

Chapter I. Education and Training Classification Systems

The Office of Occupational Statistics and Employment Projections of the Bureau of Labor Statistics (BLS) produces many types of information about education and training requirements. The Occupational Outlook *Handbook*, for example, gives detailed descriptions of the education and training requirements of occupations and occupational groups. Each of the 753 occupations for which the office publishes data are classified by education and training categories. This allows occupations to be grouped and allows for estimates of the education and training needs for the population as a whole and of the outlook for workers with various types of educational and training attainment.

The Bureau uses two classification systems to describe the education and training needs of occupations. This chapter of the Occupational Projections and Training Data bulletin summarizes these two methods of classifying occupations and then analyzes the education and training needs of the future workforce based on the 2006–16 employment projections. The chapter concludes with a list of occupations that have above the median wages and above average employment growth, which are expected to provide good job prospects for workers at each level of educational attainment. (For a full listing of the education or training categories and education cluster assignments for all 753 detailed National Employment Matrix occupations, see table III-1 in chapter III of this bulletin.)

The first system, begun in 1994, assigns occupations to a single education and training category, the one reflecting the most common path into the occupation. This classification is based on analysis by BLS economists.

The second system, introduced in 2004, assigns each occupation to an “educational attainment cluster” based on the educational attainment of current workers in the occupation. These two systems are complimentary and, together, create a more complete picture of occupational education and training requirements.

Eleven category system

BLS identifies 11 education and training categories that describe the most significant education and training pathway to employment for each occupation. A category is defined as the most significant source of education or training needed to become qualified in an occupation. The categories are as follows:

1. First professional degree
2. Doctoral degree
3. Master’s degree
4. Bachelor’s or higher degree, plus work experience
5. Bachelor’s degree
6. Associate degree
7. Postsecondary vocational award
8. Work experience in a related occupation
9. Long-term on-the-job training
10. Moderate-term on-the-job training
11. Short-term on-the-job training

BLS economists assign each occupation to one of these categories based on their knowledge and judgment. Economists analyze data from BLS and other government and private organizations, and interviews with educators, employers, training experts, and experts in professional and trade associations, and unions. For some occupations, such as physician and lawyer, the education and training required is straightforward and established by government laws and regulations. For other occupations, such as computer programmer or industrial machinery repairer, entry requirements vary considerably. When an occupation has more than one path of entry, BLS identifies the path that research suggests is applicable to most current entrants. (For a more detailed discussion of these categories see chapter III page 39 of this bulletin.)

This education and training classification system is simple and includes non-educational paths of entry, such as on-the-job training and work experience. Management occupations, for example, usually require years of experience working in a related job.

However, this classification system does not show the extent to which there are multiple paths of entry into an occupation. It also does not show that there may be multiple entry requirements: an occupation that requires on-the-job training, for example, might also require postsecondary education. In fact, table I-4 shows that in 2006, only 11 percent of jobs in the three on-the-job training categories were mostly filled by workers with a high school degree or less. For jobs requiring moderate or long-term on-the-job training, employers often try to hire individuals with at least some college education, or even a bachelor’s degree, before making a large investment in their training.

Educational attainment cluster system

The educational attainment cluster system sorts occupations according to the highest level of educational attainment of current workers. It can be used to study the job outlook for college graduates or the outlook for workers with other levels of education. This system, unlike the first one, allows occupations to fall into multiple educational attainment categories. These are identified as “mixture” occupations.

Occupations are grouped according to the percentage of workers who have a high school diploma or less, some college or an associate degree, or a college diploma (bachelor’s degree) or higher. According to the percentage of workers falling into each of these three educational levels, the occupation is assigned to one of six hierarchical education clusters shown in exhibit 1.1

If an education level represents the highest educational attainment of at least 20 percent of workers in an occupation, that education level is included in the education category of the occupation. For example, if more than 60 percent of workers have a high school diploma or less, less than 20 percent have some college or an associate degree, and less than 20 percent have a bachelor’s or higher degree, that occupation is considered a high school (HS) occupation. However, if more than 20 percent have

¹Occupations falling in the high school and college (HS/C) category were included in the HS/SC/C cluster.)

a high school degree or less, more than 20 percent have attended some college or held an associate degree, and less than 20 percent have a bachelor's or higher degree, the occupation is considered to be a high school/some college (HS/SC) occupation.

