	0.9
1995–96.....	255.1	5,689	6,147	393.4	1.8	8,774	0.2	9,480	-0.1
1996–97.....	270.2	5,923	6,393	405.1	3.0	8,882	1.2	9,586	1.1
1997–98.....	285.5	6,189	6,676	420.6	3.8	9,118	2.7	9,834	2.6
1998–99.....	302.9	6,508	7,013	438.6	4.3	9,424	3.4	10,156	3.3
1999–2000.....	323.9	6,912	7,394	455.9	3.9	9,729	3.2	10,406	2.5
2000–01.....	348.4	7,380	7,904	474.1	4.0	10,043	3.2	10,756	3.4
2001–02.....	368.4	7,727	8,259	492.6	3.9	10,333	2.9	11,043	2.7
2002–03.....	387.6	8,044	8,610	507.1	3.0	10,525	1.9	11,265	2.0
2003–04.....	403.4	8,310	8,900	516.5	1.8	10,641	1.1	11,395	1.2
2004–05.....	425.0	8,711	9,316	528.3	2.3	10,828	1.8	11,580	1.6
2005–06.....	449.1	9,145	9,778	537.8	1.8	10,950	1.1	11,709	1.1
2006–07.....	476.8	9,679	10,336	556.6	3.5	11,298	3.2	12,064	3.0
2007–08.....	506.9	10,298	10,982	570.5	2.5	11,591	2.6	12,361	2.5
2008–09.....	518.9	10,540	11,239	576.0	1.0	11,699	0.9	12,475	0.9
2009–10.....	524.7	10,636	11,427	576.9	0.1	11,693	-0.1	12,563	0.7
2010–11.....	527.3	10,663	11,433	568.3	-1.5	11,492	-1.7	12,322	-1.9
2011–12.....	527.2	10,648	11,362	552.0	-2.9	11,149	-3.0	11,897	-3.5
2012–13.....	535.8	10,771	11,509	551.8	#	11,093	-0.5	11,854	-0.4
2013–14.....	553.5	11,070	11,830	561.3	1.7	11,226	1.2	12,000	1.2
2014–15 ³	565.2	11,230	12,020	569.0	1.4	11,310	0.8	12,100	0.8
2015–16 ³	580.3	11,490	12,300	580.3	2.0	11,490	1.6	12,300	1.6
2016–17 ³	599.6	11,840	12,670	588.5	1.4	11,630	1.1	12,430	1.1
2017–18 ³	623.5	12,300	13,150	596.7	1.4	11,770	1.2	12,590	1.2
2018–19 ³	647.9	12,760	13,650	605.5	1.5	11,930	1.4	12,760	1.4
2019–20 ³	672.8	13,230	14,150	613.8	1.4	12,070	1.2	12,910	1.2
2020–21 ³	699.1	13,710	14,660	622.4	1.4	12,200	1.1	13,050	1.1
2021–22 ³	726.6	14,200	15,190	631.5	1.5	12,340	1.2	13,200	1.2
2022–23 ³	755.3	14,720	15,750	640.3	1.4	12,480	1.1	13,350	1.1
2023–24 ³	785.2	15,260	16,320	649.2	1.4	12,620	1.1	13,500	1.1
2024–25 ³	814.7	15,800	16,900	657.5	1.3	12,750	1.1	13,640	1.1
2025–26 ³	844.1	16,350	17,490	664.8	1.1	12,870	1.0	13,770	1.0
2026–27 ³	865.9	16,740	17,900	669.5	0.7	12,940	0.5	13,840	0.5

#Rounds to zero.

¹Unadjusted (or “current”) dollars have not been adjusted to compensate for inflation.

²Constant dollars based on the Consumer Price Index, prepared by the Bureau of Labor Statistics, U.S. Department of Labor, adjusted to a school-year basis.

³Projected.

NOTE: Current expenditures include instruction, support services, food services, and enterprise operations. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), “National Public Education Financial Survey,” 1989–90 through 2013–14; National Elementary and Secondary Enrollment Projection Model, 1972 through 2026; and Public Elementary and Secondary Education Current Expenditure Projection Model, 1973–74 through 2026–27. (This table was prepared March 2017.)

Table 13. Total fall enrollment in degree-granting postsecondary institutions, by attendance status, sex of student, and control of institution: Selected years, 1947 through 2026—Continued

Year	Total enrollment	Attendance status			Sex of student			Control of institution			
		Full-time	Part-time	Percent part-time	Male	Female	Percent female	Public	Private		
									Total	Nonprofit	For-profit
1	2	3	4	5	6	7	8	9	10	11	12
2015.....	19,977,270	12,290,829	7,686,441	38.2	8,721,403	11,255,867	57.0	14,568,103	5,409,167	4,063,372	1,345,795
2016 ⁵	20,185,000	12,396,000	7,789,000	38.5	8,855,000	11,330,000	57.6	14,844,000	5,341,000	—	—
2017 ⁵	20,413,000	12,564,000	7,849,000	38.6	8,869,000	11,544,000	57.9	15,003,000	5,410,000	—	—
2018 ⁵	20,688,000	12,716,000	7,972,000	38.7	8,962,000	11,726,000	58.1	15,206,000	5,481,000	—	—
2019 ⁵	21,009,000	12,899,000	8,110,000	38.8	9,082,000	11,928,000	58.2	15,443,000	5,566,000	—	—
2020 ⁵	21,346,000	13,114,000	8,232,000	38.9	9,212,000	12,135,000	58.4	15,684,000	5,662,000	—	—
2021 ⁵	21,659,000	13,302,000	8,357,000	39.0	9,331,000	12,328,000	58.5	15,910,000	5,749,000	—	—
2022 ⁵	21,888,000	13,426,000	8,462,000	39.0	9,415,000	12,473,000	58.7	16,078,000	5,810,000	—	—
2023 ⁵	22,124,000	13,569,000	8,555,000	39.1	9,499,000	12,625,000	58.8	16,251,000	5,873,000	—	—
2024 ⁵	22,331,000	13,680,000	8,651,000	39.1	9,574,000	12,757,000	58.8	16,407,000	5,924,000	—	—
2025 ⁵	22,504,000	13,750,000	8,754,000	39.1	9,634,000	12,870,000	58.8	16,541,000	5,962,000	—	—
2026 ⁵	22,631,000	13,797,000	8,835,000	39.1	9,678,000	12,953,000	58.8	16,642,000	5,990,000	—	—

—Not available.

¹Degree-credit enrollment only.

²Includes part-time resident students and all extension students (students attending courses at sites separate from the primary reporting campus). In later years, part-time student enrollment was collected as a distinct category.

³Large increases are due to the addition of schools accredited by the Accrediting Commission of Career Schools and Colleges of Technology.

⁴Because of imputation techniques, data are not consistent with figures for other years.

⁵Projected.

NOTE: Data through 1995 are for institutions of higher education, while later data are for degree-granting institutions. Degree-granting institutions grant associate's or higher degrees and partici-

pate in Title IV federal financial aid programs. The degree-granting classification is very similar to the earlier higher education classification, but it includes more 2-year colleges and excludes a few higher education institutions that did not grant degrees. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Biennial Survey of Education in the United States; Opening Fall Enrollment in Higher Education*, 1963 through 1965; Higher Education General Information Survey (HEGIS), "Fall Enrollment in Colleges and Universities" surveys, 1966 through 1985; Integrated Postsecondary Education Data System (IPEDS), "Fall Enrollment Survey" (IPEDS-EF:86-99); IPEDS Spring 2001 through Spring 2016, Fall Enrollment component; and Enrollment in Degree-Granting Institutions Projection Model, 2000 through 2026. (This table was prepared February 2017.)

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Table 19. Fall enrollment of U.S. residents in degree-granting postsecondary institutions, by race/ethnicity: Selected years, 1976 through 2026

Year	Enrollment (in thousands)									Percentage distribution									
	Total	White	Black	Hispanic	Asian/Pacific Islander			American Indian/Alaska Native	Two or more races	Total	White	Black	Hispanic	Asian/Pacific Islander			American Indian/Alaska Native	Two or more races	
					Total	Asian	Pacific Islander							Total	Asian	Pacific Islander			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
1976.....	10,767	9,076	1,033	384	198	—	—	76	—	100.0	84.3	9.6	3.6	1.8	—	—	0.7	—	
1980.....	11,782	9,833	1,107	472	286	—	—	84	—	100.0	83.5	9.4	4.0	2.4	—	—	0.7	—	
1990.....	13,427	10,722	1,247	782	572	—	—	103	—	100.0	79.9	9.3	5.8	4.3	—	—	0.8	—	
1994.....	13,823	10,427	1,449	1,046	774	—	—	127	—	100.0	75.4	10.5	7.6	5.6	—	—	0.9	—	
1995.....	13,807	10,311	1,474	1,094	797	—	—	131	—	100.0	74.7	10.7	7.9	5.8	—	—	1.0	—	
1996.....	13,901	10,264	1,506	1,166	828	—	—	138	—	100.0	73.8	10.8	8.4	6.0	—	—	1.0	—	
1997.....	14,037	10,266	1,551	1,218	859	—	—	142	—	100.0	73.1	11.0	8.7	6.1	—	—	1.0	—	
1998.....	14,063	10,179	1,583	1,257	900	—	—	144	—	100.0	72.4	11.3	8.9	6.4	—	—	1.0	—	
1999.....	14,361	10,329	1,649	1,324	914	—	—	146	—	100.0	71.9	11.5	9.2	6.4	—	—	1.0	—	
2000.....	14,784	10,462	1,730	1,462	978	—	—	151	—	100.0	70.8	11.7	9.9	6.6	—	—	1.0	—	
2001.....	15,363	10,775	1,850	1,561	1,019	—	—	158	—	100.0	70.1	12.0	10.2	6.6	—	—	1.0	—	
2002.....	16,021	11,140	1,979	1,662	1,074	—	—	166	—	100.0	69.5	12.4	10.4	6.7	—	—	1.0	—	
2003.....	16,314	11,281	2,068	1,716	1,076	—	—	173	—	100.0	69.1	12.7	10.5	6.6	—	—	1.1	—	
2004.....	16,682	11,423	2,165	1,810	1,109	—	—	176	—	100.0	68.5	13.0	10.8	6.6	—	—	1.1	—	
2005.....	16,903	11,495	2,215	1,882	1,134	—	—	176	—	100.0	68.0	13.1	11.1	6.7	—	—	1.0	—	
2006.....	17,163	11,572	2,280	1,964	1,165	—	—	181	—	100.0	67.4	13.3	11.4	6.8	—	—	1.1	—	
2007.....	17,624	11,756	2,383	2,076	1,218	—	—	190	—	100.0	66.7	13.5	11.8	6.9	—	—	1.1	—	
2008.....	18,442	12,089	2,584	2,273	1,303	—	—	193	—	100.0	65.5	14.0	12.3	7.1	—	—	1.0	—	
2009.....	19,631	12,669	2,884	2,537	1,335	—	—	206	—	100.0	64.5	14.7	12.9	6.8	—	—	1.0	—	
2010.....	20,312	12,721	3,039	2,749	1,282	1,218	64	196	325	100.0	62.6	15.0	13.5	6.3	6.0	0.3	1.0	1.6	
2011.....	20,270	12,402	3,079	2,893	1,277	1,211	66	186	433	100.0	61.2	15.2	14.3	6.3	6.0	0.3	0.9	2.1	
2012.....	19,861	11,982	2,962	2,980	1,258	1,195	64	173	505	100.0	60.3	14.9	15.0	6.3	6.0	0.3	0.9	2.5	
2013.....	19,537	11,589	2,872	3,093	1,260	1,199	61	162	560	100.0	59.3	14.7	15.8	6.4	6.1	0.3	0.8	2.9	
2014.....	19,288	11,237	2,792	3,192	1,272	1,214	59	153	642	100.0	58.3	14.5	16.5	6.6	6.3	0.3	0.8	3.3	
2015.....	18,994	10,937	2,675	3,292	1,284	1,228	56	146	660	100.0	57.6	14.1	17.3	6.8	6.5	0.3	0.8	3.5	
2016 ¹	19,160	10,992	2,752	3,306	1,282	—	—	145	683	100.0	57.4	14.4	17.3	6.7	—	—	0.8	3.6	
2017 ¹	19,334	10,995	2,808	3,386	1,296	—	—	145	705	100.0	56.9	14.5	17.5	6.7	—	—	0.8	3.6	
2018 ¹	19,550	11,033	2,859	3,475	1,312	—	—	145	726	100.0	56.4	14.6	17.8	6.7	—	—	0.7	3.7	
2019 ¹	19,803	11,093	2,913	3,570	1,333	—	—	146	748	100.0	56.0	14.7	18.0	6.7	—	—	0.7	3.8	
2020 ¹	20,059	11,151	2,970	3,667	1,356	—	—	146	768	100.0	55.6	14.8	18.3	6.8	—	—	0.7	3.8	
2021 ¹	20,286	11,192	3,024	3,758	1,379	—	—	147	786	100.0	55.2	14.9	18.5	6.8	—	—	0.7	3.9	
2022 ¹	20,435	11,185	3,065	3,836	1,395	—	—	146	806	100.0	54.7	15.0	18.8	6.8	—	—	0.7	3.9	
2023 ¹	20,589	11,170	3,113	3,921	1,410	—	—	146	829	100.0	54.3	15.1	19.0	6.8	—	—	0.7	4.0	
2024 ¹	20,712	11,137	3,152	4,002	1,423	—	—	145	853	100.0	53.8	15.2	19.3	6.9	—	—	0.7	4.1	
2025 ¹	20,799	11,084	3,185	4,079	1,430	—	—	144	877	100.0	53.3	15.3	19.6	6.9	—	—	0.7	4.2	
2026 ¹	20,841	11,007	3,210	4,142	1,436	—	—	143	904	100.0	52.8	15.4	19.9	6.9	—	—	0.7	4.3	

—Not available.

¹Projected.

NOTE: Race categories exclude persons of Hispanic ethnicity. Prior to 2010, institutions were not required to report separate data on Asians, Pacific Islanders, and students of Two or more races. Projections for Asian and Pacific Islander enrollment are not available due to the limited amount of historical data available upon which to base a projection model. Data through 1995 are for institutions of higher education, while later data are for degree-granting institutions. Degree-granting institutions grant associate's or higher degrees and participate in Title IV federal financial aid programs. The degree-granting classification is very similar to

the earlier higher education classification, but it includes more 2-year colleges and excludes a few higher education institutions that did not grant degrees. Detail may not sum to totals because of rounding. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Higher Education General Information Survey (HEGIS), "Fall Enrollment in Colleges and Universities" surveys, 1976 and 1980; Integrated Postsecondary Education Data System (IPEDS), "Fall Enrollment Survey" (IPEDS-EF:90-99); IPEDS Spring 2001 through Spring 2016, Fall Enrollment component; and Enrollment in Degree-Granting Institutions by Race/Ethnicity Projection Model, 1980 through 2026. (This table was prepared March 2017.)

Technical Appendixes

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Appendix A

Introduction to Projection Methodology

A.0. INTRODUCTION TO PROJECTION METHODOLOGY

Content of appendix A

Since its inception in 1964, the *Projections of Education Statistics* series has been providing projections of key education statistics to policymakers, educators, researchers, the press, and the general public. This edition of *Projections of Education Statistics* is the 45th in the series.

Appendix A contains this introduction, which provides a general overview of the projection methodology, as well as six additional sections that discuss the specific methodology for the different statistics projected:

- » A.0. Introduction to Projection Methodology;
- » A.1. Elementary and Secondary Enrollment;
- » A.2. Elementary and Secondary Teachers;
- » A.3. High School Graduates;
- » A.4. Expenditures for Public Elementary and Secondary Education;
- » A.5. Enrollment in Degree-Granting Postsecondary Institutions; and
- » A.6. Postsecondary Degrees Conferred.

This introduction

- » outlines the two major techniques used to make the projections;
- » summarizes key demographic and economic assumptions underlying the projections;
- » examines the accuracy of the projections; and
- » introduces the subsequent sections of appendix A.

Projection techniques

Two main projection techniques were used to develop the projections presented in this publication:

- » Exponential smoothing was the technique used in the projections of elementary and secondary enrollments and high school graduates. This technique also played a role in the projections of teachers at the elementary and secondary level, as well as enrollments and degrees conferred at the postsecondary level.
- » Multiple linear regression was the primary technique used in the projections of teachers and expenditures at the elementary and secondary level, as well as enrollments and degrees conferred at the postsecondary level.

Exponential smoothing

Two different types of exponential smoothing, single exponential smoothing and double exponential smoothing, were used in producing the projections presented in this publication.

Single exponential smoothing was used when the historical data had a basically horizontal pattern. Single exponential smoothing produces a single forecast for all years in the forecast period. In developing projections of elementary and secondary enrollments, for example, the rate at which students progress from one particular grade to the next (e.g., from grade 2 to grade 3) was projected using single exponential smoothing. Thus, this percentage was assumed to be constant over the forecast period.

In general, exponential smoothing places more weight on recent observations than on earlier ones. The weights for observations decrease exponentially as one moves further into the past. As a result, the older data have less influence on the projections. The rate at which the weights of older observations decrease is determined by the smoothing constant.

When using single exponential smoothing for a time series, P_t , a smoothed series, \hat{P}_t , is computed recursively by evaluating

$$\hat{P}_t = \alpha P_t + (1 - \alpha) \hat{P}_{t-1}$$

where $0 < \alpha \leq 1$ is the smoothing constant.

By repeated substitution, we can rewrite the equation as

$$\hat{P}_t = \alpha \sum_{s=0}^{t-1} (1 - \alpha)^s P_{t-s}$$

where time, s , goes from the first period in the time series, 0, to time period $t-1$.

The forecasts are constant for all years in the forecast period. The constant equals

$$\hat{P}_{T+k} = \hat{P}_T$$

where T is the last year of actual data and k is the k th year in the forecast period where $k > 0$.

These equations illustrate that the projection is a weighted average based on exponentially decreasing weights. For higher smoothing constants, weights for earlier observations decrease more rapidly than for lower smoothing constants.

For each of the approximately 1,200 single exponential smoothing equations in this edition of *Projections of Education Statistics*, a smoothing constant was individually chosen to minimize the sum of squared forecast errors for that equation. The smoothing constants used to produce the projections in this report ranged from 0.001 to 0.999.

Double exponential smoothing is an extension of single exponential smoothing that allows the forecasting of data with trends. It produces different forecasts for different years in the forecast period. Double exponential smoothing with two smoothing constants was used to forecast the number of doctor's degrees awarded to men and women.

The smoothing forecast using double exponential smoothing is found using the three equations:

$$\hat{P}_{t+k} = a_t + b_t k$$

$$a_t = \alpha P_t + (1 - \alpha) (a_{t-1} + b_{t-1})$$

$$b_t = \beta (a_t - a_{t-1}) + (1 - \beta) b_{t-1}$$

where a_t denotes an estimate of the level of the series at time t , b_t denotes an estimate of the level of the series at time t , and $0 < \alpha, \beta < 1$ are the smoothing constants.

Forecasts from double smoothing are computed as

$$\hat{P}_{T+k} = a_T + b_T k$$

where T is the last year of actual data and k is the k th year in the forecast period where $k > 0$. The last expression shows that forecasts from double smoothing lie on a linear trend with intercept a_T and slope b_T . Single exponential smoothing can be viewed as a special case of double exponential smoothing where the impact that time has on the forecasts has been eliminated (i.e., requiring the slope term b_t to equal 0.0).

The smoothing constants for each of the two double exponential smoothing equations used for this report were selected using a search algorithm that finds the pair of smoothing constants that together minimize the sum of forecast errors for their equation.

Beginning with the *Projections of Education Statistics to 2020*, each smoothing constant was chosen separately. In earlier editions, all the smoothing constants had been set to 0.4. Also beginning with that edition, two smoothing constants, rather than one, were used for double exponential smoothing.

Multiple linear regression

Multiple linear regression was used in cases where a strong relationship exists between the variable being projected (the dependent variable) and independent variables. This technique can be used only when accurate data and reliable projections of the independent variables are available. Key independent variables for this publication include demographic and economic factors. For example, current expenditures for public elementary and secondary education are related to economic factors such as disposable income and education revenues from state sources. The sources of the demographic and economic projections used for this publication are discussed below, under “Assumptions.”

The equations in this appendix should be viewed as forecasting rather than structural equations. That is, the equations are intended only to project values for the dependent variables, not to reflect all elements of underlying social, political, and economic structures. Lack of available data precluded the building of large-scale structural models. The particular equations shown were selected on the basis of their statistical properties, such as coefficients of determination (R^2 s), the t -statistics of the coefficients, the Durbin-Watson statistic, the Breusch-Godfrey Serial Correlation LM test statistic, and residual plots.

The functional form primarily used is the multiplicative model. When used with two independent variables, this model takes the form:

$$Y = a \cdot X_1^{b_1} \cdot X_2^{b_2}$$

This equation can easily be transformed into the linear form by taking the natural log (ln) of both sides of the equation:

$$\ln(Y) = \ln(a) + b_1 \ln X_1 + b_2 \ln X_2$$

One property of this model is that the coefficient of an independent variable shows how responsive in percentage terms the dependent variable is to a one percent change in that independent variable (also called the elasticity). For example, a 1 percent change in X_1 in the above equation would lead to a b_1 percent change in Y .

Assumptions

All projections are based on underlying assumptions, and these assumptions determine projection results to a large extent. It is important that users of projections understand the assumptions to determine the acceptability of projected time series for their purposes. All the projections in this publication are to some extent dependent on demographic and/or economic assumptions.

Demographic assumptions

Many of the projections in this publication are demographically based on the 2014 National Population Projections (December 2014) produced by the U.S. Census Bureau and the IHS U.S. Regional Economic Service, Population Projections, November 2016 produced by the economic consulting firm IHS Global Inc.

The two sets of population projections are produced using cohort-component models. In order for the national-level population projections by age, sex, and race/ethnicity to be consistent with the most recent historical estimates released by the Census Bureau, the projections were ratio-adjusted by applying the ratio of the last historical estimate to the corresponding projections year to the projections for each age, sex, and race/ethnicity combination. This allows for a consistent set of historical estimates and projections. For more information on the methodology used for Census Bureau population projections, see appendix C, Data Sources.

The enrollment projections in this publication depend on population projections for the various age groups that attend school. The future fertility rate assumption (along with corresponding projections of female populations) determines projections of the number of births, a key factor for population projections. The fertility rate assumption plays a major role in determining population projections for the age groups enrolled in nursery school, kindergarten, and elementary grades. The effects of the fertility rate assumption are more pronounced toward the end of the forecast period, while immigration assumptions affect all years. For enrollments in secondary grades and college, the fertility rate assumption is of no consequence, since all the population cohorts for these enrollment ranges have already been born.

Economic assumptions

Various economic variables are used in the forecasting models for numbers of elementary and secondary teachers, public elementary and secondary school expenditures, and postsecondary enrollment.

Projections of the economic variables were from the trend scenario of the “U.S. Quarterly Macroeconomic Model November 2016 Short-Term Baseline Projections” developed by the IHS Global Inc. This set of projections was IHS Global Inc.’s most recent set at the time the education projections in this report were produced. The trend scenario depicts a mean of possible paths that the economy could take over the forecast period, barring major shocks. The economy, in this scenario, evolves smoothly, without major fluctuations.

More information about specific assumptions

For details about the primary assumptions used in this edition of *Projections of Education Statistics*, see table A-1 on page 75.

Accuracy of the projections

Projections of time series usually differ from the final reported data due to errors from many sources. This is because of the inherent nature of the statistical universe from which the basic data are obtained and the properties of projection methodologies, which depend on the validity of many assumptions.

The mean absolute percentage error (MAPE) is one way to express the forecast accuracy of past projections. This measure expresses the average absolute value of errors over past projections in percentage terms. For example, an analysis of projection errors over the past 33 editions of *Projections of Education Statistics* indicates that the MAPEs for public school enrollment in grades preK–12 for lead times of 1, 2, 5, and 10 years were 0.3, 0.5, 1.2, and 2.4 percent, respectively. For the 1-year-out projection, this means that one would expect the projection to be within 0.3 percent of the actual value, on average.

For a list of MAPEs for selected national statistics in this publication, see table A-2 on page 76. Sections A.1 through A.6 each contain at least one text table (tables A through J) that presents the MAPEs for the key national statistics of that section. Each text table appears directly after the discussion of accuracy of that section’s national projections. For a list of MAPEs by state and region for public elementary and secondary enrollment, see tables A-7 through A-9 on pages 85–87 and for a list of MAPEs by state and region for the number of high school graduates in public schools, see table A-10 on page 93.

Tables A-3 and A-4 present an example of how the MAPEs were constructed using actual values for total enrollment in degree-granting postsecondary institutions projections for schools years 2012–13 through 2015–16 and enrollment projections from the last four editions of *Projections of Education Statistics*. The top two panels of table A-3 shows the actual values for school years 2012–13 through 2015–16 and enrollment projections for each year from *Projections of Education Statistics to 2022* with the number of projections generally decreasing by one for each subsequent edition. The bottom panel of table A-3 shows the percentage differences between the actual values and the projected values. For example, the projected value for 2012–13 presented in *Projections of Education Statistics to 2022* was 1.6 percent higher than the actual value for that year.

The top panel of table A-4 shows the absolute value of the percent differences from table A-3 arranged by lead time rather than year. For example, in the *Projections of Education Statistics to 2022*, the last year of actual data reported was 2012–13 and thus the lead time for the projection of 2012–13 data was 1 year. Thus, the 1.6 appearing in the 2012–13 column of Table A-3 for *Projections of Education Statistics to 2022* appears in the column for lead times of 1 year in Table A-4, indicating that projection of the one-year-out forecast from *Projections of Education Statistics to 2022* differed by 1.6 percent in absolute terms from its actual value. The MAPEs for each lead time shown in the bottom panel of table A-4 were calculated by computing the average of the absolute values of the percentage differences for that lead time. For example, actual values are available to calculate the absolute values of the percentage differences for a lead time of 2 years for the first three editions of the *Projections of Education Statistics* listed in table A-4. These absolute values are 4.1, 4.0, and 1.3. The MAPE for a lead time of 2 years was then calculated by taking the average of these numbers, or 3.1. This matches the MAPE that appears in the bottom panel for a lead time of 2 years. (Calculations for table A-3 are based on unrounded numbers.) These MAPEs are different from the MAPEs for public elementary and secondary enrollment projections elsewhere in this report because the MAPEs in the example were calculated using only the last four editions of *Projections of Education Statistics*.

The number of years used in the analyses of the projection errors differ both because projections of additional education statistics have been added to the report over time and because, in some cases, there have been substantial changes in the methodology used to produce the projections such that the MAPEs for the earlier projections are no longer relevant. MAPEs are presented for a statistic only after it has been produced using substantially the same methodology in five previous editions of *Projections of Education Statistics* and there are at least 5 years of historical data for use in calculating the MAPEs.

Table A-1. Summary of forecast assumptions to 2026

Variable	Assumption
1	2
Demographic assumptions	
Population	Projections are consistent with the Census Bureau estimates ¹
18- to 24-year-old population	Census Bureau projection: average annual growth rate of -0.1%
25- to 29-year-old population	Census Bureau projection: average annual growth rate of 0.3%
30- to 34-year-old population	Census Bureau projection: average annual growth rate of 1.0%
35- to 44-year-old population	Census Bureau projection: average annual growth rate of 1.3%
Economic assumptions	
Disposable income per capita in constant dollars	Annual percent changes range between 0.9% and 2.0% with an annual growth rate of 1.6%
Education revenue receipts from state sources per capita in constant dollars	Annual percent changes range between 0.2% and 2.2% with an annual growth rate of 1.1%
Inflation rate	Inflation rate ranges between 1.9% and 2.6%
Unemployment rate (males)	
Ages 18 and 19	Remains between 14.5% and 15.1%
Ages 20 to 24	Remains between 9.0% and 9.5%
Age 25 and over	Remains between 3.7% and 3.8%
Unemployment rate (females)	
Ages 18 and 19	Remains between 13.2% and 13.8%
Ages 20 to 24	Remains between 7.5% and 7.8%
Age 25 and over	Remains between 3.8% and 4.1%

¹As the Census Bureau projections were not updated to reflect the most recent 2016 Census Bureau population estimates, the Census Bureau age-specific population projections for each year were adjusted by multiplying the ratio of the total Census Bureau estimate for 2016 to the total Census Bureau projection for 2016.

SOURCE: U.S. Department of Commerce, Census Bureau, Population Estimates, retrieved September 21, 2016 from <https://www2.census.gov/programs-surveys/popest/datasets/2010-2014/national/asrh/>; and Population Projections, retrieved August 4, 2015, from <https://www.census.gov/programs-surveys/popproj.html>; and IHS Global Inc., "U.S. Quarterly Macroeconomic Model, November 2016 Short-Term Baseline Projections." (This table was prepared March 2017.)

Table A-2. Mean absolute percentage errors (MAPEs), by lead time for selected statistics in all elementary and secondary schools and degree-granting postsecondary institutions: MAPEs constructed using projections from *Projections of Education Statistics to 1984–85* through *Projections of Education Statistics to 2025*

Statistic	Lead time (years)									
	1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10	11
Public elementary and secondary schools										
Prekindergarten–12 enrollment ¹	0.3	0.5	0.8	1.0	1.2	1.4	1.7	2.0	2.2	2.4
Prekindergarten–8 enrollment ¹	0.3	0.6	0.9	1.2	1.4	1.7	2.1	2.5	2.8	3.0
9–12 enrollment ¹	0.4	0.7	1.0	1.1	1.2	1.4	1.6	1.9	2.1	2.4
White ²	0.4	1.0	1.9	3.6	4.9	5.7	5.4	—	—	—
Black ²	0.6	1.5	2.4	3.3	4.2	4.3	2.6	—	—	—
Hispanic ²	0.9	1.3	1.7	3.2	4.0	4.5	1.0	—	—	—
Asian/Pacific Islander ²	0.8	2.2	3.7	5.8	8.6	9.4	8.2	—	—	—
American Indian/Alaska Native ²	1.4	3.1	5.7	12.5	16.0	19.3	20.2	—	—	—
Elementary and secondary teachers ³	0.7	1.4	1.8	2.5	3.1	3.9	4.6	5.3	5.7	6.1
High school graduates ⁴	1.0	1.1	1.8	2.2	2.5	2.9	3.5	4.2	4.8	5.1
White ²	1.0	0.5	0.8	1.3	2.5	3.5	—	—	—	—
Black ²	2.3	3.0	3.5	5.8	7.1	9.3	—	—	—	—
Hispanic ²	3.6	4.5	6.6	13.2	16.9	16.2	—	—	—	—
Asian/Pacific Islander ²	1.5	2.6	2.8	1.6	2.3	0.5	—	—	—	—
American Indian/Alaska Native ²	1.9	1.8	3.7	6.9	8.8	7.8	—	—	—	—
Total current expenditures ⁵	1.7	2.5	2.7	2.6	2.8	3.8	5.0	6.0	6.2	6.2
Current expenditures per pupil in fall enrollment ⁵	1.7	2.4	2.6	2.6	2.9	3.7	4.9	5.9	6.7	6.9
Private elementary and secondary schools⁶										
Prekindergarten–12 enrollment	2.8	5.5	3.6	8.4	7.3	11.5	10.8	14.6	16.3	18.6
Prekindergarten–8 enrollment	3.1	5.8	3.8	9.6	8.3	14.0	13.7	17.9	20.7	22.2
9–12 enrollment	2.9	4.2	3.7	4.5	4.1	3.7	3.4	7.3	5.4	7.2
High school graduates	1.8	1.5	1.6	3.7	4.9	4.2	2.8	4.7	4.5	4.9
Degree-granting postsecondary institutions										
Total enrollment ⁷	1.5	2.6	4.0	5.1	5.9	5.9	6.6	7.5	9.0	10.3
Males ⁷	1.5	2.7	4.0	5.3	6.3	6.7	7.8	8.9	10.3	11.8
Females ⁷	1.7	2.7	4.3	5.1	5.6	5.3	5.8	6.7	8.6	10.3
4-year institutions ⁷	1.6	2.6	3.9	5.2	6.4	7.3	8.4	9.8	11.6	12.9
2-year institutions ⁷	2.9	4.1	5.7	6.0	5.9	4.4	5.0	6.3	8.5	9.4
White ⁸	2.2	4.2	6.2	7.4	7.6	6.4	6.1	5.7	7.4	9.1
Black ⁸	3.5	7.9	11.7	14.9	14.9	13.4	9.8	6.3	3.8	1.7
Hispanic ⁸	3.8	6.3	8.7	11.6	14.6	16.5	18.8	20.2	20.4	19.7
Asian/Pacific Islander ⁸	3.3	5.6	6.4	8.0	8.7	9.4	9.6	9.4	9.9	11.8
American Indian/Alaska Native ⁸	5.4	7.7	12.0	15.7	19.1	24.8	31.3	40.6	44.1	49.2
Total first-time freshman enrollment ⁹	3.0	5.3	7.2	8.4	8.2	7.2	6.2	5.7	—	—
Males ⁹	2.9	5.0	6.6	7.4	7.2	6.0	3.1	1.2	—	—
Females ⁹	3.3	5.6	7.8	9.2	9.4	9.7	8.9	9.6	—	—
Associate's degrees ⁹	2.8	5.5	8.1	11.5	12.9	13.9	14.6	15.1	—	—
Bachelor's degrees ⁹	0.6	0.6	1.1	2.4	3.6	5.1	5.8	6.2	—	—
Master's degrees ¹⁰	0.9	3.4	5.3	6.6	5.8	—	—	—	—	—
Doctor's degrees ¹⁰	0.2	0.1	0.1	1.3	0.8	—	—	—	—	—

— Not available.

¹MAPEs for public prekindergarten–12 enrollments were calculated using the last 33 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 1984–1985* through *Projections of Education Statistics to 2025*.

²MAPEs for public prekindergarten–12 enrollments and high school graduates by race/ethnicity were calculated using the last 7 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2019* through *Projections of Education Statistics to 2025*.

³Data for teachers expressed in full-time equivalents. MAPEs for teachers were calculated from the past 27 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 1997–98* through *Projections of Education Statistics to 2025*, excluding *Projections of Education Statistics to 2012* which did not include projections of teachers.

⁴MAPEs for public high school graduates were calculated from the past 26 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2000* through *Projections of Education Statistics to 2025*.

⁵In constant dollars based on the Consumer Price Index for all urban consumers, Bureau of Labor Statistics, U.S. Department of Labor. MAPEs for current expenditures were calculated using projections from the last 26 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 1997–98* through *Projections of Education Statistics to 2025*, excluding *Projections of Education Statistics to 2012* which did not include projections of current expenditures.

⁶MAPEs for private prekindergarten–12 enrollments and high school graduates were calculated from the past 15 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2011* through *Projections of Education Statistics to 2025*.

⁷MAPEs for total degree-granting postsecondary institution enrollment and degree-granting postsecondary institution enrollment by sex and level of institution were calculated using the last 19 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2007* through *Projections of Education Statistics to 2025*.

⁸MAPEs for degree-granting postsecondary institution enrollment by race/ethnicity were calculated using the last 11 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2015* through *Projections of Education Statistics to 2025*.

⁹MAPEs for degree-granting postsecondary institution first-time freshmen enrollment by sex, associate's degrees, and bachelor's degrees were calculated using the last eight editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2018* through *Projections of Education Statistics to 2025*.

¹⁰MAPEs for master's degrees, and doctor's degrees were calculated using the last five editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2021* through *Projections of Education Statistics to 2025*.

NOTE: Mean absolute percentage error is the average value over past projections of the absolute values of errors expressed in percentage terms. No MAPEs are presented for certain degrees conferred as the current models used for producing these projections have only been used for four other editions of *Projections of Education Statistics*. Calculations were made using unrounded numbers. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics*, various issues. (This table was prepared February 2017.)

Table A-3. Example of constructing mean absolute percentage errors (MAPEs) on fall enrollment in degree-granting institutions, part 1

Source	Year of data			
	2012–13	2013–14	2014–15	2015–16
1	2	3	4	5
	Enrollment in thousands			
Actual	20,644	20,377	20,207	19,977
	Projected enrollment in thousands			
<i>Projections of Education Statistics to 2022</i>	20,968	21,216	21,575	21,805
<i>Projections of Education Statistics to 2023</i>	†	20,597	21,011	21,266
<i>Projections of Education Statistics to 2024</i>	†	†	20,254	20,233
<i>Projections of Education Statistics to 2025</i>	†	†	†	20,264
	Percentage difference between actual and projected values			
<i>Projections of Education Statistics to 2022</i>	1.6	4.1	6.8	9.1
<i>Projections of Education Statistics to 2023</i>	†	1.1	4.0	6.5
<i>Projections of Education Statistics to 2024</i>	†	†	0.2	1.3
<i>Projections of Education Statistics to 2025</i>	†	†	†	1.4

† Not applicable.
 SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), IPEDS Spring 2012 through Spring

2016, Fall Enrollment component; and *Projections of Education Statistics*, various editions. (This exhibit was prepared February 2017.)