The key cutoff level for classifying occupations is set at 20 percent to help correct for workers in an occupation who have education levels well outside the norm. (See "The educational attainment distribution of occupations: A note on methodology" on page 6 of this bulletin.)

Exhibit 1. Definitions of education clusters

Education cluster	Percent of employees aged 25 to 44 in the occupation whose highest level of educational attainment is—		
	High school or less	Some college (including associate degree)	Bachelor's or higher degree
High school (HS)	Greater than or equal to 60 percent	Less than 20 percent	Less than 20 percent
High school/some college (HS/SC)	Greater than or equal to 20 percent	Greater than or equal to 20 percent	Less than 20 percent
Some college (SC)	Less than 20 percent	Greater than or equal to 60 percent	Less than 20 percent
High school/some college/college (HS/SC/C)	Greater than or equal to 20 percent	Greater than or equal to 20 percent	Greater than or equal to 20 percent
Some college/college (SC/C)	Less than 20 percent	Greater than or equal to 20 percent	Greater than or equal to 20 percent
College (C)	Less than 20 percent	Less than 20 percent	Greater than or equal to 60 percent

When the cluster system was first developed for the 2002–12 projections, the Current Population Survey (CPS) was the source of educational attainment data. For the 2006–16 projections, the CPS was replaced as the source of educational attainment data by the American Community Survey (ACS). (For more information on this change, see the note on methodology later in this chapter.)

The cluster system categorizes occupations on the basis of the educational attainment of 25- to 44-year-olds working in the occupation because these younger workers were assumed to better reflect current hiring practices than information on all workers would.

This system highlights the fact that there are often multiple pathways into an occupation. For example, according to 2005–06 ACS data, 51 percent of electricians aged 25 to 44 years have a high school diploma or less, whereas 42 percent have some college or an associate degree as their highest level of educational attainment. The education cluster system, which assigns electricians to the high school/some college (HS/SC) cluster, has the advantage of being able to capture this split. However, it has the disadvantage of being less able to address the role of training and skills acquired outside of college in career preparation. The 11 category

classification system, which puts electricians into the long-term on-the-job training category, better addresses the skill requirements needed for a job.

Projecting education and training requirements

The two classification systems can be used to estimate the number of jobs that will fall into each education and training category. This provides information on the future training needs of the workforce. It can also provide an answer to the frequently asked question: "what is the outlook for college graduates?"

Projections by education and training category. Table I-1 provides the current and projected employment distribution, and the projected numerical and percent change of jobs within the 11 education and training categories. It also lists the total number of job openings by education and training category that are expected over the 2006–16 decade. These openings are due to growth and the need to replace workers who permanently leave the occupation. (A discussion of the calculation of replacement needs can be found in chapter V of this bulletin.)

As table I-1 shows, short-term and moderate-term on-the-job training are by far the largest education and training categories. In 2006, 34.7 percent of all jobs were assigned to the short-term on-the-job training category and 18.1 percent were assigned to the moderate-term on-the-job training category meaning that these jobs can usually be learned in 1 year or less. Over the 2006–16 decade, 54.5 percent of total job openings fall into one of these two on-the-job training categories.

These two categories, however, make up a slightly smaller proportion of projected total jobs. Jobs requiring postsecondary awards and degrees make up a larger proportion of projected jobs, and jobs that primarily require a doctoral degree are expected to increase the fastest—but to generate relatively few new jobs. Most of these new jobs will stem from growth of postsecondary teachers. Occupations for which a bachelor's degree is the most significant source of education or training are expected to gain the largest share of employment over the 2006–16 decade—rising from 12.3 percent in 2006 to 13.0 percent in 2016.