Table A-4. Example of constructing mean absolute percentage errors (MAPEs) on fall enrollment in degree-granting institutions, part 2

Source	Lead time (years)			
	1	2	3	4
1	2	3	4	5
	Absolute value of percentage difference between actual and projected values			
<i>Projections of Education Statistics to 2022</i>	1.6	4.1	6.8	9.1
<i>Projections of Education Statistics to 2023</i>	1.1	4.0	6.5	†
<i>Projections of Education Statistics to 2024</i>	0.2	1.3	†	†
<i>Projections of Education Statistics to 2025</i>	1.4	†	†	†
	Mean absolute percentage error			
Example	1.1	3.1	6.6	9.1

† Not applicable.
 NOTE: The mean absolute percentage errors presented in this table are for illustrative purpose only.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), IPEDS Spring 2012 through Spring 2016, Fall Enrollment component; and *Projections of Education Statistics*, various editions. (This exhibit was prepared February 2017.)

A.1. ELEMENTARY AND SECONDARY ENROLLMENT

Projections in this edition

This edition of *Projections of Education Statistics* presents projected trends in elementary and secondary enrollment from 2015 to 2026. These projections were made using three models:

- » The *National Elementary and Secondary Enrollment Projection Model* was used to project total, public, and private school enrollments for the nation by grade level and for ungraded elementary and ungraded secondary programs.
- » The *State Public Elementary and Secondary Enrollment Projection Model* was used to project total public school enrollments by grade level for individual states and regions.
- » The *National Public Elementary and Secondary Enrollment by Race/Ethnicity Projection Model* was used to project public school enrollments for the nation by race/ethnicity and grade level.

All three elementary and secondary enrollment models used the following same methods.

Overview of approach

Two methods were used in all the elementary and secondary enrollment models:

- » The *grade progression rate method* was used to project enrollments in grades 2 through 12. In this method, a rate of progression from each grade (1 through 11) to the next grade (2 through 12) was projected using single exponential smoothing. (For example, the rate of progression from grade 2 to grade 3 is the current year's grade 3 enrollment expressed as a percentage of the previous year's grade 2 enrollment.) To calculate enrollment for each year in the forecast period, the progression rate for each grade was applied to the previous year's enrollment in the previous grade.
- » The *enrollment rate method* was used to project prekindergarten, kindergarten, and first-grade enrollments as well as elementary special and ungraded and secondary special and ungraded enrollments. For each of these enrollment categories, the enrollment rate for the last year of actual data was used as the projected enrollment rate. To calculate enrollment for each year in the forecast period, the enrollment rate for each category was applied to the projected population in the appropriate age group.

Assumptions underlying these methods

The grade progression and enrollment rate methods assume that past trends in factors affecting public and private elementary and secondary school enrollments will continue over the forecast period. This assumption implies that all factors influencing enrollments will display future patterns consistent with past patterns. This method implicitly includes the net effect of such factors as migration, dropouts, deaths, nonpromotion, and transfers between public and private schools.

Procedures and equations used in all three elementary and secondary enrollment projection models

The notation and equations that follow describe the basic procedures used to project elementary and secondary enrollments in each of the three elementary and secondary enrollment projection models.

Let:

- i = Subscript denoting age
- j = Subscript denoting grade
- t = Subscript denoting time
- T = Subscript of the first year in the forecast period
- N_t = Enrollment at the prekindergarten (nursery) level
- K_t = Enrollment at the kindergarten level
- $G_{j,t}$ = Enrollment in grade j
- E_t = Enrollment in elementary special and ungraded programs
- S_t = Enrollment in secondary special and ungraded programs
- $P_{i,t}$ = Population age i

- $R_{j,t}$ = Progression rate for grade j
- RN_t = Enrollment rate for prekindergarten (nursery school)
- RK_t = Enrollment rate for kindergarten
- $RG_{1,t}$ = Enrollment rate for grade 1
- RE_t = Enrollment rate for elementary special and ungraded programs
- RS_t = Enrollment rate for secondary special and ungraded programs.

Step 1. Calculate historical grade progression rates for each of grades 2 through 12. The first step in projecting the enrollments for grades 2 through 12 using the grade progression method was to calculate, for each grade, a progression rate for each year of actual data used to produce the projections except for the first year. The progression rate for grade j in year t equals

$$R_{j,t} = G_{j,t}/G_{j-1,t-1}$$

Step 2. Produce a projected progression rate for each of grades 2 through 12. Projections for each grade's progression rate were then produced for the forecast period using single exponential smoothing. A separate smoothing constant, chosen to minimize the sum of squared forecast errors, was used to calculate the projected progression rate for each grade. Single exponential smoothing produces a single forecast for all years in the forecast period. Therefore, for each grade j , the projected progression rate, \hat{R}_j , is the same for each year in the forecast period.

Step 3. Calculate enrollment projections for each of grades 2 through 12. For the first year in the forecast period, T , enrollment projections, $\hat{G}_{j,t}$, for grades 2 through 12, were produced using the projected progression rates and the enrollments of grades 1 through 11 from the last year of actual data, $T-1$. Specifically,

This same procedure was then used to produce the projections for the following year, $T+1$, except that enrollment projections

$$\hat{G}_{j,T} = \hat{R}_j \cdot G_{j-1,T-1}$$

for year T were used rather than actual numbers:

$$\hat{G}_{j,T+1} = \hat{R}_j \cdot \hat{G}_{j,T}$$

The enrollment projections for grades 2 through 11 for year T were those just produced using the grade progression method. The projection for grade 1 for year T was produced using the enrollment rate method, as outlined in steps 4 and 5 below.

The same procedure was used for the remaining years in the projections period.

Step 4. For the last year of actual data, calculate enrollment rates for prekindergarten, kindergarten, grade 1, elementary special and ungraded, and secondary special and ungraded. The first step in projecting prekindergarten, kindergarten, first-grade, elementary special and ungraded, and secondary special and ungraded enrollments using the enrollment rate method was to calculate enrollment rates for each enrollment category for the last year of actual data, $T-1$, where:

$$\begin{aligned} RN_{T-1} &= N_{T-1}/P_{5,T-1} \\ RK_{T-1} &= K_{T-1}/P_{5,T-1} \\ RG_{1,T-1} &= G_{1,T-1}/P_{6,T-1} \\ RE_{T-1} &= E_{T-1}/\sum_{i=5}^{13} P_{i,T-1} \\ RS_{T-1} &= S_{T-1}/\sum_{i=14}^{17} P_{i,T-1} \end{aligned}$$

These enrollment rates were then used as the projected enrollment rates for each year in the forecast period (\widehat{RN} , \widehat{RK} , \widehat{RG}_1 , \widehat{RE} , and \widehat{RS}).

Step 5. Using the rates for the last year of actual data as the projected enrollment rates, calculate enrollment projections for prekindergarten through grade 1 and the ungraded categories. For each year in the forecast period, the enrollment rates were then multiplied by the appropriate population projections from the U.S. Census Bureau ($\hat{P}_{i,t}$) to calculate enrollment projections for prekindergarten (nursery school) (\hat{N}_t), kindergarten (\hat{K}_t), first grade ($\hat{G}_{1,t}$), elementary ungraded (\hat{E}_t), and secondary ungraded (\hat{S}_t)

$$\begin{aligned}\hat{N}_t &= \widehat{RN} \cdot \hat{P}_{5,t} \\ \hat{K}_t &= \widehat{RK} \cdot \hat{P}_{5,t} \\ \hat{G}_{1,t} &= \widehat{RG}_1 \cdot \hat{P}_{5,t} \\ \hat{E}_t &= \widehat{RE} \cdot \left(\sum_{i=5}^{13} \hat{P}_{i,t} \right) \\ \hat{S}_t &= \widehat{RS} \cdot \left(\sum_{i=14}^{17} \hat{P}_{i,t} \right)\end{aligned}$$

Step 6. Calculate total elementary and secondary enrollments by summing the projections for each grade and the ungraded categories. To obtain projections of total enrollment, projections of enrollments for the individual grades (prekindergarten through 12), elementary ungraded, and secondary ungraded were summed.

National Elementary and Secondary Enrollment Projection Model

This model was used to project national total, public, and private school enrollments by grade level and for ungraded elementary and ungraded secondary programs. National enrollment projections for public and private schools were developed separately, then added together to yield total elementary and secondary enrollment projections for the nation. To develop these projections, enrollment data from NCES were used, along with population estimates and projections from the U.S. Census Bureau. Below is information about the specific data used to develop the public school projections and the private school projections, as well as information about the grade progression rates and enrollment rates specific to public schools and private schools.

For details on procedures used to develop the projections, see “Procedures and equations used in all three elementary and secondary enrollment projection models,” earlier in this section of appendix A.

Data used to develop national elementary and secondary enrollment projections

Public school enrollment data. Public school enrollment data from the NCES *Statistics of Public Elementary and Secondary School Systems* for 1972 to 1980 and the NCES Common Core of Data (CCD) for 1981 to 2014 were used to develop the national public school enrollment projections.

Private school enrollment data. Private school enrollment data from the NCES Private School Universe Survey (PSS) for 1989–90, 1991–92, 1993–94, 1995–96, 1997–98, 1999–2000, 2001–02, 2003–04, 2005–06, 2007–08, 2009–10, 2011–12, and 2013–14 were used to develop the national private school enrollment projections. Since the PSS is collected in the fall of odd-numbered years, data for even-numbered years without a PSS collection were estimated by interpolating grade-by-grade progression data from PSS.

Population estimates and projections used for public school enrollment projections. Population estimates for 1972 to 2015 and population projections for 2016 to 2026 from the U.S. Census Bureau were also used to develop the public school enrollment projections. (See table B-1 on page 129 and table B-2 on page 130.) The set of population projections used in this year’s *Projections of Education Statistics* are the Census Bureau’s 2014 National Population Projections by age and sex (December 2014), adjusted to line up with the most recent historical estimates. This was done through the use of ratio adjustments in which, for each combination of state, age, and sex, the population projections from 2016 to 2026 were multiplied by the ratio of the population estimate for 2015 to the population projection for 2015.

Population estimates and projections used for private school enrollment projections. Population estimates for 1989 to 2015 and population projections for 2016 to 2026 from the U.S. Census Bureau were used to develop the private school enrollment projections. The population projections were ratio-adjusted to line up with the most recent historical estimates.

Grade progression and enrollment rates for national elementary and secondary enrollment projections

Public school grade progression and enrollment rates. Table A-5 on page 84 shows the public school grade progression rates for 2014 and projections for 2015 through 2026. Table A-6 on page 84 shows the public school enrollment rates for 2014 and projections for 2015 through 2026.

Accuracy of national elementary and secondary enrollment projections

Mean absolute percentage errors (MAPEs) for projections of public school enrollment were calculated using the last 33 editions of *Projections of Education Statistics*, while MAPEs for projections of private school enrollment were calculated using the last 15 editions. Table A, below, shows MAPEs for both public and private school enrollment projections.

Table A. Mean absolute percentage errors (MAPEs) of enrollment projections, by lead time, control of school, and grade in elementary and secondary schools: MAPEs constructed using projections from *Projections of Education Statistics to 1984–85* through *Projections of Education Statistics to 2025*

Statistic	Lead time (years)									
	1	2	3	4	5	6	7	8	9	10
Public elementary and secondary schools										
Prekindergarten–12 enrollment	0.3	0.5	0.8	1.0	1.2	1.4	1.7	2.0	2.2	2.4
Prekindergarten–8 enrollment	0.3	0.6	0.9	1.2	1.4	1.7	2.1	2.5	2.8	3.0
9–12 enrollment	0.4	0.7	1.0	1.1	1.2	1.4	1.6	1.9	2.1	2.4
Private elementary and secondary schools										
Prekindergarten–12 enrollment	2.8	5.5	3.6	8.4	7.3	11.5	10.8	14.6	16.3	18.6
Prekindergarten–8 enrollment	3.1	5.8	3.8	9.6	8.3	14.0	13.7	17.9	20.7	22.2
9–12 enrollment	2.9	4.2	3.7	4.5	4.1	3.7	3.4	7.3	5.4	7.2

NOTE: Mean absolute percentage error (MAPE) is the average value over past projections of the absolute values of errors expressed in percentage terms. MAPEs for public prekindergarten–12 enrollments were calculated using the last 33 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 1984–85* through *Projections of Education Statistics to 2025*. MAPEs for private prekindergarten–12 enrollments were calculated from the past 15 editions, from *Projections of Education Statistics to 2011* through *Projections of Education Statistics to 2025*. Calculations were made using unrounded numbers. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics*, various issues. (This table was prepared February 2017.)

For more information about MAPEs, see Section A.0. Introduction, earlier in appendix A.

State Public Elementary and Secondary Enrollment Projection Model

This edition of *Projections of Education Statistics* contains projected trends in public elementary and secondary enrollment by grade level from 2015 to 2026 for each of the 50 states and the District of Columbia, as well as for each region of the country. The state enrollment projections were produced in two stages:

- » first, an initial set of projections for each state was produced; and
- » second, these initial projections were adjusted to sum to the national public enrollment totals produced by the National Elementary and Secondary Enrollment Projection Model.

For each region, the enrollment projections equaled the sum of enrollment projections for the states within that region. The states within each geographic region can be found in appendix F.

Initial set of state projections

The same methods used to produce the national enrollment projections—namely, the grade progression rate method and the enrollment rate method—were used to produce the initial sets of public school enrollment projections for each state and the District of Columbia. A separate smoothing constant, chosen to minimize the sum of squared forecast errors, was used to calculate the projected progression rate for each combination of jurisdiction and grade.

For details on the procedures used to develop the initial sets of projections, see “Procedures and equations used in all three elementary and secondary enrollment projection models,” earlier in this section of appendix A.

Limitations of the grade progression method for state projections

The grade progression rate method assumes that past trends in factors affecting public school enrollments will continue over the forecast period. This assumption implies that all factors influencing enrollments will display future patterns consistent with past patterns. Therefore, this method has limitations when applied to states with unanticipated changes in migration rates. This method implicitly includes the net effect of such factors as migration, dropouts, deaths, nonpromotion, and transfers to and from private schools.

Adjustments to the state projections

The initial projections of state public school enrollments were adjusted to sum to the national projections of public school prekindergarten (preK)–12, preK–8, and 9–12 enrollments shown in table 1 on page 37. This was done through the use of ratio adjustments in which all the states' initial enrollment projections for each grade level were multiplied by the ratio of the national enrollment projection for that grade level to the sum of the state enrollment projections for that grade level.

Data used to develop state elementary and secondary enrollment projections

Public school enrollment data. Public school enrollment data from the NCES *Statistics of Public Elementary and Secondary School Systems* for 1980 and from the NCES Common Core of Data (CCD) for 1981 to 2014 were used to develop these projections.

Population estimates and projections. Population estimates for 1980 to 2015 from the U.S. Census Bureau and population projections for 2015 to 2026 from IHS Global Inc. were used to develop the state-level enrollment projections. This is the second edition of *Projections of Education Statistics* to use population projections from IHS Global Inc. rather than from the Census Bureau. The change was made because it had been many years since the Census Bureau had produced population projections at the state level. Unlike the old state-level Census population projections, the IHS Global Inc. state-level population projections were by age groups rather than individual ages. For each year, age-specific population projections for each state were produced for each age from 5 through 17 by applying that age's share of national projection for its age-group to the state-level projections for its age group.

Accuracy of state elementary and secondary enrollment projections

Mean absolute percentage errors (MAPEs) for projections of public school enrollment by state were calculated using the last 21 editions of *Projections of Education Statistics*. Tables A-7 through A-9 on pages 85–87 show MAPEs for preK–12, preK–8, and 9–12 enrollment in public elementary and secondary schools by state.

National Public Elementary and Secondary Enrollment by Race/Ethnicity Projection Model

This edition of *Projections of Education Statistics* contains projected trends in national public elementary and secondary enrollment by race/ethnicity from 2015 to 2026.

This is the fourth edition to include enrollment projections for students of Two or more races. As 2010 is the first year in which all 50 states and the District of Columbia reported enrollment data for students of Two or more races, enrollment projections for this category were produced using a different method than that used for the other five racial/ethnic groups.

Prior to 2008, there was a single category for students of Asian and/or Native Hawaiian or Other Pacific Islander origin. In 2008 and 2009, states could choose to place these students in the single category, Asian and/or Native Hawaiian or Other Pacific Islander, or in one of three categories, (1) Asian, (2) Hawaiian or Other Pacific Islander, and (3) Two or more races (for students of both Asian and Hawaiian or Other Pacific Islander origin). Beginning in 2010, the option of using the single category was eliminated and states were required to place students in one of those three categories. For students of Asian and/or Native Hawaiian or Other Pacific Islander origin, projections were calculated for a single category, Asian/Pacific Islander. For 2008 and 2009, the count of the Asian/Pacific Islander students included the total of the Asian and/or Native Hawaiian or Other Pacific Islander students for states reporting one category and the counts for Asian students and Native Hawaiian or Other Pacific Islander students for states reporting three categories. Beginning in 2010, the count of the Asian/Pacific Islander students was the sum of the counts Asian students and Native Hawaiian or Other Pacific Islander students.

The enrollment projections by race/ethnicity were produced in two stages:

- » first, an initial set of projections by race/ethnicity was produced; and
- » second, these initial projections were adjusted to sum to the national totals.

Initial set of projections by race/ethnicity

The same methods used to produce the national enrollment projections—namely, the grade progression rate method and the enrollment rate method—were used to produce initial sets of projections for each of the following five racial/ethnic groups: White, Black, Hispanic, Asian/Pacific Islander, and American Indian/Alaska Native. A separate smoothing constant, chosen to minimize the sum of squared forecast errors, was used to calculate the projected progression rate for each combination of race/ethnicity and grade.

For details on the procedures used to develop the initial sets of projections, see “Procedures and equations used in all three elementary and secondary enrollment models,” earlier in this section of appendix A.

National enrollment projections for students of Two or more races by grade level were produced by taking the 2014 grade-level enrollment numbers for students of Two or more races and applying the growth rates from 2015 to 2026 of the U.S. Census Bureau’s age specific population projections for persons of Two or more races.

Adjustments to the projections by race/ethnicity

The initial projections of enrollments by race/ethnicity were adjusted to sum to the national projections of public school preK–12, preK–8, and 9–12 enrollments shown in table 1 on page 37. This was done through the use of ratio adjustments in which all the initial enrollment projections by race/ethnicity for each grade level were multiplied by the ratio of the national enrollment projection for that grade level to the sum of the initial enrollment projections by race/ethnicity for that grade level.

Data and imputations used to develop enrollment projections by race/ethnicity

Public school enrollment data. Public school enrollment data by grade level and race/ethnicity from the NCES Common Core of Data (CCD) for 1994 to 2014 were used to develop these projections. While projections by race/ethnicity were produced at the national level only, the national data used to develop these projections were constructed from state-level data on enrollment by grade level and race/ethnicity. In those instances where states did not report their enrollment data by grade level and race/ethnicity, the state-level data had to be examined and some imputations made in order to produce the national public school enrollment by grade level and race/ethnicity data. For example, in 1994, North Dakota did not report grade-level enrollment data by race/ethnicity. It did, however, report these numbers for 1995. So, to impute these numbers for 1994, North Dakota’s 1994 grade-level enrollment data were estimated by the state’s 1995 racial/ethnic distribution at each grade level.

Population estimates and projections. Population estimates for 2000 to 2015 and population projections for 2016 to 2026 from the U.S. Census Bureau were used to develop the enrollment projections by race/ethnicity. The set of population projections used in this year’s *Projections of Education Statistics* are the Census Bureau’s 2014 National Population Projections by age, sex, and race/ethnicity (December 2014), ratio-adjusted to line up with the most recent historical estimates.

Accuracy of enrollment projections by race/ethnicity

Mean absolute percentage errors (MAPEs) for projections of public school enrollment by race/ethnicity were calculated using the last seven editions of *Projections of Education Statistics*. Table B, below, shows MAPEs for public school enrollment by race/ethnicity projections.

Table B. Mean absolute percentage errors (MAPEs) of enrollment projections, by lead time and race/ethnicity: MAPEs constructed using projections from *Projections of Education Statistics to 1984–85* through *Projections of Education Statistics to 2025*

Statistic	Lead time (years)									
	1	2	3	4	5	6	7	8	9	10
Total enrollment	0.3	0.5	0.8	1.0	1.2	1.4	1.7	2.0	2.2	2.4
White	0.4	1.0	1.9	3.6	4.9	5.7	5.4	—	—	—
Black	0.6	1.5	2.4	3.3	4.2	4.3	2.6	—	—	—
Hispanic	0.9	1.3	1.7	3.2	4.0	4.5	1.0	—	—	—
Asian/Pacific Islander	0.8	2.2	3.7	5.8	8.6	9.4	8.2	—	—	—
American Indian/Alaska Native	1.4	3.1	5.7	12.5	16.0	19.3	20.2	—	—	—

— Not available.

NOTE: Mean absolute percentage error (MAPE) is the average value over past projections of the absolute values of errors expressed in percentage terms. MAPEs for public prekindergarten–12 enrollments were calculated using the last 33 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 1984–85* through *Projections of Education Statistics to 2025*. MAPEs for public prekindergarten–12 enrollments by race/ethnicity were calculated using the last seven editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2019* through *Projections of Education Statistics to 2025*. Calculations were made using unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics*, various issues. (This table was prepared February 2017.)

Table A-5. Actual and projected national public school grade progression rates: Fall 2014, and fall 2015 through fall 2026

Grade	Actual 2014	Projected 2015 through 2026
1	2	3
1 to 2	99.3	99.3
2 to 3	100.4	100.3
3 to 4	99.5	99.8
4 to 5	100.3	100.2
5 to 6	100.3	100.4
6 to 7	100.7	100.7
7 to 8	100.2	100.2
8 to 9	107.4	107.4
9 to 10	95.3	95.3
10 to 11	94.9	94.9
11 to 12	99.2	99.2

NOTE: The progression rate for a particular grade in a year equals the enrollment in the grade for that year divided by the enrollment in the previous grade in the previous year all multiplied by 100. For example, the progression rate for third-graders in 2014 equals the enrollment of third-graders in 2014 divided by the enrollment of second-graders in 2013, all multiplied by 100.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "State Nonfiscal Survey of Public Elementary/Secondary Education," 2013–14 and 2014–15; and National Elementary and Secondary Enrollment Projection Model, 1972 through 2026. (This table was prepared February 2017.)

Table A-6. Actual and projected national enrollment rates in public schools, by grade level: Fall 2014, and fall 2015 through fall 2026

Grade level	Actual 2014	Projected 2015 through 2026
1	2	3
Prekindergarten	34.2	34.2
Kindergarten	94.1	94.1
Grade 1	93.4	93.4
Elementary ungraded	0.2	0.2
Secondary ungraded	0.3	0.3

NOTE: The enrollment rate for each grade level equals the enrollment at that grade level divided by the population of that grade's base age, all multiplied by 100. The base age for each grade level is as follows: kindergarten, 5 years old; grade 1, 6 years old; elementary ungraded, 5 to 13 years old; and secondary ungraded, 14 to 17 years old. Projected values for 2015 through 2026 were held constant at the actual values for 2014.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "State Nonfiscal Survey of Public Elementary/Secondary Education," 2014–15; and National Elementary and Secondary Enrollment Projection Model, 1972 through 2026. (This table was prepared February 2017.)

Table A-7. Mean absolute percentage errors (MAPEs) for projected prekindergarten–12 enrollment in public elementary and secondary schools, by lead time, region, and state: MAPEs constructed using projections from *Projections of Education Statistics to 1984–85* through *Projections of Education Statistics to 2025*

Region and state	Lead time (years)									
	1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10	11
United States	0.3	0.5	0.8	1.0	1.2	1.4	1.7	2.0	2.2	2.4
Region										
Northeast	0.5	0.6	0.8	1.0	0.9	1.1	1.2	0.9	0.9	1.2
Midwest	0.2	0.4	0.5	0.6	0.8	1.0	1.2	1.4	1.5	1.6
South	0.4	0.8	1.2	1.7	2.0	2.4	2.9	3.5	4.0	4.4
West	0.5	0.8	1.1	1.5	1.9	2.1	2.4	2.5	2.4	2.1
State										
Alabama	0.6	0.7	1.0	1.4	2.0	2.5	3.2	4.1	4.8	5.3
Alaska	0.9	1.7	2.4	2.9	3.1	3.9	4.5	6.0	7.7	9.3
Arizona	2.0	3.0	4.4	6.2	8.0	9.3	10.3	11.1	11.9	11.3
Arkansas	0.5	1.0	1.5	2.1	2.8	3.5	4.2	4.6	4.9	5.3
California	0.5	0.9	1.3	2.0	2.3	2.7	3.2	3.6	3.9	4.3
Colorado	0.5	0.8	1.1	1.6	2.1	2.7	3.5	4.1	5.0	6.3
Connecticut	0.5	0.7	0.9	1.3	1.8	2.2	2.8	3.4	4.2	5.1
Delaware	0.7	1.3	1.6	2.2	2.9	3.6	4.6	5.3	6.3	7.3
District of Columbia	4.6	4.9	6.5	7.5	6.5	6.7	6.0	5.3	6.6	6.7
Florida	0.8	1.6	2.2	3.3	4.3	5.3	6.2	7.4	8.1	8.1
Georgia	0.6	1.2	1.7	2.5	3.1	3.8	4.7	5.4	5.9	6.3
Hawaii	1.6	2.6	3.4	4.8	6.5	7.8	9.3	10.8	12.6	14.5
Idaho	0.9	1.4	2.1	2.8	3.4	4.0	4.3	4.3	3.9	4.2
Illinois	0.5	0.7	0.9	1.1	1.3	1.6	1.8	2.3	2.5	2.7
Indiana	0.3	0.7	0.8	1.1	1.5	1.9	2.3	2.5	2.6	2.9
Iowa	0.6	0.9	1.2	1.5	1.8	2.0	2.2	2.4	2.9	3.4
Kansas	0.7	1.0	1.4	1.6	1.9	2.2	2.5	2.7	2.8	2.9
Kentucky	1.5	1.3	1.9	2.3	2.1	2.8	2.9	3.2	3.9	4.4
Louisiana	1.7	2.7	3.5	4.7	5.6	6.4	7.0	6.9	7.6	7.1
Maine	0.8	1.2	1.4	1.7	2.0	2.0	1.7	1.9	2.5	2.8
Maryland	0.5	0.8	1.1	1.6	2.1	2.4	2.5	2.2	2.0	2.3
Massachusetts	0.4	0.5	0.7	0.9	1.1	1.4	1.5	1.5	1.6	1.9
Michigan	0.6	1.4	1.8	2.4	3.0	3.6	4.2	5.0	5.7	5.9
Minnesota	0.4	0.5	0.7	0.9	1.1	1.3	1.5	1.6	1.7	2.0
Mississippi	0.4	0.9	1.2	1.5	1.7	1.9	2.2	2.5	2.9	3.3
Missouri	0.4	0.5	0.5	0.7	0.9	0.9	1.1	1.3	1.3	1.6
Montana	0.7	1.3	1.9	2.8	3.8	4.7	5.9	7.2	8.7	10.3
Nebraska	0.5	0.8	1.0	1.4	1.8	2.2	2.7	2.9	3.1	3.1
Nevada	1.0	1.7	2.7	4.4	6.2	7.8	9.8	11.3	12.7	14.0
New Hampshire	0.6	0.8	0.9	1.3	1.3	1.9	2.7	3.4	3.7	4.4
New Jersey	0.8	1.2	1.7	1.8	2.1	2.6	3.2	3.8	4.3	4.8
New Mexico	1.2	1.9	2.8	3.9	4.9	6.0	7.3	8.4	9.3	10.2
New York	0.8	1.1	1.5	1.9	2.2	2.7	2.9	2.7	2.6	2.7
North Carolina	0.8	1.4	2.1	3.1	3.8	4.5	5.2	5.5	6.2	7.0
North Dakota	0.8	1.5	2.4	3.3	4.3	5.9	7.2	8.3	9.1	9.9
Ohio	0.4	0.5	0.8	1.1	1.5	1.8	1.9	2.3	2.3	2.2
Oklahoma	0.8	1.3	1.8	2.5	3.1	3.7	4.3	5.0	5.9	6.9
Oregon	0.8	1.3	1.7	1.7	1.9	2.2	2.8	3.1	3.6	3.9
Pennsylvania	0.8	1.2	1.4	1.5	1.4	1.6	1.8	2.0	1.8	2.4
Rhode Island	1.0	1.5	2.2	2.9	3.4	3.5	3.8	3.6	3.6	4.0
South Carolina	0.7	1.1	1.5	2.1	2.6	3.1	3.7	4.4	4.8	5.4
South Dakota	1.2	2.0	3.1	4.3	5.4	6.3	7.2	7.8	8.0	8.7
Tennessee	0.9	1.2	1.6	2.0	2.3	2.6	3.2	3.8	3.7	3.7
Texas	0.7	1.2	1.7	2.4	3.0	3.7	4.6	5.6	6.4	7.1
Utah	1.4	1.7	2.0	3.2	3.7	4.5	5.5	5.6	6.6	7.2
Vermont	1.1	2.0	2.5	3.2	3.3	3.9	4.3	5.0	5.0	6.0
Virginia	0.4	0.6	0.8	1.2	1.6	1.8	2.3	2.8	3.3	3.7
Washington	0.4	0.7	1.0	1.4	1.7	2.0	2.2	2.6	2.8	3.3
West Virginia	0.5	0.7	1.0	1.4	1.9	2.4	3.1	3.7	4.5	5.0
Wisconsin	0.5	0.8	1.1	1.5	1.6	1.6	1.9	2.0	2.0	2.1
Wyoming	0.7	1.2	2.1	3.4	4.8	6.0	7.3	9.0	10.9	12.5

NOTE: Mean absolute percentage error (MAPE) is the average value over past projections of the absolute values of errors expressed in percentage terms. National MAPEs for public prekindergarten–12 enrollments were calculated using the last 33 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 1984–85* through *Projections of Education Statistics to 2025*. State MAPEs were calculated using the last 21 editions of *Pro-*

jections of Education Statistics, from *Projections of Education Statistics to 2005* through *Projections of Education Statistics to 2025*. Calculations were made using unrounded numbers. Some data have been revised from previously published figures. SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics*, various issues. (This table was prepared February 2017.)

Table A-8. Mean absolute percentage errors (MAPEs) for projected prekindergarten–8 enrollment in public elementary and secondary schools, by lead time, region, and state: MAPEs constructed using projections from *Projections of Education Statistics to 1984–85* through *Projections of Education Statistics to 2025*

Region and state	Lead time (years)									
	1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10	11
United States	0.3	0.6	0.9	1.2	1.4	1.7	2.1	2.5	2.8	3.0
Region										
Northeast	0.4	0.7	0.8	0.9	0.9	1.0	1.2	1.0	0.8	1.1
Midwest	0.2	0.4	0.5	0.7	0.8	1.0	1.1	1.2	1.4	1.5
South	0.5	1.0	1.5	2.0	2.5	2.9	3.6	4.3	4.7	5.1
West	0.5	1.0	1.4	1.9	2.2	2.5	2.8	3.0	3.0	2.8
State										
Alabama	0.6	1.0	1.4	1.9	2.5	3.1	3.8	4.6	5.1	5.2
Alaska	1.1	1.9	2.9	3.6	4.3	5.5	6.9	9.2	11.5	13.3
Arizona	1.9	2.9	4.5	6.1	7.6	9.4	10.2	11.0	11.2	10.8
Arkansas	0.7	1.2	1.9	2.6	3.5	4.3	5.1	5.4	5.8	6.2
California	0.7	1.3	1.8	2.6	3.1	3.7	4.3	4.8	5.3	5.9
Colorado	0.6	1.0	1.3	1.8	2.5	3.2	4.1	5.0	6.1	7.3
Connecticut	0.6	0.8	1.1	1.6	2.2	2.5	3.1	3.7	4.5	5.2
Delaware	0.9	1.4	1.8	2.6	3.2	4.0	5.2	6.0	7.0	8.3
District of Columbia	4.2	5.0	6.0	6.8	5.6	6.0	6.3	5.0	6.8	6.4
Florida	0.9	1.8	2.7	4.0	5.3	6.3	7.6	8.8	9.3	9.1
Georgia	0.8	1.5	2.2	3.1	3.9	4.5	5.6	6.4	6.8	7.1
Hawaii	1.8	3.0	3.9	5.5	7.8	9.5	11.6	13.9	16.3	18.3
Idaho	1.1	1.8	2.8	3.6	4.3	4.8	5.0	4.9	4.6	4.7
Illinois	0.6	0.9	1.1	1.4	1.6	2.0	2.2	2.8	2.9	3.0
Indiana	0.5	0.8	0.9	1.2	1.5	1.8	2.2	2.3	2.4	2.8
Iowa	0.7	1.1	1.5	2.1	2.7	3.1	3.5	3.8	4.3	4.6
Kansas	0.8	1.1	1.4	1.7	2.2	2.7	3.2	3.5	3.8	3.8
Kentucky	1.6	1.7	2.5	3.0	3.0	3.0	3.3	3.7	4.2	5.1
Louisiana	1.6	2.5	3.0	3.9	4.6	5.2	5.9	5.8	6.6	6.8
Maine	0.6	0.9	1.3	1.7	2.1	2.6	3.0	4.1	5.2	6.2
Maryland	0.5	0.8	1.3	1.8	2.4	2.9	3.2	3.2	3.3	3.8
Massachusetts	0.3	0.6	0.9	1.1	1.3	1.7	1.8	1.7	1.7	2.1
Michigan	0.6	1.3	1.7	2.5	3.0	3.6	4.3	5.4	6.1	6.2
Minnesota	0.4	0.5	0.8	1.1	1.2	1.4	1.5	1.3	1.4	1.6
Mississippi	0.6	1.1	1.5	2.0	2.4	2.7	2.9	3.4	3.7	3.8
Missouri	0.5	0.7	0.9	1.1	1.3	1.4	1.5	1.4	1.3	1.4
Montana	0.9	1.6	2.6	3.8	5.2	6.7	8.4	10.4	12.4	13.9
Nebraska	0.6	0.9	1.2	1.6	2.0	2.6	3.1	3.4	3.6	3.7
Nevada	1.1	2.4	4.0	6.2	8.5	10.5	12.9	14.8	16.3	17.4
New Hampshire	0.6	0.9	1.2	1.8	2.4	3.2	4.2	5.2	5.8	6.7
New Jersey	1.0	1.4	1.7	1.8	1.9	2.3	2.9	3.4	3.7	4.0
New Mexico	1.0	1.8	2.5	3.4	4.5	6.0	7.4	8.9	9.7	10.1
New York	0.6	0.9	1.2	1.8	2.3	2.5	2.8	2.7	2.6	2.7
North Carolina	1.0	1.8	2.7	3.9	4.7	5.5	6.2	6.9	7.7	8.5
North Dakota	1.1	2.1	3.2	4.3	5.5	7.4	9.0	10.4	11.2	11.8
Ohio	0.4	0.5	0.6	0.8	1.0	1.3	1.4	1.6	1.8	1.9
Oklahoma	1.1	1.7	2.4	3.2	3.9	4.7	5.4	6.2	7.1	8.2
Oregon	1.0	1.5	1.6	1.5	2.0	2.4	2.6	3.0	3.7	4.0
Pennsylvania	0.5	0.9	1.2	1.3	1.2	1.3	1.6	1.7	1.8	2.1
Rhode Island	1.1	1.7	2.2	3.1	3.6	3.9	4.5	4.4	4.6	5.4
South Carolina	0.9	1.3	1.7	2.4	2.8	3.4	3.9	4.5	5.0	5.8
South Dakota	1.3	2.1	3.1	4.8	6.2	7.7	8.7	9.9	10.4	10.6
Tennessee	0.8	1.2	1.8	2.2	2.4	2.5	2.7	3.4	3.4	3.5
Texas	0.8	1.5	2.2	3.1	3.8	4.4	5.4	6.4	7.1	7.8
Utah	1.3	1.7	2.1	3.1	3.7	4.6	5.5	6.2	7.3	7.7
Vermont	1.6	2.5	3.0	3.8	4.3	5.2	6.0	7.4	7.4	8.4
Virginia	0.5	0.7	0.8	1.2	1.6	2.1	2.6	3.2	3.7	4.0
Washington	0.5	0.7	1.0	1.5	1.8	2.2	2.3	2.7	2.8	3.1
West Virginia	0.6	0.7	1.0	1.4	1.9	2.4	3.1	3.8	4.6	5.1
Wisconsin	0.6	0.8	1.0	1.5	1.7	1.9	2.1	2.1	2.0	2.1
Wyoming	0.9	1.4	2.6	4.3	6.1	7.7	9.5	11.8	13.9	15.3

NOTE: Mean absolute percentage error (MAPE) is the average value over past projections of the absolute values of errors expressed in percentage terms. National MAPEs for public prekindergarten–8 enrollments were calculated using the last 33 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 1984–85* through *Projections of Education Statistics to 2025*. State MAPEs were calculated using the last 21 edi-

tions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2005* through *Projections of Education Statistics to 2025*. Calculations were made using unrounded numbers. Some data have been revised from previously published figures. SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics*, various issues. (This table was prepared February 2017.)

Table A-9. Mean absolute percentage errors (MAPEs) for projected grades 9–12 enrollment in public schools, by lead time, region, and state: MAPEs constructed using projections from *Projections of Education Statistics to 1984–85* through *Projections of Education Statistics to 2025*

Region and state	Lead time (years)									
	1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10	11
United States	0.4	0.7	1.0	1.1	1.2	1.4	1.6	1.9	2.1	2.4
Region										
Northeast	0.9	1.2	1.3	1.4	1.5	1.6	1.5	1.5	1.5	1.8
Midwest	0.4	0.7	0.9	1.0	1.1	1.2	1.5	1.8	1.8	1.9
South	0.4	0.8	1.3	1.6	1.8	2.0	2.1	2.4	2.8	3.6
West	0.5	0.8	1.1	1.3	1.5	1.5	1.8	2.0	1.9	1.3
State										
Alabama	0.8	1.3	1.8	2.4	2.8	3.6	4.3	5.2	6.1	6.9
Alaska	1.0	2.0	2.8	3.2	3.4	3.4	3.6	3.7	3.5	3.4
Arizona	3.6	5.6	7.5	8.6	9.0	9.3	10.4	11.3	13.6	13.0
Arkansas	0.4	0.9	1.2	1.4	1.7	2.0	2.3	2.9	3.2	3.5
California	0.4	0.9	1.3	1.8	2.1	2.3	2.5	2.7	2.4	2.2
Colorado	0.6	1.1	1.7	2.2	2.5	2.9	3.1	2.9	3.3	4.0
Connecticut	0.7	1.0	1.1	1.4	1.9	2.5	3.2	4.1	5.1	6.3
Delaware	1.2	1.7	2.0	2.4	2.7	3.1	3.7	3.8	4.9	6.2
District of Columbia	6.2	7.4	10.5	13.5	15.6	16.4	14.1	14.3	15.2	16.1
Florida	0.7	1.2	1.6	2.2	2.4	3.4	3.9	4.9	5.7	5.8
Georgia	0.5	0.9	1.3	1.6	1.9	2.5	3.0	3.6	4.3	5.0
Hawaii	1.5	2.2	3.0	3.8	4.2	4.8	5.3	5.9	5.7	6.8
Idaho	1.0	1.2	1.7	2.1	2.8	3.0	3.9	4.3	3.9	3.9
Illinois	0.7	0.9	1.2	1.4	1.6	2.1	2.4	2.9	2.9	3.2
Indiana	0.4	0.8	1.3	1.8	2.2	2.6	2.9	3.2	3.6	4.0
Iowa	0.7	0.8	1.1	1.1	1.5	1.7	2.1	2.4	2.5	2.8
Kansas	1.0	1.6	2.0	2.4	2.3	1.9	1.6	1.6	1.6	1.1
Kentucky	1.5	1.8	2.0	2.1	2.0	3.1	3.9	3.8	4.6	4.8
Louisiana	2.6	3.7	5.0	6.9	8.5	9.8	10.9	10.9	11.7	10.4
Maine	1.4	2.6	3.3	4.5	5.2	6.0	7.1	8.3	9.0	8.3
Maryland	0.5	0.8	1.2	1.7	1.9	2.2	2.3	2.3	2.0	1.8
Massachusetts	0.5	0.9	1.4	1.9	2.5	3.1	3.4	3.4	3.6	3.6
Michigan	1.3	2.1	2.8	3.3	3.8	4.3	5.4	6.5	7.9	8.9
Minnesota	0.5	0.8	1.0	1.3	1.5	1.8	2.0	2.3	2.7	3.2
Mississippi	0.6	1.2	1.9	2.4	2.8	3.2	3.7	4.3	4.7	4.7
Missouri	0.3	0.7	0.9	1.4	1.5	1.5	1.5	1.8	2.0	2.1
Montana	0.5	0.9	1.2	1.7	2.2	2.7	3.2	3.6	3.1	3.2
Nebraska	0.4	0.8	1.1	1.4	1.7	2.0	2.3	2.6	2.9	3.0
Nevada	1.2	2.1	2.7	3.0	3.6	4.6	5.8	7.9	9.3	9.3
New Hampshire	0.6	1.0	1.4	1.8	1.9	2.0	2.5	3.3	4.0	4.5
New Jersey	0.7	1.5	2.2	2.2	2.6	3.5	4.4	5.3	6.2	7.0
New Mexico	2.2	3.7	5.0	6.5	7.9	8.3	9.1	9.9	10.3	11.8
New York	1.4	2.2	2.4	2.7	2.7	3.3	3.3	3.5	3.7	3.4
North Carolina	1.0	1.3	1.5	1.7	2.3	2.7	3.1	3.0	3.6	5.0
North Dakota	0.7	1.2	1.7	2.3	3.2	4.2	5.2	6.5	7.6	8.2
Ohio	1.0	1.5	2.0	2.5	2.9	3.4	3.8	3.8	3.5	3.0
Oklahoma	0.4	0.8	1.2	1.7	2.1	2.4	2.8	3.3	4.1	4.9
Oregon	1.0	1.6	2.2	2.7	2.8	3.2	3.8	4.5	4.9	5.0
Pennsylvania	1.6	2.0	2.1	2.4	2.5	2.7	2.6	2.7	1.9	3.2
Rhode Island	0.8	1.5	2.3	3.4	4.2	4.8	4.7	4.5	4.1	4.5
South Carolina	0.7	1.3	1.9	2.4	3.0	3.6	4.1	4.6	4.7	5.4
South Dakota	1.5	2.7	4.1	5.7	7.1	7.6	8.4	9.7	10.1	10.3
Tennessee	1.8	2.0	2.6	3.6	4.4	5.0	5.6	6.1	5.8	6.0
Texas	0.5	1.0	1.5	2.0	2.4	2.7	3.2	4.0	5.0	6.1
Utah	1.7	2.1	2.1	3.8	4.0	4.9	6.3	5.4	6.2	7.1
Vermont	1.0	2.3	2.8	3.4	3.8	3.9	4.0	4.4	4.4	4.0
Virginia	0.5	0.9	1.4	2.1	2.6	2.9	3.0	3.0	3.1	3.3
Washington	0.6	0.9	1.2	1.6	2.1	2.4	3.0	3.5	4.1	4.6
West Virginia	0.6	0.8	1.1	1.5	2.1	2.8	3.6	4.2	4.7	4.9
Wisconsin	0.7	1.1	1.3	1.6	1.8	2.0	2.3	2.7	2.5	2.4
Wyoming	0.7	1.1	1.8	2.9	4.0	5.1	6.4	7.5	8.7	9.0

NOTE: Mean absolute percentage error (MAPE) is the average value over past projections of the absolute values of errors expressed in percentage terms. National MAPEs for public 9–12 enrollments were calculated using the last 33 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 1984–85* through *Projections of Education Statistics to 2025*. State MAPEs were calculated using the last 21 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2005* through *Projections of Education Statistics to 2025*. Calculations were made using unrounded numbers. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics*, various issues. (This table was prepared February 2017.)

A.2. ELEMENTARY AND SECONDARY TEACHERS

Projections in this edition

This edition of *Projections of Education Statistics* presents projected trends in elementary and secondary teachers, pupil/teacher ratios, and new teacher hires from 2015 to 2026. These projections were made using two models:

- » The *Elementary and Secondary Teacher Projection Model* was used to project the number of public school teachers, the number of private school teachers, and the total number of teachers for the nation. It was also used to project pupil/teacher ratios for public schools, private schools, and all elementary and secondary schools.
- » The *New Teacher Hires Projection Model* was used to project the number of new teacher hires in public schools, private schools, and all schools.

Overview of approach

Approach for numbers of teachers and pupil/teacher ratios

Public schools. Multiple linear regression was used to produce initial projections of public school pupil/teacher ratios separately for elementary and secondary schools. The initial projections of elementary pupil/teacher ratios and secondary pupil/teacher ratios were applied to enrollment projections to project the numbers of elementary teachers and secondary teachers, which were summed to get the total number of public school teachers. Final projections of the overall public school pupil/teacher ratios were produced by dividing total projected public school enrollment by the total projected number of teachers.

Assumptions underlying this method

This method assumes that past relationships between the public school pupil/teacher ratio (the dependent variable) and the independent variables used in the regression analysis will continue throughout the forecast period. For more information about the independent variables, see “Elementary and Secondary Teacher Projection Model,” later in this section of appendix A.

Private schools. Private school pupil/teacher ratios were projected by applying each year’s projected annual percentage change in the overall public school pupil/teacher ratio to the previous year’s private school pupil/teacher ratio. The projected private school pupil/teacher ratios were then applied to projected enrollments at private schools to produce projected numbers of private school teachers.

Assumptions underlying this method

This method assumes that the future pattern in the trend of private school pupil/teacher ratios will be the same as that for public school pupil/teacher ratios. The reader is cautioned that a number of factors could alter the assumption of consistent patterns of change in ratios over the forecast period.

Approach for new teacher hires

The following numbers were projected separately for public schools and for private schools:

- » *The number of teachers needed to fill openings when there is an increase in the size of the teaching workforce from one year to the next and the decrease in the number of replacement teachers needed if there is a decrease in the size of the teaching workforce from one year to the next.* This number was estimated based on continuation rates of teachers by their age.
- » *The number of teachers needed to fill openings due to an increase in the size of the teaching workforce from one year to the next.* This number was estimated by subtracting the projected number of teachers in one year from the projected number of teachers in the next year.

These two numbers were summed to yield the total number of “new teacher hires” for each control of school—that is, teachers who will be hired in a given year, but who did not teach in that control the previous year. A teacher who moves from one control to the other control (i.e., from a public to private school or from a private to a public school) is considered a new teacher hire, but a teacher who moves from one school to another school in the same control is not considered a new teacher hire.

Elementary and Secondary Teacher Projection Model

Projections for public schools were produced first. Projections for private schools were produced based partially on input from the public school projections. Finally, the public and private school projections were combined into total elementary and secondary school projections (not shown in the steps below).

Steps used to project numbers of teachers and pupil/teacher ratios

Public school teachers. The following steps were used for the public school projections:

Step 1. *Produce projections of pupil/teacher ratios for public elementary schools and public secondary schools separately.* Two separate equations were used—one for elementary schools and one for secondary schools. The equations for elementary and secondary schools included an AR(1) term for correcting for autocorrelation and the following independent variables:

- » *Independent variables for public elementary school pupil/teacher ratios*—(1) average teacher wage relative to the overall economy-level wage, and (2) level of education revenue from state sources in constant dollars per public elementary student.
- » *Independent variables for public secondary school pupil/teacher ratios*—(1) level of education revenue from state sources in constant dollars per public secondary student, and (2) the number of students enrolled in public secondary schools relative to the secondary school–age population.

To estimate the models, they were first transformed into nonlinear models and then the coefficients were estimated simultaneously by applying a Marquardt nonlinear least squares algorithm to the transformed equation.

For details on the equations, model statistics, and data used to project public school pupil/teacher ratios, see “Data and equations used for projections of teachers and pupil/teacher ratios,” below.

Step 2. *Produce projections of the number of teachers for public elementary schools and public secondary schools separately.* The projections of the public elementary pupil/teacher ratio and public secondary pupil/teacher ratio were applied to projections of enrollments in elementary schools and secondary schools, respectively, to produce projections of public elementary teachers and public secondary teachers.

Step 3. *Produce projections of the total number of teachers for public elementary and secondary schools combined.* The projections of public elementary teachers and public secondary teachers were added together to produce the projections of the total number of public elementary and secondary teachers.

Step 4. *Produce projections of the pupil/teacher ratio for public elementary and secondary schools combined.* The projections of total enrollment in public elementary and secondary schools were divided by the projections of the total number of public elementary and secondary teachers to produce projections of the overall pupil/teacher ratio in public elementary and secondary schools.

Private school teachers. The following steps were used for the private school projections:

Step 1. *Produce projections of the private school pupil/teacher ratio.* First, the estimate of the private school pupil/teacher ratio for 2014 was calculated by multiplying the private school pupil/teacher ratio estimate 2013 (the last year of actual data) by the percentage change from 2013 to 2014 in the public school pupil/teacher ratio. The same method was used to calculate the projections of the private school pupil/teacher ratio for 2015 through 2026. That is, each year’s projected annual percentage change in the public school pupil/teacher ratio was applied to the previous year’s private school pupil/teacher ratio.

Step 2. *Produce projections of the number of private school teachers.* The projected pupil/teacher ratios were applied to projected private school enrollments to produce projections of private school teachers from 2014 through 2026.

For information about the private school teacher and enrollment data used for the private school projections, see “Data and equations used for projections of teachers and pupil/teacher ratios,” below.

Data and equations used for projections of teachers and pupil/teacher ratios

Public school data used in these projections were by organizational level (i.e., school level), not by grade level. Thus, secondary school enrollment is not the same as enrollment in grades 9 through 12 because many jurisdictions count some grade 7 and 8 enrollment as secondary. For example, some jurisdictions may have 6-year high schools with grades 7 through 12.

Data used to estimate the equation for public elementary school pupil/teacher ratios. The following data were used to estimate the equation:

- » To compute the historical elementary school pupil/teacher ratios—Data on 1972–73 to 1980–81 enrollments in public elementary schools came from the NCES *Statistics of Public Elementary and Secondary Day Schools* and data on 1981–82 to 2014–15 enrollment came from the NCES Common Core of Data (CCD). The proportion of public school teachers who taught in elementary schools was taken from the National Education Association and then applied to the total number of public school teachers from the CCD to produce the number of teachers in elementary schools.

- » For 1973–74 and 1975–76, the education revenue from state sources data came from *Statistics of State School Systems*, published by NCES. For 1972–73, 1974–75, and 1976–77, the education revenue from state sources data came from *Revenues and Expenditures for Public Elementary and Secondary Education*, also published by NCES. For 1977–78 through 2013–14, these data came from the NCES Common Core of Data (CCD).

Estimated equation and model statistics for public elementary school pupil/teacher ratios. For the estimated equation and model statistics, see table A-10 on page 93. In the public elementary pupil/teacher ratio equation, the independent variables affect the dependent variable in the expected ways:

- » As the average teacher wage relative to the overall economy-level wage increases, the pupil/teacher ratio increases; and
- » As the level of education revenue from state sources in constant dollars per public elementary student increases, the pupil/teacher ratio decreases.

Data used to project public elementary school pupil/teacher ratios. The estimated equation was run using projected values for teacher salaries and education revenues from state sources from 2014–15 through 2026–27. For more information, see Section A.0. Introduction to Projection Methodology, earlier in this appendix and Section A.4 Expenditures for Public Elementary and Secondary Education later in this appendix.

Data used to estimate the equation for public secondary school pupil/teacher ratios. The following data were used to estimate the equation:

- » To compute the historical secondary school pupil/teacher ratios—Data on 1972–73 to 1980–81 enrollments in public elementary schools came from the NCES *Statistics of Public Elementary and Secondary Day Schools* and data on 1981–82 to 2014–15 enrollment came from the NCES Common Core of Data (CCD). The proportion of public school teachers who taught in secondary schools was taken from the National Education Association and then applied to the total number of public school teachers from the CCD to produce the number of teachers in secondary schools.
- » For 1973–74 and 1975–76, the education revenue from state sources data came from *Statistics of State School Systems*, published by NCES. For 1972–73, 1974–75, and 1976–77, the education revenue from state sources data came from *Revenues and Expenditures for Public Elementary and Secondary Education*, also published by NCES. For 1977–78 through 2013–14, these data came from the NCES Common Core of Data (CCD).
- » To compute the historical secondary school enrollment rate—Data on the secondary school-age population from 1972–73 to 2014–15 came from the U.S. Census Bureau. Data on enrollments in public secondary schools during the same period came from the CCD, as noted above.

Estimated equation and model statistics for public secondary school pupil/teacher ratios. For the estimated equation and model statistics, see table A-10 on page 93. In the public secondary pupil/teacher ratio equation, the independent variables affect the dependent variable in the expected way:

- » As enrollment rates (number of enrolled students relative to the school-age population) increase, the pupil/teacher ratio increases; and
- » As the level of education revenue from state sources in constant dollars per public secondary student increases, the pupil/teacher ratio decreases.

Data used to project public secondary school pupil/teacher ratios. The estimated equation was run using projections for education revenues, public secondary enrollments, and secondary school-age populations from 2014–15 through 2026–27. Secondary enrollment projections were derived from the enrollment projections described in Section A.1. Elementary and Secondary Enrollment. Population projections were from the Census Bureau’s 2014 National Population Projections by age and sex (December 2014), ratio-adjusted to line up with the most recent historical estimates.

Private school teacher and enrollment data. Private school data for 1989–90, 1991–92, 1993–94, 1995–96, 1997–98, 1999–2000, 2001–02, 2003–04, 2005–06, 2007–08, 2009–10, 2011–12, and 2013–14 came from the biennial NCES Private School Universe Survey (PSS). Since the PSS is collected in the fall of odd-numbered years, data for years without a PSS collection were estimated using data from the PSS.

Private school enrollment projections. Private school enrollments from 2015 to 2026 came from the projections described in Section A.1. Elementary and Secondary Enrollment, earlier in this appendix.

Accuracy of projections of numbers of teachers

Mean absolute percentage errors (MAPEs) for projections of public school teachers were calculated using the last 27 editions of *Projections of Education Statistics* that included projections of teachers. Table C, below, shows MAPEs for projections of the numbers of public school teachers. There was a change in the methodology for projecting private school teachers beginning with *Projections of Education Statistics to 2017*, and therefore there are too few years of data to present the MAPEs for private school teachers.

Table C. Mean absolute percentage errors (MAPEs) of projections of number of public elementary and secondary school teachers, by lead time: MAPEs constructed using projections from *Projections of Education Statistics to 1997–98* through *Projections of Education Statistics to 2025*

Statistic	Lead time (years)									
	1	2	3	4	5	6	7	8	9	10
Public elementary and secondary teachers	0.7	1.4	1.8	2.5	3.1	3.9	4.6	5.3	5.7	6.1

NOTE: MAPEs for teachers were calculated from the past 27 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 1997–98* through *Projections of Education Statistics to 2025*, excluding *Projections of Education Statistics to 2012*, which did not include projections of teachers. Calculations were made using unrounded numbers. Some data have been revised from previously published figures. Number of teachers reported in full-time equivalents.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics*, various issues. (This table was prepared February 2017.)

For more information about MAPEs, see Section A.0. Introduction to Projection Methodology, earlier in this appendix.

New Teacher Hires Projection Model

The New Teacher Hires Projection Model was estimated separately for public and private school teachers. The model produces projections of the number of teachers who were not teaching in the previous year, but who will be hired in a given year.

About new teacher hires

A teacher is considered to be a new teacher hire for a control of school (public or private) for a given year if the teacher teaches in that control that year but had not taught in that control in the previous year. Included among new teachers hires are: (1) teachers who are new to the profession; (2) teachers who had taught previously but had not been teaching the previous year; and (3) teachers who had been teaching in one control the previous year but have moved to the other control. Concerning the last category, if a teacher moves from one public school to a different public school, that teacher would not be counted as a new teacher hire for the purposes of this model. On the other hand, if a teacher moves from a public school to a private school, that teacher would be counted as a private school new teacher hire, since the teacher did not teach in a private school in the previous year.

The New Teacher Hires Projection Model measures the demand for teacher hires. Due to difficulties in defining and measuring the pool of potential teachers, no attempt was made to measure the supply of new teacher candidates.

Steps used to project numbers of new teacher hires

The steps outlined below provide a general summary of how the New Teacher Hires Projection Model was used to produce projections of the need for new teacher hires.

For more information about the New Teacher Hires Projection Model, see Hussar (1999).

First, the series of steps outlined below was used to produce projections of public school new teacher hires. Then, the same steps were used to produce projections of private school new hires. Finally, the public and private new teacher hires were combined to produce projections of total new teacher hires.

Step 1. *Estimate the age distribution of full-time-equivalent (FTE) teachers in 2011.* For this estimate, the age distribution of the headcount of school teachers (including both full-time and part-time teachers) in 2011 was applied to the national number of FTE teachers in the same year.

Step 2. *Project the number of new FTE teacher hires needed to replace those who left teaching between 2011 and 2012.*

- » Age-specific continuation rates for 2012 (due to data availability, 2008 continuation rates were used for private school new teacher hires) were applied to the FTE count of teachers by age for 2011, resulting in estimates of the number of FTE teachers who remained in teaching in 2012 by individual age.
- » The FTE teachers who remained in teaching by individual age were summed across all ages to produce a projection of the total number of FTE teachers who remained teaching in 2012.
- » The total projection of remaining FTE teachers in 2012 was subtracted from the total FTE teacher count for 2011 to produce the projected number of FTE teachers who left teaching.

Step 3. *Project the number of new FTE teacher hires needed due to the overall increase in the teacher workforce between 2011 and 2012.* The total number of FTE teachers in 2011 was subtracted from the total projected number of FTE teachers in 2012 to project the overall increase in the teaching workforce between 2011 and 2012.

Step 4. *Project the total number of new FTE teacher hires needed in 2012.* The number of FTE teachers who left teaching from step 2 was added to the projected net change in the number of FTE teachers from step 3 to project the total number of new FTE teacher hires needed in 2012.

Step 5. *Project the FTE count of teachers by age for 2012.* In this step

- » The age distribution for the headcount of newly hired teachers in 2011 was applied to the projected total number of new FTE teacher hires in 2012, resulting in the projected number of new FTE teacher hires by age.
- » For each individual age, the projected number of new FTE teacher hires was added to the projected number of remaining FTE teachers (from step 2, first bullet) to produce the projected FTE count of teachers by age for 2012.

Step 6. *Repeat steps 2 to 5 for each year from 2013 through 2026.*

- » In step 2
 - For public school teachers ages 22 through 66 and private school teachers ages 21 through 65, projections of age-specific continuation rates were used. A separate smoothing constant, chosen to minimize the sum of squared forecast errors, was used to calculate the projected progression rate for each age. (For a general description of the exponential smoothing technique, see Section A.0. Introduction to Projection Methodology, earlier in this appendix.)
 - For all other ages, the age-specific continuation rates for 2012 for public school teachers and 2008 for private school teachers (the last year of actual data) were used.
- » In step 3, projections of the numbers of FTE teachers were used for all years in which there were no actual teacher numbers. The projections of FTE teachers are described under “Elementary and Secondary Teacher Projection Model,” earlier in this section of appendix A.

Assumptions underlying this method

A number of assumptions are made in order to make these projections. They include that (1) the age distribution of FTE teachers in 2011 was similar to that of full-time and part-time teachers in that year (step 1); (2) the age-specific continuation rates for FTE teachers for each year from 2012 through 2026 are similar to either the projections produced using single exponential smoothing or the values for 2012, depending on the age of the teachers (step 2); (3) the age distribution for newly hired FTE teachers from 2012 through 2026 is similar to that of newly hired full-time and part-time teachers in 2011 (step 3); (4) the actual numbers of FTE teachers for each year from 2013 through 2026 are similar to projections of FTE teachers shown in table 8 on page 50; and (5) no economic or political changes further affect the size of the teaching force.

Data used for projections of new teacher hires

Data on numbers of public school teachers. The number of FTE teachers for 2012 and 2014 came from the NCES Common Core of Data (CCD).

Data on numbers of private school teachers. Private school data on the numbers of FTE teachers in 2003–04, 2005–06, 2007–08, 2009–10, 2011–12, and 2013–14 came from the biennial NCES Private School Universe Survey (PSS). Since the PSS is collected in the fall of odd-numbered years, data for years without a PSS collection were estimated using data from the PSS.

Data on the age distribution of public and private school teachers. Data on the age distribution of full-time and part-time public and private school teachers came from the 2011–12 NCES Schools and Staffing Survey (SASS). These data and their standard errors are shown in table A-11 on page 93.

Data on the age distribution of public and private new teacher hires. Data on the age distribution of newly hired full-time and part-time public and private school teachers came from the 2011–12 NCES Schools and Staffing Survey (SASS). These data and their standard errors are shown in table A-12 on page 93.

Data on and projections of age-specific continuation rates of public and private school teachers. The 2008 continuation rates came from the 2008–09 NCES Teacher Follow-Up Survey (TFS) and the 2012 continuation rates came from the 2012–13 TFS. Data from the 1994–95, 2000–01, and 2004–05 TFS were also used in the projection of age-specific continuation rates. The actual data, their standard errors, and the projections are shown in table A-13 on page 94.

Projections of the numbers of public and private elementary and secondary school teachers. These projections are described under “Elementary and Secondary Teacher Projection Model,” earlier in this section of appendix A.

Accuracy of projections of new teacher hires

No MAPEs are presented for new teacher hires as there has only been two additional years of historical data for this statistic since it was first included in *Projections of Education Statistics to 2018*.

Table A-10. Estimated equations and model statistics for public elementary and secondary teachers based on data from 1972 through 2014

Dependent variable	Equation ¹	R ²	Breusch-Godfrey Serial Correlation LM test statistic ²	Time period
1	2	3	4	5
Elementary	ln(RELENRTCH) = 3.81 + 0.07 ln(RSALARY) - 0.23 ln(RSGRNTLEENR) (48.434) (6.732) (-12.799)	0.99	.27 (0.872)	1972 to 2014
Secondary	ln(RSCENRTCH) = 4.17 - 0.22 ln(RSGRNTSCENR) + 0.72 ln(RSCENRPU) + .63 AR(1) (34.819) (-12.383) (5.453) (4.706)	0.98	2.22 (0.330)	1973 to 2014

¹AR(1) indicates that the model was estimated using least squares with the AR(1) process for correcting for first-order autocorrelation. To estimate the model, it was first transformed into a nonlinear model and then the coefficients were estimated simultaneously by applying a Marquardt nonlinear least squares algorithm to the transformed equation. For a general discussion of the problem of autocorrelation, and the method used to forecast in the presence of autocorrelation, see Judge, G., Hill, W., Griffiths, R., Lutkepohl, H., and Lee, T. (1985). *The Theory and Practice of Econometrics*. New York: John Wiley and Sons, pp. 315–318. Numbers in parentheses are *t*-statistics.

²The number in parentheses is the probability of the Chi-Square associated with the Breusch-Godfrey Serial Correlation LM Test. A *p* value greater than 0.05 implies that we do not reject the null hypothesis of no autocorrelation at the 5 percent significance level for a two-tailed test and 10 percent significance level for a one-tailed test, i.e., there is no autocorrelation present. For an explanation of the Breusch-Godfrey Serial Correlation LM test statistic, see Greene, W. (2000). *Econometric Analysis*. New Jersey: Prentice-Hall. NOTE: R² indicates the coefficient of determination.

RELENRTCH = Ratio of public elementary school enrollment to classroom teachers (i.e., pupil/teacher ratio).
RSCENRTCH = Ratio of public secondary school enrollment to classroom teachers (i.e., pupil/teacher ratio).
RSALARY = Average annual teacher salary relative to the overall economy wage in 2000 dollars.
RSGRNTLEENR = Ratio of education revenue receipts from state sources per capita to public elementary school enrollment in 2000 dollars.
RSGRNTSCENR = Ratio of education revenue receipts from state sources per capita to public secondary school enrollment in 2000 dollars.
RSCENRPU = The ratio of enrollment in public secondary schools to the 11- to 18-year-old population.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Elementary and Secondary Teacher Projection Model, 1972 through 2026. (This table was prepared February 2017.)

Table A-11. Percentage distribution of full-time and part-time school teachers, by age, control of school, and teaching status: School year 2011–12

Control of school and teaching status	Percent of total	Age distribution							
		Total	Less than 25 years	25–29 years	30–39 years	40–49 years	50–59 years	60–64 years	65 years or more
1	2	3	4	5	6	7	8	9	10
Public actual	100.0 (†)	100.0	2.8 (0.24)	12.5 (0.58)	28.9 (0.79)	25.1 (0.75)	23.1 (0.72)	6.1 (0.45)	1.4 (0.20)
Full-time	93.1 (0.46)	100.0	2.9 (0.25)	12.8 (0.60)	29.3 (0.85)	24.9 (0.81)	22.8 (0.76)	6.0 (0.48)	1.3 (0.21)
Part-time	6.9 (0.46)	100.0	1.9 (0.59)	8.7 (2.04)	23.4 (2.92)	27.5 (3.22)	27.0 (2.58)	8.7 (1.80)	2.9 (0.99)
Private actual	100.0 (†)	100.0	4.6 (1.35)	12.2 (1.26)	24.0 (1.58)	23.8 (1.57)	21.3 (1.57)	9.6 (0.97)	4.6 (0.93)
Full-time	79.4 (2.04)	100.0	4.7 (1.30)	12.5 (1.25)	25.6 (1.82)	23.8 (1.75)	21.1 (1.66)	9.0 (1.07)	3.3 (0.94)
Part-time	20.6 (2.04)	100.0	4.0 (1.90)	10.9 (3.14)	18.2 (4.31)	23.5 (3.39)	22.2 (3.15)	11.8 (3.09)	9.4 (2.60)

† Not applicable.
NOTE: Detail may not sum to totals because of rounding. Standard errors appear in parentheses. The 2011–12 data are the most recent data available.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey (SASS), “Public School Teacher Questionnaire,” 2011–12 and “Private School Teacher Questionnaire,” 2011–12; and unpublished tabulations. (This table was prepared February 2014.)

Table A-12. Percentage distribution of full-time and part-time newly hired teachers, by age and control of school: Selected school years, 1987–88 through 2011–12

Control of school and school year	Age distribution								
	Total	Less than 25 years	25–29 years	30–39 years	40–49 years	50–59 years	60–64 years	65 years or more	
1	2	3	4	5	6	7	8	9	
Public									
1987–88	100.0	17.7 (0.79)	23.7 (1.19)	33.0 (1.43)	21.2 (0.80)	4.0 (0.51)	0.3 ! (0.11)	‡ (†)	
1990–91	100.0	17.5 (1.06)	24.0 (1.35)	30.6 (1.33)	21.4 (1.28)	5.6 (0.65)	0.6 (0.18)	‡ (†)	
1993–94	100.0	16.2 (0.91)	28.7 (1.15)	24.9 (1.04)	24.6 (1.16)	5.0 (0.63)	0.5 (0.13)	0.2 ! (0.09)	
1999–2000	100.0	23.6 (1.28)	22.5 (0.97)	22.2 (1.10)	19.2 (0.90)	11.1 (0.88)	0.9 (0.23)	0.6 ! (0.26)	
2003–04	100.0	24.4 (1.21)	19.0 (1.23)	24.6 (1.10)	16.5 (1.18)	13.3 (0.93)	1.5 (0.29)	0.7 ! (0.29)	
2007–08	100.0	23.8 (1.75)	24.3 (1.79)	20.4 (1.56)	15.1 (0.94)	13.6 (1.22)	2.3 (0.39)	0.5 ! (0.22)	
2011–12	100.0	21.9 (2.46)	23.0 (2.93)	24.1 (2.79)	15.9 (2.79)	10.9 (2.58)	3.5 ! (1.35)	‡ (†)	
Private									
1987–88	100.0	17.0 (1.27)	22.8 (1.68)	32.5 (2.17)	17.9 (1.61)	5.3 (1.09)	‡ (†)	1.8 ! (0.77)	
1990–91	100.0	15.8 (1.47)	26.3 (1.83)	29.1 (1.86)	21.1 (1.67)	5.6 (0.88)	1.1 ! (0.40)	1.0 ! (0.42)	
1993–94	100.0	19.3 (1.13)	24.4 (1.19)	24.9 (1.49)	22.6 (1.18)	7.3 (0.85)	0.9 (0.20)	0.6 ! (0.23)	
1999–2000	100.0	18.5 (0.89)	17.2 (0.87)	24.1 (1.24)	22.1 (1.19)	14.0 (1.01)	2.6 (0.39)	1.5 (0.38)	
2003–04	100.0	17.1 (1.59)	16.0 (2.13)	23.0 (2.19)	22.8 (3.32)	15.3 (1.77)	3.6 (0.83)	2.1 (0.58)	
2007–08	100.0	14.3 (1.26)	18.2 (1.36)	23.2 (1.97)	23.6 (1.92)	14.4 (1.49)	4.2 (0.84)	2.1 ! (0.69)	
2011–12	100.0	14.9 ! (5.78)	20.7 (4.29)	27.5 (4.62)	17.4 (4.74)	10.8 (2.51)	5.3 ! (2.32)	‡ (†)	

† Not applicable.
! Interpret with caution. The coefficient of variation (CV) for this estimate is between 30 percent or greater.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.

NOTE: Detail may not sum to totals because of rounding. Standard errors appear in parentheses. The 2011–12 data are the most recent data available.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey (SASS), “Public School Teacher Questionnaire,” 1987–88 through 2011–12 and “Private School Teacher Questionnaire,” 1987–88 through 2011–12; and unpublished tabulations. (This table was prepared February 2014.)

Table A-13. Actual and projected continuation rates of full-time and part-time school teachers, by age and control of school: Selected school years, 1993–94 to 1994–95 through 2026–27 to 2027–28

Control of school and school year	Continuation rates, by age															
	Total		Less than 25 years		25–29 years		30–39 years		40–49 years		50–59 years		60–64 years		65 years or more	
	1	2	3	4	5	6	7	8	9							
Public actual																
1993–94 to 1994–95	93.4	(0.36)	96.2	(1.09)	90.0	(1.22)	93.3	(1.03)	96.1	(0.54)	93.7	(0.77)	69.5	(4.79)	65.9	(8.81)
1999–2000 to 2000–01	92.4	(0.38)	95.8	(0.98)	89.3	(7.38)	93.2	(2.76)	94.5	(0.61)	92.9	(4.58)	76.8	!	(29.18)	(†)
2003–04 to 2004–05	91.4	(0.55)	94.9	(1.79)	90.1	(1.71)	92.6	(0.93)	94.5	(0.78)	90.8	(0.81)	77.2	(3.00)	70.3	(9.40)
2007–08 to 2008–09	91.8	(0.45)	92.2	(1.95)	89.0	(2.33)	92.4	(1.29)	95.1	(1.06)	92.3	(1.23)	82.8	(3.97)	88.9	(4.26)
2011–12 to 2012–13	92.1	(0.65)	83.1	(9.79)	92.3	(1.39)	94.2	(1.14)	96.7	(0.53)	90.2	(1.38)	81.9	(3.11)	70.2	(12.44)
Public projected																
2012–13 to 2013–14	92.3	(†)	90.1	(†)	91.8	(†)	94.0	(†)	96.7	(†)	90.3	(†)	81.4	(†)	69.6	(†)
2013–14 to 2014–15	92.3	(†)	89.9	(†)	91.8	(†)	93.9	(†)	96.8	(†)	90.2	(†)	81.7	(†)	69.8	(†)
2014–15 to 2015–16	92.2	(†)	90.0	(†)	91.8	(†)	93.9	(†)	96.8	(†)	90.2	(†)	81.5	(†)	68.6	(†)
2015–16 to 2016–17	92.3	(†)	89.9	(†)	91.8	(†)	93.8	(†)	96.7	(†)	90.3	(†)	81.8	(†)	69.5	(†)
2016–17 to 2017–18	92.3	(†)	89.9	(†)	91.8	(†)	93.8	(†)	96.7	(†)	90.3	(†)	81.6	(†)	70.4	(†)
2017–18 to 2018–19	92.3	(†)	89.9	(†)	91.8	(†)	93.9	(†)	96.7	(†)	90.3	(†)	81.5	(†)	70.4	(†)
2018–19 to 2019–20	92.4	(†)	89.9	(†)	91.8	(†)	93.9	(†)	96.6	(†)	90.4	(†)	81.6	(†)	70.9	(†)
2019–20 to 2020–21	92.4	(†)	90.0	(†)	91.8	(†)	94.0	(†)	96.6	(†)	90.4	(†)	81.6	(†)	70.9	(†)
2020–21 to 2021–22	92.5	(†)	89.9	(†)	91.8	(†)	94.0	(†)	96.6	(†)	90.4	(†)	81.6	(†)	71.5	(†)
2021–22 to 2022–23	92.5	(†)	89.9	(†)	91.8	(†)	94.0	(†)	96.6	(†)	90.5	(†)	81.5	(†)	71.2	(†)
2022–23 to 2023–24	92.5	(†)	89.9	(†)	91.8	(†)	94.0	(†)	96.6	(†)	90.5	(†)	81.6	(†)	71.0	(†)
2023–24 to 2024–25	92.5	(†)	89.9	(†)	91.8	(†)	94.0	(†)	96.6	(†)	90.5	(†)	81.5	(†)	71.0	(†)
2024–25 to 2025–26	92.5	(†)	89.9	(†)	91.8	(†)	93.9	(†)	96.6	(†)	90.5	(†)	81.5	(†)	70.6	(†)
2025–26 to 2026–27	92.5	(†)	89.9	(†)	91.8	(†)	93.9	(†)	96.6	(†)	90.5	(†)	81.6	(†)	70.9	(†)
2026–27 to 2027–28	92.5	(†)	89.9	(†)	91.8	(†)	93.9	(†)	96.7	(†)	90.4	(†)	81.6	(†)	70.1	(†)
Private actual																
1993–94 to 1994–95	88.1	(0.74)	80.0	(4.42)	86.9	(1.64)	85.1	(1.70)	91.3	(1.14)	91.8	(1.52)	86.9	(2.74)	58.1	(8.67)
1999–2000 to 2000–01	83.0	(0.72)	61.7	(4.90)	72.2	(2.76)	80.2	(1.57)	86.1	(1.47)	92.3	(1.00)	78.8	(4.79)	75.2	(5.17)
2003–04 to 2004–05	83.3	(2.06)	75.4	(5.97)	71.7	(3.62)	82.2	(2.30)	86.8	(2.28)	89.2	(9.17)	80.1	(4.15)	79.5	(6.07)
2007–08 to 2008–09	82.2	(1.69)	77.7	(8.33)	71.7	(6.44)	79.1	(3.43)	86.1	(2.92)	86.8	(2.17)	85.2	(4.21)	77.3	(8.23)
Private projected																
2012–13 to 2013–14	81.5	(†)	69.1	(†)	73.2	(†)	80.2	(†)	86.0	(†)	88.1	(†)	80.0	(†)	75.9	(†)
2013–14 to 2014–15	81.2	(†)	68.7	(†)	73.2	(†)	80.2	(†)	86.1	(†)	87.6	(†)	79.9	(†)	75.4	(†)
2014–15 to 2015–16	81.5	(†)	70.2	(†)	73.4	(†)	80.2	(†)	86.0	(†)	87.5	(†)	79.5	(†)	77.9	(†)
2015–16 to 2016–17	81.6	(†)	69.3	(†)	73.3	(†)	80.1	(†)	86.2	(†)	87.9	(†)	80.0	(†)	76.7	(†)
2016–17 to 2017–18	81.4	(†)	69.1	(†)	73.3	(†)	80.1	(†)	85.8	(†)	87.7	(†)	80.3	(†)	75.9	(†)
2017–18 to 2018–19	81.4	(†)	69.2	(†)	73.4	(†)	80.1	(†)	85.9	(†)	87.6	(†)	79.6	(†)	77.1	(†)
2018–19 to 2019–20	81.4	(†)	69.2	(†)	73.3	(†)	80.1	(†)	86.0	(†)	87.7	(†)	79.4	(†)	77.3	(†)
2019–20 to 2020–21	81.4	(†)	69.2	(†)	73.3	(†)	80.2	(†)	86.0	(†)	87.8	(†)	79.8	(†)	76.3	(†)
2020–21 to 2021–22	81.4	(†)	69.2	(†)	73.2	(†)	80.2	(†)	85.9	(†)	87.7	(†)	79.8	(†)	76.8	(†)
2021–22 to 2022–23	81.3	(†)	69.2	(†)	73.2	(†)	80.2	(†)	86.0	(†)	87.6	(†)	79.8	(†)	76.0	(†)
2022–23 to 2023–24	81.3	(†)	69.2	(†)	73.2	(†)	80.2	(†)	85.9	(†)	87.7	(†)	80.1	(†)	75.3	(†)
2023–24 to 2024–25	81.3	(†)	69.2	(†)	73.2	(†)	80.2	(†)	85.9	(†)	87.7	(†)	80.2	(†)	75.9	(†)
2024–25 to 2025–26	81.3	(†)	69.2	(†)	73.2	(†)	80.2	(†)	86.0	(†)	87.7	(†)	79.6	(†)	76.0	(†)
2025–26 to 2026–27	81.3	(†)	69.2	(†)	73.2	(†)	80.2	(†)	85.9	(†)	87.8	(†)	79.6	(†)	75.8	(†)
2026–27 to 2027–28	81.3	(†)	69.2	(†)	73.2	(†)	80.2	(†)	85.9	(†)	87.7	(†)	80.0	(†)	75.8	(†)

† Not applicable.