Projections by educational attainment cluster. The cluster classification system also can be used to assess the future education requirements. The number of jobs in each of the six cluster categories can be projected, and these projections can be combined and modified to project the number of jobs to be filled by those with a high school diploma or less, those with some college, and those with a bachelor's or higher degree.

Employment projections by educational attainment cluster are presented in table I-2. As shown only two clusters—some college/college occupations and college occupations—are expected to have an increasing proportion of jobs between 2006 and 2016. These two clusters will rise from 26.7 percent to 28.0 percent of all jobs during the decade, meaning that jobs usually filled by the most highly educated workers are expected to increase fastest over this period. Still, by far the highest proportion of jobs in both 2006 and 2016—47.4 percent and 46.5 percent, respectively—fall into the high school/some college (HS/SC) cluster.

With modification, the six educational attainment clusters can serve as the basis for projecting the number of jobs that fall into three major educational attainment groups: workers with a high school degree or less, those with some college, and those with a bachelor's or higher degree. To arrive at the projection by these three broad educational attainment groups, the proportion of jobs within each of the six clusters that is filled by those with

Table I-1. Employment and total job openings by education and training category, 2006 and projected 2016
(Numbers in thousands)

Most significant source of education and training	Employment				2006–16 change		Total job openings due to growth and net replacement needs, 2006–16 ¹	
	Number		Percent distribution		Number	Percent	Number	Percent distribution
	2006	2016	2006	2016				
Total, all occupations	150,620	166,220	100.0	100.0	15,600	10.4	50,732	100.0
First professional degree.....	1,970	2,247	1.3	1.4	277	14.0	638	1.3
Doctoral degree.....	2,025	2,462	1.3	1.5	437	21.6	793	1.6
Master's degree	2,167	2,575	1.4	1.5	409	18.9	819	1.6
Bachelor's or higher degree, plus work experience.....	6,524	7,117	4.3	4.3	592	9.1	2,008	4.0
Bachelor's degree	18,585	21,659	12.3	13.0	3,074	16.5	6,706	13.2
Associate degree	5,812	6,899	3.9	4.2	1,087	18.7	2,240	4.4
Postsecondary vocational award	7,901	8,973	5.2	5.4	1,072	13.6	2,491	4.9
Work experience in a related occupation.....	14,579	15,889	9.7	9.6	1,310	9.0	4,126	8.1
Long-term on-the-job training....	11,489	12,200	7.6	7.3	711	6.2	3,272	6.5
Moderate-term on-the-job training	27,230	29,248	18.1	17.6	2,018	7.4	7,516	14.8
Short-term on-the-job training ...	52,339	56,951	34.7	34.3	4,613	8.8	20,123	39.7

¹ Total job openings represent the sum of employment increases and net replacements. If employment change is negative, job openings due to growth are zero and total job openings equal net replacements.

NOTE: Detail may not equal total or 100 percent due to rounding.

a high school diploma or less, some college, or a bachelor's or higher degree is determined. Projected employment change in an occupation is assigned to the three groups based on the education cluster assigned to the occupation. If the occupation is a high school (HS), some college (SC), or college (C) occupation, all jobs are projected to require this level of educational attainment. If the occupation is a "mixture occupation," that is, it is composed of two or three levels of educational attainment; projected jobs are distributed according to the existing ratio of workers who fall into the educational attainment groups comprising the cluster.

For example, for college (C) occupations (those with 60 percent or more of workers having a bachelor's or higher degree), it is assumed that all jobs in the occupation require a college degree.