! Interpret with caution. The coefficient of variation (CV) for this estimate is between 30 percent or greater.

‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.

NOTE: The continuation rate for teachers for each control of school (public schools and private schools) is the percentage of teachers in that control who continued teaching in the

same control from one year to the next. Standard errors appear in parentheses. The 2012–13 data are the most recent data available for public school teachers and the 2008–09 data are the most recent data available for private school teachers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Teacher Follow up Survey (TFS), “Public School Teacher Questionnaire,” 1994–95 through 2008–09 and “Private School Teacher Questionnaire,” 1994–95 through 2012–13; and unpublished tabulations. (This table was prepared February 2017.)

A.3. HIGH SCHOOL GRADUATES

Projections in this edition

This edition of *Projections of Education Statistics* presents projected trends in the number of high school graduates from 2014–15 to 2026–27. These projections were made using three models:

- » The *National High School Graduates Projection Model* was used to project the number of public high school graduates, the number of private high school graduates, and the total number of high school graduates for the nation.
- » The *State Public High School Graduates Projection Model* was used to project the number of public high school graduates for individual states and regions.
- » The *National Public High School Graduates by Race/Ethnicity Projection Model* was used to project the number of public high school graduates for the nation by race/ethnicity.

Overview of approach

All the high school graduates models first calculated the number of high school graduates as a percentage of grade 12 enrollment based on historical data. Single exponential smoothing was used to project this percentage. The projected percentage was then applied to projections of grade 12 enrollment.

Assumptions underlying this approach

The percentage of 12th-graders who graduate was assumed to remain constant at levels consistent with the most recent rates. This methodology assumes that past trends in factors affecting graduation rates, such as dropouts, migration, and public or private transfers, will continue over the forecast period. No specific assumptions were made regarding the dropout rate, retention rate, or the rate at which alternative credentials are awarded. The combined effect of these proportions is reflected implicitly in the graduate proportion. In addition to student behaviors, the projected number of graduates could be affected by changes in graduation requirements, but this is not considered in the projections in this report.

Procedures used in all three high school graduates projection models

The following steps were used to project the numbers of high school graduates:

Step 1. *For each year in the historic period, express the number of high school graduates as a percentage of grade 12 enrollment.* This value represents the approximate percentage of 12th graders who graduate. For information about the specific historical data and analysis periods used for the National High School Graduates Model, the State Public High School Graduates Model, and the National Public High School Graduates by Race/Ethnicity Model, see the description of the appropriate model, later in this section of appendix A.

Step 2. *Project the percentage of 12th-graders who graduate from step 1.* This percentage was projected using single exponential smoothing with a smoothing constant chosen to minimize the sum of squared forecast errors. Because single exponential smoothing produces a single forecast for all years in the forecast period, the same projected percentage of grade 12 enrollment was used for each year in the forecast period.

Step 3. *Calculate projections of the numbers of high school graduates.* For each year in the forecast period, the projected percentage from step 2 was applied to projections of grade 12 enrollment to yield projections of high school graduates.

National High School Graduates Projection Model

This model was used to project the number of public high school graduates, the number of private high school graduates, and the total number of high school graduates for the nation. Public and private high school graduates were projected separately. The public and private projections were then summed to yield projections of the total number of high school graduates for the nation.

For details of the procedures used to develop the projections, see “Procedures used in all three high school graduates projection models,” above.

Data used in the National High School Graduates Projection Model

Public school data on graduates and grade 12 enrollment. Data on public school 12th-grade enrollments and high school graduates from the NCES *Statistics of Public Elementary and Secondary School Systems* for 1972–73 to 1980–81 and the NCES Common Core of Data (CCD) for 1981–82 through 2005–06 were used to develop national projections of public high school. Also, for 2006–07 through 2013–14, data on public school 12th-grade enrollments from the CCD and data on high school graduate from the “State Dropout and Completion Data File” were used.

Private school data on graduates and grade 12 enrollment. Data on private school 12th-grade enrollments for 1989–90 through 2013–14 and high school graduates for 1988–89 through 2012–13 were used to develop national projections of private high school graduates. The data were from the biennial NCES Private School Universe Survey (PSS) from 1989–90 to 2013–14 with data for 12th grade enrollment the same as the year of the survey and the data for high school graduates for the preceding year (i.e., the 2013–14 PSS presents high school graduates for 2012–13). Since the PSS is collected in the fall of odd-numbered years, data for missing years were estimated using data from the PSS. For 12th grade enrollment, estimates for missing years were linear interpolations of the prior year’s and succeeding year’s actual values. For high school graduates, estimates for the missing years were the interpolations of the high school graduates to estimated 12th grade enrollment percentages for the prior and succeeding years multiplied by the estimated enrollments for the current year.

Public and private school enrollment projections for grade 12. Projections of grade 12 enrollment in public schools and in private schools were used to develop projections of public high school graduates and private high school graduates, respectively. The grade 12 enrollment projections were made using the grade progression method. For more information, see Section A.1. Elementary and Secondary Enrollment, earlier in this appendix.

Accuracy of national high school graduates projections

Mean absolute percentage errors (MAPEs) for projections of graduates from public high schools were calculated using the last 26 editions of *Projections of Education Statistics*, while MAPEs for projections of graduates from private high schools were calculated using the last 15 editions. Table D, below, shows MAPEs for both public and private school graduation projections.

Table D. Mean absolute percentage errors (MAPEs) of projections of high school graduates, by lead time and control of school: MAPEs constructed using projections from *Projections of Education Statistics to 2000* through *Projections of Education Statistics to 2025*

Statistic	Lead time (years)									
	1	2	3	4	5	6	7	8	9	10
Public high school graduates	1.0	1.1	1.8	2.2	2.5	2.9	3.5	4.2	4.8	5.1
Private high school graduates	1.8	1.5	1.6	3.7	4.9	4.2	2.8	4.7	4.5	4.9

NOTE: MAPEs for public high school graduates were calculated from the past 26 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2000* through *Projections of Education Statistics to 2025*. MAPEs for private high school graduates were calculated from the past 15 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2011* through *Projections of Education Statistics to 2025*. Calculations were made using unrounded numbers. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics*, various issues. (This table was prepared February 2017.)

For more information about MAPEs, see Section A.0. Introduction to Projection Methodology, earlier in appendix A.

State Public High School Graduates Projection Model

This edition of *Projections of Education Statistics* contains projections of public high school graduates from 2014–15 to 2026–27 for each of the 50 states and the District of Columbia, as well as for each region of the country. The state projections of high school graduates were produced in two stages:

- » first, an initial set of projections for each state was produced; and
- » second, these initial projections were adjusted to sum to the national public school totals produced by the National High School Graduates Projection Model.

For each region, the high school graduate projections equaled the sum of high school graduate projections for the states within that region.

Initial set of state projections

The same steps used to produce the national projections of high school graduates were used to produce an initial set of projections for each state and the District of Columbia. A separate smoothing constant, chosen to minimize the sum of squared forecast errors, was used to calculate the projected percentage of 12th grade enrollment for each jurisdiction.

For details on the steps used to develop the initial sets of projections, see “Procedures used in all three high school graduate projection models,” earlier in this section of appendix A.

Adjustments to the state projections

The initial projections of state public high school graduates were adjusted to sum to the national projections of public high school graduates shown in table 9 on page 51. This was done through the use of ratio adjustments in which all the states’ high school graduate projections were multiplied by the ratio of the national public high school graduate projection to the sum of the state public high school graduate projections.

Data used in the State Public High School Graduates Projection Model

Public school data on graduates and grade 12 enrollment at the state level. State-level data on public school high school graduates from the NCES *Statistics of Public Elementary and Secondary School Systems* for 1972–73 to 1980–81, the NCES Common Core of Data (CCD) for 1981–82 through 2004–05, and the “State Dropout and Completion Data File” for 2005–06 through 2013–14 were used to develop state-level projections of public high school graduates. State-level data on public school 12th-grade enrollments from the NCES *Statistics of Public Elementary and Secondary School Systems* for 1972–73 to 1980–81 and the NCES Common Core of Data (CCD) for 1981–82 through 2014–15 were also used.

Public school projections for grade 12 enrollment at the state level. State-level projections of grade 12 enrollment in public schools were used to develop the state-level projections of public high school graduates. The grade 12 enrollment projections were made using the grade progression method. For more information, see Section A.1. Elementary and Secondary Enrollment, earlier in this appendix.

Accuracy of state public high school graduate projections

Mean absolute percentage errors (MAPEs) for projections of the number of public high school graduates by state were calculated using the last 21 editions of *Projections of Education Statistics*. Table A-14 on page 99 shows MAPEs for the number of high school graduates by state.

National Public High School Graduates by Race/Ethnicity Projection Model

The projections of public high school graduates by race/ethnicity were produced in two stages:

- » first, an initial set of projections for each racial/ethnic group was produced; and
- » second, these initial projections were adjusted to sum to the national public school totals produced by the National High School Graduates Projection Model.

Initial set of projections by race/ethnicity

The same steps used to produce the national projections of high school graduates were used to produce an initial set of projections for each of the following five racial/ethnic groups: White, Black, Hispanic, Asian/Pacific Islander, and American Indian/Alaska Native. For example, the number of White public high school graduates was projected as a percentage of White grade 12 enrollment in public schools. A separate smoothing constant, chosen to minimize the sum of squared forecast errors, was used to calculate the projected percentage of 12th-grade enrollment for each racial/ethnic group. This is the third edition of *Projections of Education Statistics* to include projections for high school graduates of Two or more races. To produce an initial set of projections for this racial/ethnic group, the 2013–14 ratio of 12th-grade enrollment to high school graduates of the group were multiplied by the 12th-grade enrollment projections of the group from the data file used to produce table 6.

Adjustments to the projections by race/ethnicity

The projections of public high school graduates by race/ethnicity were adjusted to sum to the national projections of public high school graduates shown in table 9 on page 51. This was done through the use of ratio adjustments in which all high school graduate projections by race/ethnicity were multiplied by the ratio of the national high school graduate projection to the sum of the high school projections by race/ethnicity.

Data and imputations used in the Public High School Graduates by Race/Ethnicity Projection Model

Public school data on graduates and grade 12 enrollment by race/ethnicity. Data on public school high school graduates by race/ethnicity from the NCES Common Core of Data (CCD) for 1994–95 through 2004–05, and the “State Dropout and Completion Data File” for 2005–06 through 2013–14 were used to develop projections of public high school graduates by race/ethnicity. Data on public school 12th-grade enrollments by race/ethnicity from the NCES *Statistics of Public Elementary and Secondary School Systems* for 1972–73 to 1980–81 and the NCES Common Core of Data (CCD) for 1981–82 through 2014–15 were also used. In those instances where states did not report their high school graduate data by race/ethnicity, the state-level data had to be examined and some imputations made. For example, in 1994, Arizona did not report high school graduate data by race/ethnicity. It did, however, report grade 12 enrollment numbers by race/ethnicity for that year. So, to impute the high school graduate numbers by race/ethnicity for that year, Arizona’s total number of high school graduates for 1994 was multiplied by the state’s 1994 racial/ethnic distribution for grade 12 enrollment.

Public enrollment projections for grade 12 by race/ethnicity. Projections of grade 12 enrollment in public schools by race/ethnicity were used to develop the projections of public high school graduates by race/ethnicity. The grade 12 enrollment projections were made using the grade progression method. For more information, see Section A.1. Elementary and Secondary Enrollment, earlier in this appendix.

Accuracy of enrollment projections by race/ethnicity

Mean absolute percentage errors (MAPEs) for projections of the number of public high school graduates by race/ethnicity were calculated using the last seven editions of *Projections of Education Statistics*. Table E, below, shows MAPEs for public high school graduates by race/ethnicity projections.

Table E. Mean absolute percentage errors (MAPEs) of projections of public high school graduates, by lead time and race/ethnicity: MAPEs constructed using projections from *Projections of Education Statistics to 2000* through *Projections of Education Statistics to 2025*

Statistic	Lead time (years)									
	1	2	3	4	5	6	7	8	9	10
Total high school graduates	1.0	1.1	1.8	2.2	2.5	2.9	3.5	4.2	4.8	5.1
White	1.0	0.5	0.8	1.3	2.5	3.5	—	—	—	—
Black	2.3	3.0	3.5	5.8	7.1	9.3	—	—	—	—
Hispanic	3.6	4.5	6.6	13.2	16.9	16.2	—	—	—	—
Asian/Pacific Islander	1.5	2.6	2.8	1.6	2.3	0.5	—	—	—	—
American Indian/Alaska Native	1.9	1.8	3.7	6.9	8.8	7.8	—	—	—	—

— Not available.

NOTE: MAPEs for public high school graduates were calculated from the past 26 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2000* through *Projections of Education Statistics to 2025*. MAPEs for public high school graduates by race/ethnicity were calculated using the last 7 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2019* through *Projections of Education Statistics to 2025*. Calculations were made using unrounded numbers. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics*, various issues. (This table was prepared February 2017.)

Table A-14. Mean absolute percentage errors (MAPEs) for the projected number of high school graduates in public schools, by lead time, region, and state: MAPEs constructed using projections from *Projections of Education Statistics to 2000* through *Projections of Education Statistics to 2025*

Region and state	Lead time (years)									
	1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10	11
United States	1.0	1.1	1.8	2.2	2.5	2.9	3.5	4.2	4.8	5.1
Region										
Northeast	1.1	1.6	1.7	2.3	3.0	3.6	3.7	4.4	5.2	5.6
Midwest	1.1	0.9	1.5	1.8	2.4	2.8	2.8	3.0	3.3	3.3
South	1.1	1.5	2.5	3.1	3.7	4.5	5.0	6.0	6.9	7.9
West	1.7	2.0	2.6	3.7	3.5	3.5	3.0	2.7	3.4	3.4
State										
Alabama	3.1	3.1	2.8	5.1	6.1	7.3	8.2	8.5	9.5	10.3
Alaska	2.5	2.1	3.0	4.6	5.2	6.6	7.5	7.8	7.8	7.6
Arizona	7.6	8.0	10.0	12.6	11.4	11.6	13.8	11.6	10.5	12.5
Arkansas	1.3	1.6	2.0	2.5	2.9	2.4	2.3	2.8	3.1	3.9
California	2.4	2.5	3.3	4.6	5.0	5.2	5.2	4.4	5.1	5.0
Colorado	1.6	2.2	2.6	2.2	2.8	2.9	3.1	3.9	4.6	4.7
Connecticut	2.6	2.3	2.5	3.3	3.6	4.0	4.6	4.4	5.6	5.0
Delaware	1.9	2.5	3.2	4.6	3.9	4.9	5.0	6.0	6.7	7.6
District of Columbia	6.7	7.4	11.6	14.0	14.1	14.8	15.9	17.2	17.9	20.5
Florida	1.9	3.9	5.2	4.6	5.1	5.0	6.0	6.6	8.1	7.2
Georgia	1.9	2.7	3.5	5.5	7.4	8.4	9.1	9.4	10.2	10.1
Hawaii	3.3	3.8	4.4	5.4	8.2	8.9	10.9	11.8	13.4	14.5
Idaho	1.0	1.3	1.4	1.9	2.2	2.7	3.0	3.8	4.9	5.4
Illinois	2.5	2.1	2.9	3.6	3.8	3.7	5.4	4.4	5.1	6.5
Indiana	1.4	1.8	1.8	2.3	2.7	3.2	3.9	4.3	4.7	5.0
Iowa	1.4	1.2	1.9	2.0	2.7	2.7	2.5	2.5	2.5	2.7
Kansas	1.2	1.6	2.4	3.0	4.3	5.4	6.0	6.5	7.0	7.0
Kentucky	2.2	3.3	3.4	4.7	5.4	6.4	7.4	7.9	7.9	9.9
Louisiana	1.8	2.7	4.5	6.2	7.3	6.6	6.3	6.4	3.8	5.3
Maine	2.5	3.8	3.7	4.8	5.6	6.7	8.6	9.3	11.0	11.7
Maryland	1.2	1.2	1.8	1.7	2.4	2.8	3.3	3.3	3.5	4.6
Massachusetts	1.0	1.4	2.4	3.1	3.6	4.0	4.4	4.2	4.2	4.3
Michigan	2.9	3.8	4.5	5.6	5.5	5.5	7.1	8.0	8.7	9.5
Minnesota	2.1	1.2	1.5	1.8	2.2	2.4	2.9	3.6	4.0	4.7
Mississippi	1.4	1.6	2.2	2.5	3.5	4.3	4.4	5.1	5.5	5.7
Missouri	0.9	1.4	2.3	2.8	3.5	4.4	4.9	5.4	6.4	6.7
Montana	0.8	0.9	1.4	1.6	2.5	3.5	4.4	5.9	7.1	8.3
Nebraska	2.0	2.5	2.6	2.7	3.1	3.2	2.7	2.7	2.6	3.1
Nevada	4.7	7.1	8.8	9.8	8.8	9.3	8.6	9.5	11.1	12.8
New Hampshire	1.1	2.0	2.3	3.0	3.8	4.8	5.5	6.6	7.2	7.4
New Jersey	2.0	3.5	4.2	4.1	4.3	5.4	6.4	7.3	8.0	8.8
New Mexico	3.1	2.7	4.3	4.5	6.6	6.9	7.3	8.1	9.7	10.0
New York	1.8	2.9	3.3	5.0	6.1	7.4	8.2	9.2	9.8	10.5
North Carolina	1.9	2.4	3.6	4.1	4.9	5.6	5.9	6.8	7.8	10.2
North Dakota	1.2	1.7	2.1	2.8	3.4	3.6	4.0	4.5	5.3	7.1
Ohio	2.6	2.5	3.9	3.8	3.7	3.7	3.3	3.9	4.4	5.7
Oklahoma	1.2	1.4	1.7	1.6	2.2	2.9	3.3	3.5	3.7	4.4
Oregon	1.8	2.1	2.6	4.0	4.3	5.0	5.7	6.8	7.2	6.9
Pennsylvania	1.6	2.6	3.2	3.3	3.3	3.0	2.8	3.3	3.9	4.1
Rhode Island	1.3	1.2	2.1	1.9	2.5	3.0	4.2	5.1	5.4	5.1
South Carolina	1.7	3.2	3.1	5.3	6.7	8.2	8.6	9.0	9.0	9.5
South Dakota	2.2	2.9	3.2	5.0	7.7	8.4	9.7	10.9	12.5	13.8
Tennessee	4.2	6.1	7.9	11.1	13.5	15.5	15.8	16.4	16.2	15.4
Texas	2.4	3.5	4.7	6.0	6.5	7.4	8.3	9.7	11.3	13.0
Utah	4.6	5.6	5.3	6.2	6.1	4.9	4.8	4.9	4.3	2.3
Vermont	1.9	2.2	3.2	4.7	6.6	6.9	7.5	8.3	9.5	9.8
Virginia	1.4	2.1	2.7	4.0	4.8	4.8	4.3	3.6	3.9	4.4
Washington	1.8	1.9	2.7	2.6	3.0	3.8	4.1	4.2	5.5	5.4
West Virginia	0.6	1.0	1.8	1.9	2.4	3.5	3.8	5.0	5.4	6.0
Wisconsin	1.2	1.4	2.4	2.7	3.1	3.9	4.3	5.1	5.8	5.3
Wyoming	1.5	1.9	2.4	3.1	4.5	5.8	7.6	8.9	10.4	11.3

NOTE: Mean absolute percentage error (MAPE) is the average value over past projections of the absolute values of errors expressed in percentage terms. National MAPEs for public high school graduates were calculated using the last 26 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2000* through *Projections of Education Statistics to 2025*. State MAPEs were calculated using the last 21 editions of

Projections of Education Statistics, from *Projections of Education Statistics to 2005* through *Projections of Education Statistics to 2025*. Calculations were made using unrounded numbers. Some data have been revised from previously published figures.
SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics*, various issues. (This table was prepared February 2017.)

A.4. EXPENDITURES FOR PUBLIC ELEMENTARY AND SECONDARY EDUCATION

Projections in this edition

This edition of *Projections of Education Statistics* presents projections of total current expenditures for public elementary and secondary education, current expenditures per pupil in fall enrollment, and current expenditures per pupil in average daily attendance for 2014–15 through 2026–27.

As the source of the elementary and secondary private school data, the NCES Private School Universe Survey, does not collect data for current expenditures, there are no projections for private school current expenditures.

Overview of approach

Theoretical and empirical background

The Public Elementary and Secondary Education Current Expenditure Projection Model used in this report is based on the theoretical and empirical literature on the demand for local public services such as education.¹ Specifically, it is based on a type of model that has been called a median voter model. In brief, a median voter model posits that spending for each public good in the community (in this case, spending for education) reflects the preferences of the “median voter” in the community. This individual is identified as the voter in the community with the median income and median property value. The amount of spending in the community reflects the price of education facing the voter with the median income, as well as his income and tastes. There are competing models in which the level of spending reflects the choices of others in the community, such as government officials.

In a median voter model, the demand for education expenditures is typically linked to four different types of independent variables: (1) measures of the income of the median voter; (2) measures of intergovernmental aid for education going indirectly to the median voter; (3) measures of the price to the median voter of providing one more dollar of education expenditures per pupil; and (4) any other variables that may affect one’s tastes for education. The Public Elementary and Secondary Education Current Expenditure Projection Model contains independent variables of the first two types. It uses multiple linear regression analysis to define the relationships between these independent variables and current expenditures (the dependent variable).

Elementary and Secondary Education Current Expenditure Projection Model

Projections for current expenditures per pupil in fall enrollment were produced first. These projections were then used in calculating total expenditures and expenditures per pupil in average daily attendance.

Steps used to project current expenditures for public elementary and secondary education

Step 1. *Produce projections of education revenue from state sources.* The equation for education revenue included an AR(1) term for correcting for autocorrelation and the following independent variables:

- » disposable income per capita in constant dollars; and
- » the ratio of fall enrollment to the population.

To estimate the model, it was first transformed into a nonlinear model and then the coefficients were estimated simultaneously by applying a Marquardt nonlinear least squares algorithm to the transformed equation.

Step 2. *Produce projections of current expenditures per pupil in fall enrollment.* The equation for current expenditures per pupil for fall enrollment included an AR(1) term for correcting for autocorrelation and the following independent variables:

- » disposable income per capita in constant dollars; and
- » education revenue from state sources per capita in constant dollars. This variable was projected in step 1.

¹ For a discussion of the theory together with a review of some of the older literature, see Inman (1979). More recent empirical work includes Gamkhar and Oates (1996) and Mitias and Turnbull (2001).

To estimate the models, they were first transformed into nonlinear models and then the coefficients were estimated simultaneously by applying a Marquardt nonlinear least squares algorithm to the transformed equation.

For details on the equations used in steps 1 and 2, the data used to estimate these equations, and their results, see “Data and equations used for projections of current expenditures for public elementary and secondary education,” below.

Step 3. *Produce projections of total current expenditures.* Projections of total current expenditures were made by multiplying the projections for current expenditures per pupil in fall enrollment by projections for fall enrollment.

Step 4. *Produce projections of current expenditures per pupil in average daily attendance.* The projections for total current expenditures were divided by projections for average daily attendance to produce projections of current expenditures per pupil in average daily attendance.

All the projections were developed in 1982–84 dollars and then placed in 2015–16 dollars using the projections of the Consumer Price Index. Current-dollar projections were produced by multiplying the constant-dollar projections by projections for the Consumer Price Index. The Consumer Price Index and the other economic variables used in calculating the projections presented in this report were placed in school year terms rather than calendar year terms.

Data and equations used for projections of current expenditures for public elementary and secondary education

Data used to estimate the equations for revenue from state sources and current expenditures per pupil. The following data for the period from 1973–74 to 2013–14 were used to estimate the equations:

- » Current expenditures and revenues from state sources—For 1973–74 and 1975–76, the current expenditures data came from *Statistics of State School Systems*, published by NCES. For 1974–75 and 1976–77, the current expenditures data came from *Revenues and Expenditures for Public Elementary and Secondary Education*, also published by NCES. For 1977–78 through 2013–14, these data came from the NCES Common Core of Data (CCD) and unpublished data. For most years, the sources for the past values of revenue from state sources were identical to the sources for current expenditures.
- » Disposable personal income per capita—Disposable personal income data from the Bureau of Economic Analysis were divided by population data from the U.S. Census Bureau.
- » The ratio of fall enrollment to population data—Fall enrollment data from the CCD were divided by population data from the U.S. Census Bureau. (See table B-5 on page 133.)

Estimated equations and model statistics for revenue from state sources and current expenditures per pupil. For the results of the equations, see table A-15 on page 103. In each equation, the independent variables affect the dependent variable in the expected way. In the revenues from state sources equation:

- » All other things being equal, as disposable income per capita increases so does local governments’ education revenue from state sources per capita; and
- » As enrollment increases relative to the population, so does the local governments’ education revenue from state sources per capita.
- » In the current expenditures per pupil equation: All other things being equal, as disposable income per capita increases, so does current expenditures per pupil; and
- » As local governments’ education revenue from state sources per capita increases, so does current expenditures per pupil.

Projections for economic variables. Projections for economic variables, including disposable income and the Consumer Price Index, were from the “U.S. Quarterly Macroeconomic Model: November 2016 Short-Term Baseline Projections” from the economic consulting firm, IHS Global Inc. (see supplemental table B-5). This set of projections was IHS Global Inc.’s most recent set at the time the education projections in this report were produced. The values of all the variables from IHS Global Inc. were placed in school-year terms. The school-year numbers were calculated by taking the average of the last two quarters of one year and the first two quarters of the next year.

Projections for fall enrollment. The projections for fall enrollment are those presented in section 1 of this publication. The methodology for these projections is presented in Section A.1. Elementary and Secondary Enrollment, earlier in this appendix.

Projections for population. Population estimates for 1973 to 2015 and population projections for 2016 to 2026 from the U.S. Census Bureau were used to develop the public school current expenditure projections. The set of population projections used in this year’s *Projections of Education Statistics* are the Census Bureau’s 2014 National Population Projections (December 2014).

Historical data for average daily attendance. For 1973–74 and 1975–76, these data came from *Statistics of State School Systems*, published by NCES. For 1974–75 and 1976–77, the current expenditures data came from *Revenues and Expenditures for Public Elementary and Secondary Education*, also published by NCES. For 1977–78 through 2013–14, these data came from the CCD and unpublished NCES data.

Projections for average daily attendance. These projections were made by multiplying the projections for enrollment by the average value of the ratios of average daily attendance to enrollment from 1993–94 to 2013–14; this average value was approximately 0.93.

Accuracy of projections

Mean absolute percentage errors (MAPEs) for projections of current expenditures for public elementary and secondary education were calculated using the last 27 editions of *Projections of Education Statistics* that included projections of current expenditures. Table F, below, shows the MAPEs for projections of current expenditures.

Table F. Mean absolute percentage errors (MAPEs) of projections for total and per pupil current expenditures for public elementary and secondary education, by lead time: MAPEs constructed using projections from *Projections of Education Statistics to 1984–85* through *Projections of Education Statistics to 2025*

Statistic	Lead time (years)									
	1	2	3	4	5	6	7	8	9	10
Total current expenditures	1.7	2.5	2.7	2.6	2.8	3.8	5.0	6.0	6.2	6.2
Current expenditures per pupil in fall enrollment	1.7	2.4	2.6	2.6	2.9	3.7	4.9	5.9	6.7	6.9

NOTE: Expenditures were in constant dollars based on the Consumer Price Index for all urban consumers, Bureau of Labor Statistics, U.S. Department of Labor. MAPEs for current expenditures were calculated using projections from the last 27 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 1997–98* through *Projections of Education Statistics to 2025*, excluding *Projections of Education Statistics to 2012* which did not include projections of current expenditures. Calculations were made using unrounded numbers. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics*, various issues. (This table was prepared February 2017.)

For more information about MAPEs, see Section A.0. Introduction to Projection Methodology, earlier in this appendix.

Table A-15. Estimated equations and model statistics for current expenditures per pupil in fall enrollment for public elementary and secondary schools, and education revenue from state sources per capita based on data from 1973–74 to 2013–14

Dependent variable	Equation ¹	R ²	Breusch-Godfrey Serial Correlation LM test statistic ²	Time period
1	2	3	4	5
Current expenditures per pupil	ln(CUREXP) = 2.18 + 0.49ln(PCI) + 0.19ln(SGRANT) + 0.94AR(1) (1.889) (2.474) (2.301) (26.579)	0.996	5.74 (0.057)	1973–74 to 2013–14
Education revenue from state sources per capita ..	ln(SGRANT) = 7.73 + 0.95ln(PCI) + 1.34ln(ENRPOP) + 0.82AR(1) (1.981) (7.025) (3.069) (12.283)	0.984	1.57 (0.457)	1973–74 to 2013–14

¹AR(1) indicates that the model was estimated using least squares with the AR(1) process for correcting for first-order autocorrelation. To estimate the model, it was first transformed into a nonlinear model and then the coefficients were estimated simultaneously by applying a Marquardt nonlinear least squares algorithm to the transformed equation. For a general discussion of the problem of autocorrelation, and the method used to forecast in the presence of autocorrelation, see Judge, G., Hill, W., Griffiths, R., Lutkepohl, H., and Lee, T. (1985). *The Theory and Practice of Econometrics*. New York: John Wiley and Sons, pp. 315–318. Numbers in parentheses are *t*-statistics.

²The number in parentheses is the probability of the Chi-Square associated with the Breusch-Godfrey Serial Correlation LM Test. A *p* value greater than 0.05 implies that we do not reject the null hypothesis of no autocorrelation at the 5 percent significance level for a two-tailed test and 10 percent significance level for a one-tailed test (i.e., there is no

autocorrelation present). For an explanation of the Breusch-Godfrey Serial Correlation LM test statistic, see Greene, W. (2000). *Econometric Analysis*. New Jersey: Prentice-Hall.

NOTE: R² indicates the coefficient of determination.
CUREXP = Current expenditures of public elementary and secondary schools per pupil in fall enrollment in constant 1982–84 dollars.

SGRANT = Local governments' education revenue from state sources, per capita, in constant 1982–84 dollars.

PCI = Disposable income per capita in constant 2000 chained dollars.

ENRPOP = Ratio of fall enrollment to the population.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Public Elementary and Secondary Education Current Expenditure Projection Model, 1973–74 through 2026–27. (This table was prepared February 2017.)

A.5. ENROLLMENT IN DEGREE-GRANTING POSTSECONDARY INSTITUTIONS

Projections in this edition

This edition of *Projections of Education Statistics* presents projections of enrollment in degree-granting postsecondary institutions for fall 2016 through fall 2026. Three different models were used to produce these enrollment projections:

- » The *Enrollment in Degree-Granting Institutions Projection Model* produced projections of enrollments by attendance status, level of student, level of institution, control of institution, sex, and age. It also produced projections of full-time-equivalent enrollments by level of student, level of institution, and control of institution.
- » The *Enrollment in Degree-Granting Institutions by Race/Ethnicity Projection Model* produced projections of enrollments by race/ethnicity.
- » The *First-Time Freshmen Projection Model* produced projections of enrollments of first-time freshmen by sex.

Overview of approach

Basic features of the three degree-granting enrollment projection models

The Enrollment in Degree-Granting Institutions Projection Model is the primary model for projecting enrollment in degree-granting postsecondary institutions. For this model, enrollment rates by attendance status and sex are projected for various age categories using either the pooled seemingly unrelated regression method or the pooled seemingly unrelated regression method with a first-order autocorrelation correction. These rates are applied to projections of populations of the same sex and age to produce projections of enrollment by attendance status, sex, and age. To project enrollments by level of student, level of institution, and control of institution, rates for these characteristics are projected using single exponential smoothing and applied to enrollment projections previously produced by the model.

The Enrollment in Degree-Granting Institutions by Race/Ethnicity Projection Model takes an approach similar to that of the Enrollment in Degree-Granting Institutions Projection Model. Enrollment rates by attendance status, sex, and race/ethnicity are projected for the age categories using either the pooled seemingly unrelated regression method or the pooled seemingly unrelated regression method with a first-order autocorrelation correction. The resulting rates are iteratively corrected to ensure consistency with those projected by the Enrollment in Degree-Granting Institutions Projection Model. The adjusted rates are then applied to projections of populations of the same sex, age, and race/ethnicity.

The First-Time Freshmen Enrollment in Degree-Granting Institutions Projection Model uses single exponential smoothing to project the ratio of freshmen enrollment to undergraduate enrollment separately for males and for females. It then applies the projected ratios to the projections of undergraduate enrollment by sex that were produced by the Enrollment in Degree-Granting Institutions Projection Model.

The Enrollment in Degree-Granting Institutions Projection Model

The Enrollment in Degree-Granting Institutions Projection Model produces projections of enrollment counts by six levels of detail, as well as projections of full-time-equivalent enrollments by level of student, level of institution, and control of institution.

Steps used in the Enrollment in Degree-Granting Institutions Projection Model

Step 1. *Adjust age-specific enrollment counts from the U.S. Census Bureau to make them agree with the more highly aggregated NCES enrollment counts that do not include age.* The Enrollment in Degree-Granting Institutions Projection Model projects enrollments by six levels of detail: attendance status, level of student, level of institution, control of institution, sex, and age. While NCES does produce enrollment counts by the first five levels of detail, it does not produce data by the sixth level of detail, age, every year. However, the U.S. Census Bureau does produce annual age-specific enrollment counts.

In step 1, the age distributions from the Census Bureau counts for 2000 to 2016 were applied to the NCES counts to produce a set of enrollment data that breaks enrollments down by age while being consistent with NCES counts. Specifically, the most detailed level of Census Bureau data (by attendance status, level of student, level of institution, control of institution, sex, and age) was iteratively changed using proportions based on the more highly aggregated NCES enrollment numbers to ensure that all sums across this most detailed level of Census enrollment data equaled the more highly aggregated NCES enrollment totals that did not include age.

Step 2. *Calculate enrollment rates by attendance status, sex, and age category.* The enrollment data were broken up into 14 age categories, with separate age categories for individual ages 14 through 24 as well as for the age groups 25 to 29, 30 to 34, and 35 and over. For each of the 14 age categories, 4 enrollment rates were calculated—part-time male, full-time male, part-time female, and full-time female—resulting in a total of 56 enrollment rates. Each of the 56 enrollment rates was calculated by dividing the enrollment count for that combination of attendance status, sex, and age category by the total population for the corresponding combination of sex and age category. For each combination of attendance and sex, the enrollment rate for the oldest age category was calculated by dividing the enrollment count for those 35 and over by the total population for those 35 to 44.

Step 3. *Produce projections of enrollment rates by attendance status, sex, and age category.* Enrollment rates for most of the age groups were projected using multiple linear regression. However, because enrollment in degree-granting postsecondary institutions is negligible for ages 14, 15, and 16, these ages were not included in the multiple linear regression models. Instead, projections for individual ages 14, 15, and 16 were produced by double exponential smoothing.

The following 11 age categories were modeled: individual ages 17 through 24 and age groups 25 to 29, 30 to 34, and 35 and over. For each of these age categories, enrollment rates by attendance status and sex were produced using four pooled time-series models—one for each combination of attendance status and sex. Each model was pooled across age categories. Each equation contained two independent variables, which were measures of

- » disposable income; and
- » the unemployment rate.

Either the pooled seemingly unrelated regression method or the pooled seemingly unrelated regression method with a first-order autocorrelation correction was used to estimate each equation.

For more details on the equations used in step 3, the data used to estimate these equations, and their results, see tables A-16 through A-18 on pages 111–113.

Step 4. *Produce projections of enrollments by attendance status, sex, and age category.* For each combination of attendance status, sex, and age category, enrollment projections were produced by multiplying the projected enrollment rate for that combination by projections of the total population with the corresponding combination of sex and age category.

Step 5. *Add two additional levels of detail—level of student and level of institution—to the projected enrollments by attendance status, sex, and age category.* For this step, the 14 age categories used in the previous steps were collapsed into the following 8 categories: ages 14 to 16, 17, 18 and 19, 20 and 21, 22 to 24, 25 to 29, 30 to 34, and 35 and over. Step 5 can be broken into three parts:

First, the historic data were used to calculate the percentage distribution of enrollment by level of student and level of institution for each combination of attendance status, sex, and age category. Because it was assumed that there was no enrollment in 2-year institutions at the postbaccalaureate level, three combinations of student level and institution type were used: undergraduates at 4-year institutions, undergraduates at 2-year institutions, and postbaccalaureate students at 4-year institutions.

Second, for each combination of attendance status, sex, and age category, the percentage distribution by level of student and level of institution was projected using single exponential smoothing. A separate smoothing constant, chosen to minimize the sum of squared forecast errors, was used in each case. The percentages were then adjusted so the sum of the categories by attendance status, level of student, level of institution, sex, and age category would equal 100 percent.

For the projected percentage distributions from step 5 and the actual 2015 distributions, see tables A-19 and A-20 on pages 114 and 115.

Third, the projected distributions by level of student and type of institution were applied to the projected enrollments by attendance status, sex, and age category from step 4 to obtain the enrollment projections by attendance status, level of student, level of institution, sex, and age category.

Step 6. *Add the sixth level of detail—control of institutions—to the projected enrollments in degree-granting postsecondary institutions.* In this step, the data on enrollment by age category were not used. Control of institutions was added in the following manner:

First, the historic data were used to calculate the percentage of enrollment in public institutions for each combination of attendance status, level of student, level of institution, and sex.

Second, the percentages of enrollment in public institutions were projected using single exponential smoothing. A separate smoothing constant, chosen to minimize the sum of squared forecast errors, was used for each percentage.

For the projected percentages from step 6 and the actual 2015 percentages, see table A-21 on page 116.

Third, the projected percentages were applied to the projected enrollments in each corresponding enrollment combination to obtain projections for public institutions by attendance status, level of student, level of institution, and sex.

Fourth, the projected enrollments for public institutions were subtracted from the total to produce the projected enrollments for private institutions.

Step 7. Produce projections of full-time-equivalent enrollment by level of student, level of institution, and control of institution.

Full-time-equivalent enrollment represents total full-time and part-time enrollment as if it were enrollment on a full-time basis. It equals the sum of full-time enrollment plus the full-time-equivalent of part-time enrollment. Full-time-equivalent enrollment projections were produced in the following manner:

First, for each combination of level of student, level of institution, and control of institution, the historic data were used to calculate the full-time-equivalent of part-time enrollment as a percentage of part-time enrollment.

Second, for each combination of level of student, level of institution, and control of institution, the full-time equivalent of part-time enrollment as a percentage of part-time enrollment was projected using single exponential smoothing. A separate smoothing constant, chosen to minimize the sum of squared forecast errors, was used for each percentage.

Third, for each combination of level of student, level of institution, and control of institution, the projected percentages were applied to the projections of part-time enrollment to project the full-time equivalent of the part-time enrollment.

Fourth, the projections of full-time equivalents of part-time enrollment were added to projections of full-time enrollment to obtain projections of full-time-equivalent enrollment.

Data and equation results for the Enrollment in Degree-Granting Institutions Projection Model

Enrollment data for degree-granting postsecondary institutions. Enrollment data for 2000 to 2016 by attendance status, level of student, level of institution, control of institution, and sex came from the NCES Integrated Postsecondary Education Data System (IPEDS). These are universe counts. The U.S. Census Bureau was the source for enrollment estimates for 1981 to 2015 by the characteristics listed above, as well as age of student.

Population data and projections. Population counts for 2000 to 2016 came from the U.S. Census Bureau. Population projections for 2017 to 2026 are the Census Bureau's 2014 National Population Projections of the population by sex and age (December 2014), ratio-adjusted to line up with the most recent historical estimates. For more information, see Section A.0. Introduction to Projection Methodology, earlier in this appendix.

Projections for economic variables. The economic variables used in developing these projections were from the "U.S. Quarterly Macroeconomic Model: 4th Quarter 2015 Short-Term Baseline Projections" from the economic consulting firm, IHS Global Inc. This set of projections was IHS Global Inc.'s most recent set at the time the education projections in this report were produced.

Data and results for the equations. The following details for the equations are shown on pages 111–116:

- » Table A-16 shows enrollment rates by sex, attendance status, and age for fall 2015 and projected enrollment rates for fall 2021 and fall 2026.
- » Table A-17 shows the estimated equations and model statistics used to project enrollments for men by attendance status, and table A-18 shows the estimated equations and model statistics used to project enrollment rates for women by attendance status. The particular equations shown were selected on the basis of their statistical properties, such as coefficients of determination (R^2 s), the t -statistics of the coefficients, the Durbin-Watson statistic, the Breusch-Godfrey Serial Correlation LM test statistic, and residual plots.
- » Table A-19 shows actual and projected percentage distributions of full-time students, and table A-20 shows actual and projected percentage distributions of part-time students.
- » Table A-21 shows actual and projected data for enrollment in public degree-granting institutions as a percentage of total enrollment by sex, attendance status, student level, and level of institution.

Accuracy of projections for the Enrollment in Degree-Granting Institutions Projection Model

Mean absolute percentage errors (MAPEs) for enrollment in degree-granting institutions were calculated using the last 19 editions of *Projections of Education Statistics*. Table G, below, shows MAPEs for key projections of the Enrollment in Degree-Granting Institutions Model.

Table G. Mean absolute percentage errors (MAPEs) of projected enrollment in degree-granting postsecondary institutions, by lead time, sex, and level of institution: MAPEs constructed using projections from *Projections of Education Statistics to 2007* through *Projections of Education Statistics to 2025*

Statistic	Lead time (years)									
	1	2	3	4	5	6	7	8	9	10
Total enrollment	1.5	2.6	4.0	5.1	5.9	5.9	6.6	7.5	9.0	10.3
Males	1.5	2.7	4.0	5.3	6.3	6.7	7.8	8.9	10.3	11.8
Females	1.7	2.7	4.3	5.1	5.6	5.3	5.8	6.7	8.6	10.3
4-year institutions	1.6	2.6	3.9	5.2	6.4	7.3	8.4	9.8	11.6	12.9
2-year institutions	2.9	4.1	5.7	6.0	5.9	4.4	5.0	6.3	8.5	9.4

NOTE: MAPEs for degree-granting postsecondary institution enrollments were calculated using the last 19 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2007* through *Projections of Education Statistics to 2025*. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics*, various issues. (This table was prepared February 2017.)

For more information about MAPEs, see Section A.O. *Introduction to Projection Methodology*, earlier in this appendix.

The Enrollment in Degree-Granting Institutions by Race/Ethnicity Projection Model

The Enrollment in Degree-Granting Institutions by Race/Ethnicity Projection Model projects enrollments in degree-granting institutions by attendance status, sex, age, and race/ethnicity. The following groups are projected in this model:

- » White;
- » Black;
- » Hispanic;
- » Asian/Pacific Islander;
- » American Indian/Alaska Native; and
- » nonresident alien.

See the glossary for definitions of the five racial/ethnic categories and the nonresident alien category. (The race/ethnicity of nonresident aliens is unknown, but they are considered a separate group for purposes of this analysis.)

Steps used in the Degree-Granting Institutions by Race/Ethnicity Projection Model

Step 1. *Adjust U.S. Census Bureau enrollment counts by attendance status, sex, age, and race/ethnicity to make them sum to NCES enrollment counts by attendance status, sex, and race/ethnicity.* For 1981 to 2015, the most detailed levels of Census Bureau enrollment data (by enrollment status, sex, age, and race/ethnicity) were iteratively changed using proportions that were based on the more highly aggregated NCES enrollment numbers to ensure that the sums across these most detailed levels of enrollment data equaled the more highly aggregated NCES enrollment numbers that did not include age.

Step 2. *Calculate enrollment rates by attendance status, sex, age category, and race/ethnicity.* The enrollment data were broken up into 14 age categories, with separate age categories for individual ages 14 through 24 as well as for the age groups 25 to 29, 30 to 34, and 35 and over. For each of the 14 age categories, enrollment rates were calculated for each combination of attendance status, sex, and the six racial/ethnic groups, resulting in a total of 336 enrollment rates. Each of the 336 enrollment rates was calculated by dividing the enrollment count for that combination of attendance status, sex, age category, and race/ethnicity by the total population for the corresponding combination of sex, age category, and race/ethnicity. For each combination of attendance status, sex and racial/ethnic group, the enrollment rate for the oldest age category was calculated by dividing the enrollment count for those 35 and over by the total population for those 35 to 44.

Step 3. *Produce projections of enrollment rates by attendance status, sex, age category, and race/ethnicity.* Enrollment rates for most of the age groups and racial/ethnic groups were projected using multiple linear regression. However, there were several exceptions:

- » Due to negligible enrollments for ages 14, 15, and 16, these ages were not included in the multiple linear regression models. Instead, projections of enrollment rates for individual ages 14, 15, and 16 were produced by single exponential smoothing.
- » Due to the relatively large fluctuations in the historical enrollment rates resulting from small sample sizes, American Indian/Alaska Native enrollments were projected using single exponential smoothing.
- » Since there were no applicable population counts to compute enrollment rates for nonresident aliens, their enrollments were projected using patterns in recent historical growth.

Four racial/ethnic groups were modeled: White, Black, Hispanic, and Asian/Pacific Islander. Eleven age categories were modeled: individual ages 17 through 24 and age groups 25 to 29, 30 to 34, and 35 to 44. For each of the age categories, projected enrollment rates by attendance status, sex, and race/ethnicity were produced using 16 pooled time-series models—one for each combination of attendance status, sex, and the four racial/ethnic groups. Each equation included variables measuring

- » recent trends;
- » economic conditions (such as disposable income); and
- » demographic changes.

For more information on the equations used to project enrollment rates for the combinations of attendance status, sex, and race/ethnicity, see tables A-22 through A-29, under “Data and equations used for the Enrollment in Degree-Granting Institutions by Race/Ethnicity Projection Model,” below.

The final set of projected rates by attendance status, sex, age, and race/ethnicity were controlled to enrollment rates by attendance status, sex, and age produced by the Enrollment in Degree-Granting Institutions Projection Model to ensure consistency across models.

Step 4. *Produce projections of enrollments by attendance status, sex, age category, and race/ethnicity.* For each combination of attendance status, sex, age category, and race/ethnicity, enrollment projections were produced by multiplying the projected enrollment rate for that combination by projections of the total population with the corresponding combination of sex, age category, and race/ethnicity.

Data and equations used for the Enrollment in Degree-Granting Institutions by Race/Ethnicity Projection Model

Enrollment data for degree-granting institutions by race/ethnicity. Enrollment data for 1981 to 2015 by attendance status, sex, and race/ethnicity came from the NCES Integrated Postsecondary Education Data System (IPEDS). These are universe counts. The U.S. Census Bureau, Current Population Survey was the source for enrollment estimates for 1981 to 2015 by the characteristics listed above, as well as age of student.

Population data and projections by race/ethnicity. Population counts for 1981 to 2015 came from the U.S. Census Bureau, Population Estimates series. Population projections for 2016 to 2026 are the Census Bureau’s 2014 National Population Projections of the population by sex, age and race/ethnicity (December 2014), ratio-adjusted to line up with most recent historical estimates.

Projections for economic variables. The economic variables used in developing these projections were from the “U.S. Quarterly Macroeconomic Model: November 2016 Short-Term Baseline Projections” from the economic consulting firm, IHS Global Inc. This set of projections was IHS Global Inc.’s most recent set at the time the education projections in this report were produced.

Estimated equations and model statistics. Tables A-22 through A-29 show the estimated equations and model statistics used to project enrollment rates for the various combinations of attendance status, sex, and race/ethnicity.

Accuracy of projections for the Degree-Granting Institutions by Race/Ethnicity Projection Model

Mean absolute percentage errors (MAPEs) for enrollment in degree-granting institutions by race/ethnicity were calculated using the last 11 editions of *Projections of Education Statistics*. Table H, below, shows MAPEs for key projections of the Enrollment in Degree-Granting Institutions by Race/Ethnicity Projection Model.

Table H. Mean absolute percentage errors (MAPEs) of projected enrollment in degree-granting postsecondary institutions, by lead time and race/ethnicity: MAPEs constructed using projections from *Projections of Education Statistics to 2015* through *Projections of Education Statistics to 2025*

Statistic	Lead time (years)									
	1	2	3	4	5	6	7	8	9	10
Total enrollment	1.5	2.6	4.0	5.1	5.9	5.9	6.6	7.5	9.0	10.3
White	2.2	4.2	6.2	7.4	7.6	6.4	6.1	5.7	7.4	9.1
Black	3.5	7.9	11.7	14.9	14.9	13.4	9.8	6.3	3.8	1.7
Hispanic	3.8	6.3	8.7	11.6	14.6	16.5	18.8	20.2	20.4	19.7
Asian/Pacific Islander	3.3	5.6	6.4	8.0	8.7	9.4	9.6	9.4	9.9	11.8
American Indian/Alaska Native	5.4	7.7	12.0	15.7	19.1	24.8	31.3	40.6	44.1	49.2

NOTE: MAPEs for total degree-granting postsecondary institution enrollments were calculated using the last 19 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2007* through *Projections of Education Statistics to 2025*. MAPEs for degree-granting postsecondary institution enrollment by race/ethnicity were calculated using the last 11 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2015* through *Projections of Education Statistics to 2025*. Calculations were made using unrounded numbers. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics*, various issues. (This table was prepared February 2017.)

The First-Time Freshmen Enrollment in Degree-Granting Institutions Projection Model

The First-Time Freshmen Enrollment in Degree-Granting Institutions Projection Model produced projections of first-time freshmen enrollment in degree-granting institutions by sex.

Steps used in the First-Time Freshmen Enrollment in Degree-Granting Institutions Projection Model

The projections were produced in the following manner:

Step 1. Calculate the ratio of first-time freshmen enrollment to undergraduate enrollment. For 1975 to 2015, the ratio of first-time freshmen enrollment to undergraduate enrollment was calculated for males and females.

Step 2. Project the ratio of first-time freshmen enrollment to undergraduate enrollment. The percentages of undergraduate enrollment for both males and females were projected using single exponential smoothing. A separate smoothing constant, chosen to minimize the sum of squared forecast errors, was used for each percentage.

Step 3. Apply the projected ratio to projected undergraduate enrollment. The projected ratios were applied to projections of undergraduate enrollment by sex from the Enrollment in Degree-Granting Institutions Model to yield projections of first-time freshmen enrollment.

Assumptions underlying this method

This method assumes that the future pattern in the trend of first-time freshmen enrollment will be the same as that for undergraduate enrollment.

Data used in the First-Time Freshmen Enrollment in Degree-Granting Institutions Projection Model

Undergraduate and freshmen enrollment data for degree-granting institutions. Undergraduate and freshmen enrollment data by sex for 1975 to 2015 came from the NCES Integrated Postsecondary Education Data System (IPEDS).

Projections of undergraduate enrollment. Projections of undergraduate enrollment by sex came from the Enrollment in Degree-Granting Institutions Model, discussed earlier in this section of appendix A.

Accuracy of projections for the First-Time Freshmen Enrollment Projection Model

Mean absolute percentage errors (MAPEs) for enrollment in degree-granting institutions by race/ethnicity were calculated using the last seven editions of *Projections of Education Statistics*. Table I, below, shows MAPEs for key projections of the First-Time Freshmen Enrollment in Degree-Granting Institutions Model.

Table I. Mean absolute percentage errors (MAPEs) of projected first-time freshmen enrollment in degree-granting postsecondary institutions, by lead time and sex: MAPEs constructed using projections from *Projections of Education Statistics to 2018* through *Projections of Education Statistics to 2025*

Statistic	Lead time (years)									
	1	2	3	4	5	6	7	8	9	10
Total first-time freshmen enrollment	3.0	5.3	7.2	8.4	8.2	7.2	6.2	5.7	—	—
Males	2.9	5.0	6.6	7.4	7.2	6.0	3.1	1.2	—	—
Females	3.3	5.6	7.8	9.2	9.4	9.7	8.9	9.6	—	—

— Not available.

NOTE: MAPEs for first-time freshmen enrollment in degree-granting postsecondary institutions were calculated using the last 8 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2018* through *Projections of Education Statistics to 2025*. Calculations were made using unrounded numbers. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics*, various issues. (This table was prepared February 2017.)

Table A-16. Actual and projected enrollment rates of all students at degree-granting postsecondary institutions, by sex, attendance status, and age: Fall 2015, fall 2021, and fall 2026

Sex, attendance status, and age	Actual 2015	Projected	
		2021	2026
1	2	3	4
Males			
Full-time			
16 years old	0.6	0.7	0.7
17 years old	2.7	2.7	2.5
18 years old	30.0	32.3	33.3
19 years old	35.5	38.1	39.3
20 years old	39.4	42.7	44.6
21 years old	32.3	33.9	34.2
22 years old	24.1	26.1	27.0
23 years old	14.9	16.7	17.8
24 years old	10.8	11.8	12.2
25 to 29 years old	5.8	6.1	6.2
30 to 34 years old	2.2	2.3	2.3
35 to 44 years old	1.7	1.7	1.6
Part-time			
16 years old	#	0.1	0.1
17 years old	0.9	0.9	1.0
18 years old	6.9	7.3	7.6
19 years old	11.3	11.7	12.1
20 years old	10.3	10.5	10.7
21 years old	11.1	11.7	12.2
22 years old	7.1	7.6	7.9
23 years old	8.8	9.3	9.8
24 years old	7.3	7.8	8.2
25 to 29 years old	5.7	6.1	6.3
30 to 34 years old	3.5	3.5	3.5
35 to 44 years old	3.3	3.3	3.3
Females			
Full-time			
16 years old	0.5	0.6	0.6
17 years old	3.6	4.3	4.7
18 years old	36.1	40.2	42.4
19 years old	48.2	50.3	50.6
20 years old	49.2	53.0	54.8
21 years old	38.8	41.1	41.5
22 years old	23.4	26.4	28.0
23 years old	22.1	24.9	26.4
24 years old	12.3	14.1	15.2
25 to 29 years old	6.8	7.5	7.6
30 to 34 years old	3.4	3.6	3.6
35 to 44 years old	2.8	3.0	2.9
Part-time			
16 years old	#	0.1	0.1
17 years old	0.3	0.4	0.4
18 years old	8.0	8.5	8.9
19 years old	12.8	13.6	14.5
20 years old	13.4	13.7	14.1
21 years old	12.6	13.6	14.6
22 years old	9.2	10.0	10.7
23 years old	10.7	11.7	12.5
24 years old	7.3	8.2	8.8
25 to 29 years old	8.4	9.1	9.7
30 to 34 years old	5.1	5.4	5.5
35 to 44 years old	7.0	7.4	7.6

#Rounds to zero.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System, Spring 2015; Enrollment in Degree-Granting

Institutions Projection Model, 1980 through 2026; and U.S. Department of Commerce, Census Bureau, Current Population Reports, "Social and Economic Characteristics of Students," 2015. (This table was prepared February 2017.)

Table A-17. Estimated equations and model statistics for full-time and part-time enrollment rates of males at degree-granting postsecondary institutions based on data from 2000 to 2015

Independent variable	Coefficient	Standard error	t-statistic	R ²	D.W. statistic
1	2	3	4	5	6
Full-time					
Intercept term for 17-year-olds	-9.99	0.222	-45.06	1.00	2.01*
Intercept term for 18-year-olds	-7.08	0.217	-32.58		
Intercept term for 19-year-olds	-6.66	0.217	-30.73		
Intercept term for 20-year-olds	-6.61	0.218	-30.29		
Intercept term for 21-year-olds	-6.75	0.218	-30.91		
Intercept term for 22-year-olds	-7.23	0.219	-33.07		
Intercept term for 23-year-olds	-7.72	0.218	-35.34		
Intercept term for 24-year-olds	-7.96	0.219	-36.35		
Intercept term for 25- to 29-year-olds	-8.61	0.220	-39.10		
Intercept term for 30- to 34-year-olds	-9.54	0.221	-43.11		
Intercept term for 35- to 44-year-olds	-10.03	0.222	-45.19		
Log of three-period weighted average of per capita disposable income in 2000 dollars, using the present period and the previous two periods	1.08	0.034	31.61		
Log age-specific unemployment rate for men	0.30	0.008	35.60		
Part-time					
Intercept term for 17-year-olds	-11.23	0.556	-20.18	0.95	2.07*
Intercept term for 18-year-olds	-8.87	0.554	-16.02		
Intercept term for 19-year-olds	-8.37	0.555	-15.09		
Intercept term for 20-year-olds	-8.25	0.553	-14.92		
Intercept term for 21-year-olds	-8.38	0.556	-15.08		
Intercept term for 22-year-olds	-8.62	0.556	-15.51		
Intercept term for 23-year-olds	-8.62	0.554	-15.57		
Intercept term for 24-year-olds	-8.78	0.554	-15.84		
Intercept term for 25- to 29-year-olds	-9.19	0.552	-16.64		
Intercept term for 30- to 34-year-olds	-9.69	0.552	-17.54		
Intercept term for 35- to 44-year-olds	-9.61	0.552	-17.41		
Log of three-period weighted average of per capita disposable income in 2000 dollars, using the present period and the previous two periods	0.65	0.061	10.62		
Log unemployment rate	0.20	0.022	9.05		

* $p < .05$.
 NOTE: R² = Coefficient of determination. D.W. statistic = Durbin-Watson statistic, a test for autocorrelation among regression residuals. For more details see Johnston, J., and Dinardo, J. (1996). *Econometric Methods*. New York: McGraw-Hill. The regression method used to estimate the full-time and part-time equations was the pooled seemingly unrelated regression method. The time period used to estimate both equations is from 2000 to 2015 and the num-

ber of observations is 176. For additional information, see Intriligator, M.D. (1978). *Econometric Models, Techniques, & Applications*. New Jersey: Prentice-Hall, Inc., pp. 165–173. SOURCE: U.S. Department of Education, National Center for Education Statistics, Enrollment in Degree-Granting Institutions Projection Model, 2000 through 2026. (This table was prepared April 2017.)

Table A-18. Estimated equations and model statistics for full-time and part-time enrollment rates of females at degree-granting postsecondary institutions based on data from 2000 to 2015

Independent variable	Coefficient	Standard error	t-statistic	R ²	D.W. statistic
1	2	3	4	5	6
Full-time					
Intercept term for 17-year-olds	-10.60	0.286	-37.12	1.00	2.05*
Intercept term for 18-year-olds	-7.59	0.284	-26.75		
Intercept term for 19-year-olds	-7.18	0.283	-25.37		
Intercept term for 20-year-olds	-7.20	0.286	-25.15		
Intercept term for 21-year-olds	-7.41	0.286	-25.92		
Intercept term for 22-year-olds	-8.02	0.286	-28.07		
Intercept term for 23-year-olds	-8.45	0.286	-29.51		
Intercept term for 24-year-olds	-8.82	0.286	-30.84		
Intercept term for 25- to 29-year-olds	-9.39	0.288	-32.55		
Intercept term for 30- to 34-year-olds	-10.17	0.290	-35.10		
Intercept term for 35- to 44-year-olds	-10.41	0.290	-35.93		
Log of three-period weighted average of per capita disposable income in 2000 dollars, using the present period and the previous two periods	1.28	0.044	28.84		
Log age-specific unemployment rate for women	0.36	0.014	26.30		
Part-time					
Intercept term for 17-year-olds	-14.41	0.812	-17.76	0.92	2.29~
Intercept term for 18-year-olds	-11.34	0.770	-14.73		
Intercept term for 19-year-olds	-10.59	0.770	-13.76		
Intercept term for 20-year-olds	-10.72	0.771	-13.91		
Intercept term for 21-year-olds	-10.75	0.770	-13.97		
Intercept term for 22-year-olds	-10.99	0.770	-14.28		
Intercept term for 23-year-olds	-11.07	0.770	-14.38		
Intercept term for 24-year-olds	-11.17	0.770	-14.51		
Intercept term for 25- to 29-year-olds	-11.58	0.769	-15.06		
Intercept term for 30- to 34-year-olds	-12.04	0.769	-15.65		
Intercept term for 35- to 44-year-olds	-11.72	0.769	-15.25		
Log of three-period weighted average of per capita disposable income in 2000 dollars, using the present period and the previous two periods	0.96	0.085	11.34		
Log unemployment rate	0.13	0.031	4.17		

* $p < .05$.

~Inconclusive.

NOTE: R² = Coefficient of determination. D.W. statistic = Durbin-Watson statistic, a test for autocorrelation among regression residuals. For more details see Johnston, J., and Dinardo, J. (1996). *Econometric Methods*, New York: McGraw-Hill. The regression method used to estimate the full-time and part-time equations was the pooled seemingly unrelated regression

method. The time period used to estimate both equations is from 2000 to 2015 and the number of observations is 176. For additional information, see Intriligator, M.D. (1978). *Econometric Models, Techniques, & Applications*. New Jersey: Prentice-Hall, Inc., pp. 165–173.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Enrollment in Degree-Granting Institutions Projection Model, 2000 through 2026. (This table was prepared April 2017.)

Table A-19. Actual and projected percentages of full-time students at degree-granting postsecondary institutions, by sex, age group, student level, and level of institution: Fall 2015, and fall 2016 through fall 2026

Age group, student level, and level of institution	Males		Females	
	Actual 2015	Projected 2016 through 2026	Actual 2015	Projected 2016 through 2026
1	2	3	4	5
18 and 19 years old				
Undergraduate, 4-year institutions	68.7	67.3	75.1	72.0
Undergraduate, 2-year institutions	30.9	32.3	24.9	28.0
Postbaccalaureate, 4-year institutions	0.3	0.4	#	0.1
20 and 21 years old				
Undergraduate, 4-year institutions	79.8	77.1	78.8	79.5
Undergraduate, 2-year institutions	17.9	20.2	19.1	18.3
Postbaccalaureate, 4-year institutions	2.3	2.7	2.1	2.2
22 to 24 years old				
Undergraduate, 4-year institutions	67.6	65.0	62.2	60.1
Undergraduate, 2-year institutions	12.5	15.7	14.2	17.6
Postbaccalaureate, 4-year institutions	20.0	19.3	23.6	22.3
25 to 29 years old				
Undergraduate, 4-year institutions	41.7	43.3	42.6	42.7
Undergraduate, 2-year institutions	17.8	18.3	19.4	21.3
Postbaccalaureate, 4-year institutions	40.5	38.4	38.0	36.0
30 to 34 years old				
Undergraduate, 4-year institutions	50.0	48.1	45.1	43.0
Undergraduate, 2-year institutions	14.1	15.3	21.6	25.9
Postbaccalaureate, 4-year institutions	35.9	36.6	33.3	31.1
35 years and over				
Undergraduate, 4-year institutions	45.0	41.7	48.0	42.7
Undergraduate, 2-year institutions	23.5	24.7	22.4	29.3
Postbaccalaureate, 4-year institutions	31.5	33.6	29.6	28.0

#Rounds to zero.

NOTE: Detail may not sum to totals because of rounding. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System, Spring 2015; Enrollment in Degree-Granting Institutions Projection Model, 1980 through 2026; and U.S. Department of Commerce, Census Bureau, Current Population Reports, "Social and Economic Characteristics of Students," 2015. (This table was prepared February 2017.)

Table A-20. Actual and projected percentages of part-time students at degree-granting postsecondary institutions, by sex, age group, student level, and level of institution: Fall 2015, and fall 2016 through fall 2026

Age, student level, and level of institution	Males		Females	
	Actual 2015	Projected 2016 through 2026	Actual 2015	Projected 2016 through 2026
1	2	3	4	5
18 and 19 years old				
Undergraduate, 4-year institutions	23.9	20.3	15.8	19.6
Undergraduate, 2-year institutions	76.1	79.7	84.2	80.3
Postbaccalaureate, 4-year institutions	#	#	#	0.1
20 and 21 years old				
Undergraduate, 4-year institutions	21.5	26.2	31.4	28.1
Undergraduate, 2-year institutions	75.9	71.7	66.0	70.7
Postbaccalaureate, 4-year institutions	2.7	2.1	2.6	1.3
22 to 24 years old				
Undergraduate, 4-year institutions	40.3	37.0	44.3	40.5
Undergraduate, 2-year institutions	51.6	55.3	41.0	47.3
Postbaccalaureate, 4-year institutions	8.1	7.7	14.6	12.2
25 to 29 years old				
Undergraduate, 4-year institutions	39.8	33.4	35.0	30.4
Undergraduate, 2-year institutions	46.8	47.6	41.1	48.7
Postbaccalaureate, 4-year institutions	13.4	19.1	23.9	20.8
30 to 34 years old				
Undergraduate, 4-year institutions	35.4	33.5	35.5	31.0
Undergraduate, 2-year institutions	37.3	41.6	46.0	46.3
Postbaccalaureate, 4-year institutions	27.4	24.9	18.5	22.7
35 years and over				
Undergraduate, 4-year institutions	29.9	30.9	27.7	29.5
Undergraduate, 2-year institutions	37.0	40.9	47.6	45.5
Postbaccalaureate, 4-year institutions	33.1	28.2	24.7	24.9

#Rounds to zero.

NOTE: Detail may not sum to totals because of rounding. Some data have been revised from previously published figures.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System, Spring 2015; Enrollment in Degree-Granting Institutions Projection Model, 1980 through 2026; and U.S. Department of Commerce, Census Bureau, Current Population Reports, "Social and Economic Characteristics of Students," 2015. (This table was prepared February 2017.)

Table A-21. Actual and projected enrollment in public degree-granting postsecondary institutions as a percentage of total postsecondary enrollment, by sex, attendance status, student level, and level of institution: Fall 2015, and fall 2016 through fall 2026

Attendance status, student level, and level of institution	Males		Females	
	Actual 2015	Projected 2016 through 2026	Actual 2015	Projected 2016 through 2026
Full-time, undergraduate, 4-year institutions	67.2	67.2	63.7	63.6
Part-time, undergraduate, 4-year institutions	70.0	70.0	65.3	65.3
Full-time, undergraduate, 2-year institutions	92.9	92.9	88.5	88.5
Part-time, undergraduate, 2-year institutions	99.5	99.4	98.8	98.7
Full-time, postbaccalaureate, 4-year institutions	49.6	49.6	45.8	45.8
Part-time, postbaccalaureate, 4-year institutions	51.9	51.9	48.1	48.1

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System, Spring 2016; and Enrollment in Degree-

Granting Institutions Projection Model, 1980 through 2026. (This table was prepared February 2017.)

Table A-22. Estimated equations and model statistics for full-time and part-time enrollment rates of White males at degree-granting postsecondary institutions based on data from 1980 to 2015

Independent variable	Coefficient	Standard error	t-statistic	R ²	D.W. statistic		
1	2	3	4	5	6		
Full-time							
Intercept term for 17-year-olds	-9.22	0.279	-32.98	0.99	1.58*		
Intercept term for 18-year-olds	-6.24	0.270	-23.09				
Intercept term for 19-year-olds	-5.96	0.268	-22.26				
Intercept term for 20-year-olds	-6.13	0.268	-22.86				
Intercept term for 21-year-olds	-6.26	0.268	-23.34				
Intercept term for 22-year-olds	-6.76	0.268	-25.20				
Intercept term for 23-year-olds	-7.32	0.268	-27.28				
Intercept term for 24-year-olds	-7.70	0.270	-28.54				
Intercept term for 25- to 29-year-olds	-8.55	0.268	-31.84				
Intercept term for 30- to 34-year-olds	-9.58	0.270	-35.47				
Intercept term for 35- to 44-year-olds	-10.19	0.271	-37.60				
Log of White per capita disposable income in current dollars	0.29	0.014	20.89				
Part-time							
Intercept term for 17-year-olds	-5.10	0.506	-10.09	0.86	1.81*		
Intercept term for 18-year-olds	-1.54	0.120	-12.78				
Intercept term for 19-year-olds	-1.07	0.126	-8.45				
Intercept term for 20-year-olds	-1.01	0.117	-8.59				
Intercept term for 21-year-olds	-1.04	0.118	-8.84				
Intercept term for 22-year-olds	-1.26	0.118	-10.71				
Intercept term for 23-year-olds	-1.30	0.115	-11.38				
Intercept term for 24-year-olds	-1.34	0.113	-11.91				
Intercept term for 25- to 29-year-olds	-1.66	0.111	-14.96				
Intercept term for 30- to 34-year-olds	-2.12	0.113	-18.81				
Intercept term for 35- to 44-year-olds	-2.15	0.110	-19.60				
Log of real total private compensation employment cost index	1.48	0.146	10.11				

* $p < .05$.

NOTE: R² = Coefficient of determination. D.W. statistic = Durbin-Watson statistic, a test for autocorrelation among regression residuals. For more details see Johnston, J., and Dinardo, J. (1996). *Econometric Methods*. New York: McGraw-Hill. The regression method used to estimate the full-time and part-time equations was the pooled seemingly unrelated regression method. The time period used to estimate the equations is from 1980 to 2015. The number of

observations is 396. For additional information, see Intriligator, M.D. (1978). *Econometric Models, Techniques, & Applications*. New Jersey: Prentice-Hall, Inc., pp. 165–173. Race categories exclude persons of Hispanic ethnicity.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Enrollment in Degree-Granting Institutions by Race/Ethnicity Projection Model, 1980 through 2026. (This table was prepared February 2017.)

Table A-23. Estimated equations and model statistics for full-time and part-time enrollment rates of White females at degree-granting postsecondary institutions based on data from 1980 to 2015

Independent variable	Coefficient	Standard error	t-statistic	R ²	D.W. statistic
1	2	3	4	5	6
Full-time					
Intercept term for 17-year-olds	-12.93	0.442	-29.23	0.99	1.75*
Intercept term for 18-year-olds	-9.98	0.435	-22.96		
Intercept term for 19-year-olds	-9.80	0.433	-22.61		
Intercept term for 20-year-olds	-10.02	0.434	-23.12		
Intercept term for 21-year-olds	-10.26	0.434	-23.65		
Intercept term for 22-year-olds	-10.99	0.434	-25.34		
Intercept term for 23-year-olds	-11.53	0.435	-26.53		
Intercept term for 24-year-olds	-11.92	0.435	-27.43		
Intercept term for 25- to 29-year-olds	-12.72	0.434	-29.31		
Intercept term for 30- to 34-year-olds	-13.46	0.434	-31.03		
Intercept term for 35- to 44-year-olds	-13.65	0.434	-31.46		
Log of White per capita disposable income in current dollars	0.50	0.022	22.51		
Part-time					
Intercept term for 17-year-olds	-10.15	0.393	-25.81	0.70	1.86*
Intercept term for 18-year-olds	-6.58	0.318	-20.72		
Intercept term for 19-year-olds	-6.08	0.319	-19.06		
Intercept term for 20-year-olds	-6.17	0.319	-19.34		
Intercept term for 21-year-olds	-6.23	0.318	-19.57		
Intercept term for 22-year-olds	-6.44	0.317	-20.35		
Intercept term for 23-year-olds	-6.50	0.318	-20.48		
Intercept term for 24-year-olds	-6.54	0.316	-20.70		
Intercept term for 25- to 29-year-olds	-6.85	0.315	-21.75		
Intercept term for 30- to 34-year-olds	-7.24	0.317	-22.86		
Intercept term for 35- to 44-year-olds	-6.90	0.315	-21.90		
Log of real total private compensation employment cost index	0.22	0.016	13.82		

* $p < .05$.