Exhibit 2. Projecting jobs by educational attainment group

Education cluster	Proportion of projected jobs assigned to three educational attainment groups
HS	All projected jobs are considered "high school" jobs
HS/SC	Projected jobs are assigned to "high school" or "some college" based on the actual 2006 proportion of workers in the cluster with a high school degree or less and the proportion with some college
SC	All projected jobs are considered "some college" jobs
HS/SC/C	Projected jobs are assigned to all three groups based on the actual 2006 proportion of workers in the cluster with each level of educational attainment
SC/C	Projected jobs are assigned to "some college" or "college" based on the actual 2006 proportion of workers in the cluster with some college and the proportion with a college or higher degree
C	All projected jobs are considered college jobs
HS/C	Projected jobs are treated the same as HS/SC/C jobs

For a mixture occupation, such as some college/college (SC/C), it is assumed that all jobs in the cluster either require some college or a bachelor's or higher degree. To calculate the number of "some college" jobs in the occupation, analysts compute the ratio of the workers in that occupation who have some college to the workers who have some college or a bachelor's or higher degree. The number of "some college" jobs in the occupation is the value of this ratio multiplied by the employment level of the occupation. The procedure is applied to the other mixture occupations.

In this analysis, this technique was applied to data for 2006 and data for the projected 2006–16 decade.

The following tabulation summarizes how employment growth is assigned to the three educational attainment groups of high school or less (high school), some college (some college), and bachelor's or higher degree (college) in the education cluster classification system.

What does this assignment method reveal about the projections of employment by educational attainment over the 2006–16 decade? As Table I-3 shows, the projected change in employment for each of the 753 detailed occupations was assigned to the three educational attainment groups (high school or less, some college, and bachelor's or higher degree). Among these three groups, jobs projected to be filled by workers with a high school degree or less will account for the largest share, 43.0 percent, of all jobs in 2016. However, the jobs expected to be filled by those with a bachelor's or higher degree are expected to grow fastest at 14.8 percent.

Taking growth and replacement needs into consideration, a greater proportion of total job openings are projected to be filled by workers with at least some college rather than by those with a high school degree or less. An estimated 57.3 percent of job openings are expected to be filled by those with some college or a bachelor's or higher degree, whereas 42.7 percent of jobs are expected to be filled by those with only a high school degree or less. This figure is most likely an underestimate because the method for

Table I-2. Employment and total job openings, 2006–16 by six education clusters
(Numbers in thousands)

Education cluster	Employment				Change			Total job openings due to growth and net replacements, 2006–16 ¹	
	Number		Percent distribution		Number	Percent distribution	Percent	Number	Percent distribution
	2006	2016	2006	2016					
Total.....	150,620	166,220	100.0	100.0	15,600	100.0	10.4	50,732	100.0
High school occupations.....	16,959	18,115	11.3	10.9	1,155	7.4	6.8	5,511	10.9
High school/some college occupations.....	71,343	77,296	47.4	46.5	5,953	38.2	8.3	23,077	45.5
Some college occupations.....	287	340	.2	.2	53	.3	18.4	97	.2
High school/some college/college occupations.....	21,883	24,003	14.5	14.4	2,120	13.6	9.7	7,710	15.2
Some college/ college occupations.....	22,137	25,450	14.7	15.3	3,313	21.2	15.0	7,749	15.3
College occupations.....	18,011	21,017	12.0	12.6	3,006	19.3	16.7	6,587	13.0

¹ Total job openings represent the sum of employment increases and net replacements. If employment change is negative, job openings due to growth are zero and total job openings equal net replacements.

assigning projected employment to educational category assumes no upgrading of educational requirements for occupations over the projection decade.

Results and applications of the two classification systems

Combining the two classification systems—the 11 education and training categories and the 6 educational attainment clusters—uses the strengths of each system to provide further insight into the education and training requirements of jobs. For example, both stonemasons and maids and housekeeping cleaners are high school (HS) occupations under the cluster system. According to the 11 category system, however, stonemasons usually need long-term on-the-job training, whereas maids and housekeeping cleaners usually need short-term on-the-job training. Their respective earnings reflect, in part, the differences in training requirements; stonemasons’ median annual wages of \$35,960 in May 2006 were more than double the \$17,580 median annual wages of maids and housekeeping cleaners. Similar differences exist within each education and training category.

Similarly, both stonemasons and police and sheriff’s patrol officers usually need long-term on-the-job training. However, their educational attainment is quite different. Eighty-two percent of stonemasons have a high school diploma or less, whereas 85 percent of police and sheriff’s patrol officers have attended some college or have completed college. Compared with stonemasons’

median annual wages of \$35,960 in May 2006, police and sheriff’s patrol officers’ median annual wages in May 2006 were \$47,460. Again, the respective earnings in each of these two occupations reflect, in part, differences in educational attainment.

Table I-4 shows the distribution of 2006 and projected 2016 employment and percent change by education or training category and by educational attainment cluster. This table shows the increasing importance of education for job seekers in qualifying for future jobs. In fact, the table suggests that the fastest job growth will be in occupations at the higher end of the education spectrum under both classification systems. Although all but one category is expected to gain jobs during the projections decade, high school (HS) and high school/some college (HS/SC) jobs requiring primarily on-the-job training are projected to grow the slowest. However, high school/some college (HS/SC) occupations requiring mostly short-term and moderate term on-the-job training are expected to account for 35 percent of all jobs, even though they are projected to have slower than average growth.

Occupations with above-average growth and above-median wages by education cluster.

Career advisors, students, and job seekers often want to know which jobs offer the best career opportunities and highest wages. Table I-5 sorts occupations by educational cluster and, within each cluster, lists only those occupations that are both growing

Table I-3. Employment and total job openings by three education clusters, 2006 and projected 2016
(Numbers in thousands)

Education cluster	Employment				Change			Total job openings due to growth and net replacements, 2006–16 ¹	
	Number		Percent distribution		Number	Percent distribution	Percent	Number	Percent distribution
	2006	2016	2006	2016					
Total.....	150,620	166,220	100.0	100.0	15,600	100.0	10.4	50,732	100.0
High school graduate or less.....	66,365	71,484	44.1	43.0	5,119	32.8	7.7	21,656	42.7
Some college.....	46,229	51,074	30.7	30.7	4,845	31.1	10.5	15,534	30.6
Bachelor’s degree or higher.....	38,026	43,663	25.2	26.3	5,637	36.1	14.8	13,542	26.7

¹ Total job openings represent the sum of employment increases and net replacements. If employment change is negative, job openings due to growth are zero and total job openings equal net replacements.

NOTE: Detail may not equal total or 100 percent due to rounding.

faster than the average for total employment—10.4 percent—and have annual wages above the May 2006 median—\$30,400. These “above-average” occupations are expected to provide good job opportunities for new entrants into the workforce, although in almost every occupation, some workers earn significantly higher than the occupation’s median wages. Moreover, job growth is only one measure of the demand for workers. For specific information on the job outlook for many occupations, see the 2008–09 *Occupational Outlook Handbook*.

Most of the above-average occupations are at the higher end of the educational spectrum, but there are some above-average jobs at every level of education and training. All six of the occupations with above-median wages and above-average growth included in the high school (HS) cluster relate to construction. The 40 above-average occupations in the high school/some college (HS/SC) cluster are varied, but many (such as plumbers) also are construction occupations; many are maintenance and repair occupations (for example, automotive service technicians) or transportation occupations (for instance, bus drivers).

The high school/some college/college (HS/SC/C) cluster contains mostly occupations where a bachelor’s degree or work

experience in a related occupation are the most significant sources of education or training to become proficient in the occupation. For many occupations in this cluster, a bachelor’s degree often substitutes for work experience or is required to work for some employers. Examples of HS/SC/C occupations are property managers, lodging managers, and construction inspectors.

The some college/college (SC/C) occupations on the above-average list include occupations, such as computer support specialists, insurance and real estate sales agents, paralegals, and police officers, that often require some postsecondary education and, increasingly, a college degree.

Not surprisingly, the numerous above-average occupations in the college (C) cluster mostly include professional occupations, such as teachers, engineers, and accountants and auditors.