NOTE: R² = Coefficient of determination. D.W. statistic = Durbin-Watson statistic, a test for autocorrelation among regression residuals. For more details see Johnston, J., and Dinardo, J. (1996). *Econometric Methods*. New York: McGraw-Hill. The regression method used to estimate the full-time and part-time equations was the pooled seemingly unrelated regression method. The time period used to estimate the equations is from 1980 to 2015. The number of

observations is 396. For additional information, see Intriligator, M.D. (1978). *Econometric Models, Techniques, & Applications*. New Jersey: Prentice-Hall, Inc., pp. 165–173. Race categories exclude persons of Hispanic ethnicity. SOURCE: U.S. Department of Education, National Center for Education Statistics, Enrollment in Degree-Granting Institutions by Race/Ethnicity Projection Model, 1980 through 2026. (This table was prepared February 2017.)

Table A-24. Estimated equations and model statistics for full-time and part-time enrollment rates of Black males at degree-granting postsecondary institutions based on data from 1980 to 2015

Independent variable	Coefficient	Standard error	t-statistic	R ²	D.W. statistic		
1	2	3	4	5	6		
Full-time							
Intercept term for 17-year-olds	-11.25	0.639	-17.61	0.94	1.83*		
Intercept term for 18-year-olds	-9.00	0.633	-14.22				
Intercept term for 19-year-olds	-8.71	0.633	-13.77				
Intercept term for 20-year-olds	-8.77	0.633	-13.86				
Intercept term for 21-year-olds	-9.02	0.634	-14.22				
Intercept term for 22-year-olds	-9.22	0.634	-14.54				
Intercept term for 23-year-olds	-9.69	0.636	-15.23				
Intercept term for 24-year-olds	-9.95	0.634	-15.69				
Intercept term for 25- to 29-year-olds	-10.73	0.634	-16.91				
Intercept term for 30- to 34-year-olds	-11.55	0.637	-18.12				
Intercept term for 35- to 44-year-olds	-11.84	0.636	-18.61				
Log of Black per capita disposable income in current dollars	0.40	0.034	11.75				
Part-time							
Intercept term for 17-year-olds	-12.92	0.721	-17.93			0.51	1.96*
Intercept term for 18-year-olds	-11.40	0.558	-20.43				
Intercept term for 19-year-olds	-10.65	0.550	-19.35				
Intercept term for 20-year-olds	-10.59	0.551	-19.23				
Intercept term for 21-year-olds	-10.52	0.545	-19.31				
Intercept term for 22-year-olds	-10.62	0.552	-19.26				
Intercept term for 23-year-olds	-10.74	0.555	-19.37				
Intercept term for 24-year-olds	-10.85	0.556	-19.52				
Intercept term for 25- to 29-year-olds	-10.96	0.543	-20.18				
Intercept term for 30- to 34-year-olds	-11.22	0.542	-20.71				
Intercept term for 35- to 44-year-olds	-11.24	0.540	-20.82				
Log of Black per capita disposable income in current dollars	0.42	0.029	14.38				

* $p < .05$.

NOTE: R² = Coefficient of determination. D.W. statistic = Durbin-Watson statistic, a test for autocorrelation among regression residuals. For more details see Johnston, J., and Dinardo, J. (1996). *Econometric Methods*. New York: McGraw-Hill. The regression method used to estimate the full-time and part-time equations was the pooled seemingly unrelated regression method. The time period used to estimate the equations is from 1980 to 2015. The number of

observations is 396. For additional information, see Intriligator, M.D. (1978). *Econometric Models, Techniques, & Applications*. New Jersey: Prentice-Hall, Inc., pp. 165–173. Race categories exclude persons of Hispanic ethnicity. SOURCE: U.S. Department of Education, National Center for Education Statistics, Enrollment in Degree-Granting Institutions by Race/Ethnicity Projection Model, 1980 through 2026. (This table was prepared February 2017.)

Table A-25. Estimated equations and model statistics for full-time and part-time enrollment rates of Black females at degree-granting postsecondary institutions based on data from 1980 to 2015

Independent variable	Coefficient	Standard error	t-statistic	R ²	D.W. statistic		
1	2	3	4	5	6		
Full-time							
Intercept term for 17-year-olds	-14.44	0.627	-23.04	0.96	1.80*		
Intercept term for 18-year-olds	-12.17	0.620	-19.64				
Intercept term for 19-year-olds	-11.91	0.619	-19.25				
Intercept term for 20-year-olds	-12.15	0.619	-19.61				
Intercept term for 21-year-olds	-12.33	0.619	-19.93				
Intercept term for 22-year-olds	-12.76	0.619	-20.62				
Intercept term for 23-year-olds	-13.04	0.620	-21.04				
Intercept term for 24-year-olds	-13.41	0.621	-21.60				
Intercept term for 25- to 29-year-olds	-14.13	0.621	-22.77				
Intercept term for 30- to 34-year-olds	-14.61	0.620	-23.56				
Intercept term for 35- to 44-year-olds	-14.94	0.621	-24.05				
Log of Black per capita disposable income in current dollars	0.60	0.033	18.19				
Part-time							
Intercept term for 17-year-olds	-13.92	0.846	-16.46			0.46	1.85*
Intercept term for 18-year-olds	-11.88	0.828	-14.34				
Intercept term for 19-year-olds	-11.37	0.827	-13.75				
Intercept term for 20-year-olds	-11.33	0.826	-13.71				
Intercept term for 21-year-olds	-11.27	0.825	-13.67				
Intercept term for 22-year-olds	-11.29	0.824	-13.69				
Intercept term for 23-year-olds	-11.36	0.824	-13.78				
Intercept term for 24-year-olds	-11.48	0.825	-13.91				
Intercept term for 25- to 29-year-olds	-11.62	0.821	-14.15				
Intercept term for 30- to 34-year-olds	-11.79	0.821	-14.35				
Intercept term for 35- to 44-year-olds	-11.59	0.821	-14.12				
Log of Black per capita disposable income in current dollars	0.48	0.044	10.93				

* $p < .05$.

NOTE: R² = Coefficient of determination. D.W. statistic = Durbin-Watson statistic, a test for autocorrelation among regression residuals. For more details see Johnston, J., and Dinardo, J. (1996). *Econometric Methods*. New York: McGraw-Hill. The regression method used to estimate the full-time and part-time equations was the pooled seemingly unrelated regression method. The time period used to estimate the equations is from 1980 to 2015. The number of

observations is 396. For additional information, see Intriligator, M.D. (1978). *Econometric Models, Techniques, & Applications*. New Jersey: Prentice-Hall, Inc., pp. 165–173. Race categories exclude persons of Hispanic ethnicity. SOURCE: U.S. Department of Education, National Center for Education Statistics, Enrollment in Degree-Granting Institutions by Race/Ethnicity Projection Model, 1980 through 2026. (This table was prepared February 2017.)

Table A-26. Estimated equations and model statistics for full-time and part-time enrollment rates of Hispanic males at degree-granting postsecondary institutions based on data from 1980 to 2015

Independent variable	Coefficient	Standard error	t-statistic	R ²	D.W. statistic		
1	2	3	4	5	6		
Full-time							
Intercept term for 17-year-olds	-12.73	0.755	-16.87	0.92	1.89*		
Intercept term for 18-year-olds	-10.61	0.749	-14.16				
Intercept term for 19-year-olds	-10.39	0.749	-13.86				
Intercept term for 20-year-olds	-10.56	0.750	-14.09				
Intercept term for 21-year-olds	-10.79	0.751	-14.37				
Intercept term for 22-year-olds	-11.24	0.751	-14.98				
Intercept term for 23-year-olds	-11.54	0.751	-15.37				
Intercept term for 24-year-olds	-11.74	0.750	-15.64				
Intercept term for 25- to 29-year-olds	-12.55	0.751	-16.71				
Intercept term for 30- to 34-year-olds	-13.40	0.751	-17.84				
Intercept term for 35- to 44-year-olds	-13.88	0.753	-18.44				
Log of Hispanic per capita disposable income in current dollars	0.48	0.041	11.70				
Part-time							
Intercept term for 17-year-olds	-12.68	0.740	-17.12			0.59	1.75*
Intercept term for 18-year-olds	-10.52	0.571	-18.43				
Intercept term for 19-year-olds	-10.17	0.573	-17.75				
Intercept term for 20-year-olds	-10.04	0.571	-17.59				
Intercept term for 21-year-olds	-10.08	0.571	-17.66				
Intercept term for 22-year-olds	-10.48	0.570	-18.40				
Intercept term for 23-year-olds	-10.44	0.575	-18.18				
Intercept term for 24-year-olds	-10.68	0.570	-18.72				
Intercept term for 25- to 29-year-olds	-10.94	0.564	-19.41				
Intercept term for 30- to 34-year-olds	-11.48	0.567	-20.26				
Intercept term for 35- to 44-year-olds	-11.45	0.563	-20.34				
Log of Hispanic per capita disposable income in current dollars	0.41	0.031	13.48				

* $p < .05$.

NOTE: R² = Coefficient of determination. D.W. statistic = Durbin-Watson statistic, a test for autocorrelation among regression residuals. For more details see Johnston, J., and Dinardo, J. (1996). *Econometric Methods*. New York: McGraw-Hill. The regression method used to estimate the full-time and part-time equations was the pooled seemingly unrelated regression method. The time period used to estimate the equations is from 1980 to 2015. The number of

observations is 396. For additional information, see Intriligator, M.D. (1978). *Econometric Models, Techniques, & Applications*. New Jersey: Prentice-Hall, Inc., pp. 165–173.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Enrollment in Degree-Granting Institutions by Race/Ethnicity Projection Model, 1980 through 2026. (This table was prepared February 2017.)

Table A-27. Estimated equations and model statistics for full-time and part-time enrollment rates of Hispanic females at degree-granting postsecondary institutions based on data from 1980 to 2015

Independent variable	Coefficient	Standard error	t-statistic	R ²	D.W. statistic
1	2	3	4	5	6
Full-time					
Intercept term for 17-year-olds	-17.91	0.685	-26.15	0.92	1.90*
Intercept term for 18-year-olds	-15.39	0.674	-22.83		
Intercept term for 19-year-olds	-15.25	0.673	-22.65		
Intercept term for 20-year-olds	-15.55	0.674	-23.07		
Intercept term for 21-year-olds	-15.67	0.674	-23.23		
Intercept term for 22-year-olds	-16.28	0.675	-24.12		
Intercept term for 23-year-olds	-16.56	0.675	-24.51		
Intercept term for 24-year-olds	-17.03	0.677	-25.14		
Intercept term for 25- to 29-year-olds	-17.69	0.673	-26.28		
Intercept term for 30- to 34-year-olds	-18.37	0.675	-27.21		
Intercept term for 35- to 44-year-olds	-18.74	0.676	-27.71		
Log of Hispanic per capita disposable income in current dollars	0.77	0.037	21.03		
Part-time					
Intercept term for 17-year-olds	-14.85	0.654	-22.70	0.60	2.00*
Intercept term for 18-year-olds	-12.76	0.635	-20.09		
Intercept term for 19-year-olds	-12.37	0.636	-19.46		
Intercept term for 20-year-olds	-12.62	0.637	-19.79		
Intercept term for 21-year-olds	-12.46	0.637	-19.58		
Intercept term for 22-year-olds	-12.79	0.637	-20.07		
Intercept term for 23-year-olds	-12.71	0.634	-20.06		
Intercept term for 24-year-olds	-12.96	0.636	-20.40		
Intercept term for 25- to 29-year-olds	-13.29	0.630	-21.10		
Intercept term for 30- to 34-year-olds	-13.69	0.630	-21.72		
Intercept term for 35- to 44-year-olds	-13.58	0.630	-21.56		
Log of Hispanic per capita disposable income in current dollars	0.56	0.034	16.42		

* $p < .05$.

NOTE: R² = Coefficient of determination. D.W. statistic = Durbin-Watson statistic, a test for autocorrelation among regression residuals. For more details see Johnston, J., and Dinardo, J. (1996). *Econometric Methods*. New York: McGraw-Hill. The regression method used to estimate the full-time and part-time equations was the pooled seemingly unrelated regression method. The time period used to estimate the equations is from 1980 to 2015. The number of

observations is 396. For additional information, see Intriligator, M.D. (1978). *Econometric Models, Techniques, & Applications*. New Jersey: Prentice-Hall, Inc., pp. 165-173.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Enrollment in Degree-Granting Institutions by Race/Ethnicity Projection Model, 1980 through 2026. (This table was prepared February 2017.)

Table A-28. Estimated equations and model statistics for full-time and part-time enrollment rates of Asian/Pacific Islander males at degree-granting postsecondary institutions based on data from 1989 to 2015

Independent variable	Coefficient	Standard error	t-statistic	R ²	D.W. statistic
1	2	3	4	5	6
Full-time					
Intercept term for 17-year-olds	-3.75	0.577	-14.87	0.94	1.95*
Intercept term for 18-year-olds	-1.04	0.566	-10.11		
Intercept term for 19-year-olds	-0.79	0.568	-9.69		
Intercept term for 20-year-olds	-0.83	0.575	-9.94		
Intercept term for 21-year-olds	-0.81	0.575	-9.87		
Intercept term for 22-year-olds	-1.18	0.576	-10.48		
Intercept term for 23-year-olds	-1.47	0.577	-10.88		
Intercept term for 24-year-olds	-1.76	0.577	-11.46		
Intercept term for 25- to 29-year-olds	-2.52	0.587	-13.19		
Intercept term for 30- to 34-year-olds	-3.56	0.589	-14.98		
Intercept term for 35- to 44-year-olds	-4.38	0.588	-16.47		
Log of Asian/Pacific Islander per capita disposable income in current dollars	0.05	0.028	1.77		
Log unemployment rate for Asian/Pacific Islanders ..	0.17	0.041	4.21		
Part-time					
Intercept term for 17-year-olds	-1.68	0.904	-1.86	0.64	1.96*
Intercept term for 18-year-olds	-0.04	0.670	-0.06		
Intercept term for 19-year-olds	0.73	0.659	1.11		
Intercept term for 20-year-olds	0.54	0.670	0.80		
Intercept term for 21-year-olds	0.53	0.667	0.79		
Intercept term for 22-year-olds	0.56	0.675	0.83		
Intercept term for 23-year-olds	0.35	0.661	0.53		
Intercept term for 24-year-olds	0.25	0.658	0.39		
Intercept term for 25- to 29-year-olds	-0.17	0.650	-0.27		
Intercept term for 30- to 34-year-olds	-0.84	0.654	-1.29		
Intercept term for 35- to 44-year-olds	-1.09	0.649	-1.68		
Log of Asian/Pacific Islander level of educational attainment per household	0.14	0.041	3.44		

* $p < .05$.
 NOTE: R^2 = Coefficient of determination. D.W. statistic = Durbin-Watson statistic, a test for autocorrelation among regression residuals. For more details see Johnston, J., and Dinardo, J. (1996). *Econometric Methods*. New York: McGraw-Hill. The regression method used to estimate the full-time and part-time equations was the pooled seemingly unrelated regression method. The time period used to estimate the is from 1989 to 2015. The number of

observations equal to 297. For additional information, see Intriligator, M.D. (1978). *Econometric Models, Techniques, & Applications*. New Jersey: Prentice-Hall, Inc., pp. 165–173. Race categories exclude persons of Hispanic ethnicity.
 SOURCE: U.S. Department of Education, National Center for Education Statistics, Enrollment in Degree-Granting Institutions by Race/Ethnicity Projection Model, 1989 through 2026. (This table was prepared February 2017.)

Table A-29. Estimated equations and model statistics for full-time and part-time enrollment rates of Asian/Pacific Islander females at degree-granting postsecondary institutions based on data from 1989 to 2015

Independent variable	Coefficient	Standard error	t-statistic	R ²	D.W. statistic		
1	2	3	4	5	6		
Full-time							
Intercept term for 17-year-olds	-6.33	0.615	-10.29	0.97	1.87*		
Intercept term for 18-year-olds	-3.92	0.601	-6.52				
Intercept term for 19-year-olds	-3.45	0.605	-5.70				
Intercept term for 20-year-olds	-3.70	0.602	-6.14				
Intercept term for 21-year-olds	-3.72	0.601	-6.19				
Intercept term for 22-year-olds	-4.26	0.604	-7.05				
Intercept term for 23-year-olds	-4.55	0.601	-7.57				
Intercept term for 24-year-olds	-5.07	0.610	-8.32				
Intercept term for 25- to 29-year-olds	-6.01	0.600	-10.02				
Intercept term for 30- to 34-year-olds	-7.21	0.603	-11.97				
Intercept term for 35- to 44-year-olds	-7.78	0.602	-12.92				
Log of Asian/Pacific Islander per capita disposable income in current dollars	0.19	0.031	6.25				
Part-time							
Intercept term for 17-year-olds	1.23	0.277	4.46			0.69	2.03*
Intercept term for 18-year-olds	-1.82	0.854	-2.13				
Intercept term for 19-year-olds	-0.24	0.835	-0.29				
Intercept term for 20-year-olds	0.40	0.848	0.47				
Intercept term for 21-year-olds	0.06	0.841	0.07				
Intercept term for 22-year-olds	0.68	0.834	0.81				
Intercept term for 23-year-olds	0.29	0.836	0.35				
Intercept term for 24-year-olds	0.13	0.830	0.16				
Intercept term for 25- to 29-year-olds	0.04	0.836	0.05				
Intercept term for 30- to 34-year-olds	-0.50	0.825	-0.61				
Intercept term for 35- to 44-year-olds	-1.12	0.826	-1.35				
Log of Asian/Pacific Islander per capita disposable income in current dollars	0.91	0.199	4.60				
Log of Asian/Pacific Islander level of educational attainment per household	1.23	0.277	4.46				

* $p < .05$.

NOTE: R² = Coefficient of determination. D.W. statistic = Durbin-Watson statistic, a test for autocorrelation among regression residuals. For more details see Johnston, J., and Dinardo, J. (1996). *Econometric Methods*. New York: McGraw-Hill. The regression method used to estimate the full-time and part-time equations was the pooled seemingly unrelated regression method. The time period used to estimate the equations is from 1989 to 2015.

The number of observations is 297. For additional information, see Intriligator, M.D. (1978). *Econometric Models, Techniques, & Applications*. New Jersey: Prentice-Hall, Inc., pp. 165–173. Race categories exclude persons of Hispanic ethnicity. SOURCE: U.S. Department of Education, National Center for Education Statistics, Enrollment in Degree-Granting Institutions by Race/Ethnicity Model, 1989 through 2026. (This table was prepared February 2017.)

A.6. POSTSECONDARY DEGREES CONFERRED

Projections in this edition

This edition of *Projections of Education Statistics* presents projections of postsecondary degrees conferred by level of degree and sex of recipient for 2015–16 through 2026–27.

Overview of approach

Basic approach

Projections of associate's, bachelor's, master's, and doctor's degrees for males and females were produced using forecasting equations that relate degrees conferred to full-time enrollment in degree-granting institutions by sex, student level (undergraduate or postbaccalaureate), and institution level (2-year or 4-year).

Degrees Conferred Projection Model

Procedures used to project degrees

For all degree levels, projections of degrees conferred were made separately for males and for females. The projections for males and females were then summed to get projections of the total number of degrees.

Multiple linear regression was used to project associate's, bachelor's, master's, and doctor's degrees based on enrollment variables for males and females. The enrollment variables used for the different levels of degrees are briefly described below.

For details and results of the regression analyses used to project associate's, bachelor's, master's, and doctor's degrees, see table A-30, under "Data and equations used to project degrees," later in this section.

Associate's degrees. *Projections were based on full-time undergraduate enrollment in 2-year institutions by sex.* Males' projections of associate's degrees were based on current full-time enrollment and full-time enrollment lagged 2 years. Females' projections of associate's degrees were based on current full-time enrollment and full-time enrollment lagged 1 and 2 years.

Bachelor's degrees. *Projections were based on full-time undergraduate enrollment in 4-year institutions by sex.* For males and for females, bachelor's degree projections were based on current full-time enrollment and full-time enrollment lagged 2 years.

Master's degrees. *Projections were based on full-time postbaccalaureate enrollment by sex.* Males' projections of master's degrees were based on current full-time enrollment and full-time enrollment lagged 1 year. Females' projections of master's degrees were based on current full-time enrollment.

Doctor's degrees. *Projections were based on full-time postbaccalaureate enrollment by sex.* For males and for females, doctor's degree projections were based on current full-time postbaccalaureate enrollment and full-time postbaccalaureate enrollment lagged 1 and 2 years.

Data and equations used to project degrees

Enrollment data and projections for degree-granting institutions. Historical enrollment data by sex, level of student, and level of institution came from the NCES Integrated Postsecondary Education Data System (IPEDS). For the time period used for each level of degree, see table A-30 on page 126. The enrollment projections used are those produced for this edition of *Projections of Education Statistics*. For more information about the enrollment projections, see Section A.5. Enrollment in Degree-granting postsecondary Institutions, earlier in this appendix.

Data on degrees awarded at all levels. Historical data by level of degree and sex of recipient came from the NCES Integrated Postsecondary Education Data System (IPEDS). Associate's and bachelor's degrees were projected using data from 1970–71 to 2014–15 and master's and doctor's degrees were projected using data from 1980–81 to 2014–15.

Estimated equations and model statistics. For details on the equations used to project associate's, bachelor's, master's, and doctor's degrees, see table A-30 on page 126. The equations shown were selected on the basis of their statistical properties, such as coefficients of determination (R^2 s), the t -statistics of the coefficients, the Durbin-Watson statistic, the Breusch-Godfrey Serial Correlation LM test statistic, and residual plots.

Accuracy of projections

Mean absolute percentage errors (MAPEs) for associate's and bachelor's degrees conferred by degree-granting institutions were calculated using the last eight editions of *Projections of Education Statistics* and MAPEs for master's and doctor's degrees conferred by degree-granting institutions were calculated using the last five editions of *Projections of Education Statistics*.

Table J. Mean absolute percentage errors (MAPEs) of projected associate's and bachelor's degrees conferred by degree-granting postsecondary institutions, by lead time: MAPEs constructed using projections from *Projections of Education Statistics to 2018* through *Projections of Education Statistics to 2025*

Statistic	Lead time (years)									
	1	2	3	4	5	6	7	8	9	10
Associate's degrees	2.8	5.5	8.1	11.5	12.9	13.9	14.6	15.1	—	—
Bachelor's degrees	0.6	0.6	1.1	2.4	3.6	5.1	5.8	6.2	—	—
Master's degrees	0.9	3.4	5.3	6.6	5.8	—	—	—	—	—
Doctor's degrees	0.2	0.1	0.1	1.3	0.8	—	—	—	—	—

— Not available.

NOTE: MAPEs for associate's and bachelor's degrees conferred were calculated using the last eight editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2018* through *Projections of Education Statistics to 2025*. and MAPEs for master's degrees and doctor's degrees were calculated using the last 5 editions of *Projections of Education Statistics*, from *Projections of Education Statistics to 2021* through *Projections of Education Statistics to 2025*.

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Projections of Education Statistics*, various issues. (This table was prepared February 2017.)

For more information about MAPEs, see Section A.O. Introduction, earlier in this appendix.

Table A-30. Estimated equations and model statistics for degrees conferred, by degree type and sex based on data from 1970–71 to 2014–15

Dependent variable	Equation ¹	R ²	Breusch-Godfrey Serial Correlation LM test statistic ²	Time period
1	2	3	4	5
Associate's degrees, males	DASSOCM = 3821.3 + 74.4DUGFT2M + 86.6DUGFT2ML2 (3.06) (3.82) (4.42)	0.45	6.30 (0.043)	1970–71 to 2014–15
Associate's degrees, females	DLOGASSOCW = # + 0.8DLOGUGFT2WS3 + .6MA(1) † (7.74) (4.98)	0.79	5.16 (0.076)	1970–71 to 2014–15
Bachelor's degrees, males	DBACHM = 870.8 + 55.0DUGFT4M + 150.5DUGFT4ML2 -0.74 (2.95) (8.42)	0.73	1.56 (0.458)	1970–71 to 2014–15
Bachelor's degrees, females	DBACHW = 5115.8 + 31.4DUGFT4W + 141.0DUGFT4WL2 (2.85) (1.58) (6.75)	0.61	3.87 (0.144)	1970–71 to 2014–15
Master's degrees, males	PCHMASTM = # + 0.6PCHPBFTM + 0.5PCHPBFTML1 † (4.55) (3.41)	0.67	0.99 (0.609)	1980–81 to 2014–15
Master's degrees, females	PCHMASTW = # + 0.5PCHPBFTW + 0.5AR(1) † (3.12) (3.99)	0.60	3.23 (0.199)	1980–81 to 2014–15
Doctor's degrees, males	DDOCM = -378.8 + 60.6DPBFTML1 + 48.4DPBFTML2 (-1.71) (3.08) (2.46)	0.54	1.59 (0.451)	1980–81 to 2014–15
Doctor's degrees, females	DDOCW = 777.4 + 18.3DPBFTWL1 + 41.5DPBFTWL2 (2.80) (1.62) (3.64)	0.43	0.22 (0.896)	1980–81 to 2014–15

† Not applicable.

Rounds to zero.

¹AR(1) indicates that the model was estimated to account for first-order autocorrelation. To estimate the model, it was first transformed into a nonlinear model and then the coefficients were estimated simultaneously by applying a Marquardt nonlinear least squares algorithm to the transformed equation. MA(1) indicates that the model was estimated to incorporate moving average of the residual into model fit. For a general discussion of the problem of autocorrelation, and the method used to forecast in the presence of autocorrelation, see Judge, G., Hill, W., Griffiths, R., Lutkepohl, H., and Lee, T. (1985). *The Theory and Practice of Econometrics*. New York: John Wiley and Sons, pp. 315–318. Numbers in parentheses are *t*-statistics.

²The number in parentheses is the probability of the Chi-Square associated with the Breusch-Godfrey Serial Correlation LM Test. A *p* value greater than 0.05 implies that we do not reject the null hypothesis of no autocorrelation at the 5 percent significance level for a two-tailed test or 10 percent significance level for a one-tailed test (i.e., there is no autocorrelation present). For an explanation of the Breusch-Godfrey Serial Correlation LM test statistic, see Greene, W. (2000). *Econometric Analysis*. New Jersey: Prentice-Hall.

NOTE: R² is the coefficient of determination.

DASSOCM = First difference of associate's degrees awarded to males.

DLOGASSOCW = First difference of the log of associate's degrees awarded to females.

DBACHM = First difference of bachelor's degrees awarded to males.

DBACHW = First difference of bachelor's degrees awarded to females.

PCHMASTM = Percentage change in master's degrees awarded to males.

PCHMASTW = Percentage change in master's degrees awarded to females.

DDOCM = First difference of doctor's degrees awarded to males.

DDOCW = First difference of doctor's degrees awarded to females.

DUGFT2M = First difference of full-time male undergraduate enrollment in 2-year institutions.

DUGFT2ML2 = First difference of full-time male undergraduate enrollment in 2-year institutions, lagged two periods.

DLOGUGFT2WS3 = First difference of the sum of the full-time female undergraduate enrollment in 2-year institutions over the present year and the previous 2 years.

DUGFT4M = First difference of full-time male undergraduate enrollment in 4-year institutions.

DUGFT4ML2 = First difference of full-time male undergraduate enrollment in 4-year institutions, lagged two periods.

DUGFT4W = First difference of full-time female undergraduate enrollment in 4-year institutions.

DUGFT4WL2 = First difference of full-time female undergraduate enrollment in 4-year institutions, lagged two periods.

PCHPBFTM = Percentage change in full-time male postbaccalaureate enrollment.

PCHPBFTML1 = Percentage change in full-time male postbaccalaureate enrollment lagged 1 year.

PCHPBFTW = Percentage change in full-time female postbaccalaureate enrollment.

DPBFTML1 = First difference of full-time male postbaccalaureate enrollment lagged 1 year.

DPBFTML2 = First difference of full-time male postbaccalaureate enrollment lagged 2 years.

DPBFTWL1 = First difference of full-time female postbaccalaureate enrollment lagged 1 year.

DPBFTWL2 = First difference of full-time female postbaccalaureate enrollment lagged 2 years.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Degrees Conferred Projection Model, 1970–71 through 2026–27. (This table was prepared February 2017.)

Appendix B

Supplementary Tables

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Table B-1. Actual and projected prekindergarten- and kindergarten-age populations, by age: 2001 through 2026
[In thousands]

Year (July 1)	3- to 5-year-olds	3-year-olds	4-year-olds	5-year-olds
1	2	3	4	5
Actual				
2001	11,540	3,803	3,827	3,910
2002	11,454	3,804	3,813	3,837
2003	11,501	3,861	3,817	3,824
2004	11,714	4,008	3,877	3,830
2005	11,866	3,943	4,030	3,893
2006	11,987	3,966	3,971	4,051
2007	11,996	4,004	3,998	3,993
2008	12,058	3,992	4,041	4,024
2009	12,129	4,026	4,033	4,070
2010	12,254	4,112	4,078	4,065
2011	12,312	4,102	4,122	4,088
2012	12,228	3,983	4,113	4,132
2013	12,111	3,993	3,994	4,124
2014	12,020	4,007	4,006	4,007
2015	12,012	3,974	4,020	4,018
Projected				
2016	12,001	3,981	3,987	4,032
2017	12,016	4,012	3,989	4,016
2018	12,079	4,041	4,020	4,018
2019	12,168	4,070	4,049	4,049
2020	12,255	4,098	4,078	4,079
2021	12,339	4,125	4,107	4,108
2022	12,419	4,149	4,133	4,136
2023	12,493	4,171	4,158	4,163
2024	12,557	4,189	4,180	4,188
2025	12,610	4,203	4,198	4,210
2026	12,653	4,214	4,212	4,228

NOTE: Some data have been revised from previously published figures. Detail may not sum to totals because of rounding. As the Census Bureau projections were not updated to reflect the most recent Census Bureau population estimates, the Census Bureau age-specific population projections for each year were adjusted by multiplying the ratio of the total Census Bureau estimate for 2015 to the total Census Bureau projection for 2015.

SOURCE: U.S. Department of Commerce, Census Bureau, Population Estimates, retrieved September 21, 2016 from <https://www2.census.gov/programs-surveys/popest/datasets/2010-2015/>; and Population Projections, retrieved August 4, 2015, from <https://www.census.gov/programs-surveys/popproj.html>. (This table was prepared March 2017.)

Table B-2. Actual and projected school-age populations, by selected ages: 2001 through 2026

[In thousands]

Year (July 1)	5-year-olds	6-year-olds	5- to 13-year-olds	14- to 17-year-olds
1	2	3	4	5
Actual				
2001	3,910	3,973	37,093	16,280
2002	3,837	3,913	37,001	16,506
2003	3,824	3,838	36,814	16,694
2004	3,830	3,822	36,458	17,054
2005	3,893	3,828	36,248	17,358
2006	4,051	3,891	36,269	17,549
2007	3,993	4,046	36,296	17,597
2008	4,024	3,988	36,438	17,395
2009	4,070	4,018	36,657	17,232
2010	4,065	4,073	36,867	17,066
2011	4,088	4,075	36,918	16,873
2012	4,132	4,098	37,008	16,722
2013	4,124	4,143	37,083	16,656
2014	4,007	4,136	36,973	16,754
2015	4,018	4,019	36,924	16,814
Projected				
2016	4,032	4,030	36,976	16,779
2017	4,016	4,044	36,968	16,750
2018	4,018	4,027	36,921	16,681
2019	4,049	4,030	36,902	16,665
2020	4,079	4,061	36,890	16,762
2021	4,108	4,090	36,862	16,878
2022	4,136	4,120	36,874	16,942
2023	4,163	4,148	37,030	16,885
2024	4,188	4,175	37,202	16,816
2025	4,210	4,201	37,382	16,715
2026	4,228	4,223	37,598	16,607

NOTE: Some data have been revised from previously published figures. Detail may not sum to totals because of rounding. As the Census Bureau projections were not updated to reflect the most recent Census Bureau population estimates, the Census Bureau age-specific population projections for each year were adjusted by multiplying the ratio of the total Census Bureau estimate for 2015 to the total Census Bureau projection for 2015.

SOURCE: U.S. Department of Commerce, Census Bureau, Population Estimates, retrieved September 21, 2016 from <https://www2.census.gov/programs-surveys/pepest/datasets/2010-2015/>; and Population Projections, retrieved August 4, 2015, from <https://www.census.gov/programs-surveys/popproj.html>. (This table was prepared March 2017.)

Table B-3. Actual and projected college-age populations, by selected ages: 2001 through 2026

[In thousands]

Year (July 1)	18-year-olds	18- to 24-year-olds	25- to 29-year-olds	30- to 34-year-olds	35- to 44-year-olds
1	2	3	4	5	6
Actual					
2001	4,106	28,081	18,866	20,689	45,101
2002	4,087	28,598	18,752	20,705	44,706
2003	4,206	29,121	18,872	20,545	44,251
2004	4,218	29,474	19,193	20,220	43,881
2005	4,228	29,609	19,629	19,787	43,594
2006	4,303	29,758	20,200	19,343	43,325
2007	4,397	29,973	20,640	19,231	42,879
2008	4,590	30,355	21,003	19,365	42,275
2009	4,537	30,687	21,184	19,708	41,573
2010	4,493	30,918	21,249	20,132	41,066
2011	4,404	31,242	21,397	20,592	40,750
2012	4,361	31,510	21,485	20,983	40,640
2013	4,296	31,631	21,675	21,349	40,600
2014	4,229	31,581	22,068	21,592	40,587
2015	4,219	31,303	22,519	21,715	40,634
Projected					
2016	4,227	30,994	23,019	21,900	40,668
2017	4,243	30,790	23,491	22,055	41,021
2018	4,326	30,751	23,776	22,298	41,569
2019	4,276	30,693	23,894	22,724	42,128
2020	4,187	30,601	23,741	23,206	42,722
2021	4,217	30,604	23,484	23,739	43,419
2022	4,260	30,657	23,266	24,216	44,005
2023	4,264	30,705	23,140	24,507	44,649
2024	4,288	30,762	23,062	24,633	45,342
2025	4,334	30,782	23,121	24,490	45,978
2026	4,326	30,842	23,193	24,242	46,728

NOTE: Some data have been revised from previously published figures. Detail may not sum to totals because of rounding. As the Census Bureau projections were not updated to reflect the most recent Census Bureau population estimates, the Census Bureau age-specific population projections for each year were adjusted by multiplying the ratio of the total Census Bureau estimate for 2015 to the total Census Bureau projection for 2015.

SOURCE: U.S. Department of Commerce, Census Bureau, Population Estimates, retrieved September 21, 2016 from <https://www2.census.gov/programs-surveys/popest/datasets/2010-2015/>; and Population Projections, retrieved August 4, 2015, from <https://www.census.gov/programs-surveys/popproj.html>. (This table was prepared March 2017.)

Table B-4. Actual and projected fall enrollment in public elementary and secondary schools, change in fall enrollment from previous year, resident population, and fall enrollment as a ratio of the population: School years 2001–02 through 2026–27

School year	Fall enrollment (in thousands)	Change in fall enrollment from previous year (in thousands)	Resident population (in millions)	Fall enrollment as a ratio of the population
1	2	3	4	5
Actual				
2001–02	47,672	468	285.2	0.167
2002–03	48,183	511	287.9	0.167
2003–04	48,540	357	290.6	0.167
2004–05	48,795	255	293.2	0.166
2005–06	49,113	318	295.9	0.166
2006–07	49,316	203	298.8	0.165
2007–08	49,293	-23	301.7	0.163
2008–09	49,266	-27	304.5	0.162
2009–10	49,361	95	307.2	0.161
2010–11	49,484	123	309.8	0.160
2011–12	49,522	37	312.1	0.159
2012–13	49,771	249	314.4	0.158
2013–14	50,045	273	316.7	0.158
2014–15	50,313	268	319.2	0.158
Projected				
2015–16	50,485	172	321.7	0.157
2016–17	50,625	140	324.1	0.156
2017–18	50,710	85	326.8	0.155
2018–19	50,759	50	329.4	0.154
2019–20	50,843	84	332.0	0.153
2020–21	50,996	153	334.6	0.152
2021–22	51,152	156	337.2	0.152
2022–23	51,301	149	339.8	0.151
2023–24	51,455	154	342.4	0.150
2024–25	51,562	107	345.0	0.149
2025–26	51,632	71	347.5	0.149
2026–27	51,738	106	350.0	0.148

NOTE: Resident population includes civilian population and armed forces personnel residing with the United States; it excludes armed forces personnel overseas. Calculations were made using unrounded numbers. Some data have been revised from previously published figures. Detail may not sum to totals because of rounding. As the Census Bureau projections were not updated to reflect the most recent Census Bureau population estimates, the Census Bureau age-specific population projections for each year were adjusted by multiplying the ratio of the total Census Bureau estimate for 2015 to the total Census Bureau projection for 2015.

SOURCE: U.S. Department of Commerce, Census Bureau, Population Estimates, retrieved September 21, 2016 from <https://www2.census.gov/programs-surveys/popest/datasets/2010-2015/>; and Population Projections, retrieved August 4, 2015, from <https://www.census.gov/programs-surveys/popproj.html>. U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "State Nonfiscal Survey of Public Elementary/Secondary Education," 1996–97 through 2014–15; and National Elementary and Secondary Enrollment Projection Model, 1972 through 2026. (This table was prepared March 2017.)