There are many other criteria that can be used to derive a list of “above-average” or desirable jobs. The data and projections provided in this publication give analysts the ability to sort occupations according to a number of alternative characteristics.

Table I-4. Employment by education or training category and education cluster, 2006 and projected 2016
(Numbers in thousands)

Postsecondary education or training category	Education cluster								
	HS occupations			HS/SC occupations			SC occupations		
	2006	2016	Percent change	2006	2016	Percent change	2006	2016	Percent change
Short-term on-the-job training.....	10,526	11,280	7.2	34,144	37,384	9.5	8	10	21.9
Moderate-term on-the-job training.....	4,915	5,198	5.8	17,789	18,763	5.5	–	–	–
Long-term on-the-job training.....	1,466	1,584	8.1	7,204	7,555	4.9	–	–	–
Work experience in a related occupation.....	53	52	-0.6	5,496	6,030	9.7	52	58	11.5
Postsecondary vocational award.....	–	–	–	5,585	6,308	13.0	201	240	19.2
Associate degree.....	–	–	–	1,126	1,255	11.4	25	31	25.4
Bachelor’s degree.....	–	–	–	–	–	–	–	–	–
Bachelor’s or higher degree, plus work experience.....	–	–	–	–	–	–	–	–	–
Master’s degree.....	–	–	–	–	–	–	–	–	–
Doctoral degree.....	–	–	–	–	–	–	–	–	–
First professional degree.....	–	–	–	–	–	–	–	–	–

Postsecondary education or training category	Education cluster								
	HS/SC/C occupations			SC/C occupations			C occupations		
	2006	2016	Percent change	2006	2016	Percent change	2006	2016	Percent change
Short-term on-the-job training.....	7,498	8,094	8.0	162	183	12.6	–	–	–
Moderate-term on-the-job training.....	3,451	4,041	17.1	1,076	1,246	15.8	–	–	–
Long-term on-the-job training.....	821	853	3.8	1,998	2,208	10.5	–	–	–
Work experience in a related occupation.....	6,887	7,335	6.5	2,091	2,414	15.5	–	–	–
Postsecondary vocational award.....	1,244	1,461	17.4	871	964	10.7	–	–	–
Associate degree.....	145	156	7.5	4,515	5,457	20.8	–	–	–
Bachelor’s degree.....	1,330	1,527	14.8	6,983	8,190	17.3	10,272	11,941	16.3
Bachelor’s or higher degree, plus work experience.....	505	537	6.3	4,292	4,609	7.4	1,727	1,970	14.1
Master’s degree.....	–	–	–	124	148	19.3	2,043	2,427	18.8
Doctoral degree.....	–	–	–	25	31	21.5	1,999	2,431	21.6
First professional degree.....	–	–	–	–	–	–	1,970	2,247	14.0

The educational attainment distribution of occupations: A note on methodology

Since 2004, the Office of Occupational Statistics and Employment Projections has estimated the educational attainment distribution of employed 25- to 44-year-olds for each of the detailed National Employment Matrix occupations. For the 2002–12 and 2004–14 employment projections, the Current Population Survey (CPS) was the source of these data. Because of the size of the CPS survey, 3 to 5 years of data had to be combined for many of the occupations in order to meet BLS criteria for publication and statistical significance. Other occupations had to be estimated by proxy. For more information on how the CPS was used to derive educational attainment data by occupation see chapter I, Occupational Projections and Training Data, bulletin 2602.