Table B-5. Actual and projected macroeconomic measures of the economy: School years 2001–02 through 2026–27

School year	Disposable income per capita in constant 2015–16 dollars ¹	Education revenue receipts from state sources per capita in constant 2015–16 dollars ²	Consumer Price Index ³
1	2	3	4
Actual			
2001–02	\$35,960	\$969	0.748
2002–03	36,338	974	0.764
2003–04	37,425	958	0.781
2004–05	37,979	969	0.804
2005–06	38,667	980	0.835
2006–07	39,497	1,030	0.856
2007–08	39,913	1,055	0.888
2008–09	39,608	1,008	0.901
2009–10	39,171	926	0.910
2010–11	39,861	928	0.928
2011–12	40,456	903	0.955
2012–13	40,691	895	0.971
2013–14	40,625	923	0.986
2014–15 ⁴	41,891	897	0.993
2015–16 ⁴	42,821	917	1.000
Projected			
2016–17	43,456	929	1.019
2017–18	44,228	941	1.045
2018–19	45,133	954	1.070
2019–20	45,940	965	1.096
2020–21	46,681	975	1.123
2021–22	47,470	987	1.151
2022–23	48,251	998	1.180
2023–24	49,045	1,008	1.209
2024–25	49,829	1,017	1.239
2025–26	50,604	1,025	1.270
2026–27	51,041	1,027	1.293

¹Based on the price deflator for personal consumption expenditures, Bureau of Labor Statistics, U.S. Department of Labor.
²Based on the Consumer Price Index for all urban consumers, Bureau of Labor Statistics, U.S. Department of Labor.
³Consumer Price Index adjusted to a school-year basis (July through June).
⁴Education revenue receipts from state sources per capita is a projection.

NOTE: Calculations were made using unrounded numbers. Some data have been revised from previously published figures.
 SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "National Public Education Financial Survey," 1999–2000 through 2013–14; Revenue Receipts From State Sources Projections Model, 1971–72 through 2026–27; and IHS Global Inc., "U.S. Quarterly Macroeconomic Model, November 2016 Short-Term Baseline Projections." (This table was prepared March 2017.)

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Appendix C

Data Sources

SOURCES AND COMPARABILITY OF DATA

The information in this report was obtained from many sources, including federal and state agencies, private research organizations, and professional associations. The data were collected by many methods, including surveys of a universe (such as all colleges) or of a sample, and compilations of administrative records. Care should be used when comparing data from different sources. Differences in procedures, such as timing, phrasing of questions, and interviewer training, mean that the results from the different sources are not strictly comparable. More extensive documentation of one survey's procedures than of another's does not imply more problems with the data, only that more information is available on the survey.

ACCURACY OF DATA

The accuracy of any statistic is determined by the joint effects of “sampling” and “nonsampling” errors. Estimates based on a sample will differ from the figures that would have been obtained if a complete census had been taken using the same survey instruments, instructions, and procedures. Besides sampling errors, both of the survey types, universe and sample, are subject to errors of design, reporting, and processing, and errors due to nonresponse. To the extent possible, these nonsampling errors are kept to a minimum by methods built into the survey procedures. In general, however, the effects of nonsampling errors are more difficult to gauge than those produced by sampling variability.

SAMPLING ERRORS

The standard error is the primary measure of the sampling variability of an estimate. Standard errors can be used to produce confidence intervals. For example, from table A-11, an estimated 93.1 percent of public school teachers reported that they worked full time in 2011–12. This figure has an estimated standard error of 0.46 percent. Therefore, the estimated 95 percent confidence interval for this statistic is approximately 92.15 to 93.98 percent ($93.1 \pm 1.96 [0.46]$). That is, if the processes of selecting a sample, collecting the data, and constructing the confidence interval were repeated, it would be expected that in 95 out of 100 samples from the same population, the confidence interval would contain the true full-time working rate.

Analysis of standard errors can help assess how valid a comparison between two estimates might be. The *standard error of a difference* between two independent sample estimates is equal to the square root of the sum of the squared standard errors of the estimates. The standard error (se) of the difference between independent sample estimates a and b is

$$se_{a-b} = (se_a^2 + se_b^2)^{1/2}$$

Note that some of the standard errors in the original documents are approximations. That is, to derive estimates of standard errors that would be applicable to a wide variety of items and could be prepared at a moderate cost, a number of approximations were required. As a result, most of the standard errors presented provide a general order of magnitude rather than the exact standard error for any specific item.

NONSAMPLING ERRORS

Both universe and sample surveys are subject to nonsampling errors. Nonsampling errors are of two kinds—random and nonrandom. Random nonsampling errors may arise when respondents or interviewers interpret questions differently, when respondents must estimate values, or when coders, keyers, and other processors handle answers differently. Nonrandom nonsampling errors result from total nonresponse (no usable data obtained for a sampled unit), partial or item nonresponse (only a portion of a response may be usable), inability or unwillingness on the part of respondents to provide information, difficulty interpreting questions, mistakes in recording or keying data, errors of collection or processing, and overcoverage or undercoverage of the target universe. Random nonresponse errors usually, but not always, result in an understatement

of sampling errors and thus an overstatement of the precision of survey estimates. Because estimating the magnitude of nonsampling errors would require special experiments or access to independent data, these magnitudes are seldom available.

To compensate for suspected nonrandom errors, adjustments of the sample estimates are often made. For example, adjustments are frequently made for nonresponse, both total and partial. Imputations are usually made separately within various groups of sample members that have similar survey characteristics. Imputation for item nonresponse is usually made by substituting for a missing item the response to that item of a respondent having characteristics similar to those of the respondent.

Although the magnitude of nonsampling errors in the data used in *Projections of Education Statistics* is frequently unknown, idiosyncrasies that have been identified are noted on the appropriate tables.

FEDERAL AGENCY SOURCES

National Center for Education Statistics (NCES)

Common Core of Data

The Common Core of Data (CCD) is NCES's primary database on public elementary and secondary education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts containing data designed to be comparable across all states. This database can be used to select samples for other NCES surveys and provide basic information and descriptive statistics on public elementary and secondary schools and schooling in general.

The CCD collects statistical information annually from approximately 100,000 public elementary and secondary schools and approximately 18,000 public school districts (including supervisory unions and regional education service agencies) in the 50 states, the District of Columbia, Department of Defense (DoD) dependents schools, the Bureau of Indian Education (BIE), Puerto Rico, American Samoa, Guam, the Northern Mariana Islands, and the U.S. Virgin Islands. Three categories of information are collected in the CCD survey: general descriptive information on schools and school districts; data on students and staff; and fiscal data. The general school and district descriptive information includes name, address, phone number, and type of locale; the data on students and staff include selected demographic characteristics; and the fiscal data pertain to revenues and current expenditures.

The *EDFacts* data collection system is the primary collection tool for the CCD. NCES works collaboratively with the Department of Education's Performance Information Management Service to develop the CCD collection procedures and data definitions. Coordinators from state education agencies (SEAs) submit the CCD data at different levels (school, agency, and state) to the *EDFacts* collection system. Prior to submitting CCD files to *EDFacts*, SEAs must collect and compile information from their respective local education agencies (LEAs) through established administrative records systems within their state or jurisdiction.

Once SEAs have completed their submissions, the CCD survey staff analyzes and verifies the data for quality assurance. Even though the CCD is a universe collection and thus not subject to sampling errors, nonsampling errors can occur. The two potential sources of nonsampling errors are nonresponse and inaccurate reporting. NCES attempts to minimize nonsampling errors through the use of annual training of SEA coordinators, extensive quality reviews, and survey editing procedures. In addition, each year, SEAs are given the opportunity to revise their state-level aggregates from the previous survey cycle.

The CCD survey consists of five components: The Public Elementary/Secondary School Universe Survey, the Local Education Agency (School District) Universe Survey, the State Nonfiscal Survey of Public Elementary/Secondary Education, the National Public Education Financial Survey (NPEFS), and the School District Finance Survey (F-33). The following sections describe the CCD surveys that were used in preparing this report.

State Nonfiscal Survey of Public Elementary/Secondary Education

The State Nonfiscal Survey of Public Elementary/Secondary Education for the 2014–15 school year provides state-level, aggregate information about students and staff in public elementary and secondary education. It includes data from the 50 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, the Northern Mariana Islands, Guam, and American Samoa. The DoD dependents schools (overseas and domestic) and the BIE are also included in the survey universe. This survey covers public school student membership by grade, race/ethnicity, and state or jurisdiction and covers number of staff in public schools by category and state or jurisdiction. Beginning with the 2006–07 school year, the number of diploma

recipients and other high school completers are no longer included in the State Nonfiscal Survey of Public Elementary/Secondary Education file. These data are now collected through the Local Education Agency (School District) Universe Survey and published in the public-use Common Core of Data State Dropout and Completion Data File.

National Public Education Financial Survey

The purpose of the National Public Education Financial Survey (NPEFS) is to provide district, state, and federal policymakers, researchers, and other interested users with descriptive information about revenues and expenditures for public elementary and secondary education. The data collected are useful to (1) chief officers of state education agencies; (2) policymakers in the executive and legislative branches of federal and state governments; (3) education policy and public policy researchers; and (4) the public, journalists, and others.

Data for NPEFS are collected from state education agencies (SEAs) in the 50 states, the District of Columbia, Puerto Rico, American Samoa, Guam, the Northern Mariana Islands, and the U.S. Virgin Islands. The data file is organized by state or jurisdiction and contains revenue data by funding source; expenditure data by function (the activity being supported by the expenditure) and object (the category of expenditure); average daily attendance data; and total student membership data from the CCD State Nonfiscal Survey of Public Elementary/Secondary Education.

Further information on the nonfiscal CCD data may be obtained from

Patrick Keaton
Administrative Data Division
Elementary and Secondary Branch
National Center for Education Statistics
550 12th Street SW
Washington, DC 20202
patrick.keaton@ed.gov
<http://nces.ed.gov/ccd>

Further information on the fiscal CCD data may be obtained from

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<http://nces.ed.gov/ccd>

Integrated Postsecondary Education Data System

The Integrated Postsecondary Education Data System (IPEDS) surveys approximately 7,500 postsecondary institutions, including universities and colleges, as well as institutions offering technical and vocational education beyond the high school level. IPEDS, an annual universe collection that began in 1986, replaced the Higher Education General Information Survey (HEGIS).

IPEDS consists of interrelated survey components that provide information on postsecondary institutions, student enrollment, programs offered, degrees and certificates conferred, and both the human and financial resources involved in the provision of institutionally based postsecondary education. Prior to 2000, the IPEDS survey had the following subject-matter components: Graduation Rates; Fall Enrollment; Institutional Characteristics; Completions; Salaries, Tenure, and Fringe Benefits of Full-Time Faculty; Fall Staff; Finance; and Academic Libraries (in 2000, the Academic Libraries component became a survey separate from IPEDS). Since 2000, IPEDS survey components occurring in a particular collection year have been organized into three seasonal collection periods: fall, winter, and spring. The Institutional Characteristics and Completions components first took place during the fall 2000 collection; the Employees by Assigned Position (EAP), Salaries, and Fall Staff components first took place during the winter 2001–02 collection; and the Enrollment, Student Financial Aid, Finance, and Graduation Rates components first took place during the spring 2001 collection. In the winter 2005–06 data collection, the EAP, Fall Staff, and Salaries components were merged into the Human Resources component. During the 2007–08 collection year, the Enrollment component was broken into two separate components: 12-Month Enrollment (taking place in the fall collection) and Fall Enrollment (taking place in the spring collection). In the 2011–12 IPEDS data collection year, the Student Financial Aid component was moved to the winter data collection to aid in the timing of the net price of attendance calculations displayed on the College Navigator

(<http://nces.ed.gov/collegenavigator>). In the 2012–13 IPEDS data collection year, the Human Resources component was moved from the winter data collection to the spring data collection, and in the 2013–14 data collection year, the Graduation Rates and Graduation Rates 200% components were moved from the spring data collection to the winter data collection.

Beginning in 2008–09, the first-professional degree category was combined with the doctor's degree category. However, some degrees formerly identified as first-professional that take more than two full-time-equivalent academic years to complete, such as those in Theology (M.Div, M.H.L./Rav), are included in the Master's degree category. Doctor's degrees were broken out into three distinct categories: research/scholarship, professional practice, and other doctor's degrees.

IPEDS race/ethnicity data collection also changed in 2008–09. The "Asian" race category is now separate from a "Native Hawaiian or Other Pacific Islander" category, and a new category of "Two or more races" is added.

The degree-granting institutions portion of IPEDS is a census of colleges that award associate's or higher degrees and are eligible to participate in Title IV financial aid programs. Prior to 1993, data from technical and vocational institutions were collected through a sample survey. Beginning in 1993, all data are gathered in a census of all postsecondary institutions. Beginning in 1997, the survey was restricted to institutions participating in Title IV programs.

The classification of institutions offering college and university education changed as of 1996. Prior to 1996, institutions that had courses leading to an associate's or higher degree or that had courses accepted for credit toward those degrees were considered higher education institutions. Higher education institutions were accredited by an agency or association that was recognized by the U.S. Department of Education or were recognized directly by the Secretary of Education. The newer standard includes institutions that award associate's or higher degrees and that are eligible to participate in Title IV federal financial aid programs. Tables that contain any data according to this standard are titled "degree-granting" institutions. Time-series tables may contain data from both series, and they are noted accordingly. The impact of this change on data collected in 1996 was not large. Also, degrees awarded at the bachelor's level or higher were not heavily affected. The largest impact was on private 2-year college enrollment. In contrast, most of the data on public 4-year colleges were affected to a minimal extent. The impact on enrollment in public 2-year colleges was noticeable in certain states, such as Arizona, Arkansas, Georgia, Louisiana, and Washington, but was relatively small at the national level. Overall, total enrollment for all institutions was about one-half of 1 percent higher in 1996 for degree-granting institutions than for higher education institutions.

Prior to the establishment of IPEDS in 1986, HEGIS acquired and maintained statistical data on the characteristics and operations of institutions of higher education. Implemented in 1966, HEGIS was an annual universe survey of institutions accredited at the college level by an agency recognized by the Secretary of the U.S. Department of Education. These institutions were listed in NCES's *Education Directory, Colleges and Universities*.

HEGIS surveys collected information on institutional characteristics, faculty salaries, finances, enrollment, and degrees. Since these surveys, like IPEDS, were distributed to all higher education institutions, the data presented are not subject to sampling error. However, they are subject to nonsampling error, the sources of which varied with the survey instrument.

The NCES Taskforce for IPEDS Redesign recognized that there were issues related to the consistency of data definitions as well as the accuracy, reliability, and validity of other quality measures within and across surveys. The IPEDS redesign in 2000 provided institution-specific web-based data forms. While the new system shortened data processing time and provided better data consistency, it did not address the accuracy of the data provided by institutions.

Beginning in 2003–04 with the Prior Year Data Revision System, prior-year data have been available to institutions entering current data. This allows institutions to make changes to their prior-year entries either by adjusting the data or by providing missing data. These revisions allow the evaluation of the data's accuracy by looking at the changes made.

NCES conducted a study (NCES 2005-175) of the 2002–03 data that were revised in 2003–04 to determine the accuracy of the imputations, track the institutions that submitted revised data, and analyze the revised data they submitted. When institutions made changes to their data, it was assumed that the revised data were the "true" data. The data were analyzed for the number and type of institutions making changes, the type of changes, the magnitude of the changes, and the impact on published data.

Because NCES imputes for missing data, imputation procedures were also addressed by the Redesign Taskforce. For the 2003–04 assessment, differences between revised values and values that were imputed in the original files were compared (i.e., revised value minus imputed value). These differences were then used to provide an assessment of the effectiveness of imputation procedures. The size of the differences also provides an indication of the accuracy of imputation procedures. To assess the overall impact of

changes on aggregate IPEDS estimates, published tables for each component were reconstructed using the revised 2002–03 data. These reconstructed tables were then compared to the published tables to determine the magnitude of aggregate bias and the direction of this bias.

Since fall 2000 and spring 2001, IPEDS data collections have been web-based. Data have been provided by “keyholders,” institutional representatives appointed by campus chief executives, who are responsible for ensuring that survey data submitted by the institution are correct and complete. Because Title IV institutions are the primary focus of IPEDS and because these institutions are required to respond to IPEDS, response rates for Title IV institutions have been high (data on specific components are cited below). More details on the accuracy and reliability of IPEDS data can be found in the *Integrated Postsecondary Education Data System Data Quality Study* (NCES 2005-175).

Further information on IPEDS may be obtained from

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Fall (12-Month Enrollment)

The 12-month period during which data are collected is July 1 through June 30. Data are collected by race/ethnicity, gender, and level of study (undergraduate or postbaccalaureate) and include unduplicated headcounts and instructional activity (contact or credit hours). These data are also used to calculate a full-time-equivalent (FTE) enrollment based on instructional activity. FTE enrollment is useful for gauging the size of the educational enterprise at the institution. Prior to the 2007–08 IPEDS data collection, the data collected in the 12-Month Enrollment component were part of the Fall Enrollment component, which is conducted during the spring data collection period. However, to improve the timeliness of the data, a separate 12-Month Enrollment survey component was developed in 2007. These data are now collected in the fall for the previous academic year. The response rate for the 12-Month Enrollment component of the fall 2015 data collection was nearly 100 percent. Data from only 1 of 7,169 Title IV institutions that were expected to respond to this component contained item nonresponse, and these missing items were imputed.

Further information on the IPEDS 12-Month Enrollment component may be obtained from

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Fall (Completions)

This survey was part of the HEGIS series throughout its existence. However, the degree classification taxonomy was revised in 1970–71, 1982–83, 1991–92, 2002–03, and 2009–10. Collection of degree data has been maintained through IPEDS.

Degrees-conferred trend tables arranged by the 2009–10 classification are included in the *Projections of Education Statistics* to provide consistent data from 1970–71 through the most recent year. Data on associate’s degrees, by field of study, cannot be made comparable with figures from years prior to 1982–83. The nonresponse rate does not appear to be a significant source of nonsampling error for this survey. The response rate over the years has been high; for the fall 2015 Completions component, it rounded to 100 percent. Because of the high response rate, there was no need to conduct a nonresponse bias analysis. Imputation methods for the fall 2015 Completions component are discussed in the *2015–16 Integrated Postsecondary Education Data System (IPEDS) Methodology Report* (NCES 2016-111).

The *Integrated Postsecondary Education Data System Data Quality Study* (NCES 2005-175) indicated that most Title IV institutions supplying revised data on completions in 2003–04 were able to supply missing data for the prior year. The small differences between imputed data for the prior year and the revised actual data supplied by the institution indicated that the imputed values produced by NCES were acceptable.

Further information on the IPEDS Completions component may be obtained from

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Spring (Fall Enrollment)

This survey has been part of the HEGIS and IPEDS series since 1966. Response rates have been relatively high, generally exceeding 85 percent. Beginning in 2000, with web-based data collection, higher response rates were attained. In the spring 2016 data collection, the Fall Enrollment component covered fall 2015. Of the 7,146 institutions that were expected to respond, 7,134 responded, for a response rate that rounded to 100 percent. Data collection procedures for the Fall Enrollment component of the spring 2016 data collection are presented in *Enrollment and Employees in Postsecondary Institutions, Fall 2015; and Financial Statistics and Academic Libraries, Fiscal Year 2015: First Look (Provisional Data)* (NCES 2017-024).

Beginning with the fall 1986 survey and the introduction of IPEDS (see above), the survey was redesigned. The survey allows (in alternating years) for the collection of age and residence data. Beginning in 2000, the survey collected instructional activity and unduplicated headcount data, which are needed to compute a standardized, full-time-equivalent (FTE) enrollment statistic for the entire academic year. As of 2007–08, the timeliness of the instructional activity data has been improved by collecting these data in the fall as part of the 12-Month Enrollment component instead of in the spring as part of the Fall Enrollment component.

The *Integrated Postsecondary Education Data System Data Quality Study* (NCES 2005-175) showed that public institutions made the majority of changes to enrollment data during the 2004 revision period. The majority of changes were made to unduplicated headcount data, with the net differences between the original data and the revised data at about 1 percent. Part-time students in general and enrollment in private not-for-profit institutions were often underestimated. The fewest changes by institutions were to Classification of Instructional Programs (CIP) code data. (The CIP is a taxonomic coding scheme that contains titles and descriptions of primarily postsecondary instructional programs.)

Further information on the IPEDS Fall Enrollment component may be obtained from

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Private School Universe Survey

The purposes of the Private School Universe Survey (PSS) data collection activities are (1) to build an accurate and complete list of private schools to serve as a sampling frame for NCES sample surveys of private schools and (2) to report data on the total number of private schools, teachers, and students in the survey universe. Begun in 1989, the PSS has been conducted every 2 years, and data for the 1989–90, 1991–92, 1993–94, 1995–96, 1997–98, 1999–2000, 2001–02, 2003–04, 2005–06, 2007–08, 2009–10, 2011–12, and 2013–14 school years have been released. A First Look report on the 2013–14 PSS data, *Characteristics of Private Schools in the United States: Results From the 2013–14 Private School Universe Survey* (NCES 2016-243) was published in November 2016.

The PSS produces data similar to that of the Common Core of Data for public schools, and can be used for public-private comparisons. The data are useful for a variety of policy- and research-relevant issues, such as the growth of religiously affiliated schools, the number of private high school graduates, the length of the school year for various private schools, and the number of private school students and teachers.

The target population for this universe survey is all private schools in the United States that meet the PSS criteria of a private school (i.e., the private school is an institution that provides instruction for any of grades K through 12, has one or more teachers to give instruction, is not administered by a public agency, and is not operated in a private home).

The survey universe is composed of schools identified from a variety of sources. The main source is a list frame initially developed for the 1989–90 PSS. The list is updated regularly by matching it with lists provided by nationwide private school associations, state departments of education, and other national guides and sources that list private schools. The other source is an area frame search in approximately 124 geographic areas, conducted by the U.S. Census Bureau.

Of the 40,302 schools included in the 2009–10 sample, 10,229 were found ineligible for the survey. Those not responding numbered 1,856, and those responding numbered 28,217. The unweighted response rate for the 2009–10 PSS survey was 93.8 percent.

Of the 39,325 schools included in the 2011–12 sample, 10,030 cases were considered as out-of-scope (not eligible for the PSS). A total of 26,983 private schools completed a PSS interview (15.8 percent completed online), while 2,312 schools refused to participate, resulting in an unweighted response rate of 92.1 percent.

Of the 40,298 schools included in the 2013–14 PSS, 10,659 cases were considered as out-of-scope (not eligible for the PSS). A total of 24,566 private schools completed a PSS interview (34.1 percent completed online), while 5,073 schools refused to participate resulting in an unweighted response rate of 82.9 percent.

Further information on the PSS may be obtained from

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Schools and Staffing Survey

The Schools and Staffing Survey (SASS) is a set of related questionnaires that collect descriptive data on the context of public and private elementary and secondary education. Data reported by districts, schools, principals, and teachers provide a variety of statistics on the condition of education in the United States that may be used by policymakers and the general public. The SASS system covers a wide range of topics, including teacher demand, teacher and principal characteristics, teachers' and principals' perceptions of school climate and problems in their schools, teacher and principal compensation, district hiring and retention practices, general conditions in schools, and basic characteristics of the student population.

SASS data are collected through a mail questionnaire with telephone and in-person field follow-up. SASS has been conducted by the Census Bureau for NCES since the first administration of the survey, which was conducted during the 1987–88 school year. Subsequent SASS administrations were conducted in 1990–91, 1993–94, 1999–2000, 2003–04, 2007–08, and 2011–12.

SASS is designed to produce national, regional, and state estimates for public elementary and secondary schools, school districts, principals, teachers, and school library media centers and national and regional estimates for public charter schools, as well as principals, teachers, and school library media centers within these schools. For private schools, the sample supports national, regional, and affiliation estimates for schools, principals, and teachers.

From its inception, SASS has had four core components: school questionnaires, teacher questionnaires, principal questionnaires, and school district (prior to 1999–2000, “teacher demand and shortage”) questionnaires. A fifth component, school library media center questionnaires, was introduced in the 1993–94 administration and has been included in every subsequent administration of SASS. School library data were also collected in the 1990–91 administration of the survey through the school and principal questionnaires.

School questionnaires used in SASS include the Public and Private School Questionnaires; teacher questionnaires include the Public and Private School Teacher Questionnaires; principal questionnaires include the Public and Private School Principal (or School Administrator) Questionnaires; and school district questionnaires include the School District (or Teacher Demand and Shortage) Questionnaires.

Although the four core questionnaires and the school library media questionnaires have remained relatively stable over the various administrations of SASS, the survey has changed to accommodate emerging issues in elementary and secondary education. Some questionnaire items have been added, some have been deleted, and some have been reworded.

During the 1990–91 SASS cycle, NCES worked with the Office of Indian Education to add an Indian School Questionnaire to SASS, and it remained a part of SASS through 2007–08. The Indian School Questionnaire explores the same school-level issues that the Public and Private School Questionnaires explore, allowing comparisons among the three types of schools. The 1990–91, 1993–94, 1999–2000, 2003–04, and 2007–08 administrations of SASS obtained data on Bureau of Indian Education (BIE) schools (schools funded or operated by the BIE), but the 2011–12 administration did not obtain BIE data. SASS estimates for all survey years presented in this report exclude BIE schools, and as a result, estimates in this report may differ from those in previously published reports.

The SASS teacher surveys collect information on the characteristics of teachers, such as their age, race/ethnicity, years of teaching experience, average number of hours per week spent on teaching activities, base salary, average class size, and highest degree earned. These teacher-reported data may be combined with related information on their school's characteristics, such as school type (e.g., public traditional, public charter, Catholic, private other religious, and private nonsectarian), community type, and school enrollment size. The teacher questionnaires also ask for information on teacher opinions regarding the school and teaching environment. In 1993–94, about 53,000 public school teachers and 10,400 private school teachers were sampled. In 1999–2000, about 56,300 public school teachers, 4,400 public charter school teachers, and 10,800 private school teachers were sampled. In 2003–04, about 52,500 public school teachers and 10,000 private school teachers were sampled. In 2007–08, about 48,400 public school teachers and 8,200 private school teachers were sampled. In 2011–12, about 51,100 public school teachers and 7,100 private school teachers were sampled. Weighted overall response rates in 2011–12 were 61.8 percent for public school teachers and 50.1 percent for private school teachers.

The SASS 2011–12 sample of schools was confined to the 50 states and the District of Columbia and excludes the other jurisdictions, the Department of Defense overseas schools, the BIE schools, and schools that do not offer teacher-provided classroom instruction in grades 1–12 or the ungraded equivalent. The SASS 2011–12 sample included 10,250 traditional public schools, 750 public charter schools, and 3,000 private schools.

The public school sample for the 2011–12 SASS was based on an adjusted public school universe file from the 2009–10 Common Core of Data, a database of all the nation's public school districts and public schools. The private school sample for the 2011–12 SASS was selected from the 2009–10 Private School Universe Survey (PSS), as updated for the 2011–12 PSS. This update collected membership lists from private school associations and religious denominations, as well as private school lists from state education departments. The 2011–12 SASS private school frame was further augmented by the inclusion of additional schools that were identified through the 2009–10 PSS area frame data collection.

The NCES data product *2011–12 Schools and Staffing Survey (SASS) Restricted-Use Data Files* (NCES 2014-356) is available. (Information on how to obtain a restricted-use data license is located at <http://nces.ed.gov/pubsearch/licenses.asp>.) This DVD contains eight files (Public School District, Public School Principal, Public School, Public School Teacher, Public School Library Media Center, Private School Principal, Private School, and Private School Teacher) in multiple formats. It also contains a six-volume User's Manual, which includes a codebook for each file.

Further information on SASS may be obtained from

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Teacher Follow-Up Survey

The Teacher Follow-up Survey (TFS) is a follow-up survey of selected elementary and secondary school teachers who participate in the NCES Schools and Staffing Survey (SASS). Its purpose is to determine how many teachers remain at the same school, move to another school, or leave the profession in the year following a SASS administration. It is administered to elementary and secondary teachers in the 50 states and the District of Columbia. The TFS uses two questionnaires, one for teachers who left teaching since the previous SASS administration and another for those who are still teaching either in the same school as last year or in a different school. The objective of the TFS is to focus on the characteristics of each group in order to answer questions about teacher mobility and attrition.

The 2008–09 TFS is different from any previous TFS administration in that it also serves as the second wave of a longitudinal study of first-year teachers. Because of this, the 2008–09 TFS consists of four questionnaires. Two are for respondents who were first-year public school teachers in the 2007–08 SASS and two are for the remainder of the sample.

The 2012–13 TFS sample was made up of teachers who had taken the 2011–12 SASS survey. The 2012–13 TFS sample contained about 5,800 public school teachers and 1,200 private school teachers. The weighted overall response rate using the initial basic weight for private school teachers was notably low (39.7 percent), resulting in a decision to exclude private school teachers from the 2012–13 TFS data files. The weighted overall response rate for public school teachers was 49.9 percent (50.3 percent for current and 45.6 percent for former teachers). Further information about the 2012–13 TFS, including the analysis of unit nonresponse bias, is available in the First Look report *Teacher Attrition and Mobility: Results From the 2012–13 Teacher Follow-up Survey* (NCES 2014-077).

Further information on the TFS may be obtained from

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Bureau of Economic Analysis

National Income and Product Accounts

The National Income and Product Accounts (NIPAs), produced by the Bureau of Economic Analysis, are a set of economic accounts that provide information on the value and composition of output produced in the United States during a given period. NIPAs present measures of economic activity in the United States, including production, income distribution, and personal savings. NIPAs also include data on employee compensation and wages. These estimations were first calculated in the early 1930s to help the government design economic policies to combat the Great Depression. Most of the NIPA series are published quarterly, with annual reviews of estimates from the three most recent years conducted in the summer.

Revisions to the NIPAs have been made over the years to create a more comprehensive economic picture of the United States. For example, in 1976, consumption of fixed capital (CFC) estimates shifted to a current-cost basis. In 1991, NIPAs began to use gross domestic product (GDP) instead of gross national product (GNP) as the primary measure of U.S. production. (At that time, virtually all other countries were already using GDP as their primary measure of production.) In the 2003 comprehensive revision, a more complete and accurate measure of insurance services was adopted. The incorporation of a new classification system for personal consumption expenditures (PCE) was among the changes contained in the 2009 comprehensive revision. The comprehensive revision of 2013 included the treatment of research and development expenditures by business, government, and nonprofit institutions serving households as fixed investment. As was the case in previous years, the most recent revisions, made in 2015, were the result of the incorporation of newly available and revised source data and the adoption of improved estimating methods.

NIPAs are slowly being integrated with other federal account systems, such as the federal account system of the Bureau of Labor Statistics.

Further information on NIPAs may be obtained from

U.S. Department of Commerce
Bureau of Economic Analysis
www.bea.gov

Bureau of Labor Statistics

Consumer Price Indexes

The Consumer Price Index (CPI) represents changes in prices of all goods and services purchased for consumption by urban households. Indexes are available for two population groups: a CPI for All Urban Consumers (CPI-U) and a CPI for Urban Wage Earners and Clerical Workers (CPI-W). Unless otherwise specified, data are adjusted for inflation using the CPI-U. These values are generally adjusted to a school-year basis by averaging the July through June figures. Price indexes are available for the United States, the four Census regions, size of city, cross-classifications of regions and size classes, and 26 local areas. The major uses of the CPI include as an economic indicator, as a deflator of other economic series, and as a means of adjusting income.

Also available is the Consumer Price Index research series using current methods (CPI-U-RS), which presents an estimate of the CPI-U from 1978 to the present that incorporates most of the improvements that the Bureau of Labor Statistics has made over that time span into the entire series. The historical price index series of the CPI-U does not reflect these changes, though these changes do make the present and future CPI more accurate. The limitations of the CPI-U-RS include considerable uncertainty surrounding the magnitude of the adjustments and the several improvements in the CPI that have not been incorporated into the CPI-U-RS for various reasons. Nonetheless, the CPI-U-RS can serve as a valuable proxy for researchers needing a historical estimate of inflation using current methods. This series has not been used in this report.

Further information on consumer price indexes may be obtained from Bureau of Labor Statistics

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2 Massachusetts Avenue NE
Washington, DC 20212
<http://www.bls.gov/cpi>

Employment and Unemployment Surveys

Statistics on the employment and unemployment status of the population and related data are compiled by the Bureau of Labor Statistics (BLS) using data from the Current Population Survey (CPS) (see below) and other surveys. The CPS, a monthly household survey conducted by the U.S. Census Bureau for the Bureau of Labor Statistics, provides a comprehensive body of information on the employment and unemployment experience of the nation's population, classified by age, sex, race, and various other characteristics.

Further information on unemployment surveys may be obtained from

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Census Bureau

Current Population Survey

The Current Population Survey (CPS) is a monthly survey of about 60,000 households conducted by the U.S. Census Bureau for the Bureau of Labor Statistics. The CPS is the primary source of information of labor force statistics for the U.S. noninstitutionalized population (e.g., it excludes military personnel and their families living on bases and inmates of correctional institutions). In addition, supplemental questionnaires are used to provide further information about the U.S. population. Specifically, in October, detailed questions regarding school enrollment and school characteristics are asked. In March, detailed questions regarding income are asked.

The current sample design, introduced in July 2001, includes about 72,000 households. Each month about 58,900 of the 72,000 households are eligible for interview, and of those, 7 to 10 percent are not interviewed because of temporary absence or unavailability. Information is obtained each month from those in the household who are 15 years of age and older, and demographic data are collected for children 0–14 years of age. In addition, supplemental questions regarding school enrollment are asked about eligible household members ages 3 and older in the October survey. Prior to July 2001, data were collected in the CPS from about 50,000 dwelling units. The samples are initially selected based on the decennial census files and are periodically updated to reflect new housing construction.

A major redesign of the CPS was implemented in January 1994 to improve the quality of the data collected. Survey questions were revised, new questions were added, and computer-assisted interviewing methods were used for the survey data collection. Further information about the redesign is available in *Current Population Survey, October 1995: (School Enrollment Supplement) Technical Documentation* at <http://www.census.gov/prod/techdoc/cps/cpsoct95.pdf>.

Caution should be used when comparing data from 1994 through 2001 with data from 1993 and earlier. Data from 1994 through 2001 reflect 1990 census-based population controls, while data from 1993 and earlier reflect 1980 or earlier census-based population controls. Changes in population controls generally have relatively little impact on summary measures such as means, medians, and percentage distributions. They can have a significant impact on population counts. For example, use of the 1990 census-based population controls resulted in about a 1 percent increase in the civilian noninstitutional population and in the number of families and households. Thus, estimates of levels for data collected in 1994 and later years will differ from those for earlier years by more than what could be attributed to actual changes in the population. These differences could be disproportionately greater for certain subpopulation groups than for the total population.

Beginning in 2003, race/ethnicity questions expanded to include information on people of two or more races. Native Hawaiian/Pacific Islander data are collected separately from Asian data. The questions have also been worded to make it clear that self-reported data on race/ethnicity should reflect the race/ethnicity with which the responder identifies, rather than what may be written in official documentation.

The estimation procedure employed for monthly CPS data involves inflating weighted sample results to independent estimates of characteristics of the civilian noninstitutional population in the United States by age, sex, and race. These independent estimates are based on statistics from decennial censuses; statistics on births, deaths, immigration, and emigration; and statistics on the population in the armed services. Generalized standard error tables are provided in the Current Population Reports; methods for deriving standard errors can be found within the CPS technical documentation at <http://www.census.gov/programs-surveys/cps/technical-documentation/complete.html>. The CPS data are subject to both nonsampling and sampling errors.

Prior to 2009, standard errors were estimated using the generalized variance function. The generalized variance function is a simple model that expresses the variance as a function of the expected value of a survey estimate. Beginning with March 2009 CPS data, standard errors were estimated using replicate weight methodology. Those interested in using CPS household-level supplement replicate weights to calculate variances may refer to *Estimating Current Population Survey (CPS) Household-Level Supplement Variances Using Replicate Weights* at <http://thedataweb.rm.census.gov/pub/cps/supps/HH-level Use of the Public Use Replicate Weight File.doc>.

Further information on CPS may be obtained from

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<http://www.census.gov/cps>

Dropouts

Each October, the Current Population Survey (CPS) includes supplemental questions on the enrollment status of the population ages 3 years and over as part of the monthly basic survey on labor force participation. In addition to gathering the information on school enrollment, with the limitations on accuracy as noted below under “School Enrollment,” the survey data permit calculations of dropout rates. Both status and event dropout rates are tabulated from the October CPS. Event rates describe the proportion of students who leave school each year without completing a high school program. Status rates provide cumulative data on dropouts among all young adults within a specified age range. Status rates are higher than event rates because they include all dropouts ages 16 through 24, regardless of when they last attended school.

In addition to other survey limitations, dropout rates may be affected by survey coverage and exclusion of the institutionalized population. The incarcerated population has grown more rapidly and has a higher dropout rate than the general population. Dropout rates for the total population might be higher than those for the noninstitutionalized population if the prison and jail populations were included in the dropout rate calculations. On the other hand, if military personnel, who tend to be high school graduates, were included, it might offset some or all of the impact from the theoretical inclusion of the jail and prison populations.

Another area of concern with tabulations involving young people in household surveys is the relatively low coverage ratio compared to older age groups. CPS undercoverage results from missed housing units and missed people within sample households. Overall CPS undercoverage for October 2015 is estimated to be about 11 percent. CPS coverage varies with age, sex, and race. Generally, coverage is larger for females than for males and larger for non-Blacks than for Blacks. This differential coverage is a general problem for most household-based surveys. Further information on CPS methodology may be found in the technical documentation at <http://www.census.gov/cps>.

Further information on the calculation of dropouts and dropout rates may be obtained from *Trends in High School Dropout and Completion Rates in the United States: 2013* (NCES 2016-117) at <http://nces.ed.gov/pubs2016/2016117rev.pdf> or by contacting

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School Enrollment

Each October, the Current Population Survey (CPS) includes supplemental questions on the enrollment status of the population ages 3 years and over. Prior to 2001, the October supplement consisted of approximately 47,000 interviewed households. Beginning with the October 2001 supplement, the sample was expanded by 9,000 to a total of approximately 56,000 interviewed households. The main sources of nonsampling variability in the responses to the supplement are those inherent in the survey instrument. The question of current enrollment may not be answered accurately for various reasons. Some respondents may not know current grade information for every student in the household, a problem especially prevalent for households with members in college or in nursery school. Confusion over college credits or hours taken by a student may make it difficult to determine the year in which the student is enrolled. Problems may occur with the definition of nursery school (a group or class organized to provide educational experiences for children) where respondents' interpretations of "educational experiences" vary.

For the October 2015 basic CPS, the household-level nonresponse rate was 12.9 percent. The person-level nonresponse rate for the school enrollment supplement was an additional 8.9 percent. Since the basic CPS nonresponse rate is a household-level rate and the school enrollment supplement nonresponse rate is a person-level rate, these rates cannot be combined to derive an overall nonresponse rate. Nonresponding households may have fewer persons than interviewed ones, so combining these rates may lead to an overestimate of the true overall nonresponse rate for persons for the school enrollment supplement.

Further information on CPS methodology may be obtained from <http://www.census.gov/cps>.

Further information on the CPS School Enrollment Supplement may be obtained from

Education and Social Stratification Branch
Census Bureau
U.S. Department of Commerce
4600 Silver Hill Road
Washington, DC 20233
<http://www.census.gov/topics/education/school-enrollment.html>

Decennial Census, Population Estimates, and Population Projections

The Decennial Census is a universe survey mandated by the U.S. Constitution. It is a questionnaire sent to every household in the country, and it is composed of seven questions about the household and its members (name, sex, age, relationship, Hispanic origin, race, and whether the housing unit is owned or rented). The Census Bureau also produces annual estimates of the resident population by demographic characteristics (age, sex, race, and Hispanic origin) for the nation, states, and counties, as well as national and state projections for the resident population. The reference date for population estimates is July 1 of the given year. With each new issue of July 1 estimates, the Census Bureau revises estimates for each year back to the last census. Previously published estimates are superseded and archived.

Further information on the Decennial Census may be obtained from <http://www.census.gov>.

National Population Projections

The 2014 National Population Projections, the first based on the 2010 Census, provide projections of resident population and projections of the United States resident population by age, sex, race, and Hispanic origin from 2014 through 2060. The following is a general description of the methods used to produce the 2014 National Population Projections.

The projections were produced using a cohort component method beginning with an estimated base population for July 1, 2013. First, components of population change (mortality, fertility, and net international migration) were projected. Next, for each passing year, the population is advanced one year of age and the new age categories are updated using the projected survival rates and levels of net international migration for that year. A new birth cohort is then added to form the population under one year of age by applying projected age specific fertility rates to the average female population aged 10 to 54 years and updating the new cohort for the effects of mortality and net international migration.

The assumptions for the components of change were based on time series analysis. Initially, demographic models were used to summarize historical trends. Further information on the methodologies used to produce the 2014 National Population Projections may be obtained from <https://www.census.gov/programs-surveys/popproj.html>.

State Population Projections

These state population projections were prepared using a cohort-component method by which each component of population change—births, deaths, state-to-state migration flows, international in-migration, and international out-migration—was projected separately for each birth cohort by sex, race, and Hispanic origin. The basic framework was the same as in past Census Bureau projections.

Detailed components necessary to create the projections were obtained from vital statistics, administrative records, census data, and national projections. The cohort-component method is based on the traditional demographic accounting system:

$$P_t = P_o + B - D + DIM - DOM + IIM - IOM$$

where:

P_t = population at the end of the period

P_o = population at the beginning of the period

B = births during the period

D = deaths during the period

DIM = domestic in-migration during the period

DOM = domestic out-migration during the period

IIM = international in-migration during the period

IOM = international out-migration during the period

To generate population projections with this model, the Census Bureau created separate datasets for each of these components. In general, the assumptions concerning the future levels of fertility, mortality, and international migration are consistent with the assumptions developed for the national population projections of the Census Bureau.

Once the data for each component were developed the cohort-component method was applied to produce the projections. For each projection year, the base population for each state was disaggregated into eight race and Hispanic categories (non-Hispanic White; non-Hispanic Black; non-Hispanic American Indian, Eskimo, and Aleut; non-Hispanic Asian and Pacific Islander; Hispanic White; Hispanic Black; Hispanic American Indian, Eskimo, and Aleut; and Hispanic Asian and Pacific Islander), by sex, and single year of age (ages 0 to 85+). The next step was to survive each age-sex-race-ethnic group forward 1 year using the pertinent survival rate. The internal redistribution of the population was accomplished by applying the appropriate state-to-state migration rates to the survived population in each state. The projected out-migrants were subtracted from the state of origin and added to the state of destination (as in-migrants). Next, the appropriate number of immigrants from abroad was added to each group. The population under age 1 was created by applying the appropriate age-race-ethnic specific birth rates to females of childbearing age (ages 15 to 49). The number of births by sex and race/ethnicity were survived forward and exposed to the appropriate migration rate to yield the population under age 1. The final results of the projection process were proportionally adjusted to be consistent with the national population projections by single years of age, sex, race, and Hispanic origin. The entire process was then repeated for each year of the projection.

More information on Census Bureau projections may be obtained from

Population Division
Census Bureau
U.S. Department of Commerce
Washington, DC 20233
<http://www.census.gov>

OTHER SOURCES

IHS Global Inc.

IHS Global Inc. provides an information system that includes databases of economic and financial information; simulation and planning models; regular publications and special studies; data retrieval and management systems; and access to experts on economic, financial, industrial, and market activities. One service is the IHS Global Inc. Model of the U.S. Economy, which contains annual projections of U.S. economic and financial conditions, including forecasts for the federal government, incomes, population, prices and wages, and state and local governments, over a long-term (10- to 25-year) forecast period.

Additional information is available from

IHS Global Inc.
15 Inverness Way East
Englewood, CO 80112
<http://www.ihsglobalinsight.com>

Appendix D

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Appendix E

List of Abbreviations

ADA	Average daily attendance
CCD	Common Core of Data
CPI	Consumer Price Index
CPS	Current Population Survey
CV	Coefficient of Variation
D.W. statistic	Durbin-Watson statistic
FTE	Full-time-equivalent
HEGIS	Higher Education General Information Survey
IPEDS	Integrated Postsecondary Education Data System
IPEDS-C	Integrated Postsecondary Education Data System, Completions Survey
IPEDS-EF	Integrated Postsecondary Education Data System, Fall Enrollment Survey
MAPE	Mean absolute percentage error
NCES	National Center for Education Statistics
PreK	Prekindergarten
PreK–8	Prekindergarten through grade 8
PreK–12	Prekindergarten through grade 12
PSS	Private School Survey
SASS	Schools and Staffing Survey

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Appendix F

Glossary

A

Alternative school A public elementary/secondary school that serves students whose needs cannot be met in a regular, special education, or vocational school; may provide nontraditional education; and may serve as an adjunct to a regular school. Although alternative schools fall outside the categories of regular, special education, and vocational education, they may provide similar services or curriculum. Some examples of alternative schools are schools for potential dropouts; residential treatment centers for substance abuse (if they provide elementary or secondary education); schools for chronic truants; and schools for students with behavioral problems.

Associate's degree A degree granted for the successful completion of a sub-baccalaureate program of studies, usually requiring at least 2 years (or equivalent) of full-time college-level study. This includes degrees granted in a cooperative or work-study program.

Autocorrelation Correlation of the error terms from different observations of the same variable. Also called Serial correlation.

Average daily attendance (ADA) The aggregate attendance of a school during a reporting period (normally a school year) divided by the number of days school is in session during this period. Only days on which the pupils are under the guidance and direction of teachers should be considered days in session.

Average daily membership (ADM) The aggregate membership of a school during a reporting period (normally a school year) divided by the number of days school is in session during this period. Only days on which the pupils are under the guidance and direction of teachers should be considered as days in session. The average daily membership for groups of schools having varying lengths of terms is the average of the average daily memberships obtained for the individual schools. Membership includes all pupils who are enrolled, even if they do not actually attend.

B

Bachelor's degree A degree granted for the successful completion of a baccalaureate program of studies, usually requiring at least 4 years (or equivalent) of full-time college-level study. This includes degrees granted in a cooperative or work-study program.

Breusch-Godfrey serial correlation LM test A statistic testing the independence of errors in least-squares regression against alternatives of first-order and higher degrees of serial correlation. The test belongs to a class of asymptotic tests known as the Lagrange multiplier (LM) tests.

C

Capital outlay Funds for the acquisition of land and buildings; building construction, remodeling, and additions; the initial installation or extension of service systems and other built-in equipment; and site improvement. The category also encompasses architectural and engineering services including the development of blueprints.

Certificate A formal award certifying the satisfactory completion of a postsecondary education program. Certificates can be awarded at any level of postsecondary education and include awards below the associate's degree level.

Classroom teacher A staff member assigned the professional activities of instructing pupils in self-contained classes or courses, or in classroom situations; usually expressed in full-time equivalents.

Coefficient of variation (CV) Represents the ratio of the standard error to the estimate. For example, a CV of 30 percent indicates that the standard error of the estimate is equal to 30 percent of the estimate's value. The CV is used to compare the amount of variation relative to the magnitude of the estimate. A CV of 30 percent or greater indicates that an estimate should be interpreted with caution. For a discussion of standard errors, see Appendix A: Guide to Sources.

Cohort A group of individuals that have a statistical factor in common, for example, year of birth.

Cohort-component method A method for estimating and projecting a population that is distinguished by its ability to preserve knowledge of an age distribution of a population (which may be of a single sex, race, and Hispanic origin) over time.

College A postsecondary school that offers general or liberal arts education, usually leading to an associate's, bachelor's, master's, or doctor's degree. Junior colleges and community colleges are included under this terminology.

Constant dollars Dollar amounts that have been adjusted by means of price and cost indexes to eliminate inflationary factors and allow direct comparison across years.

Consumer Price Index (CPI) This price index measures the average change in the cost of a fixed market basket of goods and services purchased by consumers. Indexes vary for specific areas or regions, periods of time, major groups of consumer expenditures, and population groups. The CPI reflects spending patterns for two population groups: (1) all urban consumers and urban wage earners and (2) clerical workers. CPIs are calculated for both the calendar year and the school year using the U.S. All Items CPI for All Urban Consumers (CPI-U). The calendar year CPI is the same as the annual CPI-U. The school year CPI is calculated by adding the monthly CPI-U figures, beginning with July of the first year and ending with June of the following year, and then dividing that figure by 12.

Control of institutions A classification of institutions of elementary/secondary or postsecondary education by whether the institution is operated by publicly elected or appointed officials and derives its primary support from public funds (public control) or is operated by privately elected or appointed officials and derives its major source of funds from private sources (private control).

Current dollars Dollar amounts that have not been adjusted to compensate for inflation.

Current expenditures (elementary/secondary) The expenditures for operating local public schools, excluding capital outlay and interest on school debt. These expenditures include such items as salaries for school personnel, benefits, student transportation, school books and materials, and energy costs. Beginning in 1980–81, expenditures for state administration are excluded.

Instruction expenditures Includes expenditures for activities related to the interaction between teacher and students. Includes salaries and benefits for teachers and instructional aides, textbooks, supplies, and purchased services such as instruction via television. Also included are tuition expenditures to other local education agencies.

Administration expenditures Includes expenditures for school administration (i.e., the office of the principal, full-time department chairpersons, and graduation expenses), general administration (the superintendent and board of education and their immediate staff), and other support services expenditures.

Transportation Includes expenditures for vehicle operation, monitoring, and vehicle servicing and maintenance.

Food services Includes all expenditures associated with providing food to students and staff in a school or school district. The services include preparing and serving regular and incidental meals or snacks in connection with school activities, as well as the delivery of food to schools.

Enterprise operations Includes expenditures for activities that are financed, at least in part, by user charges, similar to a private business. These include operations funded by sales of products or services, together with amounts for direct program support made by state education agencies for local school districts.

Current expenditures per pupil in average daily attendance Current expenditures for the regular school term divided by the average daily attendance of full-time pupils (or full-time equivalency of pupils) during the term. See also Current expenditures and Average daily attendance.

D

Degree An award conferred by a college, university, or other postsecondary education institution as official recognition for the successful completion of a program of studies. Refers specifically to associate's or higher degrees conferred by degree-granting institutions. See also Associate's degree, Bachelor's degree, Master's degree, and Doctor's degree.

Degree/certificate-seeking student A student enrolled in courses for credit and recognized by the institution as seeking a degree, certificate, or other formal award. High school students also enrolled in postsecondary courses for credit are not considered degree/certificate-seeking. See also Degree and Certificate.

Degree-granting institutions Postsecondary institutions that are eligible for Title IV federal financial aid programs and grant an associate's or higher degree. For an institution to be eligible to participate in Title IV financial aid programs it must offer a program of at least 300 clock hours in length, have accreditation recognized by the U.S. Department of Education, have been in business for at least 2 years, and have signed a participation agreement with the Department.

Degrees of freedom The number of free or linearly independent sample observations used in the calculation of a statistic. In a time series regression with t time periods and k independent variables including a constant term, there would be t minus k degrees of freedom.

Department of Defense (DoD) dependents schools Schools that are operated by the Department of Defense Education Activity (a civilian agency of the U.S. Department of Defense) and provide comprehensive prekindergarten through 12th-grade educational programs on military installations both within the United States and overseas.

Dependent variable A mathematical variable whose value is determined by that of one or more other variables in a function. In regression analysis, when a random variable, y , is expressed as a function of variables x_1, x_2, \dots, x_k , plus a stochastic term, then y is known as the "dependent variable."

Disposable personal income Current income received by people less their contributions for social insurance, personal tax, and nontax payments. It is the income available to people for spending and saving. Nontax payments include passport fees, fines and penalties, donations, and tuitions and fees paid to schools and hospitals operated mainly by the government. See also Personal income.

Doctor's degree The highest award a student can earn for graduate study. Includes such degrees as the Doctor of Education (Ed.D.); the Doctor of Juridical Science (S.J.D.); the Doctor of Public Health (Dr.P.H.); and the Doctor of Philosophy (Ph.D.) in any field, such as agronomy, food technology, education, engineering, public administration, ophthalmology, or radiology. The doctor's degree classification encompasses three main subcategories—research/scholarship degrees, professional practice degrees, and other degrees—which are described below.

Doctor's degree—research/scholarship A Ph.D. or other doctor's degree that requires advanced work beyond the master's level, including the preparation and defense of a dissertation based on original research, or the planning and execution of an original project demonstrating substantial artistic or scholarly achievement. Examples of this type of degree may include the following and others, as designated by the awarding institution: the Ed.D. (in education), D.M.A. (in musical arts), D.B.A. (in business administration), D.Sc. (in science), D.A. (in arts), or D.M. (in medicine).

Doctor's degree—professional practice A doctor's degree that is conferred upon completion of a program providing the knowledge and skills for the recognition, credential, or license required for professional practice. The degree is awarded after a period of study such that the total time to the degree, including both preprofessional and professional preparation, equals at least 6 full-time-equivalent academic years. Some doctor's degrees of this type were formerly classified as first-professional degrees. Examples of this type of degree may include the following and others, as designated by the awarding institution: the D.C. or D.C.M. (in chiropractic); D.D.S. or D.M.D. (in dentistry); L.L.B. or J.D. (in law); M.D. (in medicine); O.D. (in optometry); D.O. (in osteopathic medicine); Pharm.D. (in pharmacy); D.P.M., Pod.D., or D.P. (in podiatry); or D.V.M. (in veterinary medicine).

Doctor's degree—other A doctor's degree that does not meet the definition of either a doctor's degree—research/scholarship or a doctor's degree—professional practice.

Double exponential smoothing A method that takes a single smoothed average component of demand and smoothes it a second time to allow for estimation of a trend effect.

Dropout The term is used to describe both the event of leaving school before completing high school and the status of an individual who is not in school and who is not a high school completer. High school completers include both

graduates of school programs as well as those completing high school through equivalency programs such as the General Educational Development (GED) program. Transferring from a public school to a private school, for example, is not regarded as a dropout event. A person who drops out of school may later return and graduate but is called a “dropout” at the time he or she leaves school. Measures to describe these behaviors include the event dropout rate (or the closely related school persistence rate), the status dropout rate, and the high school completion rate.

Durbin-Watson statistic A statistic testing the independence of errors in least squares regression against the alternative of first-order serial correlation. The statistic is a simple linear transformation of the first-order serial correlation of residuals and, although its distribution is unknown, it is tested by bounding statistics that follow R. L. Anderson's distribution.

E

Econometrics The quantitative examination of economic trends and relationships using statistical techniques, and the development, examination, and refinement of those techniques.

Elementary school A school classified as elementary by state and local practice and composed of any span of grades not above grade 8.

Elementary/secondary school Includes only schools that are part of state and local school systems, and also most nonprofit private elementary/secondary schools, both religiously affiliated and nonsectarian. Includes regular, alternative, vocational, and special education schools. U.S. totals exclude federal schools for American Indians, and federal schools on military posts and other federal installations.

Enrollment The total number of students registered in a given school unit at a given time, generally in the fall of a year.

Estimate A numerical value obtained from a statistical sample and assigned to a population parameter. The particular value yielded by an estimator in a given set of circumstances or the rule by which such particular values are calculated.

Estimating equation An equation involving observed quantities and an unknown that serves to estimate the latter.

Estimation Estimation is concerned with inference about the numerical value of unknown population values from incomplete data, such as a sample. If a single figure is calculated for each unknown parameter, the process is called point estimation. If an interval is calculated within which the parameter is likely, in some sense, to lie, the process is called interval estimation.

Expenditures, Total For elementary/secondary schools, these include all charges for current outlays plus capital outlays and interest on school debt. For degree-granting institutions, these include current outlays plus capital outlays. For government, these include charges net of recoveries and other correcting transactions other than for retirement of debt, investment in securities, extension of credit, or as agency transactions. Government expenditures include only external transactions, such as the provision of perquisites or other payments in kind. Aggregates for groups of governments exclude intergovernmental transactions among the governments.

Expenditures per pupil Charges incurred for a particular period of time divided by a student unit of measure, such as average daily attendance or fall enrollment.

Exponential smoothing A method used in time series analysis to smooth or to predict a series. There are various forms, but all are based on the supposition that more remote history has less importance than more recent history.

F

Financial aid Grants, loans, assistantships, scholarships, fellowships, tuition waivers, tuition discounts, veteran's benefits, employer aid (tuition reimbursement), and other monies (other than from relatives or friends) provided to students to help them meet expenses. Except where designated, includes Title IV subsidized and unsubsidized loans made directly to students.

First-order serial correlation When errors in one time period are correlated directly with errors in the ensuing time period.

First-professional degree NCES no longer uses this classification. Most degrees formerly classified as first-professional (such as M.D., D.D.S., Pharm.D., D.V.M., and J.D.) are now classified as doctor's degrees—professional practice. However, master's of divinity degrees are now classified as master's degrees.

First-time student (undergraduate) A student who has no prior postsecondary experience (except as noted below) attending any institution for the first time at the undergraduate level. Includes students enrolled in the fall term who attended college for the first time in the prior summer term, and students who entered with advanced standing (college credits earned before graduation from high school).

Fiscal year A period of 12 months for which accounting records are compiled. Institutions and states may designate their own accounting period, though most states use a July 1 through June 30 accounting year. The yearly accounting period for the federal government begins on October 1 and ends on the following September 30. The fiscal year is designated by the calendar year in which it ends; e.g., fiscal year 2006 begins on October 1, 2005, and ends on September 30, 2006. (From fiscal year 1844 to fiscal year 1976, the federal fiscal year began on July 1 and ended on the following June 30.)

Forecast An estimate of the future based on rational study and analysis of available pertinent data, as opposed to subjective prediction.

Forecasting Assessing the magnitude that a quantity will assume at some future point in time, as distinct from "estimation," which attempts to assess the magnitude of an already existent quantity.

For-profit institution A private institution in which the individual(s) or agency in control receives compensation other than wages, rent, or other expenses for the assumption of risk.

FTE teacher See Instructional staff.

Full-time enrollment The number of students enrolled in postsecondary education courses with total credit load equal to at least 75 percent of the normal full-time course load. At the undergraduate level, full-time enrollment typically includes students who have a credit load of 12 or more semester or quarter credits. At the postbaccalaureate level, full-time enrollment includes students who typically have a credit load of 9 or more semester or quarter credits, as well as other students who are considered full time by their institutions.

Full-time-equivalent (FTE) enrollment For postsecondary institutions, enrollment of full-time students, plus the full-time equivalent of part-time students. The full-time equivalent of the part-time students is estimated using different factors depending on the type and control of institution and level of student.

Function A mathematical correspondence that assigns exactly one element of one set to each element of the same or another set. A variable that depends on and varies with another.

Functional form A mathematical statement of the relationship among the variables in a model.

G

Geographic region One of the four regions of the United States used by the U.S. Census Bureau, as follows:

Northeast

Connecticut (CT)
Maine (ME)
Massachusetts (MA)
New Hampshire (NH)
New Jersey (NJ)
New York (NY)
Pennsylvania (PA)
Rhode Island (RI)
Vermont (VT)

Midwest

Illinois (IL)
Indiana (IN)
Iowa (IA)
Kansas (KS)
Michigan (MI)
Minnesota (MN)
Missouri (MO)
Nebraska (NE)
North Dakota (ND)
Ohio (OH)
South Dakota (SD)
Wisconsin (WI)

South

Alabama (AL)
Arkansas (AR)
Delaware (DE)
District of Columbia (DC)
Florida (FL)
Georgia (GA)
Kentucky (KY)
Louisiana (LA)
Maryland (MD)
Mississippi (MS)
North Carolina (NC)
Oklahoma (OK)
South Carolina (SC)
Tennessee (TN)
Texas (TX)
Virginia (VA)
West Virginia (WV)

West

Alaska (AK)
Arizona (AZ)
California (CA)
Colorado (CO)
Hawaii (HI)
Idaho (ID)
Montana (MT)
Nevada (NV)
New Mexico (NM)
Oregon (OR)
Utah (UT)
Washington (WA)
Wyoming (WY)

Graduate An individual who has received formal recognition for the successful completion of a prescribed program of studies.

Graduate enrollment The number of students who are working towards a master's or doctor's degree and students who are in postbaccalaureate classes but not in degree programs.

H

High school A secondary school offering the final years of high school work necessary for graduation, usually includes grades 10, 11, 12 (in a 6-3-3 plan) or grades 9, 10, 11, and 12 (in a 6-2-4 plan).

High school completer An individual who has been awarded a high school diploma or an equivalent credential, including a General Educational Development (GED) certificate.

High school diploma A formal document regulated by the state certifying the successful completion of a prescribed secondary school program of studies. In some states or communities, high school diplomas are differentiated by type, such as an academic diploma, a general diploma, or a vocational diploma.

High school equivalency certificate A formal document certifying that an individual has met the state requirements for high school graduation equivalency by obtaining satisfactory scores on an approved examination and meeting other performance requirements (if any) set by a state education agency or other appropriate body. One particular version of this certificate is the General Educational Development (GED) test. The GED test is a comprehensive test used primarily to appraise the educational development of students who have not completed their formal high school education and who may earn a high school equivalency certificate by achieving satisfactory scores. GEDs are awarded by the states or other agencies, and the test is developed and distributed by the GED Testing Service (a joint venture of the American Council on Education and Pearson).

Higher education Study beyond secondary school at an institution that offers programs terminating in an associate's, bachelor's, or higher degree.

Income tax Taxes levied on net income, that is, on gross income less certain deductions permitted by law. These taxes can be levied on individuals or on corporations or unincorporated businesses where the income is taxed distinctly from individual income.

Independent variable In regression analysis, a random variable, y , is expressed as a function of variables x_1, x_2, \dots, x_k , plus a stochastic term; the x 's are known as "independent variables."

Inflation A rise in the general level of prices of goods and services in an economy over a period of time, which generally corresponds to a decline in the real value of money or a loss of purchasing power. See also Constant dollars and Purchasing Power Parity indexes.

Instruction (elementary and secondary) Instruction encompasses all activities dealing directly with the interaction between teachers and students. Teaching may be provided for students in a school classroom, in another location such as a home or hospital, and in other learning situations such as those involving co-curricular activities. Instruction may be provided through some other approved medium, such as the Internet, television, radio, telephone, and correspondence.

Instructional staff Full-time-equivalent number of positions, not the number of different individuals occupying the positions during the school year. In local schools, includes all public elementary and secondary (junior and senior high) day-school positions that are in the nature of teaching or in the improvement of the teaching-learning situation; includes consultants or supervisors of instruction, principals, teachers, guidance personnel, librarians, psychological personnel, and other instructional staff, and excludes administrative staff, attendance personnel, clerical personnel, and junior college staff.

Interest on debt Includes expenditures for long-term debt service interest payments (i.e., those longer than 1 year).

Interpolation See Linear interpolation.

L

Lag An event occurring at time $t + k$ ($k > 0$) is said to lag behind an event occurring at time t , the extent of the lag being k . An event occurring k time periods before another may be regarded as having a negative lag.

Lead time When forecasting a statistic, the number of time periods since the last time period of actual data for that statistic used in producing the forecast.

Level of school A classification of elementary/secondary schools by instructional level. Includes elementary schools, secondary schools, and combined elementary and secondary schools. See also Elementary school, Secondary school, and Combined elementary and secondary school.

Linear interpolation A method that allows the prediction of an unknown value if any two particular values on the same scale are known and the rate of change is assumed constant.

Local education agency (LEA) See School district.

M

Master's degree A degree awarded for successful completion of a program generally requiring 1 or 2 years of full-time college-level study beyond the bachelor's degree. One type of master's degree, including the Master of Arts degree, or M.A., and the Master of Science degree, or M.S., is awarded in the liberal arts and sciences for advanced scholarship in a subject field or discipline and demonstrated ability to perform scholarly research. A second type of master's degree is awarded for the completion of a professionally oriented program, for example, an M.Ed. in education, an M.B.A. in business administration, an M.F.A. in fine arts, an M.M. in music, an M.S.W. in social work, and an M.P.A. in public administration. Some master's degrees—such as divinity degrees (M.Div. or M.H.L./Rav), which were formerly classified as “first-professional”—may require more than 2 years of full-time study beyond the bachelor's degree.

Mean absolute percentage error (MAPE) The average value of the absolute value of errors expressed in percentage terms.

Migration Geographic mobility involving a change of usual residence between clearly defined geographic units, that is, between counties, states, or regions.

Model A system of postulates, data, and inferences presented as a mathematical description of a phenomenon, such as an actual system or process. The actual phenomenon is represented by the model in order to explain, predict, and control it.

N

Non-degree-granting institutions Postsecondary institutions that participate in Title IV federal financial aid programs but do not offer accredited 4-year or 2-year degree programs. Includes some institutions transitioning to higher level program offerings, though still classified at a lower level.

Nonresident alien A person who is not a citizen of the United States and who is in this country on a temporary basis and does not have the right to remain indefinitely.

Nursery school An instructional program for groups of children during the year or years preceding kindergarten, which provides educational experiences under the direction of teachers. See also Prekindergarten and Preschool.

O

Ordinary least squares (OLS) The estimator that minimizes the sum of squared residuals.

P

Parameter A quantity that describes a statistical population.

Part-time enrollment The number of students enrolled in postsecondary education courses with a total credit load less than 75 percent of the normal full-time credit load. At the undergraduate level, part-time enrollment typically includes students who have a credit load of less than 12 semester or quarter credits. At the postbaccalaureate level, part-time enrollment typically includes students who have a credit load of less than 9 semester or quarter credits.

Personal income Current income received by people from all sources, minus their personal contributions for social insurance. Classified as “people” are individuals (including owners of unincorporated firms), nonprofit institutions serving individuals, private trust funds, and private noninsured welfare funds. Personal income includes transfers (payments not resulting from current production) from government and business such as social security benefits and military pensions, but excludes transfers among people.

Postbaccalaureate enrollment The number of students working towards advanced degrees and of students enrolled in graduate-level classes but not enrolled in degree programs. See also Graduate enrollment.

Postsecondary education The provision of formal instructional programs with a curriculum designed primarily for students who have completed the requirements for a high school diploma or equivalent. This includes programs of an academic, vocational, and continuing professional education purpose, and excludes avocational and adult basic education programs.

Postsecondary institutions (basic classification by level)

4-year institution An institution offering at least a 4-year program of college-level studies wholly or principally creditable toward a baccalaureate degree.

2-year institution An institution offering at least a 2-year program of college-level studies which terminates in an associate degree or is principally creditable toward a baccalaureate degree. Data prior to 1996 include some institutions that have a less-than-2-year program, but were designated as institutions of higher education in the Higher Education General Information Survey.

Less-than-2-year institution An institution that offers programs of less than 2 years' duration below the baccalaureate level. Includes occupational and vocational schools with programs that do not exceed 1,800 contact hours.

Prekindergarten Preprimary education for children typically ages 3–4 who have not yet entered kindergarten. It may offer a program of general education or special education and may be part of a collaborative effort with Head Start.

Preschool An instructional program enrolling children generally younger than 5 years of age and organized to provide children with educational experiences under professionally qualified teachers during the year or years immediately preceding kindergarten (or prior to entry into elementary school when there is no kindergarten). See also Nursery school and Prekindergarten.

Primary school A school with at least one grade lower than 5 and no grade higher than 8.

Private institution An institution that is controlled by an individual or agency other than a state, a subdivision of a state, or the federal government, which is usually supported primarily by other than public funds, and the operation of whose program rests with other than publicly elected or appointed officials.

Private nonprofit institution An institution in which the individual(s) or agency in control receives no compensation other than wages, rent, or other expenses for the assumption of risk. These include both independent nonprofit institutions and those affiliated with a religious organization.

Private for-profit institution An institution in which the individual(s) or agency in control receives compensation other than wages, rent, or other expenses for the assumption of risk (e.g., proprietary schools).

Private school Private elementary/secondary schools surveyed by the Private School Universe Survey (PSS) are assigned to one of three major categories (Catholic, other religious, or nonsectarian) and, within each major category, one of three subcategories based on the school's religious affiliation provided by respondents.

Catholic Schools categorized according to governance, provided by Catholic school respondents, into parochial, diocesan, and private schools.

Other religious Schools that have a religious orientation or purpose but are not Roman Catholic. Other religious schools are categorized according to religious association membership, provided by respondents, into Conservative Christian, other affiliated, and unaffiliated schools. Conservative Christian schools are those “Other religious” schools with membership in at least one of four associations: Accelerated Christian Education, American Association of Christian Schools, Association of Christian Schools International, and Oral Roberts University Education Fellowship. Affiliated schools are those “Other religious” schools not classified as Conservative Christian with membership in at least 1 of 11 associations—Association of Christian Teachers and Schools, Christian Schools International, Evangelical Lutheran Education Association, Friends Council on Education, General Conference of the Seventh-Day Adventist Church, Islamic School League of America, National Association of Episcopal Schools,

National Christian School Association, National Society for Hebrew Day Schools, Solomon Schechter Day Schools, and Southern Baptist Association of Christian Schools—or indicating membership in “other religious school associations.” Unaffiliated schools are those “Other religious” schools that have a religious orientation or purpose but are not classified as Conservative Christian or affiliated.

Nonsectarian Schools that do not have a religious orientation or purpose and are categorized according to program emphasis, provided by respondents, into regular, special emphasis, and special education schools. Regular schools are those that have a regular elementary/secondary or early childhood program emphasis. Special emphasis schools are those that have a Montessori, vocational/technical, alternative, or special program emphasis. Special education schools are those that have a special education program emphasis.

Projection In relation to a time series, an estimate of future values based on a current trend.

Public school or institution A school or institution controlled and operated by publicly elected or appointed officials and deriving its primary support from public funds.

Pupil/teacher ratio The enrollment of pupils at a given period of time, divided by the full-time-equivalent number of classroom teachers serving these pupils during the same period.

R

R^2 The coefficient of determination; the square of the correlation coefficient between the dependent variable and its ordinary least squares (OLS) estimate.

Racial/ethnic group Classification indicating general racial or ethnic heritage. Race/ethnicity data are based on the *Hispanic* ethnic category and the race categories listed below (five single-race categories, plus the *Two or more races* category). Race categories exclude persons of Hispanic ethnicity unless otherwise noted.

White A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

Black or African American A person having origins in any of the black racial groups of Africa. Used interchangeably with the shortened term *Black*.

Hispanic or Latino A person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race. Used interchangeably with the shortened term *Hispanic*.

Asian A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent, including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam. Prior to 2010–11, the Common Core of Data (CCD) combined Asian and Pacific Islander categories.

Native Hawaiian or Other Pacific Islander A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands. Prior to 2010–11, the Common Core of Data (CCD) combined Asian and Pacific Islander categories. Used interchangeably with the shortened term *Pacific Islander*.

American Indian or Alaska Native A person having origins in any of the original peoples of North and South America (including Central America), and who maintains tribal affiliation or community attachment.

Two or more races A person identifying himself or herself as of two or more of the following race groups: White, Black, Asian, Native Hawaiian or Other Pacific Islander, or American Indian or Alaska Native. Some, but not all, reporting districts use this category. “Two or more races” was introduced in the 2000 Census and became a regular category for data collection in the Current Population Survey (CPS) in 2003. The category is sometimes excluded from a historical series of data with constant categories. It is sometimes included within the category “Other.”

Region See Geographic region.

Regression analysis A statistical technique for investigating and modeling the relationship between variables.

Regular school A public elementary/secondary or charter school providing instruction and education services that does not focus primarily on special education, vocational/technical education, or alternative education.

Resident population Includes civilian population and armed forces personnel residing within the United States; excludes armed forces personnel residing overseas.

Revenue All funds received from external sources, net of refunds, and correcting transactions. Noncash transactions, such as receipt of services, commodities, or other receipts in kind are excluded, as are funds received from the issuance of debt, liquidation of investments, and nonroutine sale of property.

Revenue receipts Additions to assets that do not incur an obligation that must be met at some future date and do not represent exchanges of property for money. Assets must be available for expenditures.

Rho A measure of the correlation coefficient between errors in time period t and time period t minus 1.

S

Salary The total amount regularly paid or stipulated to be paid to an individual, before deductions, for personal services rendered while on the payroll of a business or organization.

School A division of the school system consisting of students in one or more grades or other identifiable groups and organized to give instruction of a defined type. One school may share a building with another school or one school may be housed in several buildings. Excludes schools that have closed or are planned for the future.

School district An education agency at the local level that exists primarily to operate public schools or to contract for public school services. Synonyms are “local basic administrative unit” and “local education agency.”

Secondary enrollment The total number of students registered in a school beginning with the next grade following an elementary or middle school (usually 7, 8, or 9) and ending with or below grade 12 at a given time.

Senior high school A secondary school offering the final years of high school work necessary for graduation.

Serial correlation Correlation of the error terms from different observations of the same variable. Also called Autocorrelation.

Special education school A public elementary/secondary school that focuses primarily on special education for children with disabilities and that adapts curriculum, materials, or instruction for students served.

Standard error of estimate An expression for the standard deviation of the observed values about a regression line. An estimate of the variation likely to be encountered in making predictions from the regression equation.

Student An individual for whom instruction is provided in an educational program under the jurisdiction of a school, school system, or other education institution. No distinction is made between the terms “student” and “pupil,” though “student” may refer to one receiving instruction at any level while “pupil” refers only to one attending school at the elementary or secondary level. A student may receive instruction in a school facility or in another location, such as at home or in a hospital. Instruction may be provided by direct student-teacher interaction or by some other approved medium such as television, radio, telephone, and correspondence.

Student membership Student membership is an annual headcount of students enrolled in school on October 1 or the school day closest to that date. The Common Core of Data (CCD) allows a student to be reported for only a single school or agency. For example, a vocational school (identified as a “shared time” school) may provide classes for students from a number of districts and show no membership.

T

Teacher see Instructional staff.

Time series A set of ordered observations on a quantitative characteristic of an individual or collective phenomenon taken at different points in time. Usually the observations are successive and equally spaced in time.

Time series analysis The branch of quantitative forecasting in which data for one variable are examined for patterns of trend, seasonality, and cycle.

Type of school A classification of public elementary and secondary schools that includes the following categories: regular schools, special education schools, vocational schools, and alternative schools. See also Regular school, Special education school, Vocational school, and Alternative school.

U

Unadjusted dollars See Current dollars.

Undergraduate students Students registered at an institution of postsecondary education who are working in a baccalaureate degree program or other formal program below the baccalaureate, such as an associate's degree, vocational, or technical program.

Ungraded student (elementary/secondary) A student who has been assigned to a school or program that does not have standard grade designations.

V

Variable A quantity that may assume any one of a set of values.

Y

Years out In forecasting by year, the number of years since the last year of actual data for that statistic used in producing the forecast.

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