Beginning with the 2006–16 employment projections, the American Community Survey (ACS) replaces the CPS as the source of educational attainment data by occupation. This relatively new Census Bureau survey is designed to replace the long-form version of the decennial census. This survey is based on a much larger sample of workers compared to the CPS, and thus provides greater accuracy in the assignment of educational attainment data to individual occupations. The ACS surveys about 3 million households annually, collecting demographic and employment information. The data developed for educational attainment were based upon the public microdata file, which includes about 1.5 million households or about half of the original sample. Two years of public microdata, 2005 and 2006, were used. With 2 years of data, the total sample includes about 3 million households, a substantially larger sample than was used in prior analyses.¹

Occupational information in the ACS is classified under a taxonomy that, while consistent with the 2000 Standard Occupational Classification (SOC) system, does not provide the same level of occupational detail as the National Employment Matrix. The ACS occupational classification includes 502 occupations but only publishes data for 465 occupations. The 2006–16 National Employment Matrix published projections for 753 detailed SOC-consistent occupations.

The ACS reduced 502 occupations to 465 occupations to maintain respondent confidentiality; the ACS does not publish microdata for occupations with a weighted estimated employment of less than 10,000. Instead, the ACS merged those occupations with related occupations to create a total of 465 occupations. Details of the occupational coding and of how these merged occupations were created can be found at the U.S. Census Web site: <http://www.census.gov/acs/www/Products/PUMS/C2SS/CodeList/2005/Occupation.htm>.

Because the ACS includes fewer occupations than the National Employment Matrix, proxy data was used for some Matrix occupations. For example, marketing and sales managers are a single occupation in the ACS, but are two distinct occupations in the Matrix. Since the ACS does not distinguish between the two occupations, the same levels of educational attainment were assigned to both occupations.

Switching to the ACS also led to a change in the methodology for suppressing unreliable data. Previously with the CPS, all data were suppressed for an occupation if the weighted employment

in the occupation fell under 10,000. If data were suppressed, they were replaced by one of several substitute data sources.

With the ACS, individual cells (for example, the percent of college graduates in a particular occupation) were suppressed rather than all data for that occupation. Instead of using alternate data sources, cells were simply suppressed. Thus, all of the data for this classification came from a single, uniform data source. Suppression decisions were made based upon the standard error relative to the estimated value of the cell.

As mentioned above, BLS analysts combined ACS data from 2005 and 2006 to create publishable estimates of educational attainment. With a 2-year sample, the standard error of every estimated value was calculated. For the 465 detailed ACS occupations, the standard error was calculated for the percent of workers with a high school degree or less in that occupation (HS), the percent with some college or an associate degree (SC), and the percent with a college or higher degree (C). With 465 occupations having 3 cells each (HS, SC, and C), there were 1,395 (465 x 3=1,395) estimated values. Only 118 of those 1,395 values were not published because the standard error values were too high. In all cases, the suppressed estimated value (the percent of workers in an occupation) was below the 20 percent level of significance for the classification systems.

In the unpublished data, one standard error exceeded 50 percent of the estimated value. For example, if 10 percent of workers in an occupation were estimated to have a college degree, then the data were not published if the standard error was greater than 5 percent.

Another part of the methodology for the education clusters was the determination that if fewer than 20 percent of workers in an occupation had a given level of education, that level should be ignored. Deciding on the 20-percent cutoff point required extensive research. When the education cluster system was first developed and preliminary results were examined, three cutoff points were proposed—15 percent, 20 percent, and 25 percent.

The first step in determining which level of significance to use involved studying the occupations that changed their education cluster when the cutoff point was changed. Of the occupations that changed categories, most did so between the 15 percent and 20 percent cutoff points. Far fewer occupations shifted categories between the 20 percent and 25 percent cutoff points. As the cutoff point increased, the number of occupations in mixture clusters—for example, high school/some college (HS/SC) compared to high school (HS)—decreased.

Moreover, an examination of the data suggested that the 20 percent cutoff level provided the most logical and reasonable cluster assignment for occupations with well-defined training paths. This examination of data also relied on the occupational expertise of analysts who develop employment projections and related information for the *Occupational Outlook Handbook* and other OOSEP publications.

¹ While preparing the educational attainment data for this edition of OPTD, results from the CPS and ACS were compared. The two surveys produced very similar results, and few occupations would have fallen into a different educational attainment category if the CPS had been used instead of the ACS